

CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

# **APPENDIX 1**

Habitat Map







CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

# **APPENDIX 2**

Aquatic Ecology



# 1 Methodology

## **1.1** Selection of watercourses for assessment

All freshwater watercourses which could be affected directly or indirectly by the proposed project were considered as part of the current assessment. This included watercourses draining the proposed wind farm site as well as those crossed by the proposed grid connection route and turbine delivery route (where any works had potential to cause impacts). A total of n=40 locations were selected for detailed aquatic assessment (see Table 1 and Figure 1 below). Sites were grouped according to survey clusters, i.e. A (north of proposed project), B (within project site) and C (downstream of project site). An additional n=5 surveys locations (i.e., sites N1, N2, N3, N4 & N5) were surveyed in June 2021 to reflect the updated site infrastructural layout. The nomenclature for the watercourses surveyed is as per the Environmental Protection Agency's (EPA) online map viewer.

A fisheries assessment (including electro-fishing and fisheries habitat appraisal) and white-clawed crayfish survey was undertaken at n=35 sites in June-July 2020 (Table 1 and Figure 1). A fisheries appraisal (no electro-fishing) was undertaken at an additional n=5 locations in June 2021 to reflect the updated site infrastructural layout (i.e., sites N1, N2, N3 & N4 and N5).

A freshwater pearl mussel survey was conducted at seven locations along the River Laney and Awboy River (Table 2 and Figure 2).

Biological water quality sampling (Q-sampling) was undertaken at a representative sub-set of these sites (i.e., *n*=21 sites; A1, A2, A5, B6, B7, B8, B9, B10, B11, C3, C5, C7, C11, C12, C13, C17, N1, N2, N3, N4 & N5) (Figure 3).

Physiochemical water quality samples were taken from a total of *n*=15 sites (i.e., A1, A2, A5, B6, B7, B8, B9, B10, C7, C13, C17, N1, N2, N3 & N4).

This holistic approach informed the overall aquatic ecological evaluation of each site in context of the proposed wind farm project.

More specific aquatic methodology is outlined below and in the appendices of this report.

# Table 1 :*n*=40 aquatic survey locations for the proposed Ballinagree wind farm project, Co. Cork<br/>(watercourse names are according to the EPA)

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)
A1	Nadanuller Beg Stream	18N05	Carrigagulla	536890	587246
A2	Nadanuller Beg Stream	18N05	Carrigagulla	537742	587571
A3	Unnamed stream	n/a	Crinnaloo South	538409	587668
A4	Unnamed stream	n/a	Crinnaloo South	538946	587720
A5	Glen River	18G04	Inchamay South	540517	587756
B1	Carrigagulla Stream	19C22	Carrigagulla	536626	585034
B2	Unnamed stream	n/a	Knocknagappal	534010	584604
B3	West Ballinagree Stream	19W12	Knocknagappal	534023	583798
B4	Knocknagappal 19 Stream	19K04	Knocknagappal	534644	583730
B5	River Laney	19L01	Ballynagree West	535126	584076

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)
B6	River Laney	19L01	Ballynagree West	535248	583913
B7⁵	Unnamed stream	n/a	Ballynagree East	535968	584267
B8	River Laney	19L01	Ballynagree East	536600	583906
B9	Unnamed stream	n/a	Carrigagulla	538378	584701
B10	Ballynagree East Stream	19B21	Ballynagree East	536999	581849
B11	River Laney	19L01	Annagannihy	539060	582814
C1	Carrigthomas Stream	19C48	Knocknagappul	534443	582576
C2	Maulnahorna Stream	19M10	Rahalisk	533717	582074
C3	Carrigthomas Stream	19C48	Horsemount Bridge	534597	581268
C4	Rahalisk Stream	19R08	Knocknagappul	535030	580521
C5	Carrigthomas Stream	19C48	Coppeleenbawn Bridge	535286	579818
C6	Unnamed stream	n/a	Knocknagappul	536028	580673
C7	River Laney	19L01	Ballynagree West	536793	580028
C8	Lacknahaghny Stream	19L21	Lacknahaghny	536625	579348
C9	Unnamed stream	n/a	Carrigthomas	536313	579387
C10	Unnamed stream	n/a	Carrigthomas	535957	579674
C11	River Laney	19L01	Knocknagappul Bridge	535409	579769
C12	Awboy River	19A03	Awboy Bridge	534960	579216
C13	River Laney	19L01	Clonavrick Bridge	534605	578297
C14	Clonavrick Stream	19C74	Clonavrick	535048	577820
C15	Coolaniddane River	19C67	Caherbaroul	536466	577955
C16	Kilberrihert Stream	19K24	Derryroe	536269	577345
C17	Coolaniddane River	19C67	Caherbaroul	536005	577472
C18	Caherbaroul Stream	19C76	Caherbaroul	535712	577653
C19	Bealick Stream	19B45	Rockville	536620	577111
N1	West Ballynagree Stream	19W12	Knocknagappul	534473	583824
N2	River Laney	19L01	Knocknagappul	534962	584267
N3	Unnamed stream	n/a	Ballynagree East	535352	585631
N4	River Laney	19L01	d/s ford crossing at Carrigagulla	536666	583905
N5	Unnamed stream	n/a	Knocknagappul	534809	581860

<sup>&</sup>lt;sup>5</sup> Biological and physiochemical water quality sampling at this site was undertaken in May 2021



Figure 1: Overview of the *n*=40 aquatic survey locations for the proposed Ballinagree wind farm project, Co. Cork.

## 1.2 Desk Study

A sensitive species data request was submitted (9<sup>th</sup> November 2020) to the National Parks and Wildlife Service for the 10km grid squares containing and adjoining the proposed wind farm project (i.e., W28, W37, W38, W48 & W49) and was received on the 12<sup>th</sup> November 2020. Data held by the National Biodiversity Data Centre (NDBC) was also reviewed. Records for a number of rare or protected species were available although none overlapped directly with the wind farm boundary. However, several records overlapped with or shared hydrological connectivity with associated infrastructure (i.e., grid connection route, turbine delivery route).

## 1.3 Field Assessment

Surveys of the aquatic sites within the vicinity of the proposed project were conducted in June-July 2020, June 2021 and December 2021 (total of n=40 survey locations). Survey effort focused on both instream and riparian habitats approx. 150m upstream and 150m downstream of each sampling point (see Figure 1 above). The watercourses at each survey location were described in terms of the important aquatic habitats and species.

This helped to evaluate species and habitats of ecological value in the vicinity of each site. The aquatic baseline prepared informs mitigation for the proposed project.

A broad aquatic habitat assessment was conducted utilising elements of the methodology given in the Environment Agency's 'River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003' (EA, 2003) and the Irish Heritage Council's 'A Guide to Habitats in Ireland' (Fossitt, 2000). All sites were assessed in terms of:

- Physical watercourse/waterbody characteristics (i.e., width, depth etc.);
- Substrate type, listing substrate fractions in order of dominance (i.e., bedrock, boulder, cobble, gravel, sand, silt etc.);
- Flow type, listing percentage of riffle, glide and pool in the sampling area;
- An appraisal of the macrophyte and aquatic bryophyte community at each site;
- Riparian vegetation composition.

## 1.3.1 Otter signs

The presence of otter (*Lutra lutra*) at each of the *n*=40 aquatic survey locations was determined through the recording of otter signs within 150m of the survey area. The survey broadly followed the best practice survey methodology for otter as recommended by Lenton et al. (1980), Chanin (2003), Bailey & Rochford (2006) and CIEEM (2013). Otter signs included holts, couches, spraints, latrines, slides and prints, which are useful determinants of otter utilisation of watercourses. The location of signs was recorded via handheld GPS.

## **1.3.2** Catchment-wide electro-fishing and fisheries appraisal

A catchment-wide electro-fishing (CWEF) survey of the watercourses within the vicinity of the proposed wind farm (*n*=35 of 39 sites, Table 1, and Figure 1) was conducted in July 2020, following notification to Inland Fisheries Ireland (Macroom) and under the conditions of a Department of Communications, Climate Action & Environment (DCCAE) licence. The survey was undertaken in accordance with best practice and Section 14 licencing requirements.

Furthermore, a fisheries habitat appraisal of all *n*=40 aquatic survey sites was undertaken to establish their importance for salmonid, lamprey, European eel and other fish species. The baseline assessment considered the quality of spawning, nursery and holding habitat within the vicinity of the survey sites using Life Cycle Unit (salmonids) and Lamprey Habitat Quality Index scores (lamprey).

## **1.3.3** Fish stock assessment (electro-fishing)

A single anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) was used to electro-fish sites on both named and unnamed watercourses in the vicinity of the proposed Ballinagree wind farm during July 2020, following notification to Inland Fisheries Ireland (Macroom) and under the conditions of a Department of Communications, Climate Action & Environment (DCCAE) license. Both river and holding tank water temperature was monitored continually throughout the survey to ensure temperatures of 20°C were not exceeded, thus minimising stress to the captured fish due to low dissolved oxygen levels. A portable batterypowered aerator was also used to further reduce stress to any captured fish contained in the holding tank. Salmonids, European eel and other captured fish species were transferred to a holding container with oxygenated fresh river water following capture. To reduce fish stress levels, anaesthesia was not applied to captured fish. All fish were measured to the nearest millimetre and released in-situ following a suitable recovery period.

As three primary species groups were targeted during the survey, i.e., salmonids, lamprey, and eel, the electrofishing settings were tailored for each species. By undertaking electro-fishing using the rapid electro-fishing technique (see methodology below), the broad characterisation of the fish community at each sampling reach could be determined as a longer representative length of channel can be surveyed. Electro-fishing methodology followed accepted European standards (CEN, 2003) and adhered to best practice (e.g., CFB, 2008).

## 1.3.3.1 Salmonids and European eel

For salmonid species and European eel, as well as other incidental species, electro-fishing was carried out in an upstream direction for a 10-minute CPUE, an increasingly common standard approach for wadable streams (Matson et al., 2018). A total of approx. ≥75-100m channel length was surveyed at each site, where feasible, in order to gain a better representation of fish stock assemblages. At certain, more minor watercourse sites or sites with limited access, it was more feasible to undertake electro-fishing for a 5-minute CPUE. Discrepancies in fishing effort (CPUE) between sites are accounted for in the subsequent results section.

Relative conductivity of the water at each site was checked in-situ with a conductivity meter and the electrofishing backpack was energised with the appropriate voltage and frequency to provide enough draw to attract salmonids and European eel to the anode without harm. For the low to moderate conductivity waters of the sites (most draining upland/sandstone areas) a voltage of 250-300V, frequency of 40-45Hz and pulse duration of 3.5ms was utilised to draw fish to the anode without causing physical damage.

## 1.3.3.2 Lamprey

Electro-fishing for lamprey ammocoetes was conducted using targeted box quadrat-based electro-fishing (as per Harvey & Cowx, 2003) in objectively suitable areas of sand/silt, where encountered. As lamprey take longer to emerge from silts and require a more persistent approach, they were targeted at a lower frequency (30Hz) burst DC pulse setting which also allowed detection of European eel in sediment, if present. Settings for lamprey followed those recommended and used by Harvey & Cowx (2003), APEM (2004) and Niven & McAuley (2013). Using this approach, the anode was placed under the water's surface, approx. 10–15 cm above the sediment, to prevent immobilising lamprey ammocoetes within the sediment. The anode was energised with 100V of pulsed DC for 15-20 seconds and then turned off for approximately five seconds to allow ammocoetes to emerge from their burrows. The anode was switched on and off in this way for approximately two minutes. Immobilised ammocoetes were collected by a second operator using a fine-mesh hand net as they emerged.

Lamprey species were identified to species level, where possible, with the assistance of a hand lens, through external pigmentation patterns and trunk myomere counts as described by Potter & Osborne (1975) and Gardiner (2003).

## **1.3.4** Fisheries habitat

## 1.3.4.1 Salmonids

Fisheries habitat quality for salmonids was assessed using the Life Cycle Unit method (Kennedy, 1984; O'Connor & Kennedy, 2002) to map the *n*=37 riverine sites as nursery, spawning and holding habitat, by assigning quality scores to each type of habitat.

Those habitats with poor quality substrata, shallow depth and a poorly defined river profile receive a higher score. Higher scores in the Life Cycle Unit method of fisheries quantification are representative of poorer value, with lower scores being more optimal despite this appearing counter-intuitive.

# Table 2:Life Cycle Unit scoring system for salmonid nursery, spawning and holding habitat value (as<br/>per Kennedy, 1984 & O'Connor & Kennedy, 2002)

Habitat quality	Habitat score	Total score (three components)
Poor	4	12
Moderate	3	9-11
Good	2	6-8
Excellent	1	3-5

## 1.3.4.2 Lamprey

Lamprey habitat evaluation for each survey site was undertaken using the Lamprey Habitat Quality Index (LHQI) scoring system, as devised by Macklin et al. (2018). The LHQI broadly follows a similar rationale as the Life Cycle Unit score for salmonids. Those habitats with a lack of soft, largely organic sediment areas for ammocoete burrowing, shallow sediment depth (<10cm) or compacted sediment nature receive a higher score. Higher scores in this index are thus of poorer value (in a similar fashion to the salmonid Life Cycle Unit Index), with lower scores being more optimal. Overall scores are calculated as a simple function of the sum of individual habitat scores.

Larval lamprey habitat quality as well as the suitability of adult spawning habitat is assessed based on the information provided in Maitland (2003) and other relevant literature (e.g., Gardiner, 2003). Unlike the salmonid Life Cycle Unit index, holding habitat for adult lamprey is not assessed owing to their different migratory and life history strategies, and that electro-fishing surveys routinely only sample larval lamprey.

The LHQI scoring system provides additional information compared to the habitat classification based on the observations of Applegate (1950) and Slade et al. (2003), which deals specifically with larval (sea) lamprey settlement habitat. Under this scheme, habitat is classified into three different types: preferred (Type 1), acceptable (Type 2), and not acceptable for larvae (Type 3) (Slade et al. 2003). Type 1 habitat is characterized by soft substrate materials usually consisting of a mixture of sand and fine organic matter, often with some cover over the top such as detritus or twigs in areas of deposition. Type 2 habitat is characterized by substrates consisting of shifting sand with little if any organic matter and may also contain some gravel and cobble (lamprey may be present but at much lower densities than Type 1). Type 3 habitat consists of materials too hard for larvae to burrow including bedrock and highly compacted sediment. This classification can also be broadly applied to other lamprey species ammocoetes, including *Lampetra* species.

# Table 3:Lamprey Habitat Quality Index (LHQI) scoring system for lamprey spawning and nursery<br/>habitat value (Macklin et al., 2018).

Habitat quality	Habitat score	Total score (two components)
Poor	4	8
Moderate	3	6-7
Good	2	3-5
Excellent	1	2

## **1.3.4.3** General fisheries habitat

A broad appraisal / overview of the upstream and downstream habitat at each site was also undertaken to evaluate the wider contribution to salmonid and lamprey spawning and general fisheries habitat. River habitat surveys and fisheries assessments were also carried out utilising elements of the approaches in the River Habitat Survey Methodology (Environment Agency, 2003) and Fishery Assessment Methodology (O'Grady, 2006) to broadly characterise the river sites (i.e., channel profiles, substrata etc.).

## **1.3.5** Freshwater pearl mussel survey

A freshwater pearl mussel survey was undertaken on sections of the River Laney and Awboy River in June 2020 by Sweeny Consultancy under NPWS licence C15/2020. Methodology followed NPWS guidance (Anon, 2004).

Assessments were made of the habitat suitability for freshwater pearl mussels, based on the criteria of Hastie et al. (2000) and Skinner et al. (2003).

Outside of these targeted survey areas on the River Laney, a broad appraisal of pearl mussel habitat was undertaken at each of the n=40 aquatic survey locations.

River Name	Site Code	Site Name	Grid Ref. upstream end (ITM)	Stretch Surveyed
Laney	FPM1	Windfarm Site downstream of turbines	538025 583419	Ford to 200m downstream
Laney	FPM2	Lacknahaghny Br.	536896 579983	Bridge to 100m upstream and downstream
Laney	FPM3	Knocknagappul Br.	535467 579825	Bridge to 200m downstream
Awboy	FPM4	Awboy Br.	534902 579260	Laney confluence to 100m upstream

#### Table 4: Freshwater Pearl Mussel Survey Sites

Diver	C:+-		Grid Ref.				
River	Site	Site Name	upstream end		Stretch Surve	eyed	
Name	Code		(ITM)				
Laney	FPM5	Clonavrick Br.	534592 578381	100m downsti	upstream ream of bridge	to e.	100m
Laney	FPM6	Morris's Br.	535701 575743	100m downsti	upstream ream of bridge	to e.	100m
Laney	FPM7	Downstream of Clashavoon Stream confluence	536731 573787	Stream downst	confluence ream.	to	200m



Figure 2: Freshwater Pearl Mussel Survey Sites

## 1.4 White-clawed crayfish survey

White-clawed crayfish (*Austropotamobius pallipes*) surveys were undertaken at the aquatic survey locations under a National Parks and Wildlife (NPWS) open licence (no. C79/2020), as prescribed by Sections 9, 23 and 34 of the Wildlife Act (1976-2021), to capture and release crayfish to their site of capture, under condition no. 5 of the licence. As per Inland Fisheries Ireland recommendations, the crayfish licence sampling started at the uppermost site(s) of the wind farm catchment/sub-catchments in the survey area to minimise the risk of transfer invasive propagules (including crayfish plague) in an upstream direction. Hand-searching of instream refugia and sweep netting was undertaken according to Reynolds et al. (2010). Trapping of crayfish was not feasible given the small nature of most aquatic survey locations sampled. An appraisal of white-clawed crayfish habitat at each location was also carried out based on physical channel attributes, water chemistry and incidental records in mustelid spraint. Additionally, a desktop review of crayfish records within the wider Ballinagree catchment was undertaken.

## **1.4.1 Biological water quality (Q-sampling)**

Biological water quality sampling (Q-sampling) was undertaken at a representative sub-set of aquatic survey locations in July 2020, June 2021 and December 2021 (i.e., *n*=21 sites; A1, A2, A5, B6, B7, B8, B9, B10, B11, C3, C5, C7, C11, C12, C13, C17, N1, N2, N3, N4 & N5) (Figure 3). Macro-invertebrate samples were converted to Q-ratings as per Toner et al. (2005). All riverine samples were taken with a standard kick sampling hand net (250mm width, 500µm mesh size) from areas of riffle/glide utilising a three-minute sample. Large cobble was also washed at each site where present and samples were elutriated and fixed in 70% ethanol for subsequent laboratory identification. Any rare invertebrate species were identified from the NPWS Red List publications for beetles (Foster et al., 2009), mayflies (Kelly-Quinn & Regan, 2012), stoneflies (Feeley et al., 2020) and other relevant taxa (i.e., Byrne et al., 2009; Nelson et al., 2011).

Q Value	WFD Status	Pollution status	Condition
Q5 or Q4-5	High status	Unpolluted	Satisfactory
Q4	Good status	Unpolluted	Satisfactory
Q3-4	Moderate status	Slightly polluted	Unsatisfactory
Q3 or Q2-3	Poor status	Moderately polluted	Unsatisfactory
Q2, Q1-2 or Q1	Bad status	Seriously polluted	Unsatisfactory

#### Table 5: Reference categories for EPA Q ratings (Q1 to Q5)



Figure 3: Overview of the *n*=21 Q-sampling locations for the proposed Ballinagree wind farm project, Co. Cork

## **1.5 Physiochemical water quality**

Physiochemical water quality samples were collected from a total of n=15 aquatic survey locations (Figure 4) on  $18^{th}$  June 2020,  $1^{st}$  July 2020 or  $1^{st}$  June 2021 (i.e., A1, A2, A5, B6, B7, B8, B9, B10, C7, C13, C17, N1, N2, N3 & N4).

Samples were cooled and delivered to the laboratory on the same day for analysis. In order to collate a broad water quality baseline for the study area, a range of physio-chemical parameters for each site were laboratory-tested, namely;

- pH
- Alkalinity (mg CaCO<sub>3</sub>/l)
- Total Ammonia (mg N/l)
- Molybdate Reactive Phosphorus (MRP) (mg P/l)
- Total Oxidised Nitrogen (TON) (mg N/l)
- Dissolved Organic Carbon (DOC) (mg C/l)
- Biochemical Oxygen Demand (BOD) (mg O<sub>2</sub>/l)
- Chemical Oxygen Demand (COD) (mg O<sub>2</sub>/l)
- Suspended solids (mg/L)



Figure 4: Overview of the *n*=15 physiochemical water quality sampling locations for the proposed Ballinagree wind farm project, Co. Cork

## **1.6** Aquatic ecological evaluation

The evaluation of aquatic ecological receptors contained within this report uses the geographic scale and criteria defined in the 'Guidelines for Assessment of Ecological Impacts of National Road Schemes' (NRA, 2009).

## 1.7 Biosecurity

A strict biosecurity protocol including the Check-Clean-Dry approach was adhered to during surveys for all equipment and PPE used. Disinfection of all equipment and PPE before and after use with Virkon<sup>™</sup> was conducted to prevent the transfer of pathogens or invasive propagules between survey sites. Surveys were undertaken at sites in a downstream order to minimise the risk of upstream propagule mobilisation. Any aquatic invasive species or pathogens recorded within or adjoining the survey areas were geo-referenced

# 2 Desk Study Results

## 2.1 Sensitive species data

A total of n=6 records for freshwater pearl mussel (*Margaritifera margaritifera*) were available for the River Laney (locally pronounced 'Lane'), with multiple records also available for the River Blackwater downstream of Banteer (Figure 8B.3.1). A single record overlapped with proposed wind farm infrastructure (grid connection route crossing) at survey site C13 at Clonavrick Bridge on the River Laney (record from 2007). Aside from this record, several other potential hydrological source-receptor pathways to known pearl mussel populations were identified (see Figure 5 below).

Common frog (*Rana temporaria*) were widespread throughout 10km grid squares W28, W37, W38, W48 & W49 although none overlapped with the proposed wind farm footprint.

Otter *(lutra lutra)* records were also widespread throughout the relevant grid squares. Otter records were available for the upper Awboy River, Carrigthomas Stream at Horsemount Bridge (survey site C3), Glen River at Glencaum Bridge and the Nad River in several locations. Otter were also previously recorded on the River Laney at Carrigagulla Bridge (near survey site B11), Clonavrick Bridge (survey site C11) and Morris's Bridge. The species is widespread on the River Blackwater. No otter records overlapped within the wind farm boundary.



Figure 5: Distribution of freshwater pearl mussel (*Margaritifera margaritifera*) in the vicinity of the proposed project

## 2.2 EPA water quality data (existing data)

The following outlines the available water quality data for the watercourses in context of the proposed project. Only recent water quality (i.e., since 2018) is summarised below. EPA biological monitoring data was only available for the larger watercourses within the vicinity of the proposed wind farm project (i.e., River Laney, Awboy River and Glen River), with no data available for the smaller watercourses surveyed. Whilst there was no water quality data available for the Nadanuller Beg Stream draining to the north-east of the wind farm site, the downstream-connecting Nad River (18N01) achieved Q4-5 (high status) at station RS18N010400 in 2019.

Please note that biological water quality analysis was undertaken as part of this study, with the results presented in the Section 3.2.

## 2.2.1 River Laney

The River Laney (EPA code: 21F02, locally pronounced 'Lane') was the most significant watercourse draining the wind farm site, flowing in a loosely southerly direction before adjoining the River Sullane near Ford's Mill, Macroom. A number of survey watercourses adjoined the Laney (**Figure 1**). There was a total of four EPA biological monitoring stations which have been recently monitored on the river (i.e., since 2017). The uppermost of these (station code: RS19L010100) was located at Carrigagulla Bridge, approx. 0.35km upstream of survey site B11, and achieved Q4-5 (high status) water quality in 2019. Station RS19L010200 at Knocknagappul Bridge (aquatic survey site C11) also achieved Q4-5 (high status) water quality in 2017. Downstream of the survey area, stations RS12C030100 and RS19L010500, also achieved Q4-5 (high status) water quality in 2019. The River Waterbodies Risk for the River Laney was 'not at risk' according to the EPA (although it was considered 'at risk' in the lower reaches, near Macroom).

## 2.2.2 Awboy River

One of the larger Laney tributaries, the Awboy River (19A03) joined the Laney approx. 75m downstream of Awboy Bridge on the L3418 road. There was a single EPA biological monitoring station on the river, which achieved Q5 (high status) water quality at Awboy Bridge (station RS19A030200) in 2019. This equates to the highest possible water quality standard under the Water Framework Directive (i.e., pristine water quality). The River Waterbodies Risk for the Awboy River was 'at risk' according to the EPA.

## 2.2.3 Glen River

The Glen River (18G04) drained to the north of the wind farm boundary and adjoined the River Blackwater near Banteer. There were four biological monitoring stations with recent data on the river and all achieved Q4-5 (high status) in 2018 (the nearest of which was at Glencaum Bridge approx. 2.5km downstream of survey site A5).

# **3 Results of aquatic surveys**

The following section summarises each survey site in terms of aquatic habitats, physical characteristics and overall value for fish, freshwater pearl mussel, white-clawed crayfish and macrophyte communities. Biological water quality (Q-sample) and physiochemical water quality results are also summarised for each site, where applicable. Habitat codes are according to Fossitt (2000). Scientific names are provided at first mention only. Most sites were surveyed in July 2020 with a low number (N1-N4) surveyed in June 2021. An evaluation of the aquatic ecological importance of each survey location based on these aquatic surveys is provided and summarised in Table 10.

No significant constraints were noted in terms of data collection to inform the aquatic and fisheries surveys.

## **3.1** Aquatic survey location results

## **3.1.1** Site A1 – Nadanuller Beg Stream, Carrigagulla

Site A1 was located on the uppermost reaches of the Nadanuller Beg Stream (EPA code: 18N05, also known locally as the Owenaluggin River). The upland eroding watercourse (FW1) was characterised by glide and riffle sequences with localised pool habitat over boulder cascades. The channel was approximately 1m wide and 0.2m deep with peat-stained water at the time of survey. The deep U-shaped channel graded into a valley with shallow slopes adjoining upland conifer plantations (WD4, 10-15 years old). The substrata were dominated by bedrock (20%), boulder (30%), large cobble (20%) and peat, with only localised coarse and medium gravels. The substrata were moderately silted and featured a very high coverage of filamentous algae at the time of survey. The adjoining lands comprised of wet grassland (GS4), blanket bog and pockets of heath, with purple moor grass (*Molinia caerulea*), *Juncus* sp. rushes and marsh bedstraw (*Galium palustre*) dominating. Macrophytes were absent due to the high energy of the site. However, aquatic bryophyte coverage was high locally, with *Fontinalis squamosa* and common earwort (*Scapania undulata*) present on boulder tops.

No fish were recorded from site A1 via electro-fishing. The site was considered a poor salmonid habitat overall, with poor nursery, spawning and holding areas present. The small, high-energy stream was not considered of value to European eel and was unsuitable for lamprey. Fisheries potential improved further down the watercourse (i.e., site A2.). There was no suitability for freshwater pearl mussel. No white-clawed crayfish were recorded and there were no records for the species within the catchment. No otter signs were recorded during the survey and the site was considered of low suitability given its small size and upland nature.

Biological water quality, based on Q-sampling, was calculated as Q4 (good status) (Table 6). Molybdate reactive phosphorus (MRP) (0.043mg P/I) and total ammonia (0.094mg N/I) concentrations were high and, thus, the site failed meet the good status thresholds as set out under S.I. No. 77/2019 - European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (Table 9).



Plate 1: Representative image of site A1 on the Nadanuller Beg Stream, June 2020 (facing upstream)

## 3.1.2 Site A2 – Nadanuller Beg Stream, Carrigagulla

Site A2 was located on the upper reaches of the Nadanuller Beg Stream, approx. 1km downstream from site A1. The upland eroding watercourse (FW1) averaged 1.5-2m wide and 0.2-0.3m deep. Characteristic of a highenergy, upland site, the profile was dominated by shallow riffle and glide sequences over boulder/bedrock cascades with localised pool. Bank heights were 1.5m, with a U-shaped channel. The bed was dominated by small boulder and cobble with bars of bedrock, with gravel pockets interstitially. The substrata were clean and unbedded with very limited algae growth. The site was located in upland blanket bog (PB2) and localised wet grassland (GS4), with scattered grey willow scrub (*Salix cinerea*). Macrophytes were absent but instream moss cover was high, being represented by localised *Fontinalis squamosa* and common earwort.

Brown trout (*Salmo trutta*) was the only fish species recorded from site A2 via electro-fishing. The site was considered an excellent trout nursery, with the population dominated by juveniles. Spawning habitat was good, locally, although deeper holding habitat for adults was sparse (as were adult fish themselves). The small, highenergy stream was considered of low value to European eel and was unsuitable for lamprey. There was no suitability for freshwater pearl mussel. No white-clawed crayfish were recorded and there were no records for the species within the catchment. No otter signs were recorded during the survey and the site was considered of low suitability given its small size and upland nature.

Biological water quality, based on Q-sampling, was calculated as Q4 (good status) (Table 6).





## 3.1.3 Site A3 – unnamed stream, Crinaloo South

Site A3 was located on an unnamed stream at Crinaloo South, approx. 180m upstream of the Nadanuller Beg Stream confluence. The upland eroding watercourse (FW1) averaged just 0.5-1m wide and <0.2m deep. Characteristic of a high-energy, upland site, the profile was dominated by shallow riffle and glide sequences over boulder cascades with localised deeper pools. Bank heights were 1m, with a V-shaped channel. The riparian zone was colonised by bracken (*Pteridium aquilinum*) scrub (WS1). The substrata were dominated by large boulder and cobble with small pockets of coarse gravel interstitially. Siltation was moderate. Macrophytes were absent but bryophytes were present in the form of *Fontinalis squamosa* and common earwort, with pinnate scalewort (*Porella pinnata*) and yellow fringe moss (*Racomitrium aciculare*) also present.

Brown trout was the only fish species recorded from site A3 via electro-fishing. Low numbers of adult trout were recorded, with an absence of juveniles. The site was considered of moderate value for salmonids, overall. The small, high-energy stream was considered of low value to European eel (none recorded) and was unsuitable for lamprey. There was no suitability for freshwater pearl mussel. No white-clawed crayfish were recorded and there were no records for the species within the catchment. No otter signs were recorded during the survey and the site was considered of low suitability given its small size and upland nature.



Plate 3: Representative image of site A3 on an unnamed stream at Crinaloo South, July 2020

## 3.1.4 Site A4 – unnamed stream, Crinaloo South

Site A4 was located on a second unnamed stream at Crinaloo South, approx. 1.2km upstream of the Nadanuller Beg Stream confluence. The upland eroding watercourse (FW1) averaged 2-2.5m wide and 0.2m deep. Characteristic of a high-energy, upland site, the profile was dominated by shallow riffle and glide sequences over boulder cascades with localised deeper pools. Bank heights were 1.5m, with a U-shaped channel. The site was situated in an upland area bordering mature Sitka spruce (*Picea sitchensis*) plantations (WD4) with riparian areas of blanket bog. The substrata were dominated by large boulder and cobble with small pockets of coarse gravel interstitially. Siltation was moderate. Macrophytes were absent but bryophytes were present in the form of *Fontinalis squamosa* and common earwort on instream boulders.

Brown trout and European eel (*Anguilla anguilla*) were the only two fish species recorded from site A4 via electro-fishing. Trout were present in moderate numbers, with both adults and a low number of juveniles present. A single adult eel was also recorded. The river was considered a moderate nursery with moderate quality spawning locally. Holding habitat was also considered moderate. Eel habitat was moderate overall but the high-energy site was considered unsuitable for lamprey. There was no suitability for freshwater pearl mussel. No white-clawed crayfish were recorded and there were no records for the species within the catchment. No otter signs were recorded during the survey and the site was considered of low suitability given its small size and upland nature.



Plate 4: Representative image of site A4 on an unnamed stream at Crinaloo South, July 2020

## 3.1.5 Site A5 – Glen River, Inchamay South

Site A5 on the upper reaches of the Glen River (EPA code: 18G04) (bridge crossing CC-L95791-005.00) was an upland eroding watercourse (FW1) characterised by glide and riffle sequences with localised pool habitat over boulder cascades. The channel averaged 2m wide and 0.3m deep with peat-stained water at the time of survey. The shallow U-shaped channel was cut into a shallow sloping valley. The site drained an upland area which featured frequent coniferous afforestation (WD4). The adjoining lands comprised heath (south bank)) and wet grassland with pockets of heath to the north. The riparian zone featured open banks with low lying cover of soft rush (Juncus effusus), ferns, common sorrel (Rumex acetosa), bramble (Rubus fruticosus agg.), foxglove (Digitalis purpurea), heather (Calluna vulgaris), purple moor grass, rank grasses and occasional willow and rowan (Sorbus aucuparia). The substrata were dominated by boulder (30%), large cobble (40%) with coarse and medium gravels (20%). The remaining proportions comprised silt and small pockets of finer gravel in interstitial spaces, with a concrete apron near the bridge. The substrata were heavily covered with floc and filamentous algae. Macrophytes were not present upstream but downstream slower glide supported small beds of water crowfoot vegetation (Ranunculus sp.). The site had a high coverage of Fontinalis squamosa and Chiloscyphus polyanthos, with common earwort and yellow fringe moss also present. The presence of more than three indicator macrophyte/bryophyte species means the site's aquatic vegetative community was representative of the Annex I habitat 'Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation and aquatic mosses [3260]'.

Brown trout was the only fish species recorded from site A5 via electro-fishing. Trout were present in high numbers, with a high proportion of juveniles and a low number of adults present. The site was considered a very good nursery with locally good quality salmonid spawning habitat Holding habitat was also considered good in frequent, small deeper pools. Eel habitat was moderate overall but the high-energy site was considered unsuitable for lamprey. There was no suitability for freshwater pearl mussel. No white-clawed crayfish were recorded and there were no records for the species within the catchment. No otter signs were recorded during the survey and the site was considered of low suitability given its small size and upland nature.

Biological water quality, based on Q-sampling, was calculated as Q4 (good status) (Table 6).

Site A5 was located within the Boggeragh Mountains NHA (0002447), a site designated for peatlands. This site was therefore considered of national importance. The site also supported good-quality salmonid habitat, the presence of Annex I 'floating river vegetation' habitat and good status (Q4) water quality.



Plate 5: Representative image of site A5 on the Glen River (facing downstream from bridge)

## 3.1.6 Site B1 – Carrigagulla Stream, Carrigagulla

Site B1 was located on the Carrigagulla Stream (EPA code: 19C22) approx. 270m upstream of the L2758 road crossing. The semi-natural, upland eroding watercourse (FW1) featured roughly equal proportions of riffle, glide and pool habitat with no evident channel modifications. The stream averaged 1.5m wide and 0.2-0.3m deep with a strong flow at the time of survey. The profile was characteristic of high energy site (i.e., boulder cascade). The bed was dominated by small boulder and cobble with well-rounded coarse gravel. The substrata had light siltation and were unbedded and well-rounded indicating prevalent higher energy conditions. The V-shaped channel was bordered by semi-improved grassland (GA1, wet in nature) with the immediate riparian areas characterised by patches of gorse (*Ulex europaeus*) and bramble scrub (WS1) with localised willow. Bank heights were shallow and graded into the river valley at a low angle. Macrophytes were absent but some *Fontinalis squamosa* and common earwort was present.

Brown trout was the only fish species recorded from site B1 via electro-fishing. Trout were present in low numbers, with only small adults recorded. Despite this, nursery habitat was moderate overall, with locally good spawning habitat present, However, the high-energy, steep-gradient of the site reduced the fisheries value considerably. The site was of limited value for eel and considered unsuitable for lamprey. There was no suitability for freshwater pearl mussel. No white-clawed crayfish were recorded and there were no records for the species within the catchment. No otter signs were recorded during the survey and the site was considered of low suitability given its small size and upland nature. No otter signs were recorded during the survey and the site site was considered of low suitability given its small size and upland nature.



Plate 6: Representative image of site B1 on the Carrigagulla Stream, July 2020

## **3.1.7** Site B2 – unnamed stream, Knocknagappal

Site B2 was located on an unnamed stream in an upland area to the western boundary of the wind farm site. The channel represented an upland eroding watercourse (FW1) although it was 100% dry at the time of survey. However, the channel likely conveyed significant water flows following rainfall (i.e., non-perennial stream). Situated in a steep V-shaped channel, the dry stream averaged 1.5-2m wide in a 2-4m wide channel. The stream fell over a moderate gradient downstream of the road crossing, with a bed dominated by cobble and coarse gravels (both 35%), with occasional boulder and high fractions of sand. The bankfull height ranged from 3-4m and graded into (low intensity) improved agricultural pasture (GA1) downstream of the road culvert. The riparian zone featured sparse growth of nettle (*Urtica dioica*), soft rush, foxglove, marsh bedstraw, common sorrel and marsh thistle (*Cirsium palustre*) with scattered scrub patches of bramble, grey willow, gorse and fuchsia (*Fuchsia magellanica*). Rank grasses grew along the channel bed. The stream drained coniferous afforestation (WD4) and clear-fell (WD5) upstream, with agricultural pasture and coniferous afforestation (WD4) dominating downstream. Due to the dry channel, no macrophyte or aquatic bryophyte growth was present.

The stream offered no fisheries value at the time of survey (100% dry) and was considered to offer little if any fisheries value when conveying water given its small, high-gradient, high-energy upland nature. The site had no potential for freshwater pearl mussel or white-clawed crayfish given the seasonal, upland nature of the stream. No otter signs were recorded during the survey and the site was considered of low suitability given its small size and upland nature. No otter signs were recorded during the survey and the survey and the site was considered of low suitability given its small size and upland nature.



Plate 7: Representative image of site B2 on the upper reaches of an unnamed stream at Knocknagappul (site 100% dry during the survey period)

#### 3.1.8 Site B3 – West Ballinagree Stream, Knocknagappul

Site B3 was located in the uppermost reaches of the West Ballinagree Stream (EPA code: 19W12) at a local road crossing. The channel represented an upland eroding watercourses (FW1) although it was 100% dry at the time of survey. However, the channel likely conveyed significant water flows following rainfall (i.e., non-perennial stream). Situated in a deep U-shaped channel, the dry stream averaged <1m wide in a 1.5-2m wide channel with bankfull heights averaging 1m. The stream fell over a moderate gradient downstream of the road crossing, with a bed comprising 20% small boulder, 30% cobble, 20% medium gravel, 20% fine gravel and 10% sand. Silt or mud accumulations were absent. The site was situated in an upland area dominated by coniferous afforestation (Sitka spruce, WD4). Upstream of the site, the channel was situated in a mature block of Sitka spruce, with maturing coniferous plantation downstream. The riparian zone was heavily scrubbed (shading >95%) with a typical upland plant composition dominated by abundant grey willow and bramble (WS1). Nettle, foxglove, bilberry (*Vaccinium myrtillus*), common sorrel, marsh thistle, soft rush, bittercress (*Cardamine* sp.), rank grasses and terrestrial moss species such as big shaggy moss (*Rhytidiadelphus triquetrus*) were common. Due to the dry channel, no macrophyte or aquatic bryophyte growth was present.

The stream offered no fisheries value at the time of survey (100% dry) and was considered to offer little if any fisheries value when conveying water given its small, high-gradient, high-energy upland nature. The site had no potential for freshwater pearl mussel, white-clawed crayfish or otter given the seasonal, upland nature of the stream.

It was not possible to assess biological water quality at this site given a lack of water and flow.



Plate 8: Representative image of site B3 on the West Ballynagree Stream (100% dry during the survey period)

#### 3.1.9 Site B4 – Knocknagappal Stream, Knocknagappal

Site B4 was located on the lower reaches of the Knocknagappul Stream (EPA code: 19K04, approx. 50m upstream of the confluence with the River Laney. The natural upland eroding watercourse (FW1) averaged 1-1.5m wide and 0.1-0.2m deep in a deeply cut (near vertical-sided) U-shaped channel. Shallow glide and riffle dominated the site (40% each) with only localised plunge pools, some to 1m in depth but mostly shallower. Bankfull heights were 1.5-2m and the channel evidently conveyed significantly more water during spate conditions. Natural bank scouring was frequent, particularly on the many meanders at the site. The substrata were dominated by small cobble (40%) with occasional small boulder (5%). Fine to medium gravels were frequent (30% overall), with sand also present (10%). Some exposed peat was present locally. Although some silt plumes were present underfoot, overall siltation levels were low in this high-energy channel. The stream meandered through a valley floor with mosaics of lowland blanket bog (PB4) and degraded raised bog (PB1). Common plant species included purple moor grass, soft rush, heath milkwort (Polygala serpyllifolia), marsh lousewort (Pedicularis palustris), tormentil (Potentilla erecta) bog myrtle (Myrica gale) and localised bog cotton (Eriophorum angustifolium). The area was exposed to low intensity sheep grazing and the bank of the stream were open, with low-height scrub and rank grasses. There was no instream macrophyte growth given the typically high energy of the site (spate channel). The bryophyte community was also poorly represented with only very limited drab brook moss (Hygrohypnum luridum) on instream boulders.

Brown trout was the only fish species recorded from site B4 via electro-fishing. Only a low number of juveniles were recorded. However, the site was of good value overall for salmonids given good nursery habitat, moderate spawning and moderate holding areas. Salmonid habitat improved in the downstream-connecting River Laney. The site was of moderate value for eel (albeit none recorded) but was considered unsuitable for lamprey (i.e., high-energy, upland eroding spate channel). There was no suitability for freshwater pearl mussel. No white-clawed crayfish were not recorded and there were no records for the species within the catchment. No otter signs were recorded during the survey and the site was considered of low suitability given its small size and upland nature.



Plate 9: Representative image of site B4 on the Knocknagappul Stream (facing upstream from near River Laney confluence).

## 3.1.10 Site B5 – River Laney, Ballynagree West

Site B5 on the upper reaches of the River Laney (EPA code: 19L01) was located approx. 0.1km upstream of the Knocknagappul Stream confluence. The upland eroding watercourse (FW1) averaged 2-2.5m wide in a 3m wide channel with a shallow U-shaped profile. The depth averaged 0.2-0.4m in a shallow glide dominated habitat (60%). Riffles were frequent (30%) as the river flowed over a moderate gradient, with occasional small pools locally to 0.7m. The substrata typified a higher-energy site and was dominated by cobble (40%) and small boulder (20%), with good fractions of fine to medium gravels (30% overall). Sand was present, particularly in marginal areas. Some of these areas featured soft sediment but accumulations were sand-dominated, shallow (<2cm) and relatively compacted. Exposed clay/peat was present in some areas. The substrata were unbedded. Bankfull heights averaged 1-2m (lower on the eastern bank). Natural scouring was frequent at the site (i.e., undercut banks, frequent meanders). The site was bordered by a mature coniferous plantation (WD4) to the east, with a narrow border of alder (Alnus glutinosa) and grey willow alongside a riparian strip of wet grassland (GS4). The west bank featured lowland blanket bog/grassland habitat supporting purple moor grass, marsh thistle, gorse (low-lying), soft rush and common lowland blanket bog species such as common sorrel, marsh lousewort, heath milkwort and common catsear (Hypochaeris radicata). The banks were low and open with little to no shading of the river channel. There was no instream macrophyte growth in the high energy channel. However, a range of aquatic bryophytes were present locally including drab brook moss, Hygroamblystegium tenax, Chiloscyphus polyanthos and Racomitrium aciculare. Lemanea sp. algae was also present locally. Filamentous algae coverage was low (<1%) but indicated a source of enrichment.

Brown trout was the only fish species recorded from site B5 via electro-fishing, with a moderate number of juveniles and adults captured. Nursery habitat was considered good with locally good spawning habitat also present given the unbedded, clean nature of the smaller substrata. Holding habitat was limited but good nonetheless where present in localised deeper pools. European eel habitat was moderate but the value was reduced given the paucity of larger boulder refugia and deep pools.

The Laney at site B5 was not considered of any value to lamprey given the high-energy nature. There was low suitability for freshwater pearl mussel and none are known from the River Laney. No white-clawed crayfish were recorded and there were no records for the species within the catchment. No otter signs were recorded during the survey and the site was considered of low suitability given its upland nature.

Biological water quality was not assessed at this site.



Plate 10: Representative image of site B5 on the River Laney (facing downstream)

## **3.1.11** Site B6 – River Laney, Ballynagree West

Site B6 on the upper reaches of the River Laney (EPA code: 19L01) was located approx. 0.3km downstream from site B5. The upland eroding watercourse (FW1) averaged 2-2.5m wide in a 3m wide channel with a shallow U-shaped profile. The depth averaged 0.2-0.4m in a shallow glide dominated habitat (70%). Riffles were frequent as the river flowed over a moderate gradient, with occasional small pools to 0.6m. The substrata typified a higher-energy, spate site; cobble dominated (40%) with occasional boulder (10%), both of which retained some mobility. The site featured relatively high fractions of fine (20%) and medium gravels (20%) with sand in interstitial spaces and in slacker areas of flow. Bedrock was present but rare. There were no accumulations of fine sediment and overall levels of siltation were low with generally clean, unbedded substrata. Bankfull heights were invariably 1m. The site was situated between dense blocks mature coniferous afforestation (WD4, sitka spruce). The river was bound by very dense scrub (WS1) dominated by gorse, grey willow and bramble. Fuchsia was common throughout with frequent great woodrush (*Luzula sylvatica*), bugle (*Ajuga reptans*), marsh bedstraw and fern species spurge (get species). Riparian fringes were often wet along both banks and dominated by a mossy understory in addition to the aforementioned scrub species.

Shading was high (>90%) with tunnelling frequent. Given this, macrophyte growth was absent although there was localised *Racomitrium aciculare*, *Hygroamblystegium tenax* and claw brook moss (*Hygrohypnum ochraceum*) on the topside of boulder/cobble with occasional *Chiloscyphus polyanthos* on submerged substrata. The liverwort *Pellia epiphylla* was frequent on the river banks.

Brown trout was the only fish species recorded from site B6 via electro-fishing, with adults and a low number of juveniles present.

The site was considered a good salmonid habitat overall, with good quality spawning and moderate nursery habitat present, although deeper holding areas were scarce. European eel habitat was considered moderate (none recorded) but the value was reduced given the paucity of larger boulder refugia and deep pools. The high-energy upland site was unsuitable for lamprey. There was low suitability for freshwater pearl mussel and none are known from the River Laney. No white-clawed crayfish were recorded and there were no records for the species within the catchment. No otter signs were recorded during the survey and the site was considered of low suitability given its upland nature.

Biological water quality, based on Q-sampling, was calculated as Q4 (good status) (Table 6).



Plate 11: Representative image of site B6 on the River Laney (facing downstream)

## **3.1.12** Site B7 – unnamed stream, Ballynagree East (WF-HF9)

Site B7 (watercourse crossing WF-HF9) was located on a semi-natural unnamed stream at Ballynagree East at the site of a forestry access ford crossing, approx. 0.6km upstream from the River Laney confluence. The site was also the location of a proposed watercourse crossing (pre-cast box culvert). The upland eroding watercourse (FW1) averaged 2-2.5m wide (narrowed upstream) and 0.1-0.3m deep. The shallow U-shaped profile was dominated by shallow glide habitat (60%) with frequent riffles (30%) and only localised pool (10%). Bankfull height ranged from 0.5-1m. The stream flowed over a slight gradient and adjoined the River Laney approx. 0.4km downstream.

The stream was of moderate energy with a bed dominated by cobble (40%) and boulder (30%) substrata, which were moderately compacted. Fine to medium gravels and sands were present locally in interstitial spaces and on the channel margins (30% overall). Siltation was moderate with plumes visible underfoot. The site was bordered to the west by mature coniferous plantations (WD4), with an area of replanted clear-fell located upstream and downstream on the east bank. Improved agricultural pasture (GA1) bordered the stream further downstream on the east bank. Riparian shading was high (>90%) with tunnelling frequent throughout the site, particularly upstream. Dense scrub of grey willow, gorse, fuchsia, bramble and scattered mature sitka spruce bordered the channel. Given the high shading, macrophyte growth was not present.

However, there was relatively high cover (50%) of aquatic bryophytes with species *Hygrohypnum ochraceum*, *Chiloscyphus polyanthos* and *Fontinalis squamosa* dominating. Water-forget-me-not (*Myosotis scorpioides*) was present locally in more open marginal areas of damp ground. Crescent cup liverwort (*Lunularia cruciata*) was present on muddy banks and on the topside of larger instream boulders. Filamentous algae coverage was low (<1%) but indicated a source of enrichment.

Brown trout was the only fish species recorded from site B7 via electro-fishing, with a low number of adults and juveniles present. The site was considered to have moderate nursery and spawning value for salmonids that would have been higher if not bordered by conifers (abundant pine needle deposition on bed and sedimentation visible). Holding habitat was moderate at best. European eel habitat was considered moderate but none were recorded. The high-energy upland site was unsuitable for lamprey. There was no suitability for freshwater pearl mussel. No white-clawed crayfish were recorded and there were no records for the species within the catchment. No otter signs were recorded during the survey and the site was considered of low suitability given its upland nature.

Biological water quality, based on Q-sampling (June 2021), was calculated as Q4-5 (high status) (Table 8).



Plate 12: Representative image of site B7 on an unnamed stream at Ballynagree East (at forestry track ford crossing and watercourse crossing WF-HF9)

## 3.1.13 Site B8 – River Laney, Ballynagree East

Site B8 on the upper reaches of the River Laney (EPA code: 19L01) was located approx. 4.7km downstream from site B6, at a forestry track ford crossing and 0.3km downstream of the wind farm boundary. The upland eroding river (although more depositing than upstream) averaged 4-5m in width and 0.2-0.6m in depth. The shallow U-shaped channel (bankfull height 1-2m) was dominated by slow flowing, relatively deep glide >0.5m (50%) and pool habitat (30%), with occasional riffles. Some pools were >1m deep, locally. The substrata were comprised primarily of relatively clean, unbedded cobble and medium to coarse gravels (50%) overall, with occasional larger boulder (20%, particularly upstream).

Significant amounts of sands were also present (20%), particularly in association with macrophyte beds downstream of the ford. Overall, siltation was light but present. The site was adjoined by maturing coniferous afforestation (WD4) on all sides. The banks were heavily scrubbed although the channel suffered only light shading. Scrub composed of grey willow, gorse, bramble dominated the riparian zone, with other common species including foxglove, soft rush, meadowsweet (*Filipendula ulmaria*), agrimony (*Eupatorium cannabinum*), fuchsia and fern species. Instream macrophytes were frequent upstream and downstream of the ford, with water crowfoot (*Ranunculus* sp.) dominating (20% cover overall) – this provided some good salmonid nursery areas. Hemlock water dropwort was occasional on exposed gravel shoals and along the margins. The aquatic bryophyte community consisted of common *Fontinalis squamosa* with more occasional *Hygroamblystegium tenax* and *Chiloscyphus polyanthos*. The presence of more than three indicator macrophyte/bryophyte species means the site's aquatic vegetative community was representative of the Annex I habitat 'Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation and aquatic mosses [3260]'.

Brown trout and European eel were the only fish species recorded from site B8 via electro-fishing. The trout population was dominated by adults although smaller numbers of juveniles were present also. A single adult eel was also captured. The site was considered a very good nursery and spawning area. It was also a very good holding habitat given the presence of deeper glide and pool. Despite a moderate value for lamprey (localised sediment accumulations) none were recorded. Despite good suitability for freshwater pearl mussel, none were recorded at this site. No white-clawed crayfish were recorded and there were no records for the species within the catchment. No otter signs were recorded during the survey and the site was considered of low suitability given its upland nature.

Biological water quality was not assessed at this site. Biological water quality, based on Q-sampling, was calculated as Q4 (good status) (Table 6).



Plate 13: Representative image of site B8 on the River Laney (facing downstream from ford crossing)

## 3.1.14 Site B9 – unnamed stream, Carrigagulla

Site B9 was located on the upper reaches of an unnamed stream at a farm access bridge crossing. The stream was a largely natural, upland eroding watercourse (FW1) which averaged 2.5m wide and 0.2-0.4m in depth. The channel featured a shallow U-shaped profile and was comprised primarily of shallow glide and riffle with occasional pools, especially on frequent meanders. Bankfull height was generally 1-1.5m. The substrata were dominated by cobble (40%) and boulder (20%) with occasional patches of fine to medium gravels. Siltation was moderate throughout slower-flowing areas of channel, with silt plumes present underfoot. The margins occasionally featured sand-silt accumulations. The site drained upland coniferous afforestation (WD4) and was bordered by mosaics of agricultural pasture (GA1) and species-poor wet grassland (GS4), dominated by soft rush with frequent willow and gorse scrub. The channel was heavily scrubbed in the vicinity of the survey site, with dense grey willow, bramble and gorse-dominated scrub lining both banks. Riparian shading was high (>75%), with few open areas of channel present (i.e., tunnelling). Localised marsh horsetail (*Equisetum palustre*) and coltsfoot (*Tussilago farfara*) were present upstream pf the bridge. Given the high shading, macrophyte growth was not present. However, *Fontinalis squamosa, Hygroamblystegium tenax* and *Chiloscyphus polyanthos* were common on instream substrata, with occasional *Scapania undulata* also recorded.

Brown trout and European eel were the only fish species recorded from site B9 via electro-fishing. The trout population was dominated by juveniles. A single juvenile eel was also captured. The site was considered a good salmonid nursery with moderate quality spawning (diminished because of heavily bedded substrata). Holding habitat also considered moderate locally (a small number of deeper pools present). Eel habitat was of moderate quality. The high-energy upland site was unsuitable for lamprey. There was no suitability for freshwater pearl mussel. No white-clawed crayfish were recorded and there were no records for the species within the catchment. No otter signs were recorded during the survey and the site was considered of low suitability given its small size and upland nature.

Biological water quality, based on Q-sampling, was calculated as Q4-5 (high status) (Table 6).



Plate 14: Representative image of site B9 on an unnamed stream at Carrigagulla

## 3.1.15 Site B10 - Ballynagree East Stream, Ballynagree East

Site B10 was located upstream of the L3418 road crossing on the upper reaches of the Ballynagree East Stream (EPA code: 19B21). The small, shallow, high-energy stream was an upland eroding watercourse (FW1) and averaged <1m in width and 0.05-0.15m deep. The channel was situated in a 6-7m wide steep incised V-shaped valley with bankfull heights of 3-4m. The stream flowed over a moderate to steep gradient and, resultingly, the profile was dominated by riffle (40%) with fast glide (40%). Pool habitat, although frequent, was limited in extent. The substrata were dominated by cobble (40%) and small boulder (30%) which were heavily silted in many areas (clay deposits, large silt plumes underfoot). Sand (20%) and clay-dominated silt accumulations were present, mostly in channel margins. Medium to coarse gravels were present locally. Both upstream and downstream of the survey site, the gradient decreased. The site was adjoined by improved agricultural grassland (GA1) both upstream and downstream of the bridge. The valley through which the stream flowed upstream of the bridge was steep and well-developed, with the rocky escarpment supporting mature sycamore (Acer psuedoplatanus), oak (Quercus sp.), blackthorn (Prunus spinosa) and sitka spruce. The understory comprised bilberry, opposite-leaved golden saxifrage (Chrysosplenium oppositifolium), creeping jenny (Lysimachia nummularia), ground elder (Aegopodium podagraria), wood sorrel (Oxalis acetosella) and fern species. Riparian shading was high and this precluded macrophyte growth, with none recorded present. The bryophyte community was poorly represented with local Hygroamblystegium tenax.

A single juvenile brown trout was the only fish recorded from site B10 via electro-fishing. The small, shallow high gradient stream (with heavy siltation) provided poor spawning, nursery or holding habitat and also offered little value for European eel. The upland eroding site was unsuitable for lamprey. There was no suitability for freshwater pearl mussel. No white-clawed crayfish were recorded and there were no records for the species within the catchment. No otter signs were recorded during the survey and the site was considered of low suitability given its small size and upland nature.

Biological water quality, based on Q-sampling, was calculated as Q4 (good status) (Table 6). The site failed to meet the EPA nitrate threshold for good status water quality (i.e., very high TON of 2.299mg N/I) (Table 9).



Plate 15: Representative image of site B10 on the Ballynagree East Stream

## **3.1.16** Site B11 – River Laney, Annagannihy

Site B11 on the River Laney (EPA code: 19L01) was located downstream of the confluence with the Annaginnihy Stream, approx. 0.3km downstream of Carrigagulla Bridge. The medium-sized, high-energy river was an upland eroding watercourse (FW1) which averaged 5-6m wide and 0.2-0.5m deep. The river flowed through a shallow U-shaped channel in an agricultural landscape (GA1) although maintained good riparian buffers of scrub. Characteristically, the profile was comprised primarily of riffle and fast glide (40% each) with frequent small pools, some of which were 1m in depth. The river was evidently exposed to high flow rates seasonally (i.e., spate channel) and the banks were frequently scoured and undercut locally. The substrata were dominated by boulder (40%) and large cobble (30%) with frequent bedrock (10%). Slack areas comprised smaller hard substrata (fine to coarse gravels). Sand was present locally in deeper pools (especially near the confluence). Siltation was light. A large pool located near the confluence was dominated by small cobble, finer gravels and sands. The site was adjoined by improved agricultural grassland (GA1) on both banks both upstream and downstream. The riparian buffers were dominated by grey willow and bramble/gorse scrub. Hawthorn was occasional. Non-native montbretia (Crocosmia x crocosmiiflora) was common throughout. Riparian shading was low. In terms of macrophytes, water crowfoot predominated (20% cover overall) with occasional water dropwort on gravel shoals and in channel margins. Fontinalis squamosa was abundant instream (30% cover) with frequent Hygrohypnum ochraceum, Chiloscyphus polyanthos and Racomitrium aciculare. The presence of more than three indicator macrophyte/bryophyte species means the site's aquatic vegetative community was representative of the Annex I habitat 'Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation and aquatic mosses [3260]'.

Brown trout was the only fish species recorded from site B11 via electro-fishing, with juveniles and adults present in moderate numbers. The site was a very good brown trout nursery, with moderate (locally good) spawning and some good (locally excellent) holding habitat. Instream macrophyte beds bolstered the nursery value of the site. European eel habitat was considered good throughout given undercut banks, ample boulder refugia and frequent pools although none were recorded. The high energy nature of the site precluded the presence of lamprey. There was low suitability for freshwater pearl mussel. No white-clawed crayfish were recorded and there were no records for the species within the catchment. No otter signs were recorded during the survey but the site was considered of moderate suitability.

Biological water quality, based on Q-sampling, was calculated as Q4 (good status) (Table 6).



Plate 16: Representative image of site B11 on the River Laney (facing downstream from Annaginnihy Stream confluence)

## **3.1.17** Site C1 – Carrigthomas Stream, Knocknagappul

Site C1 was located in the upper reaches of the Carrigthomas Stream (EPA code: 19C48). The site was represented by a small upland eroding watercourse (FW1) averaging 1m wide and 0.05-0.1m deep. The stream was considered likely non-perennial at this location. The channel flowed over a moderate gradient and the profile was dominated by shallow riffle (50%) with occasional riffle and limited shallow pool (10%). The stream flowed through a deeply cut, semi-natural deep U-shaped channel with frequent scouring indicative of spate tendencies. The substrata comprised cobble (40%), small boulder (30%), coarse gravel (10%), medium gravels (10%) and coarse sands (10%). Soft sediment accumulations were not present given the high energy of the site. The channel bankfull height was 1.1.2m and graded into heavily scrubbed riparian areas of grey willow, gorse, bracken and bramble, with a treeline of mature sitka spruce along the east bank. Riparian shading was very high (>90%) although the stream was more open further downstream. The riparian composition immediately bordering the stream on both the east and west banks comprised mostly mature shrubby grey willow with bracken foxglove bilberry, bramble, soft shield fern (Polystichum setiferum) and a well-developed terrestrial moss layer in the treeline understory. The site drained coniferous plantations (WD4) upstream, with improved pasture (GA1) downstream. The stream contained no macrophytes given the heavily shaded nature, high energy nature and very shallow water. However, Chiloscyphus polyanthos was present locally on instream cobble and boulder.

No fish species were recorded from site C1 via electro-fishing. The small, shallow possible seasonal site offered poor fisheries habitat overall, for both salmonids and eel. However, fisheries value improved significantly downstream (i.e., site C3). There was no suitability for lamprey, freshwater pearl mussel or otter given the site characteristics. No white-clawed crayfish were recorded and there were no records for the species within the catchment.



Plate 17: Representative image of site C1 on the Carrigthomas Stream, Knocknagappul

## 3.1.18 Site C2 – Maulnahorna Stream, Rahalisk

Site C2 on the Maulnahorna Stream (EPA code: 19M10) was a small, semi-natural upland eroding stream (FW1), averaging 0.75-1.5m wide and 0.1-0.15m deep. Located at a road crossing, the stream flowed over a moderate gradient upstream of the bridge before grading out and meandering downstream. The water level was low at the time of survey although the stream had capacity to convey significantly more water during higher flow periods (i.e., spate channel but likely non-perennial). The profile was dominated by shallow glide (50%) and frequent riffle (40%) with only localised pool to 0.2m max. Bankfull height varied from 0.5-1.5m in a shallow Ushaped channel (more V-shaped upstream). Given the high energy nature of the site, the substrata were moderately compacted. The substrata comprised 50% cobble, 20% boulder, 10% 20% medium gravel and 10% fine gravel/sand. Although some silt had accumulated underneath the bridge structure in association with an instream blockage (debris and livestock gate), siltation was light overall (i.e., clean substrata). Downstream of the bridge, the site was bordered by improved agricultural pasture (GA1) to the west with an immature sitka spruce plantation (WD4) and scrub border to the east. The riparian zone was exposed to low intensity sheep grazing and was typified by often dense patches of gorse, bramble and grey willow scrub. The channel was moderately shaded by riparian species. Macrophyte growth was largely absent although hemlock water dropwort was abundant along stream margins and on exposed gravel/cobble shoals instream. The bryophyte community was poorly represented, with only very localised Hygroamblystegium tenax present in the vicinity of the bridge.

No fish species were recorded from site C2 via electro-fishing. The narrow, shallow site was considered likely non-perennial which, despite some suitability as a salmonid nursery, precluded resident fish. There was no suitability for freshwater pearl mussel given the site characteristics. No white-clawed crayfish were recorded and there were no records for the species within the catchment. No otter signs were recorded during the survey and the site was considered of low suitability given its small size and upland nature.


Plate 18: Representative image of site C2 on the Maulnahorna Stream (downstream of bridge)

#### **3.1.19** Site C3 – Carrigthomas Stream, Horsemount Bridge

Site C3 on the Carrigthomas Stream (EPA code: 19C48, also known as the Glashreagh River) was located Horsemount Bridge, approx. 1.5km downstream from site C1. The stream was a semi-natural, upland eroding channel (FW1) draining both afforested (WD4) and agricultural pasture (GA1) areas upstream. The stream had been straightened locally near the bridge (30m section, downstream of concrete/cobble bridge apron) but retained a good natural, meandering profile further downstream. The channel averaged 2-2.5m wide but narrowed to <2m further downstream, with an average depth of just 0.1-0.15m in a shallow, U-shaped channel. Shallow glide (60%) and riffle (20%) dominated with occasional small pools, particularly downstream of the straightened section. The substrata were comprised predominantly of boulder (20%) and cobble (50%), although interstitial spaces featured medium and fine gravels (20% overall), with sand in channel margins (10%). The substrata were moderately compacted. Silt accumulations were not present although the site was suffering from moderate siltation overall (high clay-fraction silt plumes underfoot, evident agricultural impacts from livestock poaching upstream). The site was bordered by agricultural pasture on both banks (GA1), with WD4 sitka upstream in addition to more pasture. In the open section of channel in the vicinity of the bridge, the riparian zone was poorly developed (recovering from previous works) although further downstream the stream was bound by often dense scrub of grey willow, gorse and bramble. Tunneling was frequent. Macrophyte growth was sparse with only very limited water starwort (*Callitriche* sp.) and water mint (*Mentha aquatica*) present. A single small patch of round-leaved crowfoot (Ranunculus omiophyllus) was recorded immediately upstream of the bridge in the muddy paludal. The bryophyte community was poorly represented although some limited Chiloscyphus polyanthos was present locally on the topside of small boulders. Lemanea sp. algae was present occasionally on larger instream cobble and boulder.

Brown trout was the only fish species recorded from site C3 via electro-fishing, with juveniles predominating in relatively high numbers. A small number of small adults were also recorded, mostly confined to deeper pool areas near the bridge. The site was evidently a very good brown trout nursery, although this was compromised somewhat by virtue of evident siltation and substrata compaction. Nevertheless, some limited spawning habitat was present, along with localised holding areas (more so downstream). European eel habitat was moderate give the shallow nature of the site (none recorded).

The high energy nature of the site precluded the presence of lamprey. There was no suitability for freshwater pearl mussel. No white-clawed crayfish were recorded and there were no records for the species within the catchment. No otter signs were recorded during the survey and the site was considered of low suitability given its small size and upland nature.



Biological water quality, based on Q-sampling, was calculated as Q4 (good status) (Table 7).

Plate 19: Representative image of site C3 on the Carrigthomas Stream (facing downstream from Horsemount Bridge)

### **3.1.20** Site C4 – Rahalisk Stream, Knocknagappul (GCR-WCC15)

Site C4 on the Rahalisk Stream (EPA code: 19R08) was located immediately upstream of the confluence with the Carrigthomas Stream (pipe culvert, fish passable) at a proposed grid connection crossing (GCR-WCC15). The small, moderate-gradient upland eroding stream channel (FW1) averaged 0.5-0.75m wide and ≤0.05m deep. The water level was very low at the time of survey and the risk of the stream drying up was considered high during drier periods. The stream flowed in a steep, deep V-shaped channel with bankfull heights of 2-3m. Fast shallow glide and riffle dominated with no pool habitat apart from in association with the road culvert (0.2m max. depth). The substrata were composed predominantly of loose fine to medium gravel (40%) with frequent small cobble (35%) and small boulder (20%). Sand was occasional (10%), with localised shallow silt. The stream adjoined agricultural grassland (GA1) to the east and a small block of scrubby willow woodland (WD1) to the west. The riparian zone was very heavily scrubbed with dense (impenetrable) growth of bramble, nettle, gorse and bracken. Shading from terrestrial species was extremely high (>95%) and, as a result, there was no instream macrophyte growth. Some limited *Chiloscyphus polyanthos* was present on small cobble and boulder.

No fish were recorded via electro-fishing. Overall, the stream offered little fisheries value given the extremely shallow and overgrown nature of the channel. However, fisheries habitat improved in the downstream-connecting Carrigthomas Stream, underneath the local road crossing. There was no suitability for freshwater pearl mussel or otter given the site characteristics. No white-clawed crayfish were recorded and there were no records for the species within the catchment.

Biological water quality was not assessed at this site.



Plate 20: Representative image of site C4 on the Rahalisk Stream, Knocknagappul (heavily bound in scrub)

# **3.1.21** Site C5 – Carrigthomas Stream, Coppeleenbawn Bridge (GCR-WCC9)

Site C5 on the Carrigthomas Stream (EPA code: 19C48) was located downstream of the L3418 road and proposed grid connection crossing (GCR-WCC9), approx. 100m upstream from the River Laney confluence. Here, the stream was a semi-natural, upland eroding channel (FW1) which averaged 2-2.5m wide in a shallow U-shaped channel, with an average depth of 0.2-0.3m. Shallow glide dominated (60%) with frequent riffle areas (30%) and localised pool (10%) to a maximum of 0.3m. Bankfull height varied from 1.5-2m with frequent undercut banks throughout. Livestock poaching was prevalent along the southern bank (no riparian fencing) although siltation levels were light. The substrata were comprised predominantly of well-sorted gravels (50%) with frequent small cobble (30%) and localised boulder (20%). Sand and silt were present in marginal slacks (5% each). Silt was flocculent, where present. The substrata were loose and mobile throughout most of the survey section.

The site was bordered by agricultural pasture on both banks (GA1), with a scattered treeline and scrub mosaic on the north bank supporting grey willow and hawthorn with occasional osier (*Salix viminalis*), ash and alder. The scrub was dominated by bramble and gorse. Riparian shading was low overall, although high locally in more vegetated sections. Macrophyte growth was sparse with only localised hemlock water dropwort. The bryophyte community was poorly represented (low cover given mobile substrata) although some limited *Hygroamblystegium tenax* and *Hygrohypnum ochraceum* was present locally on the topside of small boulders. Filamentous algal cover was moderate locally (10% overall), although large sections of channel were free from algal impacts.

Brown trout was the dominant species recorded from site C5 via electro-fishing, with juveniles predominating in relatively high numbers. A small number of adults were also present in addition to a low number of *Lampetra* sp. ammocoetes.

The site was considered an excellent salmonid nursery (brown trout only), supporting mixed cohorts. Spawning habitat was good (locally very good, particularly near the Laney confluence in lower reaches) with holding habitat limited (moderate value). European eel habitat was moderate, at best, and none were recorded during electro-fishing. Two *Lampetra* sp. ammocoetes were recorded (likely brook lamprey given catchment migration barriers) – these were present in sub-optimal sand-flocculent silt heavily covered filamentous algae. Lamprey habitat was considered good given the presence of good spawning substrata although the lack of optimal soft sediment accumulations reduced the site's value overall. There was no suitability for freshwater pearl mussel. No white-clawed crayfish were recorded and there were no records for the species within the catchment. No otter signs were recorded during the survey but the site was considered of moderate suitability.

Biological water quality, based on Q-sampling, was calculated as Q3-4 (moderate status) (Table 7).



Plate 21: Representative image of site C5 on the Carrigthomas Stream downstream of Coppeleenbawn Bridge

### **3.1.22** Site C6 – Unnamed stream, Knocknagappul

Site C6 on an unnamed stream was located downstream of the L3418 road and proposed grid connection crossing (pipe culvert), approx. 0.75km upstream of the River Laney crossing. The small upland eroding watercourse (FW1) averaged 1-1.5m in width and just 0.05-0.1m in depth in a deep U-shaped channel. The moderate-energy stream had been straightened and deepened historically with old embankments present on the south bank. Roadside retaining walls were present upstream of the culvert. The profile was dominated by shallow glide with occasional riffle and very localised shallow pool to a maximum depth of 0.25m. The substrata were characterised by mixed gravels (more so medium and coarse) (40%) with frequent small cobble and boulder (40%). The substrata were both bedded and moderately silted throughout (heavy locally). The site was intermittently exposed to livestock poaching on both banks. Having flowed alongside the L3418 road (channel straightened), the stream flowed through intensive agricultural grassland (GA1) downstream of the road crossing. Here the channel was heavily bound in scrub (invariably impenetrable) dominated by bramble, nettle, gorse and grey willow. Mature ash and hawthorn were present intermittently along the channel.

Riparian shading was extremely high in most areas, with frequent tunnelling. Instream macrophytes were limited to very localised common water starwort (*Callitriche stagnalis*) and brooklime (*Veronica beccabunga*) in open areas of channel. *Scapania undulata* was occasional instream, in more open areas.

Brown trout was the only fish species recorded from site C6 via electro-fishing, with two small individuals captured. The site offered only moderate quality salmonid habitat, with a lack of deeper holding areas and only moderate quality nursery and spawning (siltation). European eel habitat was poor with none recorded via electro-fishing. Potential for lamprey existed but was low, with poor quality spawning substrata present (silted, bedded) and a lack of suitable sediment accumulations for larval burial. There was no suitability for freshwater pearl mussel. No white-clawed crayfish were recorded and there were no records for the species within the catchment. No otter signs were recorded during the survey and the site was considered of low suitability given its small size and shallow, high-energy nature.

Biological water quality was not assessed at this site.



Plate 22: Representative image of site C6 on an unnamed stream at Knocknagappul

# 3.1.23 Site C7 – River Laney, unnamed bridge, Ballynagree West

Site C7 on the River Laney (EPA code: 19L01) was located at a local road crossing (twin arch masonry bridge), approx. 1km south of Ballinagree village. The semi-natural upland eroding watercourse (FW1) featured some more lowland depositing characteristics. The channel averaged 6-8m wide and 0.3-0.5m deep, with frequent pools to >1.2m. Bank height ranged from <1 to 2m, with historical retaining walls on the north bank. The moderate energy site was characterised by deeper glide (50%) with frequent fast riffles (30%) and frequent pool areas (20%). In general, the river slowed and deepened downstream of the bridge (more deeper glide and pool), with faster glide and riffles dominating upstream. The substrata were dominated by clean, unbedded, well-mixed gravels and small cobble (60% overall), with occasional boulder (especially in vicinity of the bridge and downstream of the bridge) and sand (20%) in marginal areas and interstitial spaces. The site featured only light siltation and soft sediment accumulations were dominated by sand, where present. The site was adjoined by low intensity improved agricultural grassland (GA1) and mosaics of wet grassland (often dominated by soft rush but supporting a range of rank grass and herbaceous species also).

The riparian zones were well developed and comprised mature treelines of grey willow, alder, hazel (*Corylus avellana*), hawthorn, osier, sycamore and occasional ash with scattered cypress (*Cupressus* sp.) and sitka spruce. The scrubby understorey supported species including bramble, bracken, meadowsweet, foxglove, montbretia, broom (*Cytisus scoparius*), yellow iris (*Iris psuedacorus*) common valerian (*Valeriana officinalis*), gorse and rank grasses. Riparian shading was relatively low. Instream macrophyte growth was dominated by water crowfoot (20% cover) (especially downstream of bridge) with frequent *Fontinalis squamosa*. Hemlock water dropwort was common on exposed gravel shoals and in channel margins. *Chiloscyphus polyanthos* was frequent on instream cobble and boulder. Occasional *Hygroamblystegium tenax* was present on boulders. The presence of more than three indicator macrophyte/bryophyte species means the site's aquatic vegetative community was representative of the Annex I habitat 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation and aquatic mosses [3260]'. A dipper (*Cinclus hibernica*) nest was also recorded under the bridge.

Brown trout was the only fish species recorded from site C7 via electro-fishing. Mixed cohorts of brown trout were present, ranging from juveniles to larger adults. Site C7 offered excellent salmonid habitat overall, with combinations of excellent spawning (clean, unbedded gravels and cobble), excellent nursery habitat (particularly in the vicinity of *Ranunculus* beds and upstream of the bridge) and excellent holding habitat for adults (downstream of the bridge). European eel habitat was considered good given the presence of instream refugia although none were recorded during electro-fishing. Whilst optimal larval lamprey habitat was not present, areas of sub-optimal sand-dominated substrata were present in marginal areas and in association with *Ranunculus* beds. However, no ammocoetes were recorded during electro-fishing. Lamprey spawning habitat was of moderate quality locally, particularly in marginal slacks downstream of the bridge where lower flows were more amenable to the species. There was some suitability for freshwater pearl mussel, although none were recorded in surveys throughout the River Laney. No white-clawed crayfish were recorded and there were no records for the species within the catchment. No otter signs were recorded during the survey but the site was considered of good suitability due to healthy salmonid population and good foraging habitat.

Biological water quality, based on Q-sampling, was calculated as Q4 (good status) (Table 7).



Plate 23: Representative image of site C7 on the River Laney at an unnamed bridge, Ballynagree West

## **3.1.24** Site C8 – Lacknahaghny Stream, Lacknahaghny

Site C8 on the Lacknahaghny Stream (EPA code: 19L21) was a small, narrow upland eroding watercourse (FW1) located in the vicinity of a local road crossing (pipe culvert) and proposed grid connection crossing. The stream flowed between blocks of coniferous woodland (WD4) and averaged <0.75m wide and  $\leq$ 0.05m deep, in a steep V-shaped channel with bankfull heights of 2-3m. Although conveying low volumes of water at the time of survey, the channel was considered non-perennial. The substrata comprised coarse gravels and small cobble with occasional boulder although these were heavily silted and compacted. Water quality issues were evident, with near stagnant conditions and heavy peat staining. The stream meandered through dense scrub dominated by grey willow and bramble, with hogweed, gorse, common polypody, bilberry and fern species. The sitka spruce plantations flanked the channel on both banks, with a narrow alder border. Upstream of the road crossing, the channel drained a wet upland area dominated *Juncus* sp. rushes. The narrow channel featured heavy encroachment of terrestrial species and shading was invariably excessive. Macrophyte species were not present and the only bryophyte recorded was very localised *Scapania undulata* on instream boulders.

No fish were recorded from site C8 via electro-fishing. Site C8 offered no fisheries value at the time of survey and the channel was considered likely seasonal in its upper reaches, thus precluding resident fish. The site had no suitability for freshwater pearl mussel. No white-clawed crayfish were recorded and there were no records for the species within the catchment. No otter signs were recorded during the survey and the site was considered of low suitability given its small size and upland nature.



Biological water quality was not assessed at this site.

Plate 24: Representative image of site C8 on the Lacknahaghny Stream

### **3.1.25** Site C9 – unnamed stream, Carrigthomas

Site C9 was located on an unnamed stream in the vicinity of a local road and proposed grid connection crossing, approx. 0.5km upstream of the River Laney confluence. The stream was a very small, narrow upland eroding watercourse (FW1). The stream had been historically modified downstream of a local road crossing alongside a mature sitka spruce plantation (WD4), with extensive straightening and deepening evident.

The stream flowed in a deep V-shaped channel with bankfull heights of 2.5-3m. The stream averaged <1m wide and <0.05m deep at the time of survey, with a slight flow only. The substrata were dominated by small boulder and cobble (50%) with frequent sand accumulations. Iron oxide (bacterial) deposits were frequent on instream substrata (these are often associated with leachate from afforestation and low dissolved oxygen levels). Siltation was moderate locally. The profile was shallow fast glide dominated with frequent small plunge pools over a moderate gradient. The stream was heavily scrubbed over in the vicinity of the road crossing (impenetrable bramble and gorse scrub), with riparian shading also high as it flowed along the eastern boundary of the coniferous block. The small valley escarpment supported scrubby grey willow and bramble with foxglove, wood sorrel, common polypody, broad buckler fern (*Dryopteris dilatata*) and terrestrial mosses. There were no macrophytes instream given the high shading. *Scapania undulata* was occasional on instream cobbles.

No fish were recorded from site C9 via electro-fishing. Site C9 offered no fisheries value at the time of survey and the channel was considered likely non-perennial in its upper reaches, thus precluding resident fish. The site had no suitability for freshwater pearl mussel or otter. No white-clawed crayfish were recorded and there were no records for the species within the catchment.

Biological water quality was not assessed at this site.



Plate 25: Representative image of site C9 on an unnamed stream at Carrigthomas

### **3.1.26** Site C10 – unnamed stream, Carrigthomas

Site C10 was located on an unnamed stream in the vicinity of a local road and proposed grid connection crossing, approx. 185m upstream of the River Laney confluence. The small, shallow upland eroding watercourse (FW1) emanated from a pipe culvert pipe associated with the local road and joined a small unnamed stream which flow parallel to said road. The water level was low at the time of survey, with only low flows present and depths of 0.05-0.1m. The stream featured 1.5 to 2m bank heights in an often-steep, deeply-cut, V-shaped channel. Natural scouring was evident throughout the site (i.e., spate channel). The profile was featured slow-flowing glide over a moderate gradient with occasional riffle (10%) and frequent pool (70%). The substrata were dominated by a mix of bedrock (10%), small boulder (20%), cobble (40%), mixed gravels (20%) and sand (5%). The substrata were moderately silted (high clay fractions, 5%) given the low flows at the time of survey (i.e., deposition of sediment).

The site was adjoined by improved agricultural grassland (GA1) to the west and an alder plantation to the east (GA1 upstream). The riparian zone was heavily scrubbed by grey willow, bramble, foxglove, wild angelica (*Angelica sylvestris*), wood sorrel, hogweed, hedge bindweed (*Calystegia sepium*), ivy and fern species. Shading of the channel was high (>75%). Instream macrophyte growth was, thus, absent. However, some limited *Hygroamblystegium tenax* was present on the topside of instream boulders with occasional *Chiloscyphus polyanthos* on larger boulders.

No fish were recorded from site C10 via electro-fishing. Site C10 offered very low fisheries value at the time of survey and the channel was considered likely non-perennial, thus precluding resident fish. However, some limited, sub-optimal habitat was present for salmonids and European eel further downstream nearer to the Laney confluence (more deeper pools). The upland eroding site was unsuitable for lamprey. The site had no suitability for freshwater pearl mussel. No white-clawed crayfish were recorded and there were no records for the species within the catchment. No otter signs were recorded during the survey and the site was considered of low suitability given its small size and upland nature.

Biological water quality was not assessed at this site.



Plate 26: Representative image of site C10 on an unnamed stream at Carrigthomas, immediately downstream of the road culvert

# 3.1.27 Site C11 – River Laney, Knocknagappul Bridge

Site C11 on the River Laney (EPA code: 19L01) was located at Knocknagappul Bridge, a proposed grid connection crossing point. Downstream of Knocknagappul Bridge (a 3-arch structure), the swift-flowing river (FW1) averaged 6-8m in width and 0.2-0.4m deep, with locally deeper pools to 1.5m. The channel was considered semi-natural with a well-defined thalweg and bankfull heights of 1-1.5m. The profile was dominated by riffle and shallow, fast glide near the bridge with more predominant deeper glide habitat approx. 40m downstream. The riverbed comprised mostly mobile, unbedded cobble (40%) with frequent small boulder (30%) and medium to coarse gravels in the interstitial spaces and in marginal areas (20%). Sand was occasional (10%) and small accumulations were present in association with the bridge structure, instream macrophyte beds and further downstream in slacker areas of channel (i.e., pool). Siltation was light overall given the swift flows.

The site was adjoined by mosaics of agricultural grassland (GA1) and species-poor wet grassland (GS4), with soft rush frequent. Wetter areas along the riparian zone supported yellow iris and meadowsweet. The channel was flanked by treelines of mature grey willow with occasional ash, hawthorn and alder. Non-native montbretia was scattered throughout. Hemlock water dropwort was abundant along riparian areas and also common instream, with water crowfoot frequent (20% cover), particularly upstream of the bridge and downstream in deeper, slower glide habitat. Coverage of bryophytes was relatively high with frequent *Fontinalis squamosa*, *Chiloscyphus polyanthos* and *Hygroamblystegium tenax* on cobble and boulders. *Fontinalis antipyretica* was occasional. The presence of more than three indicator macrophyte/bryophyte species means the site's aquatic vegetation community was considered representative of the Annex I habitat 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation and aquatic mosses [3260]'. *Lemanea* sp. algae was also occasional throughout faster-flowing areas. Great scented liverwort (*Conocephalum conicum*) was present on muddy banks and the bridge structure.

Brown trout was the dominant fish species recorded from site C11 via electro-fishing. Relatively high numbers of mixed cohort brown trout were present, ranging from juveniles to larger adults. A single Atlantic salmon (*Salmon salar*) parr was also recorded (17.0cm FL). This was the only salmon recorded in the Ballinagree study area. The site was an excellent salmonid habitat, with good spawning substrata present throughout in addition to excellent quality nursery and holding habitat.

The site was considered of good value to European eel given the presence of deeper pool areas, scoured banks and large woody debris/boulder refugia in stream (however, none were recorded). Lamprey spawning habitat was present but localised (site more suited to salmonids) with sand-dominated sediment accumulations present locally in vicinity of the bridge and some instream *Ranunculus* beds (none recorded). There was some suitability for freshwater pearl mussel, although none were recorded in surveys throughout the River Laney. No whiteclawed crayfish were recorded and there were no records for the species within the catchment. No otter signs were recorded in the vicinity of the bridge although the site had high suitability for the species given the presence of a healthy salmonid population and good foraging habitat.

Biological water quality, based on Q-sampling, was calculated as Q4 (good status) (Table 7).



Plate 27: Representative image of site C11 the River Laney at Knocknagappul Bridge (facing downstream from bridge

### 3.1.28 Site C12 – Awboy River, Awboy Bridge (GCR-WCC8)

Site C12 on the Awboy River (EPA code: 19A03) was a medium-sized, moderate energy upland eroding watercourse (FW1). Located downstream of Awboy Bridge (proposed grid connection crossing GCR-WCC8) and 70m upstream of the River Laney confluence, the river averaged 4-5m wide and 0.2-0.4m deep. The largely-natural channel (modified upstream of the bridge, straightened through a residential garden) featured a bankfull height of 1-1.5m in a shallow U-shaped channel. Downstream of the bridge, the profile featured a repeating series of riffle-glide-pool sequences. Fast, shallow glide dominated (50%) with frequent riffles (30%) and localised pool, to a maximum depth of 0.8m. The substrata were dominated by cobble (50%) with frequent small boulder (30%) and localised bedrock (5%). Fine to medium gravels were present in interstitial spaces (10%), with occasional coarse gravels. Silt was largely absent given the high-energy nature of the site. The substrata were mostly unbedded and largely free from filamentous algae.

The site was bordered on both banks by agricultural grassland (GA1) with a mature riparian zone on both banks (willow/sycamore treelines with scrub). The mobile nature of the substrata combined with fast flows and shade discouraged macrophyte growth although some water crowfoot was present locally with hemlock water dropwort common in margins and on instream gravel shoals. *Chiloscyphus polyanthos* and *Fontinalis squamosa* dominated the bryophyte community. The presence of three indicator macrophyte/bryophyte species means the site's aquatic vegetation community was considered representative of the Annex I habitat 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation and aquatic mosses [3260]'. A single kingfisher was observed in flight near the bridge. No otter signs were recorded during the survey but given the presence of a healthy salmonid population and good foraging habitat

Brown trout was the only fish species recorded from site C12 via electro-fishing. Moderate numbers of mixed cohort brown trout were present, ranging from juveniles to larger adults. The site was evidently a good salmonid habitat, with good quality spawning, nursery and holding habitat present. Despite some good European eel suitability, particularly in vicinity of the bridge and in deeper pools, none were recorded. The high energy of the site and lack of sediment deposition precluded larval lamprey, despite some localised spawning habitat in slacker areas. No freshwater pearl mussels were recorded at this site. No white-clawed crayfish were recorded and there were no records for the species within the catchment. No otter signs were recorded during the survey but the site had high suitability for the species given the presence of a healthy salmonid population and good foraging habitat.

Biological water quality, based on Q-sampling, was calculated as Q4 (good status) (Table 7).



Plate 28: Representative image of site C12 the Awboy River at Awboy Bridge (facing downstream from bridge)

# **3.1.29** Site C13 – River Laney, Clonavrick Bridge (GCR-WCC7)

Site C13 on the River Laney (EPA code: 19L01) was located at Clonavrick Bridge, a proposed grid connection crossing point (GCR-WCC7). The river at this site was a high-energy large upland eroding watercourse (FW1), which averaged 10-12m wide and 0.6-1m in depth. The site was typified by deep, fast glide (60%) (up to 1.5m in depth upstream of the bridge) with occasional riffles areas and localised small pools.

Downstream of the bridge featured shallower, faster glide and riffles. The substrata were characteristic of a high-energy site with bedrock (10%), boulder (30%) and cobble (40%) dominating although there were good fractions of well-mixed (fine, medium, coarse) gravels in interstitial spaces and slacker areas of flow. Coarse sand was present locally (5%). Silt was absent given the high flow rates. Filamentous algae was very localised (almost absent). The site was flanked on both banks by mature treelines of ash, grey willow and sycamore with bramble-dominated scrub. In terms of macrophytes, water crowfoot was present locally (occasional) with hemlock water dropwort commonly present in margins and on exposed cobble/gravel shoals. *Fontinalis squamosa* was abundant on larger boulder and cobble, with *Chiloscyphus polyanthos* frequent. The presence of three or more indicator macrophyte/bryophyte species means the site's aquatic vegetation community was considered representative of the Annex I habitat 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation and aquatic mosses [3260]'. *Conocephalum conicum* was present on the bridge structure. A single otter spraint (old) was recorded underneath the bridge structure (ITM, 534606, 578288).

Brown trout was the only fish species recorded from site C13 via electro-fishing. Moderate numbers of mixed cohort brown trout were present, with juvenile size classes dominating over a smaller number of larger adults. Overall, site C13 was of excellent value to salmonids, with good spawning and nursery habitat in addition to excellent holding habitat (particularly downstream of the bridge) for larger adult trout. Despite good physical habitat for European eel (ample boulder refugia), none were recorded. The high-energy nature of the site precluded the presence of lamprey. No freshwater pearl mussels were recorded at this site, despite some suitability and historical records near the bridge.

No white-clawed crayfish were recorded and there were no records for the species within the catchment. No otter signs were recorded during the survey but the site had high suitability for the species given the presence of a healthy salmonid population and good foraging habitat.

Biological water quality, based on Q-sampling, was calculated as Q4 (good status) (Table 7).



Plate 29: Representative image of site C13 the River Laney at Clonavrick Bridge (facing back upstream towards bridge)

## 3.1.30 Site C14 – Clonavrick Stream, Clonavrick (GCR-WCC6)

The Clonavrick Stream (EPA code: 19C74) at site C14 was located at local road and proposed grid connection crossing (GCR-WCC6), approx. 0.4km upstream of the River Laney confluence. The <1m wide stream was semidry at the time of survey (0.05m deep max) with localised ponding and an imperceptible flow. The river had been extensively modified in the vicinity of the road crossing with a number of agricultural (pipe) culverts present downstream and recent drainage excavations adjoining the stream. Further downstream, the channel had been historically straightened but not deepened and sat in a shallow U-shaped channel. The substrata were heavily silted (plumes underfoot) and comprised coarse gravels and small cobble, with frequent silt accumulations – these were invariably flocculent. The stream was evidently suffering from enrichment and water quality issues, with a foul odour and discolouration present in addition to excessive siltation (mostly from livestock poaching). The stream flowed through agricultural grassland (GA1) with narrow riparian buffers open to regular livestock poaching. Upstream of the road crossing, the stream emanated in a small area of mixed woodland (WD1) supporting sitka spruce, sycamore and beech (*Fagus sylvatica*). Downstream, the stream was intermittently shaded by willow-dominated treeline with associated bramble and holly (*Ilex aquifolium*) scrub. Terrestrial encroachment of grasses (e.g., soft rush) was common instream. Filamentous algae (*Cladophora* sp.) was present (20% cover in those areas containing water).

