Drumlins Park Wind Farm

Chapter 5: Biodiversity

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5.1 Introduction

This chapter provides an assessment of the likely significant effects on biodiversity as a result of the construction and operation of the proposed development. This assessment considers the impact of the entire project including 3 no. grid connection options on designated areas, flora and fauna. A separate Natura Impact Statement (NIS) has been prepared.

The proposed development is located south-west of Newbliss village in Co. Monaghan. The location of the proposed development is given in **Figure 5.1**. The proposed development will involve the construction of a wind farm, associated road upgrades for the transport of infrastructure and a grid connection route. While 3 no. grid connection route options have been put forward for assessment, only one will be constructed. Each of the grid connection options are assessed in the current report.

5.1.1 Guidance

This assessment has been prepared with regard to the EPA (2017) '*Draft Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR)*', the European Commission (2017b) '*Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report*'. The CIEEM (2016) '*Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, and Coastal*', the National Roads Authority (2009) '*Guidelines for Assessment of Ecological Impacts of National Road Schemes*', the Scottish Natural Heritage (2017) '*Recommended bird survey methods to inform impact assessment of onshore wind farms*', along with a range of other guidance listed in the references section.

5.1.2 Description of Proposed Development

The proposed development comprises a wind farm, including all associated development works to accommodate its construction, installation, operation, maintenance and the export of electrical power to the national grid. This will include: -

- 8 no. wind turbines with a maximum tip height of up to 180m;
- All associated foundations and crane hardstanding areas;
- All associated underground electrical and communications cabling;
- Provision of new internal wind farm site access tracks and associated site entrances to local public roads;
- 1 no. temporary construction compound;
- 1 no. meteorological mast of up to 101m in height;
- Occasional upgrade works to public roads along the turbine component haul route;
- 3 no. grid connection and substation options; and
- All associated site development and reinstatement works including provision of drainage infrastructure.

The proposed development will comprise a substation and attendant electricity line to connect the proposed wind farm to the national grid. However, as the point of connection is not precisely known at this time, 3 no. off-site grid connection options have been assessed. These grid connection options are Option G1, Option G2 and Option G3, and a description of each is given below.

- Option G1: Construction of a 38kV substation on the proposed development site and installation of a 38kV part overhead electricity line (OHL) and part

underground electricity line (UGL) to the existing Clones 38kV substation on the national grid, which lies approximately 5km to the northwest;

- Option G2: Construction of a 38kV substation on the proposed development site and installation of a 38kV OHL to the existing Shankill 110kV substation on the national grid, which is located approximately 16km to the southwest; and
- Option G3: Construction of a 110kV substation approximately 500m to the south of the nearest turbine and connection to the existing Lisdrum to Shankill 110kV overhead line by way of approximately 500m of UGL and the erection of 2 no. strain towers.

Some minor road changes are also proposed to ensure that the wind turbine components can be transported to the site, i.e. turbine blades etc.

Full details of the proposed development are provided at **Chapter 3**.

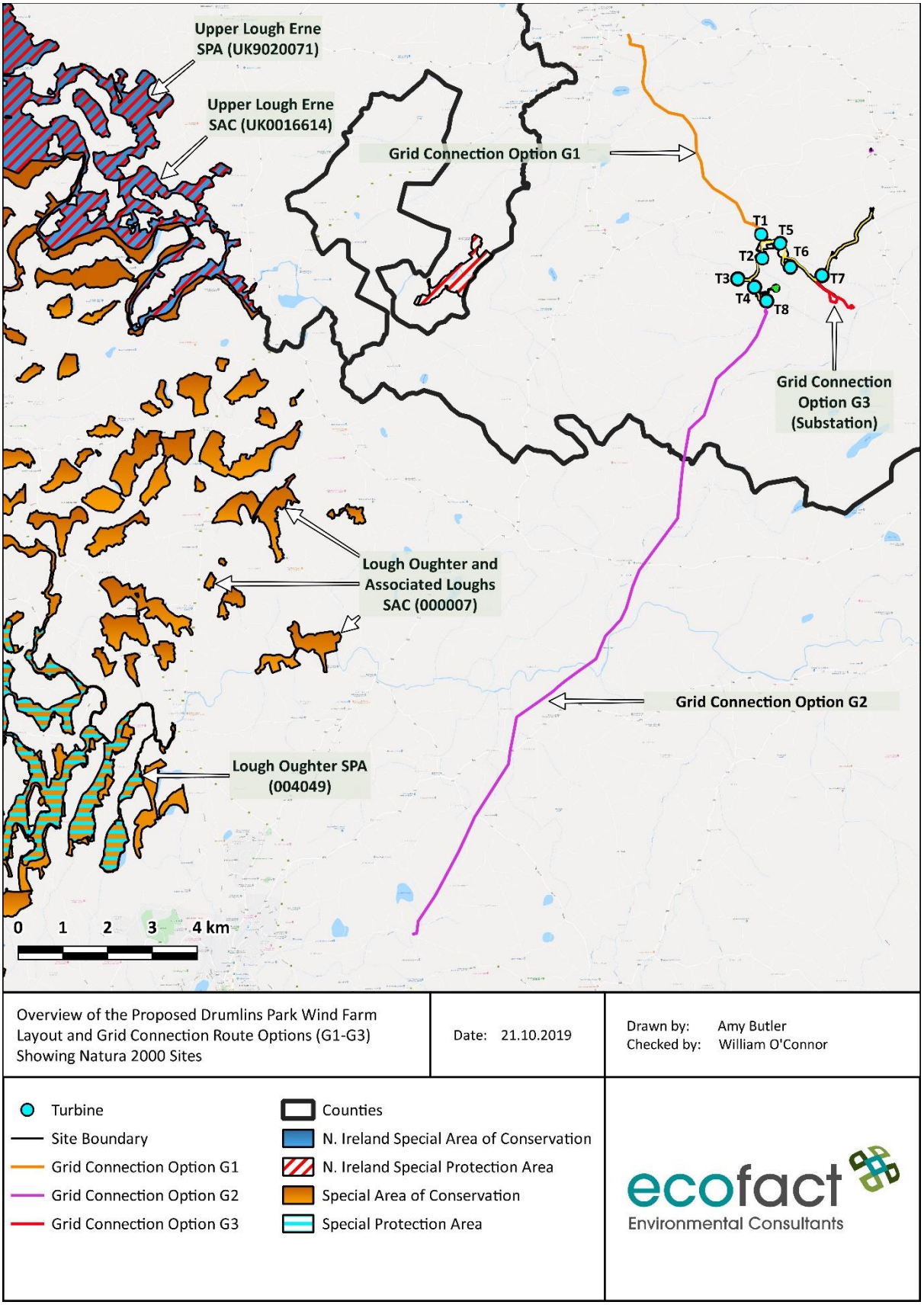


Figure 5.1: Overview of the Proposed Drumlins Park Wind Farm Layout and Grid Connection Route Options (G1-G3) Showing Natura 2000 Sites.

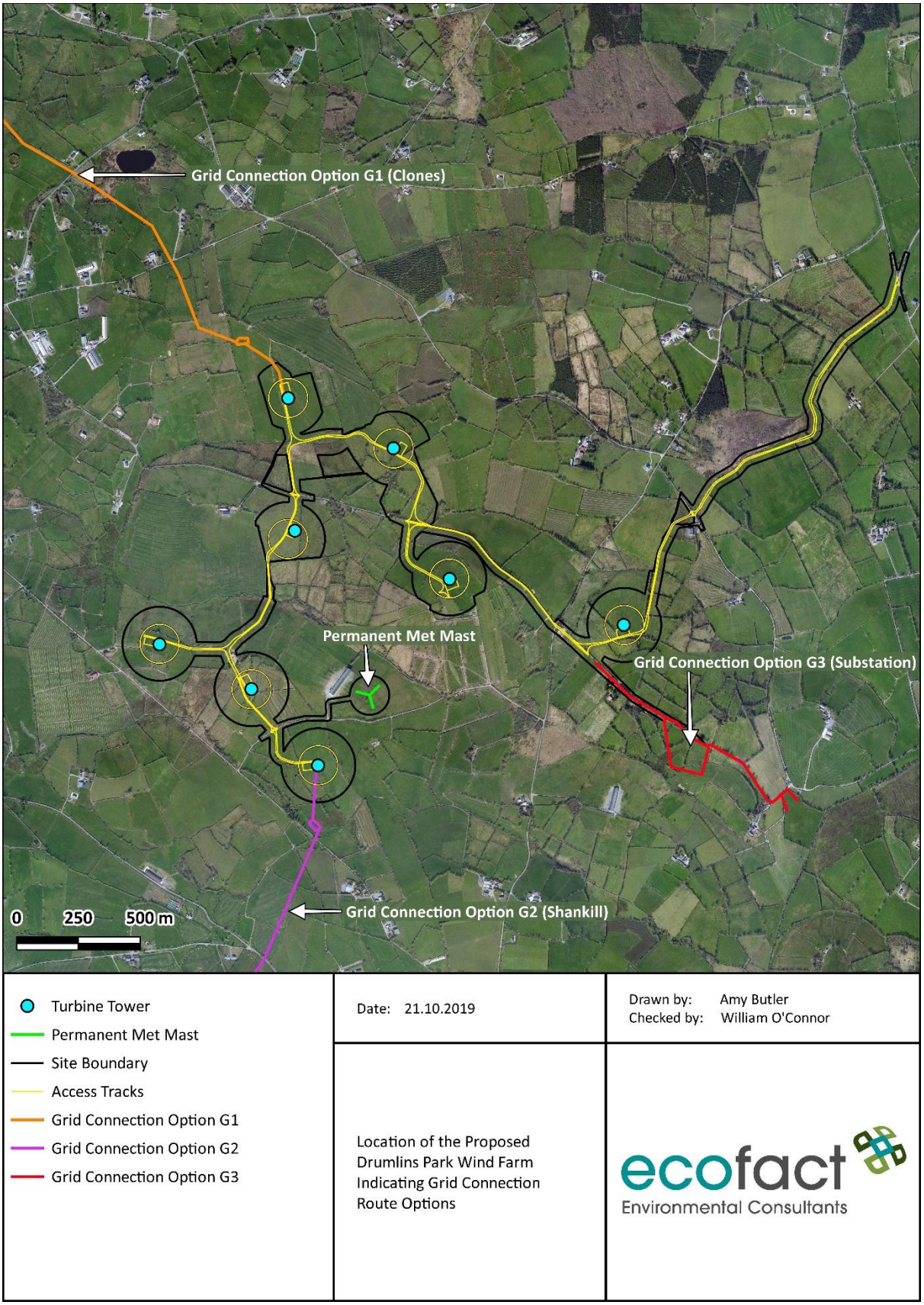


Figure 5.2: Location of the Proposed Drumlins Park Wind Farm Indicating Grid Connection Options.

5.1.3 Statement of Authority

5.1.3.1 Dr. William O'Connor (Principle Ecologist)

Dr. William O' Connor is a senior ecologist who has over 20 year's professional ecological management experience. Dr. O'Connor was the Principle Ecologist during the current assessment and was responsible for the co-ordination of all studies and production of this chapter. Dr. O'Connor has extensive experience of ecological assessments and has formal training and CPD in the areas of terrestrial ecology, mammal surveys and ornithological assessments relevant to the current appraisal.

Dr. O'Connor is a graduate of the National University of Ireland, Galway where he received a PhD degree in Zoology. He is a Fellow of the Royal Society of Biology and a Chartered Member of the Institute of Ecology and Environmental Management. He holds annual licences for a number of protected species – including a full national bat handling licence and national Freshwater Pearl Mussel survey licence. He also regularly holds project-specific licences for birds, non-volant mammals, white-clawed crayfish and fish species (electrical fishing surveys). William has extensive experience in managing Environmental Impact Assessment (EIA) and Appropriate Assessment studies for large scale projects on behalf of public and private clients; including national infrastructural and renewable energy developments. He has particular experience in relation to preparing impact assessments for proposed wind farm developments, and recently wrote a chapter of the international book '*Wildlife and Wind Farms: Conflicts and Solutions*' (Perrow, 2017).

5.1.3.2 Kevin P. Collins (Senior Ornithologist)

Kevin Collins was the project ornithologist for the current project and worked with Dr. O'Connor in delivering the ornithological impact assessment. Mr Collins is a nationally recognised ornithologist, and former director of Birdwatch Ireland. Mr Collins n is a graduate of UCC (Dip. Field Ecology, 1998) and has contributed to a number of scientific papers on birds in Ireland. Kevin is a fully qualified bird ringer and has held an 'A' permit from the British Trust for Ornithology since 1992, along with an annual license from NPWS. Mr Collins has been Ecofact's senior ornithological consultant since 2005 and has advised on the impact of birds of numerous projects, including numerous of wind farm projects throughout Ireland.

5.1.3.3 Amy Butler (Project Ecologist)

Amy Butler worked as an ecologist for the current project and has participated in bird surveys, habitat surveys and other ecological surveys since early 2016. She has also prepared all the GIS work and mapping for the current project. Ms. Butler is a graduate of the University of Limerick she was awarded an BSc (Hons) in Environmental Science in 2015.

5.1.3.4 Grace Walsh (Project Ecologist)

Grace Walsh also worked as project ecologist for the current project. She has participated in bird surveys, habitat surveys and other ecological surveys since 2017. Ms. Walsh is a graduate of the University College Cork she was awarded an BSc (Hons) in Zoology in 2015.

5.1.3.5 Other Staff

Input to the various surveys was also provided by Harm Deenan (bats) along with Ecofact employees Christina O'Connor MSc. BSc., (2016-2018) and Saoirse McGrath BSc. (2019) who participated in the surveys completed to inform this chapter.

5.2 Methodology

5.2.1 Desktop Study

A desktop study was carried out to identify features of ecological significance within the study area of the proposed wind farm and grid connection route options. The ecological assessment included designated and sensitive areas in the study area, to enable sufficient assessment to identify and quantify any significant impacts on the habitats, flora and fauna likely to arise from the proposed development.

Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Natural Heritage Areas (NHAs) and Proposed Natural Heritage Areas (pNHAs) in the vicinity of the proposed development were identified, using information provided by the National Parks and Wildlife Service (NPWS). The online database hosted by the Irish National Biodiversity Data Centre (NBDC) (www.biodiversityireland.ie) was also utilised to assess the importance of the study area for protected flora and fauna. Other sources accessed to gather information on ecological receptors in the study area included the Bat Conservation Trust's report '*Distribution Atlas of Bats in Britain and Ireland 1980-1999*' (Richardson, 2000). The '*Irish Red Data Book 2: Vertebrates - Threatened Mammals, Birds, Amphibians and Fish in Ireland*' (Whilde 1993) and the updated '*Irish Red List No. 3: Terrestrial Mammals*' (Marnell *et al*. 2009) were also reviewed.

5.2.2 Field Survey

The proposed wind farm site has been visited for walkover surveys during 2017, 2018 and 2019. A walkover habitat survey was undertaken during August and September 2017. The habitats present on the site were identified following '*A Guide to Habitats in Ireland*' by J.A. Fossitt (2000) and with regard to *'Best Practise Guidance for Habitat Surveying and Mapping*' (Smith *et al.,* 2011). Particular attention was paid to the primary habitats and land take to be directly affected by the proposed wind farm. Habitat mapping was aided by aerial photography. Further walkover surveys were undertaken in 2019 to ensure habitats on the site remained unchanged, and survey areas which had been affected by design changes. General walkover and windshield type surveys were also undertaken for all three grid connection route options, as well as using aerial photography, to identify any potential sensitive habitats along the route. Only one of these grid connection routes would be constructed and the final chosen option will be subjected to a further planning application.

A formal non-volant mammal survey was conducted on the proposed wind farm site during September 2018. This involved a walkover of the entire site surveying specifically for non-volant mammal dwellings and signs of non-volant mammal usage. All hedgerows and field boundaries on the site were walked and trails, droppings, digging, scratch marks, burrows etc. were sought and documented where found. Trail cameras were set up at various points around the site to confirm mammal usage. Further trail cameras were also set up during June 2019, and additional mammal surveys were undertaken in areas affected by design changes at that time. A general windshield type survey was undertaken for the three grid connection route options to identify any habitats that may be of importance for mammals.

Bat surveys of the proposed wind farm site were undertaken during the period July to September 2017. The survey had regard to *'Bat Surveys for Professional Ecologists: Good Practice Guidelines*' by Collins (2016) and the *'Bat Mitigation Guidelines for Ireland*' by Kelleher & Marnell (2006). The surveys included habitat assessments,

inspections of buildings and trees, inspection of local bridges, walkover bat activity surveys, transect surveys and car-based monitoring. Where possible, species identification was made in the field and any other relevant information was also noted, e.g. behaviour (hunting, commuting etc.). All bat echolocation calls were recorded for subsequent analysis to determine species identifications. Any potential bat foraging or roosting opportunities along the three grid connection route options were identified.

Extensive bird surveys have been completed at the proposed wind farm site and these surveys have been used to inform the current assessment. These surveys also extended along the proposed grid connection route options. The surveys completed were as follows: -

- The 2017 winter bird surveys were conducted from January 2017 to March 2017 and involved 4 full days survey work (Ecofact 2019c);
- The 2017 breeding bird surveys were conducted from April to June 2017 and involved 4 full days survey work (Ecofact 2019d);
- The 2017-18 winter bird surveys were completed over 10 full days extending from November 2017 to March 2018 (Ecofact 2019e);
- The 2018 breeding bird surveys were completed over 10 full days extending from March 2018 to July 2018 (Ecofact 2019f);
- The 2018-2019 winter bird surveys were conducted from October 2018 to March 2019 and involved 10 full days survey work (Ecofact 2019g);
- The 2019 breeding bird surveys were undertaken from April 2019 to July 2019 and involved 10 full days survey work (Ecofact 2019h).

Overall a total of 48 days bird survey work was undertaken at the proposed wind farm site during the period January 2017 to July 2019. The surveys included detailed wintering and breeding bird surveys. The survey work included formal vantage point surveys at three vantage points and also general surveys with results-driven observations on the wind farm site, and along the grid connection route options. While the survey focused on areas with appropriate views of the proposed wind farm site at the vantage points, areas which contained habitats of potential importance to birds of conservation importance were also surveyed. The surveys had regard to the Scottish Natural Heritage Guidance '*Recommended bird survey methods to inform impact assessment of onshore wind farms*' (SNH, 2017). As well as completing full day vantage point surveys, due to the known presence of Whooper Swans at lakes in the local study area and *ad hoc* sighting of these birds in the vicinity of the proposed wind farm site, local lakes were checked during general surveys. It is noted in the SNH guidance that target species, such as birds listed on Annex I of the EC Birds Directive or Schedule 1 of the Wildlife Act of Red-listed Birds of Conservation Concern, should be given appropriate consideration. This includes Whooper Swans which are listed on Annex I of the EC Birds Directive, and Golden Plover. Areas within the proposed development site and in the wider study area that were considered to be potentially attractive to Golden Plover were also surveyed. Some areas were noted from aerial mapping to have the potential for Snipe and these areas were also checked during the current surveys. General surveys while travelling between vantage points or local lakes were also undertaken and any species observed during these general surveys were recorded.

Aquatic Ecology surveys on the proposed wind farm site included dip-netting surveys and aquatic habitat assessments. Qualitative netting with a 'D' shaped dip net (35cm diameter, 2mm mesh) was carried out on watercourses on the site to check for the presence / absence of fish. The net was used in a circular motion to intercept small fish sheltering in instream vegetation stands and under the bank vegetation

overhang. Habitat assessment was carried out at the rivers/streams on the site using 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). General visual surveys were undertaken at each of the watercourse crossing points for the three grid connection route options.

During the walkover and habitat surveys any potential reptile, amphibian and terrestrial macroinvertebrate habitat was identified.

5.2.3 Consultation

Consultation via publically available information was undertaken with the following statutory bodies:

- National Parks and Wildlife Service (NPWS);
- Inland Fisheries Ireland (IFI);
- National Biodiversity Data Centre (NBDC).

Formal consultation was also undertaken with NPWS.

5.2.4 Evaluation

The evaluation of impact significance is a combined function of the value of the affected feature (its ecological importance), the type of impact, and the magnitude of the impact. It is therefore necessary to identify the value of ecological features within the study area in order to evaluate the significance and magnitude of possible impacts. Ecological features are assessed on a scale ranging from international-national-county-local. The local scale is approximately equivalent to one 10 km square but can be operationally defined to reflect the character of the area of interest. This scheme, taken from NRA (2009) and criteria for assessing impact magnitude is included at **Annex 5.2**.

5.2.5 Assessment of Grid Connection Options

Three grid connection options have been put forward and are assessed in this; however, it is noted that only one of these options will be built. The assessment of these options has informed the design of the routes. This chapter provides an assessment of the general impacts for each of the three grid connection route options to outline any potential ecological constraints in advance.

5.3 Description of Existing Environment

5.3.1 Natura 2000 Designated Sites

The proposed wind farm site does not lie within any Natura 2000 site. The closest Natura 2000 site to the proposed wind farm is the Kilroosky Lough Cluster Special Area of Conservation, which is located c. 6.6km north of turbine T1. The Lough Oughter and Associated Loughs SAC (000007) is located c. 10km south-east of the proposed wind farm site. The closest Special Proteciton Area to the wind farm site is the Upper Lough Erne SPA, located c. 5.5km east and is situated just along the border with Northern Ireland. It is noted that a Screening for Appropriate Assessment and Natura Impact Statement have been prepared for the proposed development (wind farm and all three grid connection options) (Ecofact, 2019a, Ecofact, 2019b). **Figure 5.3** below illustrates the Natura 2000 sites located within 15km of the entire proposed development.

Grid connection Option G1 is not located within any Natura 2000 site. The closest Natura 2000 Site to the grid connection route is the Kilroosky Lough Cluster SAC (001786), which is located c. 1.2km north. The Magheraveely Marl Loughs SAC

(UK0016621) is located c. 2km north. The closest SPA to grid connection route is the Upper Lough Erne SPA (UK9020071), situated c. 5.2km south-west.

Grid connection Option G2 is not located within any Natura 2000 site. The closest Natura 2000 site is the Lough Oughter and Associated Lougs SAC (000007), situated c. 4.5km north-west. The closest SPA to the grid connection route is the Upper Lough Erne SPA, c. 5.9km north-west, with the Lough Oughter SPA situated c. 6.8km west.

Grid connection route Option G3 is not located within any Natura 2000 site. This grid connection route is located just outside the site boundary of the proposed wind farm. It consists of a new substation with minimal cabling required resulting in a small footprint. The closest Natura 2000 site to the grid connection option is therefore similar to those given for the proposed wind farm site.

