ENVIRONMENTAL BALANCE IN DESIGN AND CONSTRUCTION

ELEMENT POWER IRELAND LTD

NATURA IMPACT STATEMENT FOR THE PROPOSED MAIGHNE WIND FARM, CO. KILDARE AND CO. MEATH

MARCH 2015

elementpower

FEHILY TIMONEY & COMPANY

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1 INTRODUCTION

Fehily Timoney and Company (FTC) was commissioned by Element Power Ireland Ltd. to prepare an application for planning permission for a proposed wind farm comprising of up to 47 no. wind turbines with a tip height of up to 169m, access tracks, underground cabling, a sub-station, borrow pits, permanent meteorological monitoring mast and associated works at locations in counties Kildare, Meath and Offaly. In compliance with the provisions of Article 6 of the Habitats Directive,[1] as implemented by Part XAB of the Planning and Development Act 2000, as amended, in circumstances where a proposed plan or project is likely to have a significant effect on a European (or Natura 2000) site, either individually or in combination with other plans or projects, an Appropriate Assessment (AA) must be undertaken by the competent authority of the implications for the site in view of the site's conservation objectives. As part of the AA process, (and pursuant to guidance issued by the National Parks and Wildlife Service (NPWS) of the Department of Arts, Culture and the Gaeltacht), this Natura Impact Statement contains information which permits the Board to conduct both a Stage One screening assessment and a Stage Two appropriate assessment.

The provisions of sections 37A to 37K of the Planning and Development Act 2000 as amended, requires applications for planning permission for strategic infrastructure projects to be made directly to An Bord Pleanála.

Article 6 of the Habitats Directive envisages a process, which is implemented in some detail by the provisions of sections 177U and 177V of the Planning and Development Act. Screening for appropriate assessment in accordance with section 177U is the first stage of the AA process (Stage One), in which the possibility of there being a significant effect on a European site is considered. Plans or projects that have no appreciable effect on a Natura 2000 site are thereby excluded, or screened out, at this stage of the process. Where screening concludes that there is the possibility of there being a significant effect on a designated site, then it is necessary to carry out an AA (Stage Two) for the purposes of Article 6(3), and an NIS is produced. The NIS, which forms the basis of the AA, considers the impact of a project or plan on the integrity of a Natura 2000 site or sites concerned and on the relevant conservation objectives, and where necessary, draws up mitigation measures to avoid/minimise negative impacts. The Board, in carrying out an AA, is required to make an examination, analysis, evaluation, findings, conclusions and a final determination as to whether or not the proposed development would adversely affect the integrity of the relevant Natura 2000/European site(s) in view of its conservation objectives. The purpose of this NIS is to provide data and information on the project and relevant European sites and an analysis of the potential effects on the site is presented in accordance with the NPWS guidance. This NIS includes both Stage One screening report (Section 5) and Stage Two appropriate assessment report (Section 6) of the AA process and assesses the potential impact of the proposed Maighne Wind Farm on the ten European sites located within 15km of the proposed development, namely:

- River Boyne and River Blackwater cSAC* (002299)
- River Boyne and River Blackwater SPA (004232)
- Ballynafagh Bog cSAC (000391)
- Pollardstown Fen cSAC (001387)
- Ballynafagh Lake cSAC (001387)
- Rye Water Valley/Carton cSAC (001398)
- The River Barrow and River Nore cSAC (002162)
- Mount Hevey Bog cSAC (002342)
- The Long Derries cSAC (000925)
- Mouds Bog cSAC (002231)

*Note: At present all SACs in Ireland are currently 'candidate' SACs, and referred to as cSACs. The relevant Statutory Instruments for the SACs in Ireland have not yet been made, however, these "candidate" sites must still be afforded the same level of protection as if they were SACs in accordance with the Habitats Directive.

[1] Council Directive 92/43/EC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.

1.1 Brief Description of Project

The Maighne Wind Farm Development comprises five clusters, located respectively, to the north of the Hill of Allen, Co. Kildare and south of Longwood, Co. Meath. The proposed wind farm site does not lie within or overlap any Natura 2000 site.

The proposed development will primarily consist of the following:

- Erection of up to 47 no. wind turbines with an overall tip height of up to 169m
- Construction of foundations and hardstanding areas in respect of each turbine
- Construction/upgrade of 9 no. site entrances from public roads
- Construction of approximately 31km of new site access tracks and associated drainage
- Upgrade of approximately 10km of existing access tracks and, where required, upgrade of associated drainage
- Excavation of 3 no. borrow pits
- Establishment of 4 no. temporary construction site compounds and associated parking areas
- Construction of drainage and sediment control systems
- Construction of 1 no. electricity substation (which will operate at a voltage up to 220kV) including:
    - 2 no. control buildings containing worker welfare facilities
    - electrical infrastructure
    - parking
    - fencing
    - appropriate landscaping
- Installation of approximately 75km of medium voltage (MV) underground cabling (which will operate at a voltage up to 33kV) between the proposed turbines and proposed on-site substation. Approximately 36km will be laid within the public roadway
- Installation of high voltage (HV) underground cabling (which will operate at a voltage up to 220kV) between the proposed on-site substation and either the existing substation at Woodland, Co. Meath (totalling approximately 29km, of which approximately 28km will be laid within the public roadway) or the existing substation at Maynooth, Co. Kildare (totalling approximately 23km, of which approximately 17km will be laid in the public roadway)
- Installation of joint bays along the cable route
- Installation of underground communication cables
- Installation of a permanent meteorological mast up to 100m in height
- Temporary alterations to the public road at identified locations to accommodate the delivery of turbines
- Associated site works including landscaping
- Tree felling
- Peat excavation.