No fish were recorded at site C14 via electro-fishing and the site was not of fisheries value at the time of survey given the lack of water and evidently poor water quality (i.e., siltation, enrichment etc.). However, fisheries habitat improved further downstream nearer the Laney confluence. There was no suitability for freshwater pearl mussel or white-clawed crayfish. No otter signs were recorded during the survey and the site was considered of low suitability given its small size.

Biological water quality was not assessed at this site.



Plate 30: Representative image of site C14 the Clonavrick Stream (downstream of road culvert)

# 3.1.31 Site C15 – Coolaniddane River, Caherbaroul

Site C15 on the upper reaches of the Coolaniddane River (EPA code: 19C67) was located downstream of a local road crossing. The small upland eroding watercourse (FW1) was semi-natural in the vicinity of the road culvert (double 900m pipe culverts), with bankfull heights of 2-2.5m in a historically straightened and deepened V-shaped channel. The river averaged 1.5-2m wide and 0.1-0.2m deep. The profile was dominated by shallow glide (70%) with occasional riffle (20%) and localised shallow pool to a maximum depth of 0.3m. The substrata were comprised of small cobble (50%) with occasional boulder (20%) with localised fine to medium gravels. Smaller substrata predominated upstream of the road crossing. As per upstream, siltation and compaction of the substrata was moderate. The site was bordered by agricultural grassland (GA1) to the north with an area of dense scrubby grey willow-dominated woodland to the south. The channel became heavily overgrown downstream of the road crossing. There were no macrophytes given the high riparian shading, with localised *Hygroamblystegium tenax* present. Filamentous algal cover was 20%, thus indicating enrichment.

No fish were recorded at site C15 via electro-fishing, despite some physical habitat suitability. Whilst the foul odour present upstream (agricultural run-off) was not present downstream, enrichment was evident and it appeared upstream agricultural pressures had impacted the fisheries habitat of the river. Thus, the site had very poor fisheries value. Irrespectively, European eel habitat was poor given the small, shallow nature of the site. The higher energy and lack of suitable sediment accumulations precluded the presence of lamprey. There was no suitability for freshwater pearl mussel or white-clawed crayfish given the site characteristics. No otter signs were recorded during the survey and the site was considered of low suitability given its small size.

Biological water quality was not assessed at this site.



Plate 31: Representative image of site C15 on the Coolaniddane River (downstream of road culvert)

# 3.1.32 Site C16 – Kilberrihert Stream, Derryroe (GCR-WCC3)

Site C16 was located on the uppermost reaches of the Kilberrihert Stream (EPA code: 19K24), downstream of a local road and proposed grid connection crossing (GCR-WCC3), approx. 260m upstream of the Coolaniddane River confluence. The channel, flowing in an east to west direction, represented a dry drainage ditch (FW4) at the time of survey. The non-perennial stream had been historically straightened and deepened in the vicinity of the road crossing and a small coniferous plantation (mature sitka spruce, WD4). The channel featured a shallow, U-shaped channel (bankfull height <0.5m) and evidently only conveyed water during periods of high flow and rainfall. The substrata were 100% silt (wet mud base, with abundant leaf litter). Given the high shading from afforestation, the understorey was poorly developed with bramble scrub dominating. Macrophytes were lacking given the extreme shading and lack of water.

No fish were recorded at site C16 and the site had no fisheries value at the time of survey given the lack of water or flow. Being located in the uppermost reaches, with no connectivity to other watercourses nearby, the site was considered unlikely to serve as a migratory pathway for European eel. There was no suitability for freshwater pearl mussel, otter or white-clawed crayfish given the site characteristics.



It was not possible to assess biological water quality at this site given a lack of water and flow.

Plate 32: Representative image of site C16 on the Kilberrihert Stream (downstream of road culvert)

### **3.1.33** Site C17 – Coolaniddane River, Caherbaroul (GCR-WCC4)

Site C16 on the Coolaniddane River (EPA code: 19C67) was located downstream of a local road and proposed grid connection crossing (GCR-WCC4), approx. 0.8km downstream from site C15. The small upland eroding watercourse (FW1) averaged 1.5-2m wide and 0.1-0.2m deep, with swift flow. Shallow glide and riffle dominated (both 40%) with only localised shallow pool present. The substrata were comprised of small cobble (40%) with occasional boulder (20%) and 40% fine to medium gravels.

As per site C15 upstream, siltation and compaction of the substrata was moderate. The site was bordered by intensive agricultural grassland (GA1) and coniferous afforestation (WD4), with the stream heavily overgrown by willow and bramble-dominated scrub. There were no macrophytes given the high riparian shading, with localised *Hygroamblystegium tenax* present. Filamentous algal cover was 20%, thus indicating enrichment.

Despite some physical suitability, no fish were recorded at site C17 via electro-fishing. Enrichment was evident and it appeared upstream agricultural pressures had impacted the fisheries habitat of the river. Thus, the site had very poor fisheries value. There was no suitability for freshwater pearl mussel or white-clawed crayfish given the site characteristics. No otter signs were recorded during the survey and the site was considered of low suitability given its small size.

Biological water quality, based on Q-sampling, was calculated as Q3 (poor status) (Table 7). The site failed to meet the EPA nitrate threshold for good status water quality (i.e., very high TON of 2.489mg N/I) (Table 9).



Plate 33: Representative image of site C17 the Coolaniddane River (upstream of road culvert)

### **3.1.34** Site C18 – Caherbaroul Stream, Caherbaroul (GCR-WCC5)

Site C18 was located on the uppermost reaches of the Caherbaroul Stream (EPA code: 19C76) at a local road and proposed grid connection crossing (GCR-WCC5). The stream was semi-dry at the time of survey, with localised ponding present to a maximum depth of 0.05m. The watercourse was evidently non-perennial at this location. The stream had been extensively straightened but not deepened and sat in a U-shaped channel. Bankfull height was 1-1.5m. A pipe culvert was present 5m downstream of the road culvert. The substrata were dominated by medium to coarse gravels but were compacted with moderate to heavy siltation. The site was bordered by intensive agricultural grassland (GA1), with a small area of grey willow scrub near the road crossing. The channel was heavily scrubbed over by low-lying scrub, dominated by bramble, gorse, nettle, broad-leaved dock (*Rubex obtusifolius*) and rank grasses.

No fish were recorded at site C18 via electro-fishing and site had no fisheries value at the time of survey given the lack of water or flow. Being located in the uppermost reaches, with no connectivity to other watercourses nearby, the site was considered unlikely to serve as a migratory pathway for European eel. There was no suitability for freshwater pearl mussel, otter or white-clawed crayfish given the site characteristics.

Biological water quality was not assessed at this site.



Plate 34: Representative image of site C18 the Caherbaroul Stream (downstream of road culvert, heavily bound in scrub)

### **3.1.35** Site C19 – Bealick Stream, Rockville

Site C19 was located on the uppermost reaches of the Bealick Stream (EPA code: 19B45) adjacent to a local road and the proposed grid connection. The channel represented a semi-dry drainage ditch (FW4), with very little water (depth <0.01m) at the time of survey. The stream had been historically straightened and deepened. The channel featured a near-vertical, deep U-shaped profile, with a bankfull height of 1m. Only local ponding of water was present and the channel was considered non-perennial at this location. The substrata were dominated by compacted fine to medium gravels with light to moderate siltation. The site was adjoined by species-poor wet grassland (GS4) to the south (*Juncus* sp. dominated) to the south with frequent areas of scrub (WS1) and wet grassland (GS4) adjoining the stream. Upstream, the channel flowed through a small area of willow-dominated mixed broad-leaved woodland. The stream was heavily scrubbed over (near 100% shading), dominated by bramble, grey willow and rank grasses. Macrophytes were lacking given the extreme shading and lack of water.

No fish were recorded at site C19 via electro-fishing and site had no fisheries value at the time of survey given the lack of water. However, the stream likely supports fish populations a considerable distance downstream, nearer the Laney confluence (i.e., >4km downstream).

Being located in the uppermost reaches, with no connectivity to other watercourses nearby, the site was considered unlikely to serve as a migratory pathway for European eel. There was no suitability for freshwater pearl mussel, otter or white-clawed crayfish given the site characteristics. Biological water quality was not assessed at this site.



Plate 35: Representative image of site C19 the Bealick Stream (semi-dry channel, localised ponding only)

### **3.1.36** Site N1 – West Ballynagree Stream, Knocknagappul (WF-HF5)

Site N1 was located on the West Ballynagree Stream at a proposed pre-cast box culvert crossing (WF-HF5), approx. 0.45km downstream from site B3. The stream was a small upland eroding watercourse (FW1), which averaged <1m wide and <0.1m deep when surveyed (June 2021). The shallow stream cascaded over boulder and localised bedrock and was dominated by a series of riffles and fast glides with localised shallow pools to 0.25m max. The stream flowed over a moderate gradient and was evidently spate in nature, with scouring and undercut banks frequent. The stream was known to be non-perennial (i.e., channel was dry at site B3 in 2020 survey period). The substrata were dominated by very coarse gravels, small cobble and angular boulder, with only very localised finer gravels. Siltation was low overall. The site was bordered by young sitka spruce plantations (WD4) with abundant willow, gorse and bramble scrub (WS1) with wet soft rush-dominated grassland (GS4) adjoining the channel. The narrow channel was often heavily tunnelled by scrub.

This coupled with fast flows, mobile substrata and likely low summer flows resulted in an absence of macrophytes. However, *Scapania undulata* was occasional on instream boulder with *Racomitrium aciculare* also occasional.

An electro-fishing survey was not undertaken at this site (i.e., fisheries appraisal only). Apart from some low seasonal potential for migratory European eel, the small upland stream had no fisheries value given its location in the headwaters of the stream and non-perennial nature. However, fisheries value improved further downstream near the River Laney confluence. The non-perennial, high-energy site was unsuitable for freshwater pearl mussel. No white-clawed crayfish were recorded and there were no records for the species within the catchment. No otter signs were recorded during the survey and the site was considered of low suitability given its small size and upland nature.

Whilst a Q-sample was taken in June 2021, the paucity of macro-invertebrates recorded (very low numbers of Tubificidae larvae and *Lumbriculus* sp.) was not sufficient to reliably calculate water quality status (Table 8). This was presumably an artefact of the non-perennial nature of the stream.



Plate 36: Representative image of site N1 on the West Ballynagree Stream at proposed watercourse crossing WF-HF5

### 3.1.37 Site N2 – River Laney, Knocknagappul (WF-HF6)

Site N2 (watercourse crossing WF-HF6) was located on the upper reaches of the River Laney, approx. 0.35km upstream of survey site B5. The upland eroding watercourse (FW1) averaged 3-4m wide and 0.1-0.2m deep, with localised pools to >0.5m locally and (often in association with meanders). The spate channel featured bankfull heights of 1m within a wider channel/shallow valley between coniferous blocks (WD4). Natural scouring and undercutting of banks was frequent. The meandering channel featured occasional plunge pools to 0.7m. The substrata typified an upland river with frequent boulder, cobble and well-sorted gravels interstitially. Coarse sand was also frequent.

Given the site characteristics (moderate gradient, moderate flows), there was little or no siltation of instream substrata and no sediment accumulations. The site was bordered by scrub vegetation supporting abundant gorse, fuchsia, willow and occasional bramble. Tunnelling of the channel was often present. The site was adjoined by mature coniferous afforestation (WD4). Riparian shading and high flows coupled with mobile substrata resulted in a lack of macrophyte growth. However, *Racomitrium aciculare* was common on larger instream boulder.

An electro-fishing survey was not undertaken at this site (i.e., fisheries appraisal only). The River Laney at site N2 (proposed pre-cast box culvert) was a moderate-quality salmonid habitat with some locally good spawning habitat. Holding pools for larger adults was sparse. The site was most of value as a brown trout nursery. European eel habitat was moderate given the site characteristics and their presence would have been inhibited by the presence of downstream hydro-electric dams. There was no potential for white-clawed crayfish. Freshwater pearl mussel were not recorded and the species is not known from the River Laney, despite some physical habitat suitability. No otter signs were recorded during the survey and the site was considered of low suitability given its small size and upland nature.

Biological water quality, based on Q-sampling, was calculated as Q4 (good status) (Table 8).



Plate 37: Representative image of site N2 on the upper River Laney at proposed watercourse crossing WF-HF6

### **3.1.38** Site N3 – Unnamed stream, Ballynagree East (WF-HF8)

Site N3 (watercourse crossing WF-HF8) was located on the uppermost reaches of a small, unnamed tributary of the River Laney at a local road crossing. The upland eroding watercourse (FW1) meandered over a moderate gradient in a natural incised valley. The stream averaged 1-2m wide and 0.1-0.2m deep. The swift-flowing channel was dominated by a series of riffles and fast shallow glide, often cascading over boulder. Occasional deeper pools (0.3m max) were present, particularly in association with meanders.

A single deep plunge pool (1m) was present in association with the existing road box culvert. This also featured a 2m fall and was a barrier to fish migration. Upstream of the bridge, the stream flowed over a steeper gradient, was shallower and narrower. Typical of a small spate channel, the substrata were dominated by angular cobble and boulder with interstitial coarse and medium gravels with some localised coarse sand. Soft sediment accumulations were absent. Overall, siltation was low given high flow rates. The substrata were compacted. The banks were frequently scoured and undercut, especially on meanders. Whilst the channel was open in the vicinity of the crossing (sheep grazing, open banks), macrophyte growth was absent. Localised *Racomitrium aciculare* was present with occasional *Cinclidotus fontinaloides*. Filamentous algae was present but coverage was low. The site was bordered by improved agricultural pasture (wet GA1) adjoined by small coniferous afforestation blocks (WD4) downstream.

An electro-fishing survey was not undertaken at this site (i.e., fisheries appraisal only). Site N3 was located in the headwaters of the small unnamed stream and thus was of low fisheries value. The high-gradient spate channel was considered likely exposed to low flows during summer months and this, coupled with natural and artificial barriers on the watercourse, likely precluded fish presence (however, some low eel potential, in season). The box culvert under road acted as an impassable barrier to fish, with a 2m fall. There was no suitability for white-clawed crayfish or freshwater pearl mussel. No otter signs were recorded during the survey and the site was considered of low suitability given its small size and upland nature.

Biological water quality, based on Q-sampling, was calculated as Q4-5 (high status) (Table 8).



Plate 38: Representative image of site N3 on the upper reaches of a small unnamed River Laney tributary at proposed watercourse crossing WF-HF8 (facing downstream from road crossing)

# 3.1.39 Site N4 – River Laney, Carrigagulla (WF-HF4)

Site N4 (watercourse crossing WF-HF4) was located on the upper reaches of the River Laney, approx. 30m downstream of an existing ford crossing and 2km downstream of survey site B6. The upland eroding river (FW1) averaged 5-8m wide and 0.2-0.4m deep in a naturally cut channel with bankfull heights of 1.5-2m. The moderate-flowing river was dominated by deep, slow-flowing glide with frequent pool and occasional riffle areas (diverse range of habitats). The substrata comprised a mix of clean, unbedded (mobile) small cobble and well-sorted gravels, with only very occasional small boulder. Sand was frequent also, with some accumulations in marginal slacks. Siltation was low overall (clean substrata), despite evident spate erosion of muddy banks (often scoured and undercut). The site was bordered by coniferous afforestation (WD4) on both banks with buffers of often mature willow, fuchsia and bramble scrub (WS1/WL2). Riparian shading was moderate but not excessive although some partial tunnelling was present downstream of the proposed singles-span bridge crossing. Instream macrophytes were limited to occasional water crowfoot in more open, swift glide areas (5% cover). The mobile substrata prevented growth of aquatic bryophytes.

An electro-fishing survey was not undertaken at this site (i.e., fisheries appraisal only). Site N4 was evidently of high value to salmonids with excellent quality spawning and nursery habitat present, in addition to some localised deeper holding pools and undercuts for larger adults. European eel habitat, whilst present, was sub-optimal given the general paucity of suitable refugia (e.g., larger boulders). Although some sand accumulations were present marginally, these were unsuitable for larval lamprey and the general upland eroding (higher-energy) nature of the site likely precluded the presence of *Lampetra* sp. The substrata were generally considered to be too mobile for freshwater pearl mussel and, irrespective of some habitat suitability, the species is not known from the River Laney. No otter signs were recorded during the survey but the site was considered of moderate suitability given the presence of a healthy salmonid population.

Biological water quality, based on Q-sampling, was calculated as Q4 (good status) (Table 8).



Plate 39: Representative image of site N4 on the upper reaches of the River Laney at proposed watercourse crossing WF-HF4 (facing upstream to existing ford crossing)

### **3.1.40** Site N5 – unnamed stream, Knocknagappul (GCR\_WCC19)

Site N5 was located on an unnamed, unmapped Carrigthomas Stream tributary (no EPA code) at a local road and proposed grid connection crossing (GCR-WCC19). The small, swift-flowing upland eroding stream (FW1) averaged 2-2.5m wide and 0.1-0.2m deep with localised pool associated with cascades and meanders to 0.4m. The largely natural stream channel flowed over a moderate gradient and had not been historically modified (with the exception of the road box culvert). The shallow stream likely suffered from low flows/water levels during drier periods. The substrata were dominated by moderately-compacted cobble and small boulder, with locally frequent small patches of fine and medium gravels and sand in slacks and in interstitial spaces. Siltation was moderate overall (due to surrounding land uses) but the high-energy of the site precluded sediment deposits. The stream was often heavily shaded by riparian scrub and macrophytes *Chiloscyphus polyanthos* and *Fontinalis antipyretica* were occasional on larger instream substrata. Filamentous algae was present (<1% cover), indicating enrichment. Livestock poaching was present in several locations. The site was bordered by sloping, low-intensity wet (*Juncus*-dominated) improved grassland (GA1) with frequent gorse-dominated scrub (WS1). Coniferous plantations (WD4) bordered the site upstream. Gorse, bramble and grey willow scrub tunnelled the stream downstream of the road crossing.

An electro-fishing survey was not undertaken at this site (i.e., fisheries appraisal only). The site was of moderate value as a salmonid nursery and spawning habitat (brown trout only). Holding habitat for adults was (typically for a small stream) present but limited in distribution and extent. Salmonid habitat improved in the downstream-connecting Carrigthomas Stream. Whilst some finer gravels suitable for *Lampetra* sp. spawning were present, there was no suitable ammocoete habitat given the high energy nature of the site. European eel habitat was moderate overall given the high energy of the site and paucity of optimal refugia. The site had low suitability for white-clawed crayfish and none were recorded. There was no suitability for freshwater pearl mussel given the small, shallow size of the stream. No otter signs were recorded during the survey and the site was considered of low suitability given its small size and high-energy nature.

Biological water quality, based on Q-sampling, was calculated as Q4 (good status) (Table 8).



Plate 40: Representative image of site N5 on an unnamed, unmapped stream at proposed watercourse crossing GCR-WCC19

# **3.2 Biological water quality (macro-invertebrates)**

With the exception of two sites (C5 and C17), all sampling locations met the good status (≥Q4) requirements of the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 and the Water Framework Directive (2000/60/EC). Sites B9 (unnamed stream), N2 (River Laney), and N4 (River Laney) achieved Q4-5 (high status).

Sites C5 (Carrigthomas Stream, Q3-4 moderate status) and C17 (Coolaniddane River, Q3 poor status) failed to meet the good status ( $\geq$ Q4) requirements of the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 and the Water Framework Directive (2000/60/EC).

No rare or protected macro-invertebrate species of conservation status greater than least concern (according to national red lists) were recorded in the biological water quality samples taken from n=21 sites (Figure 6, Tables 6,7 and 8). Whilst no red list for caddis species is currently available, there is a paucity of records for the three of the recorded cased caddis species *Drusus annulatus* (sites B6, B7, C17, N2, N4), *Potamophylax cingulatus* (sites A2, A5, B8), *Chaetopteryx villosa* (site A5) in the southwest (O'Connor, 2020).

The majority of samples achieved Q4 or Q4-5 (good status) given the presence of numbers of EPA group A (sensitive) species, such as the mayflies *Ecdyonurus venosus* and *Rhithrogena semicolorata*, and the stonefly *Perla bipunctata*. The samples also contained a good representation of group B (less sensitive) species, such as *Leuctra hippopus* and *Silo pallipes*, and low abundances of group C (tolerant) species aside from the widespread mayfly species *Baetis rhodani*.

Site C5 (Carrigthomas Stream) achieved Q3-4 (moderate status) given the presence of a single group A species, a paucity of group B and dominance of group C species. Site C17 (Coolaniddane River) achieved Q3 (poor status) given the absence of group A species, paucity of group B and the dominance of group D species.

At site N1 on the West Ballynagree Stream (watercourse crossing WF-HF5) a low number of macro-invertebrate individuals and species was recorded (i.e., very low numbers of Tubificidae larvae and *Lumbriculus* sp. were recorded present). This community composition was not sufficient to reliably calculate water quality status and was considered an artefact of the non-perennial nature of the stream.





#### Table 6:Macro-invertebrate Q-sampling results for survey sites A1, A2, A5, B6, B8, B9, B10 and B11, July 2020

Group	Family	Species	Site A1	Site A2	Site A5	Site B6	Site B8	Site B9	Site B10	Site B11	EPA class
Ephemeroptera	Heptageniidae	Ecdyonurus venosus			2		1		1	1	А
Ephemeroptera	Heptageniidae	Rhithrogena semicolorata				10	43	32	2	1	А
Ephemeroptera	Heptageniidae	Heptagenia sulphurea				1	2	1	3	1	А
Plecoptera	Chloroperlidae	Siphonoperla torrentium	7	8	16			2	1	2	А
Plecoptera	Nemouridae	Protonemura meyeri						2		2	А
Plecoptera	Perlodidae	Isoperla grammatica	2	3	21	3		7		1	А
Plecoptera	Leuctridae	Leuctra hippopus	9	1	4			1		8	В
Trichoptera	Glossosomatidae	Agapetus fuscipes						1			В
Trichoptera	Goeridae	Silo pallipes				9					В
Trichoptera	Limnephilidae	Potamophylax cingulatus		1	1		1				В
Trichoptera	Limnephilidae	Chaetopteryx villosa			6						В
Trichoptera	Limnephilidae	Drusus annulatus				1					В
Trichoptera	Limnephilidae	Halesus radiatus						1			В
Trichoptera	Odontoceridae	Odontocerum albicorne				1	1				В
Trichoptera	Sericostomatidae	Sericostoma personatum					1	1			В
Ephemeroptera	Baetidae	Baetis rhodani	8	68	17	2	13	4		38	С
Ephemeroptera	Caenidae	Caenis rivulorum								3	С
Ephemeroptera	Ephemerellidae	Serratella ignita			31	6	50	11		19	С
Trichoptera	Hydropsychidae	Hydropsyche siltalai			15	2	4	4	1		С
Trichoptera	Philopotamidae	Wormaldia occipitalis			28				2		С
Trichoptera	Philopotamidae	Philopotamus montanus				3			1	1	С
Trichoptera	Polycentropodidae	Plectrocnemia conspersa	9	2	3					1	С
Trichoptera	Polycentropodidae	Plectrocnemia geniculata			5				1		С
Trichoptera	Polycentropodidae	Polycentropus kingi			1						С
Trichoptera	Polycentropodidae	Polycentropus flavomaculatus								1	С
Trichoptera	Rhyacophilidae	Rhyacophila munda	2	1		2	2				С
Trichoptera	Rhyacophilidae	Rhyacophila dorsalis			3	1		1		1	С

Group	Family	Species	Site A1	Site A2	Site A5	Site B6	Site B8	Site B9	Site B10	Site B11	EPA class
Coleoptera	Dytiscidae	Oreodytes sanmarkii	1				2				С
Coleoptera	Elmidae	Elmis aenea		2	7		1	3		12	С
Coleoptera	Elmidae	Limnius volckmari				2	1	1		1	С
Coleoptera	Hydraenidae	Hydraena gracilis	1	2	1	1	1	2		4	С
Coleoptera	Scirtidae	Scirtidae larva						1	1		С
Diptera	Chironomidae	Chironomid larva	2	2	9		5	2		34	С
Diptera	Limoniidae	Eloeophila sp. larva								2	С
Diptera	Pediciidae	Dicranota sp.	2	2	7		1			6	С
Diptera	Simulidae	Prosimulium sp.				1		6	1	2	С
Amphipoda	Gammaridae	Gammarus duebeni		5	2	3	4	1	12	7	С
Mollusca	Planorbidae	Ancylus fluviatilis		3				2			С
Hemiptera	Veliidae	Veliidae nymph			1				1		С
Hemiptera	Veliidae	Velia caprai							1		С
Arachnida	Hydrachnidiae	Unidentified species			1					30	С
Annelidae	Oligochaeta	Unidentified species	2	2			1				n/a
Abundance			45	102	181	48	134	86	28	178	
	Taxon richness		11	14	18	14	15	19	10	19	
	Q-rating		Q4	Q4	Q4	Q4	Q4	Q4-5	Q4	Q4	
	WFD status		Good	Good	Good	Good	Good	High	Good	Good	

#### Table 7:Macro-invertebrate Q-sampling results for riverine survey sites C3, C5, C7, C11, C12, C13 and C17, July 2020

Group	Family	Species	Site C3	Site C5	Site C7	Site C11	Site C12	Site C13	Site C17	EPA class
Ephemeroptera	Heptageniidae	Ecdyonurus venosus				3	1	3		А
Ephemeroptera	Heptageniidae	Rhithrogena semicolorata	7		9	30		6		А
Ephemeroptera	Heptageniidae	Heptagenia sulphurea	1	1		1				А
Ephemeroptera	Heptageniidae	Ecdyonurus insignis			6					А
Plecoptera	Chloroperlidae	Siphonoperla torrentium	1							А
Plecoptera	Chloroperlidae	Chloroperla tripunctata					3	2		А
Plecoptera	Nemouridae	Nemoura cinerea								А
Plecoptera	Perlidae	Perla bipunctata			6	11	6	2		А
Plecoptera	Leuctridae	Leuctra hippopus		10	1	1	10			В
Trichoptera	Glossosomatidae	Agapetus delicatulus				1				В
Trichoptera	Glossosomatidae	Glossosoma boltoni			1					В
Trichoptera	Goeridae	Silo pallipes	3			1				В
Trichoptera	Odontoceridae	Odontocerum albicorne			3		1			В
Trichoptera	Limnephilidae	Drusus annulatus							1	В
Trichoptera	Limnephilidae	Potamophylax latipennis			2					В
Trichoptera	Sericostomatidae	Sericostoma personatum	1				1			В
Ephemeroptera	Baetidae	Baetis rhodani	9	13	19	15	10	17	16	С
Ephemeroptera	Caenidae	Caenis rivulorum		2		7	3	9		С
Ephemeroptera	Ephemerellidae	Serratella ignita	5	8	57	15		53	1	С
Trichoptera	Hydropsychidae	Hydropsyche siltalai				24	3	18	1	С
Trichoptera	Philopotamidae	Wormaldia occipitalis								С
Trichoptera	Philopotamidae	Philopotamus montanus				1	1		1	С
Trichoptera	Polycentropodidae	Plectrocnemia conspersa	2							С
Trichoptera	Polycentropodidae	Plectrocnemia geniculata		1						С
Trichoptera	Polycentropodidae	Polycentropus kingi							2	С
Trichoptera	Polycentropodidae	Polycentropus flavomaculatus					1	2		С
Trichoptera	Rhyacophilidae	Rhyacophila munda		1		1		1		С

Group	Family	Species	Site C3	Site C5	Site C7	Site C11	Site C12	Site C13	Site C17	EPA class
Trichoptera	Rhyacophilidae	Rhyacophila dorsalis	1		2	1	3	11	3	С
Coleoptera	Dytiscidae	Oreodytes sanmarkii	1	2						С
Coleoptera	Dytiscidae	Hydroporus tessellatus	1	1						С
Coleoptera	Dytiscidae	Agabus guttatus							2	С
Coleoptera	Dytiscidae	Dytiscidae larva							2	С
Coleoptera	Elmidae	Elmis aenea		7	5		5	4		С
Coleoptera	Elmidae	Limnius volckmari		5	1	1		1		С
Coleoptera	Halipliidae	Haliplus ruficollis group		1						С
Coleoptera	Hydraenidae	Hydraena gracilis		1		1	3			С
Coleoptera	Hydrophilidae	Helophorus brevipalpis							2	С
Coleoptera	Scirtidae	Cyphon sp. larva						1		С
Diptera	Chironomidae	Chironomid larva		5	4	2	18	5	8	С
Diptera	Limoniidae	<i>Eloeophila</i> sp. larva		2		1				С
Diptera	Pediciidae	Dicranota sp.	4	7		1	6		36	С
Diptera	Simulidae	Unidentified larva		2	1	8	1	3	6	С
Diptera	Tipuliidae	<i>Tipula</i> sp.							1	С
Amphipoda	Gammaridae	Gammarus duebeni	15	9	4	3	3	2		С
Mollusca	Planorbidae	Ancylus fluviatilis		2		1				С
Arachnida	Hydrachnidiae	Unidentified species		18			12			С
Annelidae	Oligochaeta	Unidentified species		3		1	3	1	8	n/a
	Abundance		51	101	121	131	94	141	90	
	Taxon richnes	S	11	19	13	20	20	15	14	
	Q-rating		Q4	Q3-4	Q4	Q4	Q4	Q4	Q3	
	WFD status		Good	Mod.	Good	Good	Good	Good	Poor	

Group	Family	Species	Site N1	Site N2	Site N3	Site N4	Site B7	Site N5	EPA class
Ephemeroptera	Heptageniidae	Rhithrogena semicolorata		19	5	28	15	22	А
Ephemeroptera	Heptageniidae	Ecdyonurus venosus			9	2	1	27	А
Plecoptera	Chloroperlidae	Chloroperla tripunctata		8				18	А
Plecoptera	Chloroperlidae	Siphonoperla torrentium			9		6		А
Plecoptera	Perlidae	Perla bipunctata						23	А
Plecoptera	Nemouridae	Amphinemura sulcicollis		2	1		1		А
Plecoptera	Perlodidae	Isoperla grammatica			1	4	11		А
Ephemeroptera	Baetidae	Alainites (Baetis) muticus		4	2		1		В
Plecoptera	Leuctridae	Leuctra inermis		6	3	1	17		В
Plecoptera	Leuctridae	Leuctra hipposus						18	В
Trichoptera	Goeridae	Silo pallipes		4		8	1		В
Trichoptera	Limnephilidae	Drusus annulatus		1		4	3		В
Trichoptera	Odontoceridae	Odontocerum albicorne				3	2		В
Trichoptera	Sericostomatidae	Sericostoma personatum					1	3	В
Ephemeroptera	Baetidae	Baetis rhodani		27	63	4	11	15	C
Ephemeroptera	Ephemerellidae	Serratella ignita					6		С
Trichoptera	Hydropsychidae	Hydropsyche siltalai					1		C
Trichoptera	Rhyacophilidae	Rhyacophila dorsalis						3	C
Trichoptera	Philopotamidae	Philopotamus montanus					1		C
Trichoptera	Polycentropodidae	Plectrocnemia conspersa			1		2		C
Trichoptera	Polycentropodidae	Polycentropus flavomaculatus					1		C
Coleoptera	Dytiscidae	Oreodytes sanmarkii			1	3	5		C
Coleoptera	Dytiscidae	Unidentified larva						1	C
Coleoptera	Elmidae	Limnius volckmari				1	1		C
Coleoptera	Elmidae	Elmis aenea					4	1	C
Coleoptera	Hydraenidae	Hydraena gracilis		1					С
Diptera	Chironomidae	Chironomid larva		2	2		7		C

#### Table 8: Macro-invertebrate Q-sampling results for riverine survey sites N1, N2, N3, N4 and B7 (May 2021) and N5 (December 2021)

Group	Family	Species	Site N1	Site N2	Site N3	Site N4	Site B7	Site N5	EPA class
Diptera	Pediciidae	Dicranota sp.		1	2		3		С
Diptera	Simuliidae	Unidentified larva		5	10		2	5	С
Crustacea	Gammaridae	Gammarus duebenii		8	19	2	3	8	С
Arachnida	Hydrachnidiae	Unidentified species		1					С
Annelidae	Naididae (Tubificidae)	Unidentified species	3	1			2		E
Oligochaeta	Lumbricidae	Lumbriculus sp.	1		3	1	3		n/a
	Abundance		4	90	131	61	111	125	
	2	8	7	6	8	10			
	*n/a	Q4	Q4-5	Q4	Q4-5	Q4			
	*n/a	Good	High	Good	High	Good			

\*n/a - Whilst a Q-sample was taken in June 2021, the low numbers of macro-invertebrate individuals and species recorded (very low numbers of Tubificidae larvae and Lumbriculus sp.) was not sufficient to reliably calculate water quality status. This was considered an artefact of the non-perennial nature of the stream.

# **3.3** Physiochemical water quality

The pH levels across the riverine sites was typically circumneutral with levels recorded between 6.58 and 7.54 (however, site N1 was 6.22). The majority of the sample sites were of low alkalinity (i.e.,  $\leq 20$ mg/l CaCO<sub>3</sub> at sites A1, A2, B6, B7, B8, B9, C7, C13, N1, N2, N3 and N4). Sites A5 (Glen River), B10 (Ballynagree East Stream) and C17 (Coolaniddane River) were of moderate alkalinity (i.e., 20-100mg/l CaCO<sub>3</sub> due to greater calcareous influences).

With the exception of site A1 (0.094mg N/I) the sampling sites had low levels of total ammonia which were equivalent to high status water quality (i.e., Total Ammonia levels  $\leq$ 0.040 mg N/I) according to S.I. No. 77/2019 - European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019. Site A1 failed to meet the good status standard (i.e.,  $\leq$ 0.065 mg N/I) whilst site D1 achieved good but not high status.

With regards to nutrients, molybdate reactive phosphate (MRP) levels were typically very low across the sampling and thus met high status as required in the Surface Water Regulations (i.e., levels  $\leq$  0.025 mg P/I). However, MRP concentrations were elevated at sites A1 (0.043mg P/I) and D1 (0.116mg P/I), with both sites failing to meet the good status threshold ( $\leq$ 0.035mg P/I) as set out under S.I. No. 77/2019 - European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019.

Levels of total oxidised nitrogen (TON) ranged from 0.011 to 2.489mg N/l across the sampling sites. Particularly high levels were recorded at sites B10 (2.299mg N/l) and C17 (2.489mg N/l). Total oxidised nitrogen is taken to be equivalent to nitrate given the concentration of nitrite is usually negligible (O'Boyle et al., 2019). Whilst there are no environmental quality standards for nitrate, average nitrate concentration values  $\leq 4$  mg/l NO<sub>3</sub> ( $\leq 0.9$ mg N/l) and  $\leq 8$ mg/l NO<sub>3</sub> ( $\leq 1.8$ mg N/l) are considered by the EPA to be indicative of high and good quality water, respectively. Thus, only sites B10 (Ballynagree East Stream) and C17 (Coolaniddane River) fell outside acceptable parameters for nitrate.

The observed dissolved organic carbon (DOC) levels were low across most survey sites, being <5mg C/I. These levels indicated low levels of leaching of DOC and escapement of solids into surface waters from the afforested and improved agriculture-dominated landscape in the catchment of the wind farm. However, several sites to the north of the site boundary (sites A1, A2 and A5) featured considerably higher DOC levels (i.e., 18.7, 10.4 and 5.61mg C/I, respectively). All three of these sites drained upstream coniferous plantations.

BOD levels were low across all sites with all sampling locations achieving equivalent high-status water quality under S.I. No. 77/2019 - European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (i.e.,  $\leq$ 1.3 mg O<sub>2</sub>/l).

Whilst there are no clearly defined standards for COD concentrations in surface waters, levels were elevated at sites A1 and A2 on the Nadanuller Beg Stream (i.e., an order of magnitude higher than other sampling sites at 66.9mg and 35mg  $O_2/I$ , respectively). Water with high COD typically contains high levels of oxidizable organic matter (e.g., decaying plant matter) and COD elevations often accompany clear-felling activities (Drinan et al., 2013). Higher COD results in lower dissolved oxygen levels which may negatively impact aquatic biota.

Table 9:Summary of physiochemical water quality results, June 2021 and June 2021 (B7 & N1-N4 only). Values in bold indicate failure to achieve 'good<br/>status' targets set out under the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (S.I. 77 of 2019)

								Site							
Parameter	A1	A2	A5	B6	B7	B8	B9	B10	C7	C13	C17	N1	N2	N3	N4
рН	6.69	7.16	7.21	7.04	7.20	7.33	7.32	7.54	7.40	7.40	7.46	6.22	6.96	7.00	6.96
Alkalinity (mg CaCO <sub>3</sub> /l)	9.6	18.3	21.1	12.8	16.3	16.5	18.4	26.3	16.9	18.3	38.0	11.5	11.4	12.4	11.4
Total Ammonia (mg N/I)	0.094	0.023	0.006	0.003	0.021	0.005	0.008	0.008	0.019	0.017	0.025	0.006	0.009	0.008	0.009
MRP (mg P/I)	0.043	0.016	0.004	0.001	0.024	0.002	0.005	0.009	0.010	0.006	0.116	0.001	0.003	0.003	0.005
TON (mg N/l)	0.155	0.126	0.011	0.267	0.951	0.443	0.265	2.299	0.730	0.701	2.489	0.179	0.359	0.376	0.445
DOC (mg C/I)	18.7	10.4	5.61	1.95	2.61	2.41	2.95	1.38	3.27	3.75	3.40	2.95	1.70	1.02	2.39
BOD (mg O <sub>2</sub> /l)	1.3	0.9	0.5	0.3	0.6	0.5	0.4	0.6	0.6	1.1	1.0	0.5	0.5	0.4	0.8
COD (mg O <sub>2</sub> /l)	66.9	35.2	16.4	8.2	13.1	9.1	13.2	8.6	12.7	13.7	9.5	9.5	7.7	5.0	13.6
Suspended Solids (mg/l)	3.8	2.4	0.4	0.2	0.8	1	1.6	14.6	1.0	2.0	2.2	0.4	0.2	0.8	0.6

# **3.4** Aquatic ecological evaluation

An aquatic ecological evaluation of each survey site was based on the results of aquatic surveys, electro-fishing, white-clawed crayfish, freshwater pearl mussel, physiochemical water quality and biological water quality surveys (Table 10).

A total of *n*=14 survey locations (A2, B2, B3, C4, C8, C9, C10, C14, C15, C16, C17, C19, N1 & N3) (36% of total locations) did not support fish at the time of survey (i.e., non-perennial/seasonal channels). Where fish were present, brown trout (*Salmo trutta*) dominated across the survey area, with low abundances of European eel (*Anguilla anguilla*) also recorded. *Lampetra* sp. larvae (ammocoetes) were recorded at a single site only (C5, Carrigthomas Stream). A single Atlantic salmon (*Salmo salar*) was recorded via electro-fishing at site C11 on the River Laney at Knocknagappul Bridge.

No freshwater pearl mussel or white-clawed crayfish were recorded during the aquatic surveys. Aquatic vegetation communities representative of the Annex I habitat 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation and aquatic mosses [3260]' ('floating river vegetation') were recorded at sites A5 (Glen River), C12 (Awboy River) and sites B8, B11, C7, C11, C13 (all on River Laney).

The majority of survey locations featured low alkalinity, circum-neutral pH, low MRP and low to moderate total oxidised nitrogen (TON) levels (Table 9). However, TON was particularly high at sites C17 and B10 (failed to meet EPA's threshold for good status). Levels of molybdate reactive phosphorus (MRP) were particularly high at site A1, with the site failing to meet the good status threshold set out under S.I. No. 77/2019 - European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019.

A total of n=18 sites achieved  $\geq Q4$  'good status'. Three unnamed River Laney tributaries (sites C7, B9 and N3) achieved high status (Q4-5) water quality. Two sites (C5 and C17) were of Q3 (poor status) Tables 6, 7 and 8). Siltation and afforestation pressures (siltation, eutrophication etc.) were evident on numerous watercourses within the survey area which were not achieving good status.

Site A5 on the Glen River was located within the Boggeragh Mountains NHA (0002447), a site designated for peatlands. This site was therefore considered of national importance. None of the other aquatic survey locations were evaluated as being of greater than local importance. Over half of the sites surveyed in the vicinity of the proposed Ballinagree wind farm (22 of 40, 55% of sites) were evaluated as being of local importance in terms of their aquatic ecology (i.e., A2, A3, A4, B1, B4, B5, B6, B7, B8, B9, B10, B11, C3, C5, C6, C7, C11, C12, C13, N2, N3, N4 & N5). Primarily this was due to the presence of overall moderate to good salmonid habitat and the presence of brown trout at the survey sites, in addition to good status (Q4) water quality. Site B9 (unnamed stream at Carrigagulla) achieved high status (Q4-5) water quality (i.e., pristine water quality). A single Atlantic salmon parr was recorded at site C11 (River Laney), with *Lampetra* sp. ammocoetes recorded from site C5 (Carrigthomas Stream). A kingfisher was recorded at site C12 (Awboy River).

A total of n=16 sites (41% of sites) were evaluated as being of site value in terms of their aquatic ecology (i.e., sites A1, B2, B3, C1, C2, C4, C8, C9, C10, C14, C15, C16, C17, C18, C19 & N1). Generally, this was due to low or a lack of fisheries value, in addition to poor or moderate water quality (i.e.,  $\leq$ Q3-4) and an absence of other species/habitats of high conservation value.

#### Table 10: Aquatic ecological evaluation summary of the *n*=40 survey locations according to NRA (2009) criteria

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary
A1	Nadanuller Beg Stream	18N05	Site value	Low fisheries value (no fish recorded); Q4 (good status) water quality; site failed to meet S.I. No. 77/2019 MRP & total ammonia good status thresholds; no other aquatic species or habitats of high conservation value
A2	Nadanuller Beg Stream	18N05	Local importance	Excellent salmonid (brown trout) nursery; Q4 (good status) water quality; no other aquatic species or habitats of high conservation value
A3	Unnamed stream	n/a	Local importance	Moderate salmonid habitat, brown trout present; no other aquatic species or habitats of high conservation value
A4	Unnamed stream	n/a	Local importance	Moderate salmonid habitat, brown trout & European eel present; no other aquatic species or habitats of high conservation value
A5	Glen Stream	18G04	National importance	Located within Boggeragh Mountains NHA (002447); good salmonid habitat, very good nursery, brown trout present; aquatic vegetation with good links to Annex I 'floating river vegetation' habitat <sup>1</sup> ; Q4 (good status) water quality; no other aquatic species or habitats of high conservation value
B1	Carrigagulla Stream	19C22	Local importance	Moderate salmonid habitat, brown trout present; no other aquatic species or habitats of high conservation value
B2	Unnamed stream	n/a	Site value	No fisheries or aquatic ecology value (non-perennial, 100% dry channel)
B3	West Ballinagree Stream	19W12	Site value	No fisheries or aquatic ecology value (non-perennial, 100% dry channel)
B4	Knocknagappul 19 Stream	19K04	Local importance	Moderate salmonid habitat, brown trout present; no other aquatic species or habitats of high conservation value
B5	River Laney	19L01	Local importance	Good salmonid habitat, brown trout present; no other aquatic species or habitats of high conservation value
B6	River Laney	19L01	Local importance	Good salmonid habitat, very good nursery, brown trout present; Q4 (good status) water quality; no other aquatic species or habitats of high conservation value
B7	Unnamed stream	n/a	Local importance	Moderate salmonid habitat, brown trout present; no other aquatic species or habitats of high conservation value
B8	River Laney	19L01	Local importance	Good salmonid habitat, very good nursery, brown trout & European eel present; aquatic vegetation with good links to Annex

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary
				I 'floating river vegetation' habitat <sup>1</sup> ; Q4 (good status) water quality; no other aquatic species or habitats of high conservation value
B9	Unnamed stream	n/a	Local importance	Good salmonid habitat, good nursery, brown trout & European eel present; Q4-5 (high status) water quality; no other aquatic species or habitats of high conservation value
B10	Ballynagree East Stream	19B21	Local importance	Poor salmonid habitat but brown trout present in low density; Q4 (good status) water quality; failed to meet EPA's TON target for good status water quality; no other aquatic species or habitats of high conservation value
B11	River Laney	19L01	Local importance	Good salmonid habitat, very good nursery, brown trout present; aquatic vegetation with good links to Annex I 'floating river vegetation' habitat <sup>1</sup> ; Q4 (good status) water quality; no other aquatic species or habitats of high conservation value
C1	Carrigthomas Stream	19C48	Site value	Low fisheries value (no fish recorded); no other aquatic species or habitats of high conservation value
C2	Maulnahorna Stream	19M10	Site value	Low fisheries value (no fish recorded); no other aquatic species or habitats of high conservation value
C3	Carrigthomas Stream	19C48	Local importance	Good salmonid habitat, very good nursery, brown trout present; Q4 (good status) water quality; no other aquatic species or habitats of high conservation value
C4	Rahalisk Stream	19R08	Site value	Low fisheries value (no fish recorded); no other aquatic species or habitats of high conservation value
C5	Carrigthomas Stream	19C48	Local importance	Good salmonid habitat, excellent nursery, good spawning, brown trout & Lampetra sp. ammocoetes present; Q3 (poor status) water quality; no other aquatic species or habitats of high conservation value
C6	Unnamed stream	n/a	Local importance	Poor salmonid habitat but brown trout present in low density; no other aquatic species or habitats of high conservation value
C7	River Laney	19L01	Local importance	Excellent salmonid spawning, nursery & holding habitat, brown trout present; aquatic vegetation aquatic vegetation representative of Annex I 'floating river vegetation' habitat <sup>1</sup> ; Q4 (good status) water quality; dipper nest under bridge; no other aquatic species or habitats of high conservation value
C8	Lacknahaghny Stream	19L21	Site value	Low fisheries value (no fish recorded); no other aquatic species or habitats of high conservation value
Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary
----------	---------------------	----------	--------------------------	---
С9	Unnamed stream	n/a	Site value	Low fisheries value (no fish recorded), non-perennial channel; no other aquatic species or habitats of high conservation value
C10	Unnamed stream	n/a	Site value	Low fisheries value (no fish recorded), non-perennial channel; no other aquatic species or habitats of high conservation value
C11	River Laney	19L01	Local importance	Excellent salmonid nursery & holding habitat, good spawning, Atlantic salmon & brown trout present; aquatic vegetation representative of Annex I 'floating river vegetation' habitat <sup>1</sup> ; Q4 (good status) water quality; no other aquatic species or habitats of high conservation value
C12	Awboy River	19A03	Local importance	Good salmonid spawning, nursery & holding habitat, brown trout present; aquatic vegetation aquatic vegetation representative of Annex I 'floating river vegetation' habitat <sup>1</sup> ; Q4 (good status) water quality; kingfisher recorded in flight; no other aquatic species or habitats of high conservation value
C13	River Laney	19L01	Local importance	Good salmonid spawning & nursery, excellent holding habitat, brown trout present; aquatic vegetation with good links to Annex I 'floating river vegetation' habitat <sup>1</sup> ; Q4 (good status) water quality; no other aquatic species or habitats of high conservation value
C14	Clonavrick Stream	19C74	Site value	Low fisheries value (no fish recorded), non-perennial channel with gross siltation pressures; no other aquatic species or habitats of high conservation value
C15	Coolaniddane River	19C67	Site value	Low fisheries value (no fish recorded), non-perennial channel with evident water quality pressures; no other aquatic species or habitats of high conservation value
C16	Kilberrihert Stream	19K24	Site value	No fisheries or aquatic ecology value (non-perennial, 100% dry channel)
C17	Coolaniddane River	19C67	Site value	Low fisheries value (no fish recorded); Q3 (poor status) water quality; failed to meet EPA's TON target for good status water quality; no other aquatic species or habitats of high conservation value
C18	Caherbaroul Stream	19C76	Site value	Low fisheries value (no fish recorded), non-perennial channel, evident water quality pressures; no other aquatic species or habitats of high conservation value
C19	Bealick Stream	19B45	Site value	Low fisheries value (no fish recorded), non-perennial channel; no other aquatic species or habitats of high conservation value

Site no.	Watercourse	EPA code	Evaluation of importance	Rationale summary
N1	West Ballynagree Stream	19W12	Site value	Very low fisheries value (non-perennial stream); biological water quality sample taken but not sufficient to calculate status; no other aquatic species or habitats of high conservation value
N2	River Laney	19L01	Local importance	Moderate quality salmonid and eel habitat; Q4 (good status) water quality; no other aquatic species or habitats of high conservation value
N3	Unnamed stream	n/a	Local importance	Low fisheries value; Q4-5 (high status) water quality; no other aquatic species or habitats of high conservation value
N4	River Laney	19L01	Local importance	Excellent quality salmonid nursery and spawning habitat, moderate European eel habitat; Q4 (good status) water quality; no other aquatic species or habitats of high conservation value
N5	Unnamed stream	n/a	Local importance	Moderate quality salmonid and eel habitat; Q4 (good status) water quality; no other aquatic species or habitats of high conservation value

<sup>&</sup>lt;sup>1</sup> Both Annex I habitats 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation or aquatic mosses [3260]' and 'Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]' recorded at sites A5, B8, B11, C7, C11, C12 & C13

<sup>\*</sup> **Conservation value:** Atlantic salmon (*Salmo salar*), sea lamprey (*Petromyzon marinus*), brook lamprey (Lampetra planeri), river lamprey (*Lampetra fluviatilis*), white-clawed crayfish (*Austropotamobius pallipes*) and otter (*Lutra lutra*) are listed under Annex II of the Habitats Directive [92/42/EEC]. Atlantic salmon, river lamprey, white-clawed crayfish and otter are also listed under Annex V of the Habitats Directive [92/42/EEC]. Otters, along with their breeding and resting places, are also protected under provisions of the Irish Wildlife Acts 1976 to 2021. European eel are 'critically endangered' according to most recent ICUN red list (Pike et al., 2020) and listed as 'critically engendered' in Ireland (King et al., 2011). With the exception of the Fisheries Acts 1959 to 2019, brown trout have no legal protection in Ireland.



CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

# **APPENDIX 3**

Avian Ecology



## 1 Methodology

Avian field surveys at the Site comprised of the following: multi-season vantage point surveys, breeding season Avian field surveys at the site comprised of the following: multi-season vantage point surveys, breeding season Hen Harrier hinterland surveys, general breeding and wintering season transect and point count surveys and a Red Grouse *Lagopus lapopus* survey. Survey design and extent was based on the professional knowledge of the project team and refined through the scoping and consultation process and with reference to a review of desktop information. Detailed survey methodologies are provided below.

In addition to the field surveys, a desktop study was also undertaken by consulting the National Biodiversity Data Centre (NBDC) online mapping database<sup>6</sup> to identify additional avian species historically recorded within the relevant W38 10km national grid square overlapping the terrestrial biodiversity study area.

The conservation status of bird species was considered in respect of the following: Irish Wildlife Acts (1976 – 2012 as amended); Birds of Conservation Concern in Ireland (BoCCI) Red, Amber and Green lists (see Gilbert *et al*. 2021); EU Birds Directive (2009/147/EC) Annex I list.

Consultation was also undertaken with the Development Applications Unit. Supplementary information on Hen Harrier nesting activity in the hinterland was received from the local National Parks and Wildlife Services (NPWS) Ranger and information on Barn Owl *Tyto alba* nests in the area was received from Birdwatch Ireland. It is very important to note that such consultation only involved discussion of the relevant species relative to the location/locality in question to inform Ecology Ireland's EIAR assessment and did not constitute an opinion from the consultation parties on the proposed project under consideration here.

### **1.1 Vantage Point Survey**

Standard vantage point (VP) field surveys were undertaken with due regard to NPWS VP methodology recommendations and guidance by Scottish Natural Heritage (SNH 2017).

SNH 2017 guidelines recommend that breeding/winter season surveys for target bird species be completed as part of assessments of proposed wind farm sites, with typically 6 hours of coverage per month from each VP location per season, resulting in 36-hours of survey effort per VP in each survey season (SNH 2017). Target species here included raptors, waterbirds and other high conservation value species, such as Hen Harrier (a qualifying species of the nearby Mullaghanish to Musheramore Mts. SPA) and any other Annex I species such as Peregrine Falcon *Falco peregrinus*, Merlin *Falco columbarius* and Golden Plover *Pluvialis apricaria*. A total of six vantage point locations were initially used for the VP surveys completed at the site in 2017 and 2018 (see outline below), however the study area was increased during the 2019 breeding season in response to an expansion of the study area boundary as follows; an additional two VPs (VP7 and VP8) were incorporated from March 2019 and a further two VPs (VP9 and VP10) were incorporated in July and August 2019. These 10 VPs were utilised for all subsequent VP surveys at the study area (see summary below and Figure 1).

<sup>&</sup>lt;sup>6</sup> <u>https://maps.biodiversityireland.ie/Map</u>

The VP surveys completed at the terrestrial biodiversity study area are outlined as follows (see Tables 7 to 18 for survey schedules):

Summer/Breeding Season VP Surveys (March to August inclusive):

- Summer 2017 (6 VPs, 36 hours survey effort + 5km hinterland survey)
- Summer 2018 (6 VPs, 36 hours survey effort + 5km hinterland survey)
- Summer 2019 (8 VPs from March to August inclusive, 36 hours survey effort + 5km hinterland survey; additional 2VPs in July & August with a total of 12 hours survey effort for these two additional VPs in Summer 2019)
- Summer 2020 (10 VPs, 36 hours survey effort + 5km hinterland survey)
- Winter Season VP Surveys (October to March inclusive):
  - Winter 2017/2018 (6 VPs, 35.5 hours survey effort due to very inclement weather conditions where visibility became severely compromised)
  - Winter 2018/2019 (6 VPs, 36 hours survey effort)
  - Winter 2019/2020 (10 VPs, 36 hours survey effort)
  - Winter 2020/2021 (10 VPs, 36 hours survey effort)

All bird species heard or seen during the VP watches were noted. Detailed field records were taken of target species (heard or seen) with as much of the following information recorded as possible:

- Species and estimated number
- Time first observed; Duration of observation; Estimated time on-site; Estimated time off-site (note that the expanded study area boundary was used for calculations of on and off-site times in all survey seasons including 2017 and 2018).
- Flight-line drawn on a field map and numbered to link with associated field notes
- Estimated flight height initial height estimate and any marked change noted during period of observation: 0-5m AGL (Close to ground) 5-25m AGL (Low Flight) 25-100m AGL (Medium Flight height)
   0>100m AGL (High Flight Height)
- Any other observations of note: behaviour, association or interaction with other species etc.

Field surveys were undertaken using appropriate survey equipment as required (*e.g.*, GPS units, binoculars, scope, notebooks *etc.*) and during suitable weather conditions. All field observers communicated with two-way radios/mobile phones to allow co-ordination in the event that a Hen Harrier, or other noteworthy (i.e., Annex I) species, was observed at or close to the site. The December and January 2017/2018 winter VP surveys (6 VPs across three dates from December 2017 to January 2018) overlapped with the onset of sunset/dusk that allowed an opportunity to note any Hen Harrier winter roosting activity.

Dr. Gavin Fennessy (Ecology Ireland) is an authority on collision risk and birds. He carried out Post-Doctoral research on collision risk and aircraft and has presented papers at a number of international conferences on wildlife hazard. He is retained as the advisor to Dublin Airport Authority on management of bird-strike risk at airports in Ireland. He is critical of the reliance of Collision Risk Modelling (CRM) which is prevalent in the UK.

The 'Band' model which is widely used in avian collision risk assessments for wind farms is not evidence based and the driver of the model ('avoidance rate') is generally derived without any observational data. The weaknesses inherent on a reliance on CRM are recognised (e.g., Madsen & Cook 2016) but the methodology is still widely used, albeit less so in Ireland than in the UK. We prefer instead to describe the occurrence and flight behaviour of the birds at the proposed wind farm with a knowledge of the ecology and behaviour of the species.

Data are presented in this report as flightline observation tables with corresponding flightline maps. In addition, the proportion of time spent by Hen Harriers and other Annex I species on and off the site during the survey is calculated. Specific data/mapping relating to sensitive nest site locations will not be displayed in this report.

## **1.2 Hinterland Survey**

Early and late season hinterland surveys (Hardey *et al.* 2013) were also completed in each of the four breeding season surveys to record any Hen Harrier nest sites within 5km of the terrestrial biodiversity study area. This involved a survey of Hen Harrier occupancy within 5km of the site during the bird breeding season. Suitable Hen Harrier nesting and foraging habitats within 5km of the study area were also noted. These areas, together with known historical nest sites, were then observed for Hen Harrier activity using a combination of transects and viewing points (see Tables 7 to 18 for survey schedule).

As for the VP surveys, the hinterland surveys also recorded other species of conservation importance such as Annex I species.

## **1.3 General Bird Transect/Point Count Surveys**

Standard general breeding bird transect and point count surveys (Bibby *et al.* 2000) were undertaken at the terrestrial biodiversity study area as follows (Figure 2; where additional transects and point counts were added in 2019 due to an expansion of the study area boundary):

Summer/Breeding Season General Bird Surveys (Early and Late Season):

- Summer 2017 (5 transects, 6 point counts)
- Summer 2018 (5 transects, 6 point counts)
- Summer 2019 (7 transects, 8 point counts)
- Summer 2020 (7 transects, 8 point counts)

Winter Season General Bird Surveys:

- Winter 2017/2018 (5 transects, 6 point counts, 3 surveys)
- Winter 2019/2020 (7 transects, 8 point counts, 2 surveys)

Transects were *c*. 500m in length and located in open habitats, while point-counts were of 5 minute duration and were located in closed/forestry habitats. These were established throughout the study area to survey the baseline general bird assemblage in the study area (see Figure 2). These transects/point counts were surveyed twice in each breeding season (*i.e.*, early and late periods of the nesting season) and 2 - 3 times in each wintering season surveyed.

At each transect/point count, all bird species encountered (seen or heard) within 100m of the observer were recorded and their abundance noted. The total number of birds per species was derived by adding abundance data from all transects from each survey visit; this allowed a measure of relative abundance to be examined for all bird species recorded during the transect study. The same was done with the point count data. The maximum count per visit was then derived for each species and used for subsequent analysis and interpretation of results.

Bird species occurring more than 100m from the observer or flying over the site and not using it during the transect/point count surveys, noted when walking between transects/point counts or casually noted during other aspects of the biodiversity field study (*e.g.*, VP surveys), were not included in subsequent abundance analysis, but were considered as 'additional' species for subsequent consideration. This approach allowed a current taxa list of the birds present at/near the study area to be generated.

Figure 7: Terrestrial Biodiversity Study Area. The proposed turbine layout and the Vantage Points (VPs) used in breeding and winter bird surveys are shown for reference.



# Figure 8: Terrestrial Biodiversity: Birds. Map shows the location of bird survey transects and point count locations as well as the Red Grouse Tape Lure survey transects



## 2 Field Survey Results

### 2.1 Breeding Season Vantage Point Survey Results

A total of four breeding season vantage point (VP) surveys were completed at the terrestrial biodiversity study area (*i.e.*, 2017, 2018, 2018 & 2019).

Six Annex I bird species were recorded during the breeding season VP surveys; Hen Harrier *Circus cyaneus*, Peregrine Falcon *Falco peregrinus*, Golden Plover *Pluvialis apricaria*, Merlin *Falco columbarius*, Marsh Harrier *Circus aeruginosus* and White-tailed Sea Eagle *Haliaeetus albicilla*.

#### 2.1.1 Hen Harrier Activity

Hen Harriers were recorded during all four breeding season vantage point surveys, with the number of flightlines recorded per season ranging from 4 to 13. Activity levels on site were relatively low (< 1.5% of the total survey time, see Table 1) during all VP surveys and primarily related to foraging and commuting, generally at heights <30m (see Tables 19 to 23). Individuals were recorded successfully catching and/or carrying prey on a number of occasions (see Tables 19 to 23). No courtship/display behaviour was noted during the VP surveys and no nesting activity took place at the study area or within 2km of the study area boundary in any of the survey years. Activity was relatively broadly distributed at the site, with no areas of high or focused activity noted. Relatively regular flightlines were noted in the Dooneen Hill area to the southeast of the site, outside of the terrestrial biodiversity study area boundary in association with a known nest site in the wider area. Male Hen Harrier accounted for the bulk of the flightline activity at the site, although at least one Ringtail Hen Harrier (female or immature) flightline was recorded each season. Hen Harriers were generally present in all survey months, with no clear temporal pattern of activity noted. The predominant habitat where Hen Harriers were recorded was heath/bog, conifer plantation and grassland.

A comparison of Hen Harrier activity recorded on-site (*i.e.*, within the study area boundary) and off-site (outside the study area boundary but within view of the vantage points) during the breeding season surveys is presented below in Table 1 and Plate 1. Data are presented as the percentage of total VP survey time that Hen Harrier were present on the site. Note that the number of vantage points used increased from six (in 2017 and 2018) to 10 in the 2019 and 2020 breeding seasons as a result in an expansion of the study area boundary. An increase in observations might therefore be expected as a result in the increase in area covered. No such trend is apparent however and an overall decline in Hen Harrier activity on the site was in fact observed throughout the study period (Table 1 and Plate 1).

This Annex I species is *Amber-Listed* on the Birds of Conservation Concern in Ireland list (BOCCI List) due to moderate breeding population decline and due to its unfavourable status in Europe (after Gilbert et al. 2021). Hen Harrier is a special conservation interest species of the adjacent Mullaghanish to Musheramore Mountains SPA (NPWS 2021; <u>www.npws.ie</u>).

Table 11:Percentage of VP Survey time that Hen Harrier was recorded on/off site during the<br/>breeding season surveys.

Breeding Season Summary	% Total of VP Survey Time						
Hen Harrier Activity	2017	2018	2019	2020			
On Site	1.00	1.33	0.19	0.57			
Off Site	0.46	0.64	0.21	0.06			
VP Study Survey effort	36 HRS	36 HRS	36 HRS	36 HRS			
No. of VPs	6 VPs	6 VPs	8-10 VPs	10 VPs			



Plate 41: Comparison of percentage Hen Harrier activity recorded during the four breeding VP surveys.

#### 2.1.2 Marsh Harrier Activity

A female Marsh Harrier was recorded in May 2019 flying over heath/bog in the northeast of the site for 120 seconds (see Tables 19 to 23). It was flying at a height of 5-25m above ground level (AGL) for one minute and 25-100m AGL for one minute and was chased by Hooded Crow. This was the only record of this species at the terrestrial biodiversity study area during the VP study (as well as all other ecological surveys at the site).

This Annex I species is *Amber-Listed* on the Birds of Conservation Concern in Ireland list (BOCCI List) as it is a breeding rarity in Ireland (after Gilbert *et al.* 2021).

### 2.2 Breeding Season Hen Harrier Hinterland Survey Results

Hinterland surveys were completed in all four breeding seasons (2017-2020), with survey schedules provided in Tables 7 to 18 and flightline observations provided in Tables 19 to 23. Details of nest site locations, which are known to NPWS, are not disclosed here due to the sensitive nature of this information.

In the 2017, 2018 and 2019 breeding seasons no nest site or evidence of breeding was recorded on the study area or within 2km of the study area. Two active nest sites were recorded between 2.5 and 5km from the study area boundary, one to the southwest and one to the southeast. The same nest sites were used in all three breeding seasons. Both nest sites were recorded as successfully producing young in the 2017 and 2018 survey seasons, however in the 2019 survey season one of the nest sites (the south-eastern nest) appeared to have failed.

An increase in Hen Harrier nesting activity within the 5km hinterland area was confirmed during the 2020 breeding season. A total of five nest sites were recorded, including the two historically used nest sites (2017-2019) and three newly confirmed nest sites. Four of the five nests were recorded as successfully producing at least one chick. Supplementary information on these nest sites such as nesting success was received from the local NPWS ranger.

In summary, the number of Hen Harrier nests sites in the 5km hinterland area of the study area has varied during the survey period from 1-2 and up-to 5 more recently, with no nest sites located at or within 2km of the study area. Overall, the Hen Harrier population in the Mullaghanish to Musheramore Mountains SPA has undergone serious decline in the last 10 years, however an increase in numbers of nesting pairs in the SPA was noted in 2020 (Hen Harrier Project 2020).

### 2.3 Winter Season Vantage Point Survey Results

A total of four winter season VP surveys (2017/2018, 2018/2019, 2019/2020 & 2020/2021) were undertaken at the terrestrial biodiversity study area. Survey results are presented below for each season. The survey schedule is provided in Tables 7 to 18 with flightline observations provided in Tables 24 to 27.

Six Annex I Bird species were recorded during the breeding season VP surveys; Hen Harrier, Peregrine Falcon, Golden Plover, Merlin, Red Kite *Milvus milvus* and White-tailed Sea Eagle.

#### Hen Harrier Activity

Hen Harriers were recorded during all four winter season vantage point surveys with the number of flightlines ranging from 7 to 11. Activity levels on site were low (< 0.7% of the total survey time, see Table 1) during all VP surveys and related primarily to foraging and commuting, generally at heights of <25m (see Tables 19 to 23). Individuals were regularly recorded being mobbed by Corvids, particularly Hooded Crow and Raven (see Tables 19 to 23).

Activity was relatively dispersed at the site, with no areas of high or focused activity noted. Male Hen Harrier accounted for the bulk of the flightline activity at the site, although at least two Ringtail Hen Harrier (female or immature) flightlines were recorded in each season, apart from the winter of 2019/2020 when all observations comprised male Hen Harriers. During the 2018/2019 season a number of ringtail flightlines were noted in the Dooneen Hill area to the southeast of the site, outside of the study area boundary in association with a known nest site in the wider area. Hen Harriers were generally present in all survey months, with no clear temporal pattern of activity noted. The predominant habitat where Hen Harriers were recorded was heath/bog, conifer plantation and grassland. No roosting activity was noted on/near the study area during the December and January 2017/2018 VP surveys that overlapped with the onset of the sunset/dusk period, where the study area supports limited areas of potentially suitable winter roosting habitat.

A comparison of Hen Harrier activity recorded on-site (*i.e.*, within the study area boundary) during the winter season surveys is presented below in Table 2 and Plate 2, where data are presented as the percentage of total VP survey time that Hen Harrier were present on the site. Note that the number of vantage points used increased from six (in 2017/3018 and 2018/2019) to 10 in the 2019/2020 and 2020/2021 winter seasons as a result of an expansion of the study area boundary. An increase in observations might therefore be expected as a result in the increase in area covered. Overall Hen Harrier winter season activity levels appeared to be relatively stable at the study area throughout the study period until a drop with on-site activity in 2020/2021 (Table 2 and Plate 2). Note that the off-site activity was relatively high in the 2020/2021 season (*i.e.*, almost 13 minutes recorded) however indicating the Hen Harriers were still active in the general area.

Winter Studies Comparison	% Total of VP Survey Time						
Hen Harrier (both sexes/ages)	2017/2018	2018/2019	2019/2020	2020/2021			
On Site	0.51	0.51	0.64	0.16			
Off Site	0.40	0.00	0.08	0.60			
VP Study Survey effort	35.5 HRS	36 HRS	36 HRS	36 HRS			
No. VPs	6 VPs	6 VPs	10 VPs	10 VPs			

# Table 12:Percentage of VP Survey time that Hen Harrier were recorded on/off site during the<br/>winter season surveys.



Plate 42: Figure 8A.12 Comparison of percentage Hen Harrier activity recorded during the four winter VP surveys.

#### 2.4 Breeding Season Transect & Point Count Results

A total of 44 avian species were recorded during the dedicated breeding season transect and point count surveys (see Table 3). The maximum count for each species across all seasons for transect and point count data separately is shown in Table3, with a break-down of counts for each season available in Tables 28 to 33. It is important to remember that these data do not include birds that were present more than 100m from the observer or birds flying over and not using the site during the transect/point count surveys.

The species with the highest maximum abundance on the transect surveys was Meadow Pipit with a maximum count of 42 individuals recorded across the seven transects, followed by Woodpigeon (38) and Skylark (36; see Table 3). These species were present on the site in all four survey seasons. It should be noted that the high Woodpigeon numbers is attributed to one early season count in 2019 when relatively higher numbers were noted at two transects, where the maximum count for this species was generally lower (< 18). Other relatively abundant species recorded during the transect surveys were Chaffinch, Rook (28 each) and Wren (21).

While Jackdaw had the highest maximum abundance during the point count surveys (50, see Table 3), this high count comprised a single flock at PC5 in 2018 where this species was generally not present or present in very low numbers during the point count surveys overall. After Jackdaw, the species with the highest maximum count was Chaffinch (22), followed by Wren (16), Willow Warbler (12) and Robin (10) (see Table 3). These species were present on the site in all four survey seasons.

# Table 13:Maximum abundance of bird species recorded during the transect and point count<br/>surveys during the four breeding bird seasons (2017, 2018, 2019 and 2020).

Species Name	Scientific Name	Max. Abundance Transects 2017-2020	Max. Abundance Point Counts 2017-2020	Conservatio n Status BoCCI*
Blackbird	Turdus merula	6	6	GREEN
Blackcap	Sylvia atricapilla	3	5	GREEN
Blue Tit	Cyanistes caeruleus	8	4	GREEN
Bullfinch	Pyrrhula pyrrhula	2	1	GREEN
Chaffinch	Fringilla coelebs	28	22	GREEN
Chiffchaff	Phylloscopus collybita	3	6	GREEN
Coal Tit	Periparus ater	2	5	GREEN
Crossbill	Loxia curvirostra	1	1	GREEN
Dunnock	Prunella modularis	2	2	GREEN
Goldcrest	Regulus regulus	14	7	AMBER
Goldfinch	Carduelis carduelis	3	0	GREEN
Grasshopper Warbler	Locustrella naevia	1	1	GREEN
Great Tit	Parus major	1	2	GREEN
Greenfinch	Carduelis chloris	1	2	AMBER
Grey Heron	Ardea cinerea	1	0	GREEN
Hen Harrier	Circus cyaneus	1	0	AMBER
Hooded Crow	Corvus cornix	14	3	GREEN
House Martin	Delichon urbica	5	0	AMBER
Jackdaw	Corvus monedula	6	50	GREEN
Јау	Garrulus glandarius	0	1	GREEN
Kestrel	Falco tinnunculus	1	0	RED
Lesser Redpoll	Carduelis cabaret	5	2	GREEN
Long-tailed Tit	Aegithalos caudatus	0	4	GREEN
Magpie	Pica pica	6	4	GREEN
Meadow Pipit	Anthus pratensis	42	7	RED
Mistle Thrush	Turdus viscivorus	1	2	GREEN
Pheasant	Phasianus colchicus	3	3	N/A
Pied Wagtail	Motacilla alba	2	1	GREEN
Raven	Corvus corax	8	2	GREEN
Reed Bunting	Emberiza schoeniclus	1	1	GREEN
Robin	Erithacus rubecula	9	10	GREEN
Rook	Corvus frugilegus	28	1	GREEN
Sodge Warbler	Acrocephalus	0	1	CDEEN
	schoenobaenus	0	1 	GREEN
Siskin	Carduelis spinus	2	10	GREEN
Skylark	Alauda arvensis	36	0	AMBER

Species Name	Scientific Name	Max. Abundance Transects 2017-2020	Max. Abundance Point Counts 2017-2020	Conservatio n Status BoCCI*
Song Thrush	Turdus philomelos	3	3	GREEN
Spotted Flycatcher	Muscicapa striata	1	0	AMBER
Starling	Sturnus vulgaris	5	0	AMBER
Stonechat	Saxicola torquata	1	0	GREEN
Swallow	Hirundo rustica	11	1	AMBER
Whitethroat	Phylloscopus trochilus	1	1	GREEN
Willow Warbler	Phylloscopus trochilus	8	12	AMBER
Woodpigeon	Columba palumbus	38	6	GREEN
Wren	Troglodytes troglodytes	21	16	GREEN

\*After Gilbert et al 2021, Birds of Conservation Concern in Ireland List (BoCCI List).

An additional 22 avian species were recorded on a casual basis during other terrestrial biodiversity surveys on the study area (primarily during VP surveys) or were 'off-transect' (i.e., recorded >100m from the observer or flying over, see Table 4<sup>7</sup>). The presence/absence of the additional species during the survey seasons are outlined in Table 4 below. This includes many species which are typically recorded in flight such as Buzzard, House Sparrow, Lesser Black-backed Gull, Sand Martin, Sparrowhawk and Swift. Other species that were casually recorded at the terrestrial biodiversity study area across all survey seasons included Feral Pigeon, Grey Wagtail, Linnet, Mallard and Snipe. Mallard is a special conservation interest (SCI) species of the Gearagh SPA. It is worth noting that such casually recorded Mallard were infrequently observed in very low numbers (<5 individuals, typically 1-2 at any one time) and that the study site does not support foraging, loafing or roosting features of significance for this species due to the absence of suitable habitats (*e.g.*, wetlands, lakes).

Tables 3 and 4 also display the conservation status of the avian species recorded according to the BoCCI list (after Gilbert *et al.* 2021). A total of six *Red-Listed* species of high conservation concern in Ireland have been recorded at the study area during the dedicated transect/point count surveys or on a casual basis during the four breeding seasons; Grey Wagtail, Kestrel, Meadow Pipit, Redwing, Snipe and Swift. A total of 18 of the species recorded are *Amber-Listed* on the BoCCI list (see Tables 3 and 4).

<sup>&</sup>lt;sup>7</sup> Note that Table 4 excludes target species of the VP survey which have already been described above or not included in this assessment report.

Table 14:	Additional	bird	speci	ies	ree	corded	on	a	casua	l ba	asis (	during	other	terre	estrial
	biodiversity	surv	veys a	at	the	study	area	du	iring	the	2017	, <mark>2018</mark> ,	2019	and	2020
	breeding sea	asons	5.												

Common Name	Scientific Name	2017	2018	2019	2020	BoCCI List*
Black-headed Gull	Limosa lapponica			х		AMBER
Buzzard	Buteo buteo	x	x	х	х	GREEN
Collared Dove	Streptopelia decaocto	x	x			GREEN
Cuckoo	Cuculus canorus	x	х		х	GREEN
Dipper	Cinclus cinclus			х		GREEN
Feral Pigeon	Columba livia	x	x	х	х	N/A
Fieldfare	Turdus pilaris		x		х	GREEN
Grey Wagtail	Motacilla cinerea	x	x	х	х	RED
Gull species	Larus sp.	x	х			AMBER
House Sparrow	Passer domesticus	х	x	х	х	AMBER
Herring Gull	Larus argentatus		x	х	х	AMBER
Lesser Black-backed Gull	Larus fuscus	x	x	x	x	AMBER
Linnet	Carduelis cannabina	x	x	х	х	AMBER
Mallard	Anas platyrhynchos	x	x	х	х	AMBER
Redwing	Turdus iliacus		x		х	RED
Reed Warbler	Acrocephalus scirpaceus	х	x			GREEN
Sand Martin	Riparia riparia	x	x	х	х	AMBER
Sedge Warbler	Acrocephalus schoenobaenus	x	x			GREEN
Snipe	Gallinago gallinago	х	х	х	х	RED
Sparrowhawk	Accipiter nisus	х	х	Х	х	GREEN
Swift	Apus apus		х		х	RED
Wheatear	Oenanthe oenanthe			х	х	AMBER

\*After Gilbert et al. 2021.

### 2.5 Winter Season Transect & Point Count Results

A total of 33 avian species were recorded during the dedicated winter season transect and point count surveys (see Table 5). The maximum count for each species across all seasons for transect and point count data separately is shown below in Table 5, with a break-down of counts for each season available in Tables 28 to 33. It is important to remember that these data do not include birds that were present more than 100m from the observer or birds flying over and not using the site during the transect/point count surveys.

The species with the highest maximum abundance on the transect surveys was Starling with a maximum count of 120 individuals recorded across the seven transects, followed by Meadow Pipit (97) and Fieldfare (80; see Table 5).

These species were present on the site in both survey seasons and are typical species of open habitats. Other abundant species recorded during the transect surveys were Hooded Crow (55), Woodpigeon (48) and Redwing (41).

Species with the highest maximum abundance during the point count surveys were Robin, Siskin, Chaffinch and Wren (varied 10 to 18; see Table 5). All of these species, apart from Siskin were present in both survey seasons.

# Table 15:Maximum abundance of bird species recorded during the transect and point count<br/>surveys during the two winter bird seasons (2017/2018 & 2019/2020).

		Max	Max	
		Abundance	Abundance	
		Transects	Point Counts	
Species Name	Scientific Name	Winter	Winter	BoCCI*
		2017/2018	2017/2018	
		&	&	
		2019/2020	2019/2020	
Blackbird	Turdus merula	12	2	GREEN
Blue Tit	Cyanistes caeruleus	12	4	GREEN
Bullfinch	Pyrrhula pyrrhula	0	3	GREEN
Chaffinch	Fringilla coelebs	25	12	GREEN
Coal Tit	Periparus ater	10	5	GREEN
Crossbill	Loxia curvirostra	1	2	GREEN
Dunnock	Prunella modularis	4	3	GREEN
Fieldfare	Turdus pilaris	80	0	GREEN
Goldcrest	Regulus regulus	12	8	AMBER
Goldfinch	Carduelis carduelis	18	0	GREEN
Great Tit	Parus major	2	1	GREEN
Hooded Crow	Corvus cornix	55	7	GREEN
Jackdaw	Corvus monedula	17	3	GREEN
Jay	Garrulus glandarius	1	0	GREEN
Kestrel	Falco tinnunculus	0	1	RED
Lesser Redpoll	Carduelis cabaret	4	1	GREEN
Magpie	Pica pica	5	3	GREEN
Mallard	Anas platyrhynchos	2	0	AMBER
Meadow Pipit	Anthus pratensis	97	4	RED
Pheasant	Phasianus colchicus	1	1	N/A
Pied Wagtail	Motacilla alba	2	1	GREEN
Raven	Corvus corax	19	2	GREEN
Redwing	Turdus iliacus	41	0	RED
Reed Bunting	Emberiza schoeniclus	1	1	GREEN
Robin	Erithacus rubecula	18	18	GREEN
Rook	Corvus frugilegus	30	1	GREEN

Species Name	Scientific Name	Max Abundance Transects Winter 2017/2018 & 2019/2020	Max Abundance Point Counts Winter 2017/2018 & 2019/2020	BoCCI*
Siskin	Carduelis spinus	4	13	GREEN
Skylark	Alauda arvensis	2	0	AMBER
Snipe	Gallinago gallinago	4	0	RED
Song Thrush	Turdus philomelos	4	1	GREEN
Sparrowhawk	Accipiter nisus	2	0	GREEN
Starling	Sturnus vulgaris	120	0	AMBER
Woodpigeon	Columba palumbus	48	1	GREEN
Wren	Troglodytes troglodytes	7	10	GREEN

\*After Gilbert et al. 2021, Birds of Conservation Concern in Ireland List (BoCCI List).

An additional 20 avian species were recorded on a casual basis during other terrestrial biodiversity surveys at the study area (primarily during VP surveys) or were 'off-transect' (i.e., recorded >100m from the observer or flying) during the winter seasons (see Table 6<sup>8</sup>). The presence/absence of the additional species during the survey seasons are shown below in Table 6. This includes species which were typically recorded in flight such as Great Black-backed Gull, Lesser Black-backed Gull, House Martin and Swallow (where the summer hirundine migrants were recorded in March, a transition period between winter and summer). Other species that were consistently recorded on the terrestrial biodiversity study area during all survey seasons included Buzzard, Mistle Thrush and Stonechat.

Tables 5 and 6 also outline the conservation status of the avian species recorded (BoCCI List, after Gilbert et al. 2021). A total of eight *Red-Listed* species of high conservation concern in Ireland have been recorded at the study area during the dedicated transect/point count surveys or on a casual basis during the winter seasons; Grey Wagtail, Kestrel, Meadow Pipit, Redwing, Snipe, Song Thrush, Stock Dove and Woodcock. A total of nine of the species recorded are *Amber-Listed* on the BoCCI list (see Tables 5 and 6).

An additional Annex I species that is *Amber-Listed* on the BoCCI list was noted at two different locations in the wider area of the study area; Whooper Swan *Cygnus cygnus*. These Whooper Swan data are not included in the additional casual bird results here as they did not occur at/near the study area. A flock of 61 individuals were noted at a field (51.92927 -8.911225) >5km south of the study area in early March 2019. A flock of 13 individuals were casually observed flying north over Rylane at a height of > 150m in October 2020 *c*. 4km off-site.

<sup>&</sup>lt;sup>8</sup> Note that Table 6 excludes the target species of the VP survey which have already been described above or not included in this assessment report.

# Table 16:Additional bird species recorded on a casual basis during other terrestrial<br/>biodiversity surveys at the study area during winter season surveys.

		2017	2018	2019	2020	
Common Name	Scientific Name	/	/	/	/	BoCCI*
		2018	2019	2020	2021	
Buzzard	Buteo buteo	Х	Х	Х	Х	GREEN
Chiffchaff	Phylloscopus collybita				Х	GREEN
Cormorant	Phalacrocorax carbo	Х				AMBER
Feral Pigeon	Columba livia	Х	Х	Х		GREEN
Great Black-backed	Larus marinus			v		
Gull				^		GREEN
Greenfinch	Carduelis chloris	Х				AMBER
Grey Heron	Ardea cinerea			Х	Х	GREEN
Grey Wagtail	Motacilla cinerea		Х	Х	Х	RED
House Sparrow	Passer domesticus			Х		AMBER
Jack Snipe	Lymnocryptes minimus	Х		Х	Х	GREEN
Lapwing	Vanellus vanellus				х	RED
Lesser Black-backed	Larus fuscus			~		
Gull				^		AMBER
Linnet	Carduelis cannabina	Х		Х	Х	AMBER
Long-tailed Tit	Aegithalos caudatus	Х		Х	Х	GREEN
Mistle Thrush	Turdus viscivorus	Х	х	Х	Х	GREEN
Stock Dove	Columba oenas				Х	RED
Stonechat	Saxicola torquata	Х	Х	Х	х	GREEN
Swallow	Hirundo rustica				Х	AMBER
Treecreeper	Certhia familiaris				Х	GREEN
Woodcock	Scalopax rusticola	Х		Х		RED

\*After Gilbert *et a*l. 2021, BoCCI List.

### 2.6 Desktop Study Results

A total of six additional avian species have been record historically within the W38 10km national grid square overlapping the terrestrial biodiversity study area (after NBDC database accessed on 10<sup>th</sup> May 2021). The additional species are as follows; Brambling *Fringilla montifringilla*, Moorhen *Gallinula chloropus*, Curlew *Numenius arquata*, Long-eared Owl *Asio otus*, Short-eared Owl *Asio flammeus*, and Yellowhammer *Emberiza citrinella*. Curlew and Yellowhammer are *Red-Listed* as birds of high conservation concern in Ireland (Gilbert *et al.* 2021), where Curlew have experienced a drop in breeding population of 96% since the 1980's (O'Donoghue 2020). The terrestrial biodiversity study area is not located within the current breeding range of Curlew (Balmer *et al.* 2013) and there is limited suitable foraging habitat (*i.e.*, cereal crops) at the study area for Yellowhammer that is a grain/cereal food dependent species.

The remaining species may occur at the study area from time to time, although the study area lacks significant wetland habitat to support Moorhen and Short-eared Owl is a rare and sporadic breeding species (Balmer *et al.* 2013) where the historical record here dates back to the 1980s.

Information on the current known distribution of Barn Owl nest sites (including all active sites recorded over the past ten-year period) was received from Birdwatch Ireland (BWI) in relation to the study area at Ballinagree (email from John Lusby on 5<sup>th</sup> August 2021). There are no known Barn Owl sites within the boundary of the study area (where the study area is shown on Figure 8A.1). The closest known Barn Owl site (an active nest site) is over 2km from the study area boundary. There are no other Barn Owl sites on the BWI database which are within 5km of the study area boundary, but several are located within 10km. It is important to note that BWI do not have information on all Barn Owl sites in this area, and the information provided should not be treated as a complete assessment of Barn Owl sites in this area.