5.3.2 Natural Heritage Areas

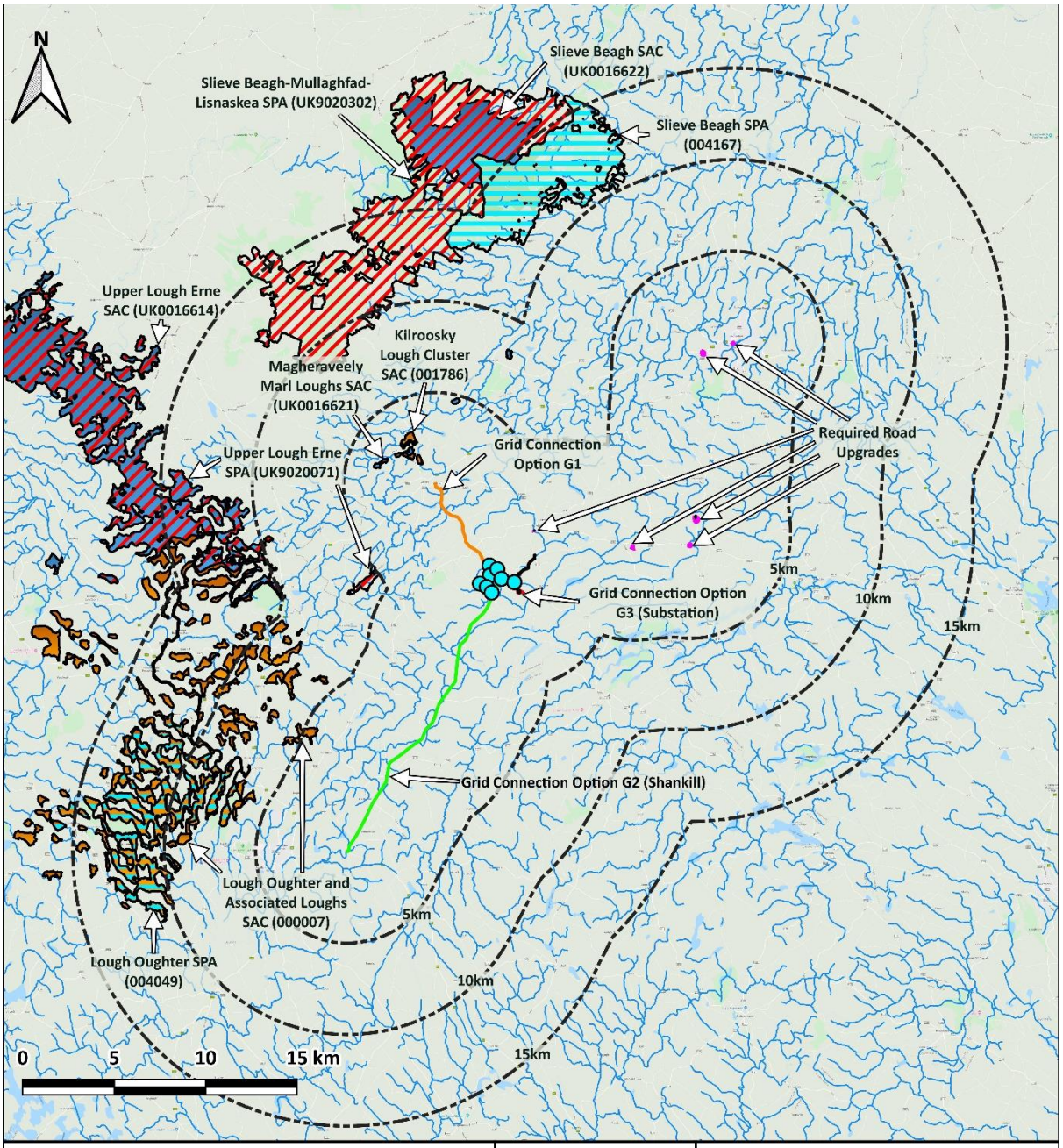
There are no Natural Heritage Areas (NHA) within the footprint of the proposed wind farm site or within 5km of the proposed wind farm site. The closest NHA is the Eshbrack Bog NHA (001603), situated some c. 19km north of the wind farm site. There are no proposed Natural Heritage Areas (pNHA) within the footprint of the proposed wind farm site. The closest pNHA is the Dromgole Lough pNHA (001601). This pNHA is located c. 3.7km east of the proposed wind farm site. Drumcor Lough pNHA is also c. 5.8km west and Lisabuck Lough pNHA is located c. 3.8km north-west.

There are no NHA within the footprint of grid connection Option G1 or within 5km. The closest NHA to Option G1 is the Eshbrack Bog NHA (001603), situated some c. 14km north. There are no pNHAs within the footprint of the grid connection route. The closest pNHA is Lisabuck Lough pNHA, situated c. 1.3km west. Following this, the Kilroosky Lough Cluster pNHA is also located c. 1.3km from the route but is located to the north.

There are no proposed Natural Heritage Areas within the footprint of grid connection route Option G2. The closest proposed Natural Heritage Area is the Drumcor Lough pNHA, situated c. 3.8km north-west. The Lough Oughter and Associated Loughs pNHA is also situated c. 3.9km north-west.

There are no NHA within the footprint of grid connection Option G3 or within 5km. The closest NHA is the Eshbrack Bog NHA (001603), situated some c. 20km north of Option G3. There are no pNHAs within the footprint of the route. This grid connection route is located just outside the site boundary of the proposed wind farm. It consists of a new substation with minimal cabling required resulting in a small footprint. Therefore, the closest pNHAs are therefore similar to those given for the proposed wind farm

Figure 5.4 below illustrates the NHA and pNHA sites located within 5km of the entire proposed development.



Proposed Drumlins Park Wind Farm Layout, Required Road Changes and Grid Connection Route Options (G1-G3) Showing Natura 2000 Sites within 15km	Date: 21.10.2019	Drawn by: Amy Butler Checked by: William O'Connor

Turbine	Counties
Site Boundary	N. Ireland Special Area of Conservation
Required Road Changes	N. Ireland Special Protection Area
Grid Connection Option G1	Special Area of Conservation
Grid Connection Option G2	Special Protection Area
Grid Connection Option G3	

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Figure 5.3: Proposed Drumlins Park Wind Farm Layout, Required Road Changes and Grid Connection Route Options (G1-G3) Showing Natura 2000 Sites within 15km.

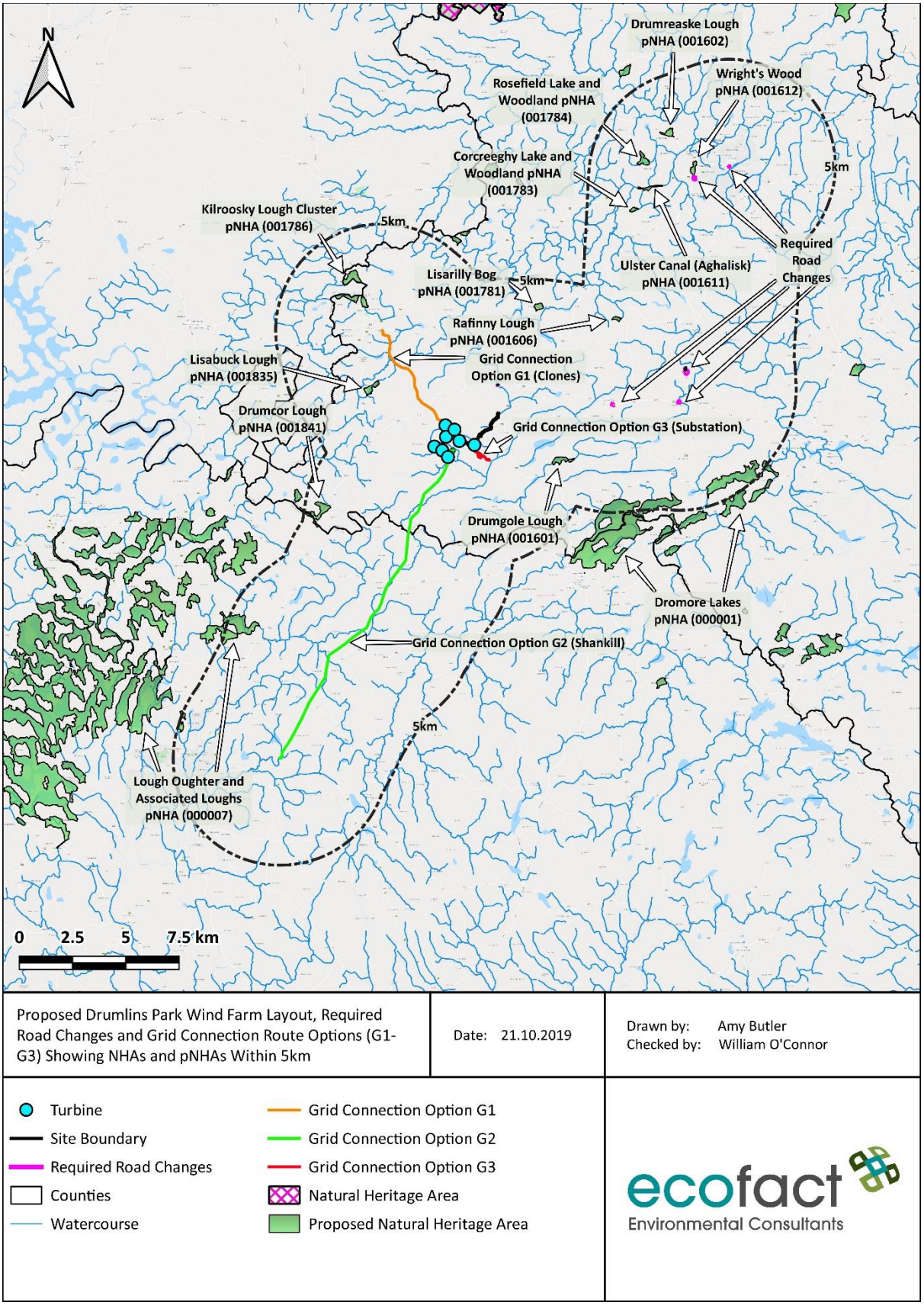

Figure 5.4: Proposed Drumlins Park Wind Farm Layout, Required Road Upgrades and Grid Connection Route Options (G1-G3) Showing NHAs and pNHAs within 5km.

5.3.3 Other

There are no Ramsar sites or other protected sites on the proposed wind farm site. The closest Ramsar Site to the proposed wind farm is Lough Oughter (Ramsar Site No. 853). Lough Oughter is also a Special Area of Conservation and Special Protection Area. Following this, the Magheraveely Marl Loughs is also noted as a Ramsar Site (No. 1717), which is also an SAC. Given the proximity of grid connection Option G3 to the wind farm site, the above text is also relevant to Option G3.

There are no Ramsar sites or other protected sites along the route of grid connection Option G1. The closest Ramsar Site to Option G1 is Lough Oughter (Ramsar Site No. 853), which is also a SAC and a SPA. Following this, the Magheraveely Marl Loughs is also noted as a Ramsar Site (No. 1717), which is also an SAC.

There are no Ramsar sites or other protected sites along the route of grid connection Option G2. The closest Ramsar site to Option G2 is Lough Oughter (Ramsar Site No. 853), which is also a SAC and a SPA. Following this the Magheraveely Marl Loughs is also noted as a Ramsar Site (No. 1717), which is also an SAC.

5.3.4 Habitats & Flora

The habitats on the proposed wind farm site are typically of Local Importance only and are habitats that are widespread and common across Ireland and the Co. Monaghan countryside. A buffer area of 250m around the wind farm site was taken into account during the habitat assessment, as can be seen in **Figures 5.5a** and **5.5b** below.

A total of 10 habitats were recorded within this area: Eroding / Upland Rivers (FW1); Treelines (WL2); Hedgerows (WL1); Drainage Ditches (FW4); Buildings and Artificial Surfaces (BL3); Wet Grassland (GS4); Mixed Broadleaved Woodland (WD1); Poor Fen and Flush (PF2); Improved Agricultural Grassland (GA1) and Scrub (WS1). **Table 5.1** below details the Fossitt Habitat Types present at each proposed turbine location.

Fossitt (2000) Habitat	T1	T2	T3	T4	T5	T6	T7	T8
Improved Agricultural Grassland (GA1)	✓	✓	✓	✓	✓	✓	✓	✓
Hedgerow (WL1)						✓		

Table 5.1: Fossitt habitat types present at each turbine location.

The majority of habitats on the site comprise improved agricultural grassland, hedgerows, wet grassland and treelines. The south-western area of the site has the largest area of wet grassland, likely due to the presence of the Dunnaluck Stream and the Skerrick East Stream. The majority of drainage ditches on the site are located near the Skerrick East Stream to the south-west, which is likely due to the wet grassland fields and lack of drainage for agricultural purposes.

In general, due to the agricultural nature of the site, buildings and artificial surfaces are present in the form of small residential houses, agricultural buildings, roads and yards. In the middle of the site between T2 and T6, there is a mosaic of small fields bounded by poor quality hedgerows with some treelines also present. These hedgerows were found to be sparse.

A large area of degraded poor fen and flush habitat is located alongside the arterial access track from R189 to T7, with some scrub / poor fen and flush mosaic habitat also present. This is the most ecologically important area of the site. It is almost entirely avoided by the proposed access track. Any woodland habitats present on the site are in small and fragmented sections. **Table 5.2** below details the Fossitt Habitat Types present within c. 110m radius from the turbine base location.

Fossitt (2000) Habitat	T1	T2	T3	T4	T5	T6	T7	T8
Improved Agricultural Grassland (GA1)	✓	✓	✓	✓	✓	✓	✓	✓
Hedgerow (WL1)	✓	✓	✓	✓	✓	✓	✓	✓
Wet Grassland (GS4)		✓	✓	✓				✓
Drainage Ditch (FW4)			✓	✓		✓		
Buildings and Artificial Surfaces (BL3)				✓		✓		
Treeline (WL2)				✓	✓		✓	✓
Mixed Broadleaved Woodland (WD1)				✓	✓			

Table 5.2: Fossitt habitat types present within c. 110m radius from the turbine base location.

All watercourses recorded in the habitat surveys were identified as being Eroding / Upland Rivers. The 1st order Dunnaluck Stream (EPA Code: 36D49) rises east of T1, flows south before turning west along the access track from T5 to T1, before flowing south again and turning east across the access track from T2 to T3 and then flows south-wast before flowing into the 3rd order River Bunnoe (EPA 36B05). The River Bunnoe eventually flows into the River Annalee a significant distance downstream of the site. The Dunnaluck Stream flows mostly through the proposed wind farm site. The 1st order Corragharry Stream (EPA Code: 36C85) rises south-west of the proposed development site and flows into the Dunnaluck Stream as a 2nd order watercourse south-east of T8. The 1st order Skerrick East Stream (EPA Code: 36S10) rises west of the site and flows east, from here is turns slightly to flow south-aest passed T4 and T8. From here it flows into the Corragharry Stream. The Closdaw Stream (EPA Code: 36C88) is another 1st order watercourse on the site, which rises north of T6 and flows south-east passed T7 before it enters the River Bunnoe. Lastly, the Newbliss Stream (EPA Code: 36N02) rises east of the access track from the R189 to T7 in the degraded poor fen and flush habitat. The Newbliss Stream is located in a separate subcatchment to the aforementioned watercourses. This stream flows into the River Finn [Monagha] (EPA Code: 36F01), which eventually flows into Upper Lough Erne in Northern Ireland.

The proposed access tracks for the wind farm do cross some of the small sized watercourses on the site. The access track from T5 to T1 runs along the Dunnaluck Stream for c. 300m. The access track from T2 to T3 also crosses the Dunnaluck Stream, near an area with wet grassland. The access road from T7 to the R189 crosses the Closdaw Stream, before running alongside the Newbliss Stream for c. 660m. The habitats present within the site boundary along each of the access tracks are detailed below in **Table 5.3**.

5.3.4.1 Improved Agricultural Grassland (GA1)

Improved Agricultural Grassland is the most abundant habitat type on the proposed wind farm site. It is typically species-poor and consists mainly of Rough Meadow-grass *(Poa trivialis*), Perennial Rye-grass *(Lolium perenne)* and Docks *(Rumex* spp.). All of the proposed turbines are located on Improved Agricultural Grassland habitat.

Improved Agricultural Grassland (GA1) consists of heavily modified or intensively managed grassland typically used for grazing and / or silage making. This habitat type is generally species-poor with abundant Rye-grass (*Lolium* sp.) often associated with White Clover (*Trifolium repens*). Improved Agricultural Grassland comprises of monoculture grasslands and rye-grass leys which typically form part of an arable rotation. Common species which can be found in this type of habitat include Meadow grasses *(Poa* spp.), Dandelion *(Taraxacum* spp.), thistles *(Cirsium arvense, C. vulgare*), Timothy *(Phleum pratense*), Plantains *(Plantago* spp.), Creeping

Buttercup *(Ranunculus repens)*, Nettle *(Urtica dioica)*, Crested Dog's-tail *(Cynosurus cristatus)*, Yorkshire-fog *(Holcus lanatus)* and docks *(Rumex* spp.) (Fossitt, 2000).

This species-poor grassland habitat has been evaluated as being of 'Local Importance'.

Access Road	GA1	WD1	GS4	BL3	WL1	WL2	FW1	WS1	PF2
R189 to T7	✓			✓	✓	✓	✓		✓
T7 - T6	✓		✓	✓	✓	✓			
T6 - T5	✓			✓	✓	✓			
T5 - T1	✓		✓		✓	✓	✓		
T1 - T2	✓		✓	✓	✓		✓		
T2 - T3	✓		✓	✓	✓	✓	✓	✓	
T3 - T4	✓	✓	✓	✓		✓		✓	
T4 - T8	✓		✓	✓	✓	✓			

Table 5.3: Fossitt habitat types present at proposed access road locations.

5.3.4.2 Wet Grassland (GS4)

Wet Grassland occurs in scattered sections on the proposed wind farm site, with the majority present alongside watercourses and the Dunnaluck Stream. This habitat type consists mainly of Rushes *(Juncus* spp.). Creeping Buttercup (*Ranunculus repens*) and Marsh Thistle (*Cirsium palustre*) were also noted.

Wet grassland typically occurs on wet or waterlogged mineral or organic soils that are poorly drained and can be found on sloping or flat ground in upland and lowland areas. In some cases, this habitat type can be influenced by seasonal or periodic flooding such as in the River Shannon Callows or the wet grasslands of turlough basins. This habitat type also consists of areas of poorly drained farmland that has not recently been improved. Wet grassland located on sloping ground is typically confined to clay-rich gley soils and loams, or organic soils that are wet but not waterlogged. The most common species that can be found in this type of habitat are rushes (*Juncus effusus, J. acutiflorus, J. articulatus, J. inflexus*), Yorkshire-fog *(Holcus lanatus)*, Marsh Foxtail *(Alopecurus geniculatus)*, small sedges (*Carex flacca, C. hirta, C. ovalis*), Rough Meadow-grass *(Poa trivialis)*, Creeping Bent *(Agrostis stolonifera)* and Tufted Hairgrass *(Deschampsia caespitosa)* (Fossitt, 2000).

This species-poor grassland habitat has been evaluated as being of 'Local Importance, Higher Value'.

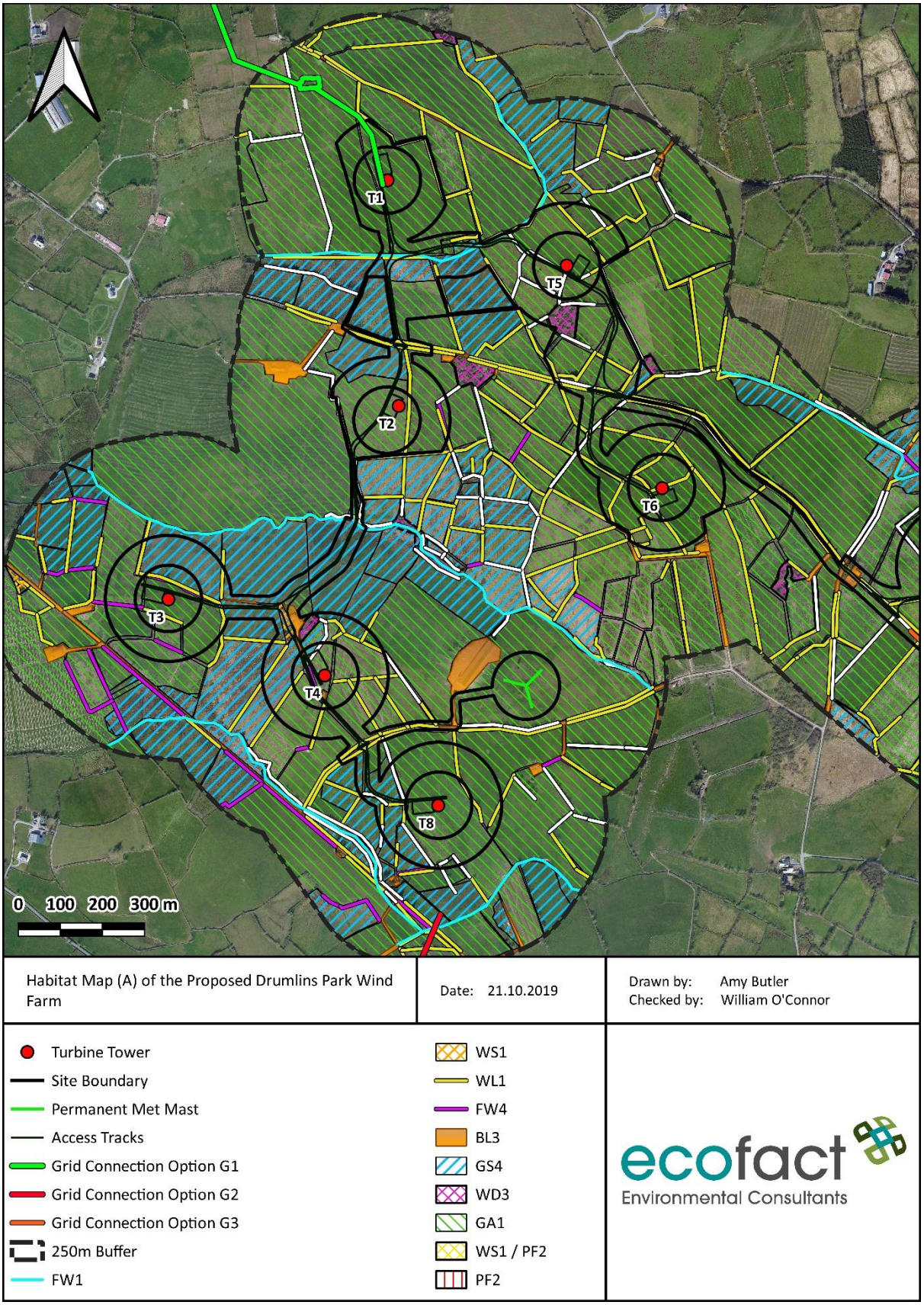

Figure 5.5a: Habitat Map (A) of the Proposed Drumlins Park Wind Farm.