Whether the connection point to the national electricity transmission grid will be located at the Woodland or Maynooth substations will be determined by EirGrid plc, which is the statutory Transmission System Operator. Accordingly, the documentation submitted with this application for permission identifies and evaluates 2 no. HV grid connection routes (which will operate at a voltage up to 220kV). The 2 no. HV grid connection cable routes included in this application will connect the proposed Maighne Wind Farm on-site substation to either one of two existing substations located at Woodland, Co. Meath or Maynooth, Co. Kildare. However, only one of these routes will be constructed following the identification of the preferred connection point by the Transmission System Operator.

1.2 Existing Site Setting

The proposed Maighne Wind Farm Development lies primarily within North Kildare (2 proposed turbine locations are in South County Meath). The landscape of north Kildare is stongly influenced by the Bog of Allen resulting in a mosaic of various habitats from improved agricultural farmland to raised bog, cutover bog and forestry in various stages of its lifecycle.

The subject site consists of 5 clusters of proposed turbines. Of these five clusters, two are located at the northern and southern extremity of the overall site in improved agricultural land, the remaining three clusters situated within or on the periphery of historical or existing raised bog basins. The majority of these basins have been exploited for resources such as peat extraction or forestry and this is reflected in the land form within which the proposed turbines are to be placed.

The area is drained by a number of river catchments, primarily the Rivers Boyne and Blackwater (north) which drain the northern clusters of the proposed wind farm site whilst the River Slate and Figile (via the Cushaling and Crabtree Rivers) drain the southern clusters. Two canals, the Royal and the Grand transect the proposed development area. The M4 motorway also transects the greater area south of the northernmost cluster of proposed turbines which abuts the county boundary with Meath.

A section of this site ultimately drains to the Blackwater and Boyne Rivers both of which form part of the River Boyne and River Blackwater cSAC (002299) and the River Boyne and River Blackwater SPA (004232).The southernmost section of the site drains to the River Barrow and River Nore cSAC (site code 002162). A number of additional Natura or European sites exist within 15km of the proposed wind farm.

1.3 Legislative Requirements

The EU Habitats Directive (92/43/EEC) on the Conservation of Natural Habitats and of Wild Fauna and Flora [(1)], forms the basis for the designation of SACs. Similarly, Special Protection Areas are legislated for under the Birds Directive (Council Directive 79/409/EEC on the Conservation of Wild Birds, subsequently replaced by Directive 2009/147/EC) [(2)]. Collectively SACs and SPAs are referred to as Natura 2000 sites, or 'European' sites as defined in the Planning and Development Act 2000, as amended. In general terms, they are considered to be of exceptional importance in terms of rare, endangered or vulnerable habitats and species within the European Community.

Under Article 6(3) of the EU Habitats Directive [(1)] an Appropriate Assessment (AA) must be undertaken by the competent authority in respect of any plan or project that is likely to have a significant effect on a Natura 2000 site, in view of that site's conservation objectives.

Insofar as applications for permission under section 37E of the Planning and Development Act 2000, as amended, in respect of strategic infrastructure development are concerned, these obligations have been implemented into Irish law by Part XAB of the Planning and Development Act 2000, as inserted, which are more detailed than Article 6(3) but which impose similar obligations on the competent authority to those imposed by Article 6(3), as construed by reference to the case law of the Court of Justice of the European Union.

The statutory agency responsible for Natura 2000 sites is the National Parks and Wildlife Service (NPWS) of the Department of Arts, Heritage and the Gaeltacht (DAHG).

In December 2009 "Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities, Department of the Environment, Heritage and Local Government [(3)]" was published. This guidance document was prepared jointly by the NPWS and Planning Divisions of DoEHLG (now DAHG), with input from local authorities. Previously, in 2001, the European Commission issued a guidance document. This NIS has been prepared in accordance with the relevant Irish and European Commission Guidance.