## **3** Avifauna Results (Full)

## **3.1** Vantage Point (VP) and Hinterland Survey Schedules (March 2017 – March 2020)

Date	VP	Time (24hrs)	Survey Effort (hrs/mins)	Weather
30.03.17	1	10.00 - 13.30	3hrs 30 mins	Dry initially then Mist/Rain; F3-4; Good to Poor Visibility;8/8 Okta
30.03.17	2	11.30 - 12.45	1hr 15mins	Dry initially then Mist/Rain; F3-4; Good to Poor (from 12.15hrs) Visibility;8/8 Okta
30.03.17	3	n/a	Ohrs Omins	Mist/Rain; F4; Moderate to Poor Visibility;8/8 Okta
30.03.17	4	10.45 - 13.30	2hrs 45mins	Dry initially then Mist/Rain; F3-4; Good to Poor (from 12.55hrs) Visibility;8/8 Okta
30.03.17	5	11.05 - 13.30	2 hrs 25mins	Dry; F3; Good Visibility;8/8 Okta
30.03.17	6	11.20 - 12.00 & 12.50 - 13.25	1hr 15mins	Dry initially then Mist/Rain; F1; Moderate to Poor Visibility;8/8 Okta
20.04.17	1	09.30 - 16.15	6hrs 45mins	Dry; F0-3; Good Visibility; 0-7/8 Okta
20.04.17	2	09.35 - 16.20	6hrs 45 mins	Dry; F0-1; Good Visibility; 3-7/8 Okta
21.04.17	3	09.45 - 16.30	6hrs 45mins	Dry; F1-2; Good Visibility; 1-8/8 Okta
21.04.17	4	09.45 - 16.50	7hrs 5mins	Dry; F1-3; Good Visibility; 1-6/8 Okta
21.04.17	5	09.45 - 16.50	7hrs 5mins	Dry; F2; Good Visibility; 2/8 Okta
21.04.17	6	10.00 - 16.55	6hrs 45mins	Dry; F1; Good Visibility; 4/8 Okta
26.04.17	2	10.00-11.00	1hr Omins	Dry; F3-4; Good Visibility; 6-7/8 Okta
26.04.17	3	11.20-13.35	2hrs 15mins	Dry; F3-4; Good Visibility; 6-7/8 Okta

 Table 17:
 VP Survey Schedule Ballinagree, Breeding Season Survey 2017

Date	VP	Time (24hrs)	Survey Effort (hrs/mins)	Weather
26.04.17	6	15.30-16.30	1hr Omins	Dry; F3-4; Good Visibility; 7/8 Okta
12.05.17	1	09.25 - 15.50	6hrs 25mins	Dry; F3; Moderate - Good Visibility; 7/8 Okta
12.05.17	2	09.35 - 16.20	6hrs 45mins	Dry; F2-4; Moderate - Good Visibility; 8/8 Okta
12.05.17	3	09.45 - 16.30	6hrs 45mins	Dry; F3-4; Good Visibility; 7/8 Okta
12.05.17	4	09.45 - 16.15	6hrs 30mins	Dry; F3-4; Moderate - Good Visibility; 6-8/8 Okta
12.05.17	5	10.05 - 16.40	6hrs 35mins	Dry; F4; Good Visibility; 8/8 Okta
12.05.17	6	09.40 - 15.40 & 16.00 - 16.45	6hrs 45mins	Dry; F2-3; Moderate - Good Visibility; 8/8 Okta
15.06.17	1	09.40 - 14.05	6hrs 25mins	Light rain; F2-3; Good Visibility; 7/8 Okta
16.06.17	2	10.00 - 16.45	6hrs 45mins	Dry; F3; Good Visibility; 2-7/8 Okta
15.06.17	3	09.50 - 16.35	6hrs 45mins	Dry; F5; Good Visibility; 7/8 Okta
15.06.17	4	09.45 - 16.15	6hrs 30mins	Dry with occ. showers; F4; Good Visibility; 8/8 Okta
16.06.17	5	10.40 - 17.15	6hrs 35mins	Dry; F2-4; Good Visibility; 7-8/8 Okta
16.06.17	6	10.05 - 16.50	6hrs 45mins	Dry; F2-3; Good Visibility; 3/8 Okta
13.07.17	1	10.30 - 16.55	6hrs 25 mins	Dry; F0-1; Good Visibility; 6/8 Okta
12.07.17	2	09.25 - 16.10	6hrs 45mins	Dry; F0-3; Good Visibility; 0-6/8 Okta
13.07.17	3	10.45 - 17.30	6hrs 45mins	Dry; F1-3; Good Visibility; 8/8 Okta
13.07.17	4	11.00 - 17.30	6hrs 30mins	Dry; Good Visibility; 6/8 Okta
12.07.17	5	09.55 - 16.30	6hrs 35mins	Dry; Good Visibility; 2-3/8 Okta
12.07.17	6	09.30 - 16.15	6hrs 45mins	Dry; F1; Good Visibility; 1-2/8 Okta
23.08.17	1	09.40 - 16.10	6hrs 30 mins	Occ. light mist); F1-2; Good Visibility; 6-8/8 Okta
23.08.17	2	09.40 - 16.25	6hrs 45mins	Occ. Rain; F3; Good Visibility; 8/8 Okta
24.08.17	3	11.05 - 17.50	6hrs 45mins	Occ. Light Mist; F2-4; Moderate - Good Visibility; 4-8/8 Okta
23.08.17	4	09.45 - 16.20	6hrs 35mins	Occ. Light Mist; Good Visibility; 4-8/8 Okta
23.08.17	5	09.50 - 16.30	6hrs 40mins	Occ. Showers; F3; Good Visibility; 6-8/8 Okta
23.08.17	6	09.45 - 16.30	6hrs 45mins	Occ. Showers; F1-2; Good Visibility; 7-8/8 Okta

Date	Time (24hrs)	Survey Effort (hrs & mins)	Weather
15.04.17	10.00 - 16.10	6 hrs 10 mins	Dry (one shower); F2-4; Good Visibility; 6-8/8 Okta
26.04.17	15.00-15.15	Ohrs 15mins	Dry; F3-4; Good Visibility; 8/8 Okta
13.07.17	10.20 - 17.20	7 hrs	Dry; F3; Good Visibility; 4-7/8 Okta

 Table 18:
 Hinterland Survey Schedule Ballinagree, Breeding Season Survey 2017

Table 19:VP Survey Schedule Ballinagree, Winter Season Survey 2017/2018

Date	VP	Time (24hrs)	Survey Effort (hrs/mins)	Weather
24.10.17	1	09.55 - 15.55	6 hrs	Dry initially, showers from 13.00, light rain for last 45 mins; F1-2; Good to Moderate Visibility (last 45 mins);8/8 Okta
24.10.17	2	09.50 - 15.50	6 hrs	Showers; F3-4; Good to Moderate Visibility; 8/8 Okta
24.10.17	3	10.03 - 16.03	6 hrs	Showers; F3; Good to Moderate Visibility; 8/8 Okta
24.10.17	4	09.50 - 15.50	6 hrs	Occ. Drizzle; F2-3; Good Visibility; 8/8 Okta
24.10.17	5	09.58 - 15.58	6 hrs	Dry; F2-3; Good to Moderate Visibility; 8/8 Okta
24.10.17	6	10.00 - 16.00	6 hrs	Occ. Showers, light rain after 14.00; F3; Good to Moderate Visibility; 8/8 Okta
09.11.17	1	08.10 - 14.10	6 hrs	Dry; F3; Good Visibility; 3-6/8 Okta
09.11.17	2	09.15 - 15.15	6 hrs	Occ. Light mist; F5; Good Visibility; 8/8 Okta
09.11.17	3	09.15 - 15.15	6 hrs	Dry; F2-4; Good Visibility; 2-7/8
09.11.17	4	09.10 - 15.10	6 hrs	Dry; F4-5; Good Visibility; 2-8/8
09.11.17	5	09.40 - 15.40	6 hrs	Occ. Showers; F3-4; Good Visibility; 2-7/8
09.11.17	6	09.50 - 15.50	6 hrs	Dry; F3-4; Good Visibility; 6-8/8
05.12.17	1	11.01 - 16.31	5.5 hrs	Occ. Drizzle; F3-4; Good - Moderate Visibility; 8/8 Okta

Date	VP	Time (24hrs)	Survey Effort (hrs/mins)	Weather
05.12.17	2	11.00 - 16.30	5.5 hrs	Dry but low cloud last 30 mins; F4; Good - Poor Visibility (last 30 mins); 8/8 Okta
05.12.17	3	11.00 - 16.30	5.5 hrs	Mist after 12.15; F3-5; Good - Poor Visibility; 8/8 Okta
05.12.17	4	11.00 - 16.30	5.5 hrs	Occ drizzle & low cloud; F3; Moderate to Poor Visibility; 8/8 Okta
05.12.17	5	10.50 - 16.35	5 hrs 45 mins	Occ. Showers & low cloud; F1-2; Good - Poor Visibility; 8/8 Okta
05.12.17	6	10.55 - 16.30	5 hrs 35 mins	Dry; F1; Good- Moderate Visibility; 8/8 Okta
25.01.18	1	11.30 - 17.30	6 hrs	Occ. Showers; F2-4; Good Visibility; 6-7/8
25.01.18	2	11.40 - 17.40	6 hrs	Occ. Showers; F4-5; Good - Moderate Visibility; 8/8
26.01.18	3	11.40 - 17.40	6 hrs	Light rain in last hour; F1-2; Good - Moderate Visibility (last 20 mins); 8/8
25.01.18	4	11.30 - 17.30	6 hrs	Occ. Showers; F3-4; Good - Moderate Visibility; 7/8
25.01.18	5	11.15 - 17.15	6 hrs	Occ. Showers; F2; Good Visibility; 7/8 Okta
26.01.18	6	11.30 - 17.30	6 hrs	Light rain last 1.5hrs; F1; Good Visibility; 7/8
21.02.18	1	10.17 - 16.17	6 hrs	Dry; F1; Good Visibility; 4-8/8 Okta
21.02.18	2	09.38 - 15.38	6 hrs	Dry; F2; Good Visibility; 1-7/8 Okta
21.02.18	3	10.15 - 16.15	6 hrs	Dry; F1; Good Visibility; 1-8/8 Okta
21.02.18	4	09.30 - 15.30	6 hrs	Dry; F1; Good Visibility; 2/8 Okta
26.02.18	5	09.45 - 15.45	6 hrs	Dry; F3-4; Good Visibility; 8/8 Okta
26.02.18	6	09.45 - 15.45	6 hrs	One light snow shower; F3; Good Visibility; 4-8/8 Okta
16.03.18	1	09.30 - 15.30	6 hrs	Occ. Showers; F2-3; Good Visibility; 8/8
16.03.18	2	09.30 - 15.30	6 hrs	Occ. showers; F2-3; Good to Moderate Visibility; 7/8 Okta
16.03.18	3	09.50 - 15.50	6 hrs	Occ. showers; F1-2; Good to Moderate Visibility; 7-8/8 Okta
16.03.18	4	09.50 - 15.50	6 hrs	Occ. showers; F3-4; Good Visibility; 8/8 Okta
21.03.18	5	10.05 - 16.05	6 hrs	Dry; F2-3; Good Visibility; 1-8/8 Okta
22.03.18	6	10.00 - 16.00	6 hrs	Dry; F1-2; Good Visibility; 4/8 Okta

Date	VP	Time (24hrs)	Survey Effort (hrs/mins)	Weather
16.03.18	1	09.30 - 15.30	6 hrs	Occ. Showers; F2-3; Good Visibility; 8/8
16.03.18	2	09.30 - 15.30	6 hrs	Occ. showers; F2-3; Good to Moderate Visibility; 7/8 Okta
16.03.18	3	09.50 - 15.50	6 hrs	Occ. showers; F1-2; Good to Moderate Visibility; 7-8/8 Okta
16.03.18	4	09.50 - 15.50	6 hrs	Occ. showers; F3-4; Good Visibility; 8/8 Okta
21.03.18	5	10.05 - 16.05	6 hrs	Dry; F2-3; Good Visibility; 1-8/8 Okta
22.03.18	6	10.00 - 16.00	6 hrs	Dry; F1-2; Good Visibility; 4/8 Okta
11.04.18	1	09.00 - 15.00	6 hrs	Dry; F0; Moderate Visibility; 8/8 Okta
19.04.18	2	08.30 - 14.30	6 hrs	Dry; F2-3; Moderate - Good Visibility; 3-8/8 Okta
11.04.18	3	09.30 - 15.30	6 hrs	Dry; F1; Moderate - Good Visibility; 8/8 Okta
11.04.18	4	09.53 - 15.53	6 hrs	Dry; F2-3; Moderate Visibility; 8/8 Okta
19.04.18	5	09.45 - 15.45	6 hrs	Dry; F2-3; Moderate - Good Visibility; 3/8 Okta
19.04.18	6	09.35 - 15.35	6 hrs	Occ. Drizzle; F1-2; Moderate - Good Visibility; 4-8/8
10.05.18	1	09.55 - 15.55	6 hrs	Dry; F3; Good Visibility; 5/8 Okta
10.05.18	2	09.48 - 15.48	6 hrs	Dry; F3-5; Good Visibility; 5/8 Okta
25.05.18	3	09.20 - 15.20	6 hrs	Dry; F3; Good Visibility; 1-5/8 Okta
10.05.18	4	10.12 - 16.12	6 hrs	Dry; F2; Good Visibility; 6/8 Okta
25.05.18	5	09.45 - 15.45	6 hrs	Dry; F3-4; Good Visibility; 1-4/8 Okta
25.05.18	6	09.30 - 15.30	6 hrs	Dry; F3; Good Visibility; 3/8 Okta
08.06.18	1	09.35 - 15.35	6 hrs	Dry; F1-2; Good Visibility; 5/8 Okta
11.06.18	2	09.00 - 15.00	6 hrs	Dry; F3; Good Visibility; 7/8 Okta
08.06.18	3	09.20 - 15.20	6 hrs	Dry; F3; Good Visibility; 7/8 Okta
08.06.18	4	09.15 - 15.15	6 hrs	Dry; F2-3; Good Visibility; 3/8 Okta
11.06.18	5	09.10 - 15.10	6 hrs	Dry; F3; Good Visibility; 7-8/8 Okta
11.06.18	6	09.30 - 15.30	6 hrs	Dry; F3-4; Moderate - Good Visibility; 4-6/8 Okta
06.07.18	1	09.12 - 15.12	6 hrs	Dry; F2; Good Visibility; 4-8/8 Okta

#### Table 20:VP Survey Schedule Ballinagree, Breeding Season Survey 2018.

Date	VP	Time (24hrs)	Survey Effort (hrs/mins)	Weather
06.07.18	2	09.21 - 15.21	6 hrs	Occ. Showers; F3; Good Visibility; 3-8/8 Okta
06.07.18	3	09.24 - 15.24	6 hrs	Dry; F2; Good Visibility; 5/8 Okta
06.07.18	4	09.05 - 15.05	6 hrs	Dry; F2-3; Good Visibility; 4-7/8 Okta
06.07.18	5	09.30 - 15.30	6 hrs	Occ. Mist; F0-1; Good Visibility; 4-8/8 Okta
06.07.18	6	09.10 - 15.10	6 hrs	Occ. Mist; F1; Good Visibility; 4-8/8 Okta
22.08.18	1	09.25 - 15.25	6 hrs	Light mist initially; F2-4; Moderate - Good Visibility; 5-8/8 Okta
22.08.18	2	09.15 - 15.15	6 hrs	Light mist initially; F3; Moderate - Good Visibility; 5-8/8 Okta
22.08.18	3	09.30 - 15.30	6 hrs	Light mist initially; F4; Moderate - Good Visibility; 5-8/8 Okta
22.08.18	4	09.15 - 15.15	6 hrs	Light mist initially; F3-4; Moderate - Good Visibility; 5-8/8 Okta
22.08.18	5	09.30 - 15.30	6 hrs	Light mist initially; F4; Moderate - Good Visibility; 6-8/8 Okta
22.08.18	6	09.20 - 15.20	6 hrs	Light mist initially; F2-4; Moderate - Good Visibility; 4-8/8 Okta

#### Table 21:Hinterland Survey Schedule Ballinagree, Breeding Season 2018

Date	Time (24hrs)	Survey Effort (hrs & mins)	Weather
11.04.18	09.48 - 16.00	6 hrs 12 mins	Dry; F1; Good Visibility; 8/8 Okta
18.04.18	08.00 - 12.20	4hrs 20 mins	Occ. Showers; F5; Poor - Good Visibility; 8/8 Okta
20.07.19	09.27 - 17.59	8 hrs 30 mins	Dry; F2-3; Good Visibility; 5/8 Okta

Date	VP	Time (24hrs)	Survey Effort (hrs/mins)	Weather
17.10.18	1	08.11 - 14.55	6 hrs	Dry; F1-2; Good Visibility; 3/8 Okta
17.10.18	2	09.24 - 15.24	6 hrs	Dry; F4; Good Visibility; 2/8 Okta
17.10.18	3	09.20 - 15.20	6 hrs	Dry; F2-3; Good Visibility; 1-6/8 Okta
17.10.18	4	09.30 - 15.30	6 hrs	Dry; F5-6; Good Visibility; 1-6/8 Okta
17.10.18	5	09.30 - 15.30	6 hrs	Dry; F4-5; Good Visibility; 3/8 Okta
17.10.18	6	08.55 - 14.55	6 hrs	Dry; F3; Good Visibility; 2/8 Okta
16.11.18	1	09.15 - 15.15	6 hrs	Occasional drizzle; F5; Moderate to Poor Visibility; 8/8 Okta
22.11.18	2	09.00 - 15.00	6 hrs	Showers for last hour; F4; Good Visibility; 7/8 Okta
16.11.18	3	09.00 - 15.00	6 hrs	Mist; F4; Poor Visibility; 8/8 Okta
16.11.18	4	09.00 - 15.00	6 hrs	Mist; F3; Moderate to Poor Visibility; 8/8 Okta
22.11.18	5	09.00 - 15.00	6 hrs	Showers for last hour; F3-4; Good Visibility; 7-8/8 Okta
22.11.18	6	09.00 - 15.00	6 hrs	Showers for last hour; F3; Good Visibility; 5/8 Okta
07.12.18	1	09.02 - 15.02	6 hrs	Showers ; F4-5; Good Visibility; 5/8 Okta
10.12.18	2	08.30 - 14.30	6 hrs	Occ. Light rain; F2; Good Visibility; 8/8 Okta
07.12.18	3	09.15 - 15.15	6 hrs	Occ. Showers; F4-6; Good Visibility; 1-7/8 Okta
07.12.18	4	09.18 - 15.18	6 hrs	Occ. Showers; F4-6; Good Visibility; 1-7/8 Okta
10.12.18	5	08.48 - 14.48	6 hrs	Occ. Drizzle; F1-2; Moderate to Poor; 8/8 Okta
07.12.18	6	09.40 - 15.40	6 hrs	Showers; F4-5; Good Visibility; 3-8/8 Okta
11.01.19	1	09.00 - 15.00	6 hrs	Occ. Mist; F1-2; Good to Moderate Visibility; 7-8/8 Okta
11.01.19	2	09.00 - 15.00	6 hrs	Occ. Mist; F1-2; Good to Moderate Visibility; 7-8/8 Okta
11.01.19	3	08.55 - 14.55	6 hrs	Occ. Mist; F1; Good Visibility; 4/8 Okta
11.01.19	4	09.00 - 15.00	6 hrs	Dry; F3; Good Visibility; 5/8 Okta
11.01.19	5	08.55 - 14.55	6 hrs	Dry; F2; Good to Moderate Visibility; 4-7/8 Okta
11.01.19	6	08.50 - 15.50	6 hrs	Occ. Light drizzle; F1; Good Visibility; 4/8 Okta
15.02.19	1	09.00 - 15.00	6 hrs	Drizzle after 13.00; F3; Good to Moderate Visibility; 8/8 Okta

Table 22:VP Survey Schedule Ballinagree, Winter Season Survey 2018/2019

Date	VP	Time (24hrs)	Survey Effort (hrs/mins)	Weather
15.02.19	2	09.00 - 15.00	6 hrs	Drizzle after 12.50; F5; Good to Moderate Visibility; 8/8 Okta
15.02.19	3	09.00 - 15.00	6 hrs	Drizzle after 12.50; F5; Good to Moderate Visibility; 8/8 Okta
15.02.19	4	09.00 - 15.00	6 hrs	Drizzle after 13.00; F3-4; Moderate - Poor Visibility; 8/8 Okta
15.02.19	5	09.25 - 15.25	6 hrs	Drizzle after 12.50; F3-4; Moderate - Poor Visibility; 8/8 Okta
15.02.19	6	08.40 - 14.40	6 hrs	Drizzle after 12.50; F1-3; Moderate - Poor Visibility; 8/8 Okta
28.03.19	1	09.40 - 15.40	6 hrs	Dry; F1-3; Good Visibility; 1/8 Okta
29.03.19	2 (new)	09.15 - 15.15	6 hrs	Dry; F1-3; Good Visibility; 4-8/8 Okta
28.03.19	3	10.15 - 16.15	6 hrs	Dry; F2-3; Good Visibility; 6/8 Okta
28.03.19	4	09.10 - 15.10	6 hrs	Dry; Good Visibility; 3/8 Okta
29.03.19	5	09.35 - 15.35	6 hrs	Dry; F3; Good Visibility; 8/8 Okta
28.03.19	6	09.45 - 15.45	6 hrs	Dry; F2; Good Visibility; 1/8 Okta

#### Table 23:VP Survey Schedule Ballinagree, Breeding Season Survey 2019.

Date	VP	Time (24hrs)	Survey Effort (hrs/mins)	Weather
28.03.19	1	09.40 - 15.40	6 hrs	Dry; F1-3; Good Visibility; 1/8 Okta
29.03.19	2 (new)	09.15 - 15.15	6 hrs	Dry; F1-3; Good Visibility; 4-8/8 Okta
28.03.19	3	10.15 - 16.15	6 hrs	Dry; F2-3; Good Visibility; 6/8 Okta
28.03.19	4	09.10 - 15.10	6 hrs	Dry; Good Visibility; 3/8 Okta
29.03.19	5	09.35 - 15.35	6 hrs	Dry; F3; Good Visibility; 8/8 Okta
28.03.19	6	09.45 - 15.45	6 hrs	Dry; F2; Good Visibility; 1/8 Okta
29.03.19	7	09.04 - 15.04	6 hrs	Dry; F2-3; Moderate to Good Visibility; 7-8/8 Okta
29.03.19	8	09.14 - 15.14	6 hrs	Dry; F3-4; Good Visibility; 2-8/8 Okta
17.04.19	1	09.00 - 15.00	6 hrs	Drizzle Initially; F4-5; Moderate to Good Visibility; 8/8 Okta
17.04.19	2 (new)	09.03 - 15.03	6 hrs	Mist Initially; F4; Moderate to Good Visibility; 8/8 Okta
17.04.19	3	10.16 - 16.16	6 hrs	Fog Initially; F3; Poor to Good Visibility; 8/8 Okta

Date	VP	Time (24hrs)	Survey Effort (hrs/mins)	Weather
17.04.19	4	09.20 - 15.20	6 hrs	Low Cloud Initially; F4; Poor to Good Visibility; 8/8 Okta
17.04.19	5	09.25 - 15.25	6 hrs	Low Cloud Initially; F3; Poor to Good Visibility; 8/8 Okta
17.04.19	6	08.57 - 14.58	6 hrs	Low Cloud Initially; F3; Poor to Good Visibility; 8/8 Okta
17.04.19	7	09.20 - 15.20	6 hrs	Low Cloud Initially; F5; Poor to Good Visibility; 7-8/8 Okta
17.04.19	8	09.00 - 15.00	6 hrs	Fog Initially; F3; Poor to Good Visibility; 8/8 Okta
13.05.19	1	09.05 - 15.05	6 hrs	Dry; F4-5; Moderate to Good Visibility; 3/8 Okta
13.05.19	2 (new)	09.25 - 15.25	6 hrs	Dry; F4; Good Visibility; 2-3/8 Okta
13.05.19	3	09.05 - 15.05	6 hrs	Dry; F4; Good Visibility; 3/8 Okta
13.05.19	4	09.25 - 15.25	6 hrs	Dry; F3-4; Good Visibility; 2-3/8 Okta
13.05.19	5	09.02 - 15.02	6 hrs	Dry; F4-5; Good Visibility; 3/8 Okta
13.05.19	6	09.50 - 15.50	6 hrs	Dry; F0-1; Good Visibility; 2/8 Okta
13.05.19	7	09.01 - 15.01	6 hrs	Dry; F6; Good Visibility; 1/8 Okta
13.05.19	8	08.59 - 14.59	6 hrs	Dry; F4; Good Visibility; 1/8 Okta
12.06.19	1	09.50 - 15.50	6 hrs	Showers; F2-3; Good Visibility; 8/8 Okta
12.06.19	2 (new)	09.30 - 15.30	6 hrs	Showers; F4; Good Visibility; 8/8 Okta
12.06.19	3	09.45 - 15.45	6 hrs	Showers; F3; Good Visibility; 7/8 Okta
12.06.19	4	10.00 - 16.00	6 hrs	Showers; F4; Good Visibility; 8/8 Okta
12.06.19	5	09.15 - 15.15	6 hrs	Showers; F3-4; Moderate Visibility; 8/8 Okta
12.06.19	6	09.26 - 11.50, 12.05 - 15.41	6 hrs	Showers; F3-4; Moderate Visibility; 8/8 Okta
12.06.19	7	09.05 - 15.05	6 hrs	Showers; F4-5; Moderate to Good Visibility; 8/8 Okta
12.06.19	8	09.40 - 15.40	6 hrs	Showers; F4; Moderate to Good Visibility; 8/8 Okta
23.07.19	1	09.00 - 15.00	6 hrs	Occ. Mist; F3-4; Poor to Good Visibility; 8/8 Okta
30.07.19	2 (new)	08.55 - 14.55	6 hrs	Occ. Mist; F4; Poor to Good Visibility; 6-8/8 Okta
23.07.19	3	09.15 - 15.15	6 hrs	Low Cloud; F4; Poor to Moderate Visibility; 8/8 Okta
23.07.19	4	09.00 - 15.00	6 hrs	Low Cloud; F4; Poor to Moderate Visibility; 8/8 Okta
30.07.19	5	09.00 - 15.00	6 hrs	Dry; F5-6; Good Visibility; 7/8 Okta

Date	VP	Time (24hrs)	Survey Effort (hrs/mins)	Weather
30.07.19	6	09.15 - 15.15	6 hrs	Dry; F3-4; Good Visibility; 5-8/8 Okta
23.07.19	7	09.01 - 15.01	6 hrs	Occ. Mist; F4-6; Poor to Moderate Visibility; 8/8 Okta
30.07.19	8	09.17 - 15.17	6 hrs	Occ. Mist; F3-4; Moderate to Good Visibility; 6-8/8 Okta
31.07.19	9	10.00 - 16.00	6 hrs	Mist Initially; F1-3; Moderate to Good Visibility; 5-8/8 Okta
31.07.19	10	10.00 - 16.00	6 hrs	Mist Initially; F1-3; Poor to Good Visibility; 8/8 Okta
21.08.19	1	07.49 - 13.49	6 hrs	Light rain initially; F4-6; Good Visibility; 8/8 Okta
21.08.19	2 (new)	07.12 - 13.12	6 hrs	Low Cloud initially; F3-6; Good Visibility; 8/8 Okta
21.08.19	3	07.32 - 13.32	6 hrs	Low Cloud initially; F6; Good Visibility; 8/8 Okta
21.08.19	4	07.55 - 13.55	6 hrs	Dry; F4; Good Visibility; 8/8 Okta
21.08.19	5	07.20 - 13.20	6 hrs	Dry; F3-4; Good Visibility; 8/8 Okta
21.08.19	6	07.20 - 13.20	6 hrs	Dry; F3-5; Moderate to Good Visibility; 8/8 Okta
21.08.19	7	07.45 - 13.45	6 hrs	Dry; F4-5; Moderate to Good Visibility; 8/8 Okta
21.08.19	8	07.40 - 13.40	6 hrs	Dry; F4-6; Moderate to Good Visibility; 8/8 Okta
21.08.19	9	07.15 - 13.15	6 hrs	Dry; F4; Poor to Good Visibility; 8/8 Okta
21.08.19	10	07.52 - 13.52	6 hrs	Dry; F3-4; Good Visibility; 8/8 Okta

#### Table 24: Hinterland Survey Schedule Ballinagree, Breeding Season 2019.

Date	Time (24hrs)	Survey Effort (hrs & mins)	Weather	
09.04.19	13.00 - 17.00	4hrs	Dry; F2; Good Visibility; Cloud 6/8	
11.04.19	4.19 14.00 - 17.45 3 hrs 45 mins		Dry; F3; Good Visibility; Cloud 5/8	
27.04.19	14.00 - 17.25	3 hrs 25 mins	Dry; F2; Good Visibility; Cloud 4/8	
15.07.19	08.30 - 17.00	8 hrs 30 mins	Dry; F3; Good Visibility; Cloud 7/8	
23.07.19	09.15 - 17.15	8 hrs	Occ. Showers; F3; Good Visibility; Cloud 4/8	
30.07.19	14.00 - 16.50	2 hrs 50 mins	Dry; F3-4; Good Visibility; Cloud 8/8	

Date	VP	Time (24hrs)	Survey Effort (hrs/mins)	Weather
11.10.19	1	09.33 - 15.33	6 hrs	Dry; F1-3; Good Visibility; 5-8/8 Okta
11.10.19	2 (new)	09.10 - 15.10	6 hrs	Dry; F3; Good Visibility; 5-8/8 Okta
11.10.19	3	09.30 - 15.30	6 hrs	Dry; F4; Good Visibility; 7/8 Okta
11.10.19	4	09.25 - 15.25	6 hrs	Dry; F4; Good Visibility; 4-8/8 Okta
22.10.19	5	09.30 - 15.30	6 hrs	Dry; F1-2; Good Visibility; 8/8 Okta
22.10.19	6	09.04 - 15.04	6 hrs	Dry; F1; Good Visibility; 8/8 Okta
11.10.19	7	09.30 - 15.30	6 hrs	Dry; F3; Good Visibility; 6/8 Okta
22.10.19	8	09.59 - 15.59	6 hrs	Occ. Showers; F3-4; Good Visibility; 8/8 Okta
22.10.19	9	09.45 - 15.45	6 hrs	Occ. Drizzle; F2-3; Good Visibility; 8/8 Okta
22.10.19	10	09.15 - 15.15	6 hrs	Dry; F2-3; Good Visibility; 8/8 Okta
19.11.19	1	09.30 - 15.30	6 hrs	Dry; F3; Good Visibility; 1-7/8 Okta
19.11.19	2 (new)	09.34 - 15.34	6 hrs	Dry; F3-4; Good Visibility; 0-6/8 Okta
19.11.19	3	09.14 - 15.14	6 hrs	Dry; F3-4; Good Visibility; 1-6/8 Okta
19.11.19	4	09.30 - 15.30	6 hrs	Dry; F2-3; Good Visibility; 2-7/8 Okta
22.11.19	5	09.15 - 15.15	6 hrs	Dry; F3; Good Visibility; 8/8 Okta
22.11.19	6	09.35 - 15.35	6 hrs	Dry; F3; Good Visibility; 7-8/8 Okta
19.11.19	7	09.06 - 15.06	6 hrs	Dry; F2; Good Visibility; 2/8 Okta
22.11.19	8	09.00 - 15.00	6 hrs	Dry; F4; Poor to Moderate Visibility; 8/8 Okta
22.11.19	9	09.23 - 15.23	6 hrs	Dry; F2-3; Good Visibility; 8/8 Okta
22.11.19	10	08.55 - 14.55	6 hrs	Dry; F2-3; Poor to Moderate Visibility; 8/8 Okta
17.12.19	1	09.00 - 15.00	6 hrs	Dry; F1; Good Visibility; 2/8 Okta
17.12.19	2 (new)	09.20 - 15.20	6 hrs	Dry; F1-2; Good Visibility; 2-5/8 Okta

Table 25:VP Survey Schedule Ballinagree, Winter Season Survey 2019/2020.

Date	VP	Time (24hrs)	Survey Effort (hrs/mins)	Weather
17.12.19	3	10.05 - 16.05	6 hrs	Dry; F1-2; Good Visibility; 3/8 Okta
17.12.19	4	09.03 - 15.03	6 hrs	Dry; F2; Good Visibility; 2/8 Okta
16.12.19	5	09.25 - 15.25	6 hrs	Dry; F2; Good Visibility; 0/8 Okta
16.12.19	6	09.11 - 15.11	6 hrs	Dry; F1; Good Visibility; 1/8 Okta
17.12.19	7	09.40 - 15.40	6 hrs	Dry; F2-3; Good Visibility; 3-5/8 Okta
16.12.19	8	09.00 - 15.00	6 hrs	Dry; F2; Good Visibility; 3-5/8 Okta
16.12.19	9	09.59 - 15.59	6 hrs	Dry; F2-3; Good Visibility; 1/8 Okta
16.12.19	10	09.55 - 15.55	6 hrs	Dry; F2; Good Visibility; 1/8 Okta
21.01.20	1	09.30 - 15.30	6 hrs	Dry; F1-4; Good Visibility; 8/8 Okta
20.01.20	2 (new)	10.06 - 16.06	6 hrs	Dry; F1-4; Fair to Good Visibility; 1-3/8 Okta
21.01.20	3	09.50 - 15.50	6 hrs	Dry; F1; Good Visibility; 8/8 Okta
21.01.20	4	08.50 - 14.50	6 hrs	Dry; F1; Good Visibility; 7/8 Okta
20.01.20	5	10.10 - 16.10	6 hrs	Dry; F1-2; Good Visibility; 1-2/8 Okta
20.01.20	6	09.50 - 15.50	6 hrs	Dry; F1; Good Visibility; 1-3/8 Okta
21.01.20	7	09.26 - 15.26	6 hrs	Dry; F2; Good Visibility; 8/8 Okta
20.01.20	8	10.15 - 16.15	6 hrs	Dry; F1-2; Good Visibility; 8/8 Okta
20.01.20	9	09.30 - 15.30	6 hrs	Dry; F1-3; Good Visibility; 0-3/8 Okta
20.01.20	10	09.30 - 15.30	6 hrs	Dry; F3-4; Good Visibility; 1-3/8 Okta
20.02.20	1	09.00 - 15.00	6 hrs	Dry; F2-3; Fair to Good Visibility; 2-8/8 Okta
20.02.20	2 (new)	09.00 - 15.00	6 hrs	Occ. Snow showers; F4-5; Moderate to Good Visibility; 2- 8/8 Okta
20.02.20	3	09.10 - 15.10	6 hrs	Occ. Snow/sleet showers; F3-4; Good Visibility; 4-6/8 Okta
20.02.20	4	09.00 - 15.00	6 hrs	Occ. showers; F3-5; Good Visibility; 6-8/8 Okta
27.02.20	5	08.58 - 14.58	6 hrs	Dry; F2-4; Good Visibility; 3/8 Okta

Date	VP	Time (24hrs)	Survey Effort (hrs/mins)	Weather
27.02.20	6	09.35 - 14.35	6 hrs	Dry; F2; Good Visibility; 4/8 Okta
20.02.20	7	09.00 - 15.00	6 hrs	Occ. Snow showers; F2; Fair to Good Visibility; 2-8/8 Okta
24.02.20	8	09.05 - 15.05	6 hrs	Dry; F3-4; Good Visibility; 2/8 Okta
27.02.20	9	09.30 - 15.30	6 hrs	Dry; F3; Good Visibility; 1-5/8 Okta
27.02.20	10	09.22 - 15.22	6 hrs	Dry; F1; Good Visibility; 1/8 Okta
18.03.20	1	09.05 - 15.05	6 hrs	Dry; F1; Good Visibility; 8/8 Okta
18.03.20	2 (new)	09.10 - 15.10	6 hrs	Dry; F1-2; Good Visibility; 8/8 Okta
18.03.20	3	09.36 - 15.36	6 hrs	Dry; F1-2; Good Visibility; 8/8 Okta
18.03.20	4	08.38 - 14.38	6 hrs	Dry; F2-3; Good Visibility; 8/8 Okta
20.03.20	5	08.50 - 14.50	6 hrs	Dry; F5; Good Visibility; 0-8/8 Okta
20.03.20	6	08.48 - 14.48	6 hrs	Dry; F2-3; Good Visibility; 1-8/8 Okta
18.03.20	7	09.03 - 15.03	6 hrs	Dry; F2-3; Good Visibility; 8/8 Okta
20.03.20	8	08.55 - 14.55	6 hrs	Dry; F4-5; Good Visibility; 1-8/8 Okta
20.03.20	9	09.10 - 15.10	6 hrs	Dry; F4; Good Visibility; 1-8/8 Okta
20.03.20	10	08.48 - 14.48	6 hrs	Dry; F3; Good Visibility; 0-8/8 Okta

#### Table 26:VP Survey Schedule Ballinagree, Breeding Season Survey 2020.

Date	VP	Time (24hrs)	Survey Effort (hrs/mins)	Weather
18.03.20	1	09.05 - 15.05	6 hrs	Dry; F1; Good Visibility; 8/8 Okta
18.03.20	2 (new)	09.10 - 15.10	6 hrs	Dry; F1-2; Good Visibility; 8/8 Okta
18.03.20	3	09.36 - 15.36	6 hrs	Dry; F1-2; Good Visibility; 8/8 Okta
18.03.20	4	08.38 - 14.38	6 hrs	Dry; F2-3; Good Visibility; 8/8 Okta
20.03.20	5	08.50 - 14.50	6 hrs	Dry; F5; Good Visibility; 0-8/8 Okta
20.03.20	6	08.48 - 14.48	6 hrs	Dry; F2-3; Good Visibility; 1-8/8 Okta
18.03.20	7	09.03 - 15.03	6 hrs	Dry; F2-3; Good Visibility; 8/8 Okta
20.03.20	8	08.55 - 14.55	6 hrs	Dry; F4-5; Good Visibility; 1-8/8 Okta

Date	VP	Time (24hrs)	Survey Effort (hrs/mins)	Weather
20.03.20	9	09.10 - 15.10	6 hrs	Dry; F4; Good Visibility; 1-8/8 Okta
20.03.20	10	08.48 - 14.48	6 hrs	Dry; F3; Good Visibility; 0-8/8 Okta
24.04.20	1	08.20 - 14.20	6 hrs	Dry; F1; Good Visibility; 6/8 Okta
24.04.20	2 (new)	08.56 - 14.56	6 hrs	Dry, F1-2, Good Visibility, 1-5/8 Okta
24.04.20	3	10.00 - 16.00	6 hrs	Dry, F1, Good Visibility, 6/8 Okta
24.04.20	4	08.45 - 14.45	6 hrs	Dry, F1, Good Visibility, 7/8 Okta
27.04.20	5	09.04 - 15.04	6 hrs	Dry, F1-2, Good Visibility, 6/8 Okta
27.04.20	6	08.30 - 14.30	6 hrs	Dry, F2, Good Visibility, 4-8/8 Okta
24.04.20	7	08.50 - 14.50	6 hrs	Dry, F0-1, Good Visibility, 8/8 Okta
27.04.20	8	08.25 - 14.25	6 hrs	Dry, F2-3, Good Visibility, 2-7/8 Okta
24.04.20	9	08.30 - 14.30	6 hrs	Dry, F1-2, Good Visibility, 4-8/8 Okta
24.04.20	10	08.42 - 14.42	6 hrs	Dry, F1-2, Good Visibility, 2-7/8 Okta
11.05.20	1	09.01 - 15.01	6 hrs	Dry, F4, Good Visibility, 3/8 Okta
11.05.20	2 (new)	08.40 - 14.40	6 hrs	Dry, F3-4, Good Visibility, 2/8 Okta
11.05.20	3	08.30 - 14.30	6 hrs	Dry, F4, Good Visibility, 0/8 Okta
11.05.20	4	08.20 - 14.20	6 hrs	Dry, F4, Good Visibility, 1/8 Okta
11.05.20	5	09.04 - 15.04	6 hrs	Dry, F2, Good Visibility, 3-4/8 Okta
11.05.20	6	09.10 - 15.10	6 hrs	Dry, F3-4, Good Visibility, 4/8 Okta
11.05.20	7	08.50 - 14.50	6 hrs	Dry, F4-5, Good Visibility, 3/8 Okta
11.05.20	8	09.03 - 15.03	6 hrs	Dry, F2-3, Good Visibility, 3-4/8 Okta
11.05.20	9	08.35 - 14.35	6 hrs	Dry, F2, Good Visibility, 1/8 Okta
11.05.20	10	09.05 - 15.05	6 hrs	Dry, F2-3, Good Visibility, 3/8 Okta
10.06.20	1	08.30 - 14.30	6 hrs	Showers, F3, Good Visibility, 8/8 Okta
10.06.20	2 (new)	08.36 - 14.36	6 hrs	Showers, F3-4, Good Visibility, 8/8 Okta
10.06.20	3	09.09 - 15.09	6 hrs	Showers, F3-4, Good Visibility, 8/8 Okta
10.06.20	4	08.43 - 14.43	6 hrs	Showers, F4, Good Visibility, 8/8 Okta

Date	VP	Time (24hrs)	Survey Effort (hrs/mins)	Weather
12.06.20	5	08.36 - 14.36	6 hrs	Dry, F3-4, Good Visibility, 8/8 Okta
12.06.20	6	08.40 - 14.40	6 hrs	Dry, F4, Poor to Good Visibility, 8/8 Okta
10.06.20	7	09.10 - 15.10	6 hrs	Showers, F3, Good Visibility, 8/8 Okta
12.06.20	8	08.41 - 14.41	6 hrs	Dry, F3-4, Poor to Good Visibility, 8/8 Okta
10.06.20	9	08.25 - 14.25	6 hrs	Showers, F2, Good Visibility, 8/8 Okta
10.06.20	10	08.20 - 14.20	6 hrs	Showers, F3, Good Visibility, 8/8 Okta
16.07.20	1	08.30 - 14.30	6 hrs	Dry, F1-2, Good Visibility, 2-7/8 Okta
16.07.20	2 (new)	08.49 - 14.49	6 hrs	Dry, F3-4, Poor to Good Visibility, 2-8/8 Okta
16.07.20	3	09.10 - 15.10	6 hrs	Dry, F1, Good Visibility, 2-6/8 Okta
16.07.20	4	08.40 - 14.40	6 hrs	Dry, F2-3, Good Visibility, 4-8/8 Okta
16.07.20	5	09.20 - 15.20	6 hrs	Dry, F3, Good Visibility, 4-5/8 Okta
16.07.20	6	08.45 - 14.48	6 hrs	Dry, F2, Good Visibility, 5/8 Okta
16.07.20	7	08.45 - 14.45	6 hrs	Dry, F5, Good Visibility, 3-8/8 Okta
16.07.20	8	08.25 - 14.25	6 hrs	Dry, F0, Poor to Good Visibility, 4/8 Okta
15.07.20	9	09.00 - 15.00	6 hrs	Occ. showers, F4, Poor to Good Visibility, 4-8/8 Okta
15.07.20	10	08.53 - 14.53	6 hrs	Dry, F4, Good Visibility, 8/8 Okta
26.08.20	1	08.55 - 14.55	6 hrs	Dry, F1, Good Visibility, 3-6/8 Okta
26.08.20	2 (new)	08.45 - 14.45	6 hrs	Mist at first, F3, Poor - Good Visibility, 3-6-8/8 Okta
26.08.20	3	08.39 - 14.39	6 hrs	Dry, F2, Good Visibility, 3/8 Okta
26.08.20	4	09.20 - 15.20	6 hrs	Dry, F2-3, Good Visibility, 6-7/8 Okta
26.08.20	5	08.15 - 14.15	6 hrs	Dry, F4-5, Good Visibility, 6-8/8 Okta
26.08.20	6	09.10 - 15.10	6 hrs	Dry, F1-2, Good Visibility, 6-8/8 Okta
26.08.20	7	08.50 - 14.50	6 hrs	Dry, F4-5, Good Visibility, 4-6/8 Okta
26.08.20	8	08.31 - 14.31	6 hrs	Dry, F3, Good Visibility, 7/8 Okta
28.08.20	9	08.44 - 14.44	6 hrs	Showers, F3-4, Good Visibility, 6-8/8 Okta
28.08.20	10	09.15 - 15.15	6 hrs	Showers, F3, Good Visibility, 8/8 Okta
Date	Time (24hrs)	Survey Effort (hrs & mins)	Weather	
----------	---------------	----------------------------	--	
27.04.20	09.00 - 15.40	6 hrs 40 mins	Dry; F2; Good Visibility; Cloud 6/8	
20.05.20	12.15 - 14.15	2 hrs	Dry; F3-4; Good Visibility; Cloud 4-6/8	
26.07.20	09.30 - 17.05	7 hrs 35 mins	Occasional light showers; F3-4; Good Visibility; Cloud 7-8/8	

#### Table 27: Hinterland Survey Schedule Ballinagree, Breeding Season 2020.

#### Table 28:VP Survey Schedule Ballinagree, Winter Season Survey 2020/2021.

Date	VP	Time (24hrs)	Survey Effort (hrs/mins)	Weather
15.10.20	1	09.00 - 15.00	6 hrs	Dry; F1; Poor to Good Visibility; 8/8 Okta
15.10.20	2 (new)	08.50 - 14.30	6 hrs	Dry; F2; Poor to Good Visibility; 8/8 Okta
15.10.20	3	09.22 - 15.22	6 hrs	Dry; F3; Poor to Good Visibility; 8/8 Okta
15.10.20	4	09.00 - 15.00	6 hrs	Dry; F2-3; Poor to Good Visibility; 7/8 Okta
13.10.20	5	08.31 - 14.31	6 hrs	Dry; FX; Poor to Good Visibility; 4-8/8 Okta
13.10.20	6	08.25 - 14.25	6 hrs	Dry; F3; Poor to Good Visibility; 8/8 Okta
15.10.20	7	10.05 - 16.06	6 hrs	Dry; F3; Poor to Good Visibility; 6-8/8 Okta
13.10.20	8	09.10 - 15.10	6 hrs	Drizzle at first; F3; Poor to Good Visibility; 7- 8/8 Okta
13.10.20	9	09.14 - 15.14	6 hrs	Drizzle at first; F3-4; Poor to Good Visibility; 8/8 Okta
13.10.20	10	09.03 - 15.03	6 hrs	Drizzle at first; F2-3; Poor to Good Visibility; 3- 6/8 Okta
27.11.20	1	08.30 - 14.30	6 hrs	Dry; F0; Poor to Good Visibility; 4/8 Okta
25.11.20	2 (new)	09.20 - 15.20	6 hrs	Dry; F2-3; Poor to Good Visibility; 1/8 Okta

Date	VP	Time (24hrs)	Survey Effort (hrs/mins)	Weather
27.11.20	3	09.30 - 15.30	6 hrs	Dry; F2; Good Visibility; 8/8 Okta
27.11.20	4	09.11 - 15.11	6 hrs	Dry; F1; Poor to Good Visibility; 8/8 Okta
25.11.20	5	08.30 - 14.30	6 hrs	Dry; F3; Good Visibility; 2/8 Okta
25.11.20	6	08.30 - 14.30	6 hrs	Dry; F2; Good Visibility; 8/8 Okta
27.11.20	7	09.10 - 15.10	6 hrs	Dry; F3-4; Poor to Good Visibility; 4-8/8 Okta
25.11.20	8	08.57 - 14.57	6 hrs	Dry; F1; Poor to Good Visibility; 2-8/8 Okta
25.11.20	9	08.36 - 14.36	6 hrs	Dry; F2; Poor to Good Visibility; 2/8 Okta
25.11.20	10	09.00 - 15.00	6 hrs	Dry; F3; Poor to Good Visibility; 8/8 Okta
08.12.20	1	08.30 - 14.30	6 hrs	Dry; F2; Good Visibility; 2/8 Okta
08.12.20	2 (new)	09.00 - 15.00	6 hrs	Showers; F4; Poor to Good Visibility; 4-8/8 Okta
08.12.20	3	09.05 - 15.05	6 hrs	Dry; F3-4; Good Visibility; 3/8 Okta
08.12.20	4	08.45 - 14.45	6 hrs	Showers; F4; Good Visibility; 4/8 Okta
10.12.20	5	08.45 - 14.45	6 hrs	Showers; F2-4; Poor Visibility; 8/8 Okta
10.12.20	6	08.45 - 14.45	6 hrs	Showers; F1; Poor to Moderate Visibility; 8/8 Okta
08.12.20	7	08.30 - 14.30	6 hrs	Showers; F2; Poor Visibility; 8/8 Okta
08.12.20	8	08.46 - 14.46	6 hrs	Dry; F4; Good Visibility; 4/8 Okta
10.12.20	9	08.39 - 14.39	6 hrs	Showers; F3; Poor to Moderate Visibility; 8/8 Okta
10.12.20	10	08.28 - 14.28	6 hrs	Showers; F2-3; Poor to Moderate Visibility; 8/8 Okta
22.01.21	1	09.00 - 15.00	6 hrs	Snow showers; F3; Moderate to Good Visibility; 4-8/8 Okta
22.01.21	2 (new)	10.05 - 16.05	6 hrs	Snow showers; F2-3; Poor to Good Visibility; 8/8 Okta
22.01.21	3	09.30 - 15.30	6 hrs	Showers; F3-4; Good Visibility; 3-8/8 Okta

Date	VP	Time (24hrs)	Survey Effort (hrs/mins)	Weather
22.01.21	4	09.08 - 15.08	6 hrs	Showers; F1-2; Good Visibility; 4/8 Okta
21.01.21	5	08.55 - 14.55	6 hrs	Showers; F3; Good Visibility; 1/8 Okta
22.01.21	6	08.50 - 14.50	6 hrs	Dry; F3; Poor to Good Visibility; 8/8 Okta
22.01.21	7	09.35 - 15.35	6 hrs	Snow showers; F5; Poor to Good Visibility; 8/8 Okta
21.01.21	8	09.13 - 15.13	6 hrs	Showers; F1-3; Moderate to Good Visibility; 4/8 Okta
21.01.21	9	09.25 - 15.25	6 hrs	Showers; F3-5; Poor to Moderate Visibility; 1- 8/8 Okta
21.01.21	10	08.50 - 14.50	6 hrs	Showers; F2; Good Visibility; 1-8/8 Okta
22.02.21	1	09.00 - 15.00	6 hrs	Dry; F1; Good Visibility; 7/8 Okta
25.02.21	2 (new)	08.52 - 14.52	6 hrs	Dry; F3-4; Good Visibility; 1-3/8 Okta
22.02.21	3	09.10 - 15.10	6 hrs	Dry; F4; Good Visibility; 8/8 Okta
22.02.21	4	09.00 - 15.00	6 hrs	Showers; F2; Good Visibility; 4/8 Okta
25.02.21	5	09.03 - 15.03	6 hrs	Dry; F2-3; Good Visibility; 2/8 Okta
25.02.21	6	09.20 - 15.20	6 hrs	Dry; F1-3; Good Visibility; 1-5/8 Okta
22.02.21	7	09.16 - 15.16	6 hrs	Dry; F5-7; Moderate to Good Visibility; 8/8 Okta
25.02.21	8	09.10 - 15.10	6 hrs	Dry; F2; Good Visibility; 2/8 Okta
25.02.21	9	08.58 - 14.58	6 hrs	Dry; F2; Good Visibility; 2/8 Okta
25.02.21	10	09.14 - 15.14	6 hrs	Showers; F2; Good Visibility; 1-8/8 Okta
16.03.21	1	08.55 - 14.55	6 hrs	Dry; F3; Good Visibility; 1-8/8 Okta
16.03.21	2 (new)	09.09 - 15.09	6 hrs	Dry; F2-3; Moderate to Good Visibility; 4-8/8 Okta
16.03.21	3	08.52 - 14.52	6 hrs	Dry; F3; Good Visibility; 3/8 Okta
16.03.21	4	09.15 - 15.15	6 hrs	Dry; F3-5; Moderate to Good Visibility; 2-8/8 Okta
30.03.21	5	08.37 - 14.37	6 hrs	Dry; F1; Poor to Good Visibility; 0-8/8 Okta

Date	VP	Time (24hrs)	Survey Effort (hrs/mins)	Weather
30.03.21	6	09.10 - 15.10	6 hrs	Dry; F1; Poor to Good Visibility; 3-8/8 Okta
16.03.21	7	09.15 - 15.15	6 hrs	Dry; F3; Poor to Good Visibility; 3-8/8 Okta
30.03.21	8	09.00 - 15.00	6 hrs	Dry; F2; Poor to Good Visibility; 3-8/8 Okta
16.03.21	9	08.45 - 14.45	6 hrs	Showers; F2; Poor to Good Visibility; 8/8 Okta
16.03.21	10	08.40 - 14.40	6 hrs	Mist at first; F2-3; Poor to Good Visibility; 0- 8/8 Okta

# **3.2 Hen Harrier Observations – Breeding Seasons**

Table 29:	Hen Harrier Observations, Breeding Season 2017 Survey.
-----------	--

Observation	Date	Time	VP	On Site Observation Time (secs)	Off Site Observation Time (secs)	Activity	Habitat	Details
1	21.04.17	16.15 - 16.35	5 & 6	1,200	0	Foraging, Commuting	Conifer plantation, scrub, rough grassland, improved grassland	Adult male Hen Harrier flying low (mostly 0-5m above ground level) over trees/scrub. Partly foraging, partly commuting. Flew over conifer plantation, rough grassland & willow scrub, down a river valley with improved agricultural fields and back up the hill where it foraged again. Lost sight behind tall conifers.
2	16.06.17	10.15	6	0	40	Foraging	Heath	Male Hen Harrier hunting over heath-covered section of Dooneens mountain to the east of VP6 (off site). Flight height of 0-5m above ground level.

Observation	Date	Time	VP	On Site Observation Time (secs)	Off Site Observation Time (secs)	Activity	Habitat	Details
3	16.06.17	13.08 - 13.09	6	0	90	Commuting, Carrying prey	Heath, Conifer Plantation	Male Hen Harrier (probably the same individual as flightline no. 2) heading south, carrying prey and flying directly. Flight height 5-25m. Flew up over conifer plantation to the south of VP6 and was lost from sight.
4a	16.06.17	16.33	6	0	30	Commuting	Heath	Male Hen Harrier flying south, quickly and directly (no prey). Flight height 5-25m.
4b	16.06.17	16.40	6	0	40	Flying	Conifer Plantation	Male Hen Harrier (presumed the same individual as flightline no. 4a) gliding slowly through conifer treetops to the south of VP6, c.15m flight height. Lost from sight to the south.
5a	12.07.17	14.14 - 14.20	6	0	360	Flying	Bog, rough grassland	Female Hen Harrier flying in from Laney River Valley 25-100m AGL initially. Mobbed by small passerines. Then gradually ascended higher, circling all the time (well above 100m) and lost from sight in clouds.
5b	12.07.17	14.44 - 14.45	6	0	40	Foraging	Bog, rough grassland	Adult female Hen Harrier (same individual as 5a) flying west across VP6 area. Foraging 0-5m AGL initially and then 5-25m AGL. Mobbed by small passerines. Lost sight as she flew towards the Laney River Valley.
6	23.08.17	13.49	5	70	20	Flying	Improved grassland	Juvenile Hen Harrier (this year's bird) flew southwest and then south at 2-4m height

Observation	Date	Time	VP	On Site Observation Time (secs)	Off Site Observation Time (secs)	Activity	Habitat	Details
1	16.03.18	10.11	4	15	0	Foraging	Bog	Brief sighting of ringtail Hen Harrier flying low <5m AGL. Probably foraging. Lost from view due to topography.
2	16.03.18	11.06	3	5	5	Flying	Conifer Plantation, Bog	Male Hen Harrier flew over forest and then over moor at 1-2m AGL. Veered south and flew over hill out of view.
3	22.03.18	12.55 - 12.57	6	0	180	Flying, carrying prey	Bog, Conifer Plantation	Male Hen Harrier carrying food in talons, being mobbed by a Raven (but out- manoeuvred it). Continued south with prey flying c. 25-100m AGL.
4	11.04.18	12.47	3	15	17	Flying	Conifer Plantation, Bog	Male Hen Harrier flying over forestry south of VP3 downhill. Flew up over the brow of the hill to the west at 2-10m AGL.
5	10.05.18	10.24 - 10.35	4	660	0	Foraging, Flying	Heath, Conifer Plantation, Rough Grassland	Male Hen Harrier foraging low over heath, conifer plantation & rough grassland habitat c. 5m AGL (15m AGL over trees).
6	10.05.18	13.06 - 13.13	1	360	50	Foraging, Consuming Prey	Heath, Conifer Plantation, Rough Grassland	Male Hen Harrier hunting, dropped to ground (point A) for 20 seconds and caught prey (possibly frog) and flew low to point B to consume it. After three minutes he climbed up and soared eastwards, dropping a little and flew southwards along a similar path to observation no. 5 (may be same bird), c. 80m AGL.

#### Table 30:Hen Harrier Observations, Breeding Season 2018.

Observation	Date	Time	VP	On Site Observation Time (secs)	Off Site Observation Time (secs)	Activity	Habitat	Details
7	08.06.18	12.51	4	115	0	Foraging	Rough Grassland, Conifer Plantation	Male Hen Harrier hunting at 0-5m AGL over rough grassland before rising to 25m and flying east over post-thicket forestry.
8	06.07.18	12.07	3	15	5	Foraging	Heath/Bog	Male Hen Harrier hunting over heath bog at a height of 0-5m AGL.
9	06.07.18	12.33 - 12.37	4	210	30	Flying	Grassland, Conifer Plantation	Male Hen Harrier flying over grassland in valley below VP4. Flight height 1-3m AGL over grassland and just above trees in Conifer Plantation.
10a	06.07.18	14.07	3	15	0	Foraging	Heath/Bog	Male Hen Harrier hunting over heath bog at a height of 0-5m AGL.
10b	06.07.18	14.09	3	0	40	Flying	Rough Grassland	Male Hen Harrier (almost certainly same individual as observation no. 10a), flying over rough grassland at 5-25m AGL.
10c	06.07.18	14.10	3	0	240	Flying (two males together briefly)	Grassland, Conifer Plantation	Male Hen Harrier (from observation no. 10a/b) joined by a second male Hen Harrier and flew together for a few seconds. One bird lost from view. The remaining bird flew over grassland and Conifer Plantation at a height of 5-25m AGL.
11	06.07.18	14.53 - 15.03	2, 6	240	330	Flying with prey	Grassland, Conifer Plantation, Heath	Male Hen Harrier flying with prey, initially c. 10m AGL, circling higher up to 500m north of VP5. Reduced height again to 5- 25m AGL to fly along ridge over heath near VP6.

Observation	Date	Time	VP	On Site Observation Time (secs)	Off Site Observation Time (secs)	Activity	Habitat	Details
1	28.03.19	15.39	6	0	149	Foraging	Heath/Bog	Ringtail Hen Harrier hunting low (1-3m AGL) over heath/bog northeast of VP6.
2	13.05.19	09.20	8	30	0	Flying	Conifer Plantation	Male Hen Harrier flying over forest at a height of 5-25m AGL.
3	12.06.19	12.15	6	0	125	Foraging	Conifer Plantation, Rough Grassland	Male Hen Harrier initially flying at 20m AGL over spruce forestry. Dropped to 1- 2m AGL, hunting over rough grassland.
4a	12.06.19	13.20	6	20	0	Commuting	Pasture	Male Hen Harrier flying at a height of 15m AGL over pasture/treelines.
4b	12.06.19	13.22	6	120	0	Foraging	Conifer Plantation, Scrub	Male Hen Harrier hunting at a height of 3- 10m AGL. Same individual as 4a.
4c	12.06.19	13.27	6	70	0	Commuting	Conifer Plantation	Male Hen Harrier commuting flight across spruce forestry, then dropped behind it, c. 15m AGL.

Table 31.	Hon Harrior	Observations	Summer Season	
Table 51.	пен панне	Observations,	Summer Season	i zurg Survey.

Table 32:	Casual Hen Ha	rrier Observations.	Summer Season	2019 Survey.
			•••••••••••••	

Observation	Date	Time	VP	On Site Observation Time (secs)	Off Site Observation Time (secs)	Activity	Habitat	Details
А	27.03.19	11.58	RG TR1	10	0	Flying	Heath/Bog	Male Hen Harrier flying with Buzzard over heather at 10-20m AGL.

В	27.03.19	12.16	RG TR1	10	0	Resting/Flying	Heath/Bog	Male Hen Harrier flushed up from heather during transect. Flew over heather for 10 seconds.
с	27.05.19	08.28	PC1	5	0	Flying	Conifer Plantation	Male Hen Harrier flying over young conifer plantation at a height of 5m AGL.

 Table 33:
 Hen Harrier Observations, Breeding Season 2020 Survey.

Observation	Date	Time	VP	On Site Observation Time (secs)	Off Site Observation Time (secs)	Activity	Habitat	Details
1	18.03.20	10.28	7&3	103	15	Foraging	Conifer Plantation	Male Hen Harrier hunting over bog and pre-thicket forestry at a height of 1-25m.
2	18.03.20	11.26	1	50	0	Foraging	Young Forestry, Scrub, Rush, Grassland	Male Hen Harrier rose out of scrub/new forestry south of VP1, foraged over new forestry and rushy grassland, zig zagging over habitat as it hunted, then flew south towards VP3 over mature forestry, flying low at all times
3	20.03.20	11.36	8	240	0	Foraging	Conifer Plantation, Improved Grassland	Male flying low over spruce forest, then hunting over rushy pasture before circling upwards to 40m height.
4	27.04.20	09.23	6	0	60	Carrying prey	Grassland	Male Hen Harrier carrying prey and flying over grassland at a height of 50-120m above ground level.
5	10.06.20	10.05	4	20	0	Flying	Heath/Bog	Male Hen Harrier flying west at a height of 5-25m.
6	10.06.20	10.49	1	68	0	Flying	Forestry	Adult Male Hen Harrier circling over Forestry at a height of 10-30m.

Observation	Date	Time	VP	On Site Observation Time (secs)	Off Site Observation Time (secs)	Activity	Habitat	Details
7a	12.06.20	08.40	5	8	0	Flying	Bog, Rough Grassland	Ringtail Hen Harrier flew east past ridge at VP5 at a height of 10-30m, then flew back west.
7b	12.06.20	08.42	5	10	0	Flying	Bog, Rough Grassland	Ringtail Hen Harrier flying east at a height of 10-30m.
8	16.07.20	12.02	8	5	0	Flying		Brief view of probable male Hen Harrier flying at a height of 5-25m.
9	26.08.20	13.25	8	45	0	Foraging	Heath/Bog	Ringtail Hen Harrier hunting over bog at a height of <20m.
10	26.08.20	13.44	3	5	0	Foraging	Forestry	Ringtail Hen Harrier flying along the edge of forestry at a height of <5m.
11	26.08.20	13.56	8	22	0	Foraging	Heath/Bog	Ringtail Hen Harrier hunting over bog at a height of <20m.
12	26.08.20	14.02	2	65	0	Circling	Heath/Bog	Ringtail Hen Harrier circling at a height of 15-50m, flew towards VP8 where it started hunting at a height of 1-2m.
13	26.08.20	14.08	2 & 5	99	0	Foraging	MF/HB	Ringtail Hen Harrier hunting between VP8 and VP2 flying low 1-2m height.

# **3.3** Hen Harrier Observations – Winter Seasons

#### Table 34: Hen Harrier Observations, Winter Season 2017/2018 Survey.

Observation	Date	Time	VP	On Site Observation Time (secs)	Off Site Observation Time (secs)	Activity	Habitat	Details
1	09.11.17	11.24 - 11.26	5	150	0	Foraging	Conifer Plantation, rough grassland	Male Hen Harrier hunting over young conifers and rough grassland. Flew south at 2-5m above ground level (AGL) and then flew over the forest at 25m AGL, and west out of view.
2	09.11.17	12.45 - 12.47	1&5	0	210	Flying	Conifer Plantation	Ringtail Hen Harrier mobbed by three crows. Flying at 25-100m AGL initially, dropped to 20m AGL.
3	09.11.17	13.18	1	4	0	Flying	Conifer Plantation	Adult male Hen Harrier flying just above treetops, 5-25m AGL.
4	09.11.17	13.33	1&4	23	161	Foraging	Conifer Plantation, rough grassland	Adult male Hen Harrier foraging, 0-5m AGL, then rose to 20m to clear forestry.
5	26.01.17	12.06 - 12.08	3	120	30	Flying	Conifer Plantation, Bog	Ringtail Hen Harrier (probably a young female) flew in from the east over forest at 8-10m AGL. Mobbed by two Ravens. The Harrier then flew low over the moor (1-2m AGL) as it ascended the hill and flushed two Snipe. It disappeared over the hill but was seen again flying along the eastern side of the peak to the southeast of Musheramore at 1-2m AGL.

Observation	Date	Time	VP	On Site Observation Time (secs)	Off Site Observation Time (secs)	Activity	Habitat	Details
6	21.02.18	13.16	3	4	0	Foraging	Conifer Plantation	Male Hen Harrier came briefly into view over immature conifer plantation to the north of VP3. Flying over conifers at 0-5m AGL. Lost from sight heading north.
7	26.02.18	11.17	5	15	0	Flying	Improved Agricultural Grassland	Adult male Hen Harrier briefly seen, flying quickly over improved agricultural grassland < 25m AGL.
8	26.02.18	11.33 - 11.37	5&6	120	120	Flying	Improved Agricultural Grassland, Scrub	Adult male Hen Harrier seen again (probably same bird as Observation 6). Flying quickly improved agricultural grassland, and scrub. Flew around disused house and farmyard at 10m AGL and dropped to 3-5m AGL as it left the site and continued down into valley and over another area of scrub before disappearing out of view.
9	16.03.18	10.11	4	15	0	Foraging	Bog	Brief sighting of ringtail Hen Harrier flying low <5m AGL. Probably foraging. Lost from view due to topography.
10	16.03.18	11.06	3	5	5	Flying	Conifer Plantation, Bog	Male Hen Harrier flew over forest and then over moor at 1-2m AGL. Veered south and flew over hill out of view.
11	22.03.18	12.55	6	0	180	Flying, carrying prey	Bog, Conifer Plantation	Male Hen Harrier carrying food in talons, being mobbed by a Raven (but out- manoeuvred it). Continued south with prey flying c. 25-100m AGL.

Observation	Date	Time	VP	On Site Observation Time (secs)	Off Site Observation Time (secs)	Activity	Habitat	Details
1	17.10.18	9.19 - 9.21	4	135	0	Flying	Rough grass and heath/bog	Male Hen Harrier flying east to west up valley over rough grass and heath/bog. Mobbed by Raven, driven off to southwest over hill.
2	17.10.18	9.38	1	40	0	Foraging	Conifer Plantation	Male Hen Harrier foraging, < 15m above ground level (AGL).
3a	17.10.18	11.24	6	0	49	Foraging	Heath/molinia	Ringtail (probable adult female) foraging low (0-5m AGL) off site over heath.
3b	17.10.18	12.08 - 12.11	6	0	180	Circling	Rough grassland	Ringtail (probable adult female) circling off site off site at a height of 5-25m AGL.
4	17.10.18	12.26	6	0	48	Foraging	Rough Grassland, Conifer Plantation	Ringtail (probable juvenile male) hunting off site over heath at a height of 0-5m AGL.
5	07.12.18	10.23	4	25	0	Foraging	Rough grassland/ Heath bog	Male Hen Harrier foraging low (<5m AGL) for 15 seconds and flying at 5-25m AGL for 10 secs.
6	07.12.18	11.33 - 11.34	6	0	60	Foraging, Flying	Rough Grassland, Conifer Plantation	Female Hen Harrier flying southwest c. 25- 30m AGL, foraging and flew over conifer plantation to the south and lost from view.
7a	11.01.19	14.17	3	5	23	Flying	Conifer Plantation	Male Hen Harrier flying east at 20m AGL (over treetops).

Observation	Date	Time	VP	On Site Observation Time (secs)	Off Site Observation Time (secs)	Activity	Habitat	Details
7b	11.01.19	14.30	2	460	30	Foraging	Conifer Plantation, Rough Grassland, Improved Grassland	Male Hen Harrier hunting low (< 10m AGL)
8	28.03.19	15.39	6	0	149	Foraging	Heath/Bog	Ringtail Hen Harrier hunting low (1-3m AGL) over heath/bog northeast of VP6.

Table 36:Hen Harrier Observations, Winter Season 2019/2020 Survey.

Observation	Date	Time	VP	On Site Observation Time (secs)	Off Site Observation Time (secs)	Activity	Habitat	Details
1	22.10.19	13.33	10	0	80	Foraging	Heath/Bog	Male Hen Harrier hunting over heath/bog at a height of <10m above ground level (AGL).
2	22.11.19	11.44	10	0	10	Foraging	Heath/Bog	Male Hen Harrier hunting over heath/bog at a height of <5m above ground level (AGL).
3	17.12.19	9.52	7	15	0	Foraging	Heath/Bog	Male Hen Harrier hunting and flying over bog to west of VP7 at 4-10m above ground level.

Observation	Date	Time	VP	On Site Observation Time (secs)	Off Site Observation Time (secs)	Activity	Habitat	Details
4	20.01.20	14.53	5	420	0	Foraging & perching	Conifer Plantation, Improved Grassland	Male Hen Harrier circling at 35m directly above VP5, being mobbed by 3 Hooded Crows. It flew north and descended as it flew and landed on a tree stump for 2 minutes. Then flew over conifer plantation at 20m height and foraged over improved grassland at 2-3m height before flying out of sight.
5	18.03.20	10.28	7&3	103	15	Foraging	Conifer Plantation	Male Hen Harrier hunting over bog and pre-thicket forestry at a height of 1-25m.
6	18.03.20	11.26	1	50	0	Foraging	Young Forestry, Scrub, Rush, Grassland	Male Hen Harrier rose out of scrub/new forestry south of VP1, foraged over new forestry and rushy grassland, zig zagging over habitat as it hunted, then flew south towards VP3 over mature forestry, flying low at all times
7	20.03.20	11.36	8	240	0	Foraging	Conifer Plantation, Improved Grassland	Male flying low over spruce forest, then hunting over rushy pasture before circling upwards to 40m height.

Observation	Date	Time	VP	On Site Observation Time (secs)	Off Site Observation Time (secs)	Activity	Habitat	Details
1	13.10.20	12.03	10	120	0	Foraging	Forestry/Clearfell	Ringtail Hen Harrier flew from mature forest along margin of young forestry and clearfelled area. Foraging at a height of 5-20m.
2	15.10.20	10.02	2	30	0	Flying	Heath/Bog	Male Hen Harrier interacting with Hooded Crow. Flying at a height of 5-25m.
3	25.11.20	11.00	8	10	0	Foraging	Bog/ Rough Grassland	Male Hen Harrier hunting over bog to the south of VP8 at a height of <10m.
4	25.11.20	11.05	9	0	30	Foraging	Heath/Bog	Male Hen Harrier foraging, disturbed flock of Golden Plover from the ground.
5	25.11.20	11.36	10	0	170	Foraging	Heath/Bog	Male Hen Harrier hunting over bog around VP10 at a height of 1-6m.
6a	25.11.20	13.05	10	0	161	Flying	Heath/Bog, Forestry	Two male Hen Harriers flying together. One bird flew off to the west.
6b	25.11.20	13.07	10	0	230	Flying, On Ground	Heath/Bog, Forestry	The second male Hen Harrier landed on the ground and remained there for 2 minutes and 5 seconds (x on map) before taking off again and flying north.
7	27.11.20	11.12	3	10	45	Foraging	Heath/Bog	Male Hen Harrier foraging at a height of less than 3m and also perched.

Table 37:Hen Harrier Observations, Winter Season 2020/2021 Survey

Observation	Date	Time	VP	On Site Observation Time (secs)	Off Site Observation Time (secs)	Activity	Habitat	Details
8	10.12.20	12.33	10	4	8	Flying	Heath/Bog, Young Forestry	Male Hen Harrier flying low over new forestry from south. Flew over clear fell and new forest, then along edge of mature forest in an easterly direction. Flying at a height of 10-20m.
9	25.02.21	11.02	2	10	0	Flying	Heath/Bog	Ringtail (female) Hen Harrier flew west over brow of hill at a height of 5-10m.
10	16.03.21	11.35	10	0	68	Foraging, Flying	Heath/Bog	Male Hen Harrier flew from west over bog at 15m height north of VP10, then veered southeast and hunting at a height of 5m above ground. Attempted strike twice on Meadow Pipit near stream to east of VP10.
11a&b	30.03.21	11.25	5 & 8	20	60	Flying	Forestry, Rough Grassland	Male Hen Harrier flying at a height of 5- 25m.

# **3.4 General Bird Transect and Point Count Results**

Species Name	Scientific Name	Max Abundance Transects	Max Abundance Point Counts
Blackbird	Turdus merula	4	6
Blackcap	Sylvia atricapilla	3	2
Blue Tit	Cyanistes caeruleus	0	1
Bullfinch	Pyrrhula pyrrhula	1	1
Chaffinch	Fringilla coelebs	13	9
Chiffchaff	Phylloscopus collybita	1	2
Coal Tit	Periparus ater	2	5
Dunnock	Prunella modularis	1	2
Goldcrest	Regulus regulus	5	3
Grasshopper Warbler	Locustrella naevia	1	0
Greenfinch	Carduelis chloris	1	2
Hen Harrier	Circus cyaneus	1	0
Hooded Crow	Corvus cornix	9	3
House Martin	Delichon urbica	2	0
Kestrel	Falco tinnunculus	1	0
Lesser Redpoll	Carduelis cabaret	2	0
Magpie	Pica pica	1	1
Meadow Pipit	Anthus pratensis	9	0
Pheasant	Phasianus colchicus	1	3
Pied Wagtail	Motacilla alba	2	0
Robin	Erithacus rubecula	9	10
Rook	Corvus frugilegus	0	1
Siskin	Carduelis spinus	2	0
Skylark	Alauda arvensis	5	0
Song Thrush	Turdus philomelos	3	1
Starling	Sturnus vulgaris	5	0
Stonechat	Saxicola torquata	1	0
Swallow	Hirundo rustica	2	0
Willow Warbler	Phylloscopus trochilus	8	12
Woodpigeon	Columba palumbus	6	5
Wren	Troglodytes troglodytes	11	11

Table 38:Breeding Season Survey Results 2017

Species Name	Scientific Name	Max Abundance Transects	Max Abundance Point Counts
Blackbird	Turdus merula	2	2
Blackcap	Sylvia atricapilla	0	4
Blue Tit	Cyanistes caeruleus	1	2
Chaffinch	Fringilla coelebs	4	7
Chiffchaff	Phylloscopus collybita	1	2
Coal Tit	Periparus ater	2	5
Crossbill	Loxia curvirostra	1	0
Dunnock	Prunella modularis	2	0
Goldcrest	Regulus regulus	0	2
Grasshopper Warbler	Locustrella naevia	0	1
Great Tit	Parus major	1	0
Greenfinch	Carduelis chloris	1	1
Hooded Crow	Corvus cornix	2	2
Jackdaw	Corvus monedula	2	50
Lesser Redpoll	Carduelis cabaret	4	2
Magpie	Pica pica	1	3
Meadow Pipit	Anthus pratensis	6	0
Pheasant	Phasianus colchicus	3	1
Pied Wagtail	Motacilla alba	1	0
Raven	Corvus corax	2	0
Reed Bunting	Emberiza schoeniclus	0	1
Robin	Erithacus rubecula	6	8
Rook	Corvus frugilegus	2	0
Siskin	Carduelis spinus	0	2
Skylark	Alauda arvensis	5	0
Song Thrush	Turdus philomelos	3	0
Stonechat	Saxicola torquata	1	0
Swallow	Hirundo rustica	1	0
Whitethroat	Phylloscopus trochilus	1	1
Willow Warbler	Phylloscopus trochilus	7	8
Woodpigeon	Columba palumbus	4	6
Wren	Troglodytes troglodytes	14	9

### Table 39:Breeding Season Survey Results 2018

## Table 40:Breeding Season Survey Results 2019

Species Name	Scientific Name	Max Abundance Transects	Max Abundance Point Counts
Blackbird	Turdus merula	6	5
Blackcap	Sylvia atricapilla	2	5
Blue Tit	Cyanistes caeruleus	2	0
Chaffinch	Fringilla coelebs	17	19
Chiffchaff	Phylloscopus collybita	1	3

Species Name	Scientific Name	Max Abundance Transects	Max Abundance Point Counts
Coal Tit	Periparus ater	2	4
Dunnock	Prunella modularis	1	1
Goldcrest	Regulus regulus	4	7
Grasshopper Warbler	Locustrella naevia	0	1
Great Tit	Parus major	1	1
Hooded Crow	Corvus cornix	14	3
Jackdaw	Corvus monedula	6	0
Jay	Garrulus glandarius	0	1
Lesser Redpoll	Carduelis cabaret	0	2
Magpie	Pica pica	4	1
Meadow Pipit	Anthus pratensis	22	0
Mistle Thrush	Turdus viscivorus	1	0
Pheasant	Phasianus colchicus	1	1
Pied Wagtail	Motacilla alba	2	0
Raven	Corvus corax	8	2
Reed Bunting	Emberiza schoeniclus	1	0
Robin	Erithacus rubecula	5	9
Rook	Corvus frugilegus	26	0
Siskin	Carduelis spinus	1	0
Skylark	Alauda arvensis	11	0
Song Thrush	Turdus philomelos	1	1
Swallow	Hirundo rustica	5	0
Whitethroat	Phylloscopus trochilus	0	1
Willow Warbler	Phylloscopus trochilus	4	12
Woodpigeon	Columba palumbus	38	1
Wren	Troglodytes troglodytes	9	14

## Table 41:Breeding Season Survey Results 2021

Species Name	Scientific Name	Max Abundance Transects	Max Abundance Point Counts
Blackbird	Turdus merula	6	4
Blackcap	Sylvia atricapilla	2	2
Blue Tit	Cyanistes caeruleus	8	4
Bullfinch	Pyrrhula pyrrhula	2	1
Chaffinch	Fringilla coelebs	28	22
Chiffchaff	Phylloscopus collybita	3	6
Coal Tit	Periparus ater	2	3
Crossbill	Loxia curvirostra	0	1
Dunnock	Prunella modularis	2	2
Goldcrest	Regulus regulus	14	6
Goldfinch	Carduelis carduelis	3	0
Grasshopper Warbler	Locustrella naevia	0	1

Species Name	Scientific Name	Max Abundance Transects	Max Abundance Point Counts
Great Tit	Parus major	0	2
Grey Heron	Ardea cinerea	1	0
Hooded Crow	Corvus cornix	14	2
House Martin	Delichon urbica	5	0
Jackdaw	Corvus monedula	6	1
Kestrel	Falco tinnunculus	1	0
Lesser Redpoll	Carduelis cabaret	5	2
Long-tailed Tit	Aegithalos caudatus	0	4
Magpie	Pica pica	6	4
Meadow Pipit	Anthus pratensis	42	7
Mistle Thrush	Turdus viscivorus	1	2
Pied Wagtail	Motacilla alba	2	1
Raven	Corvus corax	2	0
Robin	Erithacus rubecula	9	7
Rook	Corvus frugilegus	28	0
Sedge Warbler	Acrocephalus schoenobaenus	0	1
Siskin	Carduelis spinus	0	10
Skylark	Alauda arvensis	36	0
Song Thrush	Turdus philomelos	2	3
Spotted Flycatcher	Muscicapa striata	1	0
Starling	Sturnus vulgaris	5	0
Swallow	Hirundo rustica	11	1
Whitethroat	Phylloscopus trochilus	0	1
Willow Warbler	Phylloscopus trochilus	8	11
Woodpigeon	Columba palumbus	18	5
Wren	Troglodytes troglodytes	21	16

## Table 42: Winter Season Survey Results 2017/2018

Species Name	Scientific Name	Max Abundance Transects	Max Abundance Point Counts
Blackbird	Turdus merula	3	2
Blue Tit	Cyanistes caeruleus	1	1
Bullfinch	Pyrrhula pyrrhula	0	3
Chaffinch	Fringilla coelebs	12	12
Coal Tit	Periparus ater	5	4
Dunnock	Prunella modularis	1	2
Fieldfare	Turdus pilaris	70	0
Goldcrest	Regulus regulus	2	1
Great Tit	Parus major	0	1
Hooded Crow	Corvus cornix	8	1
Jackdaw	Corvus monedula	11	0
Lesser Redpoll	Carduelis cabaret	4	0

Species Name	Scientific Name	Max Abundance Transects	Max Abundance Point Counts
Magpie	Pica pica	4	2
Meadow Pipit	Anthus pratensis	8	0
Pheasant	Phasianus colchicus	1	1
Pied Wagtail	Motacilla alba	1	0
Raven	Corvus corax	19	2
Reed Bunting	Emberiza schoeniclus	0	1
Robin	Erithacus rubecula	8	10
Skylark	Alauda arvensis	2	0
Snipe	Gallinago gallinago	1	0
Song Thrush	Turdus philomelos	4	1
Sparrowhawk	Accipiter nisus	2	0
Starling	Sturnus vulgaris	120	0
Woodpigeon	Columba palumbus	3	1
Wren	Troglodytes troglodytes	5	4

### Table 43:Winter Season Survey Results 2019/2020

Species Name	Scientific Name	Max Abundance Transects	Max Abundance Point Counts
Blackbird	Turdus merula	12	2
Blue Tit	Cyanistes caeruleus	12	4
Chaffinch	Fringilla coelebs	25	12
Coal Tit	Periparus ater	10	5
Crossbill	Loxia curvirostra	1	2
Dunnock	Prunella modularis	4	3
Fieldfare	Turdus pilaris	80	0
Goldcrest	Regulus regulus	12	8
Goldfinch	Carduelis carduelis	18	0
Great Tit	Parus major	2	1
Hooded Crow	Corvus cornix	55	7
Jackdaw	Corvus monedula	17	3
Jay	Garrulus glandarius	1	0
Kestrel	Falco tinnunculus	0	1
Lesser Redpoll	Carduelis cabaret	3	1
Magpie	Pica pica	5	3
Mallard	Anas platyrhynchos	2	0
Meadow Pipit	Anthus pratensis	97	4
Pied Wagtail	Motacilla alba	2	1
Raven	Corvus corax	13	0
Redwing	Turdus iliacus	41	0
Reed Bunting	Emberiza schoeniclus	1	0
Robin	Erithacus rubecula	18	18
Rook	Corvus frugilegus	30	1

Species Name	Scientific Name	Max Abundance Transects	Max Abundance Point Counts
Siskin	Carduelis spinus	4	13
Snipe	Gallinago gallinago	4	0
Song Thrush	Turdus philomelos	1	0
Starling	Sturnus vulgaris	61	0
Woodpigeon	Columba palumbus	48	0
Wren	Troglodytes troglodytes	7	10



CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

# **APPENDIX 4**

CEMP





CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

# ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED BALLINAGREE WIND FARM

CONSTRUCTION AND ENVIRONMENTAL MANAGEMENT PLAN

Prepared for: Ballinagree Wind DAC



Ballinagree Wind farm

Date: January 2022

Core House, Pouladuff Road, Cork, T12 D773, Ireland T: +353 21 496 4133 | E: info@FTo.ie

CORK | DUBLIN | CARLOW

www.fehilytimoney.ie



# **TABLE OF CONTENTS**

1.	INTR	RODUCTION1
	1.1	General Introduction and Purpose1
	1.2	The Applicant2
	1.3	The Project2
2.	EXIS	TING SITE ENVIRONMENT
	2.1	Existing Environment Description8
		2.1.1 Wind Farm Site
		2.1.2 Turbine Delivery Route
		2.1.3 Grid Connection9
		2.1.4 Biodiversity Enhancement and Management Plan Lands9
	2.2	Biodiversity
		2.2.1 Sites of International and National Importance10
		2.2.2 Invasive Species10
	2.3	Land, Soils and Geology11
	2.4	Hydrology & Water Quality11
	2.5	Archaeological, Architectural and Cultural Heritage16
3.	OVE	RVIEW OF CONSTRUCTION WORKS17
3.	OVE 3.1	RVIEW OF CONSTRUCTION WORKS
3.	OVE 3.1	RVIEW OF CONSTRUCTION WORKS       17         Description of the Proposed Project       17         3.1.1 Wind Farm Site       17
3.	OVE 3.1	RVIEW OF CONSTRUCTION WORKS17Description of the Proposed Project173.1.1 Wind Farm Site173.1.2 Grid Connection17
3.	OVE 3.1 3.2	RVIEW OF CONSTRUCTION WORKS17Description of the Proposed Project173.1.1 Wind Farm Site173.1.2 Grid Connection17Construction Period20
3.	OVE 3.1 3.2 3.3	RVIEW OF CONSTRUCTION WORKS17Description of the Proposed Project173.1.1 Wind Farm Site173.1.2 Grid Connection17Construction Period20Overview of the Construction Sequence21
3.	OVE 3.1 3.2 3.3	RVIEW OF CONSTRUCTION WORKS17Description of the Proposed Project173.1.1 Wind Farm Site173.1.2 Grid Connection17Construction Period20Overview of the Construction Sequence213.3.1 Overview of the Construction Methodology21
3.	OVE 3.1 3.2 3.3 3.4	RVIEW OF CONSTRUCTION WORKS.17Description of the Proposed Project173.1.1 Wind Farm Site173.1.2 Grid Connection17Construction Period20Overview of the Construction Sequence213.3.1 Overview of the Construction Methodology21Construction Working Hours54
3.	OVE 3.1 3.2 3.3 3.4 ENV	RVIEW OF CONSTRUCTION WORKS17Description of the Proposed Project173.1.1 Wind Farm Site173.1.2 Grid Connection17Construction Period20Overview of the Construction Sequence213.3.1 Overview of the Construction Methodology21Construction Working Hours54IRONMENTAL MANAGEMENT PLAN.56
3. 4.	OVE 3.1 3.2 3.3 3.4 ENV 4.1	RVIEW OF CONSTRUCTION WORKS.17Description of the Proposed Project173.1.1 Wind Farm Site173.1.2 Grid Connection17Construction Period20Overview of the Construction Sequence213.3.1 Overview of the Construction Methodology21Construction Working Hours54IRONMENTAL MANAGEMENT PLAN56Introduction56
3.	OVE 3.1 3.2 3.3 3.4 ENV 4.1 4.2	RVIEW OF CONSTRUCTION WORKS17Description of the Proposed Project173.1.1 Wind Farm Site173.1.2 Grid Connection17Construction Period20Overview of the Construction Sequence213.3.1 Overview of the Construction Methodology21Construction Working Hours54IRONMENTAL MANAGEMENT PLAN56Introduction56Project Obligations56
3.	OVE 3.1 3.2 3.3 3.4 ENV 4.1 4.2	RVIEW OF CONSTRUCTION WORKS17Description of the Proposed Project173.1.1 Wind Farm Site173.1.2 Grid Connection17Construction Period20Overview of the Construction Sequence213.3.1 Overview of the Construction Methodology21Construction Working Hours54IRONMENTAL MANAGEMENT PLAN.56Introduction56Project Obligations564.2.1 EIA/NIS Obligations56
3.	OVE 3.1 3.2 3.3 3.4 ENV 4.1 4.2	RVIEW OF CONSTRUCTION WORKS.17Description of the Proposed Project173.1.1 Wind Farm Site173.1.2 Grid Connection17Construction Period20Overview of the Construction Sequence213.3.1 Overview of the Construction Methodology21Construction Working Hours54IRONMENTAL MANAGEMENT PLAN56Introduction564.2.1 EIA/NIS Obligations564.2.2 Planning Permission Obligations57
3.	OVE 3.1 3.2 3.3 3.4 ENV 4.1 4.2	RVIEW OF CONSTRUCTION WORKS.17Description of the Proposed Project173.1.1 Wind Farm Site173.1.2 Grid Connection17Construction Period20Overview of the Construction Sequence213.3.1 Overview of the Construction Methodology21Construction Working Hours54IRONMENTAL MANAGEMENT PLAN56Introduction564.2.1 EIA/NIS Obligations564.2.2 Planning Permission Obligations574.2.3 Felling Licence57



	4.3	Environmental Management Programme	58
		4.3.1 Air Quality	58
		4.3.2 Noise and Vibration	59
		4.3.3 Biodiversity / Flora and Fauna Management	60
		4.3.4 Soil Management Plan	60
		4.3.5 Surface Water Management Plan	66
		4.3.6 Archaeological Management Plan	66
		4.3.7 Waste Management Plan	67
		4.3.8 Traffic Management Plan	71
	4.4	Environmental Management Team - Structure and Responsibility	84
	4.5	Training, Awareness and Competence	85
	4.6	Environmental Policy	85
	4.7	Register of Environmental Aspects	85
	4.8	Register of Legislation	85
	4.9	Objectives and Targets	86
	4.10	Non-Conformance, Corrective and Preventative Action	86
	4.11	EMS Documentation	86
	4.12	Control of Documents	87
5.	4.12 SAFE	Control of Documents	<b>87</b> 88
5.	4.12 SAFE 5.1	Control of Documents ETY & HEALTH MANAGEMENT PLAN Introduction	87 88 88
5.	4.12 SAFE 5.1 5.2	Control of Documents ETY & HEALTH MANAGEMENT PLAN Introduction Project Obligations	87 88 88 88
5.	4.12 SAFE 5.1 5.2	Control of Documents ETY & HEALTH MANAGEMENT PLAN Introduction Project Obligations 5.2.1 EIA Obligations	87 88 88 88
5.	4.12 SAFE 5.1 5.2	Control of Documents TY & HEALTH MANAGEMENT PLAN Introduction Project Obligations 5.2.1 EIA Obligations 5.2.2 Planning Permission Obligations	87 88 88 88 88 88
5.	4.12 SAFE 5.1 5.2	Control of Documents TY & HEALTH MANAGEMENT PLAN Introduction Project Obligations	87 88 88 88 88 88 88
5.	4.12 SAFE 5.1 5.2	Control of Documents TY & HEALTH MANAGEMENT PLAN Introduction Project Obligations 5.2.1 EIA Obligations 5.2.2 Planning Permission Obligations 5.2.3 Statutory Obligations 5.2.4 The Management of Health and Safety during the Design Process	87 88 88 88 88 88 89 91
5.	4.12 SAFE 5.1 5.2	Control of Documents TY & HEALTH MANAGEMENT PLAN Introduction Project Obligations 5.2.1 EIA Obligations 5.2.2 Planning Permission Obligations 5.2.3 Statutory Obligations 5.2.4 The Management of Health and Safety during the Design Process 5.2.5 The Preliminary Safety and Health Plan	87 88 88 88 88 88 89 91 91
5.	4.12 SAFE 5.1 5.2	Control of Documents ETY & HEALTH MANAGEMENT PLAN Introduction Project Obligations	87 88 88 88 88 88 89 91 92 94
5.	4.12 SAFE 5.1 5.2	Control of Documents TY & HEALTH MANAGEMENT PLAN Introduction Project Obligations	87 88 88 88 88 89 91 92 94 94
5.	4.12 SAFE 5.1 5.2	Control of Documents TY & HEALTH MANAGEMENT PLAN	87 88 88 88 88 88 91 91 92 94 94
5.	4.12 SAFE 5.1 5.2 EME	Control of Documents TY & HEALTH MANAGEMENT PLAN Introduction Project Obligations 5.2.1 EIA Obligations 5.2.2 Planning Permission Obligations 5.2.3 Statutory Obligations 5.2.4 The Management of Health and Safety during the Design Process 5.2.5 The Preliminary Safety and Health Plan 5.2.6 The Management of Health and Safety during the Construction Phase 5.2.7 The Construction Stage Safety and Health Plan RGENCY RESPONSE PLAN Introduction	87 88 88 88 88 88 91 91 92 94 94 97
5.	4.12 SAFE 5.1 5.2 EME 6.1 6.2	Control of Documents TY & HEALTH MANAGEMENT PLAN Introduction Project Obligations 5.2.1 EIA Obligations 5.2.2 Planning Permission Obligations 5.2.3 Statutory Obligations 5.2.4 The Management of Health and Safety during the Design Process 5.2.5 The Preliminary Safety and Health Plan 5.2.6 The Management of Health and Safety during the Construction Phase 5.2.7 The Construction Stage Safety and Health Plan RGENCY RESPONSE PLAN Introduction Emergency Response Plan	87 88 88 88 88 89 91 92 94 94 97 97 98
5.	4.12 SAFE 5.1 5.2 EMEI 6.1 6.2	Control of Documents TY & HEALTH MANAGEMENT PLAN Introduction Project Obligations 5.2.1 EIA Obligations 5.2.2 Planning Permission Obligations 5.2.3 Statutory Obligations 5.2.4 The Management of Health and Safety during the Design Process 5.2.5 The Preliminary Safety and Health Plan 5.2.6 The Management of Health and Safety during the Construction Phase 5.2.7 The Construction Stage Safety and Health Plan <b>RGENCY RESPONSE PLAN</b> Introduction Emergency Response Plan	87 88 88 88 88 88 91 91 92 94 94 94 97 98 98

\_



6.2.3 Designated Responder	98
6.2.4 Emergency Alarm	99
6.2.5 Emergency Reporting	99
6.2.6 Medical Protocol	99
6.2.7 Emergency Response	99
6.2.8 Escape and Evacuation Procedure	100
6.2.9 Turbine Tower Rescue Procedure	101
6.2.10Prevention of Illness/Injury Due to Weather/Elements	101
6.2.11Environmental Emergency Procedure	101
6.2.12Emergency Response Plan – Haul Routes	101
6.2.13Emergency Events – Wind Turbines	102
6.2.14Peat Slippage Contingency Measures	102



**Page** 

# **LIST OF FIGURES**

FIGURE 1-1:	SITE LOCATION AND PROJECT OVERVIEW	3
FIGURE 1-2:	WIND FARM SITE	4
FIGURE 1-3:	TURBINE DELIVERY ROUTE	5
FIGURE 1-4:	GRID CONNECTION ROUTE	6
FIGURE 1-5:	BEMP LANDS	7
FIGURE 2-1:	OPW FLOOD DATA MAP	14
FIGURE 2-2:	Hydrological Features	15
FIGURE 3-1:	TURBINE TOWER TURNING SUMMARY	20
FIGURE 3-2:	PROPOSED CONSTRUCTION PROGRAMME	21
FIGURE 3-3:	ACCESS POINT 1	23
FIGURE 3-4:	ACCESS POINT 2	23
FIGURE 3-5:	ACCESS POINT 3	24
FIGURE 3-6:	Access Point 4	24
FIGURE 3-7:	ACCESS POINT 5	25
FIGURE 3-8:	TEMPORARY ALUMINIUM ACCESS TRACKWAY	29
FIGURE 3-9:	PIPED CULVERT CROSSING LONG SECTION	33
FIGURE 3-10	110kV Cable Duct Undercrossing Method	37
FIGURE 3-11:	110kV Cable Duct Overcrossing Method	38
FIGURE 3-12:	FLATBED FORMATION DETAIL	38
FIGURE 3-13	HDD ACTIVITY PROFILE	43
FIGURE 3-14:	EXISTING STONE BRIDGE CROSSING (WF-HF8)	44
FIGURE 3-15:	TYPICAL INSTALLATION AND TEMPORARY REINSTATEMENT OF JOINT BAY	53
FIGURE 3-16	TOWABLE SPRAYER FOR TEMPORARY REINSTATEMENT	54
FIGURE 3-17:	TRANSPORT ROUTES	55
FIGURE 4-1:	TOWER LAY DOWN AND PICK UP LOCATIONS	78
FIGURE 4-2:	TEMPORARY ROAD CLOSURE AND ROUTE DIVERSION LOCATIONS	80
FIGURE 4-3:	STOP AND GO TRAFFIC CONTROL SIGNAGE FOR SINGLE CARRIAGEWAY RURAL ROAD	81
FIGURE 4-4:	TEMPORARY TRAFFIC SIGNALS CONTROL FOR WORKS IN SINGLE CARRIAGEWAY RURAL ROADS	81
FIGURE 4-5:	ACCEPTABLE STOP-GO DISCS	82

# **LIST OF TABLES**

TABLE 2-1:	WFD RIVER STATUS AND RIVER WATERBODY RISK	13
TABLE 3-1:	TDR TEMPORARY ACCOMMODATION WORKS	18
TABLE 4-1:	NEARBY WASTE MANAGEMENT FACILITIES	70
TABLE 4-2:	EXISTING AND PROPOSED PROJECTS ASSESSED FOR CUMULATIVE IMPACTS	83



#### 1. INTRODUCTION

#### 1.1 General Introduction and Purpose

This document is the Construction and Environmental Management Plan (CEMP) for the proposed Ballinagree Wind Farm and has been prepared by Fehily Timoney and Company (FT) on behalf of Ballinagree Wind DAC.