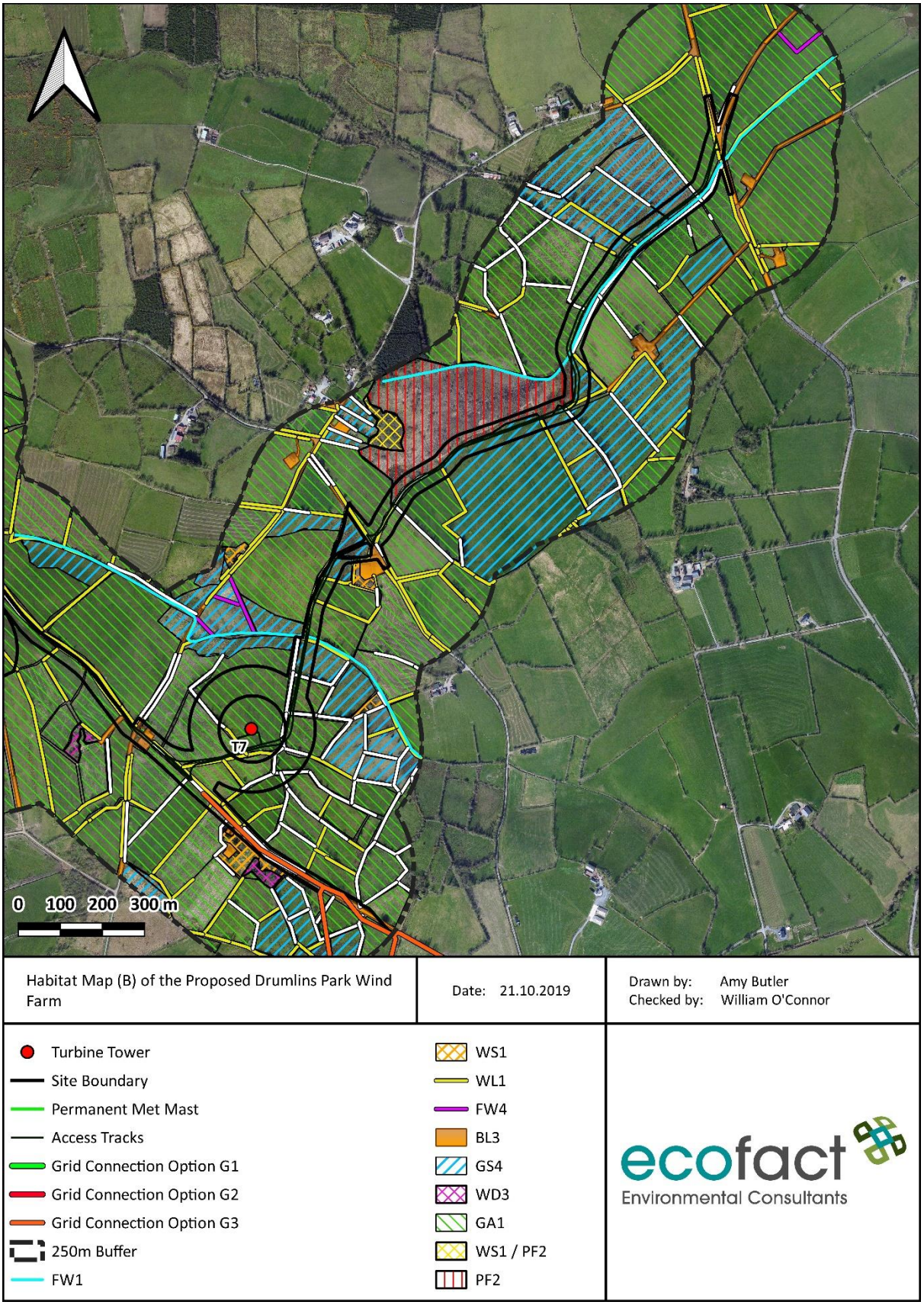

Figure 5.5b: Habitat Map (B) of the Proposed Drumlins Park Wind Farm.

5.3.4.3 Drainage Ditches (FW4)

Drainage Ditches occur in the middle of the site between T2 and T6, as well as south of T3 and T4 where wet grassland occurs. This habitat type occurs at the base of hedgerows within the proposed development site. No notable wetland plants occurred in any of the drainage ditches.

Drainage ditches consist of entirely artificial linear water bodies or wet channels, and also includes small sections of natural watercourses that have been excavated or modified. These water bodies are generally created to improve drainage and control the flow of water. This habitat type must either contain water or be wet enough to support wetland vegetation. These water bodies must be maintained and cleared in order to keep them open. Water levels will undergo seasonal fluctuations and these habitats are generally associated with hedgerows (Fossitt, 2000).

This habitat is evaluated as being of 'Local Importance'.

5.3.4.4 Eroding/Upland Rivers (FW1)

All the watercourses on the site are classified as Eroding / Upland Rivers: the Dunnaluck Stream, the Closdaw Stream, the Skerrick East Stream and the Newbliss Stream. A full description of the watercourses on the site is provided above in **Section 5.3.4**.

Eroding / Upland Rivers consist of watercourses that are actively eroding and where there is little to no sediment deposition. This typically includes the upland sections of natural watercourses where gradients are steep and water flow is fast and turbulent. The watercourses included in this habitat type are typically smaller and shallower than 'depositing / lowland rivers' (FW2) and include small mountain streams that can dry out periodically if a distinct channel exists or wetland plants are present (Fossitt, 2000).

This habitat is evaluated as being of 'Local Importance, Higher Value'.

5.3.4.5 Mixed Broadleaved Woodland (WD1)

Small sections of Mixed Broadleaved Woodland occur within the proposed development site. This habitat type is noted to occur in close proximity to the following turbine locations: T2, T4 and T5. This woodland is fragmented within the site and is not directly affected by the proposed development. Common species noted were Ash (*Fraxinus excelsior*), Alder (*Alnus glutinosa*), Hawthorn (*Crataegus monogyna*), Sycamore (*Acer pseudoplatanus*) and Willow (*Salix. spp*).

Mixed Broadleaved Woodland includes woodland with 75-100% cover of broadleaved trees and 0-25% cover of conifers with tree species of either native or non-native species. Plantations are included if the canopy height is greater than 5m, or 4m in the case of wetland areas (Fossitt, 2000).

This habitat is evaluated as being of 'Local Importance, Higher Value'. This evaluation is due to the fact that there is a lack of woodland in the study area and therefore would be of importance to wildlife in the vicinity.

5.3.4.6 Scrub (WS1)

Some small scattered sections of scrub are present in the study area, such as south of T7 and north of grid connection Option G3.

The Scrub habitat type is a broad category that includes areas that are dominated by at least 50% cover of shrubs, stunted trees or brambles. It often develops as a

precursor to woodland on abandoned or marginal farmland or inaccessible locations. It can either be open, or dense and impenetrable, and can occur in areas of dry, damp or waterlogged ground. Common species found include Bramble *(Rubus fruticosus* agg.*)*, Juniper *(Juniperus communis)*, Gorse *(Ulex europaeus)*, Blackthorn *(Prunus spinosa)* and Hawthorn *(Crataegus monogyna)*.

This habitat is evaluated as being of 'Local Importance, Higher Value'. This habitat, among a majority habitat of Improved Agricultural Grassland in the study area, is valuable to wildlife for protection and movement.

5.3.4.7 Hedgerows (WL1)

Hedgerows on the site were mostly dense with the exception of the hedgerows located near T1, T3 and T6, which were considered to be sparse. Occasional mature trees were noted to occur along most of the hedgerows on the site. The densest hedgerows are located to the south-east of T7 and to the south of the arterial access track.

Hedgerows typically form field or property boundaries and consist of linear strips of shrubs and occasional trees. Dimensions vary considerably within this habitat type and are generally classified as being mostly less than 5m high and 4m wide. The majority of hedgerows are planted and can occur on raised banks created from the digging of drainage ditches. Overgrown hedgerows that have not been managed recently or are fragmented are also included in this category. If linear strips of scrub occur at field boundaries these are also included within this habitat type. Typical species that occur in hedgerows include Hawthorn *(Crataegus monogyna)*, Gorse *(Ulex europaeus)*, Dog-rose *(Rosa canina*), Blackthorn *(Prunus spinosa*), Holly *(Ilex aquifolium)* and Bramble *(Rubus fruticosus* agg.). Species of trees which can be frequently found within hedgerows are Hazel *(Corylus avellana*), Ash *(Fraxinus excelsior*), Willows *(Salix* spp.), Elder *(Sambucus nigra*), Beech *(Fagus sylvatica*) and elms (*Ulmus* spp.) (Fossitt, 2000).

This habitat is evaluated as being of 'Local Importance, Higher Value'. This type of habitat is of value to wildlife for protection and movement.

5.3.4.8 Treelines (WL2)

Occasional treelines were noted on the proposed development site, most notably near T5 and T7. A mixture of Ash (*Fraxinus excelsior*), Hawthorn (*Crataegus monogyna*), Alder *(Alnus glutinosa*), Beech (*Fagus sylvatica*) and Sycamore (*Acer pseudoplatanus*) were noted to occur within the treelines on the site. The densest treelines were noted to be present near T7.

Treelines include a single or narrow line of trees that are greater than 5m in height and like hedgerows; they typically occur at field or property boundaries. Hedgerows that are dominated by trees greater than 5m in height are also included within this category. Most treelines are planted and are spaced apart. The majority of treelines comprise non-native tree species such as Sycamore *(Acer pseudoplatanus*), Beech *(Fagus sylvatica*), limes *(Tilia* spp.), some poplars *(Populus* spp.), Horse Chestnut *(Aesculus hippocastanum*) and conifers (Fossitt, 2000).

This habitat is evaluated as being of 'Local Importance, Higher Value'. This type of habitat is of value to wildlife for protection and movement.

5.3.4.9 Buildings & Artificial Surfaces (BL3)

Buildings and Artificial Surfaces were present on the site in the form of roads, farmyards and farm buildings.

Buildings and artificial surfaces is a broad habitat category that includes areas of built land comprising of domestic, industrial, agricultural and community buildings as well as derelict stone buildings and ruins (Fossitt, 2000).

This habitat is evaluated as being of no ecological value.

5.3.4.10 Poor Fen & Flush (PF2)

Poor Fen and Flush habitat is present north of and adjacent to the arterial access track from the R189 to T7. This area consists of degraded fen habitats adjacent to the Newbliss Stream. Some scrub / poor fen and flush mosaic habitat is also present to the west.

This category includes peat-forming fens and flushes that are fed by groundwater or flowing surface waters that are acid. The vegetation of poor fens and flushes is typically dominated by sedges (particularly *Carex rostrata, C. nigra, C. curta, C. lasiocarpa* and *C. ehincata*) and / or rushes *(Juncus effuses, J. articulates, J. acutiflorus)*. Other common components include Common cottongrass *(Eriophorum angustifolium),* Velvet bent *(Agrostis canina*), Purple moor-grass (*Molinia caeruleae*), Yorkshire-fog *(Holcus lanatus*) and broadleaved herbs such as Marsh Voilet *(Viola palustris*).

This habitat is evaluated as being of Local Importance, Higher Value.

5.3.4.11 Non-native Invasive Flora

During the course of the site walkovers, no non-native invasive flora were recorded from within the proposed wind farm site. Black currant *Ribes migrum*, Canadian Waterweed *Elodea canadensis*, Indiam Balsam *Impatiens glandulifera*, Japanese Knotweed *Fallopia japonica* and Sycamore *Acer pseudoplatanus* are non-native plant species that have been recorded in the 10km grid square H52 which encompasses the proposed wind farm site. None of these species were found during the current surveys.

5.3.4.12 Grid Connection Option G1

All the habitats along grid connection Option G1 are similar to those present at the wind farm site, discussed above. The majority of habitats along this route consist of improved agricultural grassland, hedgerows and treelines. There are no protected habitats present along the route. All the habitats present are typical of the Co. Monaghan countryside. Sensitive Receptor Areas (SRAs) were identified along the route which informed the design and routing of the grid connection. The two most notable SRAs along the route is the River Finn [Monaghan] and the Radeerpark Lake and associated Fen habitat. Direct effects were avoided the design process. The hedgerows along the route are generally not considered to be of high quality and are well maintained. The grassland habitats along the route are of a low quality resulting in low biodiversity in general. Habitats along the route are considered to be of Local importance generally. Any mature treelines and watercourses are evaluated as being of Local Importance, Higher Value. Further details of the habitats along the route are provided in **Annex 5.3**.

5.3.4.13 Grid Connection Option G2

The habitats along grid connection Option G2 are typical of the Co. Monaghan/Cavan countryside and are similar to habitats present at the proposed wind farm site, as discussed in detail above. The majority of habitats along the route consist of improved agricultural grassland, hedgerows and treelines. There are no protected habitats present along the route.

Sensitive Receptor Areas (SRAs) were identified along the entire route and this informed the design. The route was designed to avoid previously identified SRAs as much as possible (see discussion in **Annex 5.4**). The most notable SRAs along the grid connection route include watercourse crossings, in particular the River Bunnoe, and associated wetland area and the River Annalee which are larger watercourses. The grassland habitats along the route are considered to be of low value to biodiversity.

In general, the majority of habitats along the route are evaluated as being of Local Importance. However, watercourses and intact hedgerows and mature treelines are evaluated as being of Local Importance, Higher Value. More information and details of the habitats along the route of Option G2 is provided in **Annex 5.4**.

5.3.4.14 Grid Connection Option G3

As grid connection Option G3 is located just outside the proposed wind farm site, the habitats discussed above for the wind farm are the same as those found at Option G3. The footprint of this grid connection route is relatively small and the only habitats present consist of Improved Agricultural Grassland, Hedgerows, Treelines and Buildings and Artificial Surfaces. The majority of the electrical cabling is noted to follow an existing road, i.e. buildings and artificial surfaces. The substation is located on improved agricultural grassland and hedgerows. No protected habitats are present within the footprint of the route. This grid connection route does not involve the crossing of any watercourses. More information and details of the habitats along the route of Option G3 is provided in **Annex 5.5**.

5.3.4.15 Haul Route Upgrades

The habitats located at the haul route upgrade locations comprise hedgerows, improved agricultural grassland and Buildings and Artificial Surfaces and are assessed of be of Local Importance.

5.3.5 Fauna

5.3.5.1 Non-volant Mammals

The National Biodiversity Data Centre online maps hold records for non-volant mammals within the 10km grid square H52, within which the proposed wind farm is located. **Table 5.4** below details the recorded species within the 10km grid square H52 in Co. Monaghan.

During the walkover mammal survey, no definite evidence of foxes was found. Similarly, foxes were not recorded during the trail camera survey. However, foxes were recorded during the bird surveys and were seen from vantage points during these surveys.

Hares are present on the site and were recorded on numerous occasions. They were confirmed to be breeding on the site.

Pine Martens are present on the site and are using old farm buildings in the area as dens and have probably been attracted in the area by the local poultry farm. There are no Pine Marten dwellings on the site itself. Presumed Pine Marten signs (scats) were found during the mammal survey and the presence of this species on the site was confirmed with the trail camera surveys. Pine Marten activity also was recorded on the open southwestern part of the site. It is noted that the poultry farm is located in this area. It is understood that pine martens and foxes are supported by the poultry farm, which was noted during the current survey to have a bin containing chicken carcasses which would be easily accessible for mammals and it is likely that it is their primary food source.

Species Group	Species	Record Count	Date of last record	Title of Dataset	Designation
Terrestrial Mammal	European Otter *Lutra*	2	27/08/2010	Atlas of Mammals in Ireland 2010-2015	Protected Species: EU Habitats Directive >> Annex II || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Terrestrial Mammal	Red Fox *Vulpes*	8	06/07/2010	Road Kill Survey	-
Terrestrial Mammal	Pine Marten *Martes*	3	05/05/2013	Atlas of Mammals in Ireland 2010-2015	Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts
Terrestrial Mammal	Irish Stoat *Mustela erminea subsp. hibernica*	4	02/10/2008	Road Kill Survey	-
Terrestrial Mammal	Irish Hare *Lepus timidus subsp. hibernicus*	17	23/07/2018	Mammals of Ireland 2016-2025	-
Terrestrial Mammal	Feral Ferret *Mustela furo*	2	25/02/2007	National Feral Ferret (Mustela putoris furo) Database	Invasive Species: Invasive Species || Invasive Species: Invasive Species >> High Impact Invasive Species
Terrestrial Mammal	Eurasian Badger *Meles*	86	31/12/2015	Irish National Badger Sett Database	Protected Species: Wildlife Acts
Terrestrial Mammal	Eastern Red Squirrel *Sciurus vulgaris*	8	01/10/2015	Atlas of Mammals in Ireland 2010-2015	Protected Species: Wildlife Acts

Table 5.4: Mammal records from the 10km Grid Square H52, within which the proposed wind farm will be located (NBDC online maps).

Fallow Deer were recorded on the site on a number of occasions during 2019. Deer were not recorded in the previous surveys of the site.

The proposed development site does not contain Rabbits. No evidence of this species was found during extensive searches of the hedgerows. Similarly, no evidence of badgers was found. It is considered that the soil / digging conditions are suboptimal for badgers and rabbits as the soil is compacted and too wet. Due to the conditions on site and generally poor foraging habitat for badgers, it is considered unlikely that they use the proposed wind farm site. No signs of Stoat were found, and it is unlikely they are present on site due to the absence of rabbits. Due to the general absence of woodland, it is unlikely that Red Squirrels use the proposed development site and none were recorded during surveys. No signs of Hedgehogs were noted during the walkover survey and it is considered to be

unlikely that this species utilises the proposed development site due to the fragmented nature of woodland/hedgerows on the site.

Non-volant mammals on the site are evaluated as being of Local Importance, Higher Value. No Annex II species were found on the proposed wind farm site.

The National Biodiversity Data Centre online maps hold records for non-volant mammals within the 10km grid square H52 which encompasses grid connection route Option G1. This 10km grid square also encompasses the proposed wind farm site, and the records therefore are the same as for the wind farm site. Otters may use the River Finn [Monaghan] over which the grid connection route crosses. Fox are likely to be found in the area as this species is widespread over Ireland. Hares are present and were recorded during the surveys. There is a general lack of woodland or mature hedgerows and treelines along the grid connection route that would make this route less appealing to non-volant mammals in the area. It is considered that the habitats along this grid connection route are not of particular importance to mammals in the study area. Further detailed information on this grid connection route provided at **Annex 5.3**. Non-volant mammals along this route are evaluated as being of Local Importance, Higher Value.

The National Biodiversity Data Centre online maps hold records for non-volant mammals within the 10km grid square H52, H51, H41 and H40 which encompass grid connection Option G2. The records for 10km grid square H52 is provided above in **Table 5.4**. Recorded species within 10km grid squares H51, H52, H41 and H40 are included in **Annex 5.4**. Otters use the River Bunnoe and the River Annalee which are larger watercourses over which the grid connection route crosses. Foxes and Hares were recorded during the surveys. Further detailed information is provided in **Annex 5.4**. Non-volant mammals on the site are evaluated as being of Local Importance, Higher Value.

The National Biodiversity Data Centre online maps hold records for non-volant mammals within the 10km grid square H52 which encompasses grid connection Option G3, which is located adjacent to the proposed wind farm and the records therefore are the same as for the wind farm site. Further detailed information on grid connection Option G3 is provided in **Appendix 5.5**. Non-volant mammals on the site are evaluated as being of Local Importance, Higher Value.

The locations of upgrades to the public roads are not considered to be of importance for mammal species.

5.3.5.2 Bats

A desk study of available information on bats in the study area was undertaken for the proposed wind farm site. The National Biodiversity Data Centre (NBDC) maps landscape suitability for bats based on Lundy *et al.,* (2011). The maps are a visualisation of the results of the analyses based on a 'habitat suitability' index. The index ranges from 0 to 100, with 0 being least favourable and 100 most favourable for bats. **Table 5.3** below gives the suitability of the study area for the bat species found in Ireland (based on NBDC) along with their Irish Red List Status (from Marnell *et al.,* 2009). The majority of the wind farm site is given a rating of 26, whereas T8 is given a rating of 30.11. Both ratings are considered to be low and are provided in the table below. For the purpose of the assessment and results, the majority rating for the overall proposed wind farm site will be used.

Common name	Scientific name	Suitability index (wind farm / T8)	Irish red list status
All bats		26 / 30.11	

Common pipistrelle	*Pipistrellus*	42 / 46	Least Concern
Leisler's bat	*Nyctalus leisleri*	42 / 46	Near Threatened
Natterer's bat	*Myotis nattererii*	31 / 41	Least Concern
Soprano pipistrelle	*Pipistrellus pygmaeus*	41 / 44	Least Concern
Brown long-eared bat	*Plecotus auritus*	31 / 38	Least Concern
Lesser horseshoe bat	*Rhinolophus hipposideros*	3 / 4	Least Concern
Whiskered bat	*Myotis mystacinus*	8 / 8	Least Concern
Daubenton's bat	*Myotis daubentonii*	27 / 38	Least Concern
Nathusiius's pipistrelle	*Pipistrellus nauthusii*	9 / 6	Least Concern

Table 5.3: Suitability of the study area for the bat species recorded previously (based on the NBDC data). Irish Red list status also indicated (based on Marnell *et al.*, 2009).

The proposed wind farm site was surveyed during daylight hours to identify potential roost sites that could be used by bats. A derelict house (Irish Grid Ref: H54242085) along the centre road running which cuts through the proposed wind farm site was identified as a potential minor roost; however, no definitive evidence was recorded; (and may be used by Pine Marten also). In addition to this, an old bridge was found to the south of the site (Irish Grid Ref: H54432013) had bat potential. Cracks and crevices were noted in this bridge which could potentially be used by bats; however, again, no definitive evidence was recorded. A derelict building / shed nearby in the south-eastern direction of this bridge also had bat potential. Furthermore, some derelict buildings along the local road network also all had potential. These may all used as minor roosts, but no major bat activity was recorded at any of these buildings near the site. No evidence of bat roosting was found in any of the mature trees on the site although it is noted the trees were checked from the ground only

It is noted that within a radius of 5km from the centre of the proposed wind farm, there are numerous derelict buildings/ruins present, many of which will have the potential to be bat roosting locations. There are also significant woodland areas located both 1.8km to the west of the site and 2.5km east of the site that would be considered to provide more optimal habitats for bats. The site itself is considered to have sub-optimal habitat for bats and no bat roosts were identified to be on the site. The results of the transect surveys and the fixed-point survey are presented in **Table 5.4 below**. The full results are presented in Ecofact (2018) '*Mammal Assessment of Drumlins Park Wind Farm, Co. Monaghan*'

Bats are evaluated as being of Local Importance, Higher Value. No Annex II species were recorded during the current surveys.