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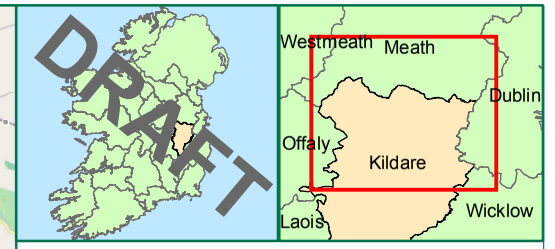

WESTMEATH

MEATH

KILDARE

OFFALY

DUBLIN

WICKLOW

Ballynakill

Windmill

Drehid
Hortland

Derrybrennan

Cloncumber

Woodland -
Option 1

Maynooth -
Option 2

Legend

- Wind Farm Cluster Boundary
- MV Cable Routes
- HV Cable Route
- Irish Grid Connection Points

0 2 4 6 8
Kilometers

Date	26/01/2015
Name Of Client	Element Power Ireland
Name Of Job	Maighne Wind Farm Natura Impact Statement
Title Of Figure	Site Location Map
Scale Used	1:150,000 @ A3
Figure No.	1.1
Rev	A

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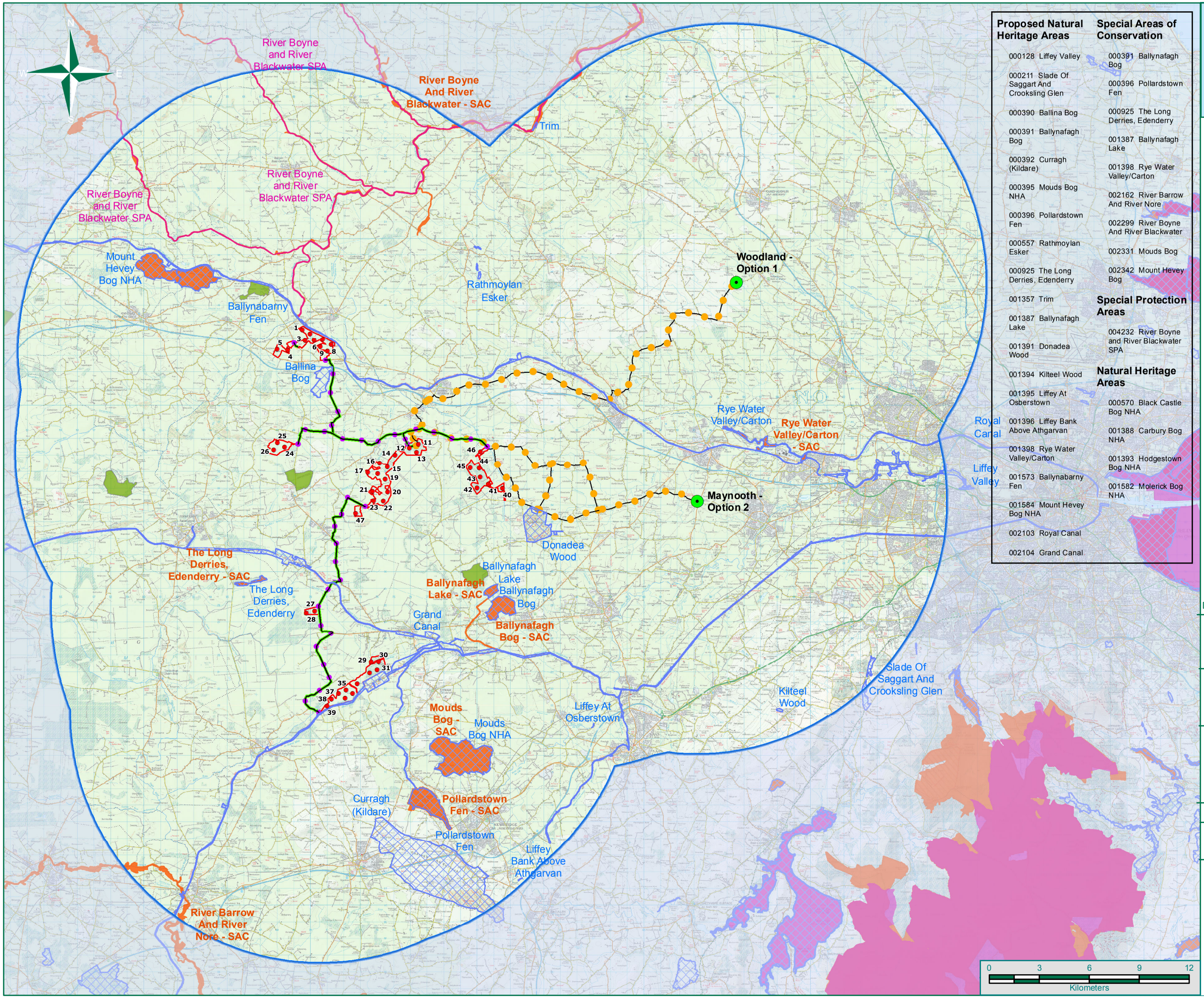