The CEMP will be updated 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 project. The CEMP will be a live document and will be subject to ongoing review through regular environmental auditing and site inspections and updated as required. For the avoidance of doubt, all measures stipulated in this CEMP will be implemented in full.

The CEMP sets out the key construction and environmental management issues associated with the proposed project and will be developed further at the post-planning and construction stages by the client and on the appointment of the main contractor to the project.

The CEMP should be read in conjunction with the EIAR. In the case of any ambiguity or contradiction between this CEMP and the EIAR, the EIAR shall take precedence.

This CEMP sets out the key environmental management issues associated with the construction, operation and decommissioning of the proposed project, to ensure that during these phases of the development, the environment is protected and impacts on the environment are minimised.

The document is divided into six sections:

- **Section 1:** *Introduction* provides an overview of the existing site and the proposed project
- Section 2: Existing Site Environmental Conditions provides details of the main existing geotechnical, hydrological, ecological and archaeological conditions onsite. These conditions are to be considered by the contractor in the construction, operation and decommissioning of this proposed project.
- **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 Ballinagree Wind Farm.
- **Section 6:** *Emergency Response Plan* contains predetermined guidelines 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 Ballinagree Wind Farm.



The applicant for the proposed project is Ballinagree Wind DAC.

#### 1.3 The Project

The proposed project is comprised of the following key elements:

- The wind farm site (also referred to in this CEMP as 'the Site');
- The grid connection;
- The turbine delivery route (also referred to in this CEMP as 'the TDR');
- Biodiversity enhancement and management plan lands (also referred to in this CEMP as 'the BEMP lands').

A detailed description of the proposed project is contained in Chapter 3 of the EIAR. A detailed description of the proposed construction works is outlined in Section 3.

An overview of the proposed project is shown in Figure 1-1.

The wind farm site includes the wind turbines, internal access tracks, hard standings, meteorological masts, recreational amenity infrastructure and associated signage, onsite substation, internal electrical and communications cabling, temporary construction compound, drainage infrastructure, borrow pits and all associated works related to the construction of the wind farm. Refer to Figure 1-2 for the general arrangement of the Site.

The grid connection which comprises a 110 kV underground cable and is shown in Figure 1-4. The Construction Methodology report provides a detailed description of the proposed grid connection infrastructure and construction methodologies associated with same. It is located in Appendix 3.3 of the EIAR.

The Turbine Delivery Route is described in Section 2.1.2 and shown in Figure 1-3.

A Biodiversity Enhancement and Management Plan is located Appendix 3.4 of the EIAR. The BEMP lands are identified in Figure 1-5.



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the G Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. EN 0001220 © Go

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) Oper



r NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. EN 0001220 © Government of Ireland





NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. EN 0001219 © Government of Ireland



0 0.5 1 W 0 2 Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. EN 0001220 © Gover



0.5 w-0 1 2 Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS I Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. EN 0001220 © Govern


# 2. EXISTING SITE ENVIRONMENT

# 2.1 Existing Environment Description

## 2.1.1 <u>Wind Farm Site</u>

The proposed wind farm site is located within the jurisdiction of Cork County Council, approximately 35 km north west of Cork City. The project is located approximately 8km south east of Millstreet and approximately 10 km north of Macroom.

The Wind Farm Site is located in a rural area approximately 8km southeast of Millstreet. Settlement in the area is made up of one-off rural housing and farmyards generally located along the road network of the area (Linear settlement pattern). The nearest settlement is the village of Ballinagree which is located approximately 1.5km to the south of the wind farm site.

The wind farm site encompasses a mixture of habitat types, with conifer plantation and pastures the main types of land cover present. Pockets of recently felled conifer woodland, heath, scrub and improved agricultural grassland are also present across the site. Pockets of upland peat bog is present in the northern part of the site.

Elevations within the wind farm site range from 200m to 490m approximately above ordinance datum. Slopes within the site range from 0% to approximately 20% grade.

Access to the site is primarily via the existing local road L2578 'Butter Road' from the direction of Millstreet to the North West. HGVs shall approach the site via this road.

Ballinagree Wind Farm shall involve the use of 5 no. existing forestry and agricultural entrances as access points with the public road. The locations of these access points are shown on Figure 1-2.

The access points which have been selected with consideration for safety of public road users and construction staff and to ensure they can be constructed to comply with the design requirements of Cork County Council and TII.

A detailed description of the existing site environment can be found in Chapter 3 of the EIAR.

The layout of the proposed wind farm site is shown on Figure 1-2.

# 2.1.2 <u>Turbine Delivery Route</u>

Large components associated with the wind farm construction will be transported to site via the identified turbine delivery route (TDR).

The TDR and location of temporary accommodation works are shown in Figure 1-3.

In some cases, accommodation works are required along the turbine delivery route such as hedge or tree cutting, relocation of powerlines/poles, lampposts, signage and local road widening. All accommodation works will be carried out in advance of the turbine deliveries in agreement with the landowner and local authority and subject to a road opening license as required.

Further information on the proposed turbine delivery route and transport routes to the wind farm site can be found in Chapter 13 of the EIAR.



## 2.1.3 <u>Grid Connection</u>

The grid connection route (GCR) will consist entirely of underground 110kV cable and will connect the on-site substation to the existing 110/220kV substation at Clashavoon. The GCR will be ca. 11.37 km in length, with 9.35 km to be constructed primarily within the existing road corridor. The proposed GCR arrangement is illustrated in Figure 1-4. The 110kV grid connection cable will follow public roads and shall feature horizontal directional drilling (HDD) at 4 no. locations to cross existing watercourses.

Further details of the proposed grid connection can be found in Section 3.1.4.

### 2.1.4 Biodiversity Enhancement and Management Plan Lands

A Biodiversity Enhancement and Management Plan is located Appendix 3.4 of the EIAR and comprises agricultural and forestry lands. The BEMP lands are identified in Figure 1-5.



## 2.2 Biodiversity

The dominant habitats present within the proposed wind farm site are largely modified habitats including mature, semi-mature and young 1st and 2nd rotation commercial conifer plantation WD4, improved agricultural grassland GA1, semi-natural to semi-improved wet grassland GS4 and buildings and artificial surfaces BL3 (forestry tracks, local roads).

For the vast majority of the route the grid cable will be buried beneath the road surface and as such the dominant habitat along the proposed grid connection route is buildings and artificial surfaces BL3. Travelling southerly the adjacent road verge are generally comprised of narrow grassy verge (wet grassland GS4, dry-humid acid grassland GS3 and/or occasional dry grassy verge GS2) with bramble and Willow scrub WS1, hedgerow WL1 or occasional treeline WL2. The dominant adjacent land-use is improved agricultural grassland GA1 or occasionally conifer plantation WD4.

## 2.2.1 Sites of International and National Importance

There are no European sites geographically overlapping with the Site, grid connection and BEMP. The Turbine Delivery Route will be along existing roads which run close to the following European sites:

- Lower River Shannon SAC (002165)
- Barrigone SAC (000432)
- Curraghchase Woods SAC (000174)
- Askeaton Fen Complex SAC (002279)
- River Shannon and River Fergus Estuaries SPA (004077)

However, there are no works proposed at these locations for the purpose of turbine delivery and as such the movement of delivery vehicles along the road will have no effects on the European sites.

Only two Natura 2000 sites are located within 5km of the study area and GCR. These are Mullaghanish to Musheramore Mts. SPA (004612) and Blackwater River SAC (002170).

The Boggeragh Mountains NHA (002447) overlaps the northern part of the wind farm study area.

### 2.2.2 Invasive Species

High impact invasive plant species, Japanese Knotweed *Fallopia japonica* was recorded within a farmland holding towards the centre/east of the study area and just off-site to the south of the study area. The Knotweed stands were not in the construction footprint of the windfarm, along the GCR or at POIs requiring work along the TDR. No Third Schedule Invasive Species were recorded within the proposed BEMP lands.

Japanese Knotweed is also present in the wider environment and is present along roadsides in the wider area. Rhododendron *Rhododendron ponticum* is also occasionally present within conifer plantation WD4 towards the centre of the study area and to the south.



## 2.3 Land, Soils and Geology

The land use across the site is predominantly made up of agricultural lands and mature forest.

The subsoils across the site comprise glacial till derived from Devonian sandstones, bedrock outcrop or subcrop, blanket peat and alluvium.

The southern portion of the proposed development site is characterised by elevated lands with typical elevations of between 323m to 430m AOD with steep to moderate slopes to the west of the site boundary. Slopes within the proposed development and at proposed infrastructure locations generally range from 2 to 16 degrees.

The northern portion of the proposed development includes turbine locations T13 to T20. It comprises of elevated lands sloping relatively steeply to the south (ranging from 2 to 16 degrees).

Slopes at proposed turbine locations in this portion of the development range from gentle (2 degrees) to moderate. There is a maximum slope angle of 16 degrees at turbine T16. Slopes at the proposed borrow pits BP01 and BP02 (western area of the site) are considered moderate to steep with slopes of 14 and 16 degrees, respectively.

Based on the GSI aquifer vulnerability mapping, overburden deposits are generally between 3 and 10m deep in the central portion of the site; generally, 3 to 5m deep in the north and east of the site; and <3m deep in the west south and a portion of the north of the site.

From a review of the GSI Landslide Susceptibility database, the proposed development and proposed infrastructure locations are generally located within areas of 'Low' to 'Moderately High' susceptibility. The midsection and north-eastern most area of the site is classed as 'Low' with a strip of the southern-most area and the northern area class as 'Moderately High'. The western-most part of the site where the borrow-pits are located is classed as 'Moderately High'.

There was no evidence of active or historical slope instability observed across the site during the site walkover. There are no historical records of landslide activity within or close to the site, according to the GSI database. The GSI information is based on a national dataset and has been superseded following a more recent walkover and study of the area. The site walkover and ground investigations including trial pits and boreholes, peat probing and shear vane testing were all carried out across the site along with a detailed slope stability assessment that resulted in the Factor of Safety across the site to be above the minimum recommended 1.3 limit, indicating a low risk of slope instability.

Detailed information on land, soils and geology is provided in Chapter 9 of EIAR.

## 2.4 Hydrology & Water Quality

The wind farm site is located within two hydrometric areas (catchment) of the Irish River Network System. These are Lee, Cork Harbour and Youghal Bay (ID 19) and Blackwater (Munster) (ID 18) catchments. The average annual rainfall for the period 1981-2010 in the area of the wind farm site is 1,720 mm.

The wind farm site is situated within three sub-catchments as defined by the WFD.



These waterbodies are known as:

- Sullane\_SC\_020 (19\_7)
- Blackwater (Munster)\_SC\_050 (18\_4)
- Blackwater (Munster)\_SC\_070 (18\_7).

Turbines T1, T2, T3, T6, T7, T8, T9, T10, T11, T12, T13, T16 and T17 are within Laney\_010 sub-basin. Turbines T4 and T5 are within Laney\_020. Turbines T14, T15 and T18 are within Nad\_010 and turbines T19 and T20 are within Glen (Banteer)\_010 sub-basin.

The cable route between the proposed on-site 110 kV substation at Knockacullata and proposed on-site 110 kV substation at Lackendarragh North is within four waterbodies (river sub-basins) catchments as defined by the WFD. These are:

- Bride (Blackwater)\_010 IE\_SW\_18B050050,
- Ross (Killavullen)\_010 IE\_SW\_18R020500,
- Bride (Blackwater)\_020 IE\_SW\_18B050320,
- Blackwater (Munster)\_180 IE\_SW\_18B022100 sub-basin.

The national flood hazard mapping (<u>www.floodmaps.ie</u>), does not indicate any record of historical flooding within the wind farm site boundary. There is a recurring flood incident recorded under the name "Annagannihy North to Musheera Co. Cork Recurring" located at the unnamed stream approximately 650m northeast of turbine T10.

OPW flood data and existing hydrological features recorded within the site area shown on Figure 2-1 and Figure 2-2.

WFD water quality status and river waterbody risk within the study area is provided in Table 2-1:



## Table 2-1: WFD River Status and River Waterbody Risk

Waterbody	Waterbody	River Status	Waterbody Risk
	Wind Farm		
Laney River	IE_SW_19L010100	High	Not at Risk
West Ballynagree	IE_SW_19L010100	High	Not at Risk
Knocknagappul 19	IE_SW_19L010100	High	Not at Risk
Carrigagulla	IE_SW_19L010100	High	Not at Risk
Nadanuller Beg	IE_SW_18N010400	High	Not at Risk
Glen (Banteer)	IE_SW_18G040600	High	Not at Risk
Unnamed tributaries of Laney River	IE_SW_19L010100	High	Not at Risk
Unnamed tributaries of Nadanuller Beg	IE_SW_19L010100	High	Not at Risk
	Grid Connection		
Bealick	IE_SW_119L010500	Good	At Risk
Kilberrihert 19	IE_SW_119L010400	High	Not at Risk
Coolaniddane	IE_SW_119L010400	High	Not at Risk
Caherbaroul	IE_SW_119L010400	High	Not at Risk
Clonavrick	IE_SW_119L010400	High	Not at Risk
Laney	IE_SW_119L010400	High	Not at Risk
Awboy	IE_SW_19A030200	Good	At Risk
Carrigthomas	IE_SW_19L010400	High	Not at Risk

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Es



0.5 w\$ 0 1 2



0.5 1 ₩₽₽ 0 1 2



# 2.5 Archaeological, Architectural and Cultural Heritage

There are 14 known archaeological sites located within the wind farm site boundary of the wind farm site.

The locations of the extant archaeological monuments within private lands adjacent to the grid connection route were inspected from the roadsides. There is a stone row (CO049-019----) located within the section of the main wind farm in Knockagappul. It is located c. 50m from the roadside and no potential unrecorded archaeological features were noted within the margins of the road. A wedge tomb further to the south (CO049-067----) is located within a garden of a private house. It is not visible from the roadside to the east but its recorded position is not close to the road margin.

The turbine delivery route will use the existing road network between Foynes and the wind farm site. An inspection was undertaken of the hardstand area within a pasture field in the Drishane Castle demesne, which will accommodate a staging area for the transfer of turbine blades. The staging area comprises a large, level, grass field which was in use as sheep grazing land at the time of survey. It is bounded at south by a section of the random rubble estate wall which borders the public road. The southeast exit from the staging area will be via an existing cul-de-sac road that extends to Drishane cemetery to the north. This burial ground includes a modern southern extension to the earlier graveyard which is recorded archaeological site (RMP CO039-077002-). The partially levelled remains of a ruinous church are on the north side of the graveyard (RMP CO039-077002-).

For further information on archaeology, architectural and cultural heritage of the project, refer to Chapter 14 of the EIAR.



## 3. OVERVIEW OF CONSTRUCTION WORKS

### **3.1** Description of the Proposed Project

### 3.1.1 Wind Farm Site

The Wind Farm Site layout is shown in Figure 1-2.

The proposed wind farm will consist of 20 no. wind turbines , 2no. meteorological masts, and 1 no. substation compound along with ancillary civil and electrical infrastructure. Walking trails will be provided for community use.

Further details can be found in Chapter 3 of the EIAR.

### 3.1.2 Grid Connection

### 3.1.2.1 Grid Connection Cable Route

The grid connection route (GCR) will consist entirely of underground 110 kV cable and will connect the on-site substation to the existing 110/220 kV substation at Clashavoon. The GCR will be approximately 11 km in length, with approximately 9 km to be constructed primarily within the existing road corridor. The proposed Grid Connection Route arrangement is illustrated in Figure 1-4. The 110 kV grid connection cable will follow public roads and shall feature horizontal directional drilling (HDD) at 4 no. locations to cross existing watercourses.

Connection works to Clashavoon substation will involve the installation of ducting, joint bays, drainage 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.

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 shall be undertaken on a rolling basis with short sections closed for short periods before moving onto the next section.

The grid connection is located within the Sullane\_SC\_020 sub-catchment in its entirety.

The majority of the proposed grid connection route is underlain by Till derived from Devonian Sandstones with limited areas of bedrock sub-crop or outcrop and alluvium indicated along the proposed route.

### 3.1.3 <u>Turbine Delivery Route</u>

The proposed turbine delivery route is presented in Figure 1-3.

Large components associated with the wind farm construction will be transported to site via the identified turbine delivery route (TDR). The proposed access route to site is as follows:



- Loads will depart the Port of Foynes and turn left onto the N69 towards Limerick;
- Loads will travel onto the M7 and turn onto the N21;
- Loads will turn onto the N20 and travel south through the towns of Charleville and Buttevant;
- Loads will turn right onto the N72 at Mallow and travel west;
- Loads will turn onto the R583 towards Millstreet;
- Loads will turn left onto the L2758 before entering Millstreet;
- Loads will travel South-East along the L2758 to the proposed wind farm site.

Key elements of the temporary accommodation works for the delivery of turbines are summarised in Table 3-1below. The general location of accommodation works are shown in Figure 1-3 and identified as 'Points of Interest (POIs)'. The location and nature of proposed temporary accommodation works are described in further detail in Table 3.1.

# Table 3-1: TDR Temporary Accommodation Works

TDR Node Reference Number (POI)	Location	Summary Description of Proposed Temporary Accommodation Works
2	Foynes Port Access Road/N69	Temporary removal of street furniture. Overrun of splitter island. Overrun and oversail of public road verge. Placement of temporary load bearing surface. Tree and vegetation trimming.
6	N69 West of Toreen	Trimming of tree canopy
7	N69 Toreen	Trimming of tree canopy
9	N69 Clarina Roundabout	Temporary removal of street furniture. Overrun and oversail of northern edge of roundabout island. Placement of temporary load bearing surface. Removal of trees and vegetation.
10	N69/N18 Dock Road West Roundabout	Temporary removal of street furniture. Overrun and oversail of northern edge of roundabout island. Placement of temporary load bearing surface. Removal of trees and vegetation.
11	N69/N18 Dock Road East Roundabout	Temporary removal of street furniture. Overrun and oversail of public road verge. Placement of temporary load bearing surface.
19	N20 Ballybeg bends	Public road verge oversail. Temporary removal of street furniture. Removal of trees and vegetation.
20	N20 Kilcloosha bends	Public road verge oversail. Removal of vegetation.
23	N20/R883 Roundabout, Mallow	Overrun and oversail through roundabout island. Ground reprofiling and placement of temporary load bearing surface. Removal of trees and vegetation.
24	N20/N72 Roundabout Mallow	Overrun and oversail through roundabout and footpaths. Placement of temporary load bearing surface. Temporary removal of street furniture. Removal of tree.
26	N72 Dromcummer Beg	Vegetation trimming. Temporary removal of street furniture.
27	N72 Coolclough Bends	Temporary removal of street furniture. Relocation of telegraph pole. Removal of vegetation.
28	N72 Dromagh	Trimming of trees and vegetation.
29	N72 Dromtarriff Bends	Trimming of trees and vegetation. Removal of hedgerow. Temporary removal of street furniture. Oversail into third party lands. Placement of temporary load bearing surface.

CLIENT: SECTION:



TDR Node Reference Number (POI)	Location	Summary Description of Proposed Temporary Accommodation Works
30	N72/R583 Junction	Removal of trees and vegetation. Temporary removal of street furniture and wall.
31	R583 Killetragh	Trimming of trees and vegetation.
32	R583 Minehill	Overrun and oversail of public road verge. Placement of temporary load bearing surface. Trimming and removal of trees and vegetation.
36	R583 Drishane Castle	Construction of a temporary staging area comprising aggregate hard standing and associated access track to and from the public road R583 in the grounds of Drishane Castle. Removal of masonry wall to facilitate temporary access from public road R583. Overrun and oversail of public road verge. Placement of temporary load bearing surface. Relocation of telegraph pole. Trimming of trees and vegetation.
37	R583 Right Bend Entering Millstreet	Relocation of utility poles and overhead lines.
38	R583/L1123 Junction	Relocation of utility poles and overhead lines. Removal of walls. Temporary removal of street furniture. Placement of load bearing surface on third party land. Overrun and oversail of public road footpaths. Suspension of parking.
40	L1123 Left bend south of Millstreet	Relocation of utility poles and overhead lines. Overrun and oversail of public road verge. Placement of temporary load bearing surface. Suspension of parking.
41	Tulig road right bend	Relocation of utility poles and overhead lines. Trimming of vegetation.
42	Tulig Road left/ right bend	Trimming of trees and vegetation. Relocation of utility poles and overhead lines.
43	River Owenbawn Left Bend	Removal of trees and vegetation. Relocation of utility poles and overhead lines. Removal of wall.
44	Auhane West of Tullig	Ground reprofiling and placement of load bearing surface on third party land. Relocation of utility poles and overhead lines. Temporary removal of street furniture. Removal of hedge.
46	Temporary widening of existing junction between Butter Road (L1123/L2758) and unnamed local road on approach to main site entrance.	Ground reprofiling and placement of load bearing surface on third party land. Removal of hedge.
47	Local Road on approach to main site	Placement of temporary load bearing surface to roadside verges.

A detailed route selection report has been completed by Pell Frischmann Consulting Engineers. It describes the accommodation works in greater detail. It is included in the EIAR as Appendix 13.2

POIs which require significant works are shown in detail in the 0400 series planning drawings.

The main street of Millstreet will not be used as part of the TDR with the exception of the delivery of wind turbine tower sections to the wind farm site, which will need to approach the junction between the R583 and L1123 from the west to avoid impacting third party property.



This is due to the turning radius of the vehicles used to transport the tower sections which is greater than that of the lifting trailers used to transport the wind turbine blades. For this reason, a left-hand turn at the junction between the R583 and L1123 Butter Road on the main TDR route is not possible for the tower loads, and it is necessary to approach this junction from the west. After the loads have passed through Millstreet, the tower sections shall be decoupled from their clamp trailers at Claratlea and laid on the public road, while keeping a lane open for through traffic. The decoupled clamp trailers shall continue west and carry out a 180 degree turn at an existing Coillte forestry access at Rathduane which has sufficient space to facilitate the manoeuvre before returning to pick up the tower sections at Claratlea. The loaded vehicles shall then return through Millstreet and turn right onto the L1123 Butter Road, rejoining the main TDR route to the wind farm site. A detailed description of the proposed manoeuvre can be found in Appendix 13.3 of the EIAR in the form of a Method Statement for Turning Tower Sections which has been prepared by Pell Frischmann Consulting Engineers and includes swept path drawings. An overview of the turning manoeuvre is shown in Figure 3.1 below.



# 3.2 Construction Period

It is expected that the construction phase, including civil, electrical and grid works, and turbine assembly will take between approximately 18 - 24 months.

The proposed construction programme upon which assessments in the EIAR have been based is presented in Figure 3-2 below.

Section. S – Overview of construction works
---







**Proposed Construction Programme** 

## **3.3 Overview of the 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 proposed 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. Drainage infrastructure will be constructed in parallel with the track construction. 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 are constructed. The proposed grid connection cable route works will commence following the completion of the proposed on-site wind farm works.

## 3.3.1 Overview of the 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.

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
- Internal Wind Farm Cable Works
- Borrow Pit Construction
- Crane Hardstands



- Turbine Foundations
- Substation Compound
- Electrical Works
- Turbine Erection
- Grid Connection Cabling Works
- TDR Temporary Accommodation Works

# 3.3.1.1 Site Entrances

Ballinagree Wind Farm will use five existing forestry and agricultural entrances. The locations of these access points are shown on Figure 1-2.

The access points have been selected with consideration for safety of public road users and construction staff and to ensure they can be constructed to comply with the requirements of both Cork County Council and TII design requirements for direct accesses. Each of the access points are described in detail in Chapter 3 and Chapter 13 of the EIAR.

Site entrance designs and minimum visibility splays to be provided for the construction and operation of the proposed wind farm are shown in 0101-Series planning application drawings.

Site entrances will be constructed using the same methodology as the construction of the wind farm tracks as described in section 3.3.1.5.

The proposed trail head car park is shown on planning drawing P2114-0300-0017

Access Point 1: This is the main site entrance for the southern part of the site and shall also act as the main site entrance for the overall wind farm. An existing Coillte forestry access shall be upgraded to facilitate the delivery of turbine components. All turbine components accessing the southern part of the site shall use this entrance for the installation of turbines T1 to T13. This access point shall also be used for all construction and operation vehicles and shall be used by both HGV's and LGV's. This access point shall also act as the main entrance to the recreational amenity trail head at the location of the southern temporary compound during the operational phase of the project. This access is already regularly used by HGV's associated with agricultural and forestry activities and will continue to be used during the construction and operation phases of the project.





Figure 3-3: Access Point 1

Access Point 2: This is the main site entrance for the northern part of the site. An existing agricultural and forestry access shall be upgraded to facilitate the delivery of turbine components. All turbine components accessing the northern part of the site shall use this entrance for the installation of turbines T14 to T20. This access point shall be used for construction and operation by both HGV's and LGV's. This access is already regularly used by HGV's associated with agricultural and forestry activities and will continue to be used for these activities during the construction and operation phases of the proposed project. This access has also been used in the past to facilitate the construction of the existing Boggeragh Wind Farm.



Figure 3-4: Access Point 2

Access Point 3: This is an existing agricultural and forestry access which provides access to the southern part of the site. This access point will be used for operational access by LGV's only. The proposed grid connection export cable shall exit this site through this access point. This access is already regularly used by HGV's associated with agricultural activities.





Figure 3-5: Access Point 3

Access Point 4: This is an existing Coillte forestry access which will be used during the construction phase by LGV's and HGV's. This access point will form part of a public road crossing point with Access Point 5 for construction traffic travelling to and from the proposed borrow pits in the west of the site only. This access is already regularly used by HGV's associated with agricultural and forestry activities.



Figure 3-6: Access Point 4

**Access Point 5:** This is an existing Coillte forestry access which will be used during the construction phase by both LGV's and HGV's. This access point will form part of a public road crossing point with Access Point 4 for construction traffic travelling to and from the proposed borrow pits in the west of the site only. This access is already regularly used by HGV's associated with agricultural and forestry activities.





Figure 3-7: **Access Point 5** 

#### 3.3.1.2 Temporary Site Compounds

CLIENT:

SECTION:

During the construction phase, it will be necessary to provide temporary facilities for construction personnel. The location of the temporary site compounds are shown on Figure 1-2.

Ballinagree will have 2no. temporary compounds; one located near the main entrance to the southern part of the site which will include welfare facilities and offices and will act as the primary construction site compound, and a second, smaller compound in the northern part of the site as shown in Figure 1-2.

Temporary compounds shall be aggregate hard standings surrounded by security fencing, located as shown on the accompanying drawings. On completion of the construction phase, the temporary compounds will be dismantled, the hardstanding will be left in situ and covered over with soil which will be allowed to revegetate naturally. Part of the southern compound will be kept as a carpark for the recreation trail.

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
- storage areas

- employee parking
- bunded fuel storage
- contractor lock-up facility
- diesel generator
- waste management areas

The temporary compound for the northern cluster is shown on planning drawing P2114-0300-0015. The temporary compound for the southern cluster is shown on planning drawing P2114-0300-0016.



### 3.3.1.3 Felling

Much of the proposed wind farm site comprises commercial coniferous forestry. 10 no. turbines are located within forestry and consequently tree felling will be required as part of the project. Permanent felling of approximately 70 ha of coniferous forestry is required within and around the wind farm infrastructure to accommodate the construction of some turbines, hardstands, crane pads, access tracks and the proposed onsite substation. The felling area proposed is the minimum necessary to construct the proposed project and also to comply with any environmental mitigation (bats in particular). In addition to the wind farm infrastructure felling described above, 18 ha of coniferous forestry is being felled as part of the proposed BEMP measures. The total amount of felling proposed for the project therefore is 88 hectares. In advance of other construction works, clearance felling will commence on site and is expected to take up to 3 months.

To ensure a tree clearance method that reduces the potential for sediment and nutrient runoff, the construction methodology will follow the specifications set out in the Forest Service Forestry and Water Quality Guidelines (2000) and Forest Harvesting and Environmental Guidelines (2000).

In this regard, before any felling works commence on site all personnel, particularly machine operators, will be made aware of the following and will have copies of relevant documentation, including:

- The felling plan, surface water management, construction management, emergency plans and any contingency plans;
- Environmental issues relating to the site;
- The outer perimeter of all buffer and exclusion zones;
- All health & safety issues relating to the site.

The proposed tree felling around proposed 'infrastructure' will be limited to:

- 20m wide corridors for new and upgraded access tracks;
- Outer footprint of turbine hardstandings including an additional 10m offset from same;
- Outer footprint of temporary compounds;
- Outer footprint of onsite substation compound;
- 6m corridor for buried cables in private lands;
- 101.3m radius around each turbine tower located in forestry for bat impact mitigation;
- 25m radius around the footprint of on-site meteorological masts.

### 3.3.1.4 Concrete Washout Area and Wheel Washing

All concrete will be delivered to site via ready-mix trucks from a local supplier.

Concrete washout will be carried out in a dedicated area of the temporary compound or at a designated washout pit on site. Only the washing of chutes will be permitted. Every concrete truck delivering concrete to the site must use the concrete washout facility prior to leaving the site. Chutes will be washed out at the designated area with a settlement pond provided to receive all run-off. Wheel wash details are shown on planning drawing P2114-0300-0024. Settlement pond details are shown on planning drawings P2114-0501-0007.



The concrete wash-out area will be constructed as follows:

- The topsoil and subsoil, if necessary, will be stripped out and placed adjacent to the temporary compound area.
- An impermeable membrane will be installed directly onto the subsoil, and/or subsoil, to form the impermeable concrete wash-out settlement lagoon.
- A designated truck wash-down concrete apron shall be constructed next to this settlement lagoon.
- Impermeable lined drains will direct the wash-out flow to the wash-out settlement lagoon.
- The residual liquids and solids will be disposed of off-site at an appropriate licenced waste facility.

Upon completion of the project the concrete wash-out areas and settlement lagoons will be decommissioned by removing the impermeable membrane and backfilling the area with the material arising during excavation. The removed material will be recovered or disposed of off-site at an appropriate facility.

Wheel wash facilities will be located near site entrances 1 and 2 as shown on Figure 1-2to 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.

### 3.3.1.5 New Site Access Tracks

All site tracks will be designed taking account of the loadings required by the turbine manufacturer and will consist of a compacted stone structure. Suitable granular fill material for the sub-base of the track will be sourced from the borrow pits within the site. Suitable class 6 structural fill will be imported from a licensed quarry as required to meet the requirements of the detailed design. Class 6F2 and clause 804 granular material for track base course and running surface will be imported from a licensed quarry.

The majority of access tracks on the site will be constructed using traditional founded track construction and best practice construction methods from suitable load bearing strata. This system 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.

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 are 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, 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 designated construction areas indicated on the contract drawings.
- All access for construction vehicles within the site shall follow the proposed internal access tracks as shown in Figure 1-2.



- 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.

2.75 km of floating road construction will be adopted in the northern part of the site where peat depths are greatest. In this instance, geogrid will be placed directly on the existing ground surface and aggregate will be placed and compacted in lifts on top with additional layers of geogrid placed at specified depths where necessary. A layer of compacted Cl 804 material will be placed on top to provide a suitable running surface.

## 3.3.1.6 Upgrade of Existing Internal Access Tracks

Figure 1-2 illustrates the internal access tracks within the Wind Farm Site.

An extensive network of agricultural and forestry access tracks exists within the site. 11.8km of these existing access tracks will be upgraded for the proposed project.

All access tracks will be widened to 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. Existing drainage infrastructure will be maintained and upgraded where necessary.

Access track formation will consist of a minimum 500mm hardcore on geo-textile membrane.

Existing track upgrades shall follow the same outline methodology as for new access tracks.

Refer to 300 series planning drawings for typical track dimensions.

### 3.3.1.7 Temporary Tracks

Temporary aluminium access trackway will be used to provide short term access to areas of the site not served by the proposed aggregate tracks during the construction and commissioning phase. This solution is commonly used to provide temporary road access to outdoor events and is designed to be installed quickly in modular sections with minimal impact to existing ground. It is primarily used for ground protection and to prevent the creation of excess mud from site vehicles.

A Temporary Aluminium Access Trackway is shown below in Figure 3-8.





Figure 3-8: Temporary Aluminium Access Trackway

# 3.3.1.8 Internal Wind Farm Cabling Works

The specification for cable trenches will vary slightly depending on cable voltage, location and existing land use. Typical cable trench construction details are presented in 0300-Series planning application drawings.

All electrical and fibre-optic cabling on site between the wind turbines and the substation building will be buried in trenches approximately 0.6m wide by 1m deep located within or directly adjacent to the internal tracks.

The following describes the construction methodology for cable installation works inside the wind farm 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 shall apply:

- 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 wind farm 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 road side 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 jointbay 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 surveys ahead of construction.
- Prior to commencement of the works, 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.

## 3.3.1.9 Drainage and Watercourse Crossings

A surface water management plan has been prepared. It can be found in Appendix 10.2 of the EIAR. it contains methodology for drainage, water quality management and silt control. The measures contained within the plan will be applied when constructing the watercourse crossings.

Drainage design and details can be found on the 0501 series planning drawings.

Watercourse crossings details can be found on the 0300 series planning drawings.

Watercourse crossings can generally be classified as follows:

- Existing structures (bridges or culverts) that need to be crossed by infrastructure (access tracks or cables) associated with the proposed project, without a need to modify the existing structure;
- Installation of new structures to facilitate the crossing of existing watercourses by infrastructure associated with the proposed project;



- Existing structures that need to be either replaced or upgraded to facilitate the crossing of existing watercourses by infrastructure associated with the proposed project;
- Crossing of existing open streams or drains by cable ducts.

The methodology/sequence of works associated with the proposed watercourse crossing methods are described below.

### Construction Methodology for Instream Works and Temporary Stream Diversions

The following methodology shall be applied at all locations where instream works are required.

- Instream works shall only take place during the period July to September (as required by IFI for instream works). However, as stated above, all instream works shall take place in written agreement with the IFI;
- Operation of machinery in-stream should be kept to an absolute minimum. All construction machinery operating in-stream should be mechanically sound to avoid leaks of oils, hydraulic fluid, etc. Machinery should 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 be sprayed and cleaned with a 1% solution of Virkon<sup>®</sup> Aquatic (or other proprietary disinfectant);
- Upon completion of the work or moving the equipment or machinery from the water, these will be visually inspected for any possible sources of contamination and any attached plant or animal material or debris will be removed. The equipment and machinery will be further sprayed and cleaned with a 1% solution of Virkon<sup>®</sup> Aquatic (or other proprietary disinfectant);
- If temporary diversion channels are necessary as part of the instream works, they should provide for fish passage, be non-eroding, and be of similar width to the natural stream channel. The channel diversion should be compliant with the following measures:
  - Diversion of water to and from temporary channels should only take place during the period July to September (as required by IFI for instream works) and in accordance with the IFI;
  - Consultation with the NPWS should also be carried out as species protected under the Wildlife Act, EU Habitats Directive and the EU Freshwater Fish Directive occur within the river water bodies affected by the instream works;
  - The works area will be clearly marked out with fencing or flagging tape to avoid unnecessary disturbance of vegetation;
  - A minimum 10 meter vegetative buffer zone will be maintained between disturbed areas and the water body. There will be no storage of material/equipment, excavated material or overnight parking of machinery inside the 10m buffer zone;
  - Double silt fencing will be placed upslope of the buffer zone on each side of the water body. The silt fencing will have removable "gates" as required to allow access of excavator while maintaining ease of replacement overnight or during periods of heavy rainfall. The silt fencing will be extended at least 10m upstream and downstream of the crossing location;
  - Bog mats will be used underneath the excavator inside the 10 meter vegetative buffer zone to prevent soil erosion and potential water quality impacts from localised surface water runoff;
  - Temporary storage of excavated overburden from the diversion channel will be undertaken outside of the 10m buffer on flat ground or within a local hollow. A containment berm will be placed downslope of the excavated material which in turn will be surrounded by secondary silt fence protection to prevent saturated soil from flowing back into the water body;

- The water body dam (in the stream to be diverted) will be made of sand (clean) bags, cobbles or clean well-graded coarse gravel fill. Poorly sorted material will not be used as it would be a potential source of fine sediment (the dam will be installed once the diversion channel is in place);
- The banks and bottom of the diversion channel will be lined with impermeable geotextile to prevent erosion and surface water quality impacts. A layer of clean course gravel will be placed over the geotextile on the bed of the channel to keep it in place;
- An energy dissipater (such as clean rock fill or splash plates) will be placed on the water body bed and opposing bank of the receiving water body downstream of the diversion channel. This will prevent scouring and erosion of the water body bed and bank at the outfall during diversion;
- Water body bed trench excavation works will commence once stream flow is fully diverted from the crossing excavation area;
- Temporary storage of excavated material from the crossing trench will be undertaken separately to the material from the diversion channel. All storage areas will be outside the 10m buffer zone. A containment berm will be placed downslope of the excavated material which in turn will be surrounded by secondary silt fence protection to prevent saturated soil from flowing back into the water body;
- Sediment laden water from trench dewatering will be discharged onto a well vegetated, dry, flat area at least 50m from a water body via a straw bale dewatering structure or geotextile filter bag. The outfall will also be surrounding by silt fencing;
- In addition, the suitability of the discharge area shall be confirmed by the site geotechnical engineer so as not to pose an increased risk to slope stability with consideration for ongoing activities both upslope and downslope of the proposed location and shall be sited to avoid areas of deep peat;
- If there is no suitable area for discharge onto ground, settlement ponds will be used where necessary and will be put in place prior to commencement of preparation works;
- Any water from trench dewatering will not be discharged directly to a water body;
- Clay bunds will be placed within the trench backfill on either side of the water body to prevent the trench acting as a drain towards the stream, thus preventing potential water quality impacts;
- Upon completion of the in-stream works, the stream crossing will be restored to its original configuration and stabilised to prevent bank erosion by means of timber stakes, timber planks and geotextiles as required (Project Design Measure);
- The diversion channel will be backfilled and reinstated to its original level and rock armour will be placed at the stream banks where the inflow and outflow of the diversion channel previously existed;
- The ground surface along the reinstated diversion channel will be re-seeded at the soonest opportunity to prevent soil erosion;
- The silt fencing on either side of the stream buffer will be left in place and maintained until the disturbed ground has re-vegetated;
- Operation of machinery and use of equipment within the 10m buffer will be kept to a minimum to avoid any unnecessary disturbance;
- Disturbance of bankside soils and stream sediments will be restricted to the minimum required for the cable laying process to avoid unnecessary impact on the stream morphology;
- There will be no batching or storage of cement allowed at the stream crossing;



- $\circ$   $\;$  There will be no refuelling allowed within 100m of the stream crossing;
- $\circ$  All plant will be checked for purpose of use prior to mobilisation at the stream crossing;
- Works will not take place during periods of heavy rainfall and will be scaled back or suspended if heavy rain is forecasted; and
- Once construction of the crossing is completed, reconnection to the existing water body can be made and this should only occur within the approved operational window for in-stream works.

# Construction Methodology for Watercourse Crossings in the Wind Farm Site

## Minor Watercourses and Drain Crossings (Access Tracks)

It is expected that all minor watercourse and drain crossings within the site will be crossed using piped culverts. Piped culverts will only be used over very short stretches i.e. at track crossings. Pipe culverts will be sized to take the 1 in 100-year flood flow with a 20% allowance for Climate Change. Concrete or HDPE pipes may be used depending on the size of the watercourse to be crossed.

The Wind Farm Site layout does not cross any significant stream within the site boundary. Minor drains such as manmade agricultural and forest drains will be crossed using 450mm diameter pipes.

Where cross drains are to be provided to convey the drainage across the track at regular intervals, the sizes of these cross drains are 300 mm diameter pipes.

Silt Protection Controls (SPCs) are proposed at the location of the drain crossings. SPCs will consist of a minimum of silt traps containing filter stone and filter material staked across the width of the swales and upstream of the outfall to any watercourse.

Pipe culverts will be installed in accordance with the design shown in Figure 3-9 below.



Figure 3-9: Piped Culvert Crossing Long Section

For a minor watercourse/drain crossing using a piped culvert, the following methodology will be used.

- The access track construction will finish at least 2.5m from the nearside bank of the minor watercourse/drain.
- Use of weather forecasts will be made, and works will be planned when a dry spell of weather is forecasted;
- Work will not be undertaken during periods of high rainfall. This will minimise the risk of entrainment of suspended sediment in surface water runoff and transport via this pathway to surface water bodies;



- Where there is a requirement to disturb either the bed or bank as a result of the construction/replacement works, the watercourse will be dammed upstream and diverted prior to work commencing;
- A temporary berm (i.e. sandbags and/or rectangular straw bales) will placed along the edge of the track/road to prevent loose material being dislodged or washed into the water body;
- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the environmental management plan outlined in Section 4. Instream works and temporary diversions where required shall be carried out in accordance with the measures outlined in Section 3.3.9.1.
- The bed of the channel in which the culvert will be laid will be prepared using a mechanical digger and hand tools to the required levels in accordance with the design.
- A bedding layer will be laid in the base of the minor watercourse/drain using Class 6 aggregate material and blinding to the desired levels in accordance with the design.
- The pipe is laid in one lift or in sections using an excavator in accordance with an approved lift plan.
- Bedding material is placed and compacted around the pipe to the desired levels in accordance with the design.
- 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.
- The pipe is covered using compacted Class 6N fill material in accordance with the design up to the levels required by the access track sub formation.
- Rock armour headwalls will be constructed where necessary to protect pipe ends and the base of slope embankments on either side of the track.
- For small drain crossings, pipes of suitable diameter will be laid directly into the bed of the drain.

In some cases, where existing internal forest tracks need to be widened, it will be necessary to widen, replace or extend existing pipe drains. In such cases, the above measures shall also be employed.

### Minor Watercourses and Drain Crossings (Cable Trenching)

For a minor watercourse/drain crossing, the following methodology will be used.

- The cable trench construction will finish at least 2.5m from the nearside bank of the minor watercourse/drain.
- Use of weather forecasts will be made, and works will be planned when a dry spell of weather is forecasted;
- Work will not be undertaken during periods of high rainfall. This will minimise the risk of entrainment of suspended sediment in surface water runoff and transport via this pathway to surface water bodies;
- Where there is a requirement to disturb either the bed or bank as a result of the construction/replacement works, the watercourse will be dammed upstream and diverted prior to work commencing;
- A temporary berm (i.e. sandbags and/or rectangular straw bales) will placed along the edge of the track/road to prevent loose material being dislodged or washed into the water body;

- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the environmental management plan outlined in Section 4. Instream works and temporary diversions where required shall be carried out in accordance with the measures outlined in Section 3.3.9.1.
- The bed of the watercourse will be prepared using a mechanical digger and hand tools to the required levels in accordance with the design along the alignment of the cable route.
- Once the trench has been excavated, a bedding layer of sand will be installed and compacted.
- PVC ducts will be installed on top of the compacted base layer material in the trench.
- Once the ducts have been installed, couplers will be fitted and capped to prevent any dirt etc. entering the unjointed open end of the duct. In poor ground conditions, the open end of the duct will be shimmed up off the bed of the trench to prevent any possible ingress of water and dirt into the duct. The shims will be removed once the next length of duct has been joined to the duct system.
- The as-built location of the installed ducts will be surveyed and recorded using a total station/GPS before the trench is backfilled to ensure recording of exact location of the ducts, and hence the operational electricity cable. These co-ordinates will be plotted on as-built record drawings for the operational phase.
- When ducts have been installed in the correct position on the trench base layer, sand will be carefully installed in the trench around the ducts so as not to displace the duct and compacted.
- A red cable protection strip will be installed above duct surround layer of material.
- A layer of excavated material will be installed on top of the duct surround material to the correct level.
- Yellow marker warning tape will be installed for the full width of the trench.
- The bed of the watercourse, stream banks and agricultural land will be reinstated as per their original condition.

## Box Culvert Construction Methodology

Box culverts have been used at stream crossings where pipes would not be sufficient.

Culverts will be sized to take the 1 in 100 year flood flow with a 20% allowance for Climate Change.

The construction methodology for the box culvert will be the same as a piped culvert with the only difference being a box being used instead of a pipe.

## Clear Span Bridge Construction Methodology

Clear Span bridge construction will be required as part of the wind farm internal access track construction (WF-HF4) as shown on drawing P2114-0300-0018. Sufficient free-board will be allowed for in the proposed bridge design to allow for 1 in 100-year fluvial flood conditions with a 20% allowance for Climate Change.

In order that flood flows will not be obstructed, the stream crossings will be sized to convey a 1 in 100-year flood flow with a 20% allowance for Climate Change.



The construction methodology is detailed as follows:

- Excavation near river banks is required to install and secure pre-cast concrete abutments.
- Abutments will be set back 2.5m from 1% AEP flood height (100-year event).
- Dry working conditions at these sites will be maintained by retaining the existing bank and using a short section of sand bags in a cofferdam style formation on the stream side of the working area. The sandbag screen will prevent any soil from excavations from falling into stream.
- On alternate sides of the stream, within the sequenced sandbag screen set-ups, the abutment base will be excavated to rock or competent stratum with a mechanical excavator.
- The foundations and abutments will be pre-cast concrete sections. They will be lifted into place on the base. The area around the abutments up to access road level will be infilled with a structural fill.
- Once each abutment is in place and secured with structural fill, the pre-cast concrete deck will be laid down on the abutments, anchored and a thin screed of concrete will be poured on top.
- When the concrete deck is connected to the abutments, the filling and compaction of the road will be completed.
- 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.
- The access road 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 road will be installed in advance of the works along with the first layer of road construction.
- All earthworks adjacent to the crossing locations will be carried out so as to prevent soil entering the watercourse.
- Safe access over the stream for this installation will be via a steel walkway & handrail which will span the stream.

# Construction methodology for Watercourse crossings along the Grid Connection

The grid connection cable route contains 3 No. bridge watercourse crossings and one large culvert crossing which will be completed using horizontal directional drilling (HDD).

A number of other minor watercourses crossing locations have been noted along the cable route, i.e. culverts, pipe drains and minor field drains. Crossing of these existing culverts will be as per undercrossing or overcrossing methods, depending on the depth of the culvert or using open trenching.

# Standard Trench Crossings of Existing Culverts or Services

For the crossing of buried pipe drains, culverts or services, if encountered, the following options for construction may be used:



- Piped Culvert Crossings Where sufficient cover is available, the cable ducts will be laid above the culvert with a minimum separation distance, 300mm to be agreed with the local authority and Eirgrid within the parameters assessed in the EIAR.
- Piped Culvert Crossings Where sufficient cover is not available, the cable ducts will be laid under the culvert with a minimum separation distance, 300mm to be agreed with the local authority and Eirgrid within the parameters assessed in the EIAR.

When crossing existing culverts or buried services, the following methodology will be employed:

- The general method of trench construction will follow the procedure outlined above for Installation of cable ducting.
- The service infrastructure shall be located and marked by an engineer in accordance with the Code of Practice for Avoiding Danger from Underground Services, Health and Safety Authority 2005.
- All services will be safeguarded and protected in accordance with the asset owner's specifications.
- Within 500 mm of the existing service, hand digging will be employed to expose it.
- Cable ducts shall pass over or under the existing service, depending on the depth of the service and other constraints. Figure 3-12 shows design details for ducts passing in flatbed formation above existing culverts and buried services.
- A minimum separation distance of 300mm shall be maintained between the cable ducts and the existing service.
- Existing services within the trench shall be left in the same condition as they were found. Any issues shall be reported to the asset owner immediately.

### Piped Culvert Crossings – Ducting Under Culvert

Where the culvert consists of a socketed concrete or sealed plastic pipe with insufficient cover over the culvert to accommodate the cable trench, a trench will then be excavated beneath the culvert and cable ducts will be installed in a trefoil arrangement under the sealed pipe.

This method of crossing is illustrated in Figure 3-10below. If these duct installation methods cannot be achieved or utilized, the ducts will be installed by alternative means as set out in the following sections.



Figure 3-10: 110kV Cable Duct Undercrossing Method



### *Piped Culvert Crossing – Ducting Over Culvert*

Where sufficient cover exists above the culvert, the trench will be excavated above the culvert and the ducts will be installed in the trefoil arrangement passing over the sealed pipe where no contact will be made with the watercourses. This method of duct installation is further detailed in Figure 3-11.



Figure 3-11: 110kV Cable Duct Overcrossing Method

Where cable ducts are to be installed over an existing culvert with insufficient cover, the ducts will be laid in a much shallower trench the depth of which will be determined by the location of the top of the culvert. The ducts will be laid in a flatbed formation over the existing service. They will be encased in a reinforced concrete surround in accordance with Eirgrid's specifications.

After the crossing over the culvert has been achieved, the ducts will be laid in a trefoil arrangement again within a standard trench. This will be done gradually to comply with minimum duct and cable design bend requirements. In transition sections between trefoil and flat formation, the base of the trench shall be graded to eliminate stepping and minimum bedding and surround material will be maintained throughout.





For further information refer to 110kV Underground Cable Construction Methodology report in Appendix 3.3 of the EIAR.

Inland Fisheries Ireland have published guidelines relating to construction works along water bodies entitled 'Requirements for the Protection of Fisheries Habitats during Construction and Development Works at River Sites", and these guidelines will be adhered to during the construction of the development.

For further details please refer to the Construction Methodology for the Ballinagree Windfarm 110kV Underground Cable Report in Appendix 3.3 of the EIAR.

Sections of trenching and ducting will involve instream works at numerous culvert crossing locations in order to install cabling. To facilitate the works, these watercourses will be dammed and the water diverted over or around the works using either a flume pipe or a diversion channel. Following the completion of works at the watercourse, the dam will be removed and the watercourse reinstated.

The following methodology describes instream works using a standard Dam and Flume diversion method:

- Where temporary fluming or flow diversion are in situ, in a watercourse frequented by salmon or trout, (at least medium sensitivity) all fish within the designated area will be subject to fish rescue and translocation downstream by a fisheries biologist.
- The flume pipe(s) will be set out on the bed of the existing stream.
- A dam will be constructed using sand bags and suitable clay material around the flume pipe(s) and across the stream so that all the flows are diverted through the pipe(s).
- Silt traps, such as geotextile membrane, straw bales etc. will be placed downstream of the in-stream trenching location prior to construction, to minimise silt loss.
- The ducting installation works will be carried out in the dry stream bed and under/around the flume pipe(s). If required, a temporary sump will be established and used to collect any additional water. This water will be removed by pumping to a percolation area if the soil is not saturated, otherwise a settlement tank will be used to remove any solids from the de-watering.
- Refer to Section 3.3.1.9.1 for further details with respect to the suitable siting of discharge areas.
- Following the completion of works, the stream bed will be reinstated with original or similar material and the spawning gravels replaced under the supervision of an aquatic ecologist.
- Once the stream bed is appropriately re-instated the dam and the flume pipe(s) will be removed thus restoring the stream to its original condition.

Section 3.3.1.9.1 contains the methodology to be adopted to carry out instream works using a standard Dam and Divert diversion method:

## Replacement of Existing Culverts

The grid connection route extends approximately 11.37 km mainly along local roads (9.35km) and an unpaved forestry access road. There are nineteen known culverts along the route. Of these culverts, most appear to be either concrete pipe, HDPE twinwall pipe or stone construction, seventeen of which are on the public road. Where there is insufficient cover over the culvert, it will be necessary to trench under the culvert. It should be again noted that the EirGrid preferred method of crossing third party services/culverts is undercrossing. For stone culverts there is a high probability that the culvert would collapse sending stream water into the trench.



To avoid this occurring, stone culverts with insufficient cover will be identified and replaced prior to trenching works. The following approach will be taken:

- Works will be supervised by the Ecological Clerk of Works and / or the project aquatic ecologist who
  will liaise with IFI and National Parks and Wildlife Service (NPWS) prior to works commencing. The ECoW
  will also monitor surface water quality downstream of the works in accordance with the surface water
  monitoring programme and will have the authority to cease any works should the monitoring identify
  unacceptable water quality conditions.
- Any works within watercourses that provide fish habitat (indicated in the EIAR at least of "Medium" sensitivity), will be avoided between Oct 1st and April 30th as per IFI guidelines.
- All plant and equipment will be serviced and cleaned before entry to site to limit risk of oil spillage and for biosecurity.
- Works will be carried out in dry weather with low flows in the streams with forecast for dry weather for the duration of the works approximately 2 days.
- Machinery used will stay on the public road; machinery will not be permitted to enter the stream channel.
- The road edge adjacent to the watercourse will be lined with sandbags and silt fences (multiple fences recommended) as appropriate to prevent runoff from the trenching works reaching the stream. The design of these multiple features shall also allow for the safe removal of accumulated silt away from the channel, particularly through staged removal of the most contaminated upper fence before the lower ones, and the removal of the final fence only when it is clear of any silt
- Clean sandbags will be used to dam flows on the upstream side of the culvert. Sandbags will be placed by hand at a suitable location to take advantage of any natural pool but set back from the works to permit unhindered excavation of the existing culvert.
- A second sandbag dam will be placed on the downstream side of the culvert to prevent backflow into the works and contain any groundwater seepage that is likely to be turbid.
- Sandbagging requires careful attention to detail if it is to be effective. All bags must be laid neck uppermost and seams aligned. Bags must not be overfilled or they will not tamp together or will burst with ease. Additional bags will be filled ready to raise the freeboard of dams.
- Flume placement for temporary flow diversion or permanent replacement of culverts will follow guidelines issued by IFI and CIRIA to ensure that fish passage is not impeded.
- If topography permits, the water will be piped over the road by gravity flow, otherwise, it will be pumped. Discharge will be via break tank or similar approved storage onto a splash-plate or rip-rap (gabion basket) to dissipate energy and avoid scour or erosion of the stream bend or banks. The pump will be fitted with a screen, so fish are not drawn into the pump intake.
- The use of pump sumps will be considered within the dammed area. These will be lined to prevent scouring. The intention is to intercept clean groundwater ingress and pump it out rather than allowing it to get silted in the works area by segregating off areas.
- Any spoil generated will be removed to a designated safe area clear of the flood plain. Some of this spoil will be saturated and will require bunding and sheeting over.
- If bank material needs to be removed it will be stored separately and reinstated accordingly.



- The ducting will be advanced past the culvert. The existing culvert will be excavated 'in the dry'. A new culvert, sized for a 100-year rainstorm event, will be installed with appropriate gradient, headworks and outfall. A precast concrete culvert, concrete pipe or HPDE pipe will be used. Culverts will be embedded to at least 300mm below the existing stream bed to ensure backwatering. Culverts will avoid a significant change in gradient (i.e. >3%). After embedding, replacement culverts will be filled with clean washed gravels and cobbles to replace lost habitat and facilitate fish movement.
- Dry stone headworks will be placed at the culvert intake and discharge. The stream bed adjacent to the works will be reinstated at the direction of the project aquatic ecologist.
- The ECoW will determine the quality of any water trapped between the two dams visual inspection and turbidity meter. If this water is clean it will be left in situ. If it is not clean, it will be removed from the works area prior to removal of the dams. If required, dewatering of the works area prior to dam removal will be undertaken by pumping from the stream bed to a suitable percolation area as described in Section 3.3.1.9.1.
- The upstream dam will then be removed to permit flow though the new culvert. This will be done in phases, so a large volume of water isn't released at once. The downstream dam will be removed in a similar manner.

### Horizontal Directional Drilling

Horizontal Directional Drilling (HDD) will be employed at 4 no. locations along the proposed grid connection route as shown on the site layout plans.

The depth of the bore shall be at least 3m below the level of the public road and stream bed. A survey of buried services within the public road will be carried out by the contractor prior to commencement to confirm the conditions predicted in the EIAR. The council will be made aware in advance of the operation and invited to oversee the activity.

The locations of the launch and reception pits are positioned to ensure the bore is at such depth as not to conflict with the drainage or surface of the road or associated infrastructure.

The operation shall take place from one side of the watercourse. It will be carried out by an experienced HDD specialist. Each crossing is expected to take place in a single day under one mobilisation.

In the case of HDD operations within the public road corridor, the works shall be carried out under a road closure and road opening license in accordance with measures described in the Traffic Management Plan.

A pilot hole for the HDD will be bored as per the agreed alignment. It shall 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 is lubricated using Clear Bore<sup>™</sup> or similar. When the pilot hole has been drilled to the correct profile, its diameter is increased if necessary, to match the external diameter of 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.

HDD will be carried out using Vermeer D36 x 50 Directional Drill, or similar plant. The launch and reception pits will be approximately 0.55 m wide, 2.5 m long and 1.5 m deep. The pits will be excavated with a suitably sized excavator and shall employ the same mitigation measures outlined herein for trenching and joint bay excavations.



The drilling rig will be securely anchored to the ground by means of anchor pins which will be attached to the front of the machine. The drill head will then be secured to the first drill rod and the operator shall commence to drill into the launch pit to a suitable angle. This will enable the excavation to obtain the depths and pitch required to the line and level of the required profile. Drilling of the pilot bore shall continue with the addition of 3.0 m long drill rods, mechanically loaded and connected into position.

During the drilling process, a mixture of a natural, inert and fully biodegradable drilling fluid such as Clear Bore<sup>™</sup> (environmentally friendly product (not toxic to aquatic organisms)) and water is pumped through the centre of the drill rods to the reamer head. This mixture is forced into the void and enables the annulus which has been created to support the surrounding sub soil and thus prevent collapse of the reamed length. Depending on the prevalent ground conditions, it may be necessary to repeat the drilling process by incrementally increasing the size of the reamers.

The use of a natural, inert and biodegradable drilling fluid such as Clear Bore<sup>™</sup> is intended to avoid any adverse effects arising from the use of other, traditional polymer-based drilling fluids. It will be used sparingly as part of the drilling operations. It will be appropriately stored prior to use and deployed in the required amounts to avoid surplus. Should any excess drilling fluid accumulate in the reception or drilling pits, it will be contained and removed from the site in the same manner as other subsoil materials associated with the drilling process to an approved disposal site. Backfilling of launch & reception pits will be conducted in accordance with the normal specification for backfilling excavated trenches and joint bays.

Minimum environmental protection measures to be implemented on site shall include the following:

- A site-specific drilling design, risk assessment and method statement shall be prepared by the contractor prior to the works.
- CLEARBORE shall be used rather than Bentonite as a drilling fluid as it is biodegradable.
- HDD operations to be limited to daylight hours and conditions when low levels of rainfall are forecast.
- The depth of the bore shall be at least 3m below the bed of the watercourse.
- Visual inspection to take place at all times along the bore path of the alignment.
- A field response plan to minimize loss of returns of drilling fluid and actions to restore returns shall be provided.
- No refuelling will take place within 50m of the watercourse or any sensitive habitats.
- Pre-construction verification surveys shall take place at drilling sites to confirm the presence of any sensitive species.
- A qualified environmental monitor or ecological clerk of works (ECoW) will be onsite for the duration of the drilling operation.





For further information on HDD works refer to 110kV Underground Cable Construction Methodology report in Appendix 3.3 of the EIAR. Further detail on HDD crossing design can be found in accompanying planning application drawings.


### Construction Methodology for Watercourse Crossings along the Turbine Delivery Route

On the turbine delivery route, one watercourse crossing is to be modified. This is an existing bridge (WF-HF8 as shown in Figure 3-14 and Figure 2-2). This will be replaced by a new clear span bridge.



Figure 3-14: Existing Stone Bridge Crossing (WF-HF8)

Sufficient free-board will be allowed for in the proposed bridge design to allow for 1 in 100-year fluvial flood conditions plus 20% for Climate Change.

The works will include the removal of an existing stone bridge and associated abutments, construction of concrete bridge supports which will be built from the public road and lifting of the assembled bridge structure into place. The bridge components will be delivered to site on standard HGVs. Disturbance of the stream bed shall be avoided where possible.

The construction methodology is as follows:

- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the environmental management plan outlined in Section 4.
- A temporary road closure will be put in place for the duration of the works (refer to Section 4.3.8 for TMP measures).
- Use of weather forecasts will be made, and works will be planned when a dry spell of weather is forecasted;
- Work will not be undertaken during periods of high rainfall. This will minimise the risk of entrainment of suspended sediment in surface water runoff and transport via this pathway to surface water bodies;



All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the environmental management plan outlined in Section 4. Instream works shall be carried out in accordance with the measures outlined in Section 3.3.9.1.

- Bank protection will be installed as necessary to ensure that disturbance to the existing stream banks are minimised during construction.
- Following excavation of the existing road surface, the existing stone bridge will be removed by a mechanical digger and taken from the works area by dumper truck. The excavated material shall be taken for disposal to a licensed waste facility in accordance with the waste management plan.
- Excavation near river banks is required to install and secure pre-cast concrete abutments meaning that dry instream working conditions will need to be established.
- The extent of the excavation for bridge supports 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.
- The excavated material will be stored within the site at designated locations per the Soil Management Plan.
- Abutments will be set back 2.5m from 1% AEP flood height (100-year event). Dry working conditions at
  these sites will be maintained by retaining the existing bank and using a short section of sand bag
  cofferdam. Only part of the stream will be isolated at any one time. This will isolate flow either side of
  the channel in sequence, to allow dry working conditions while each abutment is installed. The required
  working area is relatively small for each abutment and the cofferdam set-up allows continuous flow
  during the short construction period.
- Strong polyethylene bags filled with clean sand will be used and will be wrapped between geotextile to create watertight conditions.
- Once complete, water retained by the cofferdam will be discharged onto a well vegetated, dry, flat
  area at least 50m from a water body via a straw bale dewatering structure or geotextile filter bag. The
  outfall will also be surrounding by silt fencing; If there is no suitable area for discharge onto ground,
  settlement ponds will be used where necessary and will be put in place prior to commencement of
  preparation works;
- On alternate sides of the stream, within the sequenced cofferdam set-ups, the base for the abutments will be excavated to rock or competent stratum with a mechanical excavator.
- The foundations and abutments will be constructed using a single pre-cast concrete section and will be lifted into place on the base. The area around the abutments up to road level will be infilled with a suitable structural fill.
- Once each abutment is in place and secured with structural fill, the pre-cast concrete deck will be laid down on the abutments, anchored and a thin screed of concrete will be poured on top. Ducts for the later pulling of power and communication cables for the wind farm will be pre-cast into the bridge deck sections.
- When the concrete deck is connected to the abutments, the filling and compaction of the road will be completed.
- The road leading to and from the crossing will be profiled using suitable imported roadbase material in accordance with TII standards.
- The road surface will be reinstated to its previous condition.
- Cables will be pulled through the bridge deck following completion of the bridge structure.



# 3.3.1.10 Borrow Pit Construction

3 no. onsite borrow pits will be used to source suitable fill material for the construction of the various tracks, turbine bases and hardstanding areas. The location of the proposed borrow pits is shown on Figure 1-2.

The borrow pits will be developed as follows:

- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the environmental management plan outlined in Section 4 of this CEMP.
- The access tracks will be prepared to the borrow pit locations in line with the methodology described in Section 3.3.1.4.
- The extent of the works areas shall be accurately delineated using stakes and rope to prevent works being carried out outside the agreed areas.
- Stock proof fencing shall be installed around the borrow pit in advance of any works taking place.
- A bespoke method statement shall be drawn up by the contractor for the main construction works shortly before the works take place.
- After drainage and temporary dewatering infrastructure has been put in place, the main excavation works will commence by stripping the topsoil material.
- Topsoil will be stockpiled to be used for reinstatement of the borrow pit and used for local landscaping of the wind farm site.
- Excavation works will be carried out by the following means at the borrow pit:
  - $\circ$   $\;$  Conventional excavators (using buckets) to excavate and load dumper trucks
  - Rippers mounted on conventional excavators to 'rip' the rock where appropriate
  - Rock breakers (where required)
- Excavated material will be processed by mechanical crusher and screened as necessary.
- Excavated rock will be loaded onto dumper trucks and transported to the required area for tipping and placement e.g. when building the access tracks.
- When the borrow pits have been exploited, they shall be closed and reinstated using surplus mineral soil or rock excavated from elsewhere on the site as described in accordance with an approved project reinstatement plan.
- The borrow pit, once reinstated, shall be covered with topsoil and allowed to re-vegetate naturally. However, appropriate measures will be taken if it is found that natural re-vegetation is too slow or if the area is being taken over by inappropriate species.
- Noise, dust and site drainage mitigation measures shall be implemented as described in the environmental management plan in Section 4 of this CEMP.

To monitor groundwater during the construction phase groundwater monitoring wells will be installed between areas of deeper excavations and sensitive groundwater receptors. The wells will be used to monitoring groundwater levels and quality to assess any potential impacts during the construction works.

The borrow pits are shown on planning drawings P2114-0300-0006, P2114-0300-0007 and P2114-0300-0008.



# 3.3.1.11 Turbine Hardstands

All crane pads and associated splays will be 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/m<sup>2</sup>.

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 are used and the stone capping layer. 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. It is not likely this will be the case at this site. The crane pads are approximately 40m x 75m and 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.
- The excavated material will be stored close to the hardstand or taken back to the borrow pit. 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 to 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.

# 3.3.1.12 Turbine Foundations

The wind turbine foundations will be constructed using standard reinforced concrete construction techniques and will be designed as either:

- Submerged foundation design.
- Non-Submerged Foundation design.

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 regulations. The turbine will be anchored to the foundation as per the turbine manufacturer's guidelines which will be incorporated in the civil foundation design. The shape and size of the foundation can vary in size and shape to approximately 25m in diameter.



The turbine foundations will be constructed as follows:

# Standard Excavated Reinforced Concrete Base:

- a) 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.
- b) The excavated material will be stored at agreed locations close to the base. Topsoil and subsoil stockpiles will be formed, and the side compacted to prevent silt run off during heavy rain or air bourn dust during dry periods. The subsoil material will be used as backfill and the topsoil will be used for landscaping around the finished turbine post construction.
- c) No material will be removed from site and storage areas will be stripped of vegetation prior to stockpiling in line with best working practises.
- d) 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.
- e) 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.
- f) If soil replacement is required, the aggregate used must be tested and approved by the project geotechnical engineer.
- g) 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.
- h) Ductwork will be installed as required, and formwork erected around the steel cage and propped from the backside as required.
- i) The foundation anchorage system will be checked both for level and line prior to the concrete being installed in the base.
- j) Concrete will be placed using a concrete pump and compacted using vibrating pokers to the levels and profile indicated on the construction drawings.
- k) 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.
- I) Steel shutters will be used to pour the upper plinth section.
- m) 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 is to be approved by the project geotechnical engineer.
- n) A gravel footpath will be formed from the access track to the turbine door and around the turbine for maintenance.

# 3.3.1.13 Substation Compound

The compound surrounding the substation will measure approximately  $150 \text{ m} \times 105 \text{ m}$  as shown in 0300-Series planning application drawings. The compound will include a substation control building and electrical components necessary to import the electricity generated from the wind farm to the existing Clashavoon substation.



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.

# 3.3.1.14 Electrical Works

### Substation Fit Out and Switchgear Installation

The substations will have a domestic electrical system including lights, sockets, fire alarm and intruder alarm. The high voltage switchgear for the wind farm is installed through the following method.

- The switchboard units are 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 is then 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.

# 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 likely 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 shall 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

### 3.3.1.15 Turbine 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 delivery. Once there is a suitable weather window the turbine will be assembled.

It is anticipated that each turbine will take approximately 3 to 4 days to erect (depending on the weather), requiring two cranes. Finally, the turbines will be commissioned and tested.

Turbine installation works will be carried out in accordance to a site specific lift plan.

# 3.3.1.16 Grid Connection Cabling Works

The following describes the outline construction methodology for cable installation works along the grid connection route between the wind farm onsite substation and the Clashavoon substation.

The proposed grid connection route is shown on Figure 1-4 and described in Section 2.1.3.

- Agreement will be sought from local authorities with respect to the location of trenches on roads to ensure no damage is caused to storm-water drains, water-mains or other services. All drain and culverts affected by the works are to be re-instated to the satisfaction of the Local Authorities. Particular care will be taken in order to minimise disruption to local residents and public road users.
- The location of the cable route will be set out by GPS (RTK enabled) equipment in accordance with the design drawings prepared for the site.



- Prior to any construction works commencing, a pre-commencement road survey will be carried out on the public roads in the vicinity of the works. The area where excavations are planned will be surveyed with a cable-avoiding scanning tool, by a person trained in Location of Underground Services. Location equipment to be calibrated within the previous 12 months.
- All environmental mitigation measures will be implemented locally in advance of the works, in accordance with the measures outlined in Section 4 of this CEMP.
- Traffic management measures will be implemented prior to works commencing accordance with the construction stage TMP and measures outlined in Section 4 of this CEMP.
- Overhead lines will be identified and overhead clearance limiting measures will be put in place at the start of each day. Machinery will also include automatic limiters to safeguard against interaction with overhead lines.
- Underground services may be encountered during the trenching works the locations and depth of these underground services the locating of these services will include the reviewing of service drawings, investigations along the trenching route, and consultation with the various service providers.
- All environmental buffer zones shall be identified and set out prior to construction works advancing. Where necessary a stock proof timber post and wire fence shall be erected to establish these areas and thus prevent the entry of contractor's plant within these buffers during construction works. It is noted that given the presence of large sections of the cable route on public roads, extensive adherence to buffer zones is unlikely.
- The cable infrastructure will follow the existing road infrastructure where possible as shown on accompanying planning application drawings and Figure 1.4. Cables will be laid underground using standard trenches, with pre-excavation drainage works in place prior to trench excavation.
- In areas where the cable trench route runs within a public road carriageway, temporary reinstatement of the road surface will be carried out at the end of the working day to allow safe re-opening of the road for public traffic. See below for sequence of works for temporary road reinstatement.
- A 360-degree excavator will first remove the top layer from the route along the roadside. It will be loaded onto a haulage truck. The material will be recycled. The excavation of trench will commence. A trained spotter will be used to assist machine operators while reversing or when their visibility becomes restricted.
- Trench to be dug to agreed drawing specifications. All plant and stored material will be kept a safe distance back from the trench edges.
- No open trench will be left unattended. Pedestrian barriers will be erected to prevent unintentional entry occurring by the open trench. Cones and/or barriers will be used on rural roads to maintain a safety zone in proximity to the trench.
- Safe ladder access/egress to trenches will be provided into the trench.
- Ducts will be placed into trench manually, having been delivered to the roadside embankment/verge areas by tractor and pipe trailer and then offloaded by hand.
- Approved bedding material will be used to surround the ducts and delivered straight from a concrete truck.
- Approved fill material will be compacted at the base, again above the power cable ducting as per the engineer's design.
- Warning tape and plates will be installed by hand in accordance with the trench design and Eirgrid specifications.



- Backfill materials will be delivered to the site in tipper trucks and offloaded at agreed designated set down areas where it will be either loaded into site dumpers or a stoning cart then brought to the trench area that requires being backfilled. Main material deliveries such as ducting and pre-cast joint bay sections will be to the temporary site compound and moved to the work area as required.
- Backfill materials will be compacted using suitable compaction equipment to prevent future settlement as per NRA Specification for Roadworks Series 600 Earthworks, 2013.
- Hand digging will be used when within 500mm of any known existing services.
- Trenches where ducts are laid will be back filled every evening. During excavation works signage will be erected local to the works warning of the dangers. Traffic safety barriers will also be erected along the works area.
- Exposed duct ends will be capped.
- Spoil will be disposed of at a licenced facility
- Unauthorised access will be monitored and prevented.
- A 12mm draw rope will be blown through the ducting at a later date.
- The trench and the working strip will be reinstated to the satisfaction of the local authority and TII standards for public roads.
- Where the trench strip passes through agricultural land, the surface will be reinstated to the area's preexisting condition.

Typical trench details for the grid connection cable are shown on planning drawing P2114-0300-0014.

# Installation of Joint Bays and Link Box Chambers

- Setting out and location of services will be carried out in the same manner as for trench excavations.
- Traffic management to be set up as per the construction stage traffic management plan.
- A tracked excavator will be used for the excavation of the joint bay pits in accordance with detailed design drawings.
- A Tractor/dump trailer and/or tipper truck shall be used to remove excavated spoil from the work area. Spoil shall be removed to a licensed waste facility.
- A watchman will be used to assist machine operators while reversing or when their visibility is restricted.
- Where joint bays are located, the excavation shall be adequately protected with fencing with signage erected, warning of deep excavation.
- Safe ladder access/egress to excavation shall be in place. The ladder will be footed at the base and tied at the top.
- Base materials will be placed by the excavator from a truck and placed in the base of the excavation.
- Precast chamber sections will arrive on site via articulated lorries accompanied by a crane truck. The crane truck will load each unit separately from the articulated truck.
- The precast units will be transported to site and a flatbed trailer and a truck mounted crane will lift the section into position.
- A lift plan /DJSP will be required for all Joint Bay installations.
- When the joint bays are in place, the sections will be back filled using approved fill material. The road surface will be reinstated using cold tar/surface dressing.
- Unauthorised access will be monitored and prevented.



Typical details for Joint Bays and Link Box Chambers are shown on planning drawings P2114-0300-0011, P2114-0300-0012 and P2114-0300-0013.



Figure 3-15: Typical Installation and Temporary Reinstatement of Joint Bay

### Watercourse Crossings

Methodologies associated with watercourse crossings along the proposed grid connection route are detailed in Section 3.3.1.9.

# Temporary Reinstatement of Excavations

- 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 required on busier roads, 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 3-16: Towable Sprayer for Temporary Reinstatement

# 3.4 Construction Working Hours

The hours of construction activity will be limited to avoid unsociable hours where possible. Construction operations shall generally be restricted to between 07:00 - 19:00 hours Monday to Friday and 07:00 - 13:00 hours on Saturdays.

It should be noted that it will be necessary to commence turbine base concrete pours earlier due to time constraints incurred by the concrete curing process. Foundation pours will likely extend beyond normal working hours also. Turbine component deliveries will be caried out at night. Consultation will be carried out with the local community in advance of out of hours working. Additional emergency works may also be required outside of normal working hours as quoted above which will be notified to the planning authority. Work on Sundays or public holidays will only be conducted in exceptional circumstances and subject to prior consultation and notification insofar as possible with the local community.



r NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. EN 0001220 © Government of Ireland

# 4. ENVIRONMENTAL MANAGEMENT PLAN

# 4.1 Introduction

This plan should be read in conjunction with the EIAR.

This Environmental Management Plan (EMP) defines the work practices, environmental management procedures and management responsibilities relating to the construction of the proposed Ballinagree Wind Farm.

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. 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 environmental management system to ensure that environmental requirements for the construction of this project are met.

All site personnel will be required to be familiar with the environmental management plan'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.
- 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 the EMP and its contents.

This section includes the mitigation measures to be employed by the contractor and client during the construction, operation and decommissioning of the proposed project as per the EIAR and NIS.

# 4.2 Project Obligations

In the construction of the proposed Ballinagree Wind Farm 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. The final CEMP which will be produced by the main contractor following appointment will incorporate these obligations. The contractor and all of its sub-contractors will be fully aware of and in compliance with these environmental obligations.

# 4.2.1 <u>EIA/NIS Obligations</u>

The EIAR and NIS identified mitigation measures that will be put in place to mitigate the potential environmental impacts arising from construction of the project. Measures identified in the EIAR and NIS are detailed in this CEMP and listed in the Schedule of Mitigation Measures in Appendix 3.2 of the EIAR. 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 and NIS shall take precedence.



# 4.2.2 <u>Planning Permission Obligations</u>

All planning conditions associated with the project's planning permission shall be adhered to. All precommencement planning conditions shall be discharged fully by the project owner prior to site start.

### 4.2.3 <u>Felling Licence</u>

Felling of coniferous forestry is required within and around the wind farm infrastructure to accommodate the construction of some turbine foundations, hard stands, crane pads, access tracks and substation. 10 no. turbines are located within forestry and consequently tree felling will be required as part of the project.

The estimated maximum area of coniferous tree felling required is ca. 88ha, which will be subject to license approval from the Forest Service prior to construction.

Tree felling will be the subject of a Felling Licence from the Forest Service and will be in accordance with the conditions of such a licence. A Felling Licence will be in place prior to any felling works commencing on site. To ensure a tree clearance method that reduces the potential for sediment and nutrient runoff, the construction methodology will follow the specifications set out in the Forest Service Forestry and Water Quality Guidelines (2000) and Forest Harvesting and Environmental Guidelines (2000).

Before any harvesting works commence on site all personnel, particularly machine operators, will be made aware of the following and will have copies of relevant documentation, including:

- The felling plan, surface water management, construction management, emergency plans and any contingency plans;
- Environmental issues relating to the site;
- The outer perimeter of all buffer and exclusion zones;
- All health & safety issues relating to the site.

# 4.2.4 Other Obligations

The developer and/or contractor for the main construction works will liaise directly with the County Council and An Garda Síochána in relation to securing any necessary permits to allow the works to take place including for example (non-exhaustive list):

- 1. Commencement notice
- 2. Special Permits in relation to oversized vehicles on public roads
- 3. Temporary Road Closures (if required)
- 4. Road Opening Licence.

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 traffic management plan is included in section 4.3.8.



### 4.3 Environmental Management Programme

#### 4.3.1 <u>Air Quality</u>

Construction stage mitigation measures to minimise dust and emissions are 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.

### 4.3.1.1 Dust Management Plan

#### Introduction

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.

#### 4.3.1.1.1 Dust generation and control

#### 4.3.1.1.1.1 Dust generation

The proposed works associated with the proposed project that have the potential to cause dust include:

- Site clearance activities including felling of forestry
- Soil excavations
- Movement of dump trucks containing soils/subsoils within the site
- Stockpiling of soils.

#### 4.3.1.1.1.2 Dust control

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 project 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 site 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.

### 4.3.2 Noise and Vibration

The predicted noise levels from on-site activity from the proposed project 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 project.

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. 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.

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.

All vehicles and mechanical plant will be fitted with effective exhaust silencers. Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use.

The hours of construction activity will be as described in section 3.4.



The on-site construction noise levels will be below the relevant noise limit of 65 dB L<sub>Aeq,1hr</sub> 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. typically 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.

# 4.3.3 Biodiversity / Flora and Fauna Management

# Objectives

The primary objectives of biodiversity / flora and fauna management over the construction, operation and decommissioning phases of the project 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 wind farm site by birds post construction;
- Monitor for any collision by birds at the wind farm site post construction;
- Monitor for any collision by bats at the wind farm site post construction.

For mitigation measures associated with the protection of terrestrial ecology please refer to Appendix 3.2 of the EIAR – Schedule of Mitigation Measures.

For mitigation measures associated with the protection of aquatic ecology please refer to Appendix 3.2 of the EIAR – Schedule of Mitigation Measures.

In addition to the above mitigation measures from the EIAR, the mitigation measures from the Natura Impact Statement (NIS) carried out for the project shall also be adopted. For mitigation measures associated with the NIS please refer to Appendix 3.2 of the EIAR – Schedule of Mitigation Measures.

# 4.3.4 Soil Management Plan

All excavated material will be re-used within the site where possible, minimising the need for removal of any materials for off-site disposal. This will minimise the amount of construction traffic on local roads. This will in turn lead to the reduction of noise and dust associated with construction traffic.

There are 3 no. proposed borrow pits within the site that will provide general fill for construction. Where aggregate (structural fill) of a suitable quality required for construction cannot be sourced from the onsite borrow pits it shall be imported from a licensed quarry.



### Daily Preparation during the Implementation of the Soil Management Plan

The Geotechnical Engineer appointed by the contractor should conduct regular meetings with the Construction Management Team to discuss the phasing of soil management as the work progresses.

Particular regard will be taken of daily weather conditions and long-range forecasts. The Geotechnical Engineer should have the authority to suspend the works if weather conditions are deemed too extreme for the effective protection of earthworks, excavations and slope stability.

### Construction Stage Mitigation Measures

### Earthworks

The project will be constructed in a phased manner within a 18-24 month period, as described in Chapter 3, to reduce the potential impacts of the project on the Land, Soils and Geology. 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 works.

One of the primary mitigation measures employed at the preliminary design stage was the avoidance 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 (bedrock) as general fill in the construction of access tracks, hardstands and in reinstatement around turbine foundations.
- Overburden will be re-used on site in the form of landscaping and for reinstatement purposes at the proposed borrow pit.

Overburden deposits excavated during the course of the works will be temporarily stored in a level area 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. No long-term stockpiles of material will remain after construction. No surplus/waste soil or rock will be removed from the proposed project site. Temporary stockpiles should 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 peatland/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 or rock, 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 and bedrock, refuelling of machinery and plant will only occur at designated refuelling areas.



Soil excavated from trenches along the proposed grid connection route will be taken to a licenced facility for disposal or recycling where required. If feasible, the upper layers of tarmac and asphalt will be excavated separately to the lower engineered fill layers. The tarmac/asphalt layers will be taken to a licenced facility for disposal or recycling.

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.

### Excavations in Peat for Turbine Bases, Hardstandings and Infrastructure Foundations

The works require that turbine bases are to be founded on competent founding strata which will require excavation through peat and mineral soil.

Similarly, crane hardstandings, construction compounds, substation platforms and met mast foundations are to be founded on competent mineral soil and/or rock which will also require excavation through peat and mineral soil. Excavations for the borrow pits will also require the removal of peat and non-peat mineral soil overlying the rock.

The following measures shall be implemented to minimise any adverse impact on peat stability.

- All excavations within peat are to 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 required.
- Excavations shall be kept reasonably free from water at all times. Water should be prevented from being impounded within excavations by either using drainage channels cut into the excavation face or by pumping.
- 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.

# Measures for spills

- Fuels, lubricants and hydraulic fluids for equipment used on the construction site will be carefully handled to avoid spillage.
- Any spillage of fuels, lubricants or hydraulic oils will be immediately contained, and the contaminated soil removed from the site 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; and
- Appropriate spill control equipment, such as oil soakage pads, will be kept within the construction area and in each item of plant to deal with any accidental spillage.

A Surface Water Management Plan (SWMP) can be found in Appendix 10.2 of the EIAR which contains further details on requirements for spill management.



### Slope Stability

With regard to slope stability issues, detailed design and construction phase best practice will be implemented as follows:

- The works will be 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 excavations. Drains will divert surface water and groundwater away from excavations into the existing and proposed surface drainage network. Uncontrolled, direct and concentrated discharges of water onto the ground surface will not occur.
- Loading or stockpiling of materials on the surface of soft ground will not occur. 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. No stockpiling of material shall take place on steep slopes.
- 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. Temporary access tracks as described in section 3.3.1.7 will be used where this is not possible.
- An assessment of the stability at proposed infrastructure locations has been carried out as part of the EIAR based on worst case conditions. A further assessment will be undertaken at detailed design stage by a suitably qualified and experienced geotechnical engineer prior to the commencement of all excavations to confirm the findings of this assessment.
- 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. Careful attention will be given to the existing drainage.
- Earthworks will not be commenced when heavy or sustained rainfall is forecast. A rainfall gauge will be installed on site to provide a record of rainfall intensity. An inspection of site stability, excavations and drainage by the Geotechnical Engineer will be carried out on site regularly.
- An emergency plan is included Section 6 outlining 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.

### Borrow Pits

Three number locations have been identified as potential borrow pits. The peat depth within the development footprint of the borrow pits is less than 0.5m.

Upon removal of the rock and gravel from the borrow pits, it is proposed to reinstate the borrow pits using excavated peat and spoil. The excavated rock and gravel from the borrow pits will be used in the construction of the infrastructure elements (turbine bases, roads, etc.) at the wind farm. The contractor excavating the rock will be required to develop the borrow pits in a way which will allow the excavated peat and spoil to be placed safely. It is proposed to construct cells within the borrow pits for the placement of the excavated peat and spoil.



This is to allow for the safe placement and grading of the peat and spoil using dumper trucks and excavators. The text below provides design and construction guidelines for the borrow pits.

The borrow pits shall be constructed as follows:

- (1) The rock within the proposed borrow pit footprints will be removed by breaking based on ground investigation carried out at the proposed borrow pits.
- (2) It is proposed to construct the borrow pits so that the base of the borrow pits are below the level of the adjacent section of access road. As excavation progresses into the back edge of the borrow pits, the base of the borrow pits may be raised to suit local conditions. Localised deepening of the borrow pit floors may be required depending on extraction operations.
- (3) Depending on the depth and type of rock present in the borrow pits it may be possible to excavate the rock from the borrow pits whilst leaving in place upstands/segments of intact rock which will help to retain the placed peat and spoil. The upstands/segments of intact rock will essentially act as engineered rock buttresses within the borrow pits.
- (4) Slopes within the excavated rock formed around the perimeter of the borrow pits will be formed at stable inclinations to suit local in-situ rock conditions. Exposed sections of the rock slopes will be left with irregular faces and declivities to promote re-vegetation and provide a naturalistic appearance.
- (5) The stability of the rock faces within the borrow pits will be inspected by an experienced geotechnical engineer upon excavation to ensure stability during construction works and in the long term. This inspection will allow unfavourable rock conditions to be identified and suitable mitigation measures to be applied such as removal of loose rock.
- (6) Where it is not possible to leave upstands/segments of intact rock in place it may be necessary to construct rock buttresses founded on in-situ rock within the borrow pits. The rock buttresses should be constructed of rock fill from the borrow pit excavation. The founding stratum for each rock buttress should be inspected and approved by a competent person.
- (7) It may be necessary to construct the rock buttresses within the borrow pits in stages as infilling of peat and spoil behind the buttresses progress. The buttress should be constructed of selected rock fill and placed and compacted in suitable layers to form a buttress of sufficient stability to retain the placed peat and spoil, as necessary.
- (8) Infilling of the peat and spoil should commence at the back edge of the borrow pit and progress towards the borrow pit entrance/rock buttress. The contractor excavating the rock will be required to develop the borrow pits in a way which will allow the excavated peat and spoil to be reinstated safely.
- (9) A number of rock buttresses to form cells with the borrow pits may be required to ensure access for trucks and excavators can be achieved.
- (10) The rock buttresses should be wide enough to allow construction traffic access for tipping and grading during the placement of the excavated peat and spoil. The side slopes of the rock buttress should be constructed between 45 to 60 degrees.
- (11) The height of the rock buttresses constructed should be greater than the height of the reinstated peat and spoil to prevent any surface peat and spoil run-off. Buttresses up to 5m in height are likely to be required.
- (12) The use of temporary access ramps and long reach excavators during the placement of the excavated peat and spoil is likely to be required.
- (13) The surface of the placed peat and spoil will be shaped to allow efficient run-off of surface water from the placed arisings.



- (14) A layer of geogrid to strengthen the surface of the placed peat and spoil within the borrow pits may be required.
- (15) An interceptor drain will also be installed upslope of the borrow pit. This drain will divert any surface water away from the borrow pit and hence prevent water from ponding and lodging during construction and also when reinstated.
- (16) Control of groundwater within the borrow pits will be required and measures will be determined as part of the ground investigation programme. A temporary pump and suitable outfall locations will to be required during construction.
- (17) A settlement pond will be required at the lower side/outfall location of the borrow pits.
- (18) Where possible, the acrotelm shall be placed with the vegetation part of the sod facing the right way up to encourage growth of plants and vegetation at the surface of the peat and spoil within the borrow pits.
- (19) Supervision by a geotechnical engineer or appropriately competent person is recommended for the works.
- (20) All the above mentioned general guidelines and requirements will be confirmed by the designer prior to construction. A detailed construction methodology for the borrow pits should be compiled prior to construction.

# General Recommendations for Good Construction Practice

To minimise the risk of construction activity causing potential peat instability it is recommended that the Construction Method Statements (CMS) for the project will also take into account, but not be limited, to the general recommendations below, together with the specific recommendations above.

- (1) Avoidance of uncontrolled concentrated water discharge onto peat slopes identified as being unsuitable for such discharge. All water discharged from excavations during work shall be piped over areas specifically assessed as being unsuitable and hence directly into suitable drainage lines.
- (2) Avoidance of unstable excavations. All excavations shall 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, as appropriate, during construction in areas of possible poor ground, such as deeper peat deposits.
- (5) Site reporting procedures to ensure that working practices are suitable for the encountered ground conditions. Ground conditions to be regularly assessed by 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 wind farm site by Contractor to include an assessment of ground stability conditions (e.g. cracking, disrupted surface, closed-up drains) and drainage conditions (e.g. blocked drains, absence of water in previously flowing drains, springs, etc).



### 4.3.5 <u>Surface Water Management Plan</u>

A Surface Water Management Plan (SWMP) can be found in Appendix 10.2 of the EIAR. The Surface Water Management Plan (SWMP) should be read in conjunction with the EIAR and shall be finalised in accordance with this plan following the appointment of the contractor for the main construction works. It contains methodology for drainage, water quality management and silt control. The measures contained within the plan will be applied when working near water.