A desk study of available information on bats in the study area was undertaken for grid connection Option G1. The National Biodiversity Data Centre (NBDC) maps landscape suitability for bats based on Lundy *et al.,* (2011). The maps are a visualisation of the results of the analyses based on a 'habitat suitability' index. The index ranges from 0 to 100, with 0 being least favourable and 100 most favourable for bats. The suitability of the study area of Option G1 for the bat species found in Ireland (based on NBDC) along with their Irish Red List Status (from Marnell *et al.,* 2009) is provided in **Annex 5.3**. There are no buildings or other structures directly affected by Option G1 that may be used by bats. There are no habitats identified along the route that would be of particular importance to bat species. In general, the hedgerows and treelines along the route are of poor quality for bats. Mature treelines along the route could be used by bats during the active bat season. There are no large lakes or sections of woodland present along the route. Bats are evaluated as being of Local Importance, Higher Value.

Type of Transect			Transect Number							Fixed
Transect Number			1	2	4	5	6	7	8	
Species		Activity								
Common pipistrelle	*Pipistrellus*	Commuting	***	***	***		***	***	***	***
		Feeding	***	***	***		***		***	***
Soprano pipistrelle	*Pipistrellus pygmaeus*	Commuting	**	**	**	**	**	**	**	**
		Feeding	**	**		**	**	**	**	**
Pipistrelle sp.	*Pipistrellus* spp	Commuting	*	*	*		*	*	*	*
		Feeding	*	*			*	*	*	*
		Social Call			*		*	*	*	
Leisler's Bat	*Nyctalus leisleri*	Commuting	*		*			*	*	*
		Feeding							*	
Myotis sp.	*Myotis* spp	Commuting	*				*			*
		Feeding	*							*
Brown Long-eared Bat	*Plecotus auritus*	Commuting								*
		Feeding								

Table 5.4: Results of Transect Surveys (Walked and Driven) and results of the Fixed-Point survey on the proposed wind farm site (2017 survey).

The suitability of the study area of Option G2 for the bat species found in Ireland (based on NBDC) along with their Irish Red List Status (from Marnell *et al.*, 2009) is provided in **Annex 5.4**. There are again no buildings or other structures directly affected by the route that may be used by bats. There are no habitats identified along the route that would be of importance to bat species. Mature treelines along the route could be used by bats during the active bat season. The River Bunnoe and River Annalee are likely to be used by Daubenton's bats; however, there are no large lakes or sections of woodland present along the route. Bats are evaluated as being of Local Importance, Higher Value.

The suitability of the study area of Option G3 for the bat species found in Ireland (based on NBDC) along with their Irish Red List Status (from Marnell *et al.*, 2009) is provided in **Annex 5.5**. As the route is located adjacent to the proposed wind farm site, the results of the bat surveys conducted on the wind farm site are applicable to this grid connection route. Bats are evaluated as being of Local Importance, Higher Value.

The locations of upgrades to the public roads are not considered to be of importance for bat species.

5.3.5.3 Birds

A desk study of breeding birds recorded for the area has been completed. **Table 5.5** lists the bird species found in the 10km grid square H52; data which was received from the online National Biodiversity Data Centre maps. Of the total 85 species, 47 are passerine birds. Nine of the remaining 38 birds are wintering birds and therefore would not be recorded during the breeding bird season. Barn Owl, Black-headed Gull, Grey Partridge, Herring Gull, Corncrake, Curlew, Woodcock, Lapwing, Tufted Duck and Wigeon are all listed on the Red list of the Birds of Conservation Concern in Ireland 2014-2019. Hen Harrier has never been recorded in this area.

Common name	Scientific name	Common name	Scientific name
Barn Owl	*Tyto alba*	European Robin	*Erithacus rubecula*
Barn Swallow	*Hirundo rustica*	Fieldfare	*Turdus pilaris*
Bewick's Swan	*Cygnus columbianus subsp. bewickii*	Goldcrest	*Regulus*
Black-billed	*Pica*	Great Cormorant	*Phalacrocorax*

Common name	Scientific name	Common name	Scientific name
Magpie			*carbo*
Blackcap	*Sylvia atricapilla*	Great Crested Grebe	*Podiceps cristatus*
Black-headed Gull	*Larus ridibundus*	Great Tit	*Parus major*
Blue Tit	*Cyanistes caeruleus*	Grey Heron	*Ardea cinerea*
Chaffinch	*Fringilla coelebs*	Grey Partridge	*Perdix*
Coal Tit	*Periparus ater*	Grey Wagtail	*Motacilla cinerea*
Common Blackbird	*Turdus merula*	Greylag Goose	*Anser*
Common Bullfinch	*Pyrrhula*	Hedge Accentor	*Prunella modularis*
Common Buzzard	*Buteo*	Herring Gull	*Larus argentatus*
Common Chiffchaff	*Phylloscopus collybita*	Hooded Crow	*Corvus cornix*
Common Coot	*Fulica atra*	House Martin	*Delichon urbicum*
Common Cuckoo	*Cuculus canorus*	House Sparrow	*Passer domesticus*
Common Goldeneye	*Bucephala clangula*	Lesser Redpoll	*Carduelis cabaret*
Common Grasshopper Warbler	*Locustella naevia*	Little Egret	*Egretta garzetta*
Common Kestrel	*Falco tinnunculus*	Little Grebe	*Tachybaptus ruficollis*
Common Kingfisher	*Alcedo atthis*	Long-eared Owl	*Asio otus*
Common Linnet	*Carduelis cannabina*	Long-tailed Tit	*Aegithalos caudatus*
Common Moorhen	*Gallinula chloropus*	Mallard	*Anas platyrhynchos*
Common Pheasant	*Phasianus colchicus*	Meadow Pipit	*Anthus pratensis*
Common Pochard	*Aythya ferina*	Mistle Thrush	*Turdus viscivorus*
Common Raven	*Corvus corax*	Mute Swan	*Cygnus olor*
Common Snipe	*Gallinago*	Northern Lapwing	*Vanellus*
Common Starling	*Sturnus vulgaris*	Redwing	*Turdus iliacus*
Common Swift	*Apus*	Reed Bunting	*Emberiza schoeniclus*
Common Whitethroat	*Sylvia communis*	Rook	*Corvus frugilegus*
Common Wood Pigeon	*Columba palumbus*	Sand Martin	*Riparia*
Corn Crake	*Crex*	Sedge Warbler	*Acrocephalus schoenobaenus*
Eurasian Collared Dove	*Streptopelia decaocto*	Sky Lark	*Alauda arvensis*
Eurasian Curlew	*Numenius arquata*	Song Thrush	*Turdus philomelos*
Eurasian Jackdaw	*Corvus monedula*	Spotted Flycatcher	*Muscicapa striata*
Eurasian Jay	*Garrulus glandarius*	Tufted Duck	*Aythya fuligula*
Eurasian Siskin	*Carduelis spinus*	Water Rail	*Rallus aquaticus*
Eurasian Sparrowhawk	*Accipiter nisus*	White Wagtail	*Motacilla alba*
Eurasian Teal	*Anas crecca*	White-throated Dipper	*Cinclus cinclus*
Eurasian Treecreeper	*Certhia familiaris*	Whooper Swan	*Cygnus cygnus*
Eurasian Wigeon	*Anas penelope*	Willow Warbler	*Phylloscopus trochilus*
Eurasian Woodcock	*Scolopax rusticola*	Winter Wren	*Troglodytes*
European Golden Plover	*Pluvialis apricaria*	Yellowhammer	*Emberiza citrinella*

Common name	Scientific name	Common name	Scientific name
European Goldfinch	*Carduelis carduelis*	Barn Owl	*Tyto alba*

Table 5.5: The NBDC online maps show records of the bird species below found in the 10km Grid Square H52 which includes the Drumlins Park grid connection route and Drumlins Park Wind Farm in Co. Monaghan.

The proposed wind farm site is located in a drumlin area where pasture and hedgerows dominate the landscape. The habitats on the proposed wind farm site are of Local Importance only and are habitats that are widespread and common across Ireland. No important bird habitats occur on the site. The closest Special Area of Conservation is the Upper Lough Erne Special Protection Area (UK9020071), c. 6km west and the Kilroosky Lough Cluster Special Area of Conservation (Site Code: 001786), located ca. 6km North-west of the development.

The proposed wind farm site itself is not of any particular use to birds in general or to birds of conservation concern. This has been confirmed by three years breeding and winter bird surveys completed on the site, and along the proposed grid connection routes. The surveys completed were as follows: -

- The 2017 winter bird surveys were conducted from January 2017 to March 2017 and involved 4 full days survey work (Ecofact 2019c);
- The 2017 breeding bird surveys were conducted from April to June 2017 and involved 4 full days survey work (Ecofact 2019d);
- The 2017-18 winter bird surveys were completed over 10 full days extending from November 2017 to March 2018 (Ecofact 2019e);
- The 2018 breeding bird surveys were completed over 10 full days extending from March 2018 to July 2018 (Ecofact 2019f);
- The 2018-2019 winter bird surveys were conducted from October 2018 to March 2019 and involved 10 full days survey work (Ecofact 2019g);
- The 2019 breeding bird surveys were undertaken from April 2019 to July 2019 and involved 10 full days survey work (Ecofact 2019h).

Overall a total of 48 days bird survey work was undertaken at the proposed wind farm site during the period January 2017 to July 2019. The surveys included detailed wintering and breeding bird surveys. The survey work included formal vantage point surveys at three vantage points and also general surveys with results-driven observations on the wind farm site, and along the grid connection options. The locations of the formal vantage point survey points used are indicated in **Figure 5.6.**

Breeding Season Surveys

The results show that the proposed wind farm site is not of particular importance to breeding birds. No sensitive bird species were recorded on the proposed wind farm site during the extensive surveys completed over 3 years. **Table 5.6** lists the bird species recorded breeding on the wind farm site during the 2017-2019 bird surveys. The habitats on the site consist mainly of unimproved agricultural grassland, hedgerows and treelines. These are habitats that are widespread and common throughout Co. Monaghan and Ireland and are not considered to be of particular importance to birds. There are no lakes, no bogs, no heather moor, no young forestry, no crags, no large rivers, no fields of arable land and no reed beds on the proposed wind farm site. Therefore, the variety of habitats on this site is limited, and therefore the diversity and abundance of birdlife is limited.

The majority of bird species observed on the site during the bird surveys were either passerines or corvids. The only raptor species recorded were Buzzard, Sparrowhawk

and Kestrels. Meadow pipit and Grey wagtail were the only two species recorded which are red listed in Ireland. These species are red-listed due to the cold winters experienced in 2009/10 and 2011/12, although it is noted that these species have had a strong recovery since then. The hedgerows on the site support Chaffinch, Robin, Blackbird, Song thrush, Wren, Dunnock, Mistle thrush and Blue tit. The species observed on the site associated with open grassland include Meadow pipit, Skylark and Snipe. The limited, small and fragmented patches of woodland on the proposed wind farm site would be attractive to Jay, Buzzard, Coal tit, Goldcrest, Wood Wigeon, Rook and Raven. The farmyards and old buildings in the vicinity attracted Jackdaws, Starlings and Pied Wagtails. The one pair of Grey Wagtails seen on the site were observed on the Dunnaluck Stream. Again, it is noted that there were no species of conservation concern recorded, such as Hen harrier. The bird species recorded on the site are not considered to be at risk from wind farm developments, as they are small agile birds.

Hen Harrier has never been recorded in the study area. There are no records from this part of County Monaghan. The habitat on the proposed wind farm site and along the three grid connection options is not optimal Hen Harrier habitat. Hen harriers would never use this area. Hen harriers were not recorded during three years of survey work. The closest Hen Harrier site is the Slieve Beagh SPA located c. 17km from the proposed wind farm. Furthermore, the closest grid connection option (G1) is c. 14km from the SPA.

During the 2018 breeding bird survey, a juvenile Great Spotted Woodpecker was seen during a vantage point watch at VP1 on 26th of June 2018. This species was previously absent from Ireland for hundreds of years. There have been odd vagrants over the years, but breeding was found in Co. Down in 2006 and in Co. Dublin in 2008. Seven nests were found in Co. Wicklow in 2009. Great Spotted Woodpeckers were found to be breeding in Co. Monaghan in 2014 (Coombes & Wilson 2015). There have been a number of sightings in the county since then. This was unexpected as there is no large woodland in the vicinity and no drumming had been heard during the late winter or early spring. This was a young bird which had recently fledged. This observation is not of significance in relation to the proposed development.

A single Red Kite was seen on the 26th of June 2018 from VP 2. Red Kite is a rare visitor to Co Monaghan. There were 2 sightings of Red Kite in Co. Monaghan in 2011 (Source: www.Irishbirding.com). Red Kites have been reintroduced to Ireland after an absence of 200 years. Welsh-born Red Kites were released in Co. Wicklow from 2007 to 2011. More birds were released in North County Dublin in 2011. Birds were also released in Co. Down in 2008-2010. By 2017, twenty pairs were breeding in Northern Ireland (Source: www.rspb.org.uk. This was the only Red Kite sighting recorded on the proposed wind farm site and was likely to be an immature bird that has not yet started breeding. Again, this is not of significance in relation to the proposed development of the site.

Great Crested Grebes were recorded on many of the lakes in the wider study area during the breeding bird surveys in 2018 and 2019. Long Lake, located c. 4km from the proposed wind farm site, is an important breeding site for this species. No Great Crested Grebes were ever recorded flying near the proposed grid connection route or wind farm.

Common name*	Species name	Unimproved grassland /wet grassland	Improved grassland	Hedgerows	Isolated trees
Willow	*Phylloscopus*			*	*

Common name*	Species name	Unimproved grassland /wet grassland	Improved grassland	Hedgerows	Isolated trees
Warbler	*trochilus*				
Chiffchaff	*Phylloscopus collybita*			*	
Sedge Warbler	*Acrocephalus schoenobaenus*	*		*	
Grey Wagtail	*Motacilla cinerea*	*			
Meadow Pipit	*Anthus pratensis*	*	*	*	
Blackcap	*Sylvia atricapilla*				
Skylark	*Alauda arvensis*	*	*	*	*
Whitethroat	*Sylvia communis*		*	*	*
Reed Bunting	*Emberiza schoeniclus*	*			*
Mistle thrush	*Turdus viscivorus*	*	*	*	*
Song Thrush	*Turdus philomelos*		*	*	*
Blackbird	*Turdus merula*	*	*	*	*
Robin	*Erithacus rubecula*			*	*
Chaffinch	*Fringilla coelebs*	*	*	*	*
Linnet	*Carduelis cannabinna*	*		*	*
Dunnock	*Prunella modularis*			*	*
Goldfinch	*Carduelis*				*
Lesser Redpoll	*Carduelis caberet*			*	*
Blue tit	*Parus caeruleus*		*	*	*
Great tit	*Parus major*			*	*
Coal tit	*Parus ater*		*	*	*
Wheatear	*Oenanthe oenanthe*	*		*	*
House Sparrow	*Passer domesticus*				*
Starling	*Sturnus vulgaris*	*		*	*
Goldcrest	*Regulus regulus*			*	*
Wren	*Troglodytes troglodytes*			*	*
House Martin	*Delichon urbica*	*	*		*
Swallow	*Hirundo rustica*	*	*	*	*
Rook	*Corvus frugilegus*	*		*	*
Hooded Crow	*Corvus cornix*	*	*	*	*
Magpie	*Pica pica* Green	*	*	*	*
Jackdaw	*Corvus monedula*	*	*	*	*
Jay	*Garrulus glandarius*			*	
Woodpigeon	*Columba palumbus*		*	*	*
Pheasant	*phasianus colchicus*	*			
Common Snipe	*Gallinago gallinago*	*		*	*
Buzzard	*Buteo buteo*	*	*	*	*
Sparrowhawk	*Accipiter nisus*			*	*
Kestrel	*Falco tinnunculus*	*		*	*
Red Kite	*Milvus milvus*		*		
Great Spotted Woodpecker	*Dendrocopus major*		*		
Lesser Black-backed Gull	*Larus fuscus*		*		

Table 5.6 Bird species recorded breeding on the proposed wind farm site during the 2017-2019 bird surveys (with Birds of Conservation Concern status – breeding - highlighted for each).

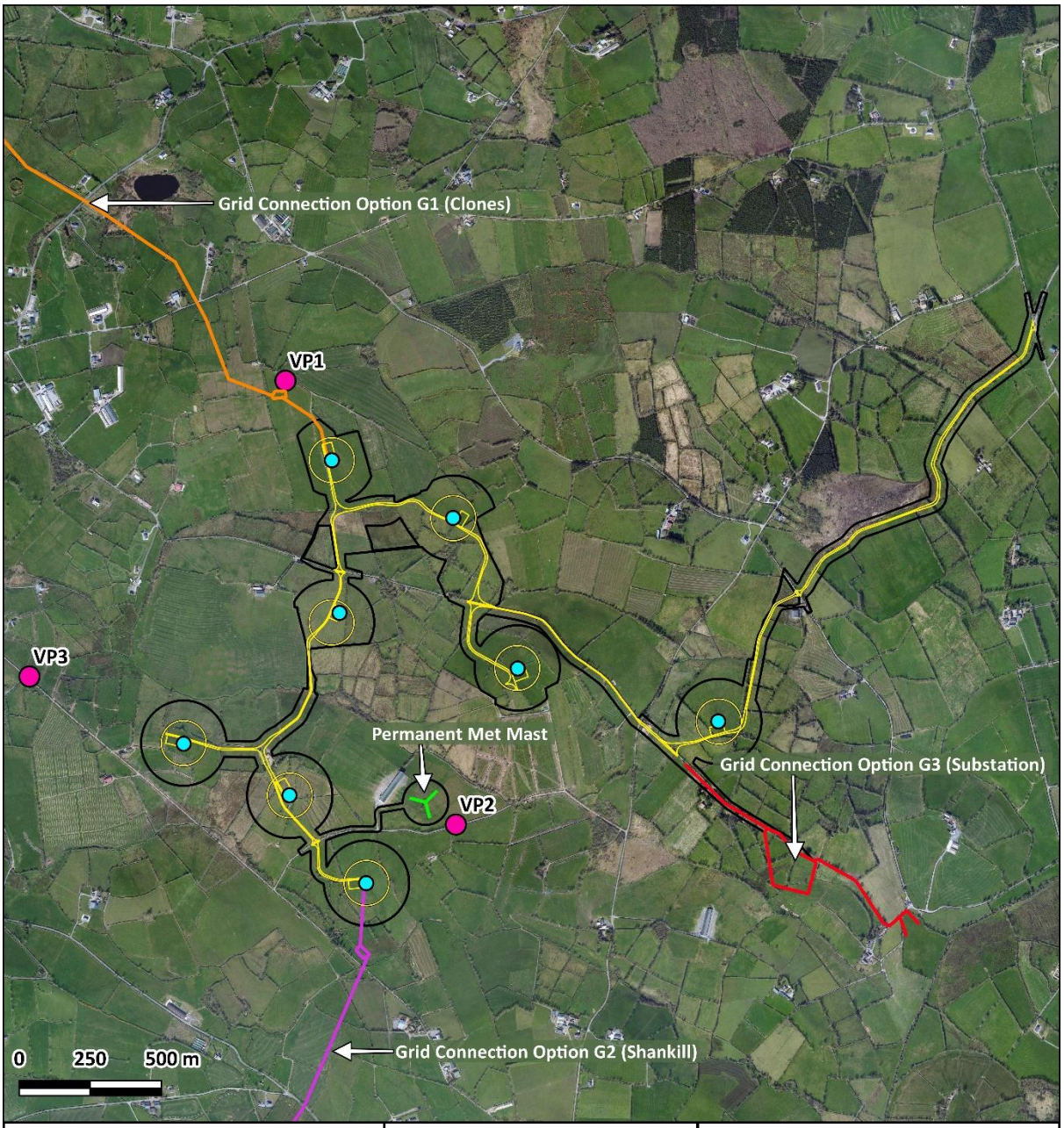

Figure 5.6: Location of the Proposed Drumlins Park Wind Farm Indicating Grid Connection Route Options and Established Vantage Points.

Winter Season Surveys

The majority of observations made during the winter bird surveys again related to common passerine birds. The overall numbers of birds recorded was considered to be low. Small to medium-sized passerine birds were dominant in the area, such as Coal tit, Starling, Wren, Robin, Fieldfare, Great tit, Mistle thrush and Song thrush. The most common birds of prey recorded were Buzzards. Buzzards were seen frequently during the vantage point watches, and also seen while driving between sites in the study area near residential housing and adjoining agricultural grassland fields. Wood pigeons were regularly seen at the proposed wind farm site and grid connection routes and the surrounding areas. Starlings were frequently observed flying in small flocks in the general study area and at the vantage point watches.

There were also occasional observations of Sparrowhawk and Kestrel. A Merlin was seen hunting on the site briefly in November 2018 and perched in a field on the site. This was a once-off observation.

In the wider study area, waterbird counts were carried out at local lakes during the winters of 2016-2017, 2017-2018 and 2018-2019. The most notable species observed at these lakes was the Whooper Swan. However, throughout the bird surveys it was confirmed that the proposed development area (including grid connection routes) is not located within regular flight paths for Whooper Swans, nor is the area itself used in large numbers. It is also not located along any areas for resting or staging. No Whooper Swans were ever recorded on the proposed wind farm site – and they would never use this site due to the absence of suitable habitat. Moreover, Whooper Swans were only recorded flying over the wind farm site once – and they were well above rotor sweep height. The proposed wind farm site is not on a regular flight path used by this species. The highest number of Whooper Swans recorded during the three-year wintering period in the wider study area for the proposed development was 60 swans at Annagose Lough. Annagose Lough is c. 6km from grid connection Option G1 and 5.9km from the closest proposed wind turbine. Overall, numbers were much lower than this and Whooper Swans were only recorded at 3 of the 16 lakes surveyed over the three winter surveys. Whooper Swans were recorded flying over the proposed wind farm site once in a small flock of 11 individuals during the wintering season of 2018/19.

The threshold for nationally important numbers of Whooper Swans, 1% of the total population, is given as 100 birds (Crowe, O. *et al*., 2008). In Crowe (2005) the Dromore Lakes in Co. Monaghan are listed as being not important. It is considered that even in the local lakes away from the proposed wind farm site, the wider study area is not of particular importance to Whooper Swans due to low recorded numbers. Additionally, the Irish Whooper Swan Study Group conducted an All-Ireland productivity survey of Whooper Swans. In 2017 Co. Monaghan counts were given as 39 swans out of a total of 4,494 swans recorded in the Republic of Ireland, 0.87% of the Republic of Ireland population (Graham McElwaine *pers. Comm.,* 2017).

Great Crested Grebes were recorded on many of the lakes in the wider study area during the Drumlins Park Winter Bird surveys in 2018/19. It is considered that Great Crested Grebes are present on most of the lakes in this area of the country, consistent with other areas in Ireland. No Great Crested Grebes were recorded flying near the grid connection routes or wind farm.