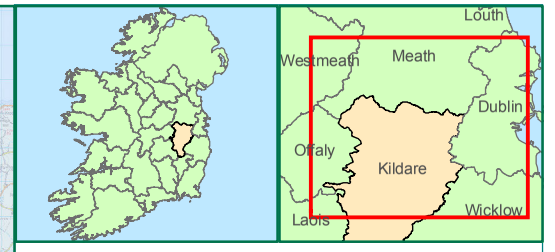

Proposed Natural Heritage Areas

000128 Liffey Valley

000211 Slade Of Saggart And Crooksling Glen

000390 Ballina Bog

000391 Ballynafagh Bog

000392 Curragh (Kildare)

000395 Mouds Bog NHA

000396 Pollardstown Fen

000557 Rathmoylan Esker

000925 The Long Derries, Edenderry

001357 Trim

001387 Ballynafagh Lake

001391 Donadea Wood

001394 Kilteel Wood

001395 Liffey At Osberstown

001396 Liffey Bank Above Athgarvan

001398 Rye Water Valley/Carton

001573 Ballynabarny Fen

001584 Mount Hevey Bog NHA

002103 Royal Canal

002104 Grand Canal

Special Areas of Conservation

000391 Ballynafagh Bog

000396 Pollardstown Fen

000925 The Long Derries, Edenderry

001387 Ballynafagh Lake

001398 Rye Water Valley/Carton

002162 River Barrow And River Nore

002299 River Boyne And River Blackwater

002331 Mouds Bog

002342 Mount Hevey Bog

Special Protection Areas

004232 River Boyne and River Blackwater SPA

Natural Heritage Areas

000570 Black Castle Bog NHA

001388 Carbury Bog NHA

001393 Hodgestown Bog NHA

001582 Molerick Bog NHA

Legend

- Turbine Locations
- Wind Farm Cluster Boundary
- 15km Buffer of Site Boundary
- MV Cable Routes
- HV Cable Route
- Irish Grid Connection Points
- Proposed Natural Heritage Areas
- Natural Heritage Areas
- Special Protection Areas
- Special Areas of Conservation

Date 26/01/2015

Name Of Client

Element Power Ireland

Name Of Job

Maighne Wind Farm
Natura Impact Statement

Title Of Figure

Designated Areas within 15km of Site Boundary

Scale Used 1: 220,000 @ A3

Figure No. 1.2

Rev A

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2 APPROPRIATE ASSESSMENT METHODOLOGY

There are four stages in an Appropriate Assessment (AA), as outlined in the European Commission Guidance document (2001) [4]. The following is a brief summary of these steps, however, there is no reliance placed on stage 3 and 4 as far as this application for proposed development is concerned.

Stage One - Screening: This stage examines the likely effects of a project either alone or in combination with other projects upon a Natura 2000 site and considers whether it can be objectively concluded that these effects will not be significant.

Stage Two - Appropriate Assessment: In this stage, the impact of the project on the integrity of the Natura 2000 site is considered with respect to the conservation objectives of the site and to its structure and function. Mitigation measures should be applied to the point where no adverse impacts on the site(s) remain.

Stage Three - Assessment of Alternative Solutions: Should the Appropriate Assessment determine that adverse impacts are likely upon a Natura 2000 site, this stage examines alternative ways of implementing the project that, where possible, avoid these adverse impacts. For the avoidance of doubt, the developer does not purport to place reliance on Stage Three.

Stage Four - Assessment where no alternative solutions exist and where adverse impacts remain: Where imperative reasons of overriding public interest (IROPI) exist, an assessment to consider whether compensatory measures will or will not effectively offset the damage to the Natura site will be necessary. European case law highlights that consideration must be given to alternatives outside the project area in carrying out the IROPI test. It is a rigorous test which projects are generally considered unlikely to pass. In any event, the developer does not purport to place any reliance on Stage Four.

In the preparation of this screening appraisal and NIS regard has been had to the EU Habitats Directive [1], Part XAB of the Planning and Development Act 2000, and to the relevant guidance, in particular:

- Assessment of Plans and Projects significantly affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC, European Commission 2001 [4].
- Managing Natura 2000 Sites: The Provisions of Article 6 of the 'Habitats Directive' 92/43/EEC, European Commission, 2000 [5].
- Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin 2009 [3].

Throughout the Stage One screening assessment report (Section 5) and the appropriate assessment report (Section 6) the line items in *italics* refer to suggested instructions for information to be contained in a screening assessment, and in an appropriate assessment from the guidance document '*Assessment of Plans and Projects significantly affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*', European Commission, 2001 [4]. The standard 'Screening Matrix' and 'Finding of No Significant Effects Report Matrix' in Annex 2 of this guidance document are also followed.

In order to identify potential 'In Combination Effects', other key plans and projects were identified for this area. The following plans, projects or data sources have been considered:

1. The County Meath Development Plan (2013 – 2019) [6].
2. The County Meath Biodiversity Action Plan 2008-2012 [7].
3. Meath County Council Online Planning Search [8].
4. Kildare County Council Online Planning Search
5. Kildare County Development Plan 2011-2017 [9]
6. County Kildare Biodiversity Plan [10]
7. Existing wind farms in the vicinity of the development using the Irish Wind Energy Association (IWEA) online mapping system [11] and the Windpower wind turbines and wind farm database [12]
8. Search completed for other developments such as factories and housing developments already constructed within 5km of the proposed development [13].

2.1 Data Used to Inform this NIS

A combination of desktop studies and comprehensive field surveys were carried out for the ecological appraisal of the existing environment of the proposed Maigne Wind Farm site and to inform the overall Environmental Impact Assessment of the proposed development by the competent authority. The methodologies employed for the ecological assessment of the site are detailed in Section 3 and the results of this appraisal are detailed in Section 4. The ecological description of the existing environment presented in Section 4 is used to inform the preparation of this NIS.