### 4.3.6 Archaeological Management Plan

#### Wind Farm Site

The extensive forestry plantations, including tree stumps and root systems within recently felled areas, within planted sections of the wind farm site will preclude advance archaeological site investigations such as geophysical survey and test trenching. A systematic advance programme of archaeological field-walking surveys will be undertaken within these areas following pre-construction tree felling to confirm that they do not contain any visible surface traces of potential unrecorded archaeological or architectural heritage sites. Archaeological monitoring of ground excavation works during the construction phase will then be carried out in these areas under license by the National Monument Service.

The turbines, hardstands and associated new access tracks located within improved green field areas will be subject to a pre-construction geophysical survey followed by targeted archaeological test trenching. This will include the investigation of a potential section of a relict field boundary noted in the interface between an area of marginal land and an improved section of pastureland located within the southern end of the T8 hardstand area. The programme of advance investigations will also include the completion of a boundary survey, to include a detailed photographic record, of the section of the drystone wall, which forms part of the Ballynagree East and Carrigagulla townland boundary, located within the northern end of the T5 hardstand.

The uneven and overgrown ground conditions within the upland open bog/heath areas in the northern end of the site are likely not suitable for pre-construction geophysical surveys. A pre-construction programme of linear archaeological test trenching will be carried out on the footprint of the three turbines (T13, 16 and 17) in these areas and along the routes of any associated new access tracks which will require ground excavation works during the construction phase.

A pre-construction archaeological wading and metal-detecting survey of proposed watercourse crossing points will be carried out under licence by the National Monuments Service.

#### Grid Connection

All ground works within undisturbed green field locations, including HDD areas, required as part of the grid connection will be subject to constant archaeological monitoring as will works within the environs of the Famine memorials at the crossroads in Killberrihert townland. An archaeological watching brief of other grid connection trench excavations within the public road will be carried out as part of the programme of licensed archaeological monitoring of the project and the extent of this supervision will be agreed in advance with the National Monuments Service as part of the license application process.

#### Turbine Delivery Route

The delivery of turbines to the wind farm site will require topsoil stripping within a green field area in the southern end of the Drishane Castle demesne lands in order to create a hardstand staging area. A pre-works geophysical survey followed by targeted archaeological test trenching will be carried out in advance of these ground works. Any ground works within other green field areas required to accommodate the turbine delivery route will be subject to archaeological monitoring.

CLIENT:	Ballinagree Wind DAC
PROJECT NAME:	Ballinagree Wind Farm, Cork - Construction and Environmental Management Plan (CEMP)
SECTION:	4 – Environmental Management Plan

### Mitigation measure for Wind Farm Site, Grid Connection and Turbine Delivery Route

In the event that any sub-surface archaeological features are identified they will be recorded and cordoned off while the National Monuments Service are consulted to determine further appropriate mitigation measures, which may include preservation *in situ* (by avoidance) or preservation by record (archaeological excavation).

### Monitoring of mitigation measures

There are a number of obligatory processes to be undertaken as part of archaeological license applications and these will allow for monitoring of the successful implementation of the archaeological mitigation measures. These include the submission of method statements detailing the proposed strategy for all site investigations will submitted for the approval of the National Monuments Service as part of the license application. These documents will clearly outline the proposed extent of works and outline the onsite and consultation processes to be enacted in the event that any unrecorded archaeological sites or features are identified. A report will be compiled on all site investigations to comply with the licensing process which will clearly present the results in written, drawn and photographic formats and copies will be submitted to Cork County Council, the National Monuments Service, the Planning Authority and the National Museum of Ireland.

### 4.3.7 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.

This Construction Waste Management Plan has been prepared for the proposed Ballinagree Wind Farm in line with the "Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects" (2006) as published by the Department of the Environment, Community and Local Government and supported by the Eastern-Midlands Region Waste Management Plan 2015-2021.

The Waste Management Plan shall 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.

### 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 that 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 project:

- municipal solid waste (MSW) from the office and canteen
- construction and demolition waste
- 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 project.

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 the construction compound:

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

The materials will be transported off-site by a licensed contractor to a proposed recovery centre and these materials will be processed through various recovery operations. A list of nearby licensed waste management facilities is shown in Table 4-1.



### Table 4-1: Nearby Waste Management Facilities

Facility	Type of wasted accepted
Kanturk Civic Amenity Site	Plastic, metals, oil, paper, cardboard, glass, electrical goods
Mallow Civic Amenity Centre	Plastic, metals, oil, paper, cardboard, glass, electrical goods, timber, green waste
Munster waste management	Domestic, commercial, industrial, agricultural
Codrum Recycle Centre	Plastic, metal, oil, paper, cardboard, glass, Electrical good

#### 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 project 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.



### 4.3.8 <u>Traffic Management Plan</u>

This document is the Construction Traffic Management Plan (TMP) for the proposed Ballinagree Wind Farm, Co. Cork. The Construction Traffic Management Plan shall be finalised in accordance with this plan following the appointment of the contractor for the main construction works and the turbine supply contract.

Some items in this plan can only be finalised with appropriate input from the contractor who will be appointed to carry out and schedule the works. Furthermore, it is appropriate that the Project Supervisor Construction Stage (PSCS), when appointed, should have an active role in the preparation/review of the Traffic Management Plan.

This plan should be read in conjunction with Chapter 13 of the EIAR.

The contractor is required to prepare the necessary Site-Specific Traffic Management Plans prior to the construction works commencing in accordance with Chapter 8 of the Traffic Signs Manual 2019 and subject to load permits.

The contractor will be responsible for the implementation of all agreements between the developer and the County Council and local residents with the objective that the transportation needs for the proposed project will have a minimal impact on the road network and local communities.

As with any construction development project, the transport of materials onto the site will give rise to increased traffic and associated impacts. However due to the very nature of construction these impacts will be temporary.

Construction traffic will require regular access to the site at varying times throughout the construction phase. The aim of this TMP is to put in place procedures to manage traffic effectively on site and in the immediate vicinity of the proposed project, to ensure the continued movement of traffic on the public roads and to minimise disturbance during transportation of materials particularly oversize loads. The correct implementation of this TMP will ensure that appropriate procedures are in place to minimise any effects on the safety and movement of the general public.

Prior to the commencement of construction, the TMP will be reviewed by the main contractor (and any subcontractors) and will be updated as necessary.

### General Traffic Management Measures

General measures that shall be addressed in the TMP shall include:

**Traffic Management Co-Ordinator** – A dedicated Traffic Management Coordinator will be appointed for the duration of the project and this person will be the main point of contact for all matters relating to traffic management on the project.

**Roads and Routes**: The final TMP will clearly identify roads that will be used to access the project site and roads that are not to be used. Turbine component and quarry material deliveries shall use the N72, R583 and L2750/L1123 Butter Road as the primary haul route..

**One-way Systems**: as some of the local roads are relatively narrow, the roads authority may want to introduce a system of one-way construction traffic movements during the construction of the development. Any such one-way systems will be identified in the construction stage TMP in agreement with the roads authority.



**Road Condition Survey**: a pre-condition survey will be carried out on all public roads that will be used in connection with the development to record the condition of the public roads in advance of construction commencing. A post-construction survey will also be carried out after the works are completed. The specification and timing of the surveys will be agreed with the roads authority. Joint surveys shall be completed if the roads authority requests. Local sections of the TDR will be upgraded prior to construction starting.

**Road Reinstatement**: All roads will be reinstated expeditiously on completion of the construction works. Roads will be reinstated to their pre-works condition or better and to the satisfaction of the roads authority.

**Site Inductions**: All workers will receive a comprehensive site induction which will include a section on traffic management and clear guidance on the routes to be used/not used to access the site.

**24-Hour Emergency Contact**: a 24-hour emergency phone number will be maintained for the duration of the construction works and the number will be noted on temporary signage at each works area (for grid connection) and the site entrance for the wind farm site.

**Traffic Management Guidance**: all necessary temporary traffic management will be planned and executed in accordance with best practice, including Chapter 8 of the Traffic Signs Manual published by the Department of Transport in 2019.

**Community Liaison**: A project website will be in place for the duration of the project's construction phase which will include regular project programme status updates, contact details, facilities for community feedback/observations as well as a complaints procedure. A community liaison will be appointed by the contractor in advance of the commencement of the construction phase who will have responsibility for consulting with members of the public and act as a first point of contact for the project management team. Letter drops will be carried out to notify members of the public living near the proposed site and cable route to advise them of any particular upcoming traffic related matters e.g. temporary lane/road closure or delivery of turbine components.

**Signage**: Clear signage relating to the development, both temporary and permanent, will be provided for accessing the site.

**Road Sweeping**: Appropriate steps will be taken to prevent soil/dirt generated during the works from being transported on the public road. When, if necessary, a road sweeper will be used to maintain the public roads in a clean condition during the construction activities of the project.

**Site Entrances**: The entrances to the site will be secured when the site is not in use. When necessary, a flagman will be used to assist traffic movements at the site entrance or in other areas as required. For example, during turbine blade and tower deliveries.

**Temporary Road Crossing Point**: Site entrances from and to the wind farm and borrow pits will be secured and locked when not in use. Where required, the entrances will be controlled by flagmen to assist traffic movements. The proposed crossing point will be managed appropriately to allow the safe passage of construction vehicles in, out and across the public road Priority will be maintained for public traffic. A concrete apron will be provided on both sides of the crossing point during the construction phase, constructed 40mm below road level and overlaid with surface course material. This road is a very quiet public road with extremely low traffic volumes.

**Abnormal Load Deliveries:** Abnormal loads will require an abnormal load permit prior to delivery and will be delivered mostly at night time as agreed with local authority and An Garda Siochána.

Measures contained within the construction stage CEMP and TMP shall be discussed with Coillte forestry operators in advance of the works to ensure no conflicts occur with ongoing forestry activities.



Mitigation measures proposed for the grid connection works include:

**Road Opening Licence**: The road works associated with the grid connection cabling will be completed in line with the requirements of a road opening license as agreed with the local authority.

**Route Proofing**: In advance of the main grid connection works an assessment will be carried out to define the precise alignment of the cable route within the corridor which has been assessed.

This will include slit trenching with the aim of minimising the construction impacts and avoiding existing services in the road.

**Maintaining Local Access**: reasonable access to local houses, farms and businesses will be maintained at all times during any road closures associated with the grid connection works. The details of this will be agreed with the roads authority in advance of the grid connection works commencing.

**Road Cleanliness**: Appropriate steps will be taken to prevent soil/dirt generated during the works from being transported on the public road. Road sweeping vehicles will be used when necessary, to ensure that the public road network remains clean.

**Temporary Trench Reinstatement**: Trenches on public roads, once backfilled, will be temporarily reinstated to the satisfaction of the roads authority.

**Surface Overlay after Trench Reinstatement**: following temporary reinstatement of trenches on public roads, sections of the public roads will receive a full surface overlay. Details to be agreed with the roads authority At a minimum they will be reinstated to their pre-works condition or better and to the satisfaction of the roads authority.

### Construction Plant and Vehicles

The typical construction plant and vehicles used as part of the construction of a wind farm are as follows (non-exhaustive):

- Hydraulic Excavators
- Dump Trucks
- General construction delivery vehicles (e.g. steel reinforcement bar, electrical components etc.)
- Concrete trucks and pumps
- Cranes of various lifting capacities (up to 1000 tonnes)
- Oversized articulated delivery vehicles (for turbine component transport)
- Site Jeeps (off-road 4x4 all purpose vehicles)
- Private vehicles of those employed on site for the construction phase.

It should be noted however that final selection of construction plant and vehicles may vary depending on suitability, availability, contractor's choice, etc.

Plant operators will be responsible for the upkeep and maintenance of construction plant and vehicles, ensuring good working order prior to use. Should emergency maintenance need to be carried out on site, this will be carried out at a designated area away from sensitive receptors and will ensure that a spill kit is nearby.



Construction commencement dates are yet to be confirmed at this stage; these will be made known to the Planning Authority by way of formal Commencement Notice.

#### Construction Compound

The locations of the construction compounds are shown on the site layout, Figure 1-2.

### Consultation and Notification

#### An Garda Síochána

The Transport Management Plan shall be finalised following the appointment of the contractor for the main construction works.

The contractor will liaise directly with An Garda Síochána in relation to the plan. Any concerns/requirements they have will be incorporated in to the plan. This may include details in relation to the escorting of oversized loads.

The necessary permits (including approved route permits) will be applied for and obtained from An Garda Síochána.

#### Cork County Council

The contractor will liaise directly with the County Council in relation to the plan. Any concerns/requirements they have will be incorporated into the plan. The contractor will also liaise with Limerick County Council, as necessary, along the final turbine delivery route.

The necessary permits (including standard permits) will be applied for and obtained from the relevant local authorities.

#### Local Residents

The following measures will be used to communicate the necessary information to the households along the local road to be used as a haul road:

- Information signs will be erected in advance of the construction/transportation works.
- A flyer drop will be carried out to advise households along the local road leading to the site in relation to the programme of construction works and especially in relation to oversized load movements.
- Residents will be consulted with regarding the development of plans for the project.
- Contact details for a Liaison Officer will be provided so that any concerns can raised, logged and be easily channelled to the Developer to be dealt with.
- A project website will be in place for the duration of the project's construction phase which will include regular project programme status updates, contact details, facilities for community feedback/observations as well as a complaints procedure.



Complaints will be entered into the site complaints log and the relevant site environmental officer will arrange to meet with those affected. The situation will be acted upon immediately and reviewed by the Project Manager.

### Key Personnel and Responsibility

Once prepared and agreed with the local County Council and An Garda Síochána the contractor will implement the project specific Traffic Management Plan (TMP).

Please note that some items in this plan can only be finalised with appropriate input from the contractor who will carry out and schedule the works. Furthermore, it is appropriate that the Project Supervisor Construction Stage (PSCS), when appointed, should have an active role in the preparation/review of the Traffic Management Plan.

Typically, the following members of the contractors' staff will have responsibility for adherence to the TMP as follows:

Traffic Management Coordinat	<b>:or</b> The Traffic Management Coordinator will be responsible for maintaining regular contact with An Garda Síochána, The local County Council, the statutory bodies and the client concerning traffic control, interference with services and co-ordination of crossings at roads, rivers and railways.
	The Transport Officer will contact the relevant bodies in relation to develop method statements prior to the work taking place. The Transport Officer will be responsible for instructing the Construction Manager, Foreman and all other personnel on the information in the agreed method statement prior to the work commencing and ensuring that the method statement is adhered to.
	The Transport Officer will be responsible for ensuring that the Traffic Management Plan will be implemented in full.
Safety Officer	The Safety Officer will be responsible for implementing all safety requirements detailed in the Project Safety Plan. Ensure that all operatives receive site safety induction prior to commencing work on site. They will ensure that all plant, particularly lifting equipment, on site has the relevant certification and are checked regularly by a competent person. The Safety Officer will carry out safety audits and checks on a regular basis and amend procedures where necessary.
Construction Manager	The Construction Manager will be responsible for overall supervision of the operations to ensure they are constructed in a safe and efficient manner. He will ensure that sufficient resources are available to meet the programme and that the necessary information is provided to the appropriate staff.
Foreman	The Foreman is responsible for ensuring that the crew carry out the work in accordance with the method statement and contract specifications and drawings using good working practices in a safe manner. He will supervise construction personnel ensuring their competence. He will check all plant and equipment on a regular basis ensuring it is maintained and in good working order.



# Wind Turbine Generator Deliveries

A detailed turbine delivery route assessment has been carried out for the project which can be found in Appendix 13.2 of the EIAR.

The components of 20 no. wind turbines will be transported by road to the Wind Farm Site for on-site assembly, using the access route outlined in the Turbine Delivery Route Assessment Report.

Wind turbine component deliveries, cranes and all large plant associated with turbine installations will use the turbine delivery route.

The impact of the deliveries on traffic is mitigated by delivering components during off-peak or night-time deliveries.

Mitigation measures proposed for the turbine delivery route also include:

**Programme of Deliveries**: a programme of deliveries will be submitted to the roads authority in advance of deliveries of turbine components to the site. The programme will include details of the dates and times of each component delivery along with the route to be taken.

Turbine component deliveries will be carried out during off-peak times and will be done using a convoy and a specialist heavy haulage company.

**Garda Escort**: Turbine deliveries will be escorted by An Garda Siochána. This will ensure the impacts of the turbine deliveries on the existing road network are minimised.

**Reinstatement**: Any area affected by the works to facilitate turbine delivery will be fully reinstated to its original condition.

**Consultation**: Consultation with the local residents and Cork County Council will be carried out in advance to manage turbine component deliveries.

The location of temporary accommodation works associated with turbine deliveries are shown in Figure 1-3. Swept path analysis drawings showing turbine component manoeuvres can be found in the Route Survey Report for the Turbine Delivery Route carried out by Pell Frischmann, October 2020 in Appendix 13.2 of the EIAR.

All turbine blades will be carried on a highly manoeuvrable superwing carrier to reduce the need for mitigation in constrained sections of the route.

It is proposed that the blade will be transferred to a Goldhofer blade lifting trailer at the temporary staging area at Drishane Castle, near Millstreet to the proposed wind farm site. This trailer has the ability to lift blades up to a maximum angle of 60 degrees, lifting blades over potential constraints and shortening the vehicle length.

The staging area shall consist of a hard standing off the public road at which turbine blades shall be transferred from the superwing carriers to the blade lifting trailers. The location of the Drishane Castle staging area is shown on Figure 3-17. The general arrangement of the temporary staging area is shown on planning drawings.

Two temporary access points to the staging area will be created from the public road at existing road junctions. These shall be controlled entrances and only used by turbine delivery vehicles, cranes and support vehicles associated with the delivery of turbine components.



Vehicles shall enter the eastern end of the staging area at an access point located at the junction between the R583 and L1116 where a break in the existing wall and hedgerow will facilitate the proposed temporary access and exit from the western end of the hard standing, making use of an existing junction between the R583 and L95831-1. The staging area will be fenced off from the public and closed when not in use and shall only be used when required during the delivery of wind turbine components in accordance with timings identified in the construction stage traffic management plan (TMP).

All overhead utilities and obstructions shall be removed at any locations that the blades are raised on the blade lifting trailer. The removal of overhead utilities will be either temporary disconnections or permanent rerouting. Such works will be carried out by the utility providers in advance of turbine delivery to site.

Any trenching and road reinstatement works associated with utility diversions will be subject to a road opening license and can be carried out in such a way as to ensure one lane of traffic will be open at all times. Such works will be carried out over a number of days.

However, if the permanent re-routing of overhead utilities is not possible, temporary disconnections of overhead lines will be required on several occasions to facilitate the delivery of turbine blades and will be carried out during the delivery of the components. Advance disconnection works will be required before the first turbine deliveries.

The schedule of turbine component deliveries will be determined by the turbine supplier. Temporary disconnections will be carried out during off peak times to facilitate convoys, with a duration of several hours between disconnection and re-connection of services on each occasion.

Towers will be carried in a 4+7 clamp adaptor style trailer, whereas loads such as the hub, nacelle housing and drive train will be carried on a six-axle step frame trailer.

The main street of Millstreet will not be used as part of the TDR with the exception of the delivery of wind turbine tower base sections to the wind farm site, which will need to approach the junction between the R583 and L1123 from the west to avoid impacting third party property.

Tower sections shall be carried by clamp trailer to a designated transfer area at Claratlea, west of Millstreet as identified in Figure 4-1 below. The tower sections will be lowered to the ground resting on timber sleepers or bog mats and the clamp trailers uncoupled. All works shall take place within the public road carriageway. The unloaded vehicles shall then turn at an existing Coillte Forestry Access at Rathduane identified in the Figure 4-2 below and return to collect the tower sections at Claratlea. The loads shall then travel east along the R583 and turn right onto the L1123 towards the wind farm site.

The manoeuvre will take place at night and can be carried out for up to 3no. turbine base tower sections in convoy. It is expected that the manoeuvre can be carried out in approximately hour per convoy and will be required to take place on up to 7no. separate occasions over a period of several months with the possibility of reducing the number of occasions if several convoys are transported together. The manoeuvre shall be carried out in accordance with a traffic management plan and under Garda escort.



Figure 4-1: Tower Lay Down and Pick Up Locations

### Restricted Public Road Use by Construction Traffic

The local authority may impose restrictions on the use of some local roads. These will be agreed in liaison with Cork County Council prior to construction, as well as specific signage requirements for construction works.

Some of the existing local roads are narrow, and to this effect, one-way delivery and access route systems may be employed to mitigate against unsuitable two-way construction traffic.

Using local roads is unavoidable, however, introducing a one-way system where necessary and restricting construction traffic access to a small number of roads will minimise disruption to the local community.

Materials will be delivered to site via the indicative haul routes shown in Figure 3-17.

### Road Closures, Diversions and Safety Measures for Road Crossings

It is envisaged that road closures will be necessary for the carrying out portions of the cable trenching, with the majority of the proposed cable trenching taking place on existing local roads. The consent of Cork County Council will be required and the necessary road diversions together with the appropriate signage will be put in place. As there is a good network of local roads, it is anticipated that there are a number of options available for diverting traffic which will allow flexibility during this process of construction and maintain local access at all times during this element of the works.

It is proposed to maintain local access at all times during this element of the works. It is proposed that all access points (domestic, business, farm) are considered when finalising the temporary road closures and diversions. Diversion signage will also be included.

Safety measures for road users adjacent to deep excavations, such as temporary concrete barriers will be detailed for Trenchless Road Crossings in advance of construction and agreed with Cork County Council.



Figure 4-2 details proposed road works locations and diversions associated with the grid connection works.

Temporary signage and traffic management for works in rural single carriageway roads in accordance with Chapter 8 of the Traffic Signs Manual is shown in Figure 4-3 and Figure 4-4..


Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS 1 Mapping Reproduced Under Licence from the Ordnance Survey Ireland Licence No. EN 0001220 © Govern





Figure 4-3: S

Stop and Go Traffic Control Signage for Single Carriageway Rural Road



Figure 4-4: Temporary Traffic Signals Control for Works in Single Carriageway Rural Roads

3 no. borrow pits have been identified to provide site-won aggregate material for the construction of the wind farm roads and hard standings. The locations of the borrow pits are shown on Figure 1-2. As described in Chapter 13 of the EIAR, a public road crossing using existing Coillte forestry access points shall be used to facilitate the transport of aggregates from the two borrow pits located in the west of the site to the southern part of the wind farm site using Access Points 4 and 5.

A controlled crossing shall be implemented between Access Points 4 and 5 to facilitate the movement of HGVs across the public road to the wind farm site. The public road at this location experiences very low traffic volumes (AADT = 17 recorded in April 2021). It is also commonly used by walkers and cyclists due to its proximity to the Duhallow Way and would likely experience increased traffic during summer months from visitors to the area.

Access points will be secured and locked when not in use. The proposed crossing point will be managed appropriately to allow the safe passage of construction vehicles in, out and across the public road. Priority will be maintained for public traffic.

The crossing point/site access points should be highlighted to vulnerable road users. Exiting site traffic will be made aware of the possible presence of vulnerable road users.



Stop and Go discs will be used to control the crossing point See Figure 4-5for acceptable type in accordance with Chapter 8 of the Traffic Signs Manual. If it is required to stop both streams of traffic at the one time, then a disc displaying Stop on both sides shall be used.





At the site crossing point, a single operator may be used to control the traffic using a double-sided Stop disc. The operator, stops both flows of traffic to allow the construction vehicle to cross the public road and then leaves the carriageway and signals to the traffic to proceed.

A concrete apron will be provided on both sides of the crossing point during the construction phase, constructed 40mm below road level and overlaid with surface course material.

#### Road Cleaning

Public roads shall be kept free of mud, dust, spillages and debris from the construction site, construction plant or haulage vehicles. Any necessary measures shall be put in place at the site entry/exit points.

#### Carriageway/ Road Reinstatement

It is anticipated that the proposed haul routes will be capable of accommodating the construction traffic associated with the project. In the event that there are concerns around the structural capacity of a road on a proposed haul route, a structural survey shall be carried out to determine suitability of the existing roads to carry the loading. Where the structural survey indicates that a proposed haul route is not in a suitable condition, details of any upgrading works required shall be submitted to Cork County Council for approval. The developer shall upgrade the road or junction in advance of haulage operations.

A pre-condition survey of haul routes, consisting of a video survey and photographs shall be carried out and a copy submitted to Cork County Council.



Any damage caused to the road shall be repaired to its previous condition, to the satisfaction of Cork County Council. Any defects that appear during the haulage period shall be rectified by the project owner.

#### Traffic Management Measures for Potential Cumulative Impacts

The following existing and proposed developments have been identified as having the potential to create cumulative negative effects on the existing road network. Should activities associated with these developments coincide with the construction of Ballinagree Wind Farm, the Contractor should advise the local authority of these developments as part of the finalisation of the construction stage TMP so that they can be considered.

#### **Existing and Proposed Projects Assessed for Cumulative Impacts Table 4-2:**

Project	Existing/Permitted	Reason for Assessment				
Existing forestry activities on the site and the surrounding forest blocks	Existing	Proximity to proposed wind farm site and sharing of haul routes.				
Solar Farm at Carragraigue, Inchamay North and Crinnaloo South Co. Cork (Planning refs 165455, 186562)	arm at Carragraigue, North and Crinnaloo D. Cork (Planning refs 186562)					
Extension to Substation to include Battery Storage at Bawnmore Wind Farm (Planning ref 185240)	Permitted	Type of development (which will give rise to construction traffic) Type of development and proximity to grid connection route.				
Knockglass Solar Farm (Planning ref 155424)	Permitted	Type of development (which will give rise to construction traffic) and proximity to grid connection route.				
Battery Storage Facility at Caherdowney, Millstreet, Co. Cork Permitted (Planning ref 185686)		Type of development (which will give rise to construction traffic) and proximity to wind farm site and TDR.				
olar Farm at Cloghmacow, Crookstown, Co. Cork (Planning Permitted ef 196847)		Type of development (which will give rise to construction traffic) and proximity to grid connection route.				
Solar Farm at Berrings, Co. Cork (Planning ref 187280)	Permitted	Type of development (which will give rise to construction traffic) and proximity to grid connection route.				
Solar Farm at Currabeha, Crookstown, Co. Cork (Planning ref 164783)	Permitted	Type of development (which will give rise to construction traffic) and proximity to grid connection route.				



#### 4.4 Environmental Management Team - Structure and Responsibility

A preliminary organisation chart is included in Figure 4-6. Revisions to the project organisation chart shall be controlled independently of this plan following the appointment of the Contractor for the main construction works.

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 4-6: 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 should be tailored to the scope of their work on site.

The contractor for the main construction works may decide to 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 project. The environmental performance at the site is on the agenda of the monthly project management meetings for the project.

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 should be appropriate to the project, 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.

#### 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 are required to be set to ensure that the project 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 project 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 should be controlled by the contractor.

The EMS and all its components must 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 must 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 project (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 are to be available for inspection in the site office. The documentation shall be to date and shall 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 Ballinagree Wind Farm and shall be read in conjunction with the Preliminary Safety & Health Plan prepared for the project by the Project Supervisor for the Design Process. The Safety and Health Management Plan for the construction stage shall 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 statement and natura impact statement mitigation measures and planning conditions. It is the contractor's responsibility to implement an effective safety management system to ensure that the developer's safety requirements for the construction of this project 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 Ballinagree Wind Farm the 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 and in the planning conditions for the proposed wind farm. 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 EIA Obligations

EIAR obligations are described in Section 4.2.1.

#### 5.2.2 Planning Permission Obligations

Planning permission obligations will be fully outlined in the Contractor's CEMP.



#### 5.2.3 <u>Statutory Obligations</u>

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 must:

- 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 project
- 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 any project 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 the project 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 proposed wind farm. This plan will be developed further at the construction stage, on the appointment of the Contractor for the main construction works.

#### 5.2.4 <u>The Management of Health and Safety during the Design Process</u>

Fehily Timoney & Company (FT) has been appointed Project Supervisor for the Design Process (to prepare the Environmental Impact Assessment Report and planning application for the proposed Ballinagree Wind Farm development). FT is competent to fulfil this role in accordance with the Safety, Health and Welfare at Work (Construction) Regulations, 2013. Health and safety are a major priority for FT and FT adopts health and safety practices that are an inherent part of a safe and sustainable business. FT's objective is to provide a safe and healthy work environment for all and to meet our duties to clients, contractors and members of the public.

It is FT's policy to comply fully with all health and safety legislation, in particular the Safety, Health and Welfare at Work Act, 2005, Safety, Health and Welfare at Work (General Application) Regulations 2007, and the Safety, Health and Welfare at Work (Construction) Regulations 2013.

FT has developed in-house procedures to ensure, so far as is reasonably practicable, that all projects:

- are designed to be capable of being constructed to be safe/ without risk to health;
- can be operated and maintained safely and without risk to health during use; and
- comply in all respects, as appropriate, with the relevant statutory enactments and instruments.

These procedures include effective risk management procedures involving the identification and evaluation of risks and the development of mitigation measures to eliminate (where possible) or reduce those risks during the life-cycle of the project. The FT team is committed to health and safety and shares responsibility for managing risk at all stages of a project.

All work by FT is undertaken in a competent and efficient manner taking account of the general principles of prevention to safeguard the safety, health and welfare of construction & maintenance workers and other third parties.

The FT procedures for the management of safety during the design process are outlined in the in-house procedure PP09 "Health and Safety Requirements in Design Projects" and is adhered to on all design projects.

The purpose of this procedure is to define the requirements for the management of health & safety during design projects, to ensure compliance with The Safety, Health and Welfare at Work (Construction) Regulations 2013 (as amended).

The procedure includes standard forms which are used to communicate health and safety considerations within the design team and also guidelines which develop the company's health and safety procedure and outline the company's responsibilities for health and safety during the design process.

The procedure addresses health and safety issues at all stages of a project, from the preliminary design through to commissioning and operation. By establishing a chain of responsibility each party is clear on their role and obligations from a health and safety perspective.



Risk assessments are carried out, at preliminary and detailed design stages by every discipline involved in the design. Each risk assessment is prepared by the designers and reviewed by the Health and Safety Facilitator for the project.

Risk assessments are used to identify hazards and assess risk at all stages during the life of the project including the construction & maintenance stages.

A Health and Safety Facilitator for the Design Process (HSF) is appointed on all projects where FT are the Project Supervisor for the Design Process (PSDP).

Health & Safety Facilitators are selected from the senior ranks of FT design staff to ensure they have the required knowledge, experience and training to carry out the role.

Meetings will be held between the HSF and relevant design personnel to collate all the risk assessments and other pertinent information and to discuss any issues relating to health and safety and ensure the constructability of the designs. The minutes of these meetings are circulated to the entire design team complete with actions allocated to the designers as appropriate. At such a meeting a "Construction Risk Analysis" form is completed which forms the basis for the Preliminary Safety & Health Plan. This document outlines the particular, significant and residual risks and in addition specific construction methods or sequences assumed during the design. Special requirements for maintenance envisaged at design stage are also included.

A Designers Safety File shall be kept and maintained during the design. All design criteria adopted, and safety & health information required for the Safety File shall be kept in this file which is maintained by the HSF and is the pre-cursor to the Safety File. The information required from the Contractor/ PSCS for inclusion in the Safety File is specified at tender stage in the Preliminary Safety and Health Plan.

This information from the PSCS & Contractor(s) and the Designers Safety File is used to compile the Safety File in the latter stages of a contract and formally issued to the Client on completion of the contract.

FT promotes a collaborative approach to health and safety on site where the Client, PSDP, Designers, Contractors and PSCS co-operate with each other and share information. Joint site safety audits and/or walk-downs are carried out as part of this collaboration and safety is monitored and addressed on site on an ongoing basis. The regular safety meetings are held to document this ongoing co-operation, get an over-view of works currently in hand onsite and about to commence and share information.

#### 5.2.5 <u>The Preliminary Safety and Health Plan</u>

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 development.

The safety and health plan is required to include the following information:

- a general description of the project;
- details of other work activities taking place on site;
- works involving particular risks;
- the timescale for the project 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 Ballinagree Wind Farm development should 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 Project
  - 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 Puts 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 in a Caisson with a Compressed Air Atmosphere
  - 4.9 Work Involving the Use of Explosives
  - 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

#### 5.2.6 <u>The Management of Health and Safety during the Construction Phase</u>

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.

#### 5.2.7 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 project and arrangements for monitoring and review of safety and health performance
  - arrangements for:
    - o regular liaison between parties on site
    - o 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 project
    - o the selection and control of contractors
    - o the exchange of safety and health information between contractors
    - o security, site induction, and on-site training
    - o 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
    - o services, including temporary electrical installations
    - preventing falls
    - work with or near fragile materials
    - o control of lifting operations
    - dealing with services (water, electricity and gas)
    - the maintenance of plant and equipment
    - poor ground conditions
    - o traffic routes and segregation of vehicles and pedestrians
    - o storage of hazardous materials
    - o dealing with existing unstable structures
    - o accommodating adjacent land use
    - o other significant safety risks



- Health risks:
  - o removal of asbestos
  - o dealing with contaminated land
  - o manual handling
  - $\circ \quad \text{use of hazardous substances}$
  - o reducing noise and vibration
  - o 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 tool box talks etc. as required.

#### 6. EMERGENCY RESPONSE PLAN

#### 6.1 Introduction

This chapter of the CEMP presents an Emergency Response Plan 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 Emergency Response Plan contains predetermined guidelines 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 Ballinagree Wind Farm. 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 Ballinagree Wind Farm, 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



## 6.2 Emergency Response Plan

An emergency response plan deals with the immediate physical effects of a disaster and outlines the initial response.

#### 6.2.1 <u>Emergency Response Liaison</u>

The contractor/PSCS will designate an individual to serve as the Emergency Response Liaison for this project. The emergency response liaison will coordinate the emergency response for the duration of any emergency at or nearby the project site.

The local County Council, 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 project 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.

#### 6.2.2 <u>Reporting Emergencies</u>

In the event of fire, storm, flood, serious injury or other emergency, contact:

#### ALL ON SITE EMERGENCIES DIAL 999

#### 6.2.3 Designated Responder

A map depicting turbine tower locations with the emergency meeting point will be furnished to the local County Council 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)	Cork University Hospital	(021) 4922000			
Ambulance Service	Dial 112 or 999				
Fire Services	Dial 112 or 999				



Service:	Contact Details:				
Garda Station	Millstreet Garda Station	029 70002			
District HQ:	Macroom Garda Station	026 20597			
Divisional HQ:	Anglesea Street Garda Station	021 4522000			

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.

#### 6.2.4 **Emergency Alarm**

CLIENT:

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):



#### 6.2.5 **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.

#### 6.2.6 **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).

#### 6.2.7 **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.

#### 6.2.8 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 operational staff in the event of fire in a wind turbine.



#### 6.2.9 <u>Turbine Tower Rescue Procedure</u>

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.

#### 6.2.10 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.

#### 6.2.11 Environmental Emergency Procedure

An emergency preparedness and response procedure is required to prevent environmental pollution incidents. Emergency Silt Control and Spillage Response Procedures are included in Section 4.3.3 to 4.3.5 of this CEMP.

Suitable spill kits and absorbent material for dealing with oil spills will be maintained on site. In the event of pollution or potential risk of pollution the Local Authority should be informed immediately.

In the case of water pollution in addition to the Local Authority, Inland Fisheries Ireland should also be informed immediately.

#### 6.2.12 Emergency Response Plan – Haul Routes

Emergency Response Procedure relating to transportation of plant, equipment and materials to site to be developed by the main contractor during the construction phase of the wind farm.



#### 6.2.13 Emergency Events – Wind Turbines

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 should 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 must compile information in a technical file confirming how the machine complies with these requirements. The commissioning of turbines and ancillaries must 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 6.2.14 below in the unlikely event of landslide scenario.

#### 6.2.14 Peat Slippage Contingency Measures

#### 6.2.14.1 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.



## 6.2.14.2 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 shall 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 should 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.

#### 6.2.14.3 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.

As detailed above, it is preferable to first prevent a peat slide from reaching a watercourse by constructing check barrages on land. Failing this, 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 should comprise well-graded coarse rock pieces from about 300mm up to typically 1000mm.

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.

Typically, the check barrage should fill the entire channel width of the watercourse up to a height of 3 to 4m with a crest width of typically 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 shall be along the existing access roads on the 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 would need to 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 should be removed as soon as any measures to prevent further peat sliding is agreed with all parties.



# **CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING**

www.fehilytimoney.ie

**CORK OFFICE** Core House, Pouladuff Road, Cork, T12 D773, Ireland

+353 21 496 4133

**Oublin Office** J5 Plaza, North Park Business Park, North Road, Dublin 11, D11 PXT0, Ireland +353 1 658 3500

## **Q** Carlow Office

Unit 6, Bagenalstown Industrial Park, Royal Oak Road, Muine Bheag, Co. Carlow, R21 XW81, Ireland +353 59 972 3800







ENVIRONMENT NSAI Certified



CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

# **APPENDIX 5**

Invasive Species Management Plan (ISMP)



# 4 Planning Phase Invasive Species Management Plan

# 4.1 **Options for control and eradication of Invasive Species**

The best available methods of control and eradication were compiled with reference to the NRA Guidelines (2010) and Fennell et al. (2018) and are summarised in this section of the report. It is recommended that a suitably experienced contractor is employed to undertake the invasive species eradication programme at the site. Methods of invasive species control are rapidly evolving, based on new research and the availability and use of chemical agents. It is important in the preparation of any invasive species management plan to highlight the need for the plan to be reviewed and adapted in the context of any changes that occur in guidance or legislation in the period between pre-planning surveys and the implementation of controls.

The approved contractor will finalise this management plan, based on contemporary experience and knowledge, and on the prevailing level of infestation of each invasive species. A pre-treatment survey will be carried out to ground-truth the extent of each invasive species and to confirm that the recommended approach herein remains appropriate. For example, manual control may only work for small, new infestations such as young Butterfly bush shrubs, but a combination of manual and chemical control may be required to ensure the complete eradication of more established shrubs. The specialist contractor will advise/finalise the best approach based on their knowledge of the species in question.

The successful eradication of invasive species from the development site may require some discussion and cooperation with neighbouring landholdings/landowners and as such the management plan will be discussed and (if possible) agreed with any relevant parties.

## 4.1.1 Management Options for Eradication of Invasive Species

Japanese Knotweed (*Fallopia japonica*) and Rhododendron (*Rhododendron pointicum*) were the only invasive plant species recorded within and outside of overall wind farm study area that are listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations, 2011 (*i.e.,* species of which it is an offense to disperse, spread or otherwise cause to grow in any place). Vector materials; soil and/or spoil taken from affected sites are also included under Regulations 49 and 50 for this species. While neither species was recorded within the construction footprint it is possible that these, or indeed other, invasive plant species could become established within the working area.

The developer will ensure through their appointed contractor that the Invasive Species Management plan is reviewed by suitably qualified and experienced specialist contractors ahead of any site mobilisation. Due to the high risk posed by this species, the location of Japanese Knotweed and Rhododendron stands will be clearly marked and cordoned off ahead of any site works. Any additional Third Schedule species present will also be recorded and mapped. The location and sensitivity of these locations will be covered in the initial induction with all site staff prior to construction works. All site staff will be made aware of the existence of this Management Plan and where it will be available for review on-site.

Where excavations or earth works associated with the construction phase are located within 7 metres of an identified Japanese knotweed stand, the excavation material will be treated as potentially contaminated material, by a licensed contractor to a suitably licensed waste facility. The potential for impacting upon any Rhododendron found within the planned working area will be assessed by a suitably qualified specialist. These locations will be marked and access to such areas will be restricted to necessary personnel (e.g., invasive species specialists). Excavations in these areas will be monitored by a suitably qualified ecologist with experience in invasive species control and management.

The specialist invasive species management contractor employed to undertake invasive plant eradication and removal will review and if necessary, update/amend the suggested management provided in this report. They will have responsibility for ensuring that the adopted approach follows the best contemporary guidance and is fully legally compliant.

Details of management options for invasive plant species noted during surveys of the wider area and which are therefore most likely to be encountered during the construction phase are provided in the following sections.

## 4.1.2 Management and Control Options for Japanese Knotweed

Management/Eradication options for Japanese Knotweed (after NRA 2010, Fennell et al. 2018) to include;

Management options for Japanese Knotweed (TBC by approved contractor) to include:				
Initial Site Staff Induction	An initial induction with all site staff will be undertaken prior to construction works starting,			
	to inform them of the occurrence in the area of Japanese Knotweed, including issues			
	caused by its spread, identification and site walkover of known location(s) - ensuring			
	clearing of footwear, equipment etc. prior to leaving infested area – i.e., PLAN, CHECK,			
	<u>CLEAN &amp; DRY (</u> Fennell <i>et al.</i> 2018)			
	All site staff will be made aware of the existence of the Management Plan and where it will			
	be available for review as required, the proposed management options appropriate for the			
	site, and the name of the contractor appointed for invasive species management and			
	removal where applicable.			
Japanese Knotweed - Brief	Japanese Knotweed is a robust, herbaceous perennial with hollow, bamboo like stems			
Description	which are green with red spots in summer before turning brown in winter. The plant has			
	yellow/cream flowers in later june or August. Its leaves are arranged in a zig-zag pattern			
Pathways of spread	Only female plants have been recorded in Ireland and while cools are comptimes			
ratilways of spread	produced these are hybrid and rarely survive. Dispersal typically occurs through rhizome			
	fragments crown fragments rhizomes and in certain cases from the stem fragments			
	usually by being transported in soil by humans or to a lesser extent, through passive			
	mechanical means such as in floodwaters. Dispersal is also achieved through vegetative			
	reproduction from plant fragments (NRA 2010, Fennell <i>et al.</i> 2018).			
Prevention	Immediate action: Minimise or avoid contact with plants and infested substrate. Fence off			
	and mark clearly where possible.			
	Plan, Check, Clean and Dry - Always clean footwear, clothing and equipment immediately			
	on leaving the infested area.			
Note:	It is a requirement of this plan that only personnel with sufficient training, experience and			
	knowledge in the control of non-native invasive species should be employed to assist in the			
	planning and implementation of control measures in relation to Japanese knotweed which			
	should be undertaken with reference to the current guidance (e.g., UK Environment			
	Agency's (n.d.) Managing Japanese knotweed on development sites - the knotweed code of			
	practice (NRA 2010).			
	The primary objective of control should be <u>total eradication</u> by targeting the underground			
	rnizome and not simply the aerial parts. It should be noted that hone of the methods			
	Any removal from site must be in line with surrent waste regulations			
	The methodology used may depend upon whether immediate removal is required or if it is			
	enough to control/eradicate the stands over a period of time. In the event that immediate			
	removal is deemed necessary ( <i>i.e.</i> , prevent the risk of spread during construction works at			
	the site) then actions 1 to 5 below will be considered. In the event that immediate removal			
	is not required ( <i>i.e.</i> , there is no risk of spread during construction and it is considered			
	feasible to eradicate over time) action 8; herbicide applications will be scheduled. For more			
	information on determining the best approach to take see Fennell et al. 2018.			
	Personnel Responsible: Date to Undertake:			
	TBC on appointment of TBC on appointment of contractor			
	contractor			

Approved methodologies to	Methods to be	e Undertaken:	Date to be Undertaken:		
be implemented for this site	TBC on app	pointment of	TBC on appointment of contractor – specialist invasive		
(to be reviewed and if	contractor with reference to		species management specialists to have reviewed and		
necessary, amended by	1 to 7 below a	nd in line with	finalised management measures and any necessary work		
approved specialist	most current	guidelines and	(e.g., pre-works survey and isolation of areas with invasiv		
contractor):	regulations).	At present <b>our</b>	plants) carried out ahead of any other site mobilisation.		
-	recommended	l approach			
	favours Measu	ire 1.			
1. Avoidance	Advantages:	No risk of	Disadvantages: Potential for inadvertent disturbance of		
	indirect dis	turbance or	Japanese knotweed populations in proximity to proposed		
	consequent	spread as a	works, associated with the movement, storage or		
	result of exca	vations works	operation of machinery or construction activity.		
	or works with	machinery in			
	the vicinity of	the Japanese			
	knotweed star	id.			
2. Hand Excavation:	Advantages: C	an be effective	Disadvantages: As the rhizome becomes more established		
small stands	for newly esta	blished plants.	hand excavation becomes impractical.		
3. Physical cutting:	Advantages:	ong term can	<b>Disadvantages:</b> Labour intensive. Not effective as new		
	weaken the r	plant rhizome.	stems will continually regrow. Unlikely to result in lasting		
	but this wou	ld take many	control. Due to the potential to spread from small rhizome		
	vears to achiev	e eradication	fragments, disposal of material should be undertaken with		
	,		due caution to prevent accidental spread of the plant.		
4. Excavation: larger	Will achieve	e immediate	Can revive and regrow if any rhizome is overlooked.		
stands	results and wi	th due care all	Process is expensive. Disposal of material should be		
	rhizomes can	be successfully	undertaken with due caution to prevent accidental spread		
	removed	,	of the plant.		
5. Burial:	Achieves imm	ediate results	Contains rather than eradicates. Only suitable for certain		
	without the ne	eed for landfill	sites. Location of burial site should be retained on land		
	disposal		deeds to prevent risk of future disturbance. The number		
	anoposa		of years for material to become unviable is undocumented		
			but has been suggested at 20 years		
6. Removal off-site:	Achieves imme	ediate removal	Expensive and will result in the removal of viable site soil.		
	and leaves no	restrictions on	Removal to approved licensed disposal facility only		
	site				
7. Chemical/Herbicide	Effective and	efficient control	can be achieved with the use of Glyphosate which is less		
Treatment:	labour intensiv	e than methods	outlined above.		
	Requires ongo	ing/repeated tre	eatments, which can have negative impact on the receiving		
	environment	and other non-	target species. Treatment near a watercourse requires		
	approval. Ove	rdosing can lead	to plant dormancy rather than eradication and as such care		
	is required in a	pplications.			
	NOTE: it is an	offence to use <b>F</b>	Plant Protection Products in a manner other than specified		
	on the label a	nd in accordance	e with the product label and with Good Plant Protection		
	Practice as pre	escribed in the E	U - (Authorization, Placing on the Market, Use and Control		
	of Plant Prote	ction Products)	Regulations, 2003 (S.I. No. 83 of 2003).		
Foliage application	Glyphosate	Autumn is	Ongoing/several treatments will be required. Up to 5		
	e., priosate	the most	vears has been required in instances where plants are well		
		effective	established.		
		time for			
		treatment			
Weed-wiping	Glyphosate	Effective in	Ongoing/several treatments will be required. Up to 5		
	- /1	some cases.	years has been required in instances where plants are well		
			established.		
Stem injection	Glyphosate	Late summer	Only one or two treatments may be feasible as stems need		
_		to autumn is	to be of required thickness (greater than 8mm). Where		
		most	regrowth occurs additional foliage application will be		
		effective	required.		
		time for	•		
		treatment of			
		stems			

Ongoing Monitoring and	Personnel	Dates to be	Reporting	Status / Are
Evaluation	Responsible:	undertaken	То:	Additional Treatments Required
Of success of eradication	TBC on	by:	TBC on	(if so give dates):
programme	appointment	TBC on	appointment	TBC on appointment of contractor
	of contractor	appointment	of contractor	
		of contractor		

# 4.1.3 Management and Control Options for Rhododendron

Management/Eradication options for Rhododendron ponticum (after NRA 2010, Fennell et al. 2018) to include;

Management options for Rhododendron (TBC by approved contractor) to include:				
Initial Site Staff Induction	An initial induction with all site staff will be undertaken prior to construction works starting, to inform them of the occurrence in the area of Rhododendron, including issues caused by its spread, identification and site walkover of known location(s) – ensuring clearing of footwear, equipment etc. prior to leaving infested area – <i>i.e.</i> , <u>PLAN, CHECK, CLEAN &amp; DRY</u> (Fennell <i>et al.</i> 2018) All site staff will be made aware of the existence of the Management Plan and where it will be available for review as required, the proposed management options appropriate for the site, and the name of the contractor appointed for invasive species management and removal where applicable.			
Rhododendron ponticum - Brief Description	Rhododendron ponticum is an evergreen shallow-rooted shrub often reach 4-5m in height – even taller in some cases. The stems are light brown and woody and become trunk-like with age. Early summer prouces lilac, pink, or purple flowers. Seed pods disperse thousands of seed in late winter. Forms dense 'forest' spreading rapidly and shading the understorey.			
Pathways of spread	Primarily reproduces by seeds, distributed by wind, water, animals and in topsoil. Can also regenerate from small rhizome fragments and stem layering. Seeds are produced when the plant reaches maturity – 10-12 years.			
Prevention	<b>Immediate action</b> : Minimise or avoid contact with plants and infested substrate. Fence off and mark clearly where possible. <u>Plan, Check, Clean and Dry</u> - Always clean footwear, clothing and equipment immediately on leaving the infested area.			
Note:	It is a requirement of this plan that only personnel with sufficient training, experience and knowledge in the control of non-native invasive species should be employed to assist in the planning and implementation of control measures in relation to Rhododendron which should be undertaken with reference to the current guidance. <b>The primary objective of control should be</b> <u>total eradication</u> by targeting the underground rhizome and not simply the aerial parts. Labour intensive to remove but easier to achieve eradication than with (say) Japanese Knotweed. Young plants should be removed wherever possible before they reach maturity and can produce seed. <b>Any removal from site must be in line with current waste regulations.</b> The methodology used may depend upon whether immediate removal is required or if it is enough to control/eradicate the stands of Rhododendron over a period of time. For small shrubs or seedlings hand-pulling is effective but for medium and large shrubs the control options include mechanical flail cutting/mulching, excavation and herbicide application. For more information on determining the best approach to take see Fennell <i>et al.</i> 2018.			
	Personnel Responsible:     Date to Undertake:       TBC on appointment of contractor     TBC on appointment of contractor			

Approved methodologies to be implemented for this site (to be reviewed and if necessary, amended by approved specialist contractor):	Methods to be Undertaken: TBC on appointment of contractor with reference to 1 to 3 below and in line with most current guidelines and regulations). At present our <u>recommended approach</u> favours Measure 1 for small shrubs and seedlings. For areas that can be disturbed Method 2 (& 3) is preferred and in areas that cannot be disturbed method 3 is the preferred control option.	Date to be Undertaken: TBC on appointment of contractor – specialist invasive species management specialists to have reviewed and finalised management measures and any necessary work (e.g., pre-works survey and isolation of areas with invasive plants) carried out ahead of any other site mobilisation.
<ol> <li>Manual – hand pulling, uprooting</li> <li>2. Physical cutting:</li> </ol>	Advantages: Recently established plants can be easily uprooted. Small shrub bushes are shallow rooted and can be uprooted using a Lever and Mulch technique. The method has minimal effect on the environment and it effectively prevents flowering and seed dispersal.	Disadvantages: Labour intensive and plant material needs to be disposed of appropriately. Does not remove the seed bank or mature specimens. Can regrow from remaining root fragments. Disadvantages: Can
flailing/mulching/excavation (specialised equipment)	out in conjunction with herbicide treatment to stumps and regrowth. Relatively quick. Works can be undertaken in the growing season (subject to other ecological constraints).	be expensive and specialist work. Arisings need to be disposed of appropriately. Cut material can obscure stumps. Mulched roots can regrow if not treated with herbicide. Plant/leaf vegetation can be toxic and hostile for revegetation by native plants.
3. Herbicide application	Advantages: Cost effective. Foliar spray appropriate for seedlings and small/cut shrubs. Stem treatment effective on larger specimens. NOTE: it is an offence to use Plant Protection Products in a manner other than specified on the label and in accordance with the product label and with Good Plant Protection Practice as prescribed in the EU - (Authorization, Placing on the Market, Use and Control of Plant Protection Products) Regulations, 2003 (S.I. No. 83 of 2003).	<b>Disadvantages:</b> Can have a negative environmental effect and impact non-target species. Cut stump treatment has less potential for environmental impact.
Foliage application	Glyphosate with Topfilm or Mixture B	Best applied during the growing season.

Cut-stump	Glyphosate		Highly effective year round.		One treatment often sufficient.		
Ongoing Monitoring and Evaluation of success of eradication programme	Personnel Responsible:		Dates undertak	to ken by	be ':	Where occurs	regrowth additional
	TBC appointment contractor	on of	TBC appointn contracto	nent or	on of	intervention required.	on may be



CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

www.fehilytimoney.ie

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

+353 21 496 4133

 Dublin Office
 J5 Plaza,
 North Park Business Park,
 North Road, Dublin 11, D11 PXTO,
 Ireland
 +353 1 658 3500



Unit 6, Bagenalstown Industrial Park, Royal Oak Road, Muine Bheag, Co. Carlow, R21 XW81, Ireland +353 59 972 3800



NSAI Certified



NSAI Certified





CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

# **APPENDIX 6**

Geotechnical and Peat Stability Assessment Report





CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

# ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR THE PROPOSED BALLINAGREE WIND FARM

**GEOTECHNICAL & PEAT STABILITY ASSESSMENT REPORT** 

Prepared for: Ballinagree Wind DAC



Date: January 2022

Core House, Pouladuff Road, Cork T12 D773, Ireland T: +353 21 4964 133 | E: info@ftco.ie CORK | DUBLIN | CARLOW www.fehilytimoney.ie


# **TABLE OF CONTENTS**

1.	NON-TECHNCIAL SUMMARY1
2.	INTRODUCTION2
2.1	Fehily Timoney and Company2
2.2	Project Description2
2.3	Ground Investigation2
2.4	Peat Stability Assessment Methodology3
2.5	Peat Failure Definition4
2.6	Main Approaches to Assessing Peat Stability5
2.7	Peat Stability Assessment – Deterministic Approach5
2.8	Applicability of the Factor of Safety (Deterministic) Approach for Peat Slopes6
2.9	Assessment of Intense Rainfall and Extreme Dry Events on the Peat Slope7
3.	DESK STUDY8
3.1	Desk Study8
3.2	Soils, Subsoil & Bedrock
3.3	Previous Failures9
3.4	Ground Investigation Findings9
4.	FINDINGS OF SITE RECONNAISSANCE10
4.1	Site Reconnaissance
4.2	Findings of Site Reconnaissance10
5.	SITE GROUND CONDITIONS12
5.1	Soils & Subsoils
5.2	Bedrock12
6.	PEAT DEPTHS, STRENGTH & SLOPE AT PROPOSED INFRASTRUCTURE LOCATIONS
6.1	Peat Depth13
6.2	Peat Strength13
6.3	Slope Angle13
6.4	Summary of Findings13
7.	PEAT STABILITY ASSESSMENTS18



7.1	Methodology for Peat Stability Assessment	18
7.2	Analysis to Determine Factor of Safety (Deterministic Approach)	20
7.3	Results of Analysis	22
	7.3.1 Undrained Analysis for the Peat	22
	7.3.2 Drained Analysis for the Peat	23
	7.3.3 Summary of Results	24
8.	PEAT STABILITY RISK ASSESSMENT	.25
8.1	Summary of Risk Assessment Results	25
9.	INDICATIVE FOUNDATION TYPE AND FOUNDATION DEPTH FOR TURBINES	.27
9.1	Summary	27
10.	SUMMARY AND RECOMMENDATIONS	.30
10.1 10.2	Summary Recommendations	30 31
11.	REFERENCES	.32

# LIST OF APPENDICES

- Appendix A: Peat Stability Risk Register
- Appendix B: Calculated FoS for Peat Slopes on Site
- Appendix C: Methodology for Peat Stability Risk Assessment



# **LIST OF FIGURES**

Figure 2-1:	Methodology for Peat Stability Assessment	4
Figure 2-2:	Peat Slope Showing Balance of Forces to Maintain Stability	6
Figure 6-1:	Peat Probe Locations	16
Figure 6-2:	Undrained Shear Strength (c <sub>u</sub> ) Profile for Peat with Depth at Turbine Locations	17

# LIST OF TABLES

Table 6.1:	Peat Depth & Slope Angle at Proposed Infrastructure Locations	
Table 7.1:	List of Effective Cohesion and Friction Angle Values for Peat	19
Table 7.2:	Factor of Safety Limits for Slopes	20
Table 7.3:	Factor of Safety Results (Undrained Condition)	22
Table 7.4:	Factor of Safety Results (Drained Conditions)	
Table 8.1:	Risk Rating Legend	25
Table 8.2:	Summary of Peat Stability Risk Register	
Table 9-1:	Summary of Indicative Turbine Foundation Type and Founding Depths	27

# 1. NON-TECHNCIAL SUMMARY

Fehily Timoney and Company (FT) was engaged by Coillte and Ørsted to undertake a geotechnical and peat stability assessment of the proposed Ballinagree Wind Farm site. In accordance with planning guidelines compiled by the Department of the Environment, Heritage and Local Government (DoEHLG), where peat is present on a proposed wind farm development, a peat stability assessment is required.

A walkover including intrusive peat depth probing, desk study, stability analysis and risk assessment was carried out to assess the susceptibility of the site to peat failure following the principles in Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (PLHRAG, 2<sup>nd</sup> Edition, 2017).

The findings show that the proposed development has an acceptable margin of safety and is suitable for the proposed wind farm development. Based on the findings, recommendations and control measures for construction work in peat lands are suggested to ensure that all works adhere to an acceptable standard of safety.

The proposed development comprises 20 no. wind turbines and associated infrastructure. The site comprises flat to steep sloped agricultural land with areas of peat bog in the north.

Slope inclinations at the main infrastructure locations range from 4 to 16 degrees. Ground conditions comprised mainly of peaty topsoil or peat overlying silt overlying bedrock.

Peat depth recorded during the site walkovers from over 124 probes ranged from 0 to 3m with an average peat depth of 0.6m. 86% of the probes recorded peat depths of less than 1.0m with 95% of peat depth probes recorded peat depths of less than 2.0m. A number of localised readings recorded peat depths from 2.0 to 3m. Peat probing was focused on areas of the site where peat was identified during the site walkover and desk study (the northern area of the site). Average peat depth is given for the probes carried out, which may be higher than the actual average peat depth for the site.

The purpose of the stability analysis was to determine the stability i.e. Factor of Safety (FoS), of the slopes across the site. The FoS provides a direct measure of the degree of stability of a 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 borrow pits, resulted in FoS above the minimum acceptable value of 1.3 and hence the site has a satisfactory margin of safety.

The risk assessment uses the results of the stability analysis in combination with qualitative factors, which cannot be reasonably included in a stability calculation but nevertheless may affect the occurrence of peat instability, to assess the risk of peat failure at the site. The results of the risk assessment are given in Appendix A.

In summary, the proposed development site has an acceptable margin of safety and is considered to be at **low** risk of peat failure.

# 2. INTRODUCTION

## 2.1 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 about 70 members of staff, including engineers, scientists, planners and technical support staff. FT 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.

## 2.2 Project Description

FT was engaged by Coillte to undertake an Environmental Impact Assessment of the proposed Ballinagree Wind Farm. As part of this assessment a geotechnical & peat stability assessment was required to be carried out.

The proposed Ballinagree Wind Farm is located approximately 10km south-east of Millstreet, Co. Cork.

The Ballinagree Wind Farm site, which comprises agricultural land, forestry and blanket peat which extends to an area of approximately 380 hectares contained to the north and north-east of the site. The site is located in the west of Co. Cork, between Millstreet and Macroom. The surrounding landscape comprises gently undulating to steep topography with land-use comprising forestry, agricultural land and peatland.

The development comprises the following:

- (1) 20 no. wind turbines with a maximum overall blade tip height of up to 185m and all associated hardstanding areas
- (2) 2 no. permanent meteorological masts up to 100m in height
- (3) Provision of new site access tracks and associated drainage
- (4) Temporary construction compound
- (5) All works associated with the connection of the proposed wind farm to the national electricity grid, including the construction of an electricity substation
- (6) New access junctions, improvements and temporary modifications to existing public road infrastructure to facilitate delivery of abnormal loads and construction access
- (7) All associated site development works

# 2.3 Ground Investigation

Intrusive investigations were undertaken by Irish Drilling Limited at the proposed borrow pit locations, all proposed turbine locations and along the proposed access tracks. The purpose of the intrusive works was to confirm the geological succession underlying the site. The site investigations comprised the excavation of 64 no. trial pits to a maximum depth of 4.8m BGL and 5 no. rotary boreholes to a maximum depth of 15m BGL. The boreholes were carried out at each of the proposed borrow pit locations to assess the suitability of the material to be used as site-won material during construction.



# 2.4 Peat Stability Assessment Methodology

FT undertook the assessment following the principles in Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments, 2<sup>nd</sup> Edition (PLHRAG, 2017). The Peat Landslide Hazard and Risk Assessment Guide (PLHRAG) is used in this report as it provides best practice methods to identify, mitigate and manage peat slide hazards and associated risks in respect of consent applications for electricity generation projects.

The best practice guide was produced following peat failures in the Shetland Islands, Scotland in September 2003 but more pertinently following the peat failure in October 2003, during the construction of a wind farm at Derrybrien, County Galway, Ireland.

The geotechnical and peat stability assessment at the site included the following activities:

- (1) Desk study
- (2) Site reconnaissance including shear strength and peat depth measurements
- (3) Peat stability assessment of the peat slopes on site using a deterministic and qualitative approach
- (4) Factor of safety plan compiled for the short-term critical condition (undrained) for points analysed along the proposed infrastructure envelope on site
- (5) A risk register was compiled to assess the potential design/construction risks at the infrastructure locations and determine adequate mitigation/control measures for each location to minimise the potential risks and ensure they are kept within an acceptable range, where necessary

A flow diagram showing the general methodology for peat stability assessment is shown in Figure 2.1. The methodology illustrates the optimisation of the wind farm layout based on the findings from the site reconnaissance and stability analysis and subsequent feedback.



Figure 2-1: Methodology for Peat Stability Assessment

# 2.5 Peat Failure Definition

Peat failure in this report refers to a significant mass movement of a body of peat that would have an adverse impact on the proposed development and the surrounding environment. Peat failure excludes localised movement of peat that would occur below an access road, creep movement or erosion type events.

The potential for peat failure at this site is examined with respect to construction works and associated activity, operation works and decommissioning works.



# 2.6 Main Approaches to Assessing Peat Stability

The main approaches to assessing stability for wind farm developments include the following:

- (1) Geomorphological
- (2) Qualitative (judgement)
- (3) Index/Probabilistic (probability)
- (4) Deterministic (factor of safety)

Approaches (1) to (3) listed above are considered subjective and do not provide a definitive indication of stability; in addition, a high level of judgement/experience is required which makes it difficult to relate the findings to real conditions. FT apply a more objective approach, the deterministic approach (as discussed in Section 2.6).

As part of FT's deterministic approach, a qualitative risk assessment is also carried out taking into account qualitative factors, which cannot necessarily be quantified, such as the presence of mechanically cut peat, quaking peat, bog pools, sub peat water flow, slope characteristics and numerous other factors. The qualitative factors used in the risk assessment are compiled based on FT's experience of assessments and construction in peat land sites and peat failures throughout Ireland and the UK. This approach follows the guidelines for geotechnical risk management as given in Clayton (2001), as referenced in the best practice for Peat Landslide Hazard and Risk Assessment Guide (PLHRAG, 2017), and takes into account the approach of MacCulloch (2005).

The risk assessment uses the results of the deterministic approach in combination with qualitative factors, which cannot be reasonably included in a stability calculation but nevertheless may affect the occurrence of peat instability to assess the risk of instability on a peat land site.

# 2.7 Peat Stability Assessment – Deterministic Approach

The peat stability assessment is carried out across a wide area to determine the stability of peat slopes and to identify areas of peatland that are suitable for development; this allows the layout of infrastructure on a particular wind farm site to be optimised. The assessment provides a numerical value (factor of safety) of the stability of individual parcels of peatland. The findings of the assessment discriminate between areas of stable and unstable peat, and areas of marginal stability where restrictions may apply. This allows for the identification of the most suitable locations for turbines, access roads and infrastructure.

A deterministic assessment requires geotechnical information and site characteristics which are obtained from desk study and site walkover, e.g. properties of peat/soil/rock, slope geometry, depth of peat, underlying strata, groundwater, etc. An adverse combination of the factors listed above could potentially result in instability. Using the information above, a factor of safety is calculated for the stability of individual parcels of peatland on a site (as discussed in Section 7).

The factor of safety is a measure of the stability of a particular slope. For any slope, the degree of stability depends on the balance of forces between the weight of the soil/peat working downslope (destabilising force) and the inherent strength of the peat/soil (shear resistance) to resist the downslope weight, see Figure 2.2.





Figure 2-2: Peat Slope Showing Balance of Forces to Maintain Stability

The factor of safety provides a direct measure of the degree of stability of a slope and is the ratio of the shear resistance over the downslope destabilising force. Provided the available shear resistance is greater than the downslope destabilising force then the factor of safety will be greater than 1.0 and the slope will remain stable. If the factor of safety is less than 1.0 the slope is unstable and liable to fail. The acceptable range for the factor of safety in peat is greater than 1.3.

# 2.8 Applicability of the Factor of Safety (Deterministic) Approach for Peat Slopes

The factor of safety approach is a standard engineering approach in assessing slopes which is applied to many engineering materials, such as peat, soil, rock, etc.

The factor of safety approach is included in the Peat Landslide Hazard and Risk Assessments Best Practice Guide for Proposed Electricity Generation Developments (PLHRAG, 2017); see Section 5.3.1 of the guide. This guide provides best practice methods to identify, mitigate and manage peat slide hazards and associated risks in respect of consent applications for electricity generation projects.

Furthermore, the best practice guide notes that the results from the factor of safety approach 'has provided the most informative results' with respect to analysing peat stability (Section 5.3.1 of the guide).

The factor of safety approach in this report includes undrained (short-term stability) and drained (long-term stability) analyses. The undrained condition is the critical condition for the development. The purpose of the drained analysis is to identify the relative susceptibility of rainfall-induced failures at the site.

Notwithstanding the above, the stability analysis used by FT in this report also includes qualitative factors to determine the potential for peat and general slope stability i.e. the analysis used does not solely rely on the factor of safety approach.

The deterministic analysis is considered an acceptable engineering design approach. This concurs with the best practice guide referenced above.



# 2.9 Assessment of Intense Rainfall and Extreme Dry Events on the Peat Slope

The deterministic approach carried out by FT examines intense rainfall and extreme dry events. The deterministic approach includes and undrained (short-term stability) and drained (long-term stability) analysis to assess the factor of safety for the peat slopes against a peat failure.

The drained loading condition applies in the long-term. This condition examines the effect of the change in groundwater level as a result of rainfall on the existing stability of the natural peat slopes. For the drained analysis the level of the water table above the failure surface is required to calculate the factor of safety for the peat slope.

In order to represent varying water levels within the peat slopes, a sensitivity analysis is carried out which assesses varying water level in the peat slopes i.e. water levels ranging from 0 to 100% of the peat depth is conducted, where 0% equates to the peat been completely dry and 100% equates to the peat being fully saturated.

By carrying out such a sensitivity analysis with varying water level in the peat slopes, the effects of intense rainfall and extreme dry events are considered and analysed. The results of which are presented in Section 7 of this report.

# 3. DESK STUDY

### 3.1 Desk Study

The main relevant sources of interest with respect to the site include:

- Geological plans and Geological Survey of Ireland database
- Ordnance survey plans
- Literature review of peat failures

The Geological Survey of Ireland (GSI, 1999) geological plans for the site were used to verify the soil and bedrock conditions.

The Ordnance Survey plans were reviewed to determine if any notable features or areas of particular interest (from a geotechnical point of view) are present on the site.

The desk study also includes a review of both published literature and GSI online dataset viewer (GSI, 2021) on peat failures/landslides in the vicinity of the site.

#### 3.2 Soils, Subsoil & Bedrock

A review of the Geological Survey of Ireland online database and published documents from GSI was carried out.

The GSI subsoils maps indicates that the site is underlain by a combination of Till derived from Devonian Sandstones, Bedrock outcrop or sub-crop, Blanket Peat and Alluvium.

In relation to bedrock, the site location and surrounding area is underlain by the Ballytrasna Formation and the Caha Mountain Formation. The Ballytrasna Formation comprises dusky-red mudstone with subordinate palered sandstones. The Caha Mountain Formation is described as comprising purple and green siltstones and sandstones.

According to the GSI datasets, there are no karst features recorded within the proposed site. The nearest karst feature is Tubrid Well (526034E 590928N) which is located approximately 20km to the north-west of the proposed site.

The GSI Online Irish Geological Heritage database indicates that the proposed development area is not located in an area of specific geological heritage interest. The nearest site of significant geological heritage features to the study area is located approximately 3km to the east of the proposed development which is the Boggeragh Mountains. The Boggeragh Mountains is a Natural Heritage Area (NHA) that consists of upland blanket bog habitat.



# 3.3 Previous Failures

There are no recorded peat failures within the proposed development site (GSI, 2021). The nearest recorded failure is located some 20km west of the study area just north of Ballyvourney. No information is available on the size of this failure

The landslide susceptibility at the site was classified by the GSI (2021) as ranging from Low to Extreme. This only relates to the topography of the site and does not take any peat specific data into account (i.e. peat depths, etc). This is expected as there are certain areas across the site, predominantly in the west that are quite steep (slopes reaching up to 22 degrees).

The presence, or otherwise, of relict peat failures or clustering of relict failures within an area is an indicator that particular site conditions exist that pre-dispose a site to failure or not as the case may be. Hence based on the historical data reviewed and the terrain and ground conditions present on site it can be concluded that site conditions in the area of the proposed development have a limited potential of peat failure.

# 3.4 Ground Investigation Findings

As mentioned in Section 2.3 above, intrusive investigations were undertaken by Irish Drilling Limited at the proposed borrow pit locations, at selected proposed turbine locations, along the proposed access tracks to confirm the geological succession underlying the site. A total of 64 no. trial pits to a maximum depth of 4.8m BGL and 6 no. rotary boreholes (at proposed borrow pit locations) to a maximum depth of 15m BGL were carried out. The trial pit and borehole logs and a ground investigation location map are included in Appendix 9.2 of the main EIAR.

Topsoil was encountered in areas across the site during the site walkover and intrusive investigations. The Topsoil was predominantly a peaty *sandy gravelly CLAY* (0.1 to 0.8 mbgl) with areas of MADE GROUND and PEAT also present across the site. Peat deposits of an amorphous peat were found predominantly in the northern area of the site.

Peat deposits were generally noted to be limited to the northern area of the site and typical thicknesses of between 0.1 - 2.7m. Peaty topsoil was present in areas of the southern area of the site.

The Topsoil and Peat deposits described above were found to overlie Glacial Till deposits either cohesive or granular in nature. Cohesive deposits encountered typically comprised *Soft to Stiff sandy gravelly SILT with high cobble and boulder content*. The granular Glacial Till deposits encountered typically comprised *Silty sandy GRAVEL with high cobble content*.

Weathered Bedrock of the Ballytrasna Formation was encountered during site investigations at depths of between 0 to 3.8m BGL where it was typically described as comprising *Weathered SILTSTONE or SANDSTONE*.

# 4. FINDINGS OF SITE RECONNAISSANCE

### 4.1 Site Reconnaissance

As part of the assessment of potential peat failure at the proposed site, FT carried out a site reconnaissance in conjunction with the desk study review described in Section 3. This comprised walkover inspections of the site with recording of salient geomorphological features with respect to the wind farm development which included peat depth and preliminary assessment of peat strength.

The following salient geomorphological features were considered:

- Active, incipient or relict instability (where present) within the peat deposits
- Presence of shallow valley or drainage line
- Wet areas
- Any change in vegetation
- Peat depth
- Slope inclination and break in slope

The survey covered the proposed turbine locations and associated infrastructure and proposed access tracks.

The method adopted for carrying out the site reconnaissance relied on experienced practitioners carrying out a visual assessment of the site supplemented with measurement of slope inclinations.

# 4.2 Findings of Site Reconnaissance

The site reconnaissance comprised a walkover inspection of the site during January and August 2020 and March 2021. Weather conditions for the site visits were mainly dry.

The findings from the site walkover have been used to optimise the layout of the infrastructure on site.

The main findings of the site walkover of the wind farm site are as follows:

- (1) The site is predominantly agricultural land, forestry and peat. Areas of peat are located predominantly in the north of the site with localised areas of peaty topsoil found in the south.
- (2) A series of peat depth probes were carried out on site. Peat depths recorded across the site ranged from 0.2 to 3m. Approximately 95 percent of peat depth probes recorded peat depths of less than 2.0m. A number of localised readings were recorded where peat depths were 2.0 to 3m.
- (3) The peat depths recorded at the turbine locations where there was peat present (there was no peat encountered at 7 turbine locations) varied from 0 to 2m with an average depth of 0.63m<sup>1</sup>.
- (4) With respect to the new proposed access tracks, peat depths are typically less than 1.0m with localised depths of up to 3m recorded.

<sup>&</sup>lt;sup>1</sup> Peat was recorded at 13 of the proposed turbine locations.



- (5) Access tracks for the wind farm comprise the upgrade of existing agricultural/forestry tracks and the construction of new tracks. The construction of new tracks will be carried out using an excavate & replace construction technique which involves the removal and replacement of peat or soft ground where encountered.
- (6) Slope angles at the turbine locations ranged from 2 to 16 degrees. These slope angle readings were obtained using a combination of readings taken during the site reconnaissance by FT using handheld equipment, such as the Silva Clino Master which has an accuracy of +/- 0.25 degrees and from contour survey plans for the site.
- (7) The slope angle quoted typically reflects the slope within the footprint of each infrastructure location.
- (8) No evidence of past failures or any significant signs of peat instability were noted on site.
- (9) A summary of the site walkover findings for the wind farm are as follows:
  - (a) The site comprises relatively flat terrain with localised areas of peat in the north and north-east of the site. Peat depths recorded across the site ranged from 0 to 3m with an average depth of 0.6m. Peat probing was focused on areas of the site where peat was identified during the site walkover and desk study (the northern area of the site). Average peat depth is given for the probes carried out, which may be higher than the actual average peat depth for the site.
  - (b) The results of the peat depth probing, shear strength testing of the peat and qualitative factors identified on site have been used in the stability and risk assessments, see Sections 6, 7 and 8 of this report for details.

In summary, based on the findings from the site reconnaissance, the proposed development would be considered to have a low risk of peat instability.

#### SITE GROUND CONDITIONS 5.

#### 5.1 Soils & Subsoils

A review of the GSI subsoils maps in Section 3 indicates that the site is underlain by a combination of Till derived from Devonian Sandstones, Bedrock outcrop or sub-crop, Blanket Peat and Alluvium.

Based on the site walkover undertaken by FT and trial pits excavated by IDL, the superficial deposits for the site were typically described as peaty topsoil or spongy brown/black fibrous and amorphous Peat overlying typically firm and stiff slightly gravelly Silt/Clay. Where peat was present on site, peat depths ranged from 0 to 3m with an average depth of 0.6m. At turbine locations, peat depth ranged from 0-2.3m.

#### 5.2 **Bedrock**

A review of the GSI bedrock maps in Section 3 indicates that the site location and surrounding area is underlain by the Ballytrasna Formation and the Caha Mountain Formation. The Ballytrasna Formation comprises duskyred mudstone with subordinate pale-red sandstones. The Caha Mountain Formation is described as comprising purple and green siltstones and sandstones.

No karst features were identified in the survey area. The closest recorded karst feature is a spring noted approximately 10km to the west of the site.





# 6. PEAT DEPTHS, STRENGTH & SLOPE AT PROPOSED INFRASTRUCTURE LOCATIONS

As part of the site walkover, peat depth, in-situ peat strength and slope angles were recorded at various locations across the site. A map is displayed in Figure 6.1 displaying where the peat probe locations were taken across the site.

### 6.1 Peat Depth

Peat depth probes were carried out at/near to proposed turbine locations and access tracks and other main infrastructure elements. At turbine locations up to 5 probes were carried out around the turbine location, where accessible, and an average peat depth was calculated. This method was used predominantly in the northern area of the site where there was evidence of more extensive peat deposits.

#### 6.2 Peat Strength

The strength testing was carried out in-situ using a Geonor H-60 Hand-Field Vane Tester. From FT's experience, hand vanes give indicative results for in-situ strength of peat and would be considered best practice for the field assessment of peat strength.

### 6.3 Slope Angle

The slope angles at each of the main infrastructure locations were obtained using a combination of readings taken during the site reconnaissance by FT using handheld equipment, such as the Silva Clino Master and from contour survey plans for site.

The slope angle quoted typically reflects the slope within the footprint of each infrastructure location. It should be noted that slope angles derived from contour survey plans would be considered approximate, as such surveys are dependent on the density of survey data and do not always reflect local variations in ground topography. Slope angles recorded during the site reconnaissance by FT using handheld equipment would generally be deemed more accurate and representative of local topography.

#### 6.4 Summary of Findings

Based on the peat depths recorded across the site by FT, the peat varied in depth from 0 to 3m with an average depth of 0.6m.

A summary of the peat depths at the proposed turbine and borrow pit locations is given in Table 6.1. The data presented in Table 6.1 is used in the peat stability assessment of the site. Peat depths are based on the data collected from both the trial pitting and peat probing.



#### **Table 6.1**: Peat Depth & Slope Angle at Proposed Infrastructure Locations

Turbine	Easting	Northing	Peat Depth	Pepth Average Peat	Slope Angle	Factor of Safety (Load Condition 2)	
			Kange (m) (*)	Depth (m)	(*) (-)	Undrained	Drained
T1	534501	584042			4		
T2	534621	583586	0.3-0.8	0.6	4	37.72	10.26
Т3	535181	583428	0.5-0.6	0.6	12	12.29	3.42
T4	535989	582819			6		
T5	536420	582647	0.2-0.3	0.3	4		
Т6	535505	583151	0.2-0.3	0.1	10		
Τ7	536168	583308			12		
Т8	536754	583185			4		
Т9	536843	583683			6		
T10	536178	584279			6		
T11	535332	584249			6		
T12	535205	584703	0.2-0.4	0.3	8		
T13	536298	586077	0.5-0.6	0.5	14	12.50	3.01
T14	536707	586702	0.5-1.5	1	8	9.43	4.77
T15	537272	586528	0.4-0.6	0.5	6	20.52	7.00
T16	537466	586089	0.2-0.4	0.3	16		
T17	537125	585649	0.6-0.7	0.6	12	18.44	3.42
T18	538431	586680	1.7-2.3	2	2	26.76	17.18
T19	538959	586490	0.2-0.6	0.4	2	126.97	21.55
T20	539629	586861	0.8-1.3	1	4	30.18	9.54
BP1	533661	533661	0.1-0.4	0.3	14		
BP2	533478	533478			16		
BP3	537925	537925	0.8-1	0.9	4	25.72	25.72

Note (1) Based on probe results from the site walkovers. The range of peat depths for the infrastructure locations are typically based on a 10m grid carried out around the infrastructure element, where accessible.

Note (2) The slope angles at each of the main infrastructure locations were obtained using a combination of readings taken during the site reconnaissance by FT using handheld equipment, such as the Silva Clino Master (which has an accuracy of +/- 0.25 degrees) and from contour survey plans for site. The slope angle quoted typically reflects the slope within the footprint of each infrastructure location.

Note (3) The data presented in the Table above is used in the peat stability assessment of the site.



In addition to probing, in-situ shear vane testing was carried out as part of the ground investigation. Strength testing was carried out at selected locations across the site to provide representative coverage of indicative peat strengths. The results of the vane testing with depth taken at the turbine locations are presented in Figure 6.2.

The hand vane results indicate undrained shear strengths in the range 10 to 62kPa across the whole site, with an average value of about 25kPa. The average value at turbine locations was recorded as 41kPA. The ground investigations that was carried out by Irish Drilling Ltd. consisted of a series of trial pits and boreholes. The peat depths encountered during the trial pitting correspond with the peat depths encountered during the peat probing.

Peat strength at sites of known peat failures (assuming undrained loading failure) are generally very low, for example the undrained shear strength at the Derrybrien failure (AGEC, 2004) as derived from back-analysis, was estimated at 2.5kPa. The recorded undrained strength at the proposed development site is significantly greater than the lower bound values for Derrybrien indicating that there is no close correlation to the peat conditions at the Derrybrien site and that there is significantly less likelihood of failure on the Ballinagree Wind Farm site.



tar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community Survey, E

der Licence from	the Ordnance Survey Ireland Lice	nce No. EN 0001220 © Government of Ireland
	COUNTY CORK	
Legend		
	Wind Farm Study A	rea

Peat Probing Locations

Ballinagree Wind Farm

-

Coillte and Ørsted

**REVISION:** 

PAGE SIZE:

**TIMONEY** www.fehilytimoney.ie

0

A3

Cork | Dublin | Carlow

PROJECT:

FIGURE NO:

SCALE: 1:21000

DATE: 22/09/2021

FEHILY

CLIENT:

- Proposed Turbine Layout
- 0 Peat Probe Locations





# 7. PEAT STABILITY ASSESSMENTS

The peat stability assessment includes an assessment of the stability of the natural peat slopes for individual parcels across the site including at the turbine locations and along the proposed access tracks. The assessment also analyses the stability of the natural peat slopes with a surcharge loading of 10kPa, equivalent to placing 1m of stockpiled peat on the surface of the peat slope.

# 7.1 Methodology for Peat Stability Assessment

Stability of a peat slope is dependent on several factors working in combination. The main factors that influence peat stability are slope angle, shear strength of peat, depth of peat, pore water pressure and loading conditions.

An adverse combination of factors could potentially result in peat sliding. An adverse condition of one of the above-mentioned factors alone is unlikely to result in peat failure. The infinite slope model (Skempton and DeLory, 1957) is used to combine these factors to determine a factor of safety for peat sliding. This model is based on a translational slide, which is a reasonable representation of the dominant mode of movement for peat failures.

To assess the factor of safety for a peat slide, an undrained (short-term stability) and drained (long-term stability) analysis has been undertaken to determine the stability of the peat slopes on site.

- 1. The undrained loading condition applies in the short-term during construction and until construction induced pore water pressures dissipate.
- 2. The drained loading condition applies in the long-term. The condition examines the effect of the change in groundwater level as a result of rainfall on the existing stability of the natural peat slopes.

Undrained shear strength values (c<sub>u</sub>) for peat are used for the total stress analysis. Based on the findings of the 2003 Derrybrien failure and other failures in peat, undrained loading during construction was found to be the critical failure mechanism.

A drained analysis requires effective cohesion (c') and effective friction angle ( $\phi$ ') values for the calculations. These values can be difficult to obtain because of disturbance experienced when sampling peat and the difficulties in interpreting test results due to the excessive strain induced within the peat. To determine suitable drained strength values a review of published information on peat was carried out. Table 7.1 shows a summary of the published information on peat together with drained strength values.

From Table 7.1 the values for c' ranged from 1.1 to 8.74kPa and  $\phi'$  ranged from 21.6 to 43°. The average c' and  $\phi'$  values are 4.5kPa and 30° respectively. Based on the above, it was considered to adopt a conservative approach and to use design values below the averages. For design the following general drained strength values have been used for the site:

$$c' = 4$$
kPa  
 $\phi' = 25^{\circ}$ 



### Table 7.1: List of Effective Cohesion and Friction Angle Values for Peat

Reference	Cohesion, c' (kPa)	Friction Angle, ø' (degs)	Testing Apparatus/ Comments
Hanrahan et al (1967)	5 to 7	36 to 43	From triaxial apparatus
Rowe and Mylleville (1996)	2.5	28	From simple shear apparatus
Landva (1980)	2 to 4	27.1 to 32.5	Mainly ring shear apparatus for normal stress greater than 13kPa
	5 to 6	-	At zero normal stress
Carling (1986)	6.5	0	-
Earroll and Hobib	0	38	From ring shear and shear box apparatus. Results are not considered representative.
(1998)	0.61	31	From direct simple shear (DSS) apparatus. Result considered too low therefore DSS not considered appropriate
Rowe, Maclean and	1.1	26	From simple shear apparatus
Soderman (1984)	3	27	From DSS apparatus
McGreever and	6	38	From triaxial apparatus using soil with 20% organic content
Farrell (1988)	6	31	From shear box apparatus using soil with 20% organic content
Hungr and Evans (1985)	3.3	-	Back-analysed from failure
Dykes and Kirk (2006)	3.2	30.4	Test within acrotelm
Dykes and Kirk (2006)	4	28.8	Test within catotelm
Warburton et al (2003)	5	23.9	Test in basal peat
Warburton et al (2003)	8.74	21.6	Test using fibrous peat
Hendry et al (2012)	0	31	Remoulded test specimen
Komatsu et al (2011)	8	34	Remoulded test specimen
Zwanenburg et al (2012)	2.3	32.3	From DSS apparatus
Den Haan & Grognet (2014)	-	37.4	From large DSS apparatus
O'Kelly & Zhang (2013)	0	28.9 to 30.3	Tests carried out on reconstituted, undisturbed and blended peat samples



# 7.2 Analysis to Determine Factor of Safety (Deterministic Approach)

The purpose of the analysis was to determine the Factor of Safety (FoS) of the peat slopes using infinite slope analysis. The analysis was carried out at the turbine locations, along the proposed access tracks and at various locations across the site.

The FoS provides a direct measure of the degree of stability of the slope. A FoS of less than unity indicates that a slope is unstable, a FoS of greater than unity indicates a stable slope.

The acceptable safe range for FoS is greater than 1.3. The previous code of practice for earthworks BS 6031:1981 (BSI, 1981), provided advice on design of earthworks slopes. It stated that for a first-time failure with a good standard of site investigation the design FoS should be greater than 1.3.

As a general guide, the FoS limits for peat slopes in this report are summarised in Table 7.2:

## Table 7.2:Factor of Safety Limits for Slopes

Factor of Safety (FoS)	Degree of Stability
Less than 1.0	Unstable (red)
Between 1.0 and 1.3	Marginally stable (yellow)
1.3 or greater	Acceptable (green)

Eurocode 7 (EC7) (IS EN 1997-1:2005) now serves as the reference document and the basis for design geotechnical engineering works. The design philosophy used in EC7 applies partial factors to soil parameters, actions and resistances. Unlike the traditional approach, EC7 does not provide a direct measure of stability, since global Factors of Safety are not used.

As such, and in order to provide a direct measure of the level of safety on a site, EC7 partial factors have not been used in this stability assessment. The results are given in terms of FoS.

A lower bound undrained shear strength,  $c_u$  for the peat of 8kPa was selected for the assessment based on the  $c_u$  values recorded at the proposed development site. It should be noted that a  $c_u$  of 8kPa for the peat is considered a conservative value for the analysis and is not representative of all peat present across the site. As described in Section 6.4, the hand vane results indicate undrained shear strengths in the range 10 to 62kPa across the whole site, with an average value of about 25kPa. The average value at turbine locations was recorded as 41kPA. In-situ testing of the peat at the site suggests that peat strength is greater than 10 kPa across the site.

The formula used to determine the factor of safety for the undrained condition in the peat (Bromhead, 1986) is as follows:

 $F = \frac{c_u}{\gamma z \sin \alpha \cos \alpha}$ 

Where:

- *F* = Factor of Safety
- $c_u$  = Undrained strength
- $\gamma$  = Bulk unit weight of material
- *z* = Depth to failure plane assumed as depth of peat
- $\alpha$  = Slope angle

The formula used to determine the factor of safety for the drained condition in the peat (Bromhead, 1986) is as follows:

$$F = \frac{c' + (\gamma z - \gamma_w h_w) \cos^2 \alpha \tan \phi'}{\gamma z \sin \alpha \cos \alpha}$$

Where:

- *F* = Factor of Safety
- c' = Effective cohesion
- $\gamma$  = Bulk unit weight of material
- *z* = Depth to failure plane assumed as depth of peat
- $\gamma_w$  = Unit weight of water
- $h_w$  = Height of water table above failure plane
- $\alpha$  = Slope angle
- $\phi'$  = Effective friction angle

For the drained analysis the level of the water table above the failure surface is required to calculate the factor of safety for the slope. Since the water level in blanket peat can be variable and can be recharged by rainfall, it is not feasible to establish its precise location throughout the site. Therefore, a sensitivity analysis using water level ranging between 0% and 100% of the peat depth was conducted, where 0% equates to the peat being completely dry and 100% equates to the peat been fully saturated.

The following general assumptions were used in the analysis of peat slopes at each location:

- (1) Peat depths are based on the maximum peat depth recorded at each location from the walkover surveys.
- (2) The slope angles used in the peat stability assessment were obtained using of readings taken during the site reconnaissance by FT using handheld equipment.
- (3) Slope angle at base of sliding assumed to be parallel to ground surface.
- (4) A lower bound undrained shear strength, c<sub>u</sub> for the peat of 8kPa was selected for the assessment. The lowest recorded value at the proposed development site during the walkover was 10kPa. It should be noted that a c<sub>u</sub> of 8kPa for the peat is considered a conservative value for the analysis and is not representative of all peat present across the site. In reality, the peat at the proposed development site has a significantly higher undrained strength which is likely as a result of the extensive drainage & extraction works which have been carried out on site.



For the stability analysis two load conditions were examined, namely

Condition (1): no surcharge loading

Condition (2): surcharge of 10 kPa, equivalent to 1m of stockpiled peat assumed as a worst case.

# 7.3 Results of Analysis

### 7.3.1 Undrained Analysis for the Peat

The results of the undrained analysis for the natural peat slopes are presented in Appendix B and the results of the undrained analysis for the most critical load case (load condition 2) are shown on Figure 7.1. The undrained analysis for load condition 2 is considered the most critical load case as most peat failures occur in the short term upon loading of the peat surface. The results from the main infrastructure locations are summarised in Table 7.3. The results from all probe data taken across the site is included in Appendix B.

The calculated FoS for load condition 1 is in excess of 1.30 for each of the locations analysed with a range of FoS of 4.15 to in excess of 400 across the whole of the site (including turbine locations, access tracks, substation and temporary compound locations), indicating a low risk of peat instability across the site. The FoS at turbine locations where peat was present ranged from 18.87 to 444.4, indicating a low risk of peat instability at turbine locations.