Individual Snipe were recorded on two occasions during the current surveys – along

the proposed grid connection route G1. No Snipe were recorded on the proposed development site. Snipe (*Gallinago gallinago*) is Amber listed in Ireland due to a decline in the European population. They are found on a large variety of wetland habitats feeding on vegetation and soil invertebrates. Snipe are ground nesting birds which normally nest near wet or boggy areas. The highest densities of birds found in Ireland are located in the Shannon and Fergus Estuary in County Clare, Ballymacoda in County Cork and Tralee Bay, Lough Gill & Akeragh Lough in County Kerry. In winter they are highly dispersed. Trends of snipe are poorly monitored in Ireland and Britain. According to the 2007-11 breeding and wintering bird atlas the highest wintering densities in Ireland are sound in the southwest and the highest breeding densities are located in the west of Ireland. These areas typically have a high cover of wetland habitat (Balmer *et al*, 2013). The NBDC online maps have multiple records of Snipe in the 10km grid square H52 which includes the wind farm site. The latest record however is from the period 2007-2011, from the Bird Atlas 2007-2011 (Balmer *et al*, 2013).

Golden Plover are red-listed in Ireland due to a large decline in the breeding population. In January 2015, numbers of Golden Plover in Ireland exceeded 47,000. From 1994/95 to 2014/15, a decline of 3.38% was observed for Golden Plover in Ireland. When just considering the period between 2004/05 to 2014/15 this increases to a 52.30% decline (Lewis *et al*, 2016). According to the National Trend Information for Golden Plover via iWeBS online, the mean annual change overall is -0.97% in numbers. The 5-year trend (2011/12 – 2015/16) is noted as -9.67%. There are several records of Golden Plover occurring in Monaghan (NBDC Maps). There are roving records of Golden Plover for the 10km grid square H52 which encompasses the proposed Drumlins Park wind farm site. These records are from the Bird Atlas 2007-2011 dataset and were noted to occur in winter, with breeding evidence present.

Golden plover were recorded on the site in relatively small flocks on two separate occasions during the current vantage point watches. The largest number recorded in one of these flocks was 60 individuals. The nationally important threshold for Golden plover in Ireland is 1,700 birds (Boland, H. & Crowe, O., 2007), and therefore it is clear that the numbers seen during the current surveys were low. Golden plover are among the most widespread species of wader in Ireland and can be found in a variety of habitats, including farmland which is common throughout the country (Crowe, O., 2005). They can be found all over Ireland and because Golden plover are small agile birds they are generally not considered to be at risk from wind farms. It is noted that Golden plover are a red-listed species for Birds of Conservation Concern in Ireland 2014-2019. Over the course of the bird surveys of 48 full days, Golden Plover were seen twice and therefore infrequently fly over the site.

The BirdLife International Position Statement on Wind Farm and Birds notes areas that should be avoided during site selection for wind farms. The proposed development avoids this list of areas which includes SPAs and areas along regular flight paths for sensitive species. Due to the bleak nature of the site and the common farmland habitats present, the site is considered ideal for the construction of wind farm. This site was evaluated as being of Local Importance (Higher Value). This is due to the fact that Meadow pipit and Grey wagtail were observed on the site, and these species are red listed in Ireland. Overall, the majority of sightings on the proposed development site were passerines and corvids. From the results of the surveys undertaken, the proposed wind farm site is not considered to be of particular importance to birds. The habitats on the site are widespread and common throughout Co. Monaghan and Ireland.

Further details regarding birds are provided in the targeted grid connection notes for

Options G1, G2 and G3 enclosed at **Annexes 5.3**, **5.4** and **5.5** respectively. The locations of upgrades to the public roads are not considered to be of importance for bird species.

5.3.5.4 Aquatic Ecology

All of the watercourses on the proposed wind farm site are of a small size and are not of significant aquatic ecology value. There are 4 watercourses on the wind farm site: the 1st order Dunnaluck Stream; 1st order Corragharry Stream; the 1st order Skerrick East Stream; and the 1st order Newbliss Stream.

These watercourses were noted to be dry in the summer of 2018 and were again partially dry during the summer of 2019. The Dunnaluck Stream, the Corragharry Stream and the Skerrick East Stream all flow into the River Bunnoe outside of the site. The River Bunnoe then flows into the River Annalee, which then flows into the River Erne. The Newbliss Stream however is located in a separate sub-catchment, and flows into the River Finn [Monaghan], which eventually flows into Upper Lough Erne.

The EPA has a biological water quality monitoring station (EPA Station Code: 36B05 0300) upstream of the Closdaw stream confluence and the proposed wind farm site. This station was last monitored in 2001 and was given a rating of Q2-3 which corresponds to WFD status 'poor'. Downstream of the Dunnaluck Stream confluence and the proposed wind farm site, there is another EPA monitoring station (EPA Station Code: 36B05 0400). This station was last monitored in 2017 and was assigned a rating of Q3 which corresponds to WFD status 'poor'. The EPAs most recent assessment of the River Bunnoe is as follows: '*Agricultural pressures appear to be the primary pressure on the River Bunnoe. This tributary of the Annalee is in poor or moderate condition over its length – all five sites examined were less than satisfactory in August 2017*'.

The dip netting surveys on the watercourses on the site revealed that there are no fish present in these streams likely due to their small size. The aquatic macroinvertebrate community was considered to be moderate to low, with common pollution tolerant species present such as *Gammarus duebeni* and *Baetis rhodani*. It is clear that these watercourses are impacted by existing pressures such as agricultural practises.

The NBDC maps do hold records of White-clawed Crayfish in the River Bunnoe downstream at Dianmore Bridge, with the most recent record from the EPA in 2007. Other records are also present upstream and downstream of this bridge site, from the Crayfish Survey of Ireland database in 2006.

The streams on the proposed wind farm site are evaluated as being of Local Importance. In terms of the proposed development; however, their presence results in the potential for pollutants to be transported to downstream areas. However, this potential impact can easily be avoided / mitigated.

Grid connection Option G1 crosses four watercourses along is c. 5km length. The first is the Legar Hill Stream (EPA Code: 36L06), a first order watercourse. Next is the 2nd order Legar Hill Stream (EPA Code: 36L91). This grid connection route option then crosses the 5th order River Finn [Monaghan] (EPA Code: 36F01) and the 1st order Scairbhigh Stream (EPA Code: 36S41). The only one of these watercourses that the EPA carries out biological monitoring on is the River Finn [Monaghan]. The nearest station upstream of grid connection Option G1 crossing was rated as Q4 in 2017, corresponding the WFD status 'good' (EPA Code: 36F01 0400). The next station downstream of this crossing was rated as Q3-4 in 2017, corresponding to WFD status 'moderate' (EPA Code: 36F01 0500). The EPA's most recent assessment of the River

Finn [Monaghan] is as follows: '*Six of the seven sites sampled on the Finn (Monaghan) in 2017 failed to achieve good water quality with two of the upper sites (0010 and 0100) deteriorating from their previous good quality. Quality improved at Scarvy Bridge (0400), however, no change occurred in the lower sites*'. The River Finn [Monaghan] is of note and is the largest watercourse along the route. Aquatic Ecology on the route is evaluated as being of Local Importance, Higher Value.

Grid connection Option G2 crosses a large number of watercourses along is c. 16km route. The first of which is the 2nd order Corragharry Stream (EPA Code: 36C85). The EPA do not carry out biological monitoring on this watercourse. Next is the 3rd order River Bunnoe (EPA Code: 36B05), which is actually crossed by this option in a number of different locations. The EPA carry out biological monitoring on this watercourse, as noted above. The upstream site is rated as Q2-3 and the downstream site, closest to the crossing location, is rated as Q3. Further downstream, near another crossing, the EPA rate a site as Q3-4 (EPA Code: 36B05 0500), corresponding to WFD status 'Moderate' in 2017. After this the route crosses the River Bunnoe a further 3 times. Following this, the route crosses the 5th order River Annalee (EPA Code: 36A02). There is an EPA station upstream of this crossing point which was rated as Q4 in 2017 (EPA Code: 36A02 0900), which corresponds to WFD status 'Good'. Next, the route crosses the 2nd order Drumnanarragh Stream (EPA Code: 36D76), which is not monitored by the EPA. After this, the route crosses the 2nd order Annagelliff Stream (EPA Code: 36A48), which is not monitored by the EPA. Finally, the route then crosses the 1st order Drumryan Stream (EPA Code: 36D92) before reaching the substation. The EPA do not carry out biological monitoring on the Drumryan stream.

The two most notable watercourses along the Option G2 route is the River Bunnoe and the River Annalee. The EPAs most recent assessment of the River Bunnoe is provided above. The EPAs most recent assessment of the River Annalee is as follows: '*The Annalee is a large river flowing east to west through County Cavan and on into the River Erne. The Annalee was found to be in generally satisfactory condition over its length when surveyed in August 2017. The macroinvertebrate fauna indicated moderate ecological quality as far as the lake-influenced site downstream of Lough Sillan (0150) – although an improvement in quality was noted at 0150 compared with the July 2013 previous survey. An unwelcome decline in the improvement observed in 2013 was not maintained at the lowest station (1400) downstream of the Cavan river confluence.*' Aquatic Ecology along grid connection Option G2 is evaluated as being of Local Importance, Higher Value.

Grid connection Option G3 does not cross any watercourses.

5.3.5.5 Reptiles & Amphibians

The NBDC maps show records of Smooth Newt north-east of Newbliss in Co. Monaghan from the Amphibians and Reptiles survey of Ireland. This record is from 2011 and notes that 3 females and 2 males were found. Again, it is noted that there are no lakes on the proposed wind farm site. One section of the Skerrick East Stream was noted to be dug out beside a road which does create an area resembling a pond. This pond is not directly affected by the proposed development as it is outside the site boundary. Most of the drainage ditches on the site are located to the south-west. There is potential for Smooth Newt to occur in the Poor Fen/Flush habitat north of the arterial access track from the R189 to T7. There are records of Common Frog east of Doohat from 2018 and it is noted that Common frog may also use the same habitats as noted above - in particular the Poor Fen/Flush habitat. There are no records of common lizard in the study area. Indeed, there are no suitable habitats for this species on the proposed wind farm site, as it prefers rocky upland areas.

Newts and Frogs were not recorded during the current survey but are expected to occur. The most suitable habitat is the wet area along the arterial access track and mitigation to protect amphibians will be required for this location. However, it should be noted that the access track avoids this area. Amphibians on the proposed wind farm site are evaluated as being of Local Importance.

The NBDC maps do not show any records for Smooth Newt, Common Frog or Common Lizard along grid connection route Option G1. The nearest Smooth Newt record is noted to be in Newbliss, as described above. There are no ponds or drainage ditches identified along the footprint of the route. It is noted that areas around the River Finn [Monaghan] and the fen habitats surrounding Radeerpark lough will almost certainly be used by amphibians such as the common frog. These areas may be used by amphibians at any time and therefore pre-construction surveys should be completed in any areas where the route travels across these habitats, should this grid connection be constructed. Reptiles and Amphibians on the route are evaluated as being of Local Importance.

The NBDC maps again do not show any records for Smooth Newt or Common Lizard along grid connection Option G2. There are records of Common Frog along the route of Option G2. There are records at Shantemon Lough which is located towards the end of the grid connection route, although the route does not cross immediately near this lake. Following this, there are various 10km grid square records which encompass the route. Any fens, watercourses or drainage ditch habitats along the route should be subject to pre-construction surveys, should this grid connection be constructed. There is no suitable habitat present for reptiles along this route. Reptiles and Amphibians on the route are evaluated as being of Local Importance.

There are no ponds or drainage ditches identified along grid connection Option G3. There are also no suitable rocky or upland habitats that may be suitable for reptiles. Additionally, there are no NBDC records for smooth newt or common lizard along the footprint of grid connection Option G3. There is a 10km grid square record from 1979 for common frog but again no suitable habitat is present within the footprint of this option.

5.3.5.6 Terrestrial Invertebrates

There are no records of Marsh Fritillary on the proposed wind farm site or in the wider study area. Indeed, the habitat for this species is not present within the direct footprint of the site. This butterfly can be found in wetland, woodland and wet grassland habitats but a key feature of its habitat is the presence of Devils Bit Scabious *Succisa pratensis*. The degraded poor fen and flush habitat north of the arterial access track from the R189 to T7 contains the only potential habitat for the species in the study area. However, the road avoids this area. There are also no records of Geyer's Whorl Snail *Vertigo geyeri* in the study area. The only potential habitat for this species is again in the poor fen and flush habitat adjacent to the arterial access track. Although this fen habitat is within the application area – it is avoided by the access track. There are no records of any other protected terrestrial invertebrates on the site according to the NBDC Maps. Terrestrial invertebrates on the proposed wind farm site are evaluated as being of Local Importance. The community on the site is considered to be a generalised community.

There are no records of protected terrestrial invertebrates along grid connection route Option G1. There is no suitable Marsh Fritillary habitat along the route, which typically consists of Devils Bit Scabious on wet grassland habitats. It is considered that the terrestrial invertebrate community present along the route comprises a generalised community of common and widespread species. Terrestrial

invertebrates along this route are evaluated as being of Local Importance.

There are again no records of protected terrestrial invertebrates along grid connection route Option G2. However, there are some wet grassland habitats and fens habitats located along the route that should be subject to pre-construction surveys, should this grid connection be constructed, to ensure no habitat is present for protected terrestrial invertebrates such as Marsh Fritillary. Terrestrial invertebrates along the route are evaluated as being of Local Importance.

There are no records of protected terrestrial invertebrates along grid connection Option G3. There is no suitable Marsh Fritillary habitat along the route, which typically consists of Devils Bit Scabious on wet grassland habitats. It is considered that the terrestrial invertebrate community present along the grid connection route comprises a generalised community of common and widespread species. Terrestrial invertebrates along the route are evaluated as being of Local Importance.

5.3.6 Key Ecological Receptors

On the basis of the extensive desktop analysis undertaken of available records and the multi-annual surveys, it is possible to identify the Key Ecological Receptors (KERs) which may experience an impact as a result of the construction and operation of the proposed development. The KERs identified and recorded within the study area are presented in **Table 5.7** below.

Ecological Receptors	Summary Description of the Ecological Receptors	Evaluation of the ecological receptors (Key Ecological Receptors are those identified as being > Local Importance)
Eroding / Upland Rivers (FW1)	Watercourses on the site, although small, are of importance to biodiversity and are evaluated as being of Local Importance, Higher Value	Local Importance, Higher Value
Poor Fen and Flush (PF2)	Degraded poor fen and flush habitat north of the access road from the R189 to T7 is important ecologically.	Local Importance, Higher Value
Mixed Broadleaved Woodland (WD1)	Although only present in small fragmented sections, this habitat would be of importance to ecology given the paucity of it in the general study area	Local Importance, Higher Value
Scrub (WS1)	Majority present north of the access road to T7. Due to the lack of diverse habitats, scrub would be of importance for wildlife in the area.	Local Importance, Higher Value
Wet Grassland (GS4)	Scattered around the proposed wind farm site this habitat would be of importance to wildlife in the area	Local Importance, Higher Value
Hedgerows (WL1)	Network of hedgerow habitats, although suboptimal, do function as wildlife corridors and can be used by birds for breeding	Local Importance, Higher Value
Treelines (WL2)	Network of treelines, although suboptimal, do function as wildlife corridors and can be used by birds for breeding	Local Importance, Higher Value
Pine Martens	Have been recorded in the study area	Local Importance, Higher

Ecological Receptors	Summary Description of the Ecological Receptors	Evaluation of the ecological receptors (Key Ecological Receptors are those identified as being > Local Importance)
	during the current surveys	Value
Bats	Bat suitability for the study area is considered to be average to low, with common species having the highest range	Local Importance, Higher Value
Birds	Extensive bird surveys carried out by Ecofact for the site. Buzzards, Sparrowhawks and Kestrels have been recorded in the area. Whooper Swans were recorded in low numbers in lakes in the wider landscape while 1 no. observation was made of Whooper Swans flying, at height above the rotor swept area, over the wind farm site	Local Importance, Higher Value

Table 5.7: Key Ecological Receptors recorded within the study area, including a summary description and evaluation.

5.4 Description of Likely Effects

5.4.1 Natura 2000 Sites

The likelihood of adverse impacts on Natura 2000 sites arising from the proposed development are discussed and assessed in detail in the 'Screening for Appropriate Assessment' Report and 'Natura Impact Statement' prepared by Ecofact (2019a, 2019b). The Natura 2000 sites that were identified to be potentially impacted were the Upper Lough Erne SPA, the Upper Lough Erne SAC, the Lough Oughter and Associated Loughs SAC, the Lough Oughter Complex SPA and the Slieve Beagh SPA. The NIS came to the conclusion that on the basis of the best available scientific evidence, it is concluded that there is reasonable scientific certainty that the proposed development will have no direct, indirect or cumulative impacts on the conservation status or integrity of the Upper Lough Erne SAC, Upper Lough Erne SPA, the Lough Oughter and Associated Loughs SAC, the Lough Oughter Complex SPA or the Slieve Beagh/Slieve Beagh-Mullaghfad-Lisnaskea SPA.

Given the detailed assessment undertaken in respect of Natura 2000 sites and the conclusions reached in the NIS, the likelihood for impacts on SPAs and SACs is not considered further.

5.4.2 Nationally Important Sites

5.4.2.1 Construction Phase

Wind Farm

There will be no likely direct impacts arising from the construction phase of the proposed development that could affect any NHAs, pNHAs or other designated areas as none are present within the footprint of the development.

Indirect effects have the potential to occur due to hydrological connections NHAs or pNHAs. The watercourses present at the site are the Dunnaluck Stream, the Skerrick East Stream and the Corragharry Stream which all flow into the River Bunnoe, which eventually reaches the Lough Oughter and Associated Loughs pNHA. Lough Oughter is also a Ramsar Site (Ramsar Site No: 853). There is no

likelihood of any localised water quality impacts arising at the proposed development site to reach this pNHA, some 23rkm downstream of the proposed wind farm site. Localised water quality impacts may arise from construction run-off, or accidental spillages of oil / fuel from the site. While it is unlikely that any localised effects during construction could affect the NHA at this distance, water quality mitigation is provided to avoid any likely significant effects and is discussed in further detail below. There are no pathways identified for potential impacts on any other NHAs or pNHAs.

It is assessed that there is no likelihood of transboundary effects on nationally important sites within Northern Ireland.

Grid Connection Options

There will be no likely direct impacts arising from the construction phase of any of the grid connection route options that could affect any NHAs, pNHAs or other designated areas as none are present within the footprint of these route options.

The only pathway for indirect impacts identified is for grid connection Option G2. This route option is located c. 6.2rkm upstream of the Lough Oughter and Associated Loughs pNHA. This pNHA is also a Ramsar Site. There is a hydrological connection via the River Annalee over which the grid connection will cross. It is envisaged that any impacts that may arise from the construction of an OHL over a watercourse of this size would not have the likelihood to be significant. No instream works would be required for this overhead route. No polesets would be located on the banks of the river. Notwithstanding the absence of likely impacts, appropriate measures are detailed in the mitigation section.

The only pathway for potential cumulative impacts was identified as being on the Lough Oughter and Associated Loughs pNHA. Both the proposed wind farm site and grid connection Option G2 have hydrological connections to the pNHA; however, given the absence of likely effects identified above, there are no impacts arising which could result in cumulative impacts Similarly, there is no likelihood of the entire proposed development resulting in cumulative effects with any other existing, permitted or proposed development.

It is assessed that there is no likelihood of transboundary effects on nationally important sites within Northern Ireland.

5.4.2.2 Operational Phase

Wind Farm

There would be no direct impacts arising from the operational phase of the proposed development that could affect any NHAs, pNHAs or other designated areas as none are present within the footprint of the proposed development.

The only pathway for likely impacts on a designated site, the Lough Oughter and Associated Loughs pNHA, was identified as via the Dunnaluck Stream, the Skerrick East Stream and the Corragharry Stream. It is likely that any water quality impacts arising from the operational phase of the proposed wind farm site would be very minimal, only affecting local water quality with no likelihood of effects being experienced by the pNHA. The watercourses on the proposed development site are not considered to be significant vectors of pollutants to downstream areas owing to size, small carrying capacity and dilution factors in receiving waters. Water quality

mitigation for the operational phase is provided for the protected of local water quality. No other pathways for potential impacts have been identified.

It is assessed that there is no likelihood of transboundary effects on nationally important sites within Northern Ireland.

Grid Connection Options

There would be no likely direct impacts arising from the operational phase of any of the grid connection options that could affect any NHAs, pNHAs or other designated areas as none are present within the footprint of these route options.

There is no likelihood of operational phase impacts arising from grid connection Option G2 to affect the Lough Oughter and Associated Loughs pNHA. Maintenance of the grid connection route would not be frequent, and no instream works would be required. No potential operational phase impacts are envisaged.

There is no likelihood of cumulative impacts arising during the operational phase of the proposed wind farm and grid connection Option G2. Similarly, there is no likelihood of the entire proposed development resulting in cumulative effects with other developments.

It is assessed that there is no likelihood of transboundary effects on nationally important sites within Northern Ireland.

5.4.3 Habitats & Flora

5.4.3.1 Construction Phase

Wind Farm

A total of 10 no. habitats were recorded in the study area during the habitat survey. 9 no. of these habitats are directly within the footprint of the proposed wind farm site. **Table 5.8** below provides a breakdown of the habitats present within the footprint of the wind farm. All of these habitats therefore have the potential to be directly impacted by the construction phase of the proposed wind farm site. While some habitats have a higher value than others and some provide good ecosystem services to the study area, the majority of habitats within this footprint are not of particular importance (considered to be locally important). These habitats are typical of Co. Monaghan countryside.

Code	Habitat Name	Evaluation	Proposed Turbine and Hardstand								Access Tracks
			1	2	3	4	5	6	7	8	
FW1	Eroding / Upland Rivers	Local Importance, Higher Value									✓
WL2	Treelines	Local Importance, Higher Value				✓	✓		✓	✓	✓
WL1	Hedgerows	Local Importance, Higher Value	✓	✓	✓	✓	✓	✓	✓	✓	✓
FW4	Drainage Ditches	Local Importance			✓	✓		✓			
BL3	Buildings and Artificial Surfaces	No Ecological Value				✓		✓			✓
GS4	Wet Grassland	Local Importance		✓	✓	✓				✓	✓

WD1	Mixed Broadleaved Woodland	Local Importance, Higher Value				✓	✓				✓
PF2	Poor Fen and Flush	Local Importance, Higher Value									✓
GA1	Improved Agricultural Grassland	Local Importance	✓	✓	✓	✓	✓	✓	✓	✓	✓
WS1	Scrub	Local Importance, Higher Value									

Table 5.8: Habitats within the footprint of the proposed wind farm

Hedgerows, treelines, woodland, eroding upland rivers, wet grassland and poor fen and flush are locally important habitats to wildlife in the area. Minor habitat loss will occur during the construction of the proposed development. The construction of the proposed access roads, hard stand areas and turbines will result in permanent habitat loss only in the area of direct construction. It is noted that all of the turbines are located on areas consisting of improved agricultural grassland. Turbine 6 is also located on a hedgerow. These are habitats typical of the Co. Monaghan countryside and are not of particular importance. Impacts affecting linear features such as the hedgerows and treelines on the site will not result in the entire loss of these habitats. Only small sections of these linear habitats will be lost as a result of the construction of the proposed wind farm.