2.2 Identification of Potentially Affected European Sites

The first step in the process is to develop a 'long list' of Natura 2000 sites potentially affected by the project. Each Natura 2000 site within certain distances from the proposed development was reviewed to establish whether or not the project is likely to have a significant effect on the integrity of the site, as defined by its structure and function and, in particular, its conservation objectives.

In accordance with the guidance document 'Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities' [3], in the approach to screening, any Natura 2000 site within the zone of impact of a plan or a project should be considered. A distance of 15km is currently recommended in the case of plans. For certain projects, the distance could be much less than 15km but this is evaluated on a case-by-case basis. A distance of 15km was considered appropriate for the likely zone of impact of this project, and includes ten Natura 2000 or European sites. The zone of impact should also include Natura 2000 sites further than 15km from a project if the project could affect water quality or quantity of those sites.

The qualifying interests of each Natura 2000 site are identified and the potential impacts are summarised into the following categories for the screening process, in the first instance, and described within the screening matrix:

- Direct impacts refer to habitat loss or fragmentation arising from land-take requirements for development or agricultural purposes. Direct impacts can be as a result of a change in land use or management, such as the removal of agricultural practices that prevent scrub encroachment.

- Indirect (or secondary impacts) may potentially arise when a development alters the hydrology of a catchment area, which in turn affects the movement of groundwater to a site, and the qualifying interests that rely on the maintenance of water levels. Deterioration in water quality can occur as an indirect consequence of development, which in turn changes the aquatic environment and reduces its capacity to support certain plants and animals. Disturbance to fauna can arise indirectly through noise, vibration and increased activity associated with the construction, operation and decommissioning phases.

The introduction of invasive species can also be defined as an indirect impact, which results in increased movement of vectors (humans, fauna, surface water), and consequently the transfer of alien species from one area to another

3 ECOLOGICAL APPRAISAL METHODOLOGY

This section details the methodology used in the ecological appraisal of the existing environment of the proposed Maighne Wind Farm Development. The results of the ecological appraisal of the site, including desktop studies and field surveys were used to inform the preparation of the NIS.

3.1 Ecological Appraisal - Relevant Guidance

The methodology for ecological appraisal in this NIS has been developed having considered relevant guidance published by the Environmental Protection Agency (EPA) including '*Guidelines on the information to be contained in Environmental Impact Statements* [14]' and '*Advice Notes on Current Practice (in the preparation of Environmental Impact Statements)* [15]'. Additional guidance available from the EU such as '*Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment*' [16] has also been considered. The assessment also takes account of '*Guidelines for Ecological Impact Assessment in the United Kingdom* [17]', published by the Chartered Institute of Ecology and Environmental Management (CIEEM). The Heritage Council publication '*Best Practice Guidance for Habitat Survey & Mapping*' [18] is also referenced.

Relevant guidance published by the National Roads Authority (NRA) such as '*Guidelines for Assessment of Ecological Impacts of National Road Schemes* [19]', '*Guidelines for Assessment of Ecological Impacts of National Road Schemes, Revision 1* [20]', '*Environmental Impact Assessment of National Road Schemes – A practical guide*' [21] and '*Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*' [22] have also been followed.

Relevant guidance from Scottish Natural Heritage (SNH) in relation to birds such as '*Recommended Bird Survey Methods to inform Impact Assessment of Onshore Wind farms* [23]','*Survey Methods for use in assessing the impacts of onshore wind farms on bird communities* [24]' and '*Assessing the cumulative impact of onshore wind energy developments* [25]' has also been utilised.

Documentation and guidance available from Meath County Council such as '*The County Meath Biodiversity Action Plan: 2008-2012* [26]' and the '*Meath County Development Plan 2013-2019* [6]' have been referenced as have documents and guidance from Kildare County Council such as the '*Kildare County Development Plan 2011-2017* [9]' and the '*County Kildare Biodiversity Plan*' [10].

In addition, in order to comprehensively research and so understand the existing behaviour of bats within the study areas the approach detailed in the following guidelines were followed:

- *Bat Surveys: Best Practice Guidelines* (2nd edition) [27];
- *Wind Turbine/Wind Farm Development Bat Survey Guidelines* [28] ;
- *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes* [29];
- *Bat Surveys: Best Practice Guidelines* (2nd edition [30];
- *Bats and Onshore Wind Turbines – Interim Guidance (2nd Edition)* [31];
- *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes* [32];
- *Guidelines for the Treatment of Bats during the Construction of National Road Schemes* [33];
- *Bat survey – specific requirements for wind farm proposals* [34];
- *Guidelines for Consideration of Bats in Wind Farm Projects* [35].

3.2 Consultation

The scope for this evaluation has been informed by pre-application consultation with An Bord Pleanála, prescribed bodies and other interested parties, including consultation undertaken with the National Parks and Wildlife Service (hereafter referred to as NPWS) in regard to the proposed development.