The calculated FoS for load condition 2 is in excess of 1.30 for each of the locations analysed with a range of FoS of 3.01 to in excess of 100 across the whole of the site (including turbine locations, access tracks, substation and temporary compound locations, indicating a low risk of peat instability across the site. The FoS at turbine locations where peat was present ranged from 9.43 to 126.97, indicating a low risk of peat instability at turbine locations.

Table 7.3:	Factor of Safety	Results	(Undrained	<b>Condition</b> )
TUDIC 7.5.	ractor or surcey	nesaits	Charamea	contaition

Turbine No./Waypoint	Easting	Northing	Factor of Safety for Load Condition		
			Condition (1)	Condition (2)	
T1	534501	584042	No Peat		
T2	534621	583586	100.59	37.72	
Т3	535181	583428	32.78	12.29	
T4	535989	582819	No Peat		
Τ5	536420	582647	No Peat		
Т6	535505	583151	No Peat		
Τ7	536168	583308	No Peat		
Т8	536754	583185	No Peat		
Т9	536843	583683	No Peat		



Turbine No./Waypoint	Easting	Northing	Factor of Safety for Load Condition		
			Condition (1)	Condition (2)	
T10	536178	584279	No	Peat	
T11	535332	584249	No	Peat	
T12	535205	584703	No	Peat	
T13	536298	586077	37.49	12.50	
T14	536707	586702	18.87	9.43	
T15	537272	586528	61.56	20.52	
T16	537466	586089	No Peat		
T17	537125	585649	49.17	18.44	
T18	538431	586680	40.14	26.76	
T19	538959	586490	444.40	126.97	
T20	539629	586861	60.36	30.18	
BP1	533661	533661	No Peat		
BP2	533503	533503	No Peat		
BP3	533478	533478	No Peat		
BP4	537925	537925	54.29	25.72	

# 7.3.2 Drained Analysis for the Peat

The results of the drained analysis for the peat are presented in Appendix B. The results from the main infrastructure locations are summarised in Table 7.4. As stated previously, the drained loading condition examines the effect of rainfall and water on the existing stability of the natural peat slopes.

The calculated FoS for load condition 1 is in excess of 1.30 for each of the locations analysed with a range of FoS of 1.56 to in excess of 70 across the whole of the site (including turbine locations, access tracks, substation and temporary compound locations, indicating a low risk of peat instability across the site. The FoS at turbine locations where peat was present ranged from 5.28 to 42.02, indicating a low risk of peat instability at turbine locations.

The calculated FoS for load condition 2 is in excess of 1.30 for each of the locations analysed with a range of FoS of 1.99 to in excess of 20 across the whole of the site (including turbine locations, access tracks, substation and temporary compound locations, indicating a low risk of peat instability across the site. The FoS at turbine locations where peat was present ranged from 3.01 to 21.55, indicating a low risk of peat instability at turbine locations.

### Table 7.4: Factor of Safety Results (Drained Conditions)

Turbine No./Waypoint	Easting	Northing	Factor of Safety for Load Condition		
			Condition (1)	Condition (2)	
T1	534501	584042	No	Peat	
T2	534621	583586	16.25	10.26	
Т3	535181	583428	5.47	3.42	
T4	535989	582819	No	Peat	
T5	536420	582647	No	Peat	
Т6	535505	583151	No	Peat	
Τ7	536168	583308	No	Peat	
Т8	536754	583185	No Peat		
Т9	536843	583683	No Peat		
T10	536178	584279	No Peat		
T11	535332	584249	No Peat		
T12	535205	584703	No Peat		
T13	536298	586077	5.28	3.01	
T14	536707	586702	6.22	4.77	
T15	537272	586528	12.13	7.00	
T16	537466	586089	No	Peat	
T17	537125	585649	5.47	3.42	
T18	538431	586680	19.09	17.18	
T19	538959	586490	42.02	21.55	
T20	539629	586861	12.42	9.54	
BP1	533661	533661	No Peat		
BP2	533503	533503	No Peat		
BP3	533478	533478	No	Peat	
BP4	537925	537925	13.06	9.69	

# 7.3.3 <u>Summary of Results</u>

The results above state that the FoS for both drained and undrained conditions at all infrastructure locations and along proposed access tracks are in excess of 1.30. This indicates that the site has a low risk of peat instability. There are areas located in the north where the FoS ranges from 1.56 to 3.63. These values are above the 1.30 allowance and there is no proposed infrastructure at these locations, therefore these areas with lower factors of safety also indicate a low risk of instability.



# 8. PEAT STABILITY RISK ASSESSMENT

A peat stability risk assessment was carried out for the main infrastructure elements at the wind farm. This approach takes into account guidelines for geotechnical/peat stability risk assessments as given in PLHRA (2017) and MacCulloch (2005).

The risk assessment uses the results of the stability analysis (deterministic approach) in combination with qualitative factors, which cannot be reasonably included in a stability calculation but nevertheless may affect the occurrence of peat instability, to assess the risk for each infrastructure element.

For each of the main infrastructure elements, a risk rating (product of probability and impact) is calculated and rated as shown in Table 8.1. Where a subsection is rated 'Medium' or 'High', control measures are required to reduce the risk to at least a 'Low' risk rating. Where a subsection is rated 'Low' or 'Negligible', only routine control measures are required.

#### Table 8.1: Risk Rating Legend

17 to 25	High: avoid works in area or significant control measures required
11 to 16	Medium: notable control measures required
5 to 10	Low: only routine control measures required
1 to 4	Negligible: none or only routine control measures required

A full methodology for the peat stability risk assessment is given in Appendix C.

### 8.1 Summary of Risk Assessment Results

The results of the peat stability risk assessment for potential peat failure at the main infrastructure elements is presented as a Geotechnical Risk Register in Appendix A and summarised in Table 8.2.

The risk rating for each infrastructure element at the proposed development is designated negligible with some mitigation/control measures being implemented on a precautionary basis. Sections of access tracks to the nearest infrastructure element will be subject to the same mitigation/control measures that apply to the nearest infrastructure element.

Details of the required mitigation/control measures can be found in the Geotechnical Risk Register for each infrastructure element (Appendix A).



# Table 8.2: Summary of Peat Stability Risk Register

Infrastructure	Pre-Control Measure Implementation Risk Rating	Pre-Control Measure Implementatio n Risk Rating Category	Notable Control Measures Required	Post-Control Measure Implementation Risk Rating	Post-Control Measure Implementation Risk Rating Category	
Turbine T1	No peat recorded at location					
Turbine T2	Negligible	1 to 4	No	Negligible	1 to 4	
Turbine T3	Negligible	1 to 4	No	Negligible	1 to 4	
Turbine T4	No peat recorded at location					
Turbine T5	No peat recorded at location					
Turbine T6	No peat recorded at location					
Turbine T7	No peat recorded at location					
Turbine T10	No peat recorded at location					
Turbine T11	No peat recorded at location					
Turbine T12	No peat recorded at location					
Turbine T13	Negligible	1 to 4	No	Negligible	1 to 4	
Turbine T14	Negligible	1 to 4	No	Negligible	1 to 4	
Turbine T15	Negligible	1 to 4	No	Negligible	1 to 4	
Turbine T16	No peat recorded at location					
Turbine T17	Negligible	1 to 4	No	Negligible	1 to 4	
Turbine T18	Negligible	1 to 4	No	Negligible	1 to 4	
Turbine T19	Negligible	1 to 4	No	Negligible	1 to 4	
Turbine T20	Negligible	1 to 4	No	Negligible	1 to 4	
BP1	No peat recorded at location					
BP2	No peat recorded at location					
BP3	No peat recorded at location					
BP4	Negligible	1 to 4	No	Negligible	1 to 4	

#### INDICATIVE FOUNDATION TYPE AND FOUNDATION DEPTH FOR TURBINES 9.

#### 9.1 Summary

Based on a review of the ground investigation information for site, a preliminary assessment of the likely foundation type and founding depths for each turbine location was carried out, where possible. A summary of this assessment is provided in Table 9-1.

#### **Summary of Indicative Turbine Foundation Type and Founding Depths Table 9-1:**

Turbine No.	Relevant GI	Geology Encountered	Turbine Foundation Type	Comment
T1	T-01	0-0.5m: Topsoil 0.5-4.3m: Glacial Till	Gravity foundation	The site investigation works carried out indicate that a gravity foundation may be required.
Т2	T-02	0-0.8m: Peat 0.8-1.7m: Glacial Till	Gravity foundation	The site investigation works carried out indicate that a gravity foundation may be required.
Т3	T-03	0-0.8m: Peat 0.8-1.3m: Bedrock	Gravity foundation	The site investigation works carried out indicate that a gravity foundation may be required.
T4	T-04	0-0.1m: Peat 0.1-1.4m: Bedrock	Gravity foundation	The site investigation works carried out indicate that a gravity foundation may be required.
Τ5	T-05	0-2.1m: Made Ground 2.1-3.6m: Bedrock	Gravity foundation	The site investigation works carried out indicate that a gravity foundation may be required.
Т6	T-06	0-0.3m: Peat 0.3-3m: Glacial Till	Gravity foundation	The site investigation works carried out indicate that a gravity foundation may be required.
Τ7	T-07	0-0.2m: Topsoil 0.2-2.5m: Glacial Till	Gravity foundation	The site investigation works carried out indicate that a gravity foundation may be required.
Т8	T-08	0-0.3m: Topsoil 0.3-2.5m: Glacial Till	Gravity foundation	The site investigation works carried out indicate that a gravity foundation may be required.



Turbine No.	Relevant GI	Geology Encountered	Turbine Foundation Type	Comment
Т9	T-09	0-0.1m: Topsoil 0.1- 4.8m: Glacial Till	Gravity foundation	The site investigation works carried out indicate that a gravity foundation may be required.
T10	T-10	0-0.2m: Topsoil 0.2-3.6m: Glacial Till	Gravity foundation	The site investigation works carried out indicate that a gravity foundation may be required.
T11	T-11	0-0.3m: Peat 0.3-4.6m: Glacial Till	Gravity foundation	The site investigation works carried out indicate that a gravity foundation may be required.
T12	T-12	0-0.2m: Topsoil 0.2-1.6m: Glacial Till	Gravity foundation	The site investigation works carried out indicate that a gravity foundation may be required.
T13	T-13	0-0.3m: Peat 0.3-4.5m: Glacial Till	Gravity foundation	The site investigation works carried out indicate that a gravity foundation may be required.
T14	T-14	0-1m: Peat 1-3.8m: Glacial Till	Gravity foundation	The site investigation works carried out indicate that a gravity foundation may be required.
T15	T-15	0-0.5m: Peat 0.5-2.1m: Glacial Till	Gravity foundation	The site investigation works carried out indicate that a gravity foundation may be required.
T16	T-16	0-0.3m: Peat 0.3-1m: Glacial Till	Gravity foundation	The site investigation works carried out indicate that a gravity foundation may be required.
T17	T-17	0-0.6m: Peat 0.6-2m: Glacial Till	Gravity foundation	The site investigation works carried out indicate that a gravity foundation may be required.
T18	T-18	0-2m: Peat 2-4.3m: Glacial Till	Gravity foundation	The site investigation works carried out indicate that a gravity foundation may be required.
T19	T-19	0-0.4m: Peat 0.4-1.4m: Glacial Till	Gravity foundation	The site investigation works carried out indicate that a gravity foundation may be required.
T20	T-20	0-0.7m: Peat 0.7-3.5m: Glacial Till	Gravity foundation	The site investigation works carried out indicate that a gravity foundation may be required.



It should be noted that further ground investigation will be carried out prior to construction at each turbine location in the form of a borehole with in-situ SPT testing at 1m intervals in the overburden and follow-on rotary core through bedrock to confirm the foundation types and founding stratums assumed in Table 10-1.

For gravity type turbine foundations, where the depth of excavation exceeds the required founding depth for the proposed turbine base, up-fill material consisting of granular fill (6N) shall be used to backfill the excavation to the required founding depth.

# **10. SUMMARY AND RECOMMENDATIONS**

#### 10.1 Summary

FT was engaged by Coillte and Ørsted to undertake a geotechnical and peat stability assessment of the proposed Ballinagree Wind Farm site.

The findings of the peat stability and general stability assessment displayed that the proposed development site has an acceptable margin of safety and is suitable for the proposed development. The findings include recommendations and control measures for construction work in peat lands to ensure that all works adhere to an acceptable standard of safety.

The site which comprises relatively flat/gently undulating terrain consisting predominantly of agricultural land with peat present in the north and north-east of the site.

Peat thicknesses recorded during the site walkover ranged from 0 to 3m with an average depth of 0.6m. 85% of the probes recorded peat depths of less than 1.0m. 95% of peat depth probes recorded peat depths of less than 2.0m. A number of localised readings were recorded where peat depths range from 2.0 to 3m.

Slope inclinations at the main infrastructure locations range from 4 to 16 degrees.

An analysis of peat sliding was carried out at the main infrastructure and borrow pit locations across the site for both the undrained and drained conditions. The purpose of the analysis was to determine the Factor of Safety (FoS) of the peat slopes.

For the undrained condition, the calculated FoS for load conditions 1 and 2 for the locations analysed, showed that all locations have an acceptable FoS of greater than 1.3, indicating a low risk of peat failure. The undrained analysis would be considered the most critical condition for the peat slopes.

A drained analysis was also carried out, which examined the effect of in particular, rainfall on the existing stability of the natural peat slopes on site. For the drained condition, the calculated FoS for load conditions (1) & (2) for the locations analysed, showed that all locations have an acceptable FoS of greater than 1.3.

The peat stability risk assessment at each infrastructure location identified a number of mitigation/control measures to further reduce the potential risk of peat failure. Sections of access tracks to the nearest infrastructure element should be subject to the same mitigation/control measures that apply to the nearest infrastructure element. See Appendix A for details of the required mitigation/control measures for each infrastructure element.

In summary, the findings of the peat assessment showed that the Ballinagree Wind Farm site has an acceptable margin of safety, is suitable for the proposed wind farm development and is considered to be at **low** risk of peat failure. The findings include recommendations and control measures for construction work in peat lands to ensure that all works adhere to an acceptable standard of safety.



# **10.2 Recommendations**

The following recommendations are given.

Notwithstanding that the site has an acceptable margin of safety and low risk of peat instability a number of mitigation/control measures are given to ensure that all works adhere to an acceptable standard of safety for work in areas of peat. Mitigation/control measures identified for each of the infrastructure elements in the risk assessment will be taken into account and implemented throughout design and construction works (Appendix A).

The proposed construction method for most of the new proposed access tracks at the wind farm is excavate and replace type construction and floating roads where there is deeper peat located in the north of the site. The FoS along all of the proposed access tracks is above the 1.30 recommendation. The access tracks follow the slopes of the existing topography as much as possible therefore there should be no stability issues.

To minimise the risk of construction activity causing potential peat instability, the Construction Method Statements (CMSs) for the project will take into account, but not be limited, to the recommendations above. This will ensure that best practice guidance regarding the management of peat stability will be inherent in the construction phase.

# **11. REFERENCES**

Applied Ground Engineering Consultants (AGEC) (2004). Derrybrien Wind Farm Final Report on Landslide of October 2003.

British Standards Institute (1981). BS 6031:1981 Code of practice for earthworks.

Bromhead, E.N. (1986). The Stability of Slopes.

Carling, P.A. (1986). Peat slides in Teesdale and Weardale, northern Pennines, July 1983: Description and failure mechanisms. Earth Surface Processes and Landforms, 11.

Clayton, C.R.I. (2001). Managing Geotechnical Risk. Institution of Civil Engineers, London.

Den Haan EJ and Grognet M (2014). A large direct simple shear device for the testing of peat at low stresses. Géotechnique Letters 4(4): 283–288, <u>http://dx.doi.org/10.1680/geolett. 14.00033</u>.

Dykes, A.P. and Kirk, K.J. (2006). Slope instability and mass movements in peat deposits. In Martini, I.P., Martinez Cortizas, A. and Chesworth, W. (Eds.) Peatlands: Evolution and Records of Environmental and Climatic Changes. Elsevier, Amsterdam.

Farrell, E.R. & Hebib, S. (1998). The determination of the geotechnical parameters of organic soils. Proceedings of International Symposium on problematic soils, IS-TOHOKU 98, Sendai, Japan.

Geological Survey of Ireland (2006). Landslides in Ireland. Geological Survey of Ireland -Irish Landslides Group. July 2006.

Geological Survey of Ireland (2021). Online dataset public viewer, July 2021.

Hanrahan, E.T., Dunne, J.M. and Sodha, V.G. (1967). Shear strength of peat. Proc. Geot. Conf., Oslo, Vol. 1.

Hendrick, E. (1990). A Bog Flow at Bellacorrick Forest, Co. Mayo. Irish Forestry, Volume 47 (1): pp 32-44.

Hendry MT, Sharma JS, Martin CD and Barbour SL (2012). Effect of fibre content and structure on anisotropic elastic stiffness and shear strength of peat. Canadian Geotechnical Journal 49(4): 403–415, <u>http://dx.doi.org/10.1139/t2012-003</u>.

Hungr, O. and Evans, S.G. (1985). An example of a peat flow near Prince Rupert, British Columbia. Canadian Geotechnical Journal, 22.

Komatsu J, Oikawa H, Tsushima M and Igarashi M (2011). Ring shear test on peat. In Proceedings of the 21st International Offshore and Polar Engineering Conference, Maui, Hawaii, USA (Chung JS, Hong SY, Langen I and Prinsenberg SJ (eds)). International Society of Offshore and Polar Engineers, Cupertino, CA, USA, vol. 2, pp. 393–396.

Landva, A.O. (1980). Vane testing in peat. Canadian Geotechnical Journal, 17(1).

MacCulloch, F. (2005). Guidelines for the Risk Management of Peat Slips on the Construction of Low Volume/Low Cost Roads over Peat. RoadEx 11 Northern Periphery.



McGeever J. and Farrell E. (1988). The shear strength of an organic silt. Proc. 2<sup>nd</sup> Baltic Conf., 1, Tallin USSR.

O'Kelly BC and Zhang L (2013). Consolidated-drained triaxial compression testing of peat. Geotechnical Testing Journal 36(3): 310–321, <u>http://dx.doi.org/10.1520/ GTJ20120053</u>.

PLHRAG (2017). Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments. Prepared for Energy Consents Unit Scottish Government, 2nd Edition. Dated April 2017.

Skempton, A. W. and DeLory, F. A. (1957). Stability of natural slopes in London Clay. Proc 4th Int. Conf. On Soil Mechanics and Foundation Engineering, Rotterdam, vol. 2, pp.72-78.

Warburton, J., Higgett, D. and Mills, A. (2003). Anatomy of a Pennine Peat Slide. Earth Surface Processes and Landforms.

Warburton, J., Holden, J. and Mills, A. J. (2003). Hydrological controls of surficial mass movements in peat. Earth-Science Reviews 67 (2004), pp. 139-156.

Zwanenburg C, Den Haan EJ, Kruse GAM and Koelewijn AR (2012). Failure of a trial embankment on peat in Booneschans, the Netherlands. Géotechnique 62(6): 479–490, <u>http://dx.doi.org/10.1680/geot.9.P.094</u>.


CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

# **APPENDIX 7**

BEMP



# Biodiversity Enhancement & Management Plan

Land Management & Monitoring Prescriptions

**Ballinagree Wind Farm** 



Prepared by: Ecology Ireland Ltd.



## Contents

1	Introduction	
2	Background to Biodiversity Management Strategy	5
2.1	Biodiversity Best Practice	5
2.2	BEMP Management	6
2.3	Overall BEMP commitments	6
3	Anthony Kelleher's lands	
3.1	Management of Grassland Habitats (GA1/GS4/GS3)	
3.2	Wild Bird Cover	
3.3	Management of Upland Heath/Bog Habitats	
3.4	Erection of Bird and Bat Nest Boxes & Bat Roost	
3.5	Establishing a Patch of Native Woodland	14
4	Noel Nunan's lands	16
4.1	Management of Grassland Habitats	
4.2	Wild Bird Cover	
4.3	Erection of Bird and Bat Nest Boxes & Bat Roost	
4.4	Establishing a Patch of Native Woodland	
5	James Scannell's lands	21
5.1	Management of Grassland Habitats	21
5.2	Wild Bird Cover	22
5.3	Erection of Bird and Bat Nest Boxes & Bat Roost	23
6	Joseph Barrett's lands	
6.1	Management of Grassland Habitats	
6.2	Erection of Bird and Bat Nest Boxes & Bat Roost	27
7	Coillte Wildlife Corridors	

Appendix A	Hedgerow Establishment & Management
Appendix B	Establishment and Management of Wild Bird Cover; Supplementary advice on
	establishment of wildbird cover
Appendix C	Design of Lesser Horseshoe Bat (Night Roost)

- Appendix D Establishment & Management of Woodland patches
- Appendix E Consent Letters

## **Executive Summary**

This Biodiversity and Environmental Management Plan has been prepared to outline a set of land management prescriptions (commitments and monitoring) as part of proposed Ballinagree Wind Farm Development. Four private landowners with a combined total of c. 304 ha of lands in the vicinity of the wind farm, but beyond 250m of any proposed turbine, have agreed to a long-term commitment to detailed land management measures designed to maintain and enhance local biodiversity. In addition, Coillte has undertaken to create wildlife corridors through strategic tree-felling between areas of upland habitat in the vicinity of the proposed wind farm area.

The measures include those designed to protect watercourses, prevent overgrazing and to clear invasive and site inappropriate plants. Higher value habitats will be actively managed to maintain and improve their value and lower value habitats will see specific interventions designed to improve their attractiveness for a wide range of species. Inputs (e.g. fertiliser, herbicide) will be controlled and appropriate planting will increase the available feeding, roosting and nesting cover for wildlife. Certain measures (e.g. control of stocking density) will be universal across the management lands. Other measures (e.g. planting of wildbird cover and native deciduous woodland) will be entirely site specific. The measures proposed for each land parcel take into account the habitats present and their current condition and importance in the local landscape.

The BEMP programme represents a significant commitment to enhance the biodiversity value and ecological connectivity across a large land bank. The programme will run for the lifetime of the windfarm and many of the proposed features (e.g. tree and hedgerow planting) will have a longer-lasting biodiversity benefit to the lands included in this plan and the wider locality. The BEMP is not designed to mitigate or address particular potential impacts associated with the construction, operation or decommissioning of the proposed wind farm. It is instead a commitment provided to yield a lasting biodiversity benefit to the area around Ballinagree.

# **1** Introduction

Ecology Ireland Wildlife Consultants Ltd. has prepared this Biodiversity Enhancement and Management Plan (BMP) for lands in the vicinity of the proposed Ballinagree Wind Farm. These lands include areas under the ownership of Coillte and also a number of private landholdings.

Biodiversity is the **shortened form of two words "biological" and "diversity"**. It refers to all the variety of life that can be found on Earth (plants, animals, fungi and micro-organisms) as well as to the communities that they form and the habitats in which they live.

The overall objectives of this plan are manifold but may be summarised as follows:

- To improve the ecological connectivity between patches of attractive habitat in the wider area
- To significantly increase the amount and quality of hedgerow across a number of landholdings
- To establish a number of high resource value habitats including hedgerows, small areas of native woodland and wildbird cover across the BEMP lands.
- To commit to biodiversity friendly farming practices through control of stocking densities, minimising the use of herbicides and pesticides and to protect watercourses from livestock.
- To erect and maintain bird and bat boxes and night roosts for Lesser Horseshoe Bats.
- Monitoring of local biodiversity and the implementation of the biodiversity prescriptions through the lifetime of the wind farm.

The BEMP is not designed to mitigate or address particular potential impacts associated with the construction, operation or decommissioning of the proposed wind farm. It is instead a commitment provided to yield a lasting biodiversity benefit to the area around Ballinagree. The measures will benefit a range of habitats and species through prescriptions that have been developed with the agreement and input of all participants in the BEMP. The commitments herein are wide-ranging but built upon established land management measures that have been developed as part of agrienvironmental and biodiversity management schemes.

#### Coillte lands

Coillte has extensive lands under their ownership in and adjacent to the proposed wind farm area. Conifer plantation is a dominant local habitat and at an early stage in the development of the BEMP an opportunity to improve connectivity between open areas of heath/bog upland was identified. This will be achieved by felling corridors (wildlife corridors) through large blocks of existing mature conifer plantation. These corridors once cleared will be maintained to improve the connectivity between patches of upland peatland habitat. An **ecological corridor** is a clearly defined geographical space that is governed and managed over the long-term to maintain or restore effective ecological connectivity.

#### **Private Lands**

A number of local landowners have also been instrumental to the development of the BEMP for private farmland. They have discussed and agreed to adopt a series of land management prescriptions on their own landholdings in the vicinity of the proposed wind farm development. Farm specific plans have been prepared with the input of the landowners to maximise the potential biodiversity gain at each site, dependent on the habitats present and their condition (see Sections 3-6 of this report). Each of the private land holdings has a significant amount of grassland, including improved agricultural grassland (GA1). Several have more upland habitats, including some areas of Annex 1 habitat (e.g. Wet Heath).

All lands, both private and public, that are included in the BEMP are over 250m from the proposed turbine locations. It was decided not to include lands closer to active turbines on a precautionary basis. If these lands (close to turbines) were actively managed to become more attractive for birds and bats (for instance) there could be a perceived marginal increase in collision risk for such individuals.

The location of the lands included in this BEMP are shown in Figure 1. This includes three wildlife corridors that will be created and maintained on Coillte lands and also four individual land holdings. Table 1 summarises the area of each of the land parcels in this BEMP. The overall area of lands which are included in this plan totals over 322 hectares.

Land Parcel	Area (ha)
Coillte wildlife corridor (northwest)	10.38
Coillte wildlife corridor (northeast)	6.63
Coillte wildlife corridor (west)	0.99
Kelleher's lands	92.14
Nunan's lands	47.32
Scannell's lands	81.82
Barrett's lands	82.98
Total Area	322.26

#### Table 1. Areas of each land parcel included in the BEMP



Figure 1. Land areas included in the BEMP.

# **2** Background to Biodiversity Management Strategy

This section presents information on the overall habitat makeup of the lands under consideration and explains what measures are appropriate for the habitats present across the land holdings. As illustrated in Figure 1, the three Coillte Wildlife Corridors are located in the vicinity of the proposed wind farm site and these corridors are designed to improve ecological connectivity between areas of upland heath/bog. The north-western of the three corridors is approximately 10.4 hectares in area, the north-eastern corridor is somewhat smaller at 6.6ha and the third corridor will be created by clearance of 0.99 ha of plantation forestry to the west of the proposed wind farm development. Lands permanently felled for this purpose will be replanted elsewhere as described in Chapter 3 of the EIAR.

There are four private landholdings included in the BEMP lands. The largest of these is Anthony Kelleher's (92 ha) and this is located closest to the proposed wind farm site. Three landholdings south of the proposed wind farm are also included. None of the landholdings are located within or adjacent to any designated conservation site. The dominant habitat across these land holdings is Improved Agricultural Grassland (GA1).

Improved Agricultural Grassland (GA1) is a habitat with generally low ecological value and as such it especially suitable for basic land management prescriptions (e.g. control of stocking, planting of hedges etc.). Provision of wildbird cover (sacrificial crop) and prescriptions in line with the All-Ireland Pollinator Plan are also typically appropriate for GA1 lands. There are also significant areas of Wet Grassland (GS4) and related habitats in these land parcels and these present an opportunity to control the extent of soft rush growth and implement other biodiversity positive features. Measures associated with rush control are included in the plans for the private lands included in the BEMP (see Sections 3-6).

Areas of degraded Wet Heath (HH3) and Cutover Bog (PB4) where present (on Kelleher's lands) are suitable for land management as these are habitats that can be greatly improved with appropriate management. Lands running by watercourses are already (at least in part) managed to control livestock access. This will be formalised in some instances with fencing and livestock exclusion. All private land holdings were walked and the proposed land management prescriptions discussed with the individual landowners. Each landowner has given formal consent to the developer to participate in the BEMP and to implement a range of management measures as discussed in this report. This represents a considerable commitment across the lifetime of the wind farm. Other proposed prescriptions discussed and agreed with each of the landowners include commitments to provide nesting/roosting opportunities for Barn Owl and bats at appropriate locations.

## 2.1 Biodiversity Best Practice

There are several advice and best practice documents and online resources that have been used in the preparation of this document. These include:

• European Commission (2008). Management of Natura 2000 habitats Northern Atlantic wet heaths with *Erica tetralix* 4010. Technical Report 08/24.

- National Red Grouse Steering Committee (2013). Red Grouse Species Action Plan. Available on <u>www.npws.ie</u>
- Hen Harrier Project (2020). Hen Harrier Programme Supporting Actions. 2<sup>nd</sup> Edition, 2020.
- Sears/Natural Scotland (2008). Bracken Control: Guide to Best Practice.
- Freshwater Habitats Trust (UK) Pond Creation Toolkit <u>https://freshwaterhabitats.org.uk/projects/million-ponds/pond-creation-toolkit/#Core%20factsheets</u>
- The All-Ireland Pollinator Plan. <u>https://pollinators.ie/</u>
- Hickey, S., Sheehan, D. & Nagle, T. (2020). Bride Project EIP: Farm Management Guidelines. Guide to Farming with Nature. Available <u>https://www.thebrideproject.ie/wp-</u> <u>content/uploads/2020/04/BRIDE-Project-Farm-Habitat-Management-Guidlines.pdf</u>

### 2.2 BEMP Management

A BEMP liaison officer will be nominated by the developer to act as a point of contact and manager for the implementation of the scheme. They will ensure that the commitments provided herein are monitored and implemented and that all participants (private landowners, Coillte) are kept updated on the progress of the BEMP. The liaison officer will act as an intermediary between the developer's ecologist and the individual landowners. Regular project review meetings will be held, particularly in the early establishment years of the scheme and advice and support will be provided as appropriate to the participants in the BEMP.

Further detail relating to the commitments provided in this BEMP and the timeline for the delivery of individual prescriptions will be discussed and agreed within 6 months of the grant of planning permission. The bulk of the interventions (planting, fencing etc.) will be achieved in the first three years from the grant of planning. The individual farm-level agreements will cover an initial 5-year period and will set measurable targets for each land holding which will be monitored and reported upon during this early establishment phase. This 5-year Action Plan will be published on a dedicated website that will be established and maintained for the duration of the project. Annual reports will be prepared and measure the progress towards targets (e.g. planting of new hedgerow) and provide an update on ecological monitoring carried out in the area during this initial 5-year establishment phase. At the end of the first 5-year plan an updated Action Plan will be prepared and agreed with the participating landowners. This will see the continuation of land management and maintenance of the various biodiversity prescriptions already in place for the remainder of the wind farm permission period. The lands will be subject to annual ecological surveys (audit of BEMP measures) throughout the lifetime of the windfarm. Key results and updates will be published on the BEMP website.

The following sections summarise the biodiversity enhancement measures that will be implemented by each of the landowners.

## 2.3 Overall BEMP commitments for lifetime of windfarm

A critical part of a Biodiversity Enhancement and Management strategy is to commit to strategies to manage the land that will promote the maintenance of the high value features and improve the overall biodiversity through active management and monitoring of the lands.

To achieve this there are lots of possible management actions that can be considered. Some are focussed on a particular species (e.g. erection a nest box) or habitat (e.g. preventing livestock entering watercourses) and other measures have a more general focus e.g. limiting stocking density.

#### There shall be none of the following allowed on the lands included in the BEMP:

- Burning areas of vegetation.
- Removal of hedgerows.
- Planting of Conifers.
- New land drainage.
- Organising, allowing or engaging in recreational activities involving off-road or racing vehicles.
- Turf-cutting.
- Unapproved use of Herbicides.
- Unapproved of pesticides/rodenticides.

#### Common Management Measures:

For all of the BEMP areas, the following measures are to be applied:

- Removal of all self-sown conifer saplings
- Removal of all invasive non-native species, notably Rhododendron
- Control of Bracken (according to Sears/Natural Scotland (2008). Bracken Control: Guide to Best Practice).

# **3** Anthony Kelleher's lands

Anthony Kelleher's farm is shown in Figure 3.1. Note lands within 250m of any proposed turbine are not included as these are not to be included in the proposed Biodiversity Land Areas. The land has a good range in elevation from about 240mOD in the south to over 390mOD at the high point of the west of the farm.

The Knocknagappul Stream runs through the northern section of the land holding. The West Ballinagree Stream joins the Knocknagappul and in turn enters the River Laney within the northeast corner of the farm. The farm contains extensive areas of Annex I habitat, predominantly Wet Heath (HH3), particularly in the north (see Figure 3.2). There is also a good amount of degraded Wet Heath and areas of dry-humid Acid Grassland (GS3). The northern part of the land holding has a range of habitats including an area of Semi-Natural Woodland/Poor Fen & Flush (WN/PF2). The southern part of the farm is dominated by Improved Agricultural Grassland (GA1).

The BEMP measures include core commitments for grassland management, particularly for the Improved Agricultural Grassland (GA1) but also some additional options to provide greater benefits for local wildlife (e.g. provision of Wild Bird Cover crop and planting of native tree species). These are all described in Section 3.1-3.5 below

The total area of the Kelleher lands included in the BEMP amounts to 92.14 ha.

Figure 3.1 Kelleher's lands



Figure 3.2 Habitat Map – Kelleher's Lands



# 3.1 Management of Grassland Habitats (GA1/GS4/GS3)

These measures will apply to areas of agricultural grassland as per Figure 3.2 above (GA1/GS3 and GS4). Stocking measures apply to all of the grassland areas, as does rush management and hedgerow management. Figure 3.3 shows the indicative extent of each of the following land management prescriptions that have been agreed in principle with Mr. Anthony Kelleher.

#### Stocking & Grassland Management

Grazing of the agricultural fields included in this BEMP option will be by cattle/sheep with a target low stocking density of 0.5 LU/Ha (this stocking density will not exceed 0.7 LU/Ha without agreement). The aim is to maintain a tussocky sward. This will help create conditions for ground nesting birds such as Meadow Pipit and Skylark. Supplementary feeding of stock with hay in the winter can take place, but feeding areas (e.g. ring feeders) will be moved around the fields regularly to prevent poaching of the ground. Supplementary feed can provide seeds and feeding opportunities for wintering passerines.

- Rush management. Rushes within the agricultural fields will not be allowed to grow to the extent that they rush tussocks collapse and form mats that can smother the ground vegetation. Rotational cutting, i.e. cutting every other year should be sufficient to maintain these levels. Rush cutting in the fields and rough grassland areas should aim to maintain rush levels at 30-70% cover. Approved herbicide application (direct application – licking) will be permitted to combat persistent high levels of rush cover.
  - a) All rush cuttings will be removed from the treated fields. Topping will be delayed until after mid-July to minimise the risk to ground-nesting birds. In fields with a heavy soft-rush infestation (>60% cover) a second cut, four to eight weeks after the initial topping, will help to reduce rush cover in the following year. Reducing and maintaining rush cover at below 50% cover in areas initially with 60% and more cover will be a target.
  - b) It may be impractical to cut rushes in the wetter or rockier fields, so these may be left if they form a small proportion of the field area, or they can be controlled by cattle trampling during aftermath grazing.

#### Hedgerow Planting/Hedgerow management/Fencing

Hedgerows will be planted according to the advice in Appendix A of this report and as indicatively illustrated in Figure 3.3. The extent of new hedgerow establishment shown would be c. 5km. In addition, existing hedgerows will be protected by stock-proof fencing and bolstered where appropriate by supplemental planting. Stock-proof fencing/electric fencing will be erected a minimum of 3m from the base of the established hedgerows.

Existing hedgerows are to be managed to provide hedges with thick (minimum 2m wide) bases. Hedges will be cut to provide an A-shape, wider at the base with the aim to create hedges that are a minimum of 2m wide at the base and 2.5m high. All hedgerow cutting is to take place in the period 1st September to 28th February, i.e. outside the bird breeding season. Any existing areas of scrub found within the grassland fields are to be retained. Trimming of the scrub can be undertaken to prevent encroachment into the surrounding areas. Hedgerow management advice from the All-Ireland Pollinator Plan will be followed (see Appendix A). Livestock will be prevented from accessing natural watercourses by stock-proof fencing. As per the Bride Project "In times past, before the advent of piped water, cattle and other livestock, used ponds, rivers and other water sources for drinking. Nowadays, increased and more concentrated numbers of livestock can cause siltation, bank erosion and water pollution at watercourse drinking points. If possible, water should be piped to troughs, located away from the river, to prevent these problems. Alternatively, the use of nose pumps or pasture pumps can be an effective alternative to river access, especially for smaller numbers of animals." An indicative map showing the principal watercourses where they intersect the BEMP lands is shown in Figure 3.3 below. All fencing will be renewed and maintained as required during the lifetime of the wind farm.

## 3.2 Wild Bird Cover

Under this option a larger area of a field (or entire fields) of Improved Agricultural Grassland will be planted and maintained to provide wild bird cover. This will be sown with an appropriate seed mix (to be approved by the project ecologist). The indicative mapping shows an area of 3.1ha under wild bird cover.

Oat & Linseed mixes can be sown each year and grow well in all soil types, but the seed mix chosen will be discussed and agreed with the project ecologist. Areas of wild bird cover will be fenced to prevent access by livestock. The areas need to be sown before the 31<sup>st</sup> May except in exceptionally wet years. The crop is left in situ through the winter period at least until mid-March. An outline document on the wild bird cover management is provided in Appendix B.

The location of the area sown can be rotated from year to year but the amount of wild bird cover will be maintained at a minimum of 3ha during the project. Management options and sowing density will be discussed and agreed with the project ecologist.

## **3.3 Management of Upland Heath/Bog Habitats**

#### Areas of peatland which will be managed to have a low stocking density are shown in Figure 3.3.

The management of grazing pressure is critical to the health and diversity of these upland habitats. To bring degraded wet heath and blanket bog into favourable condition (see EC 2008):

• a maximum year-round stocking rate of around 0.1 sheep/ha or 0.015 LUs/ha has been recommended for degraded Wet Heath/Cutover Bog, with winter levels lower still, or stock entirely removed from these areas from November-February;

Any extant land drains in this habitat will be blocked according to the advice of the project ecologist. This option also requires reliable stock fencing and control in areas where this management measure is to be applied. Annual monitoring of the heath/bog habitats included in the BEMP area will confirm the success of the management measures and make further recommendations as needed in relation to any interventions required.

To maintain intact wet heath (and blanket bog) in favourable condition undisturbed wet heaths and blanket bog requires little active management. However, it is necessary to control grazing pressure. Light or no grazing in the autumn or winter, with at most very light grazing in the summer is the ideal grazing regime (EC 2008).

- Year-round stocking rates should not exceed 0.25-0.5 ewes/ha or 0.037-0.075 LUs/ha;
- Winter stocking rates should be reduced by at least 25%, with all cattle and horses removed where there is a risk of poaching;
- Blanket bog or Wet Heath dominated by *Molinia* (Purple Moor Grass) will be better grazed with cattle or ponies in the spring and summer months, as this will reduce the dominance of this grass over time and aid restoration.

Particular attention to be given to the encroachment of scrub on higher value (Annex I) habitats. Scrub clearance (outside the bird nesting season) in the peatland habitats will be carried out manually if and when this is required – the use of plant will be avoided except for low ground pressure and light vehicles. Similarly, any encroaching self-seeded saplings and invasives will be prioritised for removal from Heath/Peatland habitats.

## 3.4 Erection of Bird and Bat Nest Boxes & Bat Roost

Under this option an external Barn Owl nest box will be erected at an agreed location either on a tree or on a pole specifically installed for this purpose. An additional Barn Owl box will be installed in an appropriate location within a farm building within the landholding area.



Barn Owl Box in situ (Credit Barn Owl Trust).

A minimum of 10 recycled plastic/woodcrete bird nest boxes will be erected at locations selected by the project ecologist. The type and specification of the boxes will be chosen to be appropriate to the habitats present. These boxes will be inspected and maintained regularly throughout the project.

A minimum of five recycled plastic/woodcrete bat roost boxes will be erected and maintained at sites selected by the project ecologist. These will be inspected annually by a licensed bat specialist. In addition, two Lesser Horseshoe Bat Night Roost structures (see Appendix D) will be installed at selected and agreed locations within the landholding.

# 3.5 Establishing a Patch of Native Woodland

# This option will involve the establishment of 2 copses of native woodland (see indicative mapping in Figure 3.3). As shown the total of indicative tree-planting is 1.8ha.

This will involve the planting two patches of woodland (using native species) to increase the local biodiversity. Native woodland patches provide food and cover for wildlife. Many biodiversity plans for farmland include provision for establishment of native woodland. For example, the Bride Valley Project Farm Management Guidelines are provided in Appendix D. The location and extent of planting, as well as the appropriate species mix will be agreed with the input of the Project Ecologist.



Figure 3.3 Summary of indicative BEMP commitments for Kelleher's lands.

# 4 Noel Nunan's lands

Noel Nunan's landholding of 47.3 ha is shown in Figure 4.1. It is dominated by improved and semiimproved grassland currently grazed by dry cattle stock. There is an area of forestry at the north of the land parcel. There is no significant watercourse within this land holding.

## 4.1 Management of Grassland Habitats

These measures will apply to areas of agricultural grassland. Stocking measures apply to all of the grassland areas, as does rush management and hedgerow management. Figure 4.2 shows the indicative extent of each of the following land management prescriptions that have been agreed in principle with Mr. Noel Nunan.

#### Stocking & Grassland Management

Grazing of the agricultural fields included in this BEMP option will be by cattle/sheep with a target low stocking density of 0.5 LU/Ha (this stocking density will not exceed 0.7 LU/Ha without agreement). The aim is to maintain a tussocky sward. This will help improve conditions for ground nesting birds such as Meadow Pipit and Skylark. Supplementary feeding of stock with hay in the winter can take place, but feeding areas (e.g. ring feeders) will be moved around the fields regularly to prevent poaching of the ground. Supplementary feed can provide seeds and feeding opportunities for wintering passerines.

- Rush management. Rushes within the agricultural fields will not be allowed to grow to the extent that they rush tussocks collapse and form mats that can smother the ground vegetation. Rotational cutting, i.e. cutting every other year should be sufficient to maintain these levels. Rush cutting in the fields and rough grassland areas should aim to maintain rush levels at 30-70% cover. Approved herbicide application (direct application licking) will be permitted to combat persistent high levels of rush cover.
  - a) All rush cuttings will be removed from the treated fields. Topping will be delayed until after mid-July to minimise the risk to ground-nesting birds. In fields with a heavy soft-rush infestation (>60% cover) a second cut, four to eight weeks after the initial topping, will help to reduce rush cover in the following year. Reducing and maintaining rush cover at below 50% cover in areas initially with 60% and more cover will be a target.
  - b) It may be impractical to cut rushes in the wetter or rockier fields, so these may be left if they form a small proportion of the field area, or they can be controlled by cattle trampling during aftermath grazing.

#### Hedgerow Planting/Hedgerow management/Fencing

The existing hedgerow network within this land holding is relatively extensive. New hedgerows will be planted according to the advice in Appendix A of this report and as indicatively illustrated in Figure 4.2. The extent of new hedgerow establishment shown would be c. 1.9km.

In addition, existing hedgerows will be protected by stock-proof fencing and bolstered where appropriate by supplemental planting. Stock-proof fencing/electric fencing will be erected a minimum of 3m from the base of the established hedgerows. All fencing will be renewed and maintained as required during the lifetime of the wind farm.

Existing hedgerows are to be managed to provide hedges with thick (minimum 2m wide) bases. Hedges will be cut to provide an A-shape, wider at the base with the aim to create hedges that are a minimum of 2m wide at the base and 2.5m high. All hedgerow cutting is to take place in the period 1st September to 28th February, i.e. outside the bird breeding season. Any existing areas of scrub found within the grassland fields are to be retained. Trimming of the scrub can be undertaken to prevent encroachment into the surrounding areas. Hedgerow management advice from the All-Ireland Pollinator Plan to be followed (see Appendix A).

## 4.2 Wild Bird Cover

Under this option a larger area of a field (or entire fields) of Improved Agricultural Grassland will be planted and maintained to provide wild bird cover. This will be sown with an appropriate seed mix (to be approved by the project ecologist). The indicative mapping shows an area of 2.6ha under wild bird cover.

Oat & Linseed mixes can be sown each year and grow well in all soil types, but the seed mix chosen will be discussed and agreed with the project ecologist. Areas of wild bird cover will be fenced to prevent access by livestock. The areas need to be sown before the 31<sup>st</sup> May except in exceptionally wet years. The crop is left in situ through the winter period at least until mid-March. An outline document on the wild bird cover management is provided in Appendix B.

The location of the area sown can be rotated from year to year but the amount of wild bird cover will be maintained at a minimum of 2ha during the project. Management options and sowing density will be discussed and agreed with the project ecologist.

# 4.3 Erection of Bird and Bat Nest Boxes & Bat Roost

# Under this option an external Barn Owl nest box will be erected at an agreed location either on a tree or on a pole specifically installed for this purpose.

A minimum of 10 recycled plastic/woodcrete bird nest boxes will be erected at locations selected by the project ecologist. The type and specification of the boxes will be chosen to be appropriate to the habitats present. These boxes will be inspected and maintained regularly throughout the project.

A minimum of five recycled plastic/woodcrete bat roost boxes will be erected and maintained at sites selected by the project ecologist. These will be inspected annually by a licensed bat specialist. In addition, one Lesser Horseshoe Bat Night Roost structures (see Appendix D) will be installed at an agreed location within the landholding.

# 4.4 Establishing a Patch of Native Woodland

# This option will involve the establishment of a copse (or copses) of native woodland (see indicative mapping in Figure 4.2). As shown the total of indicative tree-planting is 1.6 ha.

This option will involve the planting an area of woodland (using native species) to increase the local biodiversity. Native woodland patches provide food and cover for wildlife. Many biodiversity plans for farmland include provision for establishment of native woodland. For example, the Bride Valley Project Farm Management Guidelines are provided in Appendix D. The location and extent of planting, as well as the appropriate species mix will need to be agreed with the input of the Project Ecologist.



Figure 4.1 Nunan's lands included in the BEMP.



Figure 4.2 Summary of indicative BEMP commitments for Nunan's lands.

# 5 James Scannell's lands

James Scannell's land holding of 81.8 ha is shown in Figure 5.1. It is dominated by improved cattlegrazed agricultural grassland with relatively large fields and low-quality hedgerows. There is an area of forestry at the southwest of the land parcel. The land is fairly intensively managed at present and there are a series of internal farm tracks throughout the land holding. There are a number of watercourses within and directly adjacent to the land, including the Glashagarriff River and a number of minor tributaries.

## 5.1 Management of Grassland Habitats

These measures will apply to areas of agricultural grassland. Stocking measures apply to all of the grassland areas, as does rush management and hedgerow management. Figure 5.2 shows the indicative extent of each of the following land management prescriptions that have been agreed in principle with Mr. James Scannell.

#### Stocking & Grassland Management

Grazing of the agricultural fields included in this BEMP option will be by cattle/sheep with a target low stocking density of 0.5 LU/Ha (this stocking density will not exceed 0.7 LU/Ha without agreement). The aim is to maintain a tussocky sward. This will help improve conditions for ground nesting birds such as Meadow Pipit and Skylark. Supplementary feeding of stock with hay in the winter can take place, but feeding areas (e.g. ring feeders) will be moved around the fields regularly to prevent poaching of the ground. Supplementary feed can provide seeds and feeding opportunities for wintering passerines.

- Rush management. Rushes within the agricultural fields will not be allowed to grow to the extent that they rush tussocks collapse and form mats that can smother the ground vegetation. Rotational cutting, i.e. cutting every other year should be sufficient to maintain these levels. Rush cutting in the fields and rough grassland areas should aim to maintain rush levels at 30-70% cover. Approved herbicide application (direct application licking) will be permitted to combat persistent high levels of rush cover.
  - a) All rush cuttings will be removed from the treated fields. Topping will be delayed until after mid-July to minimise the risk to ground-nesting birds. In fields with a heavy soft-rush infestation (>60% cover) a second cut, four to eight weeks after the initial topping, will help to reduce rush cover in the following year. Reducing and maintaining rush cover at below 50% cover in areas initially with 60% and more cover will be a target.
  - b) It may be impractical to cut rushes in the wetter or rockier fields, so these may be left if they form a small proportion of the field area, or they can be controlled by cattle trampling during aftermath grazing.

#### Hedgerow Planting/Hedgerow management/Fencing

The existing hedgerow network within this land holding is fairly extensive but of fairly lowquality. There is considerable opportunity for hedgerow planting and management on these lands. New hedgerows will be planted according to the advice in Appendix A of this report and as indicatively illustrated in Figure 5.2. Up to 7km of new or mostly new hedgerow will be established as shown in Figure 5.2. In addition, existing hedgerows will be protected by stock-proof fencing and bolstered where appropriate by supplemental planting. Stock-proof fencing/electric fencing will be erected a minimum of 3m from the base of the established hedgerows. Stock-proof fencing will be erected to exclude livestock from accessing the watercourses that run through the land holding. All fencing will be renewed and maintained as required during the lifetime of the wind farm.

Existing hedgerows are to be managed to provide hedges with thick (minimum 2m wide) bases. Hedges will be cut to provide an A-shape, wider at the base with the aim to create hedges that are a minimum of 2m wide at the base and 2.5m high. All hedgerow cutting is to take place in the period 1st September to 28th February, i.e. outside the bird breeding season. Any existing areas of scrub found within the grassland fields are to be retained. Trimming of the scrub can be undertaken to prevent encroachment into the surrounding areas. Hedgerow management advice from the All-Ireland Pollinator Plan to be followed (see Appendix A).

Figure 5.2 also show an indicative tree-line field boundary that will be established to border an existing farm track. As shown, this will see the establishment of a native tree dominated tree-line of c. 1.7km in length.

### 5.2 Wild Bird Cover

Under this option a larger area of a field (or entire fields) of Improved Agricultural Grassland will be planted and maintained to provide wild bird cover. This will be sown with an appropriate seed mix (to be approved by the project ecologist). The indicative mapping shows an area of 4.6ha under wild bird cover.

Oat & Linseed mixes can be sown each year and grow well in all soil types, but the seed mix chosen will be discussed and agreed with the project ecologist. Areas of wild bird cover will be fenced to prevent access by livestock. The areas need to be sown before the 31<sup>st</sup> May except in exceptionally wet years. The crop is left in situ through the winter period at least until mid-March. An outline document on the wild bird cover management is provided in Appendix B.

The location of the area sown can be rotated from year to year but the amount of wild bird cover will be maintained at a minimum of 4ha during the project. Management options and sowing density will be discussed and agreed with the project ecologist.

## 5.3 Erection of Bird and Bat Nest Boxes & Bat Roost

Under this option an external Barn Owl nest box will be erected at an agreed location either on a tree or on a pole specifically installed for this purpose. If a suitable additional site is available on farm buildings a second Barn Owl box will be erected within the land holding.

A minimum of 10 recycled plastic/woodcrete bird nest boxes will be erected at locations selected by the project ecologist. The type and specification of the boxes will be chosen to be appropriate to the habitats present. These boxes will be inspected and maintained regularly throughout the project.

A minimum of five recycled plastic/woodcrete bat roost boxes will be erected and maintained at sites selected by the project ecologist. These will be inspected annually by a licensed bat specialist. In addition, two Lesser Horseshoe Bat Night Roost structures (see Appendix C) will be installed at selected agreed locations within the landholding.

Figure 5.1 Scannell's lands included in the BEMP.



Figure 5.2 Summary of indicative BEMP commitments for Scannell's lands.



# 6 Joseph Barrett's lands

Joseph Barrett's land holding of c. 83 ha is shown in Figure 6.1. It is dominated by improved agricultural grassland with a fairly extensive existing hedgerow network of variable quality. The land is fairly intensively managed and the field size is relatively large. A small watercourse flows along the northern boundary of the land holding.

### 6.1 Management of Grassland Habitats

These measures will apply to areas of agricultural grassland. Stocking measures apply to all of the grassland areas, as does rush management and hedgerow management. Figure 6.2 shows the indicative extent of each of the following land management prescriptions that have been agreed in principle with Mr. Joseph Barrett.

#### Stocking & Grassland Management

Grazing of the agricultural fields included in this BEMP option will be by cattle/sheep with a target low stocking density of 0.5 LU/Ha (this stocking density will not exceed 0.7 LU/Ha without agreement). The aim is to maintain a tussocky sward. This will help improve conditions for ground nesting birds such as Meadow Pipit and Skylark. Supplementary feeding of stock with hay in the winter can take place, but feeding areas (e.g. ring feeders) will be moved around the fields regularly to prevent poaching of the ground. Supplementary feed can provide seeds and feeding opportunities for wintering passerines.

- Rush management. Rushes within the agricultural fields will not be allowed to grow to the extent that they rush tussocks collapse and form mats that can smother the ground vegetation. Rotational cutting, i.e. cutting every other year should be sufficient to maintain these levels. Rush cutting in the fields and rough grassland areas should aim to maintain rush levels at 30-70% cover. Approved herbicide application (direct application licking) will be permitted to combat persistent high levels of rush cover.
  - a) All rush cuttings will be removed from the treated fields. Topping will be delayed until after mid-July to minimise the risk to ground-nesting birds. In fields with a heavy soft-rush infestation (>60% cover) a second cut, four to eight weeks after the initial topping, will help to reduce rush cover in the following year. Reducing and maintaining rush cover at below 50% cover in areas initially with 60% and more cover will be a target.
  - b) It may be impractical to cut rushes in the wetter or rockier fields, so these may be left if they form a small proportion of the field area, or they can be controlled by cattle trampling during aftermath grazing.

#### Hedgerow Planting/Hedgerow management/Fencing

The existing hedgerow network within this land holding is fairly extensive (>11km) but is of variable quality. There is also considerable opportunity for hedgerow planting and management on these lands. Existing hedgerows will be subject to supplementary (bolstering) planting to improve their structure and biodiversity value. New hedgerows will be planted according to the advice in Appendix

A of this report and as indicatively illustrated in Figure 6.2. Up to 4.8km of new hedgerow will be established as shown in Figure 6.2. In addition, existing hedgerows will be protected by stock-proof fencing. Stock-proof fencing/electric fencing will be erected a minimum of 3m from the base of the established hedgerows. Stock-proof fencing will also be erected to exclude livestock from accessing the watercourse that runs through the northern part of the land holding. All fencing will be renewed and maintained as required during the lifetime of the wind farm.

Existing hedgerows are to be managed to provide hedges with thick (minimum 2m wide) bases. Hedges will be cut to provide an A-shape, wider at the base with the aim to create hedges that are a minimum of 2m wide at the base and 2.5m high. All hedgerow cutting is to take place in the period 1st September to 28th February, i.e. outside the bird breeding season. Any existing areas of scrub found within the grassland fields are to be retained. Trimming of the scrub can be undertaken to prevent encroachment into the surrounding areas. Hedgerow management advice from the All-Ireland Pollinator Plan to be followed (see Appendix A).

# 6.2 Erection of Bird and Bat Nest Boxes & Bat Roost

Under this option an external Barn Owl nest box will be erected at an agreed location either on a tree or on a pole specifically installed for this purpose. If a suitable additional site is available on farm buildings a second Barn Owl box will be erected within the land holding. A bat roost box will be installed within a suitable farm building within the landholding.

A minimum of 15 recycled plastic/woodcrete bird nest boxes will be erected at locations selected by the project ecologist. The type and specification of the boxes will be chosen to be appropriate to the habitats present. These boxes will be inspected and maintained regularly throughout the project.

A minimum of 8 recycled plastic/woodcrete bat roost boxes will be erected and maintained at sites selected by the project ecologist. These will be inspected annually by a licensed bat specialist. In addition, two Lesser Horseshoe Bat Night Roost structures (see Appendix C) will be installed at selected and agreed locations within the landholding.

### Figure 6.1 Barrett's lands



Figure 6.2 Summary of indicative BEMP commitments for Barrett's lands.



# 7 Coillte Wildlife Corridors

It is proposed to strategically clear c. 18ha of Coillte lands to provide enhanced ecological connectivity between large areas of open upland habitats (see Figure 1). As is shown in Figures 7.1-7.3 below this will open corridors between areas of upland habitat.

#### Proposed Restoration/Management Actions

The following agreed actions will be subject to discussion and agreement with both BAU Estates Team and the Certification & Environment Team to actions and methodologies employed will reflect those employed by Coillte under forest certification guidelines. However, the proposed approach as part of the BEMP commitments is as follows:

- 1. Fell and extract existing conifer crop with tracked machinery in Year 1.
- 2. Mulch any remaining brash using a low ground-pressure excavator in Year 1.
- 3. Block furrow drains in Year 1, inserting peat dams at intervals of 10 metres. Dams may be spaced further apart in flatter areas.
- 4. During year 3 check to see if any natural regeneration of conifers is occurring in the area and manually clear any regeneration of exotics if present.

During Year 6 check to see if any natural regeneration of conifers is occurring in the area and manually clear any regeneration of exotics if present.

As part of the ongoing monitoring of the BEMP passive monitoring of the use by mammals and birds of these corridors will be monitored using long-term deployment of wildlife trail cameras over the course of the first 5-year action plan phase of the BEMP. In addition, the use of the corridors by commuting and foraging bats will be monitored using passive detectors during the first 5-year action plan. Key results will be posted on the BEMP website.

The current aerial mapping view of each of the corridors is shown in Figure 7.1-7.3 below.



Figure 7.1 Coillte wildlife corridor to west of the proposed wind farm site (0.99ha).



Figure 7.2 Coillte wildlife corridor to northwest of the proposed wind farm site (10.38ha).




### Appendix A

### **Hedgerow Establishment & Management**

(Credit: Bride Project; All-Ireland Pollinator Plan)

Bride Project website: <u>https://www.thebrideproject.ie/</u> (accessed 22<sup>nd</sup> November 2021) All-Ireland Pollinator Plan website: <u>https://pollinators.ie/</u> (accessed 22<sup>nd</sup> November 2021.



#### OVERVIEW

The majority of Ireland's hedgerows date from the eighteenth and nineteenth century, but some hedgerows have been dated to prehistoric times. Hedgerows have been used to define field, farm, parish and even county boundaries and they are a very ancient and important part of our heritage. They were also used as livestock enclosures and thus needed to be stockproof. This is why many of our hedgerows contain thorn species such as Hawthorn (Whitethorn), Blackthorn, Holly, Dog Rose, Bramble and Gorse (Furze). The electric fence has now replaced these and is being used to

reinforce stockproof hedging on many farms. The BRIDE Project hedgerow mix introduces several other native and less widely used species such as Guelder Rose, Spindle, Hazel, Buckthorn, Alder Buckthorn and Bird Cherry to enhance the biodiversity value of this new approach to hedgerow creation. This measure is designed to reinstate some of our lost hedgerows along with creating a new habitat for insects, birds and bats. **Retain - not remove!** 



Guelder Rose, one of the hedgerow species included in the BRIDE Hedgerow Mix

#### TIMEFRAME

Any time between October and March.

#### LOCATION

Hedgerows can be planted in the centre of a large field or alongside a livestock or machinery passageway. The quality of existing hedgerows can be improved by filling gaps with some of the hedgerow species.

#### BENEFITS

Hedgerows create shelter from rain and sun for livestock as well as a very important habitat for a wide range of plant and animal species. Hedgerows provide corridors for wildlife that enable them to connect with other habitats. A mature hedgerow will visually enhance the farm you work on and also the countryside you live in. It can also prevent run-off from farmland thus preventing flooding, soil erosion and pollution. Hedgerows also significantly lower your carbon footprint.

#### HABITAT CREATION - GRASSLAND FARMER

New hedgerows should ideally be located alongside a farm passageway or can be used to replace an existing wire fence boundary. If planting beside a farm passageway, ensure it is set back far enough from the passageway (2m) such that it does not interfere with livestock, electric fences or machinery. Plant on the northern side of an east-west running passageway to allow the sun dry out the passageway and thus help to prevent potholes. Plant on either side or both sides of a north-south running passageway.

Have the ground as bare as possible before planting a new hedgerow. The plants should be spaced at 3 per metre in a staggered line using the BRIDE Project hedgerow mix (up to 15 species – use at least 8 species). The mix contains many different species as the focus is on improving biodiversity rather than making the hedgerow stockproof. The traditional

hedgerow contained mainly Whitethorn (Hawthorn) and Blackthorn but with the advent of electric fencing the need for thorn shrub species is no longer as important as it was in the past. Planting a native tree every 50m will add to the structure and biodiversity value of the hedgerow. Adding too many trees will cause shade as the trees mature in later years and possibly out compete the hedgerow species. When choosing plants, it is important to use plants with a good root structure that are tall and strong enough to require minimum maintenance. Small 'whips' will mean more work keeping the area free from competing grasses and bramble. Ensure the hedgerow is protected from livestock using an electric fence 1m out from the hedgerow. new



This fence will need to be moved out further as the hedge grows and expands.

BRIDE Hedgei	row Plant Mix
Species	Latin Name
Crab Apple	Malus sylvestris
Blackthorn	Prunus spinosa
Alder Buckthorn	Frangula alnus
Purging Buckthorn	Rhamnus catharticus
Bird Cherry	Prunus padus
Wild Cherry	Prunus avium
Dogwood	Cornus sanguinea
Hawthorn	Crataegus monogyna
Hazel	Corylus avellana
Holly	llex aquifolium
Wild Privet	Ligustrum vulgare
Guelder Rose	Viburnum opulus
Spindle	Euonymous europaeus
Goat Willow	Salix caprea
Grey Willow	Salix cinerea

#### **HABITAT CREATION - TILLAGE FARMER**

This option may not suit tillage farmers as the requirement for larger fields and machinery was the reason many hedgerows were removed in recent decades. However, planting a new hedgerow in some of the bigger fields will greatly add to the biodiversity and carbon reduction of tillage farms as well as creating corridors of connectivity for wildlife. Large fields are prone to soil erosion, weather exposure and run-off. Creating new hedgerows will minimise soil erosion and siltation of streams and rivers and greatly enhance the landscape value of your farm. Livestock access will not be an issue for tillage farmers but avoiding spray drift and fertiliser onto the habitat is important.

#### HABITAT MANAGEMENT - EXISTING HEDGEROWS

All BRIDE Project hedgerows should be allowed to grow and mature so that their full biodiversity and carbon sequestration value can be achieved. They should be sidetrimmed only, to prevent encroachment and this will need to be carried out every year or at least every 2 years. The practice of "leaving a whitethorn here and there" defeats the purpose of the exercise and makes the job more



Side Trimmed Hedgerow

difficult for the hedge cutting contractor. Do not use pesticide, fertiliser and slurry anywhere near the habitat.

#### HABITAT MANAGEMENT - NEW HEDGEROWS

If rabbits or hares are a problem, guards will need to be used and will be an additional cost where this is an issue. Over the first and possibly second year, vegetation will need to be kept down to ensure the new plants are not out-competed. Trampling around the plants in the first year of establishment will prevent undergrowth build-up. The first year can also be problematic for the plant if drought conditions occur. The new hedgerow may need watering



Rabbit / Hare guards may be needed in certain areas

if this is the case. Wind rock can be an issue before the plant gets properly rooted so ensure the plant is upright and straight at all times. Pruning after planting is not required as the mix contains many plant species, several of which will not tolerate pruning.

#### HABITAT MANAGEMENT - ROADSIDE HEDGEROWS

Roadside hedges can be maintained in a similar way to hedgerows in a field. However, in an area of poor visibility, the hedge will need to be flailed to a height where visibility of oncoming traffic or pedestrians is not compromised e.g. at a junction, bad bend, under power or telephone lines, at a field entrance, dwelling house or farm entrance - where good sightlines are important. Roadside hedgerows need to be side trimmed every year (this can take place throughout the year, in the interest of safety) to prevent encroachment onto the road, thereby reducing the risk of damage and injury to vehicles and road users respectively.



Poor quality hedgerow with low height structure, gaps and low density

### Hedgerow Management advice:

#### Cutting to encourage flowering

- Leave at least one mature Whitethorn/ Blackthorn tree within each hedgerow.
- Where possible, cut hedgerows on a minimum 3-year cycle. Cutting annually stops the hedgerow flowering and fruiting.
- Where possible, cut in rotation rather than all at once as this will ensure some areas of hedgerow on your farm will always flower (Blackthorn is white in March. Whitethorn flowers at silage time in May).
- Hedges managed for pollinators should ideally be cut between Nov-Jan. If they must be cut outside this, cut in rotation, so some areas remain undisturbed.
- Let some Bramble and Ivy grow in hedgerows. They are key nectar and pollen sources in summer and autumn.
- Where hedgerows must be cut along the roadside for safety, allow the inside to flower.
- Aim for a hedgerow that is as high as possible, but at least 2.5m above ground level or above the bank.
- Let some of your hedgerows grow wild, side-trimming only.

#### Hedgerow base

- Avoid spraying the hedgerow base, use mechanical weed control and spot spray only in exceptional cases
- Leave an unfertilised buffer margin at the hedgerow base



A pollinator-friendly hedgerow should be flowering, at least 2.5m in height, and should be trimmed in an A-shape.



Willow is a very important food source in early spring when queens emerge from hibernation. Having Grey/Goat Willow, Whitethorn, Whitebeam, Crab apple or Wild Cherry as individual mature trees around the farm will provide important food for pollinators.



### **Appendix B**

### **Establishment and Management of Wild Bird Cover**

(After joint presentation by Teagasc, BirdWatch Ireland and Bat Conservation Ireland) (https://www.teagasc.ie/media/website/environment/biodiversity-countryside/Wild-Bird-

Cover.pdf)

# Supplementary advice on establishment of wildbird cover strips

(from Hen Harrier Project; <a href="http://www.henharrierproject.ie/HHPActions.pdf">http://www.henharrierproject.ie/HHPActions.pdf</a>)

Why?

This unharvested crop is a giant bird table for seed eating birds and tillage flora and fauna

Linnet

### Seed eating birds

- in decline due to :
  - Intensification
  - Specialisation
  - Loss of tillage in many counties

### Seed eating birds

- need a variety of seeds:
  - Large cereal seeds Yellowhammer
  - Small linseed or kale seeds Linnet

### Flowers in Wild Bird Cover Attract pollinators and insects





llowhamme

Leisler's bat Blackbird Feed on insects and worms

Wild Bird Cover crops





**Birds of prey** feed on small mammals







**Birds and Bats** 





Oats & Linseed sown each year *Recommended* > Grow in all soil types (including heavy, acid) > Tolerates a low pH



### Kale

- Needs a high pH- lime important
- Fertiliser may be essential for establishment
- Club root risk (resistant varieties available)
- Biennial
  - Vegetative in year 1
  - Flowers and seeds in year 2
  - Remains in situ for 2 years
  - Sow every 2<sup>nd</sup> year
  - Establish half the plot in kale and other half cereal

Year	Half Plot	Half Plot
1	Kale Yr 1	Cereal
2	Kale Yr 2	Cereal
3	Cereal	Kale Yr 1
4	Cereal	Kale Yr 2
5	Kale Yr 1	Cereal



2

## 3

### Sowing & Management

- Fine, firm seedbed essential
- Any cultivation method allowed provided successful crop establishment
- Pre-sowing weed control may be necessary
- Plough, harrow and roll as necessary
- Drill or broadcast if drilling, reduce seed rate
- Fertilize at half prescribed rate



### **GLAS Requirements**

### Sow by 31 May

- each year for cereals,
- every second year for kale
- Do not apply pesticides after sowing
- Spot treat noxious weeds and invasive species







### Fence

- stock proof
- fit for purpose
- Do not harvest



- Leave in situ until 15 March the following year (2 seasons for kale)
- Before replanting, livestock may enter from 15 March to aid decomposition of trash











4

The Hen Harrier Project has prepared a number of recommended actions for biodiversity on farmland. They recommend a wild bird seed cover strip alongside an existing hedge or treeline:

### Wild Bird Cover

The crop is sown as a strip 9 m wide, running parallel to an existing hedge. The crop should be sown on the sheltered side of the hedge, ideally on the southern or eastern side. If livestock are present the crop must be protected by a stockproof fence. An uncultivated grass strip at least 1 m wide must be retained between the hedge and the seed crop. The crop must contain a cereal crop (preferably Triticale) and Linseed. Other seeds such as Buckwheat, Gold of Pleasure, Mustard, Fodder Radish, Forage/ Oil Seed Rape and Vetch may also be included in the seed mix. The sowing rate is 7.5 Kg of Triticale/ 100 m strip and 1.5 Kgs of Linseed. Other seeds should be in much smaller quantities. Triticale is the recommended cereal crop; it has considerable advantages over Oats as it is better suited to acidic soils and poor ground conditions. It also has stronger straw which will delay lodging. The chaff on the seed triticale makes it less attractive to birds and rodents ensuring that seed consumption is delayed until other food sources are depleted, this will ensure that a significant feed resource is retained into the mid-winter period.

prepare the site as early as ground conditions permit. Burn

off the existing sward with a suitable herbicide to prevent competition with perennial grasses. it is important to avoid drift into the adjacent hedge or uncultivated grass strips.

- sites for wild bird cover should be power harrowed rather than ploughed. This reduces post cultivation soil carbon loss.
- the crop must be sown by May 31st each year, where a spring sown crop has failed it is permitted to establish an Autumn sown crop with suitable winter cereals 10 Kgs/ 100 m strip or 0.5 Kgs/ 100m of Forage Rape. Availing of this option wil prevent the use of the site for wild bird cover in the following year.
- the action must be delivered in an 11 m wide strip along a field boundary (9m crop with a 1 m grass strip between the crop and the hedge and a further 1 m grass strip between the crop and the fence). The minimum length of a strip is 80m. This action can be delivered at multiple locations on the farm.
- the wild bird cover does not have to remain in the same place for the duration of the project. It can be established in different locations each year.
- the crop must remain in situ until the March 15th the following year. Livestock may enter the parcel from March 15th to planting time, to aid in the decomposition of the trash.
- linseed/ cereal mix 1.5 kg Linseed for a 100m strip plus
  7.5 kg of Triticale/ ha for 100 m
- pesticides cannot be applied post sowing.

- Annual weeds particularly weeds of cultivation are a positive feature of wild bird cover strips.
- one bag of granulated lime and 0.5 bags of 10:10:20 should be spread on each 100 m strip at the time of sowing
- all seeds can be scattered by hand, but it is important that they are rolled into the seed bed immediately after sowing.

When you have finished growing wild bird cover on a site, let grasses and herbs regenerate naturally from the seed bank in the soil.

### Appendix C

## Design of Lesser Horseshoe Bat (Night Roost)

(Credit: Vincent Wildlife Trust)

Vincent Wildlife Trust website: <u>https://www.vincentwildlife.ie/</u> (accessed November 22<sup>nd</sup> 2021).

### Cathedine Night Roost Design

The Vincent Wildlife Trust



### Cathedine Night Roost Design





### Appendix D

# Establishment & Management of Woodland patches (Credit: Bride Project)

Bride Project website: <u>https://www.thebrideproject.ie/</u> (accessed 22<sup>nd</sup> November 2021)

### WOODLAND (B, C, WQ)



#### **OVERVIEW:**

Native woodland (woodland that is dominated by trees that are native to Ireland) once covered most of Ireland but once the first farmers came to inhabit the island over 5000 years ago, the countryside has slowly changed to a landscape dominated by agriculture. The gradual dominance of agriculture has left the island with a very low percentage of woodland cover (one of the lowest in the EU).

#### TIMEFRAME

Trees can be planted anytime from October through to March

#### LOCATION

Locating an area to plant woodland needs to be considered carefully as the wood will change dramatically as the trees begin to mature. Furthermore, woodland has traditionally been planted on the poorest land area of the farm and if this area is not suitable for grass or cereals it may not be suitable for trees. Keep in mind the long-term view of this undertaking and ensure that it will not interfere with any future building or other development plans. Most areas of the farm should be suitable for planting but consider the potential loss of a cherished view (in years to come). Know the soil type of your farm so that the most suitable species can be planted. Ensure no overhead powerlines are present. Existing farmland habitats should be avoided.

#### BENEFITS

Trees provide enormous environmental benefits such as food and shelter for a wide range of species. Trees are also vital for their role in carbon sequestration and their ability to soak up

water and hence reduce flood risk. Native trees in particular are very valuable for biodiversity as they can support a huge range of insects, fungi, mosses, lichens, plants, birds and mammals. Mature woodland, especially native woodland, is one of the most biodiversity-rich habitats and even small areas of woodland can significantly improve the biodiversity of intensively managed farmland. Planting woodland, hedgerows or tree-lines will positively alter the visual landscape of the countryside for

years to come. Removing these habitats will do the opposite and create a featureless landscape.



Rare native oak woodland near Conna, in the Bride valley

#### HABITAT CREATION

A native woodland plot involves the planting of 160 native trees on 0.1ha (min.) of the farm. The Native Woodland Establishment Scheme is more suitable to planting larger areas (over 0.1ha). These sapling trees consisting of nine species (Pedunculate or Sessile Oak, Scots Pine, Downy Birch, Wild Cherry, Hawthorn, Hazel, Spindle, Crab Apple, Buckthorn or Alder Buckthorn) in a fenced plot to prevent livestock access. The larger (Oak and Scots Pine) and medium-sized species (Wild Cherry and Downy Birch) are planted in the central area of the plot while the smaller species are planted on the outer perimeter but some of the more shade tolerant species (Hawthorn, Spindle and Hazel) will be interspersed throughout the wood. Willows are extremely important for biodiversity as many insect species rely on them for pollen and as a food plant. They can easily be planted from cuttings and it is recommended that at least five be planted in each wood.

BRIDE Woodland Plant Mix								
Latin Name								
Alnus glutinosa								
Betula pubescens								
Prunus padus								
Prunus avium								
Corylus avellana								
llex aquifolium								
Quercus robur								
Quercus petraea								
Pinus sylvestris								
Sorbus aucuparia								
Salix caprea								
Salix cinerea								

New woodland is ideally suited to an awkward corner or an area away from the farmyard, but do not put it on an existing wildlife habitat. The new wood will not be thinned as it is designed purely for biodiversity enhancement and should be planted as a legacy with future generations in mind. It is said that "an oak tree grows for 300 years, rests for 300 years and declines gracefully for the next 300 years". Leave a winding path through larger woodland plots so that the farmer and future generations can appreciate the wood as it grows and matures. Open spaces within a wood provide important habitats for wildflowers and grasses and will help to increase the biodiversity value of the wood. Native tree species (see BRIDE Project tree mix) suited to the farm's specific soil type and aspect will be chosen by the ecologist in consultation with the project participant.

#### HABITAT MANAGEMENT New native woodland

It is important that newly planted trees are kept free from encroaching grass and bramble especially during the first three years after planting. It is also to ensure that important protective fencing is erected to prevent livestock access. Check for rabbit or hare damage and use guards if necessary. Pruning in the first 3-5 years, if needed, will prevent forking of the tree in future years. Water (especially in the first year) if necessary.



Pruning the tree in the first 3-5 years will prevent forking later. It is only a matter of time before this tree will split.

#### Established Deciduous Woodland

Existing woodland should be fenced to prevent livestock access. Deer can also damage woodland and fencing may be necessary if deer are preventing natural regeneration. Invasive species such as Cherry Laurel and Rhododendron should be eradicated. This process is best achieved by cutting and chemically treating the remnant stump - treatment may need to be continued for at least three years. Non-native trees such as Beech and Sycamore support far less biodiversity than native tree species such as Oak and these non-native species can dominate large sections of woodland if they remain unchecked. Gradual replacement of non-native tree species with native trees could be considered.

Deadwood, whether fallen or standing is a very important component of native woodland ecosystems. Dead or decaying trees provide a rich habitat for fungi and a wide range of invertebrates that recycle nutrients back into the soil during the decomposition process. No need for bug hotels in a properly functioning woodland!

Appendix E

**Letters of Consent** 

Landowner: Andrew Scannell

Address: Kilberrihert, Coachford, County Cork

Folio Number(s): CK10316F, CK28978F and CK104443F

Date:\_\_\_\_<u>29/11/2021</u>\_\_\_

To Whom it may concern,

I confirm that I am aware of and I hereby consent to the submission of a planning application for the Ballinagree Wind DAC project which includes the proposal for my lands to be included as part of the Biodiversity Enhancement Management Plan. The proposed works are described in the plans and reports submitted alongside the planning applications.

Regards,

- indry Scamel

Landowner: <u>Anthony Kelleher</u>

Address: <u>Horsemount</u>, Ballinagree, Macroom, Cork

Folio Number(s): CK49759 and CK45440F

Date: 24/11/2021

To Whom it may concern,

I confirm that I am aware of and I hereby consent to the submission of a planning application for the Ballinagree Wind DAC project which includes the proposal for my lands to be included as part of the Biodiversity Enhancement Management Plan. The proposed works are described in the plans and reports submitted alongside the planning applications.

Regards,

Dm

Landowner: Joe Barrett

Address: Glounaglough, Rylane, County Cork

Folio Number(s): Part of Folios CK11021, CK11023 and CK3039

Date: 29/11/2021

To Whom it may concern,

I confirm that I am aware of and I hereby consent to the submission of a planning application for the Ballinagree Wind DAC project which includes the proposal for my lands to be included as part of the Biodiversity Enhancement Management Plan. The proposed works are described in the plans and reports submitted alongside the planning applications.

Regard 00

Landowner: Noel Nunan

Address: Cahernaboul, Macroom, County Cork

Folio Number(s): CK7131

Date: 29/11/2021

To Whom it may concern,

i confirm that I am aware of and I hereby consent to the submission of a planning application for the Ballinagree Wind DAC project which includes the proposal for my lands to be included as part of the Biodiversity Enhancement Management Plan. The proposed works are described in the plans and reports submitted alongside the planning applications.

Regards,



CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

# **APPENDIX 8**

List of Cumulative Projects



### Appendix 1.2: Projects Considered in the Cumulative Assessment

Projects considered for Cumulative Assessment in the EIAR

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description	Address	Distance from Project
Boggeragh Wind Farm (1)	X 537022 Y 588100	2001 - 2008	011248 085944	Grant	Operational	Construction of Wind Farm consisting of 20 wind turbines of 80m hub height & 80m blade diameter elect substation with control building & assoc works. Completion of wind farm consisting of 19 no. wind turbines of 80m hub height and 80m blade diameter and electrical substation with control building granted under Planning Reg. No. 01/1248.	Carrigduff, Crinnaloo South, Inchamay North, Carrragraigue	2km North of Wind Farm Site
Boggeragh Wind Farm (2)	X 539837 Y 585668	2010 - 2011	108067	Grant	Operational	A wind farm consisting of 38 no. wind turbines with a maximum ground to top blade tip height of up to 136.5 metres with ancillary structures, 4 borrow pits, 1 no. permanent meteorological mast, 1 no. substation, upgrading of existing roads/access tracks, underground cabling and provision of new access track and new entrances onto public roads and all associated infrastructure (at the Boggeragh Mountains in the townlands of Ballynagree East, Carrigagulla, Annagannihy, Knocknagoun, Kilcullen North, Barrahaurin, Commeenaplaw, Meenahony, Gowlane North, Carrigduff, Crinaloo South, Inchamay South, Glenaneatnagh South, Nadanuller Beg and Knock)	Ballynagree East, Carrigagulla, Co Cork	1km East of Wind Farm Site
Esk Wind Farm	X 544258 Y 591425	2011 - 2014	115276 145602	Grant	Operational	Permission for wind farm comprising the provision of a total of 14no. Wind turbines with a maximum overall blade tip height of up to 136.5m, upgrading of existing and provision of new internal access roads, provision of a wind anemometry mast (height up to 90m), 4no. borrow pits, an electricity substation with control room and associated equipment, underground electricity connection cabling, 3no. temporary construction compounds, and all ancillary site works including the upgrading of site access junctions (145602).	Derrygowna, Esk North, Esk South, Garrane, Glandine, Glannaharee East, Glannaharee West, Glanminnane, Knockavaddra, Monanveel, Co Cork	6km North East of Wind Farm Site
Carraigcannon Wind Farm	X 539462 Y 591287	2003 - 2011	034181 094564	Grant	Operational	Windfarm to include 10 no. wind turbines, ESB control building, compound and ancillary site works.	Carrragraigue, Charlesfield, Rathcoole, Mallow	3.5km North of Wind Farm Site
Carriganimmy Wind Farm	X 530089 Y 582538	2007	074102	Grant	Operational	Wind farm with 6 no. wind turbines (80m hub height and 80m blade diameter with total height not exceeding 120m), a 38kV substation to include pylon and control building within a fenced compound, 1 no. 80m high meteorological mast, construction and upgrading of site entrances, site tracks and associated works	Carriganimmy, Macroom, Co Cork	5km West of Wind Farm Site
Bawnmore Wind Farm	X 537770 Y 578542	2008	016529 086149 088770	Grant	Operational	Wind farm to include 7 no. turbines, substation and site tracks. An increase in hub height from 60 to 85 metres and rotor blade diameter from 66 to 82 metres as well as the addition of 1no. wind turbine to the permitted wind farm development at Cahernafulla. Associated changes to include relocation of permitted turbines, relocation of permitted substation & access	Cahernafulla, Kilberrihert, Aghabullogue, Co Cork	5km South of Wind Farm Site

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description	Address	Distance from Project
						tracks, and increase in site area to provide for new access road and entrance		
Extension to 110kV Substation to include Battery Storage	X 537658 Y 587776	2018	184256	Grant	Operational	Construction of an extension to existing 110kv electricity substation. The proposed works for which planning permission is sought will involve the construction of new palisade fencing, bunded concrete plinths, 4no. battery storage units, transformers, control cabin, access track and all associated site works.	Crinnaloo South, Millstreet, Co. Cork	1km North of Wind Farm Site
Solar Farm	X 537026 Y 591906	2016 - 2019	165455 186562	Grant	Not yet constructed	Permission for the development of a solar photovoltaic panel array consisting of up to 33,000sq.m of solar panels on ground mounted steel frames, 2 no. electricity control cabins, 4 no. inverter units, underground cable and ducts, hardstanding area, boundary security fence, new entrance onto public road, CCTV and all associated site services and works. Planning permission is sought for a period of 10 years. An extension to the permitted solar photovoltaic (PV) array.	Carragraigue, Inchamay North and Crinnaloo South Co. Cork	5km North of Wind Farm Site
Met Mast	X 537676 Y 586145	2020	205342	Grant	Not yet constructed	The erection of a temporary 100m lattice type meteorological mast for a period of 5 years. The structure will be fixed to ground anchors by guy wires and will include instruments for measuring local climate conditions and all ancillary works.	Carrigagulla, Ballinagree, Co Cork	200m from T17
Met Mast	X 535551 Y 583216	2021	214476	New Application	Existing	The continued use of an existing, temporary lattice type meteorological mast, 80m in height. The structure is fixed to ground mounted anchors by guy wires and includes associated instruments to measure local meteorological conditions. Permission is sought for a period of 5 years.	Ballynagree West, Macroom, Co Cork	50m from T6
Extension to Substation to include Battery Storage at Bawnmore Wind Farm	X 537270 Y 578451	2018	185240	Grant	Not yet constructed	An extension to the existing electricity substation, comprising of the construction of up to 4 no. battery storage units, palisade fencing, bunded concrete plinths, associated electrical equipment, transformers and all ancillary site works.	Kilberrihert, Coachford, Co. Cork	1.7km north of Clashavoon Substation
Knockglass Solar Farm (adjacent Bawnmore Wind Farm)	X 538337 Y 578149	2015	155424	Grant	Not yet constructed	Solar PV Panel array consisting of up to 33,000sq.metres of solar panels on ground mounted steel frames, 2 No. electrical control cabins, 5 No. inverter units, underground cable ducts, hardstanding area, boundary security fence, site entrances, access tracks, CCTV and all associated site works.	Knockglass & Kilberrihert, Coachford, Co. Cork	1.9km north Clashavoon Substation
Battery Storage	X 526153 Y 584281	2018	185686	Grant	Not yet constructed	Construction of a battery storage compound including 2 no. battery storage buildings with associated plant and equipment, an ancillary 110kV electricity substation with 2 no. control buildings, associated electrical plant & equipment and fencing, underground electricity cabling, surface water drainage, site entrance and access track, security fencing and all ancillary site works.	Caherdowney, Millstreet, Co. Cork	9km West of Wind Farm Site
Solar Farm	X 540565 Y 565575	2019 - 2020	196847	Grant	Not yet constructed	A 5 MW solar farm comprising approximately 22,200 photovoltaic panels on ground mounted frames within a site area of 8.12 hectares, 2 no. single storey inverter / transformer	Cloghmacow, Crookstown, Co. Cork	11.5km south of Clashavoon Substation

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description	Address	Distance from Project
						stations, 1 no. single storey delivery station, security fencing, CCTV, and all associated ancillary development works.		
Solar Farm	X 551136 Y 575818	2018 - 2019	187280	Granted	Not yet constructed	The construction and operation of solar PV arrays mounted on metal frames on a 21.3ha site, inclusive of an electrical substation compound, up to 10 inverter units, a temporary construction area and ancillary facilities (inclusive of gross floor space of proposed works up to 248sqm). The planning application is accompanied by an environmental report and stage 1 screening for appropriate assessment.	Berrings, Co. Cork	14km east of Clashavoon Substation
Solar Farm	X 541634 Y 564446	2016 - 2017	164783	Granted	Not yet constructed	A 5 MW solar farm comprising approximately 22,200 photovoltaic panels on ground mounted frames within a site area of 8.5 hectares, 2 no. single storey inverter/transformer stations, 1 no. single storey delivery station, security fencing, CCTV and all associated ancillary development works	Currabeha, Crookstown, Co. Cork	13km south of Clashavoon Substation
Existing and permitted Wind turbines within 20km of study area	-	-	-	-		All existing and permitted wind turbines within 20km of the study area have been considered in the visual assessment as set out in Chapter 15: Landscape and Visual		0-20km of Main Wind Farm Site
Existing Forestry Activity	-	-	-	-	Ongoing	Commercial forestry activity in the proximity to the Ballinagree Wind Farm site.		0km

### Other Projects identified for Cumulative Assessment in the EIAR

Kerry County Council applications within 20km of Wind Farm (main site) since 2011

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description	Address	Distance from Project
Wind Farm - Extension of Duration	X 520616 Y 582490	2011	0691680	Conditional	Operational	Complete development of wind farm, consisting of 2 no. wind turbines, 2 no. transformers, a control and metering building, a meteorological mast, site tracks and associated works.	Cummeenabuddogue and Clydaghroe, Co. Kerry	12.7km west of Main Wind Farm site

### **Grid Route**

All application within 250m of each side of the grid route within last 5 years.

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description	Address	Distance from Project
Permission	X 534761 Y 578954	2021	215628	Conditional	Finalised	To construct a new dwelling house.	Bawnmore, Macroom, Co. Cork	<5m
Permission	X 535938 Y 577516	2017	176948	Conditional	Finalised	Construction of new dwellinghouse, domestic garage and new entrance together with all other ancillary site works.	Caherbaroul, Macroom, Co. Cork	<10m

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description	Address	Distance from Project
Permission	X 535288 Y 579968	2017	174237	Conditional	Finalised	To construct new single storey extensions to front and side of existing two storey dwelling along with internal and external alterations, new sewerage treatment system to replace existing septic tank, re-located site entrance, new single storey extension to existing domestic garage and all associated works.	Knocknagappul, Horsemount, Ballinagree, Macroom, Co. Cork	<10m
Permission	X 534553 Y 581275	2019	196751	Conditional	Finalised	The demolition of out building and the single storey annex to the rear (north-west) and side (south-west) of an existing dwelling and for a) the construction of a two storey extension to the rear (north-west) and side (south-west) of the dwelling house b) removal of the existing roof and construction of a new roof at a higher level c) various elevational changes to the existing dwelling d) decommissioning of existing septic tank and installation of a secondary waste water treatment unit and polishing filter and all ancillary and necessary site works to complete the development.	Rahalisk, Ballinagree, Co. Cork	55m
Permission	X 534427 Y 578167	2016	166355	Conditional	Finalised	(i) Retention of the as constructed domestic garage (ii) change of use of the existing domestic garage to a Pre-school unit (iii) construct new extension (36sq.m) on the western side of the existing garage for toilets/office which will form part of the new pre-school unit and associated site works.	Bawnmore, Macroom, Co. Cork	55m
Permission	X 536176 Y 577232	2020	206573	Conditional	Finalised	Construction of a dwellinghouse.	Derryroe, Macroom, Co. Cork	75m
Permission	X 534426 Y 578068	2018	185336	Conditional	Finalised	Construct a slatted house and all associated site works.	Bawnmore, Macroom, Co. Cork	96m
Permission	X 536328 Y 576977	2021	206866	Conditional	Finalised	a) Permission for retention of dwelling to include revised boundaries, entrance and site layout including septic tank, all as constructed, and b) Permission for decommissioning of existing septic tank and soak pit and construction of new septic tank and percolation area.	Derryroe, Macroom, Co. Cork	138m
Extension of Duration	X 535442 Y 580045	2019	194044	Conditional	Finalised	Construction of dwellinghouse, domestic garage, new entrance and all associated site works.	Knocknagcapall, Ballinagree, Macroom, Co. Cork	138m
Permission	X 534848 Y 581777	2016	166235	Conditional	Finalised	Construction of dwellinghouse, domestic garage, new entrance and all associated site works.	Knocknagappul, Ballinagree, Macroom, Co. Cork	147m
Permission	X 534321 Y 578515	2018	186011	Conditional	Finalised	Construction of dwellinghouse, domestic garage, new entrance and all associated site works.	Bawnmore, Macroom, Co. Cork	148m

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description	Address	Distance from Project
Permission	X 536293 Y 577504	2020	204757	Conditional	Finalised	1)Demolitions to an existing dwelling, 2)construction of extension to rear of existing dwelling, 3)alterations to existing dwelling, 4)alterations to existing vehicular entrance, 5) decommissioning of existing septic tank and installation of a new septic tank and percolation area and all associated site works Construction of dwellinghouse, domestic garage, new entrance and all associated site works.	Kilberrihert, Coachford, Co. Cork	161m
Permission	X 534408 Y 581125	2021	206924	Conditional	Finalised	Permission for new two storey dwelling, sewerage system and all associated works.	Rahalisk, Ballinagree, Co. Cork	215m
Permission	X 535992 Y 577811	2016	166336	Conditional	Finalised	For garage (garage relocation & change of garage plan from that permitted under planning Ref No.15/6634)	Caherbaroul, Macroom, Co. Cork	228m
Permission	X 535521 Y 583210	2021	214476	Conditional	Finalised	The continued use of an existing, temporary lattice type meteorological mast, 80m in height. The structure is fixed to ground mounted anchors by guy wires and includes associated instruments to measure local meteorological conditions. Permission is sought for a period of 5 years. The mast was erected on site as exempted development pursuant to Class 20 (A), Part 1 Schedule 2 of the Planning & Development Regulations 2001 (as amended) in November 2019.	Ballynagree West, Near Ballinagree, Macroom, Co. Cork	>250m
Permission	X 534651 Y 582433	2021	216635	Conditional	Finalised	New single storey and two storey extension to side of existing two storey dwelling, new sewerage system upgrade to existing system and all associated works.	Horsemount, Knocknagappul, Ballinagree, Macroom, Co. Cork	<10m

### Turbine Delivery Route (TDR) Route

Application within 250m of nodes within last 5 years.