The arterial access track from the R189 to T7 runs adjacent to degraded poor fen and flush habitat which would be locally important for wildlife; however, no loss of habitat is envisaged.

The access tracks included in the proposed wind farm site also cross some small 1st order streams within the site boundary. This includes the Dunnaluck Stream, the Corragharry Stream, the Skerrick east Stream and the Newbliss stream. It is acknowledged that there will be some direct riparian disturbance during the construction of the access tracks in proximity to these watercourses. Siltation and water quality issues are considered likely to arise as a result of surface water run-off and accidental spillages of oil / fuel / concrete / cement which could impact on local aquatic life. Instream works are not envisaged for the construction of the access tracks. It is also noted that background water quality pressures do exist in the affected watercourses, with the downstream River Bunnoe being at Poor WFD status. Mitigation will be required for each crossing point to minimise the impacts on water quality. Given the nature of the receiving environment, impacts on water quality/aquatic habitats arising from the proposed development are evaluated as being imperceptible negative in the local context.

There is the likelihood for indirect water quality impacts to arise as a result of the construction of the proposed development. Siltation and water pollution have the potential to impact the watercourses in the study area indirectly through surface run-off and accidental spillages of oil / fuel / concrete / cement that could travel further downstream. Such impacts could indirectly affect fish in other watercourses downstream by impacting levels of oxygen present, and food sources. It is noted again that the background water quality for the River Bunnoe downstream of the Dunnaluck Stream confluence is rated as Poor WFD status by the EPA. Overall, the watercourses on the proposed development site are not considered to be significant vectors of pollutants to downstream areas owing to size, small carrying capacity and dilution factors in receiving waters. Water quality mitigation measures will ensure the avoidance of any potential indirect impacts on downstream

waterbodies. Indirect impacts on water quality arising from the construction phase of the proposed development are evaluated as being imperceptible negative in the local context.

The proposed development could result in the introduction and / or spread of non-native invasive species to existing habitats within or adjacent to the development site. This may occur through the utilisation of machinery which has previously been operating on a contaminated site. Although no non-native invasive species were identified during the current surveys, invasive species can be easily introduced to the area. The importation and spread of non-native invasive species, in the absence of mitigation, is assessed as a significant negative impact at the local level in the long to permanent period.

Potential cumulative impacts on habitats and flora during the construction phase of the proposed wind farm site comprise water quality impacts in combination with existing agricultural activities in the area. The EPA notes that the River Bunnoe is impacted by water quality pressures arising from agricultural practises in the area. All of the small streams on the proposed development site are noted to be of poor quality. It is considered that with water quality mitigation measures listed below, likely impacts on water quality would be imperceptible negative in the local context. It is assessed that the implementation of mitigation measures, there is no likelihood of any significant cumulative impacts on water quality.

It is assessed that there is no likelihood of transboundary effects on habitats and flora within Northern Ireland.

Grid Connection Options

The majority of habitats noted along the grid connection routes (3 no. options) are considered to be similar to those of the proposed wind farm site. These habitats mostly consist of improved agricultural grassland, hedgerows and treelines, which are typical habitats in the Monaghan and Cavan countryside. However, direct habitat loss will arise as a result of the construction of either of the three grid connection route options. Direct habitat loss will only occur however at the footprint of each polest and substation location. Following reinstatement of underground line trenches, habitats will regenerate. It is considered that the area of habitat loss is negligible.

However, habitat at the crossing of the River Bunnoe is considered to potentially be of more importance to wildlife. However, again the direct loss of habitat would indeed be negligible. Therefore, the likely impact of habitat loss caused the construction of the grid connection route options are evaluated as being imperceptible negative in the local context. It is also noted that grid connection Option G3 would have the least impact on habitats in the study area.

Grid connection Options G1 and G2 cross some watercourses along their routes. Of particular note, Option G1 crosses the River Finn [Monaghan] and Option G2 crosses the River Bunnoe and the River Annalee. These are larger watercourses located along the routes. The proposed development has the potential to result in some direct riparian disturbance during the construction of the grid connection routes in proximity to the above watercourses. However, no polesets will be located within the riparian area of any of the watercourses. No instream works will be required for these overhead lines. Mitigation is provided to ensure any polesets are located a distance from these waterbodies. In the absence of mitigation impacts on water quality/aquatic habitats arising from the proposed development are evaluated as being slight negative in the local context.

There is the potential for indirect water quality/aquatic habitat impacts to arise as a result of the construction of grid connection Options G1 and G2 as they cross some watercourses. The River Bunnoe, the River Annalee and the River Finn [Monaghan] all flow into the River Erne and therefore a pathway exists for potential indirect impacts. Siltation impacts may arise from the construction of polesets adjacent to these waterbodies and machinery and materials required for the works could result in accidental spillages of oil / fuel / concrete / cement. Such impacts could indirectly affect fish in other watercourses downstream by impacting levels of oxygen present, and food sources. However, again no instream works would be required for the overhead lines. Mitigation is provided to ensure the polesets are located at a distance from waterbodies and water quality protection measures will be employed on site. In the absence of mitigation indirect impacts on water quality arising from the proposed development are evaluated as being slight negative in the local context.

Any of the grid connection route options could result in the introduction and / or spread of non-native invasive species. This may occur through the utilisation of machinery which has previously been operating on a contaminated site. Although no non-native invasive species were identified during the surveys, invasive species can be easily introduced to the area. The importation and spread of non-native invasive species, in the absence of mitigation, is assessed as a significant negative impact at the local level in the long to permanent period.

Potential cumulative impacts on habitats and flora during the construction phase of the grid connection route options comprise water quality impacts in combination with existing water quality pressures in the wider study area such as agricultural practises. Siltation, run-off and accidental spillages of oil / fuel / concrete or cement, as described above, could lead to in-combination impacts on water quality. It is assessed that with the implementation of mitigation measures any cumulative impacts on water quality would likely be imperceptible negative in the local context.

It is assessed that there is no likelihood of transboundary effects on habitats and flora within Northern Ireland.

5.4.3.2 Operational Phase

Wind Farm

There are no ongoing operational impacts likely to affect habitats and flora.

No indirect impacts affecting habitats or flora are identified as likely to arise during the operational phase of the proposed wind farm.

No cumulative affecting habitats or flora are identified as likely to arise during the operational phase of the proposed wind farm.

It is assessed that there is no likelihood of transboundary effects on habitats and flora within Northern Ireland.

Grid Connection Options

There are no ongoing operational impacts likely to affect habitats and flora.

No indirect impacts affecting habitats or flora are identified as likely to arise during the operational phase.

No cumulative impacts affecting habitats or flora are identified to arise during the operational phase.

It is assessed that there is no likelihood of transboundary effects on habitats and flora within Northern Ireland.

5.4.4 Fauna

5.4.4.1 Non-volant mammals

Construction Phase

Wind Farm

While no active mammal dwellings were identified on the proposed wind farm site during field investigations, Hares do breed on the site. Pine Martens on the site appear to be using the farm buildings in the study area but no Pine Marten dwellings were found on the site itself. The trail camera surveys also confirmed the presence of Fallow Deer and foxes (not protected) which use the site.

Impacts affecting the non-volant mammals listed above will include the direct loss of habitat and the fragmentation of existing habitat due to turbine, hard stand and access track construction in conjunction with the increased activity on the site leading to disturbance and noise impacts. The footprint of the proposed wind farm site including access roads will affect hedgerows, treelines, and woodland habitats and therefore would result in a slight negative impact on habitat connectivity for mammal species. These impacts would be limited to the local context where habitual commuting routes along hedgerows may be affected. The potential impact on hares, pine martens, foxes and fallow deer are assessed as being slight negative. The mobility of these species and the availability of suitable habitat, including forage and cover within the vicinity of the proposed wind farm site, reduces the potential impact of the proposed development.

It is considered that the only potential indirect impacts during the construction phase would constitute water quality impacts on the streams within the proposed development site and downstream waters. As the non-volant mammals recorded during the current surveys are not dependent on water quality, there is no likelihood of significant impacts to arising regarding water quality on the mammal population within the site. It is recognised, however, that other mammal species, such as Otter, are present downstream in larger watercourses such as the River Bunnoe and the River Annalee. Potential water quality impacts arising from siltation, resulting from excavations adjacent to watercourses and / or accidental spillages of fuel / oil / cement / concrete during the works could indirectly affect downstream waters and therefore potentially Otters food sources. However due to the small size of the streams on the site and their small carrying capacity, no significant impacts would be likely to arise in the absence of mitigation. Water quality mitigation is provided to ensure the protection of local water quality. Indirect impacts affecting non-volant mammals during the construction phase are evaluated as being imperceptible negative in the local context.

The proposed development in combination with any other developments in the study area is not considered to have the potential to result in cumulative impacts on non-volant mammals during the construction phase. Potential construction phase impacts have been identified as disturbance, water quality and habitat loss / fragmentation, as above. These direct and indirect impacts were assessed as being slight negative and imperceptible negative in the local context. The proposed development site is generally located on habitats of low ecological value that are common in the Co. Monaghan countryside. It is considered that no likely significant cumulative impacts would arise in relation to disturbance, water quality or habitat loss. Cumulative impacts on non-volant mammals during the construction phase is

evaluated as being imperceptible negative in the local context.

It is assessed that there is no likelihood of transboundary effects on non-volant mammals within Northern Ireland.

Grid Connection Options

It is noted that direct impacts on non-volant mammals during the construction phase of any of the three grid connection route options would constitute disturbance, habitat loss / fragmentation and water quality. However, it is noted that the direct footprint of each of the grid connection route options is very minor, especially in contrast to the proposed wind farm site. Habitat loss will only occur at the direct footprint of the polesets and substations. This is not considered to have the potential to lead to any significant adverse impacts on non-volant mammals. Disturbance impacts would also be minimal and will only occur in the short time while the polesets and wires would be installed. Additionally, there is a very low likelihood of water quality impacts arising; no instream works are required and the polesets will be set back from riparian areas of any of the watercourses it will cross. However, despite this, pre-construction mammal surveys will be undertaken at select locations along the chosen grid connection route option to ensure no active mammal dwellings are present prior to construction. Direct impacts on non-volant mammals during the construction phase are evaluated as being imperceptible negative.

The only potential indirect impact identified during the construction phase is the potential for water quality pollution. In particular, in areas where the grid connection routes cross larger watercourses, such as the River Finn [Monaghan], the River Bunnoe and the River Annalee. However, is noted that no instream works will be required for any the grid connection route options, and the polesets will be set back from riparian areas. It is considered that even in the absence of mitigation there is no likelihood of significant water quality impacts. Water quality mitigation is provided for the protection of local water quality. Indirect impacts on non-volant mammals during the construction phase are evaluated as being imperceptible negative.

The proposed grid connection route in combination with any other developments in the study area is not considered to have the potential to result in cumulative impacts on non-volant mammals during the construction phase. Potential construction phase impacts have been identified as disturbance, water quality and habitat loss / fragmentation, as above. These direct and indirect impacts were assessed as being imperceptible negative in the local context. The proposed grid connection routes are generally located on habitats of low ecological value that are common in the Monaghan and Cavan countryside. It is considered that no significant cumulative impacts would arise in relation to disturbance, water quality or habitat loss. Cumulative impacts on non-volant mammals during the construction phase is evaluated as being imperceptible negative in the local context.

It is assessed that there is no likelihood of transboundary effects on non-volant mammals within Northern Ireland.

Operational Phase

Wind Farm

Due to the nature of the proposed development during its operational phase, no direct impacts on non-volant mammals will arise.

Due to the nature of the proposed development during its operational phase, no indirect impacts on non-volant mammals will arise

As there would be no direct or indirect operational phase impacts affecting non-volant mammals, it is considered that there would be no likelihood of cumulative impacts arising during the operational phase in-combination with other developments in the study area.

It is assessed that there is no likelihood of transboundary effects on non-volant mammals within Northern Ireland.

Grid Connection

Due to the nature of the proposed grid connection options during their operational phase, no direct impacts on non-volant mammals will arise.

Due to the nature of the proposed grid connection options during their operational phase, no indirect impacts on non-volant mammals will arise.

As there would be no direct or indirect operational phase impacts affecting non-volant mammals, it is considered that there would be no likelihood of cumulative impacts arising during the operational phase in-combination with other developments in the study area.

It is assessed that there is no likelihood of transboundary effects on non-volant mammals within Northern Ireland.

5.4.4.2 Bats

Construction Phase

Wind Farm

The majority of bats recorded during the surveys were common species that are found in large numbers all over Ireland: Common pipistrelle and Soprano pipistrelle. Leisler's bats were also recorded during the current surveys but in lower numbers. *Myotis* sp. and Brown long-eared bat were also recorded as present. It is considered that the impacts that may affect bats during the construction phase are minor. These potential impacts include disturbance and habitat loss / fragmentation. No bat roosts were identified on the site during the surveys. Disturbance impacts will arise during the construction phase due to the increase of machinery and human activity on the site. These impacts would be likely to occur during the daytime hours and would be unlikely to adversely affect bats. However, some minor habitat loss and fragmentation impacts will occur during the construction phase. During site clearance and earthworks sections of hedgerows and treelines will be removed resulting in some loss of foraging and commuting habitat. It is considered that these habitats are common throughout the local area and throughout Co. Monaghan and the loss of these habitats would not be significant. Again, it is noted the majority of species recorded are common and would readily utilise adjacent habitats outside the proposed development site for foraging and commuting purposes. Direct impacts on bats during the construction phase are evaluated as being imperceptible negative.

The only pathway for indirect impacts on bats during the construction phase is in relation to the ground clearance works. Site clearance and earthworks will result in the removal of vegetation, and possibly pollution slight deterioration of water quality in the small streams on the site. This could potentially result in decreased insect production which would indirectly affect food sources for bats in the study area. The presence of vegetation, hedgerows and treelines and indeed watercourses aid the production of insects for bats. Again, it is noted that the majority of species recorded on the site are common species that would readily utilise adjacent habitats outside the proposed development site for foraging. The proposed development site was

also not used by these bats in high numbers. Indirect impacts on bats during the construction phase are evaluated as being imperceptible negative.

Potential cumulative impacts on bats concern in-combination impacts of disturbance, habitat loss and a decrease in insect / food production. It is considered that as the direct and indirect impacts during the construction phase are evaluated as being imperceptible negative, there is no likelihood of significant cumulative impacts arising. The majority of bats recorded on the site were common species that are widespread and would readily use adjacent agricultural habitats for foraging and commuting. There are no habitats on the site that would be of particular importance to bats. Cumulative impacts during the construction phase are evaluated as being imperceptible negative.

It is assessed that there is no likelihood of transboundary effects on bats within Northern Ireland. It is noted that a number of single turbine/micro generation sites are located within County Fermanagh; however, it is assessed that there is no likelihood of cumulative transboundary effects on bat populations.

Grid Connection

It is noted that any mature trees along the grid connection route options may be potentially used as bat roosts during the active bat season. However, no particular trees with high bat potential are affected.

No buildings were identified within the footprint of any of the grid connection route options and therefore no building roosts were identified. Treelines and hedgerow habitats along the grid connection route options may be subject to partial removal (trimming) and disturbance during the construction phase which would result in a direct loss of these foraging habitats for bats. Habitat loss however would be minor, within the direct footprint of the polesets, and the polesets will be located away from linear habitats such as treelines and hedgerows as much as possible. Direct disturbance impacts may also arise resulting from increased noise and human activity. It is considered that the majority of habitats along each of the grid connection route options are habitats that are typical of the Monaghan and Cavan countryside and all over Ireland. Provided mitigation is followed, in particular the pre-construction surveys, direct impacts on bats during the construction phase of the grid connection routes are evaluated as being imperceptible negative.

Potential indirect impacts may arise from displacement due to deterioration of suitable habitat or resulting from increased human activities. However, as discussed above, the majority of habitats along each of the grid connection route options are habitats that are typical of the Monaghan and Cavan countryside. It is considered that these habitats are readily available elsewhere and adjacent to the grid connection route options. Again, it is noted that any mature trees within the footprint of the chosen route will be checked in advance for the presence of bats. Provided mitigation is followed, indirect impacts on bats during the construction phase of the grid connection routes are evaluated as being imperceptible negative.

Potential cumulative impacts on bats concern in-combination impacts of disturbance, habitat loss and a decrease in insect / food production. It is considered that as the direct and indirect impacts during the construction phase are evaluated as being imperceptible negative, there is no likelihood of significant cumulative impacts arising. There are no habitats on the site that would be of particular importance to bats. Cumulative impacts during the construction phase are evaluated as being imperceptible negative.

It is assessed that there is no likelihood of transboundary effects on bats within

Northern Ireland. It is noted that a number of single turbine/micro generation sites are located within County Fermanagh; however, it is assessed that there is no likelihood of cumulative transboundary effects on bat populations.

Operational Phase

Wind Farm

The majority of bats recorded on the proposed wind farm site were common species that are present in large numbers all over Ireland: Common pipistrelle and Soprano pipistrelle. Leisler's bats were also recorded during the current surveys but in lower numbers. *Myotis* sp. and Brown long-eared bat were also recorded as present. Bats can be directly impacted by wind farm developments in a number of ways during the operational phase, such as collision, habitat loss / fragmentation and barotrauma effects.

Baerwald et al (2008) showed that bats do not have to make contact with the turbine to be killed as the change in atmospheric pressure resulting from the rotating rotor causes bats' lungs to haemorrhage leading to the animals' death. Baerwald et al (2008) also found that 90% of bat fatalities associated with American wind farms involved internal haemorrhaging consistent with barotrauma, and that direct contact with turbine blades only accounted for about half of the fatalities. It is noted that barotrauma effects would only occur very near the turbine blades and would not be a factor during times of low wind speed.

Pipistrelle species are unlikely to collide with turbines as they forage close to hedgerows, treelines and other features that harbour insects. Pipistrelle bats typically fly 5-10m above ground level (Russ, 1999). This level is well below the tips of rotors (20-25m above ground) so at these flight heights, common and soprano pipistrelle bats would not be affected by moving rotors. However, they are also noted in Perrow, M. R. (2017) as being a species that are at risk from turbine collisions, with common pipistrelles and soprano pipistrelles accounting for a total of 20.7% and 4% of all collisions with wind turbines in Europe. It is noted that this is probably because these two species are among the most common in Europe and therefore higher numbers would collide with wind turbines. Nonetheless, it is noted that pipistrelles are at risk from wind turbine collisions (Perrow, M. R., 2017). The most recent SNH guidance also notes that common pipistrelle and soprano pipistrelles are at high risk of collision with wind turbines (SNH, 2019). Leisler's are also known to be at risk from wind turbines, noted as being of high risk in the recent SNH (2019) guidelines, as they are a high-flying species and fly across open landscapes. However, Leisler's were not recorded in significant numbers on the site.

The potential for bat fatalities exists for the proposed wind farm site involving direct collision and barotrauma. The most recent SNH guidance for bats and wind farms note that providing buffer distances from treelines or hedgerows, as well as providing a reduced rotation speed for the wind turbines while idling can significantly reduce the potential for bat fatalities, by up to 50% (SNH, 2019). It is noted again that Common pipistrelles and Soprano pipistrelles are common all over Ireland and are species that are very adaptable to changes in habitat and landscapes as they are opportunistic. Numbers recorded on the site were low.

Potential indirect impacts on bats concern displacement due to human disturbance or the presence of the wind farm development. Again, it is noted that the majority of species recorded on the site are common species that are adaptable and would readily use the adjacent agricultural habitats outside of the site for foraging and commuting. None of the habitats on the site were noted to be of particular

importance to bats. It is considered that these bats would indeed be displaced but would easily utilise adjacent local habitats (likely within the same fields) that are common in the immediate vicinity. The indirect impact of displacement on bats during the operational phase is evaluated as being imperceptible negative in the local context.

It is considered that the only likely cumulative impact on bats would be the fatality / collision risk impact. There are no other known wind farm developments in the vicinity of the proposed development that could add cumulatively to this impact. No other structures in the area have been identified as having the potential for collisions regarding bats. Cumulative impacts during the operational phase are evaluated as being imperceptible negative.

It is assessed that there is no likelihood of transboundary effects on bats within Northern Ireland. It is noted that a number of single turbine/micro generation sites are located within County Fermanagh; however, it is assessed that there is no likelihood of cumulative transboundary effects on bat populations.

Operational Phase

Grid Connection

Due to the nature of the grid connection options during their operational phase, no direct impacts on bats will arise.

Due to the nature of the grid connection options during their operational phase, no indirect impacts on bats will arise.

As there would be no direct or indirect operational phase impacts affecting bats for the grid connection options, it is considered that there would be no likelihood of cumulative impacts arising during the operational phase in-combination with other developments in the study area.

It is assessed that there is no likelihood of transboundary effects on bats within Northern Ireland. It is noted that a number of single turbine/micro generation sites are located within County Fermanagh; however, it is assessed that there is no likelihood of cumulative transboundary effects on bat populations.

5.4.4.3 Birds

Construction Phase

Wind Farm

Recent scientific studies have shown that greater impacts on bird populations occur during the construction, rather than subsequent operation, of wind farms. This is presented in the paper by Pearce-Higgins et al. (2012) '*Greater impacts of wind farms on bird populations during construction than subsequent operation: results of a multi-site and multi-species analysis*'. The proposed wind farm site is not located on or adjacent to any SPA. The nearest designated area of interest to birds is the Upper Lough Erne SPA (UK9020071) which is located 5.4km west of the proposed wind farm site. The Lough Oughter Complex SPA is located 16.4km South-west of the proposed wind farm site. These SPAs are designated for Whooper Swans.

The Slieve Beagh-Mullaghfad-Lisnaskea SPA is located 13.5km North of the proposed wind farm site and the Slieve Beagh SPA is located 17.5km North of the proposed wind farm site. These SPAs are designated for Hen Harrier. As evidenced from the detailed multi-annual bird surveys, Hen Harriers would never be found on the proposed development site and could therefore not be affected. Similarly, there is no habitat for, nor records of, hen harrier along any of the proposed grid connection

options. Whooper Swans would never use the site for foraging and have only been recorded crossing the development site on 1 no. occasion, at height. Whooper Swan have only been recorded in the general study area in relatively low numbers. No bird of special conservation interest has ever been recorded on the proposed development site. The site is not used by wintering birds for foraging or roosting; with occasional records of very small flocks of Golden Plover recorded near the site only.

Potential indirect impacts on birds would be related to displacement impacts, as discussed above.

Potential cumulative impacts on birds concern in-combination impacts of disturbance and habitat loss. It is considered that as the direct and indirect impacts during the construction phase are evaluated as being imperceptible negative, there is no likelihood of significant cumulative impacts arising. Cumulative impacts during the construction phase are evaluated as being not significant.