3.3 Desktop Study

The desktop study involved an examination of ecological aspects from sources of information including information on the NPWS webpage, metadata available online from the NPWS mapping system (http://webgis.npws.ie/npwsviewer/), and the National Biodiversity Data Centre (hereafter referred to as NBDC) mapping system (http://maps.biodiversityireland.ie/#/Home). Additional sources of information such as natural heritage datasets (county surveys) commissioned by Meath County Council and Kildare County Council, which have been made available, have also been reviewed.

All information relating to the Natura 2000 sites within 15km of the proposed site (site descriptions, qualifying interests, conservation objectives etc.) was obtained from the NPWS webpage (www.npws.ie).

3.4 Field Assessment

The following describes the individual methods employed on a taxa-specific basis.

3.4.1 Avifauna

Target Species
The following criteria has been utilised to select target species for the current study. Scottish Natural Heritage (SNH) guidance [23] on the assessment of the effects of wind farms on ornithological interests suggests that there are three important species lists from which target species be drawn, as follows:

1. Species listed on Annex 1 of the Birds Directive [2]
2. Red-listed birds of Conservation Concern [36]
3. Schedule 1 of the Wildlife and Countryside Act 1981 (not applicable in Ireland) and;
4. Regularly occurring migratory species.

In addition to the above, consideration should be given to species identified locally as of conservation concern, regionally as of conservation concern or those particularly susceptible to impact from wind farm development. Note that not all species on the above lists would be categorised as target species, e.g. most passerine species and general lowland farmland birds are not considered to be particularly susceptible to impacts from wind farms [23].

In the Irish context, it has been suggested that target species should be taken from species of conservation concern in Ireland (BOCCI [36]), those likely to occur within the vicinity of the proposed wind farm, and those most at risk from particular impacts such as disturbance and displacement [37].

'Birds of Conservation Concern in Ireland' (BoCCI) are classified into three separate lists; red, amber and green. *Red-listed* species are of high conservation concern, *Amber-listed* species are of medium conservation concern and *Green-listed* species are considered to be of no conservation concern [36].

To date three BoCCI lists have been published with the current list by Colhoun & Cummins (2014) [36] superseding the two former lists by Lynas *et al.* (2007) [38] and Newton *et al.* (1999) [39]. The conservation status of bird species found in this study was assessed using the most recent (2014) BoCCI List [36].

Additionally, a review of the bird species listed on Annex I on the EU Birds Directive (2009/147/EC) was undertaken in assessing the conservation status of birds. Annex I species are often afforded additional protection through the designation of Special Protection Areas (SPAs) throughout EU countries in addition to existing National legislation.

The following table details the species identified as target species prior to commencement of studies, based on occurrence within the study area, known sensitivities to development and conservation status:

Table 3.1: Target Specifies identified for Avifauna Surveys

Common Name	Species	Annex I Status (18)	BoCCI status (19)
Golden Plover	*Pluvialis apricaria*	Yes	Red
Kingfisher	*Alcedo atthis*	Yes	Amber
Merlin	*Falco columbarius*	Yes	Amber
Whooper Swan	*Cygnus*	Yes	Amber
Peregrine	*Falco peregrinus*	Yes	Green
Greenland White Fronted Goose	*Anser albifrons*	Yes	Amber
Hen Harrier	*Circus cyaneus*	Yes	Amber
Black-headed Gull	*Larus ridibundus*	No	Red
Curlew	*Numenius arquata*	No	Red
Lapwing	*Vanellus vanellus*	No	Red
Woodcock	*Scolopax rusticola*	No	Red
Redshank	*Tringa totanus*	No	Red
Barn Owl	*Tyto alba*	No	Red
Yellowhammer	*Emberiza citronella*	No	Red
Common Gull	*Larus canus*	No	Amber
Kestrel	*Falco tinnunculus*	No	Amber
Lesser Black-backed Gull	*Larus fuscus*	No	Amber
Mute Swan	*Cygnus olor*	No	Amber
Snipe	*Gallinago gallinago*	No	Amber
Buzzard	*Buteo buteo*	No	Green

Overview of Methods

Winter season surveys were carried out from December 2012 to March 2014 inclusive. The main components were a winter walkover survey, a flight activity survey and dedicated Hen Harrier and Red Grouse surveys. Breeding season surveys were carried out from April 2013 to August 2013, with additional surveys in April 2014 to June 2014. In addition to best practice methods for surveying birds such as the Countryside Bird Survey (CBS) and breeding wader surveys following established guidance [(40)], surveys to address target species such as breeding Barn Owl and Merlin were also implemented following recent best practice guidance in Ireland [(41)] [(42)].

Winter Walkover Survey

A winter walkover survey based on the previously published method in Brown and Shepherd 1993 [(43)] was utilised to sample general winter bird numbers and levels of activity on site. This method was utilised for winter walkover surveys as it can be easily adapted or modified to sample general birds within different habitat types in the landscape, i.e. rather than targeting wading species as per the original method it can be modified to record all species.