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description	Address	Distance from Project
Permission	X 553382 Y 623075	2017	174574	Conditional	Application Finalised	Construction of a single storey extension to side of dwelling, alterations to front and both sides of dwelling and all associated site works	11 Cedar Court, Rathgoggan Middle, Charleville, Co. Cork	100m
Retention	X 553222 Y 623063	2016	164209	Conditional	Application Finalised	Retention to existing dwelling of: (a) side porch, (b) rear 2 storey and single storey extension, and (c) attached and detached domestic garages	Love Lane, Rathgoggan Middle, Charleville, Co. Cork	150m

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description	Address	Distance from Project
Retention	X 553465 Y 623090	2018	186419	Conditional	Application Finalised	Retention of the existing single storey extensions to the front, side and rear elevations of the existing two storey dwelling house with all associated site and ancillary works.	Old Limerick Road, Rathgoggan Middle, Charleville, Co. Cork	250m
Retention	X 553993 Y 621927	2019	194554	Conditional	Application Finalised	Retention for; 1) Minor alterations to elevations, internal modifications to layout and minor increase to footprint of extension to petrol station / shop / diner permitted under Planning Reg. No. 01/1502, 2) Retention for change of use of store permitted under Planning Reg. No. 05/4350 and extension to same for use as dry goods store, food preparation area, bakery, kitchen, cold rooms, staff amenities and attached waste store and enclosed yard area (partially covered by canopy), 3) Retention for change of use and alterations to elevations / layout, including new roof, of dwelling house on site to use as solid fuel store, ancillary to petrol station, partial demolition of boundary wall to said dwelling and closure of site entrance to Charter School Road previously serving dwelling, 4) Retention for alterations to site entrance on Charter School Road and 3no. site entrances on N20, 5) Retention of shop, 7) Retention for brush car wash, associated store and 2no. manual car wash units, 8) Retention for car parking layout as constructed including 67no. car parking spaces and 2no. HGV spaces, 9) Retention for self-service laundrette unit and, 10) all associated site works.	Amber Service Station, Rathgoggan South, Charleville, Co. Cork	200m
Permission	X 554023 Y 621983	2021	215568	Further Information	Application Finalised	To carry out rear demolition, alterations, renovations and extensions to an existing dwelling house and all associated site works.	Ballysally, Rathgoggan South, Charleville, Co. Cork	150m
Permission	X 554216 Y 609187	2018	176600	Conditional	Application Finalised	Change of use of former retail outlet on ground floor of premises to residential.	Main Street, Buttevant, Co. Cork	200m
Permission	X 554650 Y 607335	2019	194723	Conditional	Application Finalised	Construct a two storey dwelling, a garage, a proprietary wastewater treatment system and polishing filter and all associated site works	Ballybeg Middle, Buttevant, Co. Cork	250m
Permission	X 555176 Y 599582	2019	194636	Conditional	Application Finalised	Retention of (a) existing porch to front of dwelling (b) alterations to dwelling (c) detached 2 storey building used as living accommodation ancillary to main dwelling and planning permission for the installation of 2 velux roof lights to rear of existing dwelling and planning permission for 2 storey extension to rear and side of existing dwelling for use as granny flat including the incorporation of detached 2 storey building used as living accommodation ancillary to main dwelling into same and all associated site works.	Upper Lackanalooha, Lackanalooha TD, Mallow, Co. Cork	200m
Permission	X 555360 Y 599181	2018	177205	Conditional	Application Finalised	Construction of dwelling house and associated services on lands which are adjacent to existing dwelling and construction of new vehicular entrance to existing dwelling.	No. 8 The Alders, Lackanalooha, Mallow, Co. Cork	250m

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description	Address	Distance from Project
Permission	X 555276 Y 598845	2020	206152	Conditional	Application Finalised	The development will consist of replacing approximately 155m of existing 2.4m high chainlink fence and associated access/emergency gates with 155m of new 2.4m high green palisade security fencing/gates and all associated site work at an existing above ground natural gas installation.	Ballyclough AGI (Above Ground Installation), West End, Annabella, Mallow, Co. Cork	250m
Permission	X 555226 Y 598696	2016	166063	Conditional	Application Finalised	Installation of a 3m high 'lamp post' style relief vent stack servicing the existing below ground natural gas pressure reduction unit with all ancillary services and associated site works	Limerick Road DRIug, Limerick Road, Annabella, Mallow, Co. Cork	200m
Permission	X 555269 Y 598451	2020	204925	Conditional	Application Finalised	Development on a site which will consist of the demolition of part of the existing Co-Op store, and associated garden centre, agri store, and delivery yard, and the provision of an expanded Co-Op store, and associated part-covered garden centre, agri store and delivery yard; the refurbishment of Annabella Villas (Protected Structure Reg Nos. 70-71) (Unit 1) to provide a restaurant use at lower ground floor and ground floor, to include the sale of hot food for consumption off the premises, and offices on the first floor and second floor; repair works to the Coach Houses (Protected structure Reg No. 72); 7no. new units (Units 2-8) suitable for convenience retail/comparison retail/retail warehousing/restaurant/café use, with retail use to include the sale of alcohol for consumption off the premises, and restaurant/café use to include the sale of hot food for consumption off the premises. A glazed connection, for restaurant use, is proposed between the lower ground floor of Annabella Villas (Protected Structure Reg Nos. 70-71) (Unit 1) and Unit 2. The proposed development also provides for the demolition of part of the boundary wall fronting West End; public realm works on West End; car parking; cycle parking; signage; waste management areas; ESB substation; rooftop plant, including solar panels; and all site development, infrastructural and landscaping works, including modifications to the existing access off Park Road, and improved/new pedestrian connections on West End and Park Road. The northern part of the site is located within an Architectural Conservation Area (ACA-1). An Environmental Impact Assessment Report (EIAR) will be submitted to the Planning Authority with the application. A Natura Impact Statement (NIS) will be submitted to the Planning Authority with the application.	West End and Park Road, Annabella, Mallow, Co. Cork	150m
Retention	X 531940 Y 597374	2018	185465	Conditional	Application Finalised	Retain extension as constructed to the rear of existing dwelling house including all associated siteworks.	Dromahoe, Dromagh, Mallow, Co. Cork	200m
Permission	X 532105 Y 597198	2018	176611	Conditional	Application Finalised	Construction of a split level, single and two storey dwelling with garage/shed, new site entrance and all associated site works.	Black Road Cross, Dromahoe, Dromagh, Mallow, Co. Cork	200m

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description	Address	Distance from Project
Permission	X 530592 Y 596027	2017	175147	Conditional	Application Finalised	Retention of: a) dwelling and attached garage as constructed (previous Reg. No. 1005/67), b) domestic garage/fuel shed, c) entrance and d) altered site boundaries and Permission for installation of wastewater treatment unit	Garrane North, Killetragh, Dromagh, Mallow, Co. Cork	100m
Permission	X 528622 Y 591868	2020	205904	Conditional	Application Finalised	To construct new public footpath & all associated services & site works (from Drishane Castle entrance to the Coole crossroads).	Drishane More, Millstreet, Co. Cork	100m
Retention	X 528236 Y 591461	2020	205553	Conditional	Application Finalised	To retain dwellinghouse and domestic garage as constructed and all associated site works.	Drishane More, Millstreet, Co. Cork	100m
Permission	X 527807 Y 590337	2018	176769	Conditional	Application Finalised	Construction of a new two storey warehouse with covered canopy consisting of storage space for medical equipment, staff use, repair workshop and a toilet with all associated site works and services including minor amendments to existing site entrance and minor boundary treatments, an area for recycling bins, additional on-site parking and all associated site works for O Flynn Medical Facility.	O Flynn Medical Facility, Liscahane, Millstreet, Co. Cork	250m
Permission	X 527813 Y 590339	2017	175297	Conditional	Application Finalised	Construction of single storey detached lightweight storage shed to rear of existing building(for storage of medical equipment) for O'Flynn Medical.	Liscahane, Millstreet, Co. Cork	250m
Permission	X 528771 Y 589661	2016	164469	Conditional	Application Finalised	To construct new single storey dwelling, domestic garage, site entrance, sewerage treatment system and all associated site works.	Tullig, Millstreet, Co. Cork	200m
Permission	X 529590 Y 589493	2017	174607	Conditional	Application Finalised	Retention and completion of dormer dwelling including all ancillary works and Permission for the construction of domestic garage, entrance and installation of septic tank and percolation area	Tullig, Millstreet, Co. Cork	150m
Permission	X 529817 Y 589221	2019	194280	Conditional	Application Finalised	Construct a new dwelling house.	Tullig, Millstreet, Co. Cork	200m
Permission	X 532240 Y 587390	2021	214764	Conditional	Application Finalised	Two storey extension to rear of existing dwelling, façade alterations, demolition of existing shed, construction of new domestic garage, completion of road boundary wall, sewerage upgrade works and all associated works.	Aubane, Tullig, Millstreet, Co. Cork	200m

Biodiversity Enhancement and Management Lands (BEMP lands)

Applications within 250m of the BEMP lands over the past 5 years.

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description	Address	Distance from Project
Permission	X 538415 Y 578213	2015	155424	Conditional	Application Finalised	Solar PV Panel array consisting of up to 33,000sq.metres of solar panels on ground mounted steel frames, 2 No. electrical control cabins, 5 No. inverter units, underground cable ducts,	Knockglass and Kilberrihert, Coachford, Co. Cork	100m
Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description	Address	Distance from Project
-----------------------	----------------------	------	------------------------------	-------------	--------------------------	---	--	--------------------------
						hardstanding area, boundary security fence, site entrances, access tracks, CCTV and all associated site works.		
Extension of Duration	X 538415 Y 578213	2021	215941	Conditional	Application Finalised	Solar PV Panel array consisting of up to 33,000sq.metres of solar panels on ground mounted steel frames, 2 no. electrical control cabins, 5 no. inverter units, underground cable ducts, hardstanding area, boundary security fence, site entrances, access tracks, CCTV and all associated site works Extension of duration of permission granted under Planning Reference: 15/5424, An Bord Pleanala Appeal reference: PL04.245862.	Knockglass and Kilberrihert, Coachford, Co. Cork	100m
Permission	X 539064 Y 578240	2014	145772	Conditional	Application Finalised	Construction of two-storey front extension to dwelling house, construction of side extension to existing dwelling house together with elevational changes to the existing dwelling house, demolition of existing outhouses, installation of new septic tank and percolation area and alterations to existing entrance	Laharankeal Rusheen Co.Cork	200m
Permission	X 539318 Y 578573	2021	216883		New Application	The construction of new dwellinghouse, domestic garage, new entrance, waste water treatment system together with all other ancillary site works.	Leadawillin and , Carriganish, Coachford, Co. Cork	50m
Permission	X 538909 Y 578744	2018	185020	Conditional	Application Finalised	Construct, 1) cow cubicle house with feed passage & slatted tanks, 2) milking parlour & dairy, 3) loose house, 4) cow collecting yard, drafting area and cattle pens, 5) open silo and 6) farm roadway. All to be carried out in conjunction with all associated site works	Cahernafulla, Kilberrihert, Coachford, Co. Cork	0m
Permission	X 539074 Y 579363	2012	125073	Conditional	Application Finalised	Construction of dwelling and domestic garage and associated site works	Dooneens, Rylane, Co. Cork	50m
Permission	X 539166 Y 580047	2012	124442	Conditional	Application Finalised	Construction of slatted house with underground tank	Dooneens, Rylane, Co. Cork	100m
Permission	X 539166 Y 580047	2021	214824	Conditional	Application Finalised	Construction of slatted house with underground effluent tank and all associated site works.	Dooneens, Rylane, Co. Cork	100m
Permission	X 535938 Y 578287	2017	174546	Conditional	Application Finalised	Retention of existing as built dwellinghouse and site boundaries to that permitted under planning ref: No. 13/6305	Caherbaroul, Macroom, Co. Cork	20m
Permission	X 536344 Y 578535	2019	194192	Conditional	Application Finalised	Construction of a single storey dwellinghouse and a single storey detached garage including all associated site works, drainage works and associated landscaping	Caherbaroul, Macroom, Co. Cork	20m
Permission	X 534652 Y 582436	2021	216635	Conditional	Application Finalised	New single storey and two storey extension to side of existing two storey dwelling, new sewerage system upgrade to existing system and all associated works.	Horsemount, Knocknagappul, Ballinagree, Macroom, Co. Cork	200m
Permission	X 535551 Y 583216	2021	214476	Conditional	Application Finalised	The continued use of an existing, temporary lattice type meteorological mast, 80m in height. The structure is fixed to ground mounted anchors by guy wires and includes associated instruments to measure local meteorological conditions. Permission is sought for a period of 5 years.	Ballynagree West, Macroom, Co. Cork	250m

#### Wind Farm Main Site

Application within 2km over last 5 years.

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description	Address	Distance from Project
Permission	X 537731 Y 582531	2018	185683	Granted	Application Finalised	Construct a dwellinghouse, detached domestic garage, on site sewerage treatment and all associated site works	Carrigagulla, Ballinagree, Co. Cork	0.15km
Permission	X 537732 Y 582531	2021	214315	Granted	Application Finalised	To construct a dwelling house (change of plan from that permitted under Planning Reg No.: 18/5683), detached domestic garage, on site sewerage treatment and all associated site works	Carrigagulla, Ballinagree, Co. Cork	0.2km
Permission	X 534992 Y 581829	2016	166235	Granted	Application Finalised	Construction of dwellinghouse, domestic garage, new entrance and all associated site works.	Knocknagcapall, Ballinagree, Macroom, Co.Cork	0.3km
Permission	X 536169 Y 581502	2017	175008	Granted	Application Finalised	Construction of dwellinghouse, domestic garage and new entrance together with all other ancillary site works	Ballynagree West, Macroom, Co. Cork	0.5km
Permission	X 537745 Y 581447	2020	204627	Granted	Application Finalised	Permission for retention of bungalow as constructed, change of plan and elevations from that permitted on site under Planning Reg. No. 1455/64; (2) permission for demolition of existing ancillary domestic structures on site (51sqm) and demolition of existing chimney stack serving dwelling; (3) permission for the construction of new extension to side of existing dwelling; (4) permission for the construction of new front entrance porch; (5) permission for the construction of new extension, served by link, to rear of existing dwelling to accommodate new domestic garage and utilities spaces; (6) to carry out minor alterations to existing elevations and; (7) all associated site works.	Dooneens, Rylane, Co. Cork	0.7km
Permission	X 537654 Y 587792	2016	166837	Granted	Application Finalised	Permission for the construction of an extension to the existing 110kv electricity substation and Retention of existing development. The proposed works for which Permission is sought will involve the construction of new palisade fencing, bunded concrete plinth, power filter cabinet, transformer, access track and all associated site works. The development for which Retention is sought constitutes ground levelling, 2 no. storage containers, minor re-location of control building and security fence, access road, drainage and all associated works	Crinnaloo South, Millstreet, Co. Cork	0.75km
Permission	X 537622 Y 587819	2018	184256	Granted	Application Finalised	Construction of an extension to existing 110kv electricity substation. The proposed works for which planning permission is sought will involve the construction of new palisade fencing, bunded concrete plinths, 4no. battery storage units, transformers, control cabin, access track and all associated site works.	Crinnaloo South, Millstreet, Co. Cork	0.75km
Permission	X 537702 Y 587850	2018	186562	Granted	Application Finalised	An extension to the permitted solar photovoltaic (PV) array permitted by Cork County Council (planning reference 16/5455). The development will consist of; 1) up to 41,600 m2	Carragraigue, Inchamay North and Crinnaloo South Co. Cork	0.75km

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description	Address	Distance from Project
						of solar panels on ground mounted steel frames, internal underground cables & ducts, up to 5 no. inverter units, boundary security fence, CCTV and landscaping; 2) underground electrical grid connection cabling and ducting connecting the permitted onsite control cabin (planning reference 16/5455) to the national grid at Boggeragh Substation in the townland of Crinnaloo South, Co. Cork and 3) all associated ancillary works. A Natura Impact Statement (NIS) accompanies this application.		
Permission	X 536333 Y 581081	2016	166924	n/a	Incomplete Application	Construction of (1) Playground and associated walkway, (2) New vehicular and pedestrian entrance to proposed development, (3) New public footpath and all associated services and site works (from existing footpath at Saint John's Drive to proposed new entrance), (4) Construction of car park on site of proposed development	Ballynagree West, Co. Cork	0.85km
Permission	X 536333 Y 581065	2017	175641	Granted	Application Finalised	<ol> <li>Construction of playground and associated walkway, 2) New vehicular and pedestrian entrance to proposed development,</li> <li>New public footpath and all associated services and site works (from existing footpath at Saint John's Drive to proposed new entrance) and 4) Construction of a car park on site of proposed development.</li> </ol>	Ballynagree West, Macroom, Co. Cork	0.85km
Permission	X 536295 Y 580915	2018	185664	Granted	Application Finalised	1) Retention of dwelling house, garage and entrance as constructed, 2) Permission to rectify site boundaries, 3) Permission to construct 2 no. extensions to existing dwelling.	Ballynagree West, Macroom, Co. Cork	0.9km
Permission	X 536451 Y 581027	2019	196531	Granted	Application Finalised	(a) Construct a single storey resource classroom on to the western elevation of the existing school building and (b) associated siteworks.	Ballynagree West, Co. Cork	1km
Permission	X 534550 Y 581257	2019	196751	Granted	Application Finalised	The demolition of out building and the single storey annex to the rear (north-west) and side (south-west) of an existing dwelling and for a) the construction of a two storey extension to the rear (north-west) and side (south-west) of the dwelling house b) removal of the existing roof and construction of a new roof at a higher level c) various elevational changes to the existing dwelling d) decommissioning of existing septic tank and installation of a secondary waste water treatment unit and polishing filter and all ancillary and necessary site works to complete the development.	Rahalisk, Ballinagree, Co. Cork	1km
Permission	X 533672 Y 582193	2020	205744	Granted	Application Finalised	To construct a new dwelling house.	Maulnahorna, Carriganima, Macroom, Co. Cork	1km
Permission	X 537652 Y 580838	2016	164804	Granted	Application Finalised	Permission for domestic garage to serve 2-storey dwelling and all associated site works	Lyroe, Rylane, Co. Cork	1.2km
Permission	X 536144 Y 580729	2016	166583	Granted	Application Finalised	The construction of a part 2 storey and part 1 1/2 storey dwellinghouse with a detached garage, construction of a new vehicular entrance, installation of a sewerage treatment plant	Ballynagree West, Macroom, Co. Cork	1.2km

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description	Address	Distance from Project
						and soil polishing filter, all necessary landscaping and ancillary site works		
Permission	X 533366 Y 582516	2021	215535	Granted	Decision Made	To demolish existing sun room on western side of existing dwelling house and construct new extensions to the northern and western sides of existing dwelling house along with all associated site works.	Moulnahorna, Carriganima, Macroom, Co. Cork	1.2km
Permission	X 534402 Y 581113	2020	206924	Granted	Application Finalised	Permission for new two storey dwelling, sewerage system and all associated works.	Rahalisk, Ballinagree, Co. Cork	1.2km
Extension of Duration	X 537655 Y 580836	2020	204243	Granted	Unconditional	Construction of a two storey dwelling, site entrance, sewerage treatment system and all associated site works. Extension of Duration to Permission granted under Planning Ref. No 15/05633	Lyroe, Rylane, Co. Cork	1.2km
Permission	X 536487 Y 580442	2020	206065	Granted	Application Finalised	Permission for new two storey dwelling, domestic garage, sewerage system and all associated works.	Ballinagree West, Ballinagree, Macroom, Co. Cork	1.4km
Permission	X 536359 Y 580264	2020	204766	Granted	Application Finalised	Construct cubicle house with underground effluent tanks, feeding passage, calf house, dairy, store, milking parlour and holding yard, walled silage pit and all associated site works	Ballinagree West, Macroom, Co. Cork	1.5km
Permission	X 536348 Y 580268	2020	204766	Granted	Application Finalised	Construct cubicle house with underground effluent tanks, feeding passage, calf house, dairy, store, milking parlour and holding yard, walled silage pit and all associated site works	Ballinagree West, Macroom, Co. Cork	1.5km
Permission	X 536348 Y 580268	2019	196648	n/a	Incomplete Application	To construct cubicle house with underground effluent tank, feeding passage, calf house, dairy store, milking parlour and holding yard, walled silage pit and all associated site works.	Ballynagree West, Macroom, Co. Cork	1.5km
Permission	X 536348 Y 580268	2019	196809	Refused	Decision made	To construct cubicle house with underground effluent tank, feeding passage, calf house, dairy store, milking parlour and holding yard, walled silage pit and all associated site works	Ballynagree West, Macroom, Co. Cork	1.5km
Permission	X 539353 Y 583112	2020	204992	Granted	Application Finalised	A sunroom extension to the front of the existing dwelling.	Annagannihy, Rylane, Co. Cork	1.5km
Permission	X 532205 Y587321	2019	196765	Granted	Application Finalised	To construct slatted house and all associated site works	Aubane Upper Tullig, Millstreet, Co. Cork	1.7km
Permission	X 532242 Y 587389	2021	214764	Granted	Application Finalised	Two storey extension to rear of existing dwelling, façade alterations, demolition of existing shed, construction of new domestic garage, completion of road boundary wall, sewerage upgrade works and all associated works.	Aubane, Tullig, Millstreet, Co. Cork	1.8km
Extension of Duration	X 535413 Y 579991	2019	194044	Unconditional	Application Finalised	Construction of dwellinghouse, domestic garage and associated site works.	Knocknagcapall, Ballinagree, Macroom, Co. Cork	2km
Permission	X 535391 Y 579959	2019	195313	Granted	Application Finalised	Construction of dwellinghouse and a domestic outbuilding plus site and ancillary works	Knocknagcapall, Ballinagree, Macroom, Co. Cork	2km
Permission	X 535580 Y 588749	2018	185505	Granted	Application Finalised	Construct a dwellinghouse	Carrigduff, Rathcoole, Mallow, Co. Cork	2km

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description	Address	Distance from Project
Permission	X 535745 Y 588905	2017	176552	Refused	Application Finalised	A storey and a half type dwelling, domestic garage and septic tank.	Carrigduff, Rathcoole, Mallow, Co. Cork	2km
Permission	X 532779 Y 588192	2019	194664	Granted	Application Finalised	Removal of existing external timber facade on all elevations of dwelling and replace with masonry block and plaster (b) Installation of two no. doors to replace windows and one no. window (c) Convert the existing attic /storage area into a habitable space with 2 no. bedrooms, 1 no. bathroom, 1 office / storage area and (d) Raising of the existing chimney.	Brookpark, Rathcool, Mallow, Co. Cork	2km
Permission	X 530949 Y 587725	2020	205254	Conditional	Decision made	the construction of silage walls on an existing silage slab and all associated site works	Tullig, Millstreet, Cork	3km
Permission	X 530686 Y 587618	2020	204152	Granted	Application Finalised	To construct a new dwelling house.	Tullig, Millstreet, Cork	3km
Permission	X 536372 Y 580969	2020	205301	Granted	Application Finalised	(A) Extensions and alterations to an existing dwelling house including, a porch to the front, a sunroom to the south side, roof windows to the rear roof and attic storage areas, and (B) to construct a detached domestic garage to the rear of the existing dwelling house and all associated site works.	Ballinagree West, Macroom, Co. Cork	0.8km
Permission	X 534134 Y 582345	2021	216700	n/a	Further Information	The following works to existing agricultural barn, 1) convert barn to residential dwelling at ground floor and partial first floor, 2) indoor storage area, 3) outdoor covered area, 4) external façade alterations to suit residential dwelling, 5) new sewerage system, 6) improvement works to existing site entrance and 7) all associated works.	Rahalisk, Ballinagree, Macroom, Co. Cork	0.4km
Extension of Duration	X 534970 Y 581859	2021	216528	n/a	Incomplete Application	Construction of dwellinghouse, domestic garage, new entrance and all associated site works Extension of Duration to Permission granted under Planning Ref. No.16/6235	Knocknagappul, Ballinagree, Macroom, Co. Cork	0.3km
Permission	X 533366 Y 582467	2021	215535	Granted	Application Finalised	To demolish existing sun room on western side of existing dwelling house and construct new extensions to the northern and western sides of existing dwelling house along with all associated site works.	Moulnahorna, Maulnahorna, Carriganima, Macroom, Co. Cork	1km
Permission	X 534893 Y 588705	2016	164334	Granted	Application Finalised	Construction of an animal house incorporating slatted and straw bedded areas, feed passages and associated works	Horsemount Mountain, Kilcorney, Mallow, Co. Cork	2.1km
Permission	X 534646 Y 582431	2021	216635	Conditional	Decision made	New single storey and two storey extension to side of existing two storey dwelling, new sewerage system upgrade to existing system and all associated works.	Horsemount, Knocknagappul, Ballinagree, Macroom, Co. Cork	0.23km

#### Wind Farm Site

Large developments within 20km over the past ten years

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description	Address	Distance from Project
Permission	X 537718 Y 587863	2018	186562	Conditional	Finalised	An extension to the permitted solar photovoltaic (PV) array permitted by Cork County Council (planning reference 16/5455). The development will consist of; 1) up to 41,600 m2 of solar panels on ground mounted steel frames, internal underground cables & ducts, up to 5 no. inverter units, boundary security fence, CCTV and landscaping; 2) underground electrical grid connection cabling and ducting connecting the permitted onsite control cabin (planning reference 16/5455) to the national grid at Boggeragh Substation in the townland of Crinnaloo South, Co. Cork and 3) all associated ancillary works. A Natura Impact Statement (NIS) accompanies this application.	Carragraigue, Inchamay North and Crinnaloo South, Near Rathcool, Co. Cork	<1km
Permission	X 538192 Y 579565	2016	164329	Conditional	Finalised	Continuance of use for existing 30m telecommunications structure, carrying associated telecommunications equipment, associated cabinets, including existing access track (as per Planning Ref: 09/6214), and Permission for additional telecommunications equipment and cabinet, all within existing secure compound. The development will continue to form part of existing 3G Broadband Network	Dooneens, Rylane, Co. Cork	1.1km
Permission	X 537672 Y 587863	2018	186562	Conditional	Application Finalised	An extension to the permitted solar photovoltaic (PV) array permitted by Cork County Council (planning reference 16/5455). The development will consist of; 1) up to 41,600 m2 of solar panels on ground mounted steel frames, internal underground cables & ducts, up to 5 no. inverter units, boundary security fence, CCTV and landscaping; 2) underground electrical grid connection cabling and ducting connecting the permitted onsite control cabin (planning reference 16/5455) to the national grid at Boggeragh Substation in the townland of Crinnaloo South, Co. Cork and 3) all associated ancillary works. A Natura Impact Statement (NIS) accompanies this application.	Carragraigue, Inchamay North, Crinnaloo South near Rathcool, Co. Cork	1.2km
Permission	X 526690 Y 587640	2016	167216	Conditional	Finalised	Permission for the development associated with the uprate of a section of the existing Clashavoon to Tarbert 220kV overhead line. The proposed development pertains to the length of existing overhead line between mast structure number 63 ( south-east of the Knockanure 220kV substation, Co. Kerry) and mast structure number 233 (north of the existing Ballyvouskill 220kV substation, Co. Cork). The overall length of this section of overhead line is approximately 60.4 km, of which 21.2 km is located in Co. Cork and 39.2 km is located in Co. Kerry. The proposed development in County Cork, between the Cork- Kerry county boundary north-west of mast structure number 173 and mast structure number 233, is located in the	Glencollins Upper,, Lackanastooka, Tooreenglanahee, Meentyflugh, Knock, Cloghboola More,, Co. Cork	5.3km

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description
						townlands of Glencollins Upper, Lackanastooka, Tooreenglanahee, Meentyflugh, Knockeenadallane, Doonasleen North, Doonasleen South, Doonasleen East, Ummeraboy East, Glantane More, Knockduff Upper, Knockduff Lower, Mullaghroe North, Derragh, Knockane, Lislehane, Lissaniska, Ahane Beg, Coolykeerane, Shanaknock, Claraghatlea North, Claragh More, Inchileigh, Mountleader, Geararoe and Cloghboola More. The proposed development in Co. Cork comprises of the renewal and alteration of a total of 61 existing mast structures, including foundation upgrade works and restringing of the existing overhead line with new conductor. The proposed development also includes all associated and ancillary works including, comprising or relating to permanent and temporary construction and excavation, involving construction of temporary guard poles, the construction and reinstatement of temporary entrances, widening of existing entrances, temporary silt fencing, temporary silt traps, temporary culverts, temporary clear span bridging, and the clearance of vegetation at various locations along the route to facilitate the proposed principle development. The proposed development will be facilitated by the storage of construction materials and associated and ancillary activities, at existing hard-standing yards. These 6 yards (2 in Co. Cork and 4 in Co. Kerry) are located in the vicinity of the overhead line, in the townlands of Lislehane and Liscahane. No works or change of use, are proposed in theses existing yards and as such they do not form part of the proposed development. A Natura Impact Statement (NIS) accompanies this application.
Permission	X 538174 Y 577927	2015	155424	Conditional	Application Finalised	Solar PV Panel array consisting of up to 33,000sq.metres of solar panels on ground mounted steel frames, 2 No. electrical control cabins, 5 No. inverter units, underground cable ducts, hardstanding area, boundary security fence, site entrances, access tracks, CCTV and all associated site works.
Permission	X 537238 Y 591877	2016	165455	Conditional	Application Finalised	Permission for the development of a solar photovoltaic panel array consisting of up to 33,000sq.m of solar panels on ground mounted steel frames, 2 no. electricity control cabins, 4 no. inverter units, underground cable and ducts, hardstanding area, boundary security fence, new entrance onto public road, CCTV and all associated site services and works. Planning permission is sought for a period of 10 years. A Natura Impact Assessment (NIS) accompanies this application.
Permission	X 526185 Y 584281	2018	185686	Conditional	Finalised	Construction of a battery storage compound including 2 no. battery storage buildings with associated plant and equipment, an ancillary 110kV electricity substation with 2 no. control buildings, associated electrical plant & equipment and fencing,

Address	Distance from Project
Knockglass & Kilberrihert, Coachford, Co. Cork	5km
Carragraigue, Rathcool, Co. Cork	5.5km
Caherdowney, Millstreet, Co. Cork	5.6km

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description
						underground electricity cabling, surface water drainage, site entrance and access track, security fencing and all ancillary site works.
Permission	X 526045 Y 584081	2018	186438	Conditional	Finalised	The proposed development will comprise the construction of one (1) no. ± 100 Mvar STATCOM transformer, one (1) no. auxiliary transformer, three (3) no. reactors, one (1) no. outdoor cooling bank, control and valve building (268m <sup>2</sup> ), underground connection to existing ESB substation. It further includes security fencing, security gate, four (4) no. 25m high lightning masts, permeable surfacing, and an internal access road. There will also be the construction of one (1) no. temporary contractors' compound. The development is an extension to the existing substation and the overall site area (within the planning application boundary) is 0.73ha. Access is provided via a local road (L5226) onto the R582.
Permission	X 526032 Y 584075	2020	205281	Conditional	Finalised	Proposed modifications to the previously permitted development (planning ref: 18/06438 granted on 7th March 2019). The proposed modifications will comprise the additional construction of one (1) harmonic filter, one (1) HV circuit breaker (including CT and VT), one (1) MV disconnector and earth switch, two (2) cable sealing ends, three (3) additional lightning masts (approximately 25m high) and additional lamppost lightning. It further includes a retaining wall (approximately 2.5m high), asphalt (non-permeable) surfacing, additional permanent access road, additional fencing to match existing 2.6m high palisade, additional permanent access gate and all other ancillary site development works. The development will remain an extension to the existing substation and this extension will have an overall site area (within the planning application boundary) of 0.73ha. Access will continue to be provided via a L5226 and the R582.
Permission	X 525800 Y 584186	2018	184182	Conditional	Finalised	A battery energy storage facility which will comprise of rechargeable battery units contained within up to 39 No. 40 foot containers on site and the associated development of unit substations, a 110 kV substation, security fencing, security cameras, lightning mast, new site roads and the upgrading of the existing vehicular access. The facility will connect into the adjoining Ballyvouskill ESB substation via underground cable. All associated site development, landscaping and boundary treatment works above and below ground.
Permission	X 525784 Y 584185	2018	184182	Conditional	Finalised	A battery energy storage facility which will comprise of rechargeable battery units contained within up to 39 No. 40 foot containers on site and the associated development of unit substations, a 110 kV substation, security fencing, security cameras, lightning mast, new site roads and the upgrading of the existing vehicular access. The facility will connect into the adjoining Ballyvouskill ESB substation via underground cable.

Address	Distance from Project
Caherdowney, Millstreet	5.8km
Existing ESB Ballyvouskill 220/110 kV substation, Located in the townland of , Caherdowney, Millstreet, Co. Cork	5.8km
Caherdowney, Millstreet, Co. Cork	5.8km
Caherdowney, Millstreet, Co. Cork	5.9km

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description	Address	Distance from Project
						All associated site development, landscaping and boundary treatment works above and below ground.		
Permission	X 543945 Y 591617	2011	115276	Conditional	Application Finalised	Windfarm to consist of [a] the provision of a total of 12 no. wind turbines with a maximum ground to top blade tip height of up to 126 metres, [b] upgrading of existing and provision of new internal access roads, [c] provision of a wind anemometry mast (85 metres in height), [d] 2 no. borrow pits, [e] an electricity sub-station with control room (as previously approved under Planning Reg. No. 11/4242), and [f] associated equipment and all ancillary site and facilitating works to existing road junctions.	Esk North, Esk South, Derrygowna, Monanveel, Glanminnane, Millstreet/Mallow	6km
Permission	X 544258 Y 591425	2014	145602	Conditional	Application Finalised	Permission for wind farm comprising the provision of a total of 14no. Wind turbines with a maximum overall blade tip height pf up to 136.5m, upgrading of existing and provision of new internal access roads, provision of a wind anemometry mast (height up to 90m), 4no. borrow pits, an electricity substation with control room and associated equipment, underground electricity connection cabling, 3no. temporary construction compounds, and all ancillary site works including the upgrading of site access junctions.	Derrygowna, Esk North, Esk South, Garrane, Glandine, Glannaharee East, Glannaharee West, Glanminnane, Knockavaddra, Monanveel, Co. Cork	6km
Permission	X 526153 Y 584281	2018	185686	Conditional	Application Finalised	Construction of a battery storage compound including 2 no. battery storage buildings with associated plant and equipment, an ancillary 110kV electricity substation with 2 no. control buildings, associated electrical plant & equipment and fencing, underground electricity cabling, surface water drainage, site entrance and access track, security fencing and all ancillary site works.	Caherdowney, Millstreet, Co. Cork	7km
Permission	X 527305 Y 590995	2017	174490	Conditional	Application Finalised	The upgrading/replacement and extending of the existing waste water treatment plant and installation of a new outfall pipe. The upgrading/replacement includes the extending of the existing Wastewater Treatment Plant (WWTP) from a capacity of 1,600 population equivalents to 2,210 population equivalents. The development includes the construction of a control building, extended access road, improvements to gates and fencing, new preliminary treatment works (including screening, grit removal and storm water storage), new secondary treatment tanks, chemical dosing tanks, sludge handling facilities and tanks, pipework, mechanical and electrical plant, landscaping and associated ancillary works at the site. A new underground treated effluent outfall pipeline to the River Finnow, approximately 1.3km to the North West of the existing plant, laid along Station Road (L1115). The demolition/disposal of the existing settlement tanks, sludge beds and tanks, control building, chemical storage and reinstatement of the area is to be included in the development. The existing oxidation ditch will be retained for future use. A	Millstreet Waste Water Treatment Plant, Station Road (Drominahilla and Coomlogane), Millstreet, Co. Cork	7km

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description	Address	Distance from Project
						Natura Impact Statement will be submitted as part of this planning application.		
Permission	X 545881 Y 588506	2013	135576	Conditional	Application Finalised	The upgrading and widening of an existing forestry road (1.67km in length) and its public road entrance and existing track way (362m in length) to provide an alternative means of access for construction and maintenance to the wind farm development that has been previously granted planning permission under Pl. Ref. 10/08067.	Glandine and Glannaharee East, Bweeng, Mallow	8km
Permission	X 543236 Y 573437	2020	206446	Pending	Appealed	Permission for the development of a small-scale quarry with the extraction of rock using ripping and rock breaker and the on-site crushing and screening with mobile plant, and open storage of crushed rock. The installation and use of a mobile wheel wash and the continued use of the site access road, facility entrance from regional road R618, continued use of the existing weighbridge office, welfare facilities and existing septic tank and percolation area. The extraction of rock will extend to an area of 2.15 hectares. Following extraction, the site will be restored using stripped overburden, an eight-year quarry lifespan is sought.	Former O'Regan Precast Quarry, Carhoo Lower and Coolnagearagh townlands, Coachford, Co. Cork	9.1km
Permission	X 543427 Y 573582	2020	204969	Conditional	Finalised	Importation of soil and stone for the restoration of a quarry in order to improve the agricultural output of the quarry and return it to an agricultural field.	Carhoo Lower, Coachford, Co. Cork	9.4km
Permission	X 523145 Y 585297	2013	135717	Conditional	Application Finalised	Ten year planning permission for an extension to existing Gneeves Wind Farm (Planning Refs. 99/0616, 03/6585, 04/1355, 04/0188, 08/5636, 13/4566). The proposed extension will comprise of 3no. turbines (each with a maximum tip height of 91m), a borrow pit, new internal access roads, upgrading of existing internal access roads, underground cables, an extension to the existing substation building with a wastewater holding tank and ancillary work	Gneeves, near Millstreet, Co.Cork	9.5km
Permission	X 542139 Y 596621	2015	156515	Conditional	Application Finalised	Continuance of use for existing 27m telecommunications structure, with antennas fixed to the top, giving overall height of 29.8m, carrying associated telecommunications equipment, associated cabinets, including existing access track (as per planning ref: 08/10152), and permission for additional telecommunications equipment and cabinet, all within existing secure compound. The development will continue to form part of existing 3G broadband network	Curraghrour East , Banteer, Co. Cork	9.8km
Permission	X 535938 Y 570659	2013	134021	Conditional	Appealed	(a) Permission for retention of the temporary construction entrance and ancillary works, and permission for replacement of the original 3.5m wide gate with a 4m wide double leaf gate and associated ancillary works, (b) Permission for c. 20m of 1.8m high 358 type mesh fencing and 4m wide double leaf gate at entry to ESB lands, (c) Permission for c.77m of 1.8m high 358 type mesh fencing, (d) Permission for retention of c.66m of temporary fencing 1.8m high (palisade) attached to	ESB Hydro Lands, Coolcour, Macroom, Co. Cork	9.9km

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description	Address	Distance from Project
						concrete bollard and permission for associated planting scheme, (e) Permission for retention of c.109m of existing bollard arrangement and permission to replace the temporary mesh fencing with 1.8m high 358 type mesh fencing and associated planting scheme, and (f) Permission to erect c.25m of 1.8m high 358 type mesh fencing and permission to replace a section of existing 1.2m high chain-link fence and gate with 1.2m high supreme type mesh fence and gate.		
Permission	X 526349 Y 597850	2017	174308	Conditional	Finalised	Construction and operation of a Solar PV development consisting of photovoltaic panels on ground mounted frames within a site area of up to 32.2ha to include two single storey electrical substation cabins, 26 single storey electrical inverter/transformer stations, battery units and storage units, CCTV cameras, access tracks, fencing and associated electrical cabling and ancillary site works and infrastructure.	Knocknacarracoosh, Meenskeha West, Cullen, Co. Cork	11.2km
Extension of Duration	X 546191 Y 603235	2016	164186	Pending	New Application	Redevelopment of Ballygiblin Manor, stables, orangery and Stewards House into a 40 no. bed hotel and spa with associated ancillary dining, 18-hole golf course to include artificial lake, golf clubhouse, golf academy, driving bays, cart storage, 16 no. holiday homes and 101 no. residential units, maintenance facility, installation of waste water treatment plant, foul storage tank, 3 no. pumping stations, water storage tank, 2 no. wells, provision of 573 no. parking spaces, landscaping and all associated site works and services – Extension of Duration of Permission granted under planning ref: 08/4403	Ballygiblin, Cecilstown, Co. Cork	12km
Permission	X 528741 Y 597977	2012	124940	Conditional	Application Finalised	Retirement of the existing station and the construction of a replacement station on a site adjacent to the existing station. The new works will include; 3 no. new containerised control and switchgear modules; 2 no. new bunded power transformers with oil interceptor; 2 no. new house transformers; new internal gravel road; new 1.4m high concrete post and rail boundary fence; new 2.6m high palisade compound fence and gates; new splayed entrance and associated site works.	ESB Cloonbannin, 38kV electrical transformer station, Cloonbannin West, Mallow	13km
Permission	X 521265 Y 576462	2019	196016	Conditional	Application Finalised	(i) upgrade of the existing underground Ballymakeera pumping station and replacement of above ground kiosk; (ii) creation of a new dedicated access to the pumping station site; (iii) decommissioning of an existing septic tank and gravity outfall pipe; and (iv) all ancillary development and associated temporary works including vehicle turning area, and perimeter fencing with access gate on to the public road.	Ballymakeery, Macroom, Co. Cork	13.5km
Permission	X 551892 Y 583876	2021	214715	Conditional	Application Finalised	An amendment to the development permitted pursuant to Cork County Council Planning Register Reference 09/4399 to increase the operational duration of the existing wind turbine	Pluckanes West, Donoughmore, Co. Cork	13.7km

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description	
						and all associated ancillary infrastructure from 20 years to 30 years from the date of full commissioning of the wind turbine.	
Extention of Duration	X 537714 Y 602868	2021	214724	N/A	Finalised	Construction of a new two-storey primary school with a total internal floor area of 3253sqm on a green field site, consisting of 16no. classrooms, a general purpose hall, library, support accommodation, a 3 no. classroom special needs unit/ASD unit and all ancillary works. This includes for the provision of 37no. on-site car parking spaces and 3 no. disabled parking spaces, vehicular access roads, set down area, pedestrian access pathways, ball courts, play areas, bin store, bicycle shelters, oil storage tank, new connection to existing foul drainage system, surface water drainage system with storm water attenuation connected to existing surface water network at entrance to Market Place. Diversion of on-site overhead electricity cables to underground, signage and landscaping, as part of the overall site development works on a site area of circa 2.389 hectares. The development also comprises a portion of a new link road with a priority junction off Mill Road - Extension of duration of permission granted under planning reference: 15/04230 - An Bord Pleanala reference : PL 04.245860	
Permission	X 520688 Y 577001	2018	185158	Conditional	Application Finalised	To construct 25 No. dwellinghouses (16 previously permitted under planning reference number 05/6890), consisting of 16 No. 4 bedroom semi detached houses, 8 No 3 bedroom semi detached houses, 1 No. 4 bedroom detached, public open space, extension to existing estate driveway and footpaths, extension of public lighting, foul and surface water sewers, attenuation system together with permission for 2 No. temporary construction entrances separate to the existing main entrance.	
Extension of Duration	X 520931 Y 576841	2014	146162	Unconditional	Finalised	a) Construction of an eighty-five bed residential nursing home with ancillary facilities and associated site works to service the development. (b) Demolition of exiting petrol station, shed and ancillary structures. (c) New entrance/exit and car parking facilities.	
Permission	X 537572 Y 600594	2016	164601	Conditional	Application Finalised	A 5 MW solar farm comprising approximately 22,200 photovoltaic panels on ground mounted frames within a site area of 12.23 hectares, 2 no. single storey inverter/transformer stations, 1 no. single storey delivery station, security fencing, CCTV and all associated ancillary development works	C
Permission	X 526532 Y 589817	2016	167216	Conditional	Application Finalised	Permission for the development associated with the uprate of a section of the existing Clashavoon to Tarbert 220kV overhead line. The proposed development pertains to the length of existing overhead line between mast structure	Т

Address	Distance from Project
Mill Road, Kanturk, Co. Cork	13.8km
Cluain Reidh Housing Development, Flats, Ballymakeera, Co. Cork	13.8km
Flats, Ballymakeera, Co. Cork	14km
Dromalour, Coolclogh, Kanturk, Co. Cork	14km
Glencollins Upper,, Lackanastooka, Tooreenglanahee, Meentyflugh,	15km

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description
						number 63 ( south-east of the Knockanure 220kV substation, Co. Kerry) and mast structure number 233 (north of the existing Ballyvouskill 220kV substation, Co. Cork). The overall length of this section of overhead line is approximately 60.4 km, of which 21.2 km is located in Co. Cork and 39.2 km is located in Co. Kerry. The proposed development in County Cork, between the Cork-Kerry county boundary north-west of mast structure number 173 and mast structure number 233, is located in the townlands of Glencollins Upper, Lackanastooka, Tooreenglanahee, Meentyflugh, Knockeenadallane, Doonasleen North, Doonasleen South, Doonasleen East, Ummeraboy East, Glantane More, Knockduff Upper, Knockduff Lower, Mullaghroe North, Derragh, Knockane, Lislehane, Lissaniska, Ahane Beg, Coolykeerane, Shanaknock, Claraghatlea North, Claragh More, Inchileigh, Mountleader, Geararoe and Cloghboola More. The proposed development in Co. Cork comprises of the renewal and alteration of a total of 61 existing mast structures, including foundation upgrade works and restringing of the existing overhead line with new conductor. The proposed development also includes all associated and ancillary works including, comprising or relating to permanent and temporary construction and excavation, involving construction of temporary access tracks, improvement and reinstatement of new temporary entrances, widening of existing entrances, temporary silt fencing, temporary silt traps, temporary culverts, temporary clear span bridging, and the clearance of vegetation at various locations along the route to facilitate the proposed principle development. The proposed development will be facilitated by the storage of construction materials and associated and ancillary activities, at existing hard-standing yards. These 6 yards (2 in Co. Cork and 4 in Co. Kerry) are located in the vicinity of the overhead line, in the townlands of Lislehane and Liscahane. No works or change of use, are proposed in theses existing yards and as such they do not form part of the propo
Permission	X 518233 Y 581524	2019	194972	Conditional	Application Finalised	a 7 turbine wind farm, solar photovoltaic array, electricity substation, battery storage compound and all associated works consisting of the following, i. Up to 7 wind turbines with an overall blade tip height of up to 150 metres and all associated foundations and hard-standing areas; ii. Up to 70,000sq.m solar photovoltaic array, with up to 17 associated inverters and 2 no. control cabins; iii. 1 no. borrow pit, iv. 1 No. permanent meteorological mast with a maximum height of up to 100 meters; v. Upgrade of existing and provision of

Address	Distance from Project
Knock, Cloghboola More, Co. Cork	
Slievereagh and Coomnaclohy, Ballyvourney, Co. Cork	15km

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description	
						new site access roads, vi. 1 no. 38kV electrical substation with 1 no. control building with welfare facilities, associated electrical plant and equipment security fencing and waste water holding tank; vii battery storage compound accommodating 4 no. battery storage containers, security fencing, and associated electrical plant and equipment, viii. Forestry felling ix. 1 no. temporary construction compound, x. Site drainage xi. All associated internal underground cabling; xii. 38kV underground grid connection cabling; xiii. All associated site development and ancillary works. The proposed development will have an operational life of 30 years from the date of commissioning of the development and the application seeks a ten year planning permission. An Environmental Impact Assessment Report (EIAR) and a Natura Impact Statement (NIS) have been prepared in respect of the proposed development.	
Permission	X 539546 Y 604845	2017	174334	Conditional	Finalised	Permission for (1) Retention of: (i) Alterations to viewing area to front of clubhouse, (ii) Gymnasium as constructed, (iii) Alterations to site levels of training pitch, (iv) 6 no. floodlights on steel columns to training pitch and (v) All-weather pitch as constructed, (2) Retention of (i) 3 no. floodlights on steel columns to main pitch to North of site and removal of same and (3) Construction of 6 no. floodlights attached to 18m high steel columns to main pitch and all ancillary site works.	
Permission	X 540489 Y 565560	2019	196847	Conditional	Appealed	A 5 MW solar farm comprising approximately 22,200 photovoltaic panels on ground mounted frames within a site area of 8.12 hectares, 2 no. single storey inverter / transformer stations, 1 no. single storey delivery station, security fencing, CCTV, and all associated ancillary development works.	G
Permission	X 544470 Y 566623	2020	205074	Conditional	Appealed	The development will consist of quarrying activities within the red line application area of 40.17ha of an existing permitted quarry (06/13499 and PL04.226347). Development is sought for a period of 20 years. The proposed development will comprise the extension of the existing quarry excavation area vertically by an additional 2 X 18m high benches from the current floor level of ca.4mAOD to -32mAOD and a deepening of the quarry sump from the current level of ca -22mAOD to - 36mAOD within the permitted extraction footprint area of 20.2ha. The proposed development will involve the stripping of overburden and its storage for use in environmental bunds and site restoration; the extraction of rock by means of blasting, the crushing and processing of rock. The proposed development will utilise the existing quarry infrastructure and other ancillaries to complete the works. An Environmental Impact Assessment Report and Natura Impact Statement will be submitted to the planning authority with this application.	

Address	Distance from Project
Knocknacolan, Kanturk, Co. Cork	15.8km
Cloghmacow, Crookstown, Co. Cork	15.8km
Castlemore Quarry, Crookstown, Co. Cork	16km

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description	Address	Distance from Project
Permission	X 537530 Y 603051	2021	214525		Further Information	1) Demolition of an existing dwelling. 2) Construction of 4 No. two storey semi detached dwellings. 3) Carrying out of all associated site works.	Mill Road, Kanturk, Co. Cork, (Corner of Mill Road and Percival Street)	16.1km
Permission	X 534433 Y 563844	2014	146760	Conditional	Application Finalised	The construction of six wind turbines, with a maximum tip height of up to 131m and associated turbine foundations and hardstanding areas, 1 no. permanent meteorological mast up to 90m in height, upgrade of existing and provision of new site tracks and associated drainage, new access junction and improvements to public road to facilitate turbine delivery, 1 no. borrow pit, underground electrical and communications cables, permanent signage and other associated ancillary infrastructure. This application is intended to replace the development already granted permission under PL04.219620 (05/5907) and subsequently extended under 11/6605. This application is seeking a 10-year planning permission. An Environmental Impact Statement and AA Screening Report have been prepared in respect of the planning application.	Lackareagh and Garranereagh, Lissarda and Barnadivane (Kneeves) Teerelton, Co. Cork	16.5km
Permission	X 520819 Y 570175	2016	156966	Conditional	Application Finalised	The proposed wind farm will comprise the provision of a total of 11 no. wind turbines with a maximum ground to blade tip height of up to 150m, upgrading of existing and provision of new internal access roads, provision of a wind anemometry mast (height up to 100 metres), 2 no. borrow pits, underground electrical cabling, underground grid connection electrical cabling including all associated infrastructure, junction accommodation works for the proposed turbine delivery route and provision of a temporary roadway to facilitate turbine component deliveries, 1 no. electricity sub- station with control building and associated equipment, 1 no. construction compound, upgrading of the existing site access junctions, permanent signage, and all ancillary site works. The proposed development comprises the redesign of a wind farm at this location previously considered by Cork County Council and An Bord Pleanála under pl. ref: 11/5245, and PL 04.240801 respectively.	Cloontycarthy, Cleanrath North, Cleanrath South, D, Rathgaskig, Derragh, Augeris, Gorteenakilla, Carri, Co. Cork	16.5km
Permission	X 535726 Y 605774	2021	206830	Conditional	Finalised	Revisions to a previously permitted horse-riding track and associated development under Reg. Ref. 17/4281 at an existing stud farm. The revisions consist of the occasional use of the site for nature / conservation visits by invited members of the public; addition of viewing points, safety fencing, kerbs and gates along the riding track; improved sightlines to the existing site access; provision of parking for 6 No. visitor cars and area for temporary portable toilet facilities for visiting days. All on site of approx. 3.9 hectares.	Meelaherragh, Kanturk, Co. Cork	16.6km
Permission	X 539361 Y 565919	2015	155590	Conditional	Application Finalised	Demolition of existing two storey/single storey building consisting of ground floor retail shop and overhead apartment, decommission and removal of existing petrol and diesel underground storage tanks and pump, demolition of existing farm buildings and removal of silage pit and slurry	Cloghmacow & Ballymichael, Kilmurry, Co. Cork	17km

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description
						tank and construction of 2 no. vehicular site entrances, new bin storage area and residential development of 23 no. detached dwellinghouses, 6 no. terraced dwellinghouses, 5 no. residential serviced sites and 23 no. domestic garages, new two storey building consisting of 1 no. ground floor retail unit and 3 no. first floor units for commercial/office/medical use and all associated site works, construction of (on a separate site to serve residential developments) a control kiosk, underground treatment unit and percolation area, new boundary fence and vehicular site entrance to serve same and all associated site works – Extension of duration of permission granted under planning reg no. 09/6122. An Bord Pleanála Reference: PL 04.237116
Permission	X 541634 Y 564446	2017	164783	Conditional	Finalised	A 5 MW solar farm comprising approximately 22,200 photovoltaic panels on ground mounted frames within a site area of 8.5 hectares, 2 no. single storey inverter/transformer stations, 1 no. single storey delivery station, security fencing, CCTV and all associated ancillary development works
Permission	X 547674 Y 603316	2019	195802	Conditional	Appealed	An extension to the existing limestone quarry and all associated site development and landscaping works in the townlands of Scart, Ballyclough, and Kilgilky South. The proposed extension is 5ha. to the east of the existing quarry and will be accessed via a new access road, to be constructed, to the west of the existing quarry, leading directly onto the L1201-57. The applicant is seeking a 15 year planning permission. The proposed development will include; (1) a change of extraction method to blasting; (2) crushing and screening of aggregates; (3) construction of the new access road and upon completion of this new access road, cessation of use of existing access onto the L5302-12 for quarrying activities; (4) installation of a prefabricated administration office and portable toilet; (5) parking area; (6) wheel wash; (7) weighbridge; (8) covered fuel storage area; (9) entrance signs; (10) lighting; (11) CCTV cameras; (12) a rainwater harvesting tank and (13) new overhead and underground power supply. An Environmental Impact Assessment Report (EIAR) will be submitted to the Planning Authority with the Planning Application. A Natura Impact Statement (EIS) will be submitted to the Planning Authority with the Planning Application
Permission	X 529994 Y 563986	2017	17185	Conditional	Finalised	Permission for the installation of a readymix concrete plant and associated siteworks
Extension of Duration	X 551614 Y 600266	2021	214498	Conditional	Finalised	A 5 MW solar farm comprising approximately 22,200 photovoltaic panels on ground mounted frames within a site area of 15.38 hectares, 2 no. single storey inverter/transformer stations, 1 no. single storey delivery station, security fencing, CCTV and all associated ancillary

Address	Distance from Project
Currabeha, Crookstown, Co. Cork	17.1km
Scart, Ballyclough and Kilgilky South, Cecilstown, Mallow, Co. Cork	17.2km
Carrigboy, Kilmichael, Macroom, Co. Cork	17.5km
Gortnagross, Mallow, Co. Cork	17.6km

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description
						development works Extension of duration of permission granted under planning reference: 15/7003
Permission	X 554822 Y 597043	2016	167121	Conditional	Finalised	The development of 14 no. serviced sites for future employment uses comprising 4 no. enterprise sites, 4 no. general industry sites, 6 no. sites for warehousing/distribution and all associated ancillary development works including vehicular entrance from the R638 access road network, separate pedestrian entrance from R620, services compound, foul and storm water drainage, water supply infrastructure (including fire fighting tank and potable water treatment station), 2 no. pump houses, ESB substation, landscaping and amenity areas.
Permission	X 532494 Y 607038	2016	164597	Conditional	Application Finalised	Upgrade to the existing waste water treatment plant (WWTP) with proposed plant including balance tank, anoxic, anaerobic and aeration tanks, proposed clarifier tank, Dissolved Air Flotation (DAF) plant, underground effluent pumping station, culverts, control room, filters and concrete plinths. The proposed development will include the demolition of the existing 11 meter bio-tower at the Newmarket Co-Operative Creameries Ltd facility in Newmarket town, Co Cork, within the townlands of Scarteen Lower, Garrannawarrig Upper, Park, Garrannawarrig Lower and Liscongill. Installation of an underground pumped pipeline to convey treated water from the facility to a discharge point on the River Dalua, 4 kilometers to the south east of the facility, utilizing the R576 road corridor, including all necessary pipeline connection, drainage and vent infrastructures. Intensification of use of the existing facility through an increase in the duration of the weekly and annual milk processing period at the Newmarket creamery resulting in an increase in milk processing up to a maximum of 80 million gallons per annum. These changes will be subject to an amendment by EPA, of the existing site Industrial Emissions Directive Licence. An Environmental Impact Statement and Natura Impact Statement accompany this planning application. The proposed development includes work to Allen's Bridge, a recorded monument under the National Monuments Act and is located within the zone of potential for the historic town of Newmarket which has a Recorded Monument designation.
Permission	X 552544 Y 569910	2018	185155	Conditional	Finalised	Development consists of restoration of part (c. 6.7 ha) of existing quarry (QR19 06/11798 & PL04.225332) by importation of up to 300,000 tonnes per annum of inert soil and stones and river dredging spoil (EWC 17-05-04 and 17-05- 06).The proposed soil recovery facility will utilise the permitted quarry infrastructure including internal roads, site office, welfare facilities and other ancillaries to complete the works. Access to the site will be from the permitted main entrance on the N22 National Primary Road. A wheel wash

Address	Distance from Project
Ballydahin and Gooldshill, Mallow, Co. Cork	17.8km
Scarteen Lower, Newmarket, Co. Cork	18km
Garryhesta Pit, Knockanemore, Ovens, Co. Cork	18.1km

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description
						and weighbridge will be provided as part of the proposed development and the existing workshop will be utilised as a quarantine area. A hard-stand with drainage to oil interceptor will also be provided as a designated refuelling area. The total application area including the site infrastructure covers 7.9 ha of lands. The development will be subject to the requirements of the waste management licence. An Environmental Impact Assessment Report (EIAR) will be submitted to the Planning Authority with the application.
Permission	X 532924 Y 563645	2016	16256	Conditional	Appealed	Ten year permission to construct an underground electricity cable. The proposed underground electricity cable will be 38kV, will run predominantly within the public road corridor and is intended to connect the proposed Shehy More Wind Farm (Pl. Ref. 13/551, An Bord Pleanála PL04. 243486) to the National Grid via either the permitted substation at Garranareagh (Pl. Ref. 11/6605, An Bord Pleanála PL04.219620) or the currently proposed substation at Barnadivane (Kneeves) (Pl. Ref. 14/557, An Bord Pleanála PL04.244439). At time of lodging this application the proposed Shehy More Wind Farm and proposed substation at Barnadivane (Kneeves) remain under appeal with An Bord Pleanála.
Permission	X 556344 Y 595308	2018	185230	Conditional	Finalised	Retention of existing 20 metre high telecommunications support structure carrying telecommunications equipment, together with existing equipment container and associated equipment within a fenced compound as previously granted under local authority reference 12/06523. The development will continue to form part of Meteor Mobile Communications Ltd existing and future telecommunications and broadband network.
Permission	X 534025 Y 562996	2011	116605	Unconditional	Application Finalised	Completion of construction of 18 wind turbines, 18 transformers, a 110 KV substation, 110 KV switch station, 70 metres wind monitoring mast, construction and upgrading of site entrances, site tracks and associated works as permitted under ABP ref. no. PL 04.219620 (Pl. reg. no. 05/5907)
Permission	X 553945 Y 573107	2015	156625	Conditional	Application Finalised	A 5 MW solar farm comprising approximately 22,200 photovoltaic panels on ground mounted frames within a site area of 10.5 hectares, 2 no. single storey inverter/transformer stations, 1 no. single storey delivery station, security fencing, CCTV, and all associated ancillary development works.
Permission	X 557222 Y 574543	2019	195413	Conditional	Application Finalised	Construction of 74 no. residential units comprising 5 no. detached 5 bed dwellings, 16 no. detached 4 bed dwellings, 50 no. semi-detached 3 bed dwellings of varying designs and 3 no. terraced 3 bed housing dwelling with all associated site development works including the culverting of an existing stream, foul and storm drainage with attenuation and flood mitigation, landscaping and amenity areas. The proposed development incorporates 1 no. new access from the R579.

Address	Distance from Project
Cloghboola, Cornery,Garryantornora, Tooreenalour,, Gortnacarriga, Gortaknockane, Cooragreenane, Coolr, Carrignacurra, Dromnagapple, Teeranassig, Clonmoyl, Lisnacuddy, Reanacaheragh, Barnadivane, Barnadivan	18.6km
Coillte Lands, Carrigduff, Mallow, Co. Cork	18.7km
Barnadivane, Terelton, Lissarda	19km
Curraleigh, Inniscarra, Co. Cork	19km
Dromin, Cloghroe, Tower, Co. Cork	20km

Development Name/Type	Coordinates (ITM)	Year	Planning Reference Number	Decision	Status	Description	Address	Distance from Project
Permission	X 551136 Y 575818	2018	187280	Conditional	Finalised	The construction and operation of solar PV arrays mounted on metal frames on a 21.3ha site, inclusive of an electrical substation compound, up to 10 inverter units, a temporary construction area and ancillary facilities (inclusive of gross floor space of proposed works up to 248sqm). The planning application is accompanied by an environmental report and stage 1 screening for appropriate assessment.	Berrings, Berrings, Co. Cork	20km
Permission	X 548001 Y 577192	2021	216514	Further Information		A twenty-year permission for the importation and recycling of up to 80,000 tonnes of construction and demolition (C&D) material per annum, including the construction of a new shed to manage/recycle the C&D material; and permission for the importation of up to 200,000 tonnes per annum of imported inert material (consisting of mainly soil/subsoil and stone) and the restoration/infilling of an existing quarry to provide agricultural/biodiversity uses, and all associated ancillary development works including tree planting and the provision of 4 no. bird/wildlife observation hides. The proposed development will utilise the existing quarry infrastructure including internal roads, site office, machinery shed, weighbridge, staff canteen and welfare facilities. An Environmental Impact Assessment Report (EIAR) will be submitted to the planning authority with the application. The application relates to development which comprises an activity requiring a waste licence (which has been provided by the Environmental Protection Agency under Licence Register No. W0255-02).	Tullig More and, Knockane (townlands), Dripsey, Co. Cork	12km



CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

## **APPENDIX 9**

### **Consideration of Afforestation**



### **Consideration of Afforestation**

#### Statutory Overview

The United Nations Framework Convention on Climate Change, the Kyoto Protocol, the Paris Agreement and the recent Glasgow Climate Pact have as their ultimate objective the stabilisation of greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous human interference with the climate system, in a time frame which allows ecosystems to adapt naturally and enables sustainable development.

The Forest Service of the Department of Agriculture, Food & the Marine is Ireland's national forest authority. It is responsible for national forest policy, the promotion of private forestry, the administration of the forest consent system and forestry support schemes, forest health and protection, the control of felling, and the promotion of research in forestry and forest products.

The strategic goal of Ireland's forest policy is: "To develop an internationally competitive and sustainable forest sector that provides a full range of economic, environmental and social benefits to society and which accords with the Forest Europe definition of sustainable forest management."<sup>1</sup> Benefits accruing from this policy are an increase in the sustainable production of forest biomass for use in domestic markets and for renewable energy production, and an increase in levels of carbon sequestration contributing towards climate change mitigation.

The level of forest cover in Ireland is at 11% which is well below the European average of 38%. National forest policy has a goal of increasing Ireland's forest cover to 18% of total land area. Further policies underpinning this goal are a national afforestation programme of at least 8,000 hectares per annum and a requirement to replant areas following final harvesting of tree crops ("clearfelling")<sup>2</sup>. Where areas are being permanently clearfelled arising from a change in land use (for example, during wind farm construction), forest policy dictates that these must be replaced by afforestation of an alternative site on a hectare-per-hectare basis anywhere in the State (see Section 5.3 of the Forest Service Felling and Reforestation Policy<sup>3</sup> as shown in Appendix 1 - note only Infrastructure or Construction felling proposed for this project).

Areas of forestry proposed to be permanently clearfelled for this wind farm are located in upland, marginal land locations. Some of these areas are of low forest productivity due to the nature of the environment and will be replaced by alternative afforestation which will be of higher forest productivity, corresponding to the latest afforestation guidelines, thus providing increased carbon sequestration.

The clearfelling of trees in the State requires a felling licence. The legislative provisions governing such licences are set out in the Forestry Act 2014 (as amended) and the Forestry Regulations 2017 (as amended).

The associated afforestation of alternative lands equivalent in area to lands being permanently clearfelled (in this case, for wind farm construction) can occur anywhere in the State and is also subject to licencing by the Forest Service ('afforestation licencing').

<sup>1</sup> 

https://www.agriculture.gov.ie/media/migration/forestry/forestpolicyreviewforestsproductsandpeople/00487 %20Forestry%20Review%20-%20web%2022.7.14.pdf

<sup>&</sup>lt;sup>2</sup> https://www.irishstatutebook.ie/eli/2014/act/31/section/17/enacted/en/html#sec17

<sup>&</sup>lt;sup>3</sup> https://assets.gov.ie/96814/4830fc08-0227-4504-83fa-2fd90a7942f2.pdf

Section 11(d) of the Forestry Act requires the Minister, in the performance of his functions, to determine whether screening for EIA or AA is required and whether EIA or AA are required and, if so, to ensure that they are carried out. This obligation applies to both forestry felling and afforestation licencing.

As the Board is aware section 34(13) and section 37H(6) of the Planning and Development Act 2000 (as amended) make clear that a person is not entitled to carry out a development merely because they have obtained planning permission, i.e. the planning permission does not obviate the need to have all other statutory and legal consents required to carry out the proposed development.

#### Afforestation Licence

The requirements for afforestation licencing are set out in the Forestry Regulations 2017 - this includes consideration of EIA and AA as set out in parts 7 and 8 respectively. Further detail is set out in the Environmental Requirements for Afforestation (DAFM, 2016)<sup>4</sup>, copy included in Appendix 2. This ensures that afforestation takes place in a way that complies with environmental legislation and enhances the contribution new woodlands and forests can make to the environment and to the provision of ecosystem services, such as water protection and landscape enhancement.

The typical environmental effects of afforestation include potential effects on biodiversity, soils and geology, hydrology and hydrogeology, cultural heritage, landscape and visual, and air and climate.

In regard to biodiversity there are potential effects on existing habitats and species present at and in the vicinity of the site. In regard to soils and geology there are potential effects on the existing soil environment resulting from ground preparation, the construction of drains and tree planting. In relation to hydrology and hydrogeology there are potential effects on existing drainage patterns and water quality during site preparation. In relation to cultural heritage there are potential effects on the known and unknown cultural heritage features in the environment. In relation to landscape and visual there are potential effects on visual amenity and the landscape character of the area. In relation to air and climate there are potential effects on atmospheric carbon balances. There are also potential effects on the existing land use.

As part of the comprehensive environmental review and documentation to support any licence application, any potential negative effects arising are fully considered and avoided where possible or reduced where appropriate to an acceptable standard through mitigation measures. With careful management, and mitigation measures such as careful site selection, set-back from streams, careful drainage design and management, etc. afforestation can be carried out at appropriate locations without significant effects on the environment or adverse effects on the integrity of European sites. Before a license is granted the Minister as competent authority will carry out an EIA, if required, for the purposes of the EIA Directive and an appropriate assessment, if required, for the purposes of the Habitats Directive.

The Environmental Requirements for Afforestation sets out the typical sequence of tasks to be undertaken in order to proceed with afforestation activities (pre-application design, Forest Service licencing, site works and on-going management). It identifies key environmental issues namely water, biodiversity, archaeology, and landscape and sets objectives for their protection during design as follows:

<sup>&</sup>lt;sup>4</sup> https://www.gov.ie/en/publication/642e6-forestry/#environmental-requirements

Water Objec- tive:To protect water and aquatic habitats and species, during afforestation and throughout the remainder of the forest rotation.Biodiversity Objectives:To ensure that afforestation does not adversely impact designated conserva- tion areas, protected habitats, or protected species of fauna or flora and their habitat.Archaeology and built herit- age objective:To seek to ensure that proposed afforestation development projects do not ad- versely impact directly or indirectly on known or suspected archaeological sites and monuments or on other important built heritage structures or features. This includes protecting their amenities and where relevant, their wider land- scape setting, in particular, their relationship with other roughly contemporary or determinably linked sites, monuments, structures or features. Where afforestation is approved near known or suspected archaeological sites and monuments or other important built heritage structures or features. Where afforestation is approved near known or suspected archaeological sites and monuments or other important built heritage structures or features. Where afforestation is approved near known or suspected archaeological sites and monuments or other important built heritage structures or features, to seek to ensure that: (i) appropriate exclusion zones, fencing, access paths and other entities and where the structures or features is the structure of the struct
tive:throughout the remainder of the forest rotation.Biodiversity Objectives:To ensure that afforestation does not adversely impact designated conserva- tion areas, protected habitats, or protected species of fauna or flora and their habitat.Archaeology and built herit- age objective:To seek to ensure that proposed afforestation development projects do not ad- versely impact directly or indirectly on known or suspected archaeological sites and monuments or on other important built heritage structures or features. This includes protecting their amenities and where relevant, their wider land- scape setting, in particular, their relationship with other roughly contemporary or determinably linked sites, monuments, structures or features. Where afforestation is approved near known or suspected archaeological sites and monuments or other important built heritage structures or features. Where afforestation is approved near known or suspected archaeological sites and monuments or other important built heritage structures or features.
Biodiversity Objectives:To ensure that afforestation does not adversely impact designated conserva- tion areas, protected habitats, or protected species of fauna or flora and their habitat.Archaeology and built herit- age objective:To seek to ensure that proposed afforestation development projects do not ad- versely impact directly or indirectly on known or suspected archaeological sites and monuments or on other important built heritage structures or features. This includes protecting their amenities and where relevant, their wider land- scape setting, in particular, their relationship with other roughly contemporary or determinably linked sites, monuments, structures or features. Where afforestation is approved near known or suspected archaeological sites and monuments or other important built heritage structures or features, to seek to ensure that: (i) appropriate exclusion zones, fencing, access paths and
Objectives:tion areas, protected habitats, or protected species of fauna or flora and their habitat.To enhance the biodiversity value of the new forest throughout its rotation.Archaeology and built herit- age objective:To seek to ensure that proposed afforestation development projects do not ad- versely impact directly or indirectly on known or suspected archaeological sites and monuments or on other important built heritage structures or features. This includes protecting their amenities and where relevant, their wider land- scape setting, in particular, their relationship with other roughly contemporary or determinably linked sites, monuments, structures or features. Where afforestation is approved near known or suspected archaeological sites and monuments or other important built heritage structures or features. Where afforestation is approved near known or suspected archaeological sites and monuments or other important built heritage structures or features, to seek to ensure that: (i) appropriate exclusion zones, fencing, access paths and other important built heritage structures or features, to
habitat.Archaeology and built herit- age objective:To seek to ensure that proposed afforestation development projects do not ad- versely impact directly or indirectly on known or suspected archaeological sites and monuments or on other important built heritage structures or features. This includes protecting their amenities and where relevant, their wider land- scape setting, in particular, their relationship with other roughly contemporary or determinably linked sites, monuments, structures or features. Where afforestation is approved near known or suspected archaeological sites and monuments or other important built heritage structures or features. Where afforestation is approved near known or suspected archaeological sites and monuments or other important built heritage structures or features, to seek to ensure that: (i) appropriate exclusion zones, fencing, access paths and
Archaeology and built herit- age objective:To seek to ensure that proposed afforestation development projects do not ad- versely impact directly or indirectly on known or suspected archaeological sites and monuments or on other important built heritage structures or features. This includes protecting their amenities and where relevant, their wider land- scape setting, in particular, their relationship with other roughly contemporary or determinably linked sites, monuments, structures or features. Where afforestation is approved near known or suspected archaeological sites and monuments or other important built heritage structures or features.
To enhance the biodiversity value of the new forest throughout its rotation.Archaeology and built herit- age objective:To seek to ensure that proposed afforestation development projects do not ad- versely impact directly or indirectly on known or suspected archaeological sites and monuments or on other important built heritage structures or features. This includes protecting their amenities and where relevant, their wider land- scape setting, in particular, their relationship with other roughly contemporary or determinably linked sites, monuments, structures or features. Where afforestation is approved near known or suspected archaeological sites and monuments or other important built heritage structures or features, to seek to ensure that: (i) appropriate exclusion zones, fencing, access paths and
Archaeology and built herit- age objective:To seek to ensure that proposed afforestation development projects do not ad- versely impact directly or indirectly on known or suspected archaeological sites and monuments or on other important built heritage structures or features. This includes protecting their amenities and where relevant, their wider land- scape setting, in particular, their relationship with other roughly contemporary or determinably linked sites, monuments, structures or features. Where afforestation is approved near known or suspected archaeological sites and monuments or other important built heritage structures or features, to seek to ensure that: (i) appropriate exclusion zones, fencing, access paths and
<ul> <li>and built heritage objective:</li> <li>versely impact directly or indirectly on known or suspected archaeological sites and monuments or on other important built heritage structures or features. This includes protecting their amenities and where relevant, their wider land-scape setting, in particular, their relationship with other roughly contemporary or determinably linked sites, monuments, structures or features. Where afforestation is approved near known or suspected archaeological sites and monuments or other important built heritage structures or features, to seek to ensure that: (i) appropriate exclusion zones, fencing, access paths and</li> </ul>
age objective:and monuments or on other important built heritage structures or features. This includes protecting their amenities and where relevant, their wider land- scape setting, in particular, their relationship with other roughly contemporary or determinably linked sites, monuments, structures or features. Where afforestation is approved near known or suspected archaeological sites and monuments or other important built heritage structures or features, to seek to ensure that: (i) appropriate exclusion zones, fencing, access paths and
This includes protecting their amenities and where relevant, their wider land- scape setting, in particular, their relationship with other roughly contemporary or determinably linked sites, monuments, structures or features. Where afforestation is approved near known or suspected archaeological sites and monuments or other important built heritage structures or features, to seek to ensure that: (i) appropriate exclusion zones, fencing, access paths and
scape setting, in particular, their relationship with other roughly contemporary or determinably linked sites, monuments, structures or features. Where afforestation is approved near known or suspected archaeological sites and monuments or other important built heritage structures or features, to seek to ensure that: (i) appropriate exclusion zones, fencing, access paths and
or determinably linked sites, monuments, structures or features. Where afforestation is approved near known or suspected archaeological sites and monuments or other important built heritage structures or features, to seek to ensure that: (i) appropriate exclusion zones, fencing, access paths and
Where afforestation is approved near known or suspected archaeological sites and monuments or other important built heritage structures or features, to seek to ensure that: (i) appropriate exclusion zones, fencing, access paths and
and monuments or other important built heritage structures or features, to seek to ensure that: (i) appropriate exclusion zones, fencing, access paths and
seek to ensure that: (i) appropriate exclusion zones, fencing, access paths and
other relevant measures are incorporated into the project design; (ii) there is
an appropriate response should any previously unrecorded archaeological site,
monument, object, structure or feature be discovered during site work; and (iii)
any approved design is sympathetic to and provides an appropriate visual set-
ting for such sites, monuments, structures or features.
<b>Landscape Ob-</b> To ensure that the proposed forest is designed so that it is visually acceptable
jective: and in keeping with landscape and amenity sensitivities.

Design considerations and parameters are also set out in the document and include for example:

- Examination of the proximity and connectivity of the lands to Designated Conservation Areas or Priority 8 Freshwater Pearl Mussel Catchment areas
- Examination for the presence of Protected Habitats or Protected Species of fauna or flora and their habitat
- Retention of Protected Areas as well as other notable biodiversity features such as existing hedgerows, existing broadleaf scrub/woodland, veteran trees or other ecologically important features such as water flushes, etc.
- Provision of water setbacks, appropriate site drainage design and acceptable ground cultivation techniques to protect aquatic zones both during afforestation and throughout the remainder of the forest rotation
- Provision of other environmental setbacks (unplanted/undisturbed open spaces) to buffer retained habitats, archaeological features, public roads or ROWs, cultural features or utilised buildings
- Identification and protection of any existing (or later discovered) archaeological or cultural features, including setbacks, provision for future access to/protection of the site by fencing
- Sensitive planting design so that the proposed forest is visually acceptable and in keeping with the local landscape and local amenities

It should be noted that the granting of all afforestation licences is subject to conditions, including environmental conditions, that must be adhered to.



*Figure 1: Forest Standards Manual Nov. 2015; Environmental Requirements for Afforestation Dec 2016.* 

#### Consideration of Afforestation in the Context of Planning Submissions

The developer is seeking a ten-year planning permission which incorporates time to secure a grid connection agreement, a route to market (RESS or equivalent Power Purchase Agreement), select the preferred equipment suppliers and put the necessary capital funding in place to allow construction and delivery to commence. This application for planning permission considers the environmental impacts of the felling activities required to deliver the project infrastructure and operate the proposed wind farm.

While the environmental impacts of the felling activities are considered at this application stage it is noted the felling of trees at the site for the purposes of the wind farm is subject to and can only occur following the grant of a felling licence by the Forest Service. Planning permission for the project may not be granted or, if granted, may have amendments introduced by condition(s). Therefore, the extent of felling required to be licensed for the purpose of giving effect to the windfarm project can only be determined once planning permission for the windfarm project has been granted. Furthermore, it will be a condition of the felling licence that an equivalent area of land required to be felled shall be replanted as per Forest Service Felling and Reforestation Policy. Thus, the extent of the lands required for afforestation can also only be known once planning permission has been granted for the windfarm project. In these circumstances, the application for the licence can, in practical terms, only be made once planning permission has been granted.

It is, in any event, environmentally prudent to progress the felling and afforestation licences closest to the time when the proposed felling activities are required, rather than long in advance during the wind farm planning submission stage, when the project programme remains uncertain and the exact areas cannot be fully confirmed. If a licence was obtained prior to seeking and/or obtaining planning permission, it is highly likely that any licencing approvals sought from the Forest Service would have expired before it could be taken up due to the time required for the planning processes and post-planning delivery preparations. The Forest Service Afforestation Licences expire after 3 years from when they are consented.

Critically given the dynamic nature of the receiving environment, the identification and licensing of alternative afforestation lands at a later point in time (post planning consent) has the added benefit of ensuring that the licensing process fully reflects current legislative requirements, and, more importantly, the most up-to-date environmental information and that the cumulative / incombination assessment considers the wider environmental impacts at that point in time

As mentioned above, key environmental issues relating to afforestation include water, soils, biodiversity, archaeology, landscape and climate. Each is subject to regular updates in terms of best practice, guidelines, standards and national policies. For example, the EPA regularly update the water quality status of rivers across the country, and planning authorities review their landscape strategies in line with their review of County Development Plans every six years. Delaying the identification of alternative afforestation lands until such time as they are required enables identification of optimum lands available (from an environmental) perspective for afforestation at that time.

In light of the foregoing and for the purposes of this project, the developer commits that the location of any replanting (alternative afforestation) associated with the project will be greater than 10km from the wind farm site and also outside any potential hydrological pathways of connectivity i.e. outside the catchment within which the proposed project is located. On this basis, it is reasonable to conclude that there will be no more than imperceptible indirect or in-combination effects associated with the replanting.

In addition, the developer commits to not commencing the project until both a felling and afforestation licence(s) is in place and therefore (as discussed above) this ensures the afforested lands are identified, assessed and licenced appropriately by the relevant consenting authority.

#### References

Forestry Regulations 2017 (S.I. No. 191 of 2017). http://www.irishstatutebook.ie/eli/2017/si/191/made/en/print

Forestry Act 2014. http://www.irishstatutebook.ie/eli/2014/act/31/enacted/en/html

*Felling and Reforestation Policy*, Forest Service, Department of Agriculture, Food & the Marine, Ireland (2017).

https://assets.gov.ie/96814/4830fc08-0227-4504-83fa-2fd90a7942f2.pdf

*Forestry Standards Manual,* Forest Service, Department of Agriculture, Food & the Marine, Ireland (2015).

https://www.gov.ie/en/publication/640f49-forestry-standards-manual/

*Environmental Requirements for Afforestation*, Forest Service, Department of Agriculture, Food & the Marine, Ireland (2016).

https://assets.gov.ie/109253/e9ad373a-4767-4596-bc90-2b166f8e6f06.pdf

## **Appendix 1**

Section 5.3 of the Felling and Reforestation Policy (DAFM, 2017)

#### 5.3 Supporting renewable energy and energy security

#### 5.3.1 Overview

The development of renewables is at the heart of the Government's energy policy, as laid out in the document *Strategy for Renewable Energy: 2012-2020* (Department of Communications, Energy & Natural Resources, 2012). Under Directive 2009/28/EC, Ireland is legally obliged to ensure that by 2020 at least 16% of all energy consumed in the State is from renewable sources. Ireland must ensure that there is a steady, progressive and measurable increase between now and the year 2020, in the amount of renewable energy consumed in the electricity, heat and transport sectors, commensurate with the achievement of the national target.

Underpinning the Government's energy and economic policy objectives are five Strategic Goals reflecting the key dimensions of the renewable energy challenge to 2020. The first Strategic Goal refers to wind and aims to have "*Progressively more renewable electricity from onshore and offshore wind power for the domestic and export markets.*"

It is Forest Service policy to facilitate wind energy as much as possible within the context of sustainable forest management and efforts to expand the national forest estate.

#### 5.3.2 Policy on felling licences for wind farm development

Where a developer intends to construct a wind farm that is within or partially within a forest or that will require tree felling, it is extremely important that the developer consults the Forest Service at the <u>earliest</u> <u>possible stage</u> of the project. This may help to develop a collaborative approach that will ensure that all forestry issues are identified and mitigated at the earliest opportunity.

In line with general Forest Service policy, where grant-aided forestry is to be used for wind farm development, any grants and premiums already paid out by the Forest Service in relation to the areas felled for the turbine bases, roads and infrastructure must be repaid where the forest is still in receipt of afforestation premiums and / or still in contract under the Afforestation Scheme.

**Photo 8** A wind farm within a forest plantation. Forest Service policy is to facilitate wind energy within the context of SFM and the expansion of the national forest estate.



Wind farm construction typically encompasses three categories of tree felling: infrastructure; construction; and turbulence. Each category requires a felling licence. Table 6 and the following sections detail the specific requirements regarding each category. Also, Case Study 2 provides for three worked examples of wind farm development, and associated licensing issues.

#### 5.3.2.1 General requirements

Notwithstanding any requirement for the wind farm developer to produce an Environmental Impact Statement (EIS) in respect of the development and the requirement to assess the impact of tree felling / reforestation proposals in an EIS, when felling licence applications are made, the Forest Service may require the developer to report on the potential loss of soil and biomass CO<sub>2</sub>, and the reduction in productivity of the forest area associated with different wind farm forest management and landscape plans. Potential impacts to be reported on and assessed may also include site stability, water quality, habitats and species, landscape, archaeology, and other issues that may be deemed appropriate by the Forest Service.

If Planning Permission has been granted for the development by the local authority or by an Bord Pleanála, a copy of the full Planning Permission should be submitted to support the felling licence application. Also, if an EIS or a Natura Impact Statement have been prepared, these need to be submitted to support the felling licence application.

Category of tree felling		Reforestation of felled area required?	Alternative afforestation required? (See Note 1)	Refunding of grant & premiums required? (See Note 2)
Infrastructure felling		No	Yes	Yes
Construction felling		Yes	No	No
	≤20 ha	Yes	No	No
Turbulence felling	>20 ha	Yes	Yes, 10% turbulence fell area – see Section 5.3.2.4	No

**Table 6** Requirements for each category of felling associated with wind farm development, regardingreforestation, alternative afforestation, and the refunding of grant and premiums.

**Note 1** If 'YES', the alternative site must be of an area equivalent in size. Section 5.7 sets out the procedures required. If the forest area proposed for permanent removal is still in receipt of premiums and / or is still in contract under the Afforestation Grant & Premium Scheme, the alternative site may be eligible under the Afforestation Grant & Premium Scheme.

**Note 2** If 'YES', the refunding of any afforestation grants and premiums already paid out by the Forest Service is required if the forest area proposed for permanent removal is still in receipt of premiums and / or is still in contract under the Afforestation Grant & Premium Scheme. Also, if 'YES' or 'NO', if premiums are still being paid, premium payments on the area will cease.

#### 5.3.2.2 Infrastructure felling

Infrastructural felling relates to trees that are permanently removed from the site in order to make way for infrastructure associated with the wind farm, such as access roads and turbine bases.

For infrastructure felling, the afforestation of alternative land and the repayment of grant and premium payments are required – see Table 6 and Section 5.7 for details. In addition, where the infrastructure fell area is still in receipt of premiums, then premium payments will cease, i.e. the felled area will not continue to receive premium payments.

#### 5.3.2.3 Construction felling

During the construction phase of the wind farm development, there are forest areas that require the temporary removal of tree cover to facilitate construction, e.g. 'borrow pits' for stone. Once construction is completed, the land is reforested.

For construction felling, the afforestation of alternative land and the repayment of grant and premium payments are not required – see Table 6. In addition, where the construction fell area is still in receipt of premiums, then premium payments will cease, i.e. the felled area will not continue to receive premium payments.

#### 5.3.2.4 Turbulence felling

Turbulence felling is deemed to be felling in the vicinity of turbines for the purpose of avoiding air turbulence that can be created by the forest canopy. It is carried out in order to increase the efficiency of the turbine by reducing turbulence in the airflow, and to reduce vibrations through the turbine blades, thereby lowering stress on the turbine components.

Turbine manufacturers assess the forest layout, age profile and management plans for the forest along with topography and wind mast data. Based on that assessment, some manufacturers will require turbulence felling as part of the terms of supplying turbines for a particular site. In the case of many wind farms, the manufacturer's requirements are therefore not known until late in the planning of the project, as no turbine will have been selected. In general, manufacturers recommend that tree height is restricted within 300 metres, in the dominant wind direction.

Turbulence felling may be allowed in certain cases, and subject to reforestation requirements. For completeness and to ensure that the EIS itself is valid, it is important that the EIS takes into account the maximum turbulence felling that could potentially occur under the project.

Felling Licence requirements in relation to turbulence felling include the following:

- 1. The repayment of afforestation grants and premiums already paid out by the Forest Service is not required. In addition, where the turbulence fell area is still in receipt of premiums, then premium payments will cease, i.e. the felled area will not continue to receive premium payments.
- 2. The granting of a licence for a turbulence felling will be subject to the normal checks carried out by the Forest Service in respect of silvicultural, environmental and landscape considerations, etc. A felling coupe is defined for this purpose as a contiguous or adjacent area, any part of which is felled in a 2 (calendar) year period.
- 3. A distinction is made between turbulence felling ≤20 ha and >20 ha. Excluding the area

for the turbine bases, etc. from the limit, the 20 ha limit specified in this section is a total limit for the entire wind farm development. The limit is not interpreted as 20 ha per turbine or any other interpretation that is deemed by the Minister to be in excess of a total of 20 ha per wind farm development. In terms of reforestation, the following applies:

• Where the felling coupe area for turbulence felling is less than or equal to 20 ha, this is considered consistent with sustainable forest management. Where the cumulative total area of 20 ha or less is adjacent to one or more turbines and it is proposed to fell this area in accordance with normal good forest practice, such felling will not be considered turbulence felling. There is no requirement to afforest additional land. The area where the trees are being felled must be reforested.

#### Case Study 2: Windfarm development

The following tables provide examples of typical windfarm applications.

Felling type	Area (ha)	Reforest felled site	Alternative afforestation	Refund Afforestation Grant & Premium
Infrastructure	10	No	Yes (10 ha)	Yes
Construction	2	Yes	No	No
Turbulence	35	Yes	Yes (3.5 ha)	No

Site 1 Sitka spruce, 10 yrs. Reforest with North Coastal Lodgepole pine.