It is assessed that there is no likelihood of transboundary effects on birds within Northern Ireland.

Grid Connection

There may be a requirement to remove/trim trees and hedgerows during the construction of any of the grid connection route options. This would be required to obtain access to install the polesets and also install the wires. None of the grid connection options pass through any areas of particular sensitivity to bird populations and this will reduce the magnitude of the impact. There are no important wintering bird areas where birds could be disturbed during construction works. Although the works would affect a relatively long linear area (Options G1 and G2), the works in any one particular area would be short in duration and insignificant in magnitude. Any hedgerows removed would also be replaced.

The indirect effects on birds of the grid connection options are similar to those outlined for direct impacts above.

The cumulative effects on birds of the grid connection options are similar to those outlined for direct impacts above and could include some displacement due to construction disturbance. There are no other projects or developments in the study area which could result in adverse impacts on bird populations.

It is assessed that there is no likelihood of transboundary effects on birds within Northern Ireland.

Operational Phase

Wind Farm

The operational phase of a wind farm development has the potential to give rise to collisions, disturbance and displacement of birds, especially migratory wintering birds. Bird collisions and mortalities could also arise from electrocution, should overhead power lines (associated with grid connections) be located along flight paths. The risk of collision is reduced considerably when birds are absent or present in small numbers only. The proposed development site does not contain any important bird habitats and very few bird species, other than passerines and corvids, use the site. Likewise, the site is not on regular flyway and almost no events of birds flying over the site have been observed during three years of bird surveys. On the very rare occasion (1 no. occasion) when Whooper Swans have passed the site, they were flying high and above rotor sweep height. These events are associated with the swans moving from their staging areas to their main wintering areas. These are very occasional events and swans could potentially cross any part of Ireland when flying

high and making these movements. There are no staging sites or wintering sites for Whooper Swans on, or in the immediate vicinity, of the proposed wind farm site (or along any of the proposed grid connection route options). Therefore, there is no reasonable likelihood of Whooper Swan collisions occurring. It is assessed as no potential.

Ongoing scientific and commercial research have identified that although a range of bird species do occasionally collide with wind turbines; overall, collision events are uncommon or rare (Langston and Pullan 2003, Drewitt and Langston 2006) and in fact, the majority of birds actively avoid flying into moving turbines.

In relation to other bird species on the site, Pearse-Higgins et al. (2009) states that there is little evidence of any effect of wind turbine proximity on passerines. Although direct reductions in breeding birds were observed within a 500m buffer zone (Pearse-Higgins et al., 2009) this is not assessed as likely to result in a significant impact for the proposed wind farm site as it is a sub-optimal site for birds, with the site dominated by improved agricultural grassland.

Occasional small flocks of Golden Plover were seen near the proposed development site during the three years of winter bird surveys. However, this species would never breed on the site and will not be affected. Fielding and Haworth (2010) study showed that Golden Plover are not susceptible to operational wind farms. In addition, the Charadriiformes/waders, a group of birds to which Golden Plover belongs is not considered particularly sensitive to collision with wind turbines, as concluded by Langston and Pullan (2004).

The displacement of birds from areas within and surrounding wind farms due to visual intrusion and disturbance can amount effectively to habitat loss. Displacement can also occur during the operational phases of wind farms and may be caused by the presence of the turbines themselves through visual, noise and vibration impacts, or as a result of vehicle and personnel movements related to site maintenance. Potential disturbances and displacement to birds during the operational phase of the proposed development would be significantly less than during the construction phase and would be considered insignificant in relation to existing local activities. Disturbance problems are most likely to occur where there are important waterfowl populations and would be of most significance where birds are disturbed from a scarce resource. Neither important bird populations or scare resources for birds occur on or in the immediate vicinity of the proposed development site. Therefore, it is concluded that any disturbance or displacement effect would not be significant.

The effect of birds altering their migration flyways or local flight paths to avoid a wind farm is also a form of displacement. This effect is of concern because of the possibility of increased energy expenditure when birds have to fly further, as a result of avoiding a large array of turbines, and the potential disruption of linkages between distant feeding, roosting, and breeding areas otherwise unaffected by the wind farm. This impact is more likely to be of concern in offshore wind farms. The current proposed development is not located on any known migration route for birds and there is no flyway over the site. Therefore, there is no likelihood of this impact occurring.

Buzzards were by far the most common raptor recorded during the three years of bird surveys. They bred near the site and were recorded on at least one occasion during a majority of the vantage point watches, especially from VP2. They were observed soaring over the site, occasionally hunting and foraging, and also perching on trees. They were not recorded breeding on the actual site – but did so nearby. They are susceptible to collisions with the wind turbines; however, Buzzards

are a green listed species in Ireland and are not of conservation concern.

Buzzards are vulnerable to collisions due to their typical flight behaviour, where their flight path is more likely to overlap with the sweep area of the turbine rotor blades (Furness *et al*. 2013). Indeed, most of the time they were recorded on the proposed wind farm site they were soaring – rather than hunting. Grunkorn *et al*. (2017) predicted a decline in Common Buzzard population in Germany associated with wind turbine collision fatalities. This study acknowledged that protection of Buzzards is not always solvable and suggested that mitigation such as improving compensatory habitat and food availability could be undertaken. Higher levels of flight intensity and higher densities (e.g. due to seasonal concentrations of species) is correlated to turbine collisions and bird fatalities on wind farms. The proposed wind farm site does not provide optimal foraging habitat for Buzzards at present

Kestrels only very occasionally use the site for hunting and foraging and have not been recorded nesting on the site. Kestrels are also vulnerable to turbine collisions due to their hovering behaviour while hunting. The proposed wind farm site does not provide optimal foraging habitat for Kestrels. Kestrels are amber listed – but are a widespread and common species that are currently increasing in numbers.

There were occasional sightings of Sparrowhawks hunting on the site. There was a nest to the west of the site in 2019 and occasional hunting forays were recorded on the western side of the site during this survey and around proposed turbines T3 and T4. However, Sparrowhawks fly relatively low and are not at risk of turbine collision. Overall activity of this species on the site was also relatively low. Sparrowhawks are green listed in Ireland and not of conservation concern.

Merlin was only recorded on occasions – in winter – and this was a young bird passing through the area. The proposed wind farm site is not suitable Merlin habitat and this one observation would not raise any concerns in relation to the proposed development. Similarly, the Red Kite that was observed on the site was just a once-off random observation of a young bird passing though.

It is assessed that there is no likelihood of transboundary effects on birds within Northern Ireland. It is noted that a number of single turbine/micro generation sites are located within County Fermanagh; however, it is assessed that there is no likelihood of cumulative transboundary effects on bird populations.

Grid Connection

Direct impacts would include the potential for birds to collide with the wires. However, none of the routes pass though sensitive areas or through flyways. Nonetheless it is proposed to provide bird diverters in certain areas along Options G1 and G2 to mitigate this potential impact.

The indirect effects of the operation of the grid connection route on birds are similar to those outlined in the section for direct impacts above.

There are no other developments in the vicinity of the proposed development which are assessed as likely to result in cumulative effects on birds.

It is assessed that there is no likelihood of transboundary effects on birds within Northern Ireland. It is noted that a number of single turbine/micro generation sites are located within County Fermanagh; however, it is assessed that there is no likelihood of cumulative transboundary effects on bird populations.

5.4.4.4 Aquatic Ecology

Construction Phase

Wind Farm

The potential direct impacts on aquatic ecology during the construction phase are primarily related to water quality impacts. Site excavations such as foundations for proposed turbines and excavations for the associated hardstands can result in sediment input to the small streams draining the proposed development site. It is noted again that no fish were recorded in these small streams. The closest turbine to a watercourse is T5, which is located c. 130m from the Dunnaluck Stream. Additionally, the access tracks for the proposed wind farm site cross some of the watercourses on the site. The Dunnaluck Stream is crossed three times by access tracks, the Closdaw Stream is crossed once and the access tracks from the R189 to T7 runs alongside the Newbliss stream for c. 600m as well as crossing over it. These are the areas in which there is a high risk for water quality impacts to arise.

Suspended solids and run off from these areas may enter these watercourses and adversely affect water quality. Any operations which resulting the loss of sediment will also result in increased nutrients being released from the soil.

Machinery on the site can also result in accidental spillages of oil / fuel / concrete / cement which can adversely impact water quality. The potential impacts on water quality affecting aquatic ecological interests, in this case macroinvertebrates, would be slight negative at most as these streams are of low ecological value. It is important to note however that with effective mitigation, water quality impacts can be reduced to imperceptible negative at most in the local context.

Potential indirect impacts also concern water quality as mentioned above. These water quality impacts can also travel downstream to other receiving waters such as the River Bunnoe. However, if mitigation measures proposed are implemented effectively, there will be no impact to downstream receiving waters. Indirect impacts on water quality are evaluated as being imperceptible negative in the local context.

Of particular risk to watercourses would be the introduction of riparian invasive plants such as Japanese Knotweed *Fallopia japonica*, Himalayan balsam *Impatiens glandulifera*, or Rhododendron *Rhododendron ponticum* which can block light to fisheries channels reducing the carrying capacity for fish. Again, no fish were recorded on the streams on the site, but they are present downstream in the River Bunnoe. Biosecurity mitigation will be sufficient to ensure no non-native invasive species are introduced to the site. With the implementation of mitigation measures, indirect impacts concerning invasive species are evaluated as being imperceptible negative in the local context.

Potential cumulative impacts during the construction phase would concern in combination impacts with existing agricultural pressures in the area affecting aquatic ecology. In particular, the EPA note agricultural pressures as having an impact on the downstream River Bunnoe. Indeed, the streams on the site are not considered to be of good water quality due to existing background pressures. However, with effective water quality mitigation, it is considered that there would be no additional impact on water quality in the study area and therefore would not constitute a cumulative impact. Cumulative impacts during the construction phase are evaluated as being imperceptible negative in the local context.

It is assessed that there is no potential for transboundary effects on aquatic ecology within Northern Ireland.

Grid Connection

Direct impacts on aquatic ecology during the construction phase primarily concern

water quality impacts. Where the polesets of the chosen grid connection route (Option G1 or G2; no polesets associated with Option G3) are located adjacent to watercourses and involve the cabling crossing over watercourses, there is the potential for impacts to arise. These impacts mainly concern suspended solids and run-off, as well as the potential for accidental spillages of concrete / cement or oil / fuel from any machinery required. However, the polesets will not be located adjacent to the riparian area of any of the watercourses. In the absence of mitigation impacts on water quality arising from the proposed grid connection route are evaluated as being slight negative in the local context.

Direct water quality impacts as described above can also be indirect impacts on water quality in downstream receiving waters. The River Bunnoe, the River Annalee and the River Finn [Monaghan] all flow into the River Erne and therefore a pathway exists for potential indirect impacts. Siltation impacts may arise from the construction of polesets adjacent to these waterbodies and machinery and materials required for the works could result in accidental spillages of oil / fuel / concrete / cement. Such impacts could indirectly affect fish in other watercourses downstream by impacting levels of oxygen present, and food sources. However, again no instream works would be required for the grid connection options. In the absence of mitigation indirect impacts on water quality arising from the proposed development are evaluated as being slight negative in the local context.

Each of the grid connection options could result in the introduction and / or spread of non-native invasive species which can be of particular risk to fisheries. This may occur through the utilisation of machinery which has previously been operating on a contaminated site. Although no non-native invasive species were identified during the field surveys, invasive species can be easily introduced to the area. The importation and spread of non-native invasive species, in the absence of mitigation, is assessed as a significant negative impact at the local level in the long to permanent period.

Potential cumulative impacts on aquatic ecology during the construction phase of the grid connection route options comprise water quality impacts in combination with existing water quality pressures in the wider study area such as agricultural practises. Siltation, run-off and accidental spillages of oil / fuel / concrete or cement as described above could lead to in-combination impacts on water quality. However, no instream works will be required. It is envisaged that with the implementation of mitigation measures any cumulative impacts on water quality would be imperceptible negative in the local context.

It is assessed that there is no likelihood of transboundary effects on aquatic ecology within Northern Ireland.

Operational Phase

Wind Farm

During the operational phase, there is the potential for impacts on water quality to arise in relation to chemicals and oils that may be required for the maintenance of the wind turbines or substations. In particular, at turbines and hardstand areas which are located in relative proximity to watercourses, such as T5. It is considered however given even the closest distance, c. 130m from T5, it is very unlikely that these chemicals / oils could reach the Dunnaluck Stream. Nonetheless, water quality mitigation will be provided that will ensure direct impacts on water quality which could affect aquatic ecology during the operational phase would be imperceptible negative in the local context.

The potential for direct impacts on water quality as noted above can also lead to indirect impacts on aquatic ecology by travelling to downstream watercourses such as the River Bunnoe. Again, the streams on the site are of a very small size and do not have sufficient carrying capacity to transfer large amounts of pollution downstream. Water quality mitigation is considered to be sufficient to ensure that indirect impacts on water quality during the operational phase would be imperceptible negative in the local context.

Potential cumulative impacts during the operational phase concern water quality impacts arising from chemicals and oils that may be required for the maintenance of the wind turbines that could enter the watercourses on site. It is known that there are existing background water quality issues affecting the watercourses on the site. The closest turbine to a watercourse is T5, which is located c. 130m from the Dunnaluck Stream. Water quality mitigation is sufficient to avoid direct and indirect impacts on receiving watercourses. It is considered therefore that there would be no cumulative impacts in-combination with agricultural practises in the area. Cumulative impacts during the operational phase are evaluated as being imperceptible negative in the local context.

It is assessed that there is no likelihood of transboundary effects on aquatic ecology within Northern Ireland.

Grid Connection

Due to the nature of the proposed grid connection options during the operational phase, no direct impacts on aquatic ecology will arise.

Due to the nature of the proposed grid connection options during the operational phase, no indirect impacts on aquatic ecology will arise.

No cumulative impacts affecting aquatic ecology are identified to arise during the operational phase of the proposed grid connection route.

It is assessed that there is no likelihood of transboundary effects on aquatic ecology within Northern Ireland.

5.4.4.5 Reptiles & Amphibians

Construction Phase

Wind Farm

No habitat for reptiles was identified on the proposed wind farm site and no previous records are present for the area. The potential for direct impacts to arise that could affect amphibians concern direct water quality, disturbance and habitat loss impacts. None of the proposed wind turbines are located on watercourses or drainage ditches and there are no lakes on the site. However, the proposed access tracks do cross some drainage ditches and small streams and mitigation will be implemented. Water quality impacts may arise through runoff from the construction of access roads and result in increased suspended solids. Accidental spillages of oil / fuel / cement / concrete may also reach these small streams and result in adverse water quality impacts that could affect amphibians. Increased human activity and machinery on the site will result in disturbance impacts during the construction phase. Habitat loss will also occur at the locations where the access tracks cross watercourses or drainage ditches. It is noted that the drainage ditches and watercourses on the site are not considered to be ideal amphibian habitat. Direct impacts on amphibians during the construction phase of the proposed wind farm are evaluated as being imperceptible negative in the local context.

Indirect impacts on amphibians mainly concern water quality impacts, which can travel to downstream watercourses off the proposed development site. Water quality impacts such as suspended solids run–off and accidental spillages of oil / fuel / concrete / cement at the access track crossing locations can be transported downstream. However, the streams on the site are of such a small size and do not have ample carrying capacity to transport large volumes of pollutants downstream. Water quality mitigation measures are considered to be sufficient to ensure adverse water quality impacts are avoided. Indirect impacts on amphibians are evaluated as being imperceptible negative in the local context.

Potential cumulative impacts on amphibians concern water quality impacts in-combination with agricultural pressures in the area which are having an adverse effect on water quality. Siltation, run-off and accidental spillages of oil / fuel / concrete or cement as described above could lead to in-combination impacts on water quality. It is envisaged that with the implementation of mitigation measures any cumulative impacts on water quality would be imperceptible negative in the local context.

Grid Connection

No habitat for reptiles was identified on the proposed wind farm site and no previous records are present for the area. There are no ponds or lakes identified along the footprint of any the grid connection route options. Direct impacts on amphibians during the construction phase primarily concern water quality impacts. These impacts may arise where the polesets of the chosen grid connection route option are placed adjacent to watercourses, and where the route crosses wetland or fens habitats such as grid connection Option G2. These impacts mainly concern suspended solids and run-off, as well as the potential for accidental spillages of concrete / cement or oil / fuel from any machinery required. However, the polesets will not be located adjacent to the riparian area of any of the watercourses. Mitigation is provided to ensure any polesets are located at a distance from watercourses. In the absence of mitigation impacts on water quality affecting amphibians arising from the proposed grid connection route are evaluated as being slight negative in the local context.

Direct water quality impacts as described above can also be indirect impacts on water quality in downstream receiving waters. Any small sized watercourses and fens or wetland habitats adjacent to the receiving waters could also be indirectly affected by water quality impacts. In the absence of mitigation indirect impacts on water quality arising from the proposed development are evaluated as being slight negative in the local context.

Each of the grid connection route options could result in the introduction and / or spread of non-native invasive species which can be of particular risk to waterbodies and therefore amphibian habitats. This may occur through the utilisation of machinery which has previously been operating on a contaminated site. The importation and spread of non-native invasive species, in the absence of mitigation, is assessed as a significant negative impact at the local level in the long to permanent period. Mitigation is provided for the protection of biosecurity which would reduce this impact to imperceptible negative in the local context.

Potential cumulative impacts on amphibians during the construction phase of the grid connection route options comprise water quality impacts in combination with existing water quality pressures in the wider study area such as agricultural practises. Siltation, run-off and accidental spillages of oil / fuel / concrete or cement as described above could lead to in-combination impacts on water quality. However,

no instream works will be required. It is envisaged that with the implementation of mitigation measures any cumulative impacts on water quality would be imperceptible negative in the local context.

It is assessed that there is no likelihood of transboundary effects on reptiles and amphibians within Northern Ireland.

Operational Phase

Wind Farm

During the operational phase, there is the potential for impacts on water quality to arise in relation to chemicals and oils that may be required for the maintenance of the wind turbines. This could affect any amphibians present in the watercourses or drainage ditches. In particular, at turbines and hard stand areas are located proximate to watercourses, such as T5. It is considered however given even the closest distance, c. 130m from T5, it is very unlikely that these chemicals / oils could reach the Dunnaluck Stream. Nonetheless, water quality mitigation will be provided that would ensure direct impacts on water quality during the operational phase would be imperceptible negative in the local context.

The potential for direct impacts on water quality as noted above can also lead to indirect impacts by travelling to downstream watercourses such as the River Bunnoe. Again, the streams on the site are of a very small size and do not have sufficient carrying capacity to transfer large amounts of pollution downstream. As noted above in relation to direct impacts, water quality mitigation is considered to be more than sufficient to ensure that indirect impacts on water quality during the operational phase would be imperceptible negative in the local context.

Potential cumulative impacts during the operational phase concern water quality impacts arising from chemicals and oils that may be required for the maintenance of the wind turbines that could enter the watercourses on site and affect any amphibians using these habitats. It is known that there are existing background water quality issues affecting the watercourses on the site. It is considered that water quality mitigation is more than sufficient to avoid direct and indirect impacts on receiving watercourses or drainage ditches. It is considered therefore that there would be no cumulative impacts in-combination with agricultural practises in the area. Cumulative impacts during the operational phase are evaluated as being imperceptible negative in the local context.

It is assessed that there is no likelihood of transboundary effects on reptiles and amphibians within Northern Ireland.

Grid Connection

Due to the nature of the proposed grid connection options during the operational phase, no direct impacts on reptiles and amphibians will arise.

Due to the nature of the proposed grid connection options during the operational phase, no indirect impacts on reptiles and amphibians will arise.

No cumulative impacts affecting reptiles and amphibians are identified to arise during the operational phase of the proposed grid connection options.

It is assessed that there is no likelihood of transboundary effects on reptiles and amphibians within Northern Ireland.

5.4.4.6 Terrestrial Macroinvertebrates

Construction Phase

Wind Farm

Likely direct impacts on terrestrial macroinvertebrates mainly concern habitat loss / fragmentation and disturbance. It is noted that the majority of the wind farm site consists of agricultural grassland, hedgerow and treelines habitats and therefore the terrestrial macroinvertebrate community present is considered to be a generalised community typical of countryside habitats such as these. However, the poor fen and flush habitat located north of the arterial access track from the R189 to T7 is the most likely habitat in the area for protected terrestrial invertebrates. Only a small section of this habitat is present adjacent to the access road and this habitat is largely avoided. The habitat loss that may occur for these species would be minor however, as the access road is located just along the southern edge of this habitat and avoids the fen.

Potential indirect impacts could occur at the Poor Fen and Flush habitat near the access track. However, impacts can be minimised with mitigation. Similarly, indirect impacts could occur as a result of the introduction and dispersal of non-native invasive species. However, this impact can be avoided with suitable mitigation (biosecurity).

Potential cumulative impacts on terrestrial invertebrates concern habitat loss / fragmentation, disturbance and invasive species impacts in combination with existing activities in the study area such as agricultural practises. However, it is considered that cumulative impacts on terrestrial invertebrates would be imperceptible negative in the local context.

Grid Connection

Potential direct impacts on terrestrial invertebrates concern habitat loss / fragmentation and disturbance. It is noted that pre-construction surveys should be carried out at any wetland / fen habitat located along grid connection Option G2. Grid connection Options G1 and G3 do not cross over any good quality wetland or fens habitats. Nonetheless, any habitat loss would only occur within the direct footprint of the poleset for Option G2. Some disturbance impacts may arise during construction however it is considered that this would be minor and very short term. Direct impacts on terrestrial invertebrates are evaluated as being imperceptible negative.

Potential indirect impacts affecting terrestrial invertebrates concern disturbance impacts. It is noted that pre-construction surveys should be carried out at any wetland / fen habitat located along grid connection Option G2. Disturbance impacts would arise during the construction and placement of polesets at wetland / fen habitats along grid connection route Option G2. However, it is considered that this would be minor and very short term. Indirect impacts on terrestrial invertebrates are evaluated as being imperceptible negative.

Machinery working adjacent to wetland / fen habitats along grid connection Option G2 may introduce non-native invasive species to these areas and therefore result in indirect impacts on terrestrial invertebrate habitat. Mitigation is provided for the protection of biosecurity which would ensure this impact is imperceptible negative in the local context.

It is considered that with the small footprint of the polesets and mitigation proposed, cumulative impacts on terrestrial invertebrates would be imperceptible negative in the local context.

Operational Phase

Wind Farm

No effects are envisaged as a result of the operation of the proposed wind farm.

Grid Connection

Due to the nature of the proposed grid connection options during the operational phase, no direct impacts on terrestrial invertebrates will arise.

Due to the nature of the proposed grid connection options during the operational phase, no indirect impacts on terrestrial invertebrates will arise.