This method is recommended in published guidance on surveys to be used when carrying out impact assessments of wind farms on birds [(24)]. The study area for this survey was the proposed land folio footprint.

Three walking surveys of the entire wind farm land folio footprint were conducted. On each visit individual land folios were walked using routes selected to sample the different habitats present.

Routes utilised were varied across visits as were surveyors and timing of walks to avoid bias. Vantage point watches to sample levels of flight activity and to record species not easily recorded when walking (such as raptors) were incorporated, as per the published method [43], into the surveys. The direction and duration of each walking survey (including watch effort) was recorded on each visit; flight lines of note were also recorded.

Birds present within the various habitats were recorded and totals of each species per visit noted. Flight activity of target species was recorded as duration in seconds and flight lines of note recorded on maps. Target notes were made on the presence of key species such as Whooper Swan (i.e. location, habitat, behaviour) as well as additional species such as mammals and or potentially important habitats.

The subject site was walked on three separate occasions during the winter period (defined as October to March inclusive); site visits were conducted in October/November 2012 (Visit 1), January 2013 (Visit 2) and March 2013 (Visit 3) (see Appendix 10 for survey dates and times of surveys). All walkover surveys were carried out with landowner consent.

Flight Activity Survey

Flight activity surveys, based on observations of flight activity at pre-defined height bands (selected to match predicted rotor envelopes) are typically collated and used to establish a number of key metrics such as [44]:

1. The time each target species spends flying over a defined survey area
2. The relative use of different parts of the survey area by each target species
3. The proportion of flying time each target species spends at turbine rotor height.

The study area for this survey was the turbine clusters of Cloncumber and Derrybrennan as well as lands to the south of Derrybrennan including Lullymore Heritage Park (identified as a possible roost for Swans).

Vantage point effort following SNH guidance were carried out over the winter of 2013/2014 at these locations (Lullymore Heritage Park Ponds/Cloncumber cluster) where Whooper Swan activity had been noted close by in the winter of 2012/2013 (i.e. feeding or roosting swans had been recorded during walkover or other surveys); the Cloncumber cluster was surveyed from an elevated vantage point to the south which afforded views of the site and towards Lullymore, whilst the Lullymore Heritage Park Ponds was surveyed from an elevated point to the west of the park which allowed views both of the pond itself and also northwards towards the proposed turbine locations at Derrybrennan. Thirty-six hours of vantage point effort was carried out at each vantage point within the period October 2013 to March 2014. Spring passage in April 2014 was also surveyed.

Table 3.2: Vantage Point Locations

Vantage Point number	Townland	Grid Reference
1	Lullymore	N69680 29664
2	Cloncumber	N71545 21732

Following SNH guidance [23] and the results of consultation with NPWS, watches were conducted from one hour before sunrise to two hours after (total duration 180 minutes) and from two hours before sunset to one hour after, thereby sampling diurnal, crepuscular and nocturnal activity of target species.

Data recorded included flight activity of target species (flight height, duration, directionality) in addition to metrics such as flock size (per recorded transit) and time of observation relative to sunrise or sunset. Flight height was recorded at height intervals of <50m, 50-170m and >170m (see Chapter 2, Section 2.3.2 of the accompanying EIS). Flight activity was annotated onto field maps. Total numbers of target species present both on arrival at the vantage point (when relative) and on departure (when relative) were noted.

Equipment utilised for surveys included binoculars, spotting scopes and dictaphones for dictating flight heights.

Countryside Bird Survey

For general breeding birds the method utilised was based on the existing British Trust for Ornithology (BTO) Breeding Bird Survey (BBS or CBS) [45]. The study area for this survey comprised a total of 7 no. 1 kilometre squares which were selected and centred on different habitats present within the subject site (see Figure 7.5.0, Appendix 6). For each square birds were counted over two visits, each timed to coincide with the early part of the breeding season (April to mid-May 2013) and later part of the season (mid- May to late June 2013) with visits at least four weeks apart. Pre-selected walking routes or transects (two in number) were used to walk the area within the square. Surveyors recorded all birds seen or heard as they walked methodically along their transect routes. Birds were noted in four distance categories, measured at right angles to the transect line (within 25m, between 25m-100m and over 100m from the transect line) and those seen in flight only. Recording birds in distance bands gives a measure of bird detectability and allows relative population densities to be estimated if required [45].

SNH guidance on recommended bird survey methods to inform impact assessment of onshore wind farms states:

> *"Surveys of farmland passerines especially on more intensive arable habitat are generally not required".* [23]

Countryside bird surveys were therefore carried out during one summer only as it is generally considered that passerine species are not significantly impacted by wind farms [23]; in addition variation in numbers between years is not expected to differ significantly.

Breeding Waders

Species of waders breeding at the Maighne Wind Farm Development were surveyed within the 500m envelope around each proposed turbine location. A number of methods were combined from published literature [40] [46] and best practice guidance [23] to estimate numbers of target species breeding within this envelope. Note; unless specified otherwise the term '500m envelope' will refer to the envelope of the relevant cluster being discussed, references to individual turbines or individual turbine envelopes will be further detailed.