#### Site 2 Sitka spruce, 25 yrs. Reforest with Sitka spruce.

Felling type	Area (ha)	Reforest felled site	Alternative afforestation	Refund Afforestation Grant & Premium
Infrastructure	5	No	Yes (5 ha)	No
Construction	0.5	Yes	No	No
Turbulence	16	Yes	No	No

#### Site 3 Sitka spruce, 14 yrs. Reforest with Sitka spruce.

Felling type	Area (ha)	Reforest felled site	Alternative afforestation	Refund Afforestation Grant & Premium
Infrastructure	5	No	Yes (5ha)	Yes
Construction	0.5	Yes	No	No
Turbulence	16	Yes	No	No

- Where the felling coupe area for turbulence felling is greater than 20 ha, the applicant is required to reforest the area. In addition, 10% of the turbulence felling coupe area must be afforested on an alternative site to allow for the increase in soil carbon emissions at afforestation and the loss of potential carbon sequestration due to the proposed method of forest management. See Section 5.7 for details regarding the afforestation procedure.
- Subsequent to a licence being granted for 20 ha or less, any cumulative felling applied for above the 20 ha limit will be considered to be turbulence felling. Therefore, the original area of 20 hectares or less that was licensed will also then be regarded as turbulence felling. For example, if 20 hectares are felled in the first year and a further 12 hectares of felling is applied for in (e.g.) Year 3, then the additional 12 ha (if granted) and the original 20 ha will be treated as 32 ha of turbulence felling. The rules for turbulence felling will then apply to all 32 ha.

# **Appendix 2**

Environmental Requirements for Afforestation (DAFM, 2016)

# Environmental Requirements for Afforestation

### December 2016





Department of Agriculture, Food and the Marine An Roinn Talmhaíochta, Bia agus Mara The Forest Service of the Department of Agriculture, Food and the Marine is responsible for ensuring the development of forestry within Ireland in a manner and to a scale that maximises its contribution to national socio-economic well-being on a sustainable basis that is compatible with the protection of the environment. Its strategic objectives are:

- 1. To foster the efficient and sustainable development of forestry
- 2. To increase quality planting
- 3. To promote the planting of diverse tree species
- 4. To improve the level of farmer participation in forestry
- 5. To promote research and training in the sector
- 6. To encourage increased employment in the sector

#### Published by:

Forest Service Department of Agriculture, Food & the Marine, Johnstown Castle Estate Co. Wexford Tel. 053 91 63400 / Lo-Call 1890 200 509 E-mail forestservice@agriculture.gov.ie Web www.agriculture.gov.ie/forestservice

All photos Forest Service unless otherwise stated. Illustrations by Aislinn Adams © Forest Service, Department of Agriculture, Food & the Marine, Ireland

December 2016

## Contents

Section 1: Introduction	
1.1 Context	1
1.2 About these Environmental Requirements	2
Section 2: Design	
2.1 Overview	3
2.2 Background checks	3
2.3 Basic requirements at design stage	3
2.4 Water	4
2.5 Biodiversity	8
2.6 Archaeology and built heritage	16
2.7 Landscape	20
2.8 Environmental setbacks	24
2.9 Future operational areas	28
2.10 Open spaces and deer management	28
2.11 Site inputs	29
2.12 Further environmental assessment	29
Section 3: Site Works	
3.1 Overview	31
3.2 Site management	31
3.3 Oversight by other specialists	31
3.4 Contingency measures	32
3.5 Treatment of setbacks	32
3.6 Treatment of future operational areas	37
3.7 Operational safeguards	38
3.8 Archaeological finds discovered during site works	44
3.9 Burning	44
3.10 Form 2 submission	45
Section 4: Ongoing Management	
4.1 Overview	47
4.2 Site inputs	47
4.3 Drains and sediment traps	47

4.4 Treatment of setbacks 48

## Section 1 Introduction

#### 1.1 Context

National forest policy - as set out in *Forests, Products and People* (2014) - is to increase the forest area in accordance with sustainable forest management (SFM) principles, in order to support a long-term sustainable roundwood supply, and associated employment and economic activity. As the consenting authority for afforestation, the Forest Service of the Department of Agriculture, Food & the Marine must ensure that this increase takes place in a way that complies with environmental legislation and that enhances the contribution new woodlands and forests can make to the environment and to the provision of ecosystem services, such as water protection and landscape enhancement.

The overall aim of these *Environmental Requirements for Afforestation* is to ensure that the establishment of new woodlands and forests is carried out in a way that is compatible with the protection and enhancement of our environment, including water quality, biodiversity, archaeology and landscape. (Sites proposed for afforestation must also meet the minimum timber productivity requirement set out in the Forest Service *Land Types for Afforestation* document, and this assessment should be carried out by the Registered Forester before advancing to application stage.)

In assessing an application for afforestation, the Forest Service is required to consider potential impacts across a range of issues and sensitivities. This includes in-combination impacts regarding water, biodiversity, landscape, social issues, etc. The following lists the primary components of the legal, regulatory and funding framework that apply:

- European Communities (Forest Consent & Assessment) Regulations 2010 (S.I.558 of 2010), as amended
- European Union rules governing the Forestry Programme



Sensitively sited, designed and established plantations adding to Ireland's expanding forest resource.
- Forestry Programme
- Legally protected species and habitats and associated designations (e.g. Special Areas of Conservation, Special Protection Areas, Natural Heritage Areas) and procedures (e.g. Appropriate Assessment)
- Water Framework Directive
- Legislation regarding archaeology and built heritage, including the National Monuments Acts 1930 to 2014
- Forest Service requirements, procedures and protocols, e.g. the terms and conditions of the Afforestation Scheme (if grant aid is being sought), the Forestry Standards Manual; the Forestry & Freshwater Pearl Mussel Requirements; the Forestry & Kerry Slug Guidelines; the Forestry & Otter Guidelines; and the Forest Protection Guidelines.

(For further details, refer to the **SUPPORTING DOCUMENT** on the Forest Service website - see below for details.)

Any statutory approval (with or without grant aid) for afforestation is conditional on adherence to the measures set out in these *Environmental Requirements for Afforestation*, to the conditions of approval, and to the standards and procedures set out in the *Forestry Standards Manual*. Where a parallel approval for grant aid has been issued, the Afforestation Scheme Terms & Conditions also apply.

Any divergence from the measures set out in these Requirements must be fully described in the initial application and depicted clearly on the Biodiversity Map, for consideration by the Forest Service.

# **1.2 About these Environmental Requirements**

The Environmental Requirements for Afforestation replace those measures relating to afforestation contained within the following Forest Service Environmental Guidelines: Forestry & Water Quality Guidelines, Forestry & Archaeology Guidelines, Forestry & the Landscape Guidelines, and Forest Biodiversity Guidelines. (Note, however, that these guidelines still apply to other Forest Service regulated activities, as specified in any approval, consent or licence issued.)

The *Environmental Requirements for Afforestation* are set out in three stages. These reflect the typical sequence of activities undertaken by an Applicant and her / his Registered Forester and the corresponding environmental requirements that apply, throughout afforestation and up to the end of the premium period (or 15 years, for non-grant aided forests). These three stages are as follows:

- 1. Pre-Application Design
- 2. Site Works
- 3. Ongoing Management

This document is accompanied by a web-based document entitled *Environmental Requirements* for Afforestation: SUPPORTING DOCUMENT (see www.agriculture.gov.ie/forestservice/ grantsandpremiumschemes2015-2016/). This web-based document is an integral part of the Requirements and is referred to throughout, as the 'SUPPORTING DOCUMENT'.

# Section 2 Design

# 2.1 Overview

During Stage 1: Pre-Application Design, the Registered Forester assesses the site and carries out various checks, and subsequently designs the afforestation proposal in a way that addresses the various environmental features and sensitivities identified. This design is then reflected in the subsequent application (Form 1) for technical approval (and financial approval, if sought) submitted to the Forest Service for assessment. Please note, it is the responsibility of the Applicant to provide the relevant information needed to enable the Forest Service to make a full assessment of the application.

# 2.2 Background checks

Various sources of information can be checked by the Registered Forester early in the pre-application design stage, to identify environmental features and sensitivities. Relevant safeguards can then be incorporated into the design to avoid possible negative impacts and to enhance positive impacts. Potentially, this may also shorten and streamline the assessment process.

**iNET** provides the primary source of information and provides a platform for mandatory Form 1 checks regarding water, designated sites, archaeology, etc. However, other important sources of environmental information are available - see the **SUPPORTING DOCUMENT**. Dialogue with the Applicant may also reveal more subtle sensitivities that might exist.

# 2.3 Basic requirements at design stage

The basic design-stage requirements in relation to water, biodiversity, archaeology and landscape are set out below. Note the following:

- If faced with a particularly sensitive and complex site in relation to a particular environmental feature or sensitivity, a Registered Forester may propose measures above and beyond the minimum requirements set out in this document. Examples include wider-than-normal water setbacks due to a downstream Special Area of Conservation (SAC).
- Furthermore, a relevant expert (e.g. hydrologist, ecologist, archaeologist, landscape architect) may be engaged early in the process, to assess the feature / sensitivity and to propose appropriate measures. This may result in a more refined application and may avoid complexities and delays in the application process. For example, it may avoid the need for the Forest Service to seek further information, and may allay the concerns of local people and statutory consultees.
- An individual site or part of a site may be deemed eligible from a productivity perspective (following the Land Types for Afforestation assessment process) but unsuitable from an environmental perspective. These sites may become apparent to Registered Foresters at the early design stage, following his / her onsite assessment and background checks, and <u>should</u> <u>not be advanced to application stage</u>.

# 2.4 Water

# OBJECTIVE: TO PROTECT WATER AND AQUATIC HABITATS AND SPECIES, DURING AFFORESTATION AND THROUGHOUT THE REMAINDER OF THE FOREST ROTATION.

The Registered Forester must assess the potential risk of sedimentation and nutrient runoff entering into 'receiving waters' (streams, rivers, lakes), both during afforestation and throughout the remainder of the rotation, and adapt the forest design and planned operations accordingly. Key factors include soil type, slope, available pathways for water, the erodibility of the soil and subsoil, downstream SACs, and the status objective of the waterbody itself. Regarding the latter, particular regard is needed if the proposed afforestation site is within the catchment area of a high status objective waterbody or a waterbody at risk of decline in status.

For guidance, the **SUPPORTING DOCUMENT** gives examples of scenarios that (alone or in combination) can heighten the risk to water.

During site assessment, identify and map (on the required Biodiversity Map) the water features defined in Table 1, each of which require a water setback.

## 2.4.1 Water setback

A water setback(\*) is an area of a defined width, positioned adjoining the water features defined in Table 1, and left largely undisturbed during afforestation and throughout the remainder of the rotation, specifically for the protection of water. All new drains installed as part of the afforestation project must terminate in sediment traps <u>outside</u> the water setback. The relevant setback for each water feature is set out in Section 2.8.

(\* Formerly referred to as 'aquatic buffer zone'.)



The protection of water quality and aquatic habitats and species is a key requirement for all new afforestation projects.

Type of water feature	Definition					
Aquatic zone	A permanent or seasonal river, stream or lake shown on an Ordnance Survey 6 inch map. (Note, the EPA water layer on iNET may not capture all aquatic zones onsite.)					
Relevant watercourse	A watercourse that is not shown on an OS 6 inch map but which: ➤ is connected to an aquatic zone onsite, adjoining the site or elsewhere;					
	and					
	has the potential to carry significant amounts of sediments / nutrients, o shows evidence of erosion / deposition.					
	Relevant watercourses are often artificial, and include existing drains and channels and other potential pathways that may contain flowing water during and immediately after rainfall.					
	Note, not every watercourse may be a 'relevant watercourse'. For example, a well-vegetated agricultural drain on moderately sloping ground may not be a relevant watercourse.					
Hotspot	An area (often localised) that is a potential source for sediment / nutrient loss during afforestation and / or future forestry operations. Examples include soft wet ground, flushes and springs, and pockets where machine access is difficult due to low ground-bearing capacity.					
Water abstraction point	Abstraction point of any surface waters, borehole, spring or well used for the abstraction of water for human consumption in a water scheme.					

 Table 1 Water features requiring water setbacks.

# 2.4.2 Drainage and cultivation

Drainage and cultivation are necessary on most afforestation sites, to enable establishment. Typical methods include conventional mounding (with mound drains), ripping, inverted mounding and scrap mounding. Key factors are as follows:

- It is critical that water collected within drains flows slowly, both during afforestation and throughout the remainder of the forest rotation. This minimises the potential for erosion and the transport of sediments and nutrients to receiving waters. This requires an assessment of soil, slope and likely rainfall, and the selection and refinement of the most appropriate option(s), incorporating correct drain alignment, spacing and depth, and the proper deployment of sediment traps. Refer to the *Forestry Standards Manual* for specifications regarding drains, sediment traps, mounding, ripping, etc. Additional information is contained in the *Forest Road Manual* and *Forest Drainage Engineering: A Design Manual*. For details on operational safeguards (e.g. sediment trap distribution), see Section 3.7.1.
- All new drains must terminate in an appropriately-sized sediment trap located <u>outside</u> the water setback. New drains <u>must not</u> enter into or traverse the water setback itself (an exception exists for flat difficult-to-drain sites – see Section 3.7.1 for details.)



A well-defined water setback early in the afforestation process, with natural ground vegetation emerging.

- Match drainage and cultivation to the specific conditions that exist in different parts of the site, selecting the least intensive options and specifications needed to successfully establish and grow the forest. Where site conditions allow (e.g. on naturally free-draining sites), consideration should first be given to the least impacting techniques, such as ripping and inverted mounding. In water-sensitive parts of the site, inverted mounding or simple pit planting should be considered.
- The drainage and cultivation proposed for different plots must be determined during the design stage and accurately depicted on the submitted Biodiversity Map. Also depict any additional safeguards deemed necessary (see Section 3.7.1).
- Of particular concern are peat soils, steep slopes capable of generating higher water velocities, and old land drains and other possible pathways that may become reactivated. Also of particular concern is the capacity of the new drainage network to withstand high rainfall events, without the failure of sediment traps and water setbacks.

## 2.4.3 Water crossings

Water features may need to be crossed for site development works and ongoing site management. Crossings may be temporary in nature or may comprise permanent structures intended to link in with a future forest road.

The following requirements apply:

- > Any work in an aquatic zone should be limited to the period May to September, inclusive.
- Crossings should be designed so that:
  - the number of crossings over a given aquatic zone is minimised;
  - disruption to the bank, bed and adjacent water setback is minimised;
  - the water flow is crossed at a right angle;
  - cement or uncured concrete is kept out of the aquatic zone, with 'cast-in-place' concrete isolated from any water which might enter the aquatic zone, until the

concrete is cured;

- · local stone is used for bridge kerbs and end treatments for culverts;
- all timber treatment is carried out off-site.
- Consult with the Inland Fisheries Ireland at least 6 weeks prior to constructing any crossing of an aquatic zone.
- If planning a permanent structure intended to link in with a future forest road, consider whether or not the location of the crossing is environmentally appropriate for that future use.
- > Bridge construction is necessary where culverts may restrict fish migration.
  - All supports and buttresses should be completely out of the stream.
  - Do not create shallow or shooting flow at the bridge aprons, to ensure that water velocities do not impede fish movement.
- Fords are not desirable and should only be used where the design is approved by Inland Fisheries Ireland.
- All culverts should be well-bedded and of sufficient size to carry normal flow, to accommodate 25-year storm events, and to avoid blockages and washouts. Ends should be tapered to match the embankment slope. If greater than 1.0 metre in diameter, culverts should be buried to a depth of 30 cm or 20% of their height (whichever is greater) below the streambed, and the original bed material placed in the culvert.

If proposing a crossing, submit full design details with the afforestation application, and clearly indicate the proposed location on the Biodiversity Map. Also provide details regarding removal and site restoration, where the proposed crossing is temporary in nature.

# 2.5 Biodiversity

### **OBJECTIVES:**

- TO ENSURE THAT AFFORESTATION DOES NOT ADVERSELY IMPACT DESIGNATED CONSERVATION AREAS, PROTECTED HABITATS, OR PROTECTED SPECIES OF FAUNA OR FLORA AND THEIR HABITAT.
- > TO ENHANCE THE BIODIVERSITY VALUE OF THE NEW FOREST THROUGHOUT ITS ROTATION.

Biodiversity is the variety of living organisms, including: (i) the diversity of species; (ii) the genetic diversity or variation within the species; and (iii) the ecosystems in which species live. Conifer, broadleaf and mixed woodlands and forests can contribute greatly to biodiversity, both within their boundaries and as wildlife corridors and refuges in the wider landscape.

## 2.5.1 Protected habitats and species

Afforestation can impact of a range of habitats and species protected under various legislation. Table 2 sets out various scenarios that may apply, and the likely outcome regarding any proposed afforestation application. Applicants are encouraged to seek ecological input early in the design stage in situations where one or more of these scenarios apply, and to tailor any subsequent application accordingly before submission to the Forest Service.



Yellow brimstone. Sensitive design at afforestation will enhance the forest's biodiversity value throughout the entire rotation. **Table 2** Various scenarios that may apply regarding protected habitats and species, and the likely outcome regarding the proposed afforestationapplication. (Note, the use of the term 'the project' below relates to afforestation and management of the forest rotation.)

<ul> <li>1. Is the plot(s) within a Special Area of Conservation (SAC), Special Protection Area (SPA), a Natural Heritage Area (NHA) or proposed NHA, a Nature Reserve, a National Park, or a Refuge for Flora and Fauna?</li> <li>These sites are designated for the conservation of habitats and species. For example, SACs are designated under the Habitats Directive to create a coherent European ecological network in order to ensure the restoration or maintenance of habitats (Annex I) and animal and plant species (Annex II) of Community interest at a favourable conservation status.</li> <li><i>Relevant legislation:</i> EU Habitats Directive; EU Birds Directive; Wildlife Act 1976; Wildlife (Amendments) Act 2000; European Communities (Birds and Natural Habitats) Regulations 2011 (S.I.477 of 2011)</li> </ul>	<ul> <li>If 'Yes', the Forest Service may require an ecological report demonstrating how the project can take place in a manner compatible with the ecological objectives of the designation.</li> <li>In relation to NATURA sites (SACs and SPAs), the Forest Service will undertake screening and where necessary, appropriate assessment, and can only approve the project if it is satisfied that it will not adversely affect the integrity of the NATURA site, either alone or in combination with other plans or projects. See the Forest Service Forestry Standards Manual for details of this Appropriate Assessment Procedure.</li> <li>Do not submit any area of a habitat listed as a qualifying interest of the SAC.</li> <li>The Forest Service is not in a position to approve afforestation applications within Hen Harrier SPAs, pending the completion of the Threat Response Plan.</li> <li>In relation to proposed afforestation within NHAs, the Forest Service requires the submission of a completed Notifiable Action Form (which documents National Parks &amp; Wildlife Service consent) with the initial Afforestation Application (Form 1).</li> </ul>
2. In non-designated areas, is there a habitat listed in Annex I of the Habitats Directive, known to be present or observed within the plot(s)? See SUPPORTING DOCUMENT for a list of Annex I habitats (and the corresponding Fossitt (2000) habitat classification) that may occur on afforestation sites. Relevant legislation: Habitats Directive.	If 'Yes', the Forest Service may require an ecological report assessing the habitat and its extent and identifying mitigation measures capable of ensuring that the project can take place in a manner compatible with the maintenance or restoration to a favourable conservation status of that habitat. NOTE, at a site level, the Forest Service will not approve the afforestation of a non-designated Annex I habitat that is deemed to be a favourable condition, based on an assessment of its area, structure and function, and future prospects. Such habitat must be excluded from the application or incorporated as a retained habitat. In both cases, an appropriate habitat setback will also be required so as not to impact on future prospects.

<ul> <li>3. Is the plot(s) within one of the Priority 8 Freshwater Pearl Mussel (FPM) Catchments (as listed in the SUPPORTING DOCUMENT)?</li> <li>FPM is a freshwater shellfish that is highly vulnerable to siltation and nutrient runoff and other water impacts, and is a highly threatened species of European importance.</li> <li>The Strategy for Conservation of the Freshwater Pearl Mussel (September 2011) prioritises the conservation of FPM populations within 8 sub-basin catchments. See the SUPPORTING DOCUMENT for details.</li> <li>Relevant legislation: Habitats Directive; European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (S.I.296 of 2009)</li> </ul>	If 'Yes', afforestation approval is dependent <i>inter alia</i> upon the submission and subsequent evaluation by the Forest Service, of a Form A (Site Assessment) and Form B (Mitigation Measures) from the <i>Forestry &amp;</i> <i>Freshwater Pearl Mussel Requirements</i> . The Forest Service may also require NATURA Impact Statement (NIS). Note that, if approved, afforestation within these catchments is likely to limited to native woodland establishment under GPC9 and GPC10.	
<ul> <li>4. Is the plot(s) within the 6 km zone of any other Freshwater Pearl Mussel Catchment listed in the SUPPORTING DOCUMENT?</li> <li>For details of FPM, see above.</li> <li>Relevant legislation: Habitats Directive; European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009.</li> </ul>	If 'Yes', afforestation approval is dependent <i>inter alia</i> upon the submission and subsequent evaluation by the Forest Service, of a Form A (Site Assessment) and Form B (Mitigation Measures) from the <i>Forestry &amp;</i> <i>Freshwater Pearl Mussel Requirements</i> . The Forest Service may also request a NIS.	
5. Is there an Annex IV species or its habitat (if in the species range) known to be present or observed within the plot(s)? Species listed in Annex IV of the Habitats Directive are strictly protected. It is an offence to deliberately disturb the species or damage or destroy its breeding or resting places wherever it occurs, whether inside or outside designated areas. Annex IV species include otter, Kerry slug and bats. <i>Relevant legislation:</i> Habitats Directive.	<ul> <li>If 'Yes' for otter, follow the requirements set out in the Forest Service Forestry &amp; Otter Guidelines.</li> <li>If 'Yes' for Kerry slug, follow the requirements set out in the Forest Service Forestry &amp; Kerry Slug Guidelines</li> <li>If 'Yes' for any other Annex IV species, the Forest Service may require an ecological report demonstrating how the project can and will be designed and implemented in a manner compatible with the protection of the species and its habitat.</li> </ul>	

<ul> <li>6. Is there an Annex II species and / or its habitat known to be present or observed within the plot(s)?</li> <li>Species listed in Annex II of the Habitats Directive are animal and plant species of Community interest whose conservation requires the designation of SACs. Outside of SACs, these species are protected against damage that impacts their favourable conservation status (or ability to achieve that status) (for example, damage that reduces the natural range of the species). There are a number of Annex II species, included the Killarney Fern, Yellow Marsh Saxifrage and River Lamprey.</li> <li><i>Relevant legislation:</i> Habitats Directive; Environmental Liability Directive; European Communities (Environmental Liability) Regulations 2008 (S.I.547 of 2008).</li> </ul>	If 'Yes', the Forest Service may require an ecological report confirming the presence of the species or its known habitat, a determination regarding whether or not the project would impact on the species' favourable conservation status (or its ability to achieve that status), and if so, required mitigation.
7. Is the application located on sandstone geology in West Cork or Kerry, as illustrated in Figure 1 of the Forest Service Forestry & Kerry Slug Guidelines? As an Annex IV species under the Habitats Directive, the Kerry slug (Geomalacus maculosus) is strictly protected wherever it occurs. It is an offence to deliberately disturb the species or damage or destroy its breeding or resting places wherever it occurs, whether inside or outside designated areas. It is also an offence under national legislation (Wildlife Act 1976, Wildlife (Amendment) Act 2000) to deliberately destroy or damage the slug or its habitat. Relevant legislation: Habitats Directive; Wildlife Act 1976; Wildlife (Amendment) Act 2000.	If 'Yes', follow the decision path set out in the Forest Service Forestry & Kerry Slug Guidelines. Detail both the outcome of this process and any resulting amendments to forestry operations required (as set out in these Guidelines) in the proposed application for afforestation.
<ul> <li>8. Is there a population of a species protected under the Flora (Protection) Order 2015 (S.I.356 of 2015) known to be present or observed within the plot(s)?</li> <li>The Flora (Protection) Order 2015 protects various plants (see SUPPORTING DOCUMENT). It is an offence (save under a licence granted under Section 21 of the Wildlife Act 1976) to (<i>inter alia</i>) wilfully alter, damage, destroy or interfere with the habitat or environment of these plants. This applies to wherever the plants are found, whether inside or outside designated areas.</li> <li>See SUPPORTING DOCUMENT for relevant sources of information.</li> <li><i>Relevant legislation:</i> Wildlife Act 1976; Wildlife (Amendment) Act 2000; Flora (Protection) Order 2015 (S.I.356 of 2015).</li> </ul>	If 'Yes', the Forest Service may request the submission of an ecological report confirming the presence (or otherwise) of the species, and required mitigation.

Note regarding species of animal protected under the Wildlife Act 1976 and the Wildlife (Amendment) Act 2000

Mammal, amphibian, reptile and invertebrate species protected under the Wildlife Act 1976 and the Wildlife (Amendment) Act 2000 (see **SUPPORTING DOCUMENT** for list) are protected from injury, or from disturbance / damage to their breeding or resting place, wherever these occur. The majority of these species are considered by other scenarios listed above. Further cover is provided by specific Forest Service requirements for Kerry slug and otter and guidance for bat species, Therefore, to avoid duplication, the above does not contain a specific question dealing directly with the Wildlife Act 1976 and the Wildlife (Amendment) Act 2000.

# 2.5.2 Areas for Biodiversity Enhancement

During onsite assessment, identify Areas for Biodiversity Enhancement, or ABEs. Their function is (*inter alia*) to conserve existing habitats and biodiversity features onsite and to promote the development of biodiversity generally within the new forest.

ABEs comprise environmental setbacks, future operational areas and retained habitats, as described below.

- An environmental setback is a (largely) unplanted and undisturbed open space of a defined width (as set out in Section 2.8) installed to protect a particular environmental feature or sensitivity. Different types apply (as listed below) depending on the feature or sensitivity involved:
  - water setback
  - retained habitat setback
  - archaeological setback
  - public road setback
  - utilised building setback
  - landscape setback

In addition to their main protective role, these environmental setbacks are important biodiversity features in their own right, providing open and edge habitats along the forest margin. As described later, this role can be enhanced further through simple design and additional planting.

- A future operational area is an open space left unplanted in order to facilitate the future management of the plantation (e.g. a rideline) or to accommodate future infrastructure (e.g. a forest road or landing bay). In addition to their primary management function, these operational areas are also important biodiversity features in their own right, and this value can be enhanced further through simple design and additional planting.
- A retained habitats is an existing onsite habitat selected for retention within the future forest. These can be area-based features (e.g. a localised flush), linear features (e.g. a hedgerow) or point features (e.g. a veteran tree). Design must aim to protect and enhance these habitats throughout the forest rotation, and to allow associated native flora and fauna to develop. This may involve the addition of a habitat setback, to prevent future impacts (e.g. overshadowing) from the growing forest canopy – see Section 2.8 for details.

(Note, it may be necessary to exclude from the afforestation application, areas containing certain habitats or species that require grazing to persist. Otherwise, these areas will become overgrown as the result of fencing.)

Ensure that future operational areas for future forest roads do not overlap with environmental setbacks for water, archaeology and retained habitats.

Tables 3 and 4 list the various features that are eligible as ABEs for the purpose of grant and premium calculation.

Site features	Eligible as ABE?	
Water setback	Yes	
Retained habitat setback	Yes	
Archaeological setback	Yes	
Public road setback	Yes	
Utilised building setback	Yes	
Landscape setback	Yes	
Hedgerows and other woody habitats	See Table 4	
Created lakes / reservoirs	Yes	
Railway setbacks	Yes	
Drains	Yes	
Future operational areas left for planned forest roads, turning bays, ridelines, etc.	Yes	
Unplantable areas	No	
Areas of shallow, rocky soil	No	
Rock and scree	No	
Aquatic zones (as defined in Table 1)	No	
Rights-of-way held by 3 <sup>rd</sup> parties	No	
Areas with turbary or grazing rights held by 3 <sup>rd</sup> parties	No	
Major water mains	No	
Power line corridors	No	
Gas pipeline corridors	No	
Public roads	No	
Other features	If deemed appropriate by the Forest Service	

Table 3 Site features and their eligibility as ABEs. (Also see Table 4 regarding woody habitats.)

Type of woody habitat	Eligibility as ABE and available options(*)	Comment	
Area of scrub (e.g. elder) and non-high forest species (e.g. blackthorn, hawthorn, willow)	<ul> <li>Eligible as ABE. Therefore, either:</li> <li>&gt; include as retained habitat; OR</li> <li>&gt; clear(**) and plant; OR</li> <li>&gt; exclude from the application.</li> </ul>	Non-high forest species often have a high biodiversity value.	
Individual high forest trees (e.g. oak, ash, beech, hazel(***), birch, pine)	Eligible as ABE. Therefore, include as retained habitat (i.e. point features).	Individual trees such as these can have a high biodiversity value.	
Areas of high forest trees (see above examples) less than 0.1 ha in size	Eligible as ABE. Therefore, either: ➤ include as retained habitat; OR ➤ exclude from the application.	Groups comprising trees such as these can have a high biodiversity value.	
Areas of high forest trees (see above examples) 0.1 ha or greater in sizeNot eligible as ABE. Therefore, exclude from the application.		Such areas meet the definition of a forest, and existing forests cannot receive afforestation payments.	
Hedgerows	<ul> <li>Eligible as ABE. Therefore, either:</li> <li>&gt; include as retained habitat <u>plus</u> setback; OR</li> <li>&gt; include as retained habitat.</li> </ul>	Apply habitat setback as per Section 2.5.4. Otherwise, no habitat setback required.	
Rhododendron / laurel	<ul> <li>Not eligible as ABE. Therefore, either:</li> <li>➤ clear and plant, OR</li> <li>➤ exclude from the application.</li> </ul>	These are non-native invasive species and must not be retained as ABE.	
birch, pine) Areas of high forest trees (see above examples) less than 0.1 ha in size Areas of high forest trees (see above examples) 0.1 ha or greater in size Hedgerows Rhododendron / laurel	<ul> <li>Eligible as ABE. Therefore, either:</li> <li>include as retained habitat; OR</li> <li>exclude from the application.</li> </ul> Not eligible as ABE. Therefore, exclude from the application. Eligible as ABE. Therefore, either: <ul> <li>include as retained habitat <u>plus</u> setback; OR</li> <li>include as retained habitat.</li> </ul> Not eligible as ABE. Therefore, either: <ul> <li>clear and plant, OR</li> <li>exclude from the application.</li> </ul>	value. Groups comprising trees such as these can have a high biodiversity value. Such areas meet the definition of a forest, and existing forests cannot receive afforestation payments. Apply habitat setback as per Section 2.5.4. Otherwise, no habitat setback required. These are non-native invasive species and must not be retained as ABE.	

Table 4 Woody habitat types, their eligibility as ABEs, and available options.

\* Each relevant option can be applied to all of the corresponding woody habitat type onsite, or to different sections of it.

\*\* Under a Felling Licence, if required. Note, the retention of alluvial woodland comprising willow may require prioritisation within the wider landscape, due to ecological considerations and water protection.

\*\*\* Hazel may be classed as 'scrub' where it has encroached in the last 5 years.

# 2.5.3 ABE criteria

ABE eligibility criteria are as follows:

- Between 10-15% of the afforestation site must be treated with particular regard to biodiversity, comprising a combination of open spaces (i.e. environmental setbacks and future operation areas) and retained habitats. Where ABEs add up to more than 15% of the total area, the claim area must be reduced accordingly, as set out in the *Forestry Standards Manual*.
- ABEs must comprise areas suitable for planting, but where the potential for a commercial forest crop is foregone for the purpose of retaining habitats and creating open spaces in order to (*inter alia*) promote biodiversity within the future forest. Areas that are unsuitable for planting are not eligible as ABEs.
- ABEs must be an integral part of the site. For example, an ABE plot cannot be in an adjoining field / land parcel or in a separate plot away from the main area of the plantation.

- ➢ Generally, identify ABEs using the following sequence:
  - Step 1: Identify environmental setbacks (for water, archaeology, landscape, etc.) and future operational areas, to allow for the environmental features / sensitivities identified and management needs envisaged.
  - Step 2: Select the 'best quality' habitats(\*) onsite for retention, together with any habitat setbacks deemed necessary to prevent future impacts (e.g. overshadowing) from the growing forest canopy.
- Applicants must not remove habitats prior to submission of the afforestation application. Otherwise, the application may be refused.
- The submitted Biodiversity Map must show any proposed ABEs (i.e. environmental setbacks, future operational areas and retained habitats) as Bio Plots and as linear or point features, and state the equivalent area. The *Forestry Standards Manual* sets out the mapping requirements. It is critical that the Biodiversity Map accurately depicts all relevant environmental features and sensitivities (including biodiversity features), proposed cultivation and drainage, and the location of setbacks and other protective measures.

(\* A basic level of ecological assessment by the Registered Forester will help to identify which habitats will have the greatest biodiversity value. When identifying and mapping retained habitats, use the Level 2 (or Level 3, if possible) habitat classification in Fossitt's *A Guide to Habitats in Ireland* (2000) (PDF available at www.heritagecouncil.ie).)

## 2.5.4 Hedgerows

Hedgerow networks are one of the most widespread semi-natural habitats in the countryside, due to their extent, connectivity, structure and composition. In addition to their biodiversity value, hedgerows form part of the cultural and historic heritage of the country, and are important landscape features. As such, they must be regarded carefully during pre-application design and subsequent site works.

All hedgerows must be retained. In general, do not break through hedgerows during afforestation. Similarly, do not use hedgerow trees as makeshift straining posts for fencelines.

A habitat setback (5 metres minimum) should also be considered in relation to particular hedgerows onsite, to ensure their continued presence as the surrounding canopy develops. This decision should be informed by the quality of the hedgerow (in terms of its age, species composition and structure), its landscape importance, and other attributes (e.g. whether or not the hedgerow represents a townland boundary or if it is associated with another habitat such as a stream).

Other situations can arise where a hedgerow setback is desirable, e.g. to create a future wind-firm edge to enable staggered felling later, or to realise the potential role of a hedgerow as part of water management onsite.

Hedgerows with setbacks will also act as links and corridors for many species of flora and fauna between other areas of semi-natural habitat within the wider landscape. Therefore, consider applying setbacks to one or more contiguous lengths of hedgerow that run from one side of the afforestation site to the other, to promote this habitat connectivity.

# 2.6 Archaeology and built heritage

### **OBJECTIVES:**

- TO SEEK TO ENSURE THAT PROPOSED AFFORESTATION DEVELOPMENT PROJECTS DO NOT ADVERSELY IMPACT DIRECTLY OR INDIRECTLY ON KNOWN OR SUSPECTED ARCHAEOLOGICAL SITES AND MONUMENTS OR ON OTHER IMPORTANT BUILT HERITAGE STRUCTURES OR FEATURES. THIS INCLUDES PROTECTING THEIR AMENITIES AND WHERE RELEVANT, THEIR WIDER LANDSCAPE SETTING, IN PARTICULAR, THEIR RELATIONSHIP WITH OTHER ROUGHLY CONTEMPORARY OR DETERMINABLY LINKED SITES, MONUMENTS, STRUCTURES OR FEATURES.
- WHERE AFFORESTATION IS APPROVED NEAR KNOWN OR SUSPECTED ARCHAEOLOGICAL SITES AND MONUMENTS OR OTHER IMPORTANT BUILT HERITAGE STRUCTURES OR FEATURES, TO SEEK TO ENSURE THAT: (I) APPROPRIATE EXCLUSION ZONES, FENCING, ACCESS PATHS AND OTHER RELEVANT MEASURES ARE INCORPORATED INTO THE PROJECT DESIGN; (II) THERE IS AN APPROPRIATE RESPONSE SHOULD ANY PREVIOUSLY UNRECORDED ARCHAEOLOGICAL SITE, MONUMENT, OBJECT, STRUCTURE OR FEATURE BE DISCOVERED DURING SITE WORK; AND (III) ANY APPROVED DESIGN IS SYMPATHETIC TO AND PROVIDES AN APPROPRIATE VISUAL SETTING FOR SUCH SITES, MONUMENTS, STRUCTURES OR FEATURES.

## 2.6.1 Potential impacts

The Irish countryside is rich in the physical remains of human activity stretching back over the millennia. These vary from the more obvious and iconic monument types such as megalithic tombs, standing stones, ringforts, crannógs, churches and graveyards, burial grounds and medieval castles, to the less well-known and less visible or entirely below-ground surface monument types such as ancient timber and gravel roadways (toghers), cooking places (fulachta fiadh) and settlement sites. All archaeological sites and monuments can have or may survive solely as associated artefacts and features. Examples include stone or metal tools, pottery sherds, post holes or refuse pits. These are often only uncovered during ploughing, drainage works, construction or turf cutting.

Archaeological sites and monuments and other important built heritage structures and features are part



A central court tomb, Magheraghanrush or Deerpark, Co. Sligo (Coillte property). (Illustration Aislinn Adams)

of our national heritage. There is a wealth of information to be gathered from such sites, monuments, structures and features, both from those which are visible above the ground and from those which have little or no surface expression. In addition to their educational value in terms of informing current and future generations and visitors about the history and development of our culture and society, they are also important recreational and tourism resources at local, regional and national levels.

## 2.6.2 Procedures

Land proposed for afforestation may contain or be located adjacent to archaeological sites and monuments and built heritage structures and features. For the purpose of these Requirements, these are grouped into three categories:

- 'Designated' archaeological sites and monuments, which include those: entered onto the Record of Monuments and Places (RMP) or the Register of Historic Monuments (RHM); National Monuments in the ownership or the guardianship of the Minister for Arts, Heritage, Regional, Rural & Gaeltacht Affairs or a Local Authority; or those subject to a Preservation Order (PO) or a Temporary Preservation Order (TPO). Also included are sites and monuments newly discovered at the pre-application design stage or during the site works stage, post-approval. Examples include megalithic tombs, cairns, barrows, mounds, ringforts, enclosures, churches and graveyards, castles, tower houses and children's burial grounds.
- 'Designated' buildings and structures or parts of structures which form part of the architectural heritage and which are of special interest, i.e. those entered onto the Record of Protected Structures (RPS) in the relevant County Development Plan or those entered into the National Inventory of Architectural Heritage (NIAH). Examples include vernacular cottages and houses, country houses and lodges, designed gardens and parklands, parish churches, historic creameries, military fortifications, mine engine houses, water mills, canals, locks and lock houses, and old school houses.
- 'Non-designated' built heritage structures, e.g. lime kilns, sheep folds, creamery stands, stiles, townland boundaries, pumps and pump houses, mill ponds, and derelict dwellings / farm buildings.

Given the nature of afforestation (site selection, ground preparation operations, canopy development, and making provisions for future management operations), the potential for damage to our archaeological and built heritage clearly exists. For example, soil cultivation and drainage works can directly or indirectly disturb or impact both upstanding and sub-surface archaeological sites and monuments and associated features and artefacts. Even the digging of drains and sediment traps near such sites or monuments may cause organic deposits and artefacts (e.g. structural timbers, wooden artefacts or leather) preserved by anaerobic conditions to decay quicker as the soil deposit dries out. Similarly, changes caused to soil chemistry (e.g. from needle fall) may cause metal artefacts or ceramics to decay quicker.

The early identification of the nature, extent, setting, visual envelope and linkages of archaeological sites and monuments or other important built heritage structures or features, and the incorporation of these considerations both at the pre-application design stage and during site works (where afforestation is approved near known or suspected archaeological sites and monuments) will help to avoid or minimise the risk of damage.

Examples of measures to avoid, reduce or mitigate adverse impacts include:

- > avoidance of areas of known or suspected elevated archaeological potential;
- incorporation of appropriate archaeological setbacks;

- access routes;
- unplanted lines of sight;
- > arranging for in-works supervisory safeguards such as archaeological monitoring; and
- the sensitive design of the forest edge adjoining archaeological setbacks, to provide an appropriate setting.

The Registered Forester must identify known archaeological sites and monuments or other important built heritage structures or features, on and adjoining a site proposed for afforestation, through review of the relevant layers on iNET, and through a thorough onsite assessment.

The Forester should also utilise readily accessible sources of information. For example, the online digital service - the Historic Environment Viewer - provided by the Department of Arts, Heritage, Regional, Rural & Gaeltacht Affairs, facilitates access to the databases of the National Monuments Service (NMS) Sites and Monuments Record (SMR) and the NIAH. In addition, the RPS for each county is normally accessible on-line, and can usually be found as an appendix to the published County Development Plan. See the *Forestry Standards Manual* for further details.

Where possible, include all reference numbers (e.g. RMP number) on the Biodiversity Map submitted with the application. Doing so may expedite the Forest Service assessment of the application.

Once the various archaeological sites and monuments and other important built heritage structures or features (including those both 'designated' and 'non-designated') have been identified, the relevant minimum archaeological setbacks detailed in Section 2.8 apply, as well as any other measures proposed to address considerations such as the nature, extent, setting, visual envelope and linkages of these sites, monuments, structures or features.

# 2.6.3 Conditions attached to or further information required in approvals

As a general rule, the archaeological conditions that may be attached to any approval for afforestation will be taken from, but are not limited to, one or more of a tiered hierarchy of archaeological mitigation responses. These include:

- archaeological setbacks (including fenced-off exclusion zones);
- access routes;
- unplanted lines of sight;
- increasing the size of the archaeological setbacks;
- the exclusion of a larger area or areas of archaeological potential;
- archaeological monitoring of specified areas by an independent archaeological consultant retained by the Applicant or the Registered Forester;
- refusal of either part or all of the development, pending the consideration by the Forest Service and NMS of an archaeological assessment and an archaeological impact statement prepared by an independent archaeological consultant retained by the Applicant or the Registered Forester; or
- refusal after submission, where warranted due to significant adverse impacts that are evident at the very outset of the Forest Service assessment, or which become so as the assessment continues.

Note, as explained above, where it is evident to the Forest Service at the outset or where it becomes



Ogham Stone, Knickeen, Co. Wicklow (Coillte property).

evident as the assessment progresses, that a proposed development is likely to have significant adverse impacts on archaeological, historical or cultural sites or features, and which in its opinion cannot be adequately addressed by conditions based on the tiered hierarchy of archaeological mitigation responses listed above, the application may be refused entirely.

## 2.6.4 Archaeological finds at the pre-application design stage

Note that, during the onsite assessment or with local knowledge, the Registered Forester may also encounter a previously unrecorded archaeological site or monument at the pre-application design stage. If discovered, the location of any new or suspected new archaeological site or monument must be included on the Biodiversity Map, and a clear reference included in the map's table legend. Furthermore, a clear description must be provided in the 'Other Environmental Considerations' section of the Afforestation Application Form 1.

The Forest Service will consider such reports as part of its assessment of the application. Following referral to the NMS, it may impose one or more relevant archaeological conditions, with a default position being to favour preservation *in situ* of any new archaeological site or monument so identified (in accordance with the principles and approach as set out in Part III of *Framework and Principles for the Protection of the Archaeological Heritage* (Department of Arts, Heritage, Gaeltacht and the Islands, 1999)).

Where an archaeological object is discovered at this stage, it must by law be reported within a reasonable time period (and not longer than 96 hours) to the Garda Síochána or the National Museum of Ireland. Also, unless there is reasonable cause to believe that removal or interference is necessary to preserve it or to keep it safe, it must not be disturbed. The unsupervised recovery of archaeological objects by untrained persons can greatly diminish or entirely eliminate any knowledge or research value that might be gained from a particular discovery. It is important that, wherever possible, archaeological objects are recovered in a structured scientific manner, with careful recording made of their association with other objects, structures, features and soil layers.

(Note, see Section 3.8 for details regarding archaeological finds discovered during site works.)

# 2.7 Landscape

## OBJECTIVE: TO ENSURE THAT THE PROPOSED FOREST IS DESIGNED SO THAT IT IS VISUALLY ACCEPTABLE AND IN KEEPING WITH LANDSCAPE AND AMENITY SENSITIVITIES.

The predominantly open landscape of Ireland is a result of the progressive clearance of the natural woodland cover through the centuries, primarily for agriculture. In such an open landscape, afforestation is a major change. Registered Foresters should therefore apply attention to shape, scale, species diversity, margins, open spaces and views, to ensure that the new forest complements the character of the landscape, and to avoid intrusive and monotonous plantations. Careful design of forests at the pre-application design stage is important, as only limited improvements can be made later on.

The Registered Forester should consult with the relevant County Development Plan (both Draft and Final Plans), which will identify areas of particular landscape sensitivity and important views. The Registered Forester should also view the site from various vantage points and approaches, to identify how best to design the forest(\*).

(\* Within sensitive landscapes, it may be advisable for Registered Foresters to submit a series of photographs of the site, as viewed from various approach roads and local vantage points, together with an OS Discovery map indicating where each photo was taken. This will enable to Forest Service to assess how the afforestation will fit into the landscape, as viewed from these positions. Some digital cameras and smartphones have a function to take panoramic photographs, which are ideally suited for this purpose.)

Achieving an acceptable landscape design can be a subjective exercise. However, the following measures can be applied as required, taking account of the size of the proposed plantation, its position in the landscape, and its visibility from key vantage points, near and far. For example, a plantation on a visible hillside within a sensitive landscape will require a greater degree of design compared to a plantation within a lowland area with hedgerows, where measures may be limited to well-designed setbacks adjoining dwellings and public roads.

It is important that any measure applied is done so at an appropriate scale, in order to have the desired impact.



When appropriately sited and with sensitive layout and design, new woodlands and forests make a significant contribution to the landscape. (Photo Gillian Mills)

Shape, margins and diversity are key considerations in forest landscape design. (Illustration Aislinn Adams)

# 2.7.1 Shape

- Shape is the dominant landscape feature. It refers to the forest outline and also to the pattern of different species within it.
- Overall straight or horizontal lines and geometric or regular shapes should be avoided, where possible. These are often imposed by property boundaries, but can be mitigated by landscape setbacks (see Section 2.8).
- The planting of single, small groups and irregular belts of native species (e.g. birch, rowan, oak and Scots pine, as site conditions allow) along the forest edge or within any environmental setback will also add visual interest see Sections 3.5.3 and 3.5.4.
- On hillsides, planting should conform to the overall pattern in the landscape, whether natural landforms or field patterns, and follow the same rounded or irregular shapes.
- Large open landscapes are more suited to relatively large forested areas, while smaller and more regular shapes fit in better within a lowland pattern of fields and hedgerows.

# 2.7.2 Margins

- Avoid abrupt margins between the forest and open ground, between different species and between different Grant & Premium Category (GPC) plots.
- On sites approaching the skyline, the upper margin should be in line with the predominant landscape characteristics, be they irregular or smooth. Avoid leaving a narrow parallel band of open ground near the skyline. The open ground should reflect the scale of the hill or ridge. At lower points, planting can be carried right over the skyline.
- In upland areas, long straight vertical boundaries should be avoided. Instead, a diagonal trend should be maintained.
- Along highly visible forest margins, localised areas of spruce and pine trees towards the outer 10-15 metres of the forest can be planted at wider and irregular spacing. This measure, when

used in conjunction with forest edge planting, can promote the sense of a natural tree line, therefore softening the external margin.

- In lowland areas, straight boundaries can be acceptable where they reflect the agricultural field pattern.
- On lower margins, plantations can be blended into the agricultural landscape by introducing and extending broadleaf plots and additional broadleaves upwards in amongst conifer plots, especially following hollows in the landform.

## 2.7.3 Diversity

- Diversity can be promoted by using a variety of species and by incorporated and reinforcing open spaces and retained habitats.
- Too much variety, however, should be avoided. It is usually desirable that one species dominates by about two-thirds.
- To be considered eligible under the Afforestation Scheme, the proposed plantation must have a minimum of 10% broadleaves, either as plots of minimum width and / or as single, small groups and irregular belts of additional broadleaves. Furthermore, each plot must comply with one of the GPCs described in the *Forestry Standards Manual*, and its corresponding requirements, including species composition.
- Promote an interlocking pattern along the margin between plots of different species. This can be achieved by extending groups and single trees of one species into the other, within the scope allowed under the GPCs involved.
- > Avoid creating long rows of single species or rows or blocks of alternate species.
- Avoid species boundaries crossing the skyline.
- Plot outlines and group planting should follow ground vegetation patterns this will help maintain a natural appearance.
- Reinforce the outline of retained woody habitats, by planting broadleaves in adjoining tongues or groups.
- The planting of single, small groups and irregular belts of native species (e.g. birch, rowan, oak and Scots pine, as site conditions allow) along the forest edge or within any environmental setback will add visual interest – see Sections 3.5.3 and 3.5.4.

## 2.7.4 Environmental setbacks and future operational areas

Within the overall plantation boundary, the pattern created by environmental setbacks and future operation areas must be taken into account. The layout and design of these open spaces is set out elsewhere in this document. As an overall measure, where these features intersect with each other, introduce appropriately-scaled bell mouths in order to eliminate stark junctions and corners that may be visible from outside the plantation. The use of forest edge planting and environmental setback planting (see Sections 3.5.3 and 3.5.4) can also soften harsh angles.

Integrate environmental setbacks and future operational areas, to create a more natural landscape design. (Illustration Aislinn Adams)

# 2.7.5 Other considerations

- Where possible, ridelines and firebreaks through forests should follow landform and make use of natural features. They should follow an irregular route that avoids dividing a plantation into equal parts, and they should not be sited at right angles or parallel to contours.
- Landscape setbacks and appropriate edge design for public roads and dwellings are important – see Section 2.8 for requirements.



# 2.8 Environmental setbacks

An environmental setback is a (largely) unplanted and undisturbed open space of a defined width, installed to protect a particular environmental feature or sensitivity. Different types apply, depending on the feature or sensitivity involved, i.e.

- water setback
- retained habitat setback
- archaeological setback
- public road setback
- utilised building setback
- landscape setback

Table 5 describes the minimum setback width (as measured horizontally) and setback treatment for each of the above. Note, the Forest Service may stipulate, on a site-specific basis, greater setback widths than those prescribed, or setbacks in relation to other types of features or sensitivities (e.g. swallow holes).

In all cases:

- Where different setbacks overlap, the greater setback width applies.
- The setbacks described in Table 5 are eligible as ABEs.
- In general, setbacks are to remain undisturbed at afforestation and throughout the remainder of the rotation, and allowed to develop naturally. Setbacks will typically develop a sward of natural ground vegetation accompanied over time by (potentially) pockets of native woody growth.
- The ongoing treatment of setbacks during Site Works and Ongoing Site Management are detailed in those chapters.



Water setbacks and setbacks from other environmental features and sensitivities are a key part of forest design. (Illustration Aislinn Adams)

 Table 5 Environmental setback type and purpose, and corresponding minimum setback distance and additional design requirements.

 Note, all setbacks are measured in metres <u>horizontally</u>.

#### WATER SETBACK

Purpose: To create at the outset, a buffer of natural ground vegetation positioned between defined water features and the forest crop and associated operations, in order to protect water quality and aquatic ecosystems from possible sediment and nutrient runoff from the site at afforestation and throughout the remainder of the forest rotation.

Minimum setback width, as measured from the nearest bank / edge of the water feature, as observed on-the-ground (setback applies to each side of the water feature, e.g. to both banks of an aquatic zone):

Aquatic zone (as per Table 1):

Slope leading to the aquatic zone (apply as appropriate, where slope varies over the site)	Setback width	Setback width for peat soils and for sites within the catchment area of high status objective waterbodies (see note opposite)
Moderate (even to 1-in-7 / 0-15%)	10 metre	20 metre
Steep (1-in-7 to 1-in-3 / 15-30%)	15 metre	25 metre
Very steep (1-in-3 / >30%)	20 metre	25 metre

<u>Relevant watercourse</u>: 5 metre

Hotspot: 5 metre

Drinking water abstraction point: 20 metre

#### Additional design:

- Widen the water setback at various points along its length, to include adjoining wet hollows and other low-lying areas where water gravitates towards as it drains from the land.
- Based on the immediate landform / topography, vary the setback to avoid artificial lines and to create a naturally undulating forest edge.

NOTE, if the afforestation site is within the catchment area of a high status objective waterbody, the required setback width (as per the 3<sup>rd</sup> column opposite) can be reduced by 10 metres (from the landward side) if an appropriate GPC9 or GPC10 plot is included instead of this 10 m strip. For example, where a 25 m setback applies, this can be reduced to 15 m by applying the following sequence: aquatic zone  $\rightarrow$ 15 m unplanted water setback  $\rightarrow$  GPC9 or GPC10 plot. Standard requirements for GPC9 & GPC10 plots apply, as per *NWS Establishment GPC9 & GPC 10: Silvicultural Standards*.

### HABITAT SETBACK

Purpose: To create adequate space adjoining a retained habitat to avoid or reduce any impacts arising from the emerging forest and its canopy.

Different habitats identified as retained habitats (either as biodiversity plots or as linear or point biodiversity features) may require an unplanted habitat setback to prevent undue impact (such as shading) from the emerging forest. Setback width depends on the habitat and the potential impact(s). Apply careful design, e.g. focus the habitat setback mainly on the south-western, southern and south-eastern side of the habitat, to minimise the blockage of sunlight as the adjoining forest canopy grows. Note that the retained habitat itself must remain undisturbed (unless otherwise agreed or prescribed).

#### **ARCHAEOLOGICAL SETBACK**

Purpose: To physically separate the archaeological site or monument or other important built heritage structures or features from afforestation works, the emerging forest, and future forest operations.

Site, monument, building, structure	Minimum setback from the outermost extent of the archaeological site, monument, important built heritage structures or features, as evident onsite	NOTE, for desi monuments a structures (as
'Designated' archaeological sites and monuments (see note opposite)	20 metre exclusion zone	following appl <ul> <li>It is ess</li> </ul>
'Designated' buildings and structures or parts thereof which form part of the architectural heritage and which are of special interest (see note opposite)	30 metre exclusion zone for upstanding structures (e.g. building) Otherwise, 20 metre exclusion zone	known correct doubt, seek ac
Non-designated built heritage structures, e.g. lime kilns, sheep folds, creamery stands, stiles, pumps and pump houses, mill ponds, and derelict dwellings / farm buildings	<ul> <li>10 metre unplanted setback (demarcating fencing <u>not</u> required)</li> <li>Where there is a cluster of such structures (e.g. a ruined dwelling and a number of out-buildings, often enclosed in a yard or by a boundary wall), the 10 metre unplanted setback to be measured from the enclosing boundary wall, or edges of the outermost buildings.</li> <li>Where there are associated features such as boundary walls, mill races, or historic foot paths, 5 metre unplanted setbacks may also be applied to those features. Similarly for townland boundaries.</li> </ul>	<ul> <li>Archae</li> <li>The bo be clea pedest mainta 3.5.1 fo</li> </ul>

ignated archaeological sites and nd for designated buildings and defined in Section 2.6), the lies:

- sential that the full extent (i.e. the nost extent) of these features is so that the exclusion zone can be tly identified. Where there is any the Registered Forester should dvice from the relevant designating ity or the Forest Service eologist.
- oundary of the exclusion zone must arly demarcated by fencing, and trian access routes must also be ained or established (see Section or details).

#### PUBLIC ROAD SETBACK

Purpose: To ensure adequate clearance to prevent tunnelling along the public road, to retain sightlines, and to create visual diversity for road users.

#### Minimum setback, as measured from the surfaced edge of the public road:

#### Additional design:

> Based on the immediate landform / topography, vary the setback to avoid artificial lines and to create a naturally undulating forest edge.

10 metre (average, within any one application) (For conifer plots, note the additional requirement regarding edge planting - see Section 3.5.3.)

- > Provisions for future extractions should be planned and associated open spaces retained along the forest edge. Retain locally important views from the public road, by introducing open spaces through the forest. Also introduce open spaces that highlight natural features visible along the roadside.
- Increase setback, where appropriate, to allow for greater visibility at bends in the road.

#### UTILISED BUILDING SETBACK

Purpose: To prevent encroachment and isolation, the blocking of light and the curtailment of views in relation to dwellings, associated buildings, and roofed farm buildings.

Minimum setback, as measured from the outer wall of the roofed building:

Dwelling houses:

- > 60 metre minimum
- Smaller setback allowable (to a minimum of 30 metre), if written agreement of the neighbouring dweller is provided at Form 1 stage

<u>Roofed farm buildings</u>: 10 m

<u>Temporary buildings (e.g. timber sheds, kennels & buildings less than 25 m<sup>2</sup>)</u>: No setback required

#### Additional design:

- Setback distance is most critical when a building is surrounded by forest on two or more sides.
- Based on the immediate landform / topography, vary the setback to avoid artificial lines and to create a naturally undulating forest edge.
- Consider retaining locally important views from the dwelling, by introducing open spaces through the forest. Also introduce open spaces that highlight natural features visible from the dwelling.
- In relation to setbacks from dwellings, setback planting is encouraged within the 30 m to 60 m zone, if agreed to by the neighbouring dweller.

#### LANDSCAPE SETBACK

Purpose: To disrupt artificially straight lines and sharp angles along other visible sections of the plantation's outer perimeter, and to create stronger visual 'tie-in' with adjoining hedgerows and other semi-natural / natural features.

Setback and design as appropriate. Will vary, depending on site details – see Section 2.7.

Appropriate setbacks from dwellings, designed with appropriate edge planting with native broadleaf species, will avoid overshadowing and a sense of isolation. (Illustration Aislinn Adams)



# 2.9 Future operational areas

Future operational areas are areas left unplanted in order to facilitate the future management of the plantation (e.g. a rideline) or to accommodate future infrastructure (e.g. a forest road or landing bay). In addition to their primary management function, these operational areas are also important biodiversity features in their own right, and this value can be enhanced further through simple design and additional planting. The following applies:

- Edge design should take account of good landscaping practices and the local topography. Avoid creating an unnaturally straight forest edge. Instead, taking account of the immediate landform, create a more naturally undulating edge.
- Where possible, orientate in an east-west direction, to maximise sunlight throughout the day and the seasons.

# 2.10 Open spaces and deer management

Forest design at afforestation should incorporate measures to facilitate future deer management. Environment setbacks and future operational areas may provide suitable open spaces to apply control, complete with appropriate shooting positions and safe back stops. However, these may need to be augmented by additional future operational areas, specifically for this purpose. Also, in the case of open spaces likely to be used for deer management purposes, avoid landscape and biodiversity planting within these spaces and along the adjoining forest edge, in order to retain clear lines of sight. A deer hide overlooking an open space. During afforestation, incorporate features that will facilitate deer management in the future.



# 2.11 Site inputs

At design stage, planned site inputs such as fertilisers and herbicides should be tailored to the specific requirements of each plot. Aim to achieve successful establishment with the minimal level of artificial inputs possible.

Regarding fertilisers, phosphorus (P) is the main nutrient fertiliser applied at afforestation, with nitrogen (N) and potassium (K) occasionally applied as remedial fertilisation. Note that peaty soils have a very low capacity to bind phosphorus. Slow-release formulations may be appropriate on more sensitive parts of the site.

The afforestation application must detail:

- the proposed fertiliser type and application rate; and
- the proposed method of vegetation control (including herbicide type and application rate, if applicable).

Note that further operational safeguards regarding fertiliser and herbicide application are set out in Section 3.7.

# 2.12 Further environmental assessment

Stage 1: Design culminates in the submission of a Form 1 for afforestation approval. This triggers the Forest Service assessment of the proposal. In some situations, the Forest Service may seek specific environmental information regarding the proposal, before it can continue with its assessment. In such cases, a request for further information will be sent to the Applicant and his / her Registered Forester.

In a minority of cases, the information sought may entail the following, which typically involve the input of a specialist:

Ecological Report

- > Archaeological Assessment / Archaeological Impact Statement
- Water Management Plan
- Visual Impact Assessment
- NATURA Impact Statement (NIS)
- Environmental Impact Statement (EIS)

See the **SUPPORTING DOCUMENT** for further details.

# Section 3 Site Works

# 3.1 Overview

Stage 2: Site Works spans the period between the receipt of the technical approval for afforestation up to the completion of initial site works and (where grant-aided) Form 2 submission.

The technical approval will set out conditions that must be adhered to. If uncertainty exists regarding any condition, contact the Forest Service for clarity before proceeding with any work.

Note the following:

- Site works can only commence after receipt of the technical approval (note, in order to be eligible for grant aid, projects submitted under the Afforestation Scheme must await financial approval, before commencing.)
- The Registered Forester must secure written Forest Service agreement before pursing any material change to a project post-approval. Not doing so may invalidate the technical approval and the financial approval (where relevant) issued.

## 3.2 Site management

The Registered Forester must ensure that all operators are fully aware of, and properly implement, all relevant measures set out in these Requirements and all environmental conditions attached to the technical approval issued. This should be carried out *via* onsite management and supervision. 'Tool box' meetings are encouraged, whereby the Registered Forester reviews the various sensitivities and safeguards during an onsite meeting with the operators before operations commence.

Onsite activities should also be reviewed periodically during the site works, to ensure that related safeguards are in place and that contingency planning (see below) is functioning.

## 3.3 Oversight by other specialists

Conditions attached to the technical approval may stipulate the onsite presence of a specialist during site works. For example, a condition may stipulate the archaeological monitoring of specified areas. Archaeological monitoring involves having a suitably qualified archaeologist present during certain operations, or during the course of the carrying out of certain parts of approved development works, in order to identify and protect archaeological deposits, features or objects that may be uncovered or otherwise impacted by those operations. In such cases:

- an independent archaeological consultant must be retained by the Applicant or Registered Forester to carry out the monitoring;
- as set out in Section 3.8, the archaeologist will be empowered by the approval conditions to stop any works in the immediate area of any new discoveries *inter alia*, so as to ensure the timely notification of the relevant authorities, the proper recording of any exposed archaeological material, and the preservation by record or preservation *in situ* of the

elements of the archaeological heritage, as appropriate;

- there will be a condition requiring the archaeological consultant to submit a full report on the results of the archaeological monitoring (including any discoveries made and any subsequent archaeological work undertaken) to the Forest Service, the NMS and the National Museum of Ireland; and
- failure to ensure that the archaeological monitoring is undertaken during the course of the carrying out of the specified parts of approved development or to submit the required report on this monitoring before or at latest at Form 2 stage, may be deemed to be:
  - a breach of the statutory approval for afforestation; and / or
  - a breach of the specific environmental conditions attached to the approval for grant aid and may: (i) delay the progress of the Form 2 (Application for 1<sup>st</sup> Grant Instalment); and (ii) be subject to a penalty.

Sanctions may also applied, as set out in the *Terms & Conditions for the Registration of Foresters and Forestry Companies*.

# 3.4 Contingency measures

Ensure that an adequate contingency plan is prepared. This plan must clearly inform operators how to react and who to contact, should an unexpected event arise that may create a risk to the environment, e.g. a period of intense rainfall, an accidental spillage of chemicals, the discovery of an unidentified archaeological site, monument or object. The plan should be readily available onsite and all operators should be made familiar with its content.

The **SUPPORTING DOCUMENT** contains a template contingency plan, to be completed as relevant.

# 3.5 Treatment of setbacks

As set out in Stage 1: Design, the following setbacks, comprising (largely) unplanted and undisturbed open spaces of a defined width, are required to protect different environmental features and sensitivities:

- water setbacks
- retained habitat setbacks
- archaeological setbacks
- public road setbacks
- utilised building setbacks
- landscape setbacks

See Table 5 for setback widths and design details. The treatment of these setbacks during Stage 2: Site Works is set out below.

The Registered Forester must ensure that all operators are aware of the importance of any environmental setbacks required onsite, their location and extent, and what is and is not permitted within them (as per Table 6 below). An environmental setback must not be used for any forest operation or for any other purpose which could compromise its protective function or which could

## damage the environmental feature or sensitivity being protected.

Under the Forestry Schemes Penalty Schedules, failure to adhere to the required environmental setbacks can incur significant penalties.

## 3.5.1 Installing environmental setbacks

It is good forest practice to mark out environmental setbacks *before* operations commence, to avoid incursions. The following guidance applies:

- Mark off the setback using temporary markers, e.g. posts or bamboos with hi-vis tape, securely driven into the soil with approximately 1.5 metres remaining visible above ground.
- Marker spacing will vary depending on setback shape, e.g. 10 metre spacing for setbacks which vary in width; 30 metre spacing for long linear setbacks.
- Linear setbacks (e.g. archaeological sight lines) can be demarcated by markers set along the centre line.
- Also use markers to indicate the position of any additional enhancement planting proposed along the forest edge or within the setback itself (see below).

## Note that specific requirements apply regarding 'designated' archaeological sites and monuments and 'designated' buildings and structures or parts of structures which form part of the architectural heritage and which are of special interest:

- Unless the conditions attached to the technical approval specify otherwise, erect a permanent fence comprising two strands of plain wire on the outer edge of the archaeological / built heritage exclusion zone. Adhere to the standard Forest Service fencing specifications, including the use of IS 436 stakes (see the *Forestry Standards Manual*)(\*). Note, where the outer edge of an archaeological monument / built heritage structure or feature is not evident on-the-ground, the advice of the Forest Service Archaeologist or a consultant archaeologist retained by the Applicant or her / his Registered Forester should be sought. (\*This fence must be stock proof, if it represents an external boundary of the plantation.)
- Existing access routes to an archaeological site must be left unplanted and undisturbed, and must be left open for pedestrian access by archaeological officials throughout the rotation. If there is no existing access route, leave an unplanted 4 metre wide route suitable for pedestrian access from the direction of the nearest public road, forest road or track.

## 3.5.2 Subsequent treatment

Table 6 details what is and is not permitted within the various environmental setbacks.

 Table 6 Treatment of environmental setbacks during site works. Note, if setbacks overlap, the more environmentally stringent set of requirements apply.

	Operation						
Setback type	Forest edge planting	Environmental setback planting	Demarcation fencing with stakes and wire	Machine traffic	Cultivation / Drainage	Fertiliser application / Vegetation management	Temporary onsite storage of fertiliser, fuel, etc. associated with afforestation
Water setback	Encouraged – see Section 3.5.3.	Encouraged – see Section 3.5.4.	Not required	Exclude	Exclude. New drains must not enter into or traverse the water setback, or discharge directly into the aquatic zone or into an existing drain (with an exception detailed in Section 3.7.1).	<ul> <li>Permitted if required to establish setback planting, based on the following requirements:</li> <li>Fertiliser application limited to the manual application of an appropriate slow-release formulation into the planting pit.</li> <li>Regarding vegetation management, herbicide use is prohibited. Use non-herbicide methods instead, such as trampling, mulches and mats.</li> </ul>	Exclude
Habitat setback	Encouraged – see Section 3.5.3.	Exclude	Not required	Exclude	Exclude	Exclude	Exclude
Archaeological setback	Encouraged – see Section 3.5.3.	Exclude	Required for designated archaeological features – see Section 3.5.1 for details.	Exclude	Exclude	Exclude	Exclude

Setback type	Forest edge planting	Environmental setback planting	Demarcation fencing with stakes and wire	Machine traffic	Cultivation / Drainage	Fertiliser application / Vegetation management	Temporary onsite storage of fertiliser, fuel, etc. associated with afforestation
Public road setback	Mandatory for roadside conifer plots – see Section 3.5.3.	Exclude	Not required	Permitted	Exlude	Exclude	Permitted, subject to safeguards under Section 3.7.5.
Utilised building setback	Mandatory for setbacks from dwellings – see Section 3.5.3.	In relation to setbacks from dwellings, setback planting is encouraged within the 30 m to 60 m zone, if agreed to by the neighbouring dweller. See Section 3.5.4.	Not required	Permitted	Exclude	<ul> <li>Permitted if required to establish setback planting, based on the following requirements:</li> <li>Fertiliser application limited to the manual application of an appropriate slow-release formulation into the planting pit.</li> <li>Regarding vegetation management, herbicide use is prohibited. Use non-herbicide methods instead, such as trampling, mulches and mats.</li> </ul>	Permitted, subject to safeguards under Section 3.7.5. However, if within a setback from a dwelling, exclude the preparation and storage of herbicides (and other pesticides, if used).
Landscape setback	Encouraged – see Section 3.5.3.	Encouraged – see Section 3.5.4.	Not required	Permitted	Permitted, for setback planting.	Permitted, for setback planting.	Permitted, subject to safeguards under Section 3.7.5.

## 3.5.3 Forest edge planting

- Forest edge planting comprises the planting of single, small groups and irregular belts of native species (e.g. birch, rowan, oak and Scots pine, as site conditions allow) along the outer edge of conifer GPC plots, typically those adjoining environmental setbacks.
- > This measure enhances the landscape and biodiversity value of the forest edge.
- > Forest edge planting is mandatory within conifer plots adjoining:
  - utilised building setbacks created for dwellings; and
  - public road setbacks, where the strip 10 metres to 20 metres from the road must be planted with broadleaf trees, to give a minimum two-thirds coverage within this strip.
- Forest edge planting is encouraged in relation to all other environmental setbacks, as site conditions allow - see Table 6.
- Where applied, forest edge planting must not encroach into the environmental setback itself, in order to maintain the necessary setback width. Forest edge planting forms part of the GPC plot.
- Where applied as single trees, ensure that the tree is adequately protected against grazing, using a standard tree shelter or a deer guard, as necessary.
- Where applied as groups, adopt a robust planting design using trees with compatible growth rates, planted with necessary protection against grazing. Group size may vary from 5-10 trees to 50 trees and over, depending on landscape scale. In deer-prone areas, wider spacing and the use of deer guards may be appropriate specify details on the Certified Species Map.

# 3.5.4 Environmental setback planting

Environmental setback planting comprises the planting of single, small groups and irregular belts of native species (e.g. birch, rowan, oak and Scots pine, as site conditions allow) <u>within</u> an environmental setback.



Forest edge planting, using deer shelters.

- This measure enhances the environmental role of the setback itself, e.g. planting within a landscape setback will create better visual 'tie-in' between the surrounding landscape and the forest edge.
- > Apply environmental setback planting as per Table 6 and as site conditions allow.
- Where applied as single trees, ensure that the tree is adequately protected against grazing, using a standard tree shelter or a deer guard, as necessary.
- Where applied as groups, adopt a robust planting design using trees with compatible growth rates, planted with necessary protection against grazing. Group size may vary from 5-10 trees to 50 trees and over, depending on landscape scale. In deer-prone areas, wider spacing and the use of deer guards may be appropriate specify details on the Certified Species Map.
- > Environmental setback planting should not exceed 20% of the area of the setback.
- Note, setback planting may be counter-productive within setbacks likely to be important for deer management, as it may obstruct sight lines.
- > The following applies specifically in relation to planting within water setbacks:
  - Strategic planting within water setbacks may help to deliver direct in-stream ecosystem services such as bank stabilisation, cooling / shading, and food drop into the aquatic ecosystem.
  - Pursue water setback planting only where agreed in advance with Inland Fisheries Ireland and (where relevant) NPWS.
  - Limit to single or small groups (5-10 trees) of native riparian species (birch, willow, and occasional alder and pedunculate oak) at strategic points within the water setback.
  - Such trees should be pit-planted and protected from grazing, as necessary.

# 3.6 Treatment of future operational areas

Treat future operational areas (as described in Section 2.5.2) as follows, to enhance their landscape and biodiversity value:

- > As per good practice, mark out these areas *before* operations commence (see Section 3.5.1).
- Based on the immediate topography, vary their width to avoid artificially straight lines and to create a naturally undulating forest edge.
- Consider forest edge planting (see Section 3.5.3).
# 3.7 Operational safeguards

Mandatory measures to protect the environment during operations are set out below. Conditions attached to the technical approval may also contain additional measures to be adhered to. Also note Section 3.1 (regarding material changes post-approval) and Section 3.4 (regarding contingency planning).

#### 3.7.1 Drainage and cultivation

A key requirement regarding drainage and cultivation is the protection of aquatic zones (streams, rivers and lakes) from any sediment and nutrients contained in water draining off the site, both during afforestation and throughout the remainder of the forest rotation. The following measures apply.

- ▶ Review Section 2.4.2 regarding key factors dictating selection and design.
- It is critical that water collected in drains flows slowly, both during afforestation and throughout the remainder of the rotation.
- Adhere to the overall drainage and cultivation plan approved for the project, and to the specifications set out in the *Forestry Standards Manual*.
- Select machinery based on soil, drainage and slope, to minimise the risk of rutting.
- In relation to water setbacks for aquatic zones and other water features (see Section 2.8):
  - Ensure that all new drains end in an appropriately-sized sediment trap or an interceptor drain(\*) positioned <u>outside</u> of the water setback. This will allow discharged water to seep through the water setback, enabling ground vegetation to filter out sediments and nutrients.
  - Do not carry out any cultivation within the water setback itself.
  - New drains must not enter into or traverse the water setback, or discharge directly into the aquatic zone or into an existing drain(\*\*).

(\* Interceptor drains are constructed along the outer edge of the water setback. They collect the discharge from the drained area and allow it to overflow into the water setback. See *Forestry Standards Manual* for details.)

(\*\* An exception applies to flat difficult-to-drain sites, where it may be necessary to link drains directly into the aquatic zone or an existing drain, provided it can be assured (based on site factors and / or sediment traps and other safeguards) that sediment and nutrients will not enter the aquatic zone. (If linking into an existing drain, the following applies: Existing drains may be 'greened over' to varying degrees, and this vegetation plays an important role in filtering out sediments and nutrients. Therefore, if the existing drain needed to be cleaned out, consider doing so in sections over several years, as opposed to a single operation.) Note, no linkage into aquatic zones and existing drains is permitted where the *Forestry & Freshwater Pearl Mussel Requirements* apply or anywhere within the Priority 8 Freshwater Pearl Mussel Catchments. This restriction may result in the site falling under the category 'Unsuitable Land Type' (see FS-DAFM *Land Types for Afforestation*) and therefore ineligible for funding under the Afforestation Scheme.)

- In general, do not carry out any drainage or cultivation within any other environmental setback. See Table 6 for details.
- Collector drains that receive water from mound drains should be no more than 80 metres apart. The angle of descent within these collector drains, as measured within the channel of the drain itself, should be no greater than 2 degrees (1-in-30). Collector drains should be excavated to a depth no more than 15 cm below the depth of the mound drains. The

Conventional mounding (left) and invert mounding for more sensitive sites (right).



intersection between mound drains and collector drains must be offset along the length of the collector drains, to ensure that individual mound drains do not continue in long unbroken runs down the slope.

- Regarding sediment traps:
  - The number, design and size of sediment traps must be sufficient to protect against the sedimentation of any receiving aquatic zone during afforestation and throughout the remainder of the forest rotation.
  - In order to capture sediment as close to the source as possible, sediment traps must be installed *throughout* the drainage network. The number of sediment traps installed must reflect the risk of sediment becoming mobilised.
  - Sediment traps are required at the end of all new drains leading to the water setback. These sediment traps must be located *<u>outside</u>* the water setback.
  - Sediment traps should be located on level ground (where possible) and should be rectangular in nature, with the longer side orientated parallel to the flow.
  - Sediment traps can represent a site hazard and may require specific health and safety measures such as fencing.
  - Monitor sediment traps throughout operations. If sediment traps are filling up, clear out the built-up sediment and deposit it on level ground several meters away.
- Stop all drainage and cultivation operations during periods of rainfall, in situations where rainfall level and site conditions create the risk of sediment becoming mobilised onsite.
   Operations can only recommence once an adequate period of time has elapsed for the risk to abate. This safeguard is triggered by tracking weather forecasts and by contingency planning.
- Where the drainage network and sediment traps are under pressure and signs of failure are evident, additional measures will be required, often in the form of additional sediment traps. In complex situations, the input of a hydrologist or an engineer may be required.

#### Forest Service, Department of Agriculture, Food & the Marine

In-drain sediment trap (left) and a sediment trap adjoining a water setback (foreground) (right).



Additional safeguards include the following:

- Small dams positioned within drains and comprising timber, stone or staked geotexile, can be used to slow water flow and to encourage sediment deposition. These should have a 'V'shape in their centre, to control the overflow of water and to prevent the scouring out of the sides of the channel during flood events.
- It may be necessary to install large settling ponds into which site drains flow. These settling ponds must be appropriately sized (i.e. sufficient to contain flow from high rainfall events), strategically located within the main body of the plantation and away from aquatic zones, and properly maintained.
- Favour plots of more species-diverse GPCs in areas adjoining water setbacks, where site conditions allow.
- Design the drainage network in a way that will eliminate or reduce water-related risks during operations later in the forest rotation, e.g. roading, thinning.
- Develop windfirm edges within the forest (e.g. using ridelines or retained hedgerows with habitat setbacks) to enable the future harvesting of smaller coupe sizes over staggered periods of time.

#### 3.7.2 Fertiliser application

A key consideration regarding fertiliser application during site works is to eliminate the risk of run-off into receiving waters. The following apply:

- Match fertiliser type and application rate to specific plots aim to achieve successful establishment with the minimal level of fertiliser input possible. Do not apply fertiliser if it is not needed.
- Where available, granular formulations should be used to reduce the potential for drift and wash-off into receiving waters.
- Fertiliser application is not permitted within the water setback (some exceptions apply see Table 6) or within 20 metres of the aquatic zone, whichever is greatest. Manual fertiliser application only is permitted from this point back to 50 metres from the aquatic zone.
- In general, fertiliser application is not permitted within water setbacks or other environmental setbacks. However, some exceptions apply see Table 6.
- Do not apply fertiliser if heavy rainfall is predicted, or during heavy rainfall and / or high winds. Following heavy rainfall, commence application only after the site has dried out sufficiently for runoff not to pose a risk.
- > Apply fertiliser manually, where possible.
- > Consider using alternative slow-release fertilisers in more sensitive parts of the site.

#### 3.7.3 Vegetation management using herbicides and other methods

Vegetation management during afforestation typically involves the use of herbicide. Regarding the use of pesticides, including herbicides:

- The use of pesticides is governed by the European Communities (Sustainable Use of Pesticides) Regulations 2012 (S.I.155/2012). Users of pesticides should familiarise themselves with these Regulations and adhere to them.
- Only a registered professional user can apply pesticides authorised for professional use. A professional user is any person who applies / sprays professional use products (regardless of the quantity or method of application), including operators, technicians, employees and self-employed people, both in the farming and other sectors.
- All users of pesticide products registered for professional use must follow the principles of Good Plant Protection Practice, available for download at www.pcs.agriculture.gov.ie/sud/ professionaluserssprayeroperators/
- Appendix I to the above Good Plant Protection Practice document sets out general principles of integrated pest management, which all professional users are required to follow. Appendix II sets out other legal requirements relating to the safe use of plant protection products.
- Any pesticide to be used in forestry must be approved for use in Ireland. Details of approved products can be checked on the Pesticide Control Service section of the DAFM website (see www.pcs.agriculture.gov.ie).

Herbicide application within the forestry context must foll must follow the principles of Good Plant Protection Practice.

A key consideration regarding herbicide application during site works is to eliminate the risk of runoff into receiving waters. The following apply:

- Aim to achieve successful establishment with the minimal level of herbicide input possible. Do not apply herbicides if they are not required.
- Do not apply herbicide if heavy rainfall is predicted, or during heavy rainfall and / or high winds. Following heavy rainfall, only recommence application after the site has dried out sufficiently for runoff not to pose a risk.
- Fully adhere to the manufacturer's instructions and also measures set out in the Forest Service Forest Protection Guidelines and Guidelines for the Use of Herbicides in Forestry.



- > Do not apply herbicides within the following areas, relying instead on non-herbicide methods such as trampling, mulches and mats:
  - within the water setback or within 20 metres of the aquatic zone, whichever is greatest;
  - within the water setback of a relevant watercourse or hotspot;
  - within specified distances from different types of water abstraction points, as prescribed by S.I.155/2012 see Table 7;
  - within 15 metres of a landscape feature known to be a groundwater vulnerable area, including karst areas, sinkholes and collapse features; or
  - within a utilised building setback created for a dwelling.
- Herbicides are not permitted in sites within SACs and SPAs without completing a risk assessment (this may form part of a NIS, where sought). Preference should be given to low risk plant protection products or biological and cultural control measures in cases where their use is unavoidable.

**Table 7** Distances from different types of water abstraction points, within which pesticide (including herbicide) application is prohibited under Schedule 2 of S.I.155/2012.

Type of abstraction point	Prohibited distance
Abstraction point of any surface waters, borehole, spring or well used for the	5 metres
abstraction of water for human consumption in a water scheme supplying 1 m <sup>o</sup>	
or less of water per day or serving 10 or less persons	
Abstraction point of any surface waters, borehole, spring or well used for the	25 metres
abstraction of water for human consumption in a water scheme 25 m supplying 1	
- 10 m <sup>3</sup> of water per day or serving 10 - 50 persons	
Abstraction point of any surface waters, borehole, spring or well used for the	100 metres
abstraction of water for human consumption in a water scheme 100 m supplying	
10 m <sup>3</sup> or more of water per day or serving 50 - 500 persons	
Abstraction point of any surface waters, borehole, spring or well used for the	200 metres
abstraction of water for human consumption in a water scheme supplying 100	
m <sup>3</sup> or more of water per day or serving 500 or more persons	

# 3.7.4 Other pesticide use

Other pesticides may be needed on rare occasions within the context of afforestation. In such cases, the above requirements regarding herbicides apply at a minimum, and more stringent measures may also be required. Regarding the risk of Pine Weevil outbreak (e.g. an afforestation site adjoining a recent conifer clearfell), any necessary dipping of planting stock must be carried out off-site in the forest nursery, with onsite application permitted only in response to an ongoing outbreak. Alternative control measures are encouraged, e.g. the use of larger planting stock.

# 3.7.5 Preparation, storage and use of potentially hazardous material

Spillage or leakage of fertilisers, herbicides (and other pesticides), fuel and machine oils can be highly damaging to the environment, especially water. The following apply regarding these materials:

- > Minimise onsite storage and preparation.
- If unavoidable, store and prepare (if relevant) at a dry, elevated location at least 50 metres from any aquatic zone and at least 20 metres from all other water features (as listed in Table 1). This also applies to all machine refuelling, maintenance and repair work.
- Do not discharge any substance into an aquatic zone, relevant watercourse or hotspot, or into any drain or sediment trap.
- > Do not rinse out containers onsite.
- Do not clean equipment within 50 metre of any aquatic zone or within 20 metres of any other water feature (as listed in Table 1). All wash waters must be disposed of carefully.
- > Collect and retain spent machine oil for appropriate disposal off-site.
- Remove all empty fertiliser bags, pesticide and oil containers, and all general refuse, from the site during and after site works, for appropriate disposal off-site.
- Regarding pesticides (including herbicides), adhere to the principles of Good Plant Protection Practice (see Section 3.7.3) and to relevant sections of the *Forest Protection Guidelines* and *Guidelines for the Use of Herbicides in Forestry*.

# 3.8 Archaeological finds discovered during site works

Previously unidentified archaeological sites or artefacts may be exposed during the course of site work, particularly during cultivation and drainage. These include artefact scatters, objects such as pottery, flint and other stone artefacts, bronze or iron tools and quern stones, as well as burials and structural features such as the foundations of buried structures or trackways. For example, the presence of a spread of black soil or charcoal and burnt and heat-shattered stone is likely to indicate the presence of a levelled cooking place (i.e. a fulacht fiadh) or other human activity in the past.

If an archaeological find is discovered, the following applies:

- The Garda Síochána, the National Museum of Ireland or the National Monuments Service must be notified immediately.
- The archaeological object(s) or feature(s) must be left undisturbed. A minimum exclusion zone 20 metres in radius centred on its location, and preferably larger, must be immediately created until the site of the find has been investigated.
- Where an archaeological object is discovered other than by a qualified archaeologist operating under an excavation licence issued by the NMS, it must be reported in the same way as described in the Section 2.6.4.
- Where feasible, all operations should be switched to some other part of the afforestation site, as far away as practically possible, until the investigation is complete.

As outlined above, clear contingency planning must be in place covering the possibility whereby an unidentified archaeological site or object is discovered during site works.

# 3.9 Burning

The burning of woody vegetation may occasionally be necessary to facilitate afforestation. This is normally carried out during the season prior to planting.

# Note that, under the Wildlife (Amendment) Act 2000, it is an offence to cut, grub, burn or otherwise destroy, during the period 1<sup>st</sup> March to the 31<sup>st</sup> August inclusive, any vegetation growing on any land not then cultivated.

Furthermore, under no circumstances should such material be burned on or near a known or suspected archaeological site or monument or other important built heritage structure or feature or within the archaeological setback / exclusion zone, as this could cause damage to the site, monument, structure or feature as well as to underlying archaeological deposits.

For details, see the Forest Service *Prescribed Burning: Code of Practice - Ireland* (www.agriculture.gov. ie/forestservice/firemanagement/)

# 3.10 Form 2 submission

Where the project has received financial approval and the 1<sup>st</sup> grant instalment is being sought, the Registered Forester must walk the site within 2 months prior to submitting the relevant Form 2, and satisfy her- / himself that the plantation is compliant (*inter alia*) with all relevant measures set out in these Requirements and with all environmental conditions attached to the technical approval issued. If not, rectify any outstanding issue(s) before submitting the Form 2.

As set out in the *Forestry Standards Manual*, a subsequent Forest Service inspection may stipulate remedial works is cases where the plantation is not compliant.

Forest Service, Department of Agriculture, Food & the Marine

# Section 4 Ongoing Management

#### 4.1 Overview

Stage 3: Ongoing Management spans the period from the completion of initial site works (and payment of the 1<sup>st</sup> grant instalment, if grant-aided) up to Year 15 (i.e. the end of the premium period, if applicable).

During this part of the forest rotation, there are generally no major site inputs required. However, basic environmental measures apply, in addition to any specific conditions attached to the original approval. Other silvicultural requirements also apply during the premium payment period, as set out in the *Forestry Standards Manual* (e.g. the maintenance of stocking levels, fence lines and fire breaks, fertiliser application) all of which must be carried out appropriately to prevent environmental impacts.

Key will be the ongoing monitoring of the site, to ensure compliance with silvicultural and environmental standards, requirements and conditions and also to check that potential threats to the environment do not emerge (particularly in relation to drains and sediment traps) and that various protective measures (principally setbacks) are functioning as intended.

### 4.2 Site inputs

Site inputs during Stage 3 are generally limited to the first 4 years up to submission of the Form 3 (if grant-aided). At this point, the forest should be fully established(\*), with all plots having at least 90% of the original stocking spread evenly throughout the plot, with originally approved species represented proportionately, and with trees free from competing vegetation and free-growing (see the *Forestry Standards Manual*). Such inputs include herbicide application and possible fertiliser application, if nutrient deficiencies arise. Both inputs must adhere to measures set out in Sections 3.7.2 and 3.7.3 of these Requirements. (\*Note, establishment may take longer on some sites.)

Regarding fertiliser application, assess exact requirements through a foliage analysis, following the procedures set out in the *Forestry Standards Manual*.

(Over larger areas, aerial fertilisation may be required. No aerial fertilisation can be undertaken unless an Aerial Fertilisation Licence as been obtained from the Forest Service. Refer to the separate *Aerial Fertilisation Requirements* for details.)

Ensure that any necessary filling-in prior to Form 3 submission reflects the diversity of the original planting, in relation to biodiversity and landscape.

# 4.3 Drains and sediment traps

Check drains and sediment traps regularly up to Year 4 and periodically thereafter, particularly during and after heavy rainfall, in order to assess how effectively they are working.

If sediment traps are filling up, clear out the built-up sediment and dispose of it on level ground several meters away. Where the drainage network and sediment traps are under pressure and signs of failure are evident, additional measures will be required, often in the form of additional sediment

traps. In complex situations, the input of a hydrologist or an engineer may be required.

In most cases, drains will stabilise and 'green-up' with colonising vegetation over time.

## **4.4 Treatment of setbacks**

As set out in Stage 1: Design and Stage 2: Site Works, the following setbacks, comprising (largely) unplanted and undisturbed open spaces of a defined width, are required to protect different environmental features and sensitivities:

- water setbacks
- retained habitat setbacks
- archaeological setbacks
- public road setbacks
- utilised building setbacks
- landscape setbacks

The treatment of these setbacks during Stage 3: Ongoing Management is as follows:

- 1. The intended protective function of these setbacks must be maintained throughout this stage of the forest's development. This generally entails leaving these areas undisturbed and allowing natural ground vegetation to develop. Management may be required in some cases, e.g. to control woody growth within a setback adjoining a dwelling, to retain an important view or to prevent fire risk.
- 2. Monitor the development of forest edge planting and environmental setback planting (where undertaken) and maintain trees as appropriate (e.g. vegetation management, replacement of mortalities, adjustment and eventual removal of tree shelters) until the trees are established and free of grazing pressure.



A well-established water setback adjoining a broadleaf plot.

- 3. Adhere to the specifications set out in Table 6 regarding permitted operations within setbacks.
- 4. The type of natural vegetation that will emerge within the various setbacks will vary according to soil, elevation, aspect, grazing pressure, etc. On most sites, a mosaic of natural ground vegetation and pockets of woody growth will typically emerge throughout this stage.
- 5. Monitor and apply appropriate control to prevent the colonisation of setbacks by rhododendron and other exotic invasives. This requirement also applies to paths required in relation to 'designated' archaeological sites and monuments and 'designated' buildings and structures, to maintain access by archaeological officials.
- 6. The colonisation of the water setback with exotic invasives, in particular, Japanese knotweed, Himalayan balsam and rhododendron, is of significant concern regarding water quality. Where best practice involves herbicide use, consult with Inland Fisheries Ireland and other relevant bodies in advance. Controlling such species is difficult and expensive, and often requires a wider catchment approach for progress to be sustained.

Note, 2 and 5 above also apply to the treatment of future operational areas (see Section 2.9) during this stage of the rotation.

Forest Service, Department of Agriculture, Food & the Marine



CONSULTANTS IN ENGINEERING, ENVIRONMENTAL SCIENCE & PLANNING

www.fehilytimoney.ie

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

+353 21 496 4133

 Dublin Office
 J5 Plaza,
 North Park Business Park,
 North Road, Dublin 11, D11 PXTO,
 Ireland
 +353 1 658 3500



Unit 6, Bagenalstown Industrial Park, Royal Oak Road, Muine Bheag, Co. Carlow, R21 XW81, Ireland +353 59 972 3800



NSAI Certified



NSAI Certified

ENVIRONMENT ISO 14001:2015 NSAI Certified