No cumulative impacts affecting terrestrial invertebrates are identified to arise during the operational phase of the proposed grid connection options.

5.5 Mitigation Measures & Monitoring

5.5.1 Designated Sites

5.5.1.1 Construction Phase

Mitigation measures for Natura 2000 sites are provided in the Natura Impact Statement for the proposed development prepared by Ecofact (2019b). These mitigation measures are considered sufficient to also avoid any potential construction phase impacts on the Lough Oughter and Associated Loughs pNHA and Ramsar site, as this is also a SAC. The mitigation measures included in the Natura Impact Statement are provided below for clarity.

As has been set out above, the protection of water quality is key to the avoidance of effects on both SPAs and SACs. While the Upper Lough Erne SPA and Lough Oughter Complex SPA are designated because of the presence of bird species, the quality of the aquatic habitat is central to their presence at these locations. While adverse effects are not expected or predicted to occur, the greatest likelihood of adverse water quality effects to arise is evaluated to be at its greatest during the construction phase due to the nature of construction activities. It should be noted that the protection of water quality has been a central consideration during the design process of the proposed development. This is evidenced by the fact that, except for watercourse crossings and a small section of the 110kV substation, a 50m buffer has been implemented around all watercourses.

In the first instance, water quality will be protected through best-practice construction phase management process. For example, excavation works will not be undertaken during times of prolonged or intense rainfall or if such weather events are forecast and no development works will be commenced at a specific location until such time as the drainage management system is in place, to the satisfaction of the Environmental Manager, for the relevant works. Secondly, the implementation and management of the drainage network will be subject to strict control measures set out in the Construction Environmental Management Plan (CEMP) and Surface Water Management Plan (SWMP). Outline plans, which will be developed further prior to the commencement of development to include precise details of water quality protection measures, have been prepared and have had regard to the '*Guidelines for the crossing of watercourses during the construction of national road schemes*' (NRA, 2008b) and '*Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters*' (IFI, 2016). The (detailed) SWMP will set out measures to avoid siltation, erosion, surface water run-off and accidental pollution events which all have the potential to adversely affect water quality within the site during the construction phase. The implementation of these measures will ensure that no surface water runoff is discharged to any watercourse without being fully treated in advance; thereby ensuring that no likely significant effects occur.

Timing of the proposed works will also take account of the fisheries constraints within the study area, where no works will be undertaken in the instream/near-stream environment during the salmonid close season (October–March annually), which also avoids the lamprey spawning season, as a precautionary measure.

All infrastructures shall have a setback 50m away from all streams within the site except for the locations of watercourse crossings. Any access tracks crossing watercourses will be constructed as clear span bridges (bottomless culverts), insofar as is possible to minimise works within/in the immediate vicinity of watercourses. Where access tracks pass close to watercourses, silt fencing will be used to protect the streams. A sealed silt fence will be placed at both sides of any crossing points and to a minimum of 10m upstream and downstream of each crossing at both sides of the access track. The maintenance and monitoring of such silt fences will be subject to an on-site water quality monitoring programme.

All access tracks, foundations and areas of hardstanding will be designed to minimise excavation on the site and to reduce the risk of sediment runoff. The drainage management system will be constructed to ensure that all 'dirty' water is intercepted and is fully attenuated by passing it through a treatment train to remove all sediment. Runoff, once treated, will be discharged via a buffered outfall to ensure that no erosion of soil occurs.

Temporary spoil heaps from the excavations for the turbine bases and trenches (where cables are to be buried) will be covered with geotextile and surrounded by silt fences to filter sediment from the surface water run-off from excavated material. Spoil will only be stockpiled on-site for a short duration and will be used for landscaping/reinstatement (e.g. berms) or will be disposed of in the dedicated spoil deposition areas. Berms will be surrounded by silt fencing until vegetation has been established in the following growing season.

Secure concrete washout areas will be designated on site and the washout of concrete trucks will only be permitted at these locations.

Standing water in the excavations at the turbine bases will contain an increased concentration of suspended solids. The excavations will be pumped into the drainage treatment train and all such water will be fully treated prior to discharge.

Portaloos will be used to provide toilet facilities for site personnel and all sanitary waste will be removed from site via a licensed waste disposal contractor and will not be discharged on site.

Any diesel or fuel oils stored on site will stored in the temporary construction compound and will be bunded to 110% of the capacity of the storage tank. The bund will also be roofed to avoid the ingress of rainwater. Such facilities will not be located near any drain or watercourse and will be placed as far away from any drainage feature as is possible. Design and installation of fuel tanks will be in accordance with best practice guidelines.

From the construction compound, fuel will be transported to works area by a 4x4 in a double skinned bowser with drip trays under a strict protocol and carried out by suitably trained personnel. The bowser/4x4 will be fully stocked with spill kits and absorbent material, with delivery personnel being fully trained to deal with any accidental spills. The bowser will be bunded appropriately for its carrying capacity.

It is considered that all of the measures listed above is sufficient to avoid any likely significant impacts regarding invasive species and water quality impacts

5.5.1.2 Operational Phase

The operational wind farm will have a negligible effect on local watercourses, as there are no further likely significant impacts of surface water run-off or watercourses within the site. During the operation phase, oils will be required for cooling the transformers giving rise to the potential for oil spills within the wind farm site. However, the transformers will be bunded to over 110 % of the volume of oil within them.

Weekly inspections of the erosion and sediment control measures on site will be required during the construction period, followed by fortnightly inspections until the risk of erosion or siltation has declined following the successful establishment of vegetation during the operational phase.

Access to the site will be limited using a gate to prevent illegal dumping on the site.

5.5.2 Habitats & Flora

5.5.2.1 Construction Phase

Land clearance and soil stripping within the footprint of the works will be limited to the works area, with habitats outside of the required works or access requirements left intact. Disturbed areas within the footprint of the works will be allowed to regenerate naturally or will be reseeded with native species. The required works footprint for the proposed development, including turbine locations, access roads etc will be clearly defined to reduce land take impacts affecting habitats during construction. Fencing of the works area during construction will minimise impacts on adjoining habitats. Specifically, where the access road from the R189 to T7 runs adjacent to the Newbliss Stream, berms will be created during the construction phase to ensure run-off from this access road does not enter this watercourse. Silt fences, and other water treatment measures will also be provided in this area to prevent run-off to the Newbliss stream.

Replanting for loss of hedgerow habitats will ensure that there is no net loss of these locally important habitats within the study area. Any planting to be carried out will utilise native species only and will take cognisance of the existing habitat structure within the local landscape. It is noted that the replanting will be undertaken to maintain the wildlife value of the site – rather than improve it for species such as Buzzards and Kestrels (see **Section 5.5.3.3**).

In order to ensure the biosecurity of the site, a range of best practice construction measures will be implemented throughout construction. These measures will be incorporated into an Invasive Species Management Plan which will be prepared and incorporated into the CEMP, prior to the commencement of development. The Invasive Species Management Plan will incorporate measures set out in *'The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads'* by NRA (2010)."

Additionally, excess material arising from excavations for the polesets (associated with grid connection Options G1 and G2) will be disposed of through a registered waste company and will not be used for infilling any areas other than those areas excavated for the proposed development. There will be no permanent stockpiles in situ following the completion of construction. Polesets will be set back from riparian areas near any watercourse crossings. No instream works will be undertaken as part of grid connection works. Relevant guidelines listed above will ensure care is taken when working alongside watercourses. Any temporary storage of excavated material will be in assigned areas, in habitats of low ecological value. Upon completion of the works at each section of the proposed development, there will be a site cleanup where the site will be returned to its pre-construction condition or better.

5.5.2.2 Operational Phase

No further habitat or flora mitigation is required during the operational phase of the proposed development.

5.5.3 Fauna

5.5.3.1 Non-volant Mammals

Construction Phase

Temporary fencing will be erected around the required site works to delineate the works area and to minimise the likelihood for disturbance impacts outside of the works area. As no mammal dwellings were identified within the impact area of the proposed development, there is no specific mitigation required for the protection of mammals in relation to relocation / construction of artificial dwellings. However, it is noted that pre-construction surveys should be undertaken on the site to ensure no active mammal dwellings have been created prior to construction.

The retention of areas of habitats and linear features such as treelines and hedgerows will reduce impacts on many common mammal species within the site. It is recommended that hedgerow removal, if required will be carried out slowly to ensure that any mammals present can escape, such as hares.

For the protection of mammals, works will only be undertaken during daylight hours only to avoid disturbance impacts.

Operational Phase

As the operational phase of the proposed development will not result in impacts on fauna, no mitigation measures are required.

5.5.3.2 Bats

Construction Phase

Bats are most active, particularly in relation to foraging, at night-time and therefore construction works will only be undertaken during daylight hours with no works being carried out between dusk and dawn (except in exceptional circumstances). Furthermore, there will be no illumination of hedgerows / treelines / scrub habitats as these are likely to be used by commuting / foraging bats and any such illumination may interrupt normal behaviour. Any mature trees required to be felled will be checked in advance for usage by bats by a suitably qualified bat ecologist. The NRA (2006) '*Guidelines for the Treatment of Bats during the construction of road* schemes' will also be followed as relevant.

Regarding grid connection Options G1 and G2, polesets will be set back from hedgerows and treelines as much as possible so as to reduce the likely impact of foraging habitat loss during the construction phase.

Operational Phase

The most recent SNH guidance for bats and wind farms note that providing buffer distances from treelines or hedgerows, as well as providing a reduced rotation speed for the wind turbines while idling can significantly reduce the likelihood of bat fatalities, by up to 50% (SNH, 2019).

It is recommended a distance of 50m between turbine blade tip and nearest key habitat features, in this case treelines and hedgerows (no turbines are within 50m of a watercourse) is recommended as a standard mitigation measures for all bat species occurring at proposed wind farms. A formula is used to ensure that a

distance of 50m or more can be ensured between the blade tip and a potential feeding features at the nearest point : √[(50 + bl)2 - (hh - fh)2] where bl = blade length, hh = hub height, fh = feature height (SNH, 2019). **Figure 5.7** below provides an example of the formula given above, to ensure a minimum distance of 50m from blade tip to habitat feature. Where required, hedgerows and treelines will be removed to ensure this minimum distance is provided. Any hedgerow which is removed will be replanted elsewhere within the site but will be carefully located (locations to be selected by the ECoW) so as not to attract commuting or foraging bats towards turbine locations.

There is evidence that bat casualties at wind farms is reduced by pitching the blades out of wind ('feathering') to reduce rotation speeds below 2rpm while idling. The reduction in speed resulting from feathering compared with normal idling may reduce bat fatality rates by up to 50%. As this option does not result in any loss of output, as best practise, it is recommended wherever it is practically possible. It can be applied at any sites with a blade pitch control system which can be automated using SCADA data (SNH, 2019). It is considered that with the implementation of buffer distances and reducing the rotation speed while turbines are idle, the risk of mortality of the common bat species on the site is significantly reduced.

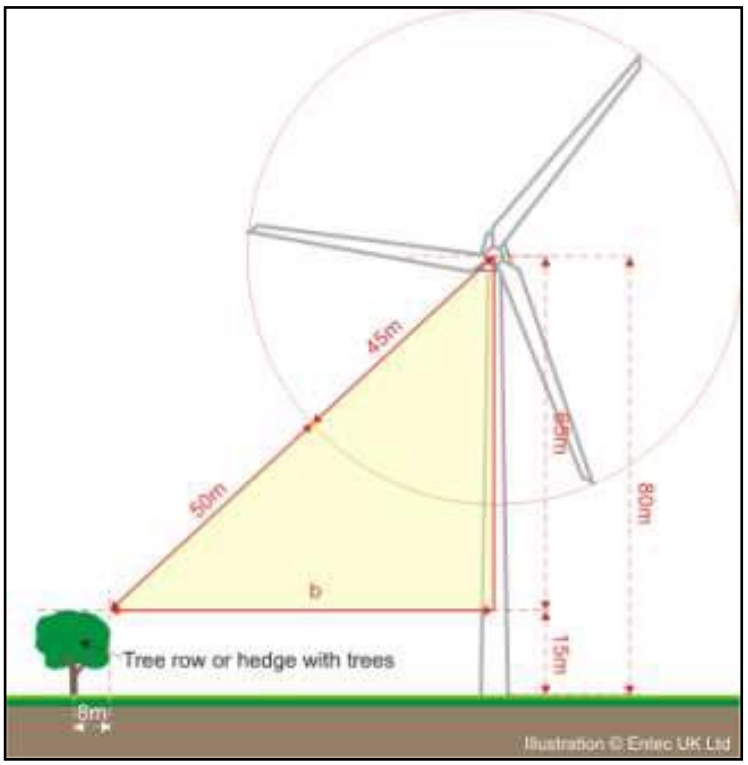

Figure 5.7: Illustration for formula for ensuring a minimum distance of 50 metres from blade tip to habitat (potential feeding) features. (From Scottish Natural Heritage (2019))

As no operational phase impacts on bats were identified for the grid connection route options, no specific mitigation is required.

5.5.3.3 Birds

Construction Phase

No hedgerows or treelines on the site will be cleared during the bird nesting season which runs from 1st March to the 31st of August. Hedgerow and treeline clearance will be kept to a minimum as required. No other mitigation for birds is required during the

construction phase of the proposed development site.

Operational Phase

Any attractive perches on the site, such as large tree branches, that may be used by birds of prey will be removed and will be detailed in the Habitat Management Plan (HMP) to be prepared prior to commencement of development. Pre-construction ecology surveys will be undertaken on the site and this will identify the perches which will be subject to removal. This habitat management plan will not aim to create new habitats attractive to birds on the site itself. The site at present consists of suboptimal agricultural habitats that are not of particular importance to birds – and it is proposed to keep it this way. Therefore, the aim will be to maintain what is already there and not result in any loss of hedgerows. This approach would mean that no habitat for wood mice or similar small mammals would be created that may make the site more attractive for Kestrels, which were occasionally recorded on the site. By removing suitable perches inside the site, it is envisaged that the likelihood of collisions would be reduced. Nonetheless, Buzzards are our most common bird of prey in Ireland and are indeed Green listed. They frequently utilise farmland habitats such as those on the wind farm site and therefore no issues regarding displacement are envisaged, as these habitats are common and widespread.

As set out above, the bird surveys undertaken have demonstrated that the proposed development site is not located along a regular flight path for Whooper Swan and, given the nature of the landscape, Whooper Swan are likely to be flying at height. Notwithstanding this and as a precautionary measure, it is proposed to install bird diverters at locations where overhead lines (grid connection Options G1 and G2 should either of these options be chosen) may be in close proximity to lakes or other waterbodies which will, in accordance with the precautionary principle, provide added certainty as to the absence of effects on Whooper Swan and the SPA. The precise location of these bird diverters will be advised by a suitably qualified ornithologist.

A study in California on the effectiveness of flight diverters highlighted that land management planning and the strategic positioning of power lines would be effective mitigation for bird collisions with power lines. It was suggested that with enough distance from roosting sites in trees, larger, less manoeuvrable bird species, such as cranes in the case of this study, would be able to reach the necessary altitude and adjust flight height to avoid power lines (Yee et al. 2007). Bird diverters may be effective as markers of the power lines, triggering adjustment of flight paths of the approaching birds. Barrientos et al. (2011) analysed the effectiveness of bird diverters and recorded a decrease in mortality rate due to power line collisions of birds by 78%.

Bernardino et al. (2018) reports that most investigations into the effectiveness of bird diverters is inconclusive however some comparisons have been made and evidence indicates that overall spiral diverters seem to be slightly more effective. It has been reported that spiral vibration dampers were more effective diverters than plates (Brown and Drewien, 1995) and more effective than flappers and clamps without moving parts (Anderson, 2002; Calabuig and Ferrer, 2009). Barrientos et al. (2012) found that for most species the success of spiral bird diverters was not dependent on the size of the spirals; once the marking is achieved there is no benefit of a larger size spiral. The colour of spirals has also been investigated and found to have no influence on effectiveness of diverters reducing mortality (Calabuig and Ferrer, 2009).

An investigation into diverter malfunctions discovered that 123 flapper bird diverter

devices out of the 600 examined malfunctioned within nine months of installation. The rate of malfunction was found to increase with; a decrease in the flapper size; decreased power line diameter; and increased distance between poles. In comparison, the rate of malfunction in 600 spiral devices examined was 0 (Batsuuri Dashnyam, 2016).

5.5.3.4 Aquatic Ecology

Construction Phase

The water quality and invasive species mitigation listed above will ensure the avoidance of likely significant impacts on aquatic ecology.

The mitigation measures listed above for impacts on habitats and flora during the construction phase are considered sufficient to avoid likely significant impacts on aquatic ecology.

Operational Phase

The operational phase water quality mitigation listed above will avoid likely significant impacts on aquatic ecology.

As the operational phase of the proposed grid connection options will not result in impacts on aquatic ecology, no specific mitigation measures are required.

5.5.3.5 Reptiles & Amphibians

Construction Phase

The water quality mitigation listed above will ensure the avoidance of likely significant water quality impacts that may arise during the construction phase and result in effects on amphibians. Pre-construction surveys are recommended for Smooth Newt and Common Frog in any of the drainage ditches affected by the proposed development. A derogation licence may be required from NPWS if any of these species are found on the site. Biosecurity mitigation is provided above which will also ensure there are no likely significant invasive species impacts which may affect amphibians.

Pre-construction surveys will also be undertaken at specified locations should either grid connection Option G1 or G2 be constructed.

Operational Phase

The operational phase water quality mitigation provided above will ensure likely significant impacts on reptiles and amphibians do not occur.

As the operational phase of the proposed grid connection options will not result in impacts on amphibians, no specific mitigation measures are required.

5.5.3.6 Terrestrial Macroinvertebrates

Construction Phase

The mitigation measures provided above for the protection of habitats and flora during the construction phase will also avoid impacts on terrestrial invertebrates during the construction phase.

Operational Phase

No specific mitigation measures are required for the operational phase to avoid likely significant impacts on terrestrial macroinvertebrates.

5.6 Residual Effects

Residual impacts are those which occur following the implementation of mitigation measures. The majority of habitats in the study area are considered to be of low ecological value, with the exception of some hedgerows, treelines, eroding upland rivers, poor fen and flush, wet grassland and scattered sections of woodland which are important to local wildlife. The mitigation measures proposed will provide robust and effective protection to each species/habitat identified and as a result residual impacts are not anticipated to occur.

5.6.1 Designated Sites

The residual impacts on affected Natura 2000 sites are discussed in the Natura Impact Statement. Based on information provided in the NIS, it was concluded that on the basis of the best available scientific evidence, there is reasonable scientific certainty that the proposed development will have no direct, indirect or cumulative impacts on the conservation status or integrity of the Upper Lough Erne SAC, Upper Lough Erne SPA, the Lough Oughter and Associated Loughs SAC, the Lough Oughter Complex SPA or the Slieve Beagh/Slieve Beagh-Mullaghfad-Lisnaskea SPA..

The proposed development will not result in significant direct, indirect or cumulative impacts on pNHAs and no residual impacts are identified.

5.6.2 Habitats & Flora

Subject to the implementation of mitigation measures, the proposed development (including grid connection options) will not result in the spread of non-native invasive species. Water quality mitigation measures implemented during the construction phase will ensure no significant impacts occur to the aquatic habitats in the study area. The residual impacts on habitats and flora are therefore assessed as 'none'.

5.6.3 Fauna

5.6.3.1 Non-volant Mammals

Subject to the implementation of standard construction measures and the targeted measures outlined above, including a pre-construction mammal survey, there will be no residual impacts on non-volant mammals. The overall impact on non-volant mammals is assessed as 'none'.

5.6.3.2 Bats

Mitigation measures listed above will ensure that impacts on bats are reduced insofar as possible. Following the implementation of mitigation measures, there remains the potential for some collisions with the turbines resulting in bat mortality. However, surveys undertaken have identified common species which are not of conservation concern. These species are adaptable and readily utilise a large range of habitats in the Irish landscape. The residual impact is assessed as being slight negative.

The overall impact on bats for the grid connection options is assessed as 'none'.

5.6.3.3 Birds

Subject to the implementation of mitigation measures, the construction of the proposed development (including grid connection options) will not result any significant adverse impacts on birds. Any clearance of hedgerows or scrub will be undertaken outside of the bird nesting season. There will be a minor collision risk and displacement impacts for green-listed bird species (Buzzards) from the proposed turbines. There will be no impact on Annex I bird species. The residual impacts on

birds is assessed as slight negative in a local context.

5.6.3.4 Aquatic Ecology

Following the implementation of appropriate mitigation as discussed above, the residual impact on aquatic ecology is assessed as 'none'.

5.6.3.5 Reptiles & Amphibians

Following the implementation of mitigation measures, the residual impact on aquatic ecology is assessed as 'none'.

5.6.3.6 Terrestrial Macroinvertebrates

Mitigation measures listed will ensure that impacts on terrestrial macroinvertebrates are reduced insofar as possible. Following the implementation of mitigation measures, there remains the potential for habitat loss; however, the residual impact is assessed as being slight negative.

5.7 Summary

The following table presents Key Ecological Receptors (KERS) which have been identified as likely to be affected by the proposed development; identifies the impacts which are assessed as likely to occur and outlines the residual impacts predicted to occur following the implementation of mitigation measures. Residual impacts on these KERS are at the lower end of the significance spectrum and range from 'none' to 'slight-negative'

Ecological Receptors	Potential Impacts	Mitigation	Residual Impacts
Eroding / Upland Rivers (FW1)	Riparian Disturbance, Water Quality Pollution	Water quality protection minimise works area near streams, biosecurity.	None
Poor Fen and Flush (PF2)	Disturbance, Water Quality Pollution	Minimise works footprint, water quality protection, biosecurity.	None
Mixed Broadleaved Woodland (WD1)	Minor Habitat Loss	Minimise works footprint, biosecurity.	None
Scrub (WS1)	Minor Habitat Loss,	Minimise works footprint, biosecurity.	None
Wet Grassland (GS4)	Minor Habitat Loss,	Minimise works footprint, biosecurity.	None
Hedgerows (WL1)	Minor Habitat Loss,	Minimise works footprint, biosecurity, replanting.	None
Treelines (WL2)	Minor Habitat Loss,	Minimise works footprint, biosecurity, replanting.	None
Pine Marten	Minor Habitat Loss, Disturbance and Noise	No mitigation required.	None
Bats	Minor habitat loss and fragmentation, Disturbance, Collisions,	Minimise works footprint, check trees, replanting.	Potential for collisions, assessed as slight negative (local) due to common species present

Ecological Receptors	Potential Impacts	Mitigation	Residual Impacts
	Barotrauma		
Birds	Minor habitat loss and fragmentation, disturbance, collisions, displacement	Minimise works footprint, avoid bird nesting season for vegetation clearance, site will not be managed in a way that would attract raptors.	Potential for collisions, assessed as slight negative (local) due to common Green-listed species present

Table 5.9: Summary of impacts, mitigation and residual impacts on Key Ecological Receptors.

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