Methods utilised were grouped into 2 categories; those for breeding Lapwing *Vanellus vanellus* and those for other species such as Curlew *Numenius arquata*, Common Snipe *Gallinago gallinago*, Redshank *Tringa totanus*, Woodcock *Scolopax rusticola*, Common Sandpiper *Actitis hypoleucos* and Ringed Plover *Charadrius hiaticula.* For each species, a pre-defined matrix of suitable habitats was created and used to select target habitats for survey.

Table 3.3: Target Species and Associated Suitable Breeding Habitat

Target Species	Suitable Breeding Habitat
Lapwing	Lowland wet grassland, arable farmland, cutover bog with pools and wet grassland
Snipe	Wet pastures, marsh, bogs (intact and cutover) and fens
Redshank	Bog
Curlew	Bog
Common Sandpiper	Streams/rivers in bog
Woodcock	Woodland, bog woodland
Ringed Plover	Cutover bog, milled peat with exposed gravel

Survey methods for Lapwing followed those in Bibby *et al.* 2000 [40] wherein the primary count unit for breeding birds is defined as an incubating female; in addition displaying birds, birds standing guard near nests or distraction displays were also recorded as indications of occupied territories.

Extensive areas of open ground were covered from roads, farm tracks or roadsides (where possible); larger areas of open ground not visible from easily accessible vantage points were walked using transects.

Surveys were carried out during the time periods recommended in Bibby *et al.* 2000 [40] although territorial behaviour noted outside these periods was also utilised in the assessment. For all additional species of wader the employed method was essentially the same and utilised transects walked through suitable habitat within 3 hours of dawn or dusk. Count units (see Table 3.4) were predefined for each target species and included in the method statement provided to surveyors.

All suitable habitats for waders were visited, at four week intervals, during the months of April, May and June 2013. Observations from each visit were annotated onto maps (locations of territories or breeding attempts) and a final, summary map produced at the end of the survey season using ArcGIS Desktop 10.1. Breeding wader summary sheets were also compiled at the end of the breeding season, indicating in each case the minimum number of breeding pairs/occupied territories known to occur (see Appendix 11: Bird Survey Data 2).

Table 3.4: Count Units for each Wading Species

Species	Count Unit
Lapwing	Incubating Bird
Common Snipe	Drumming or Chipping Bird
Redshank	Alarming Bird
Woodcock	Displaying Male
Ringed Plover	Presence or Absence/ Fledged Young late in season
Common Sandpiper	Presence or Absence/ Fledged young late in season
Curlew	Territorial Activity

Due to design layout changes, any lacunae in coverage of the predicted 500m envelope were surveyed in April, May, and June 2014, following methods used previously.

Barn Owl

Barn Owl survey methods were designed in conjunction with Dr. John Lusby of BirdWatch Ireland and followed best practice as utilised in recent Barn Owl surveys in Ireland [47] [41]. The method employed was an occupancy search of suitable breeding or nesting sites. The method was designed not only to record Barn Owl presence or absence within the subject site hinterland, but also to provide a comparable baseline on the relative percentage occupancy of suitable sites, thereby allowing comparison with known densities in other areas. This was predicated on the low degree of availability of baseline information on this species within the study area.

The designated search area was set as a 1.5km hinterland around the proposed turbine locations. Within this area all potentially suitable sites (for which access permission was granted) were cold searched for occupancy by Barn Owl. For each location visited the grid reference was noted and the site scored on the following metrics: Suitability (four categories), Nesting Opportunities Present (nine categories) and Activity (three categories). Any additional species present were also noted.

Locations of all suitable sites (occupied or unoccupied) were recorded using a GPS and mapped with ArcGIS Desktop 10.1.

Merlin

Merlin surveys were centred on suitable habitat for the species and methods used were based on previous surveys in Ireland [42] [48]; developed in association with Dr. John Lusby of BirdWatch Ireland and agreed with NPWS. Areas of potentially suitable habitat for Merlin, as defined in previous surveys [48] [42], exists within or adjacent to the clusters which comprise the Maighne Wind Farm Development. The study area for Merlin was defined as a 1km square centrally placed on the available suitable habitat (illustrated in Figure 7.5.0, Appendix 6). A total of 3 no. 1 km squares were surveyed for Merlin presence.

Three visits were undertaken to the study square, each at 4-week intervals and timed to coincide with periods of Merlin activity (April to mid-May 2013, mid-May to late June 2013, and July to mid-August 2013). Prior to the first visit, all areas within the square identified as not suitable for Merlin (open water, urban areas, farmland, enclosed pastures and areas above 700m) were excluded from the target search area. The remaining habitat was walked using parallel transects 120m apart and intensively searched for evidence of Merlin. Features such as suitable nest sites (old corvid nests) and suitable perches (posts, hummocks, boulders, remnant peat stands and root mats) were noted and the grid reference recorded. Transect locations were recorded on ortho-photographs of the study square.

Recorded information/evidence was defined in the form of secondary Merlin evidence (whitewash, pellets, feathers), prey remains (feather spots, moth wings, prey remains etc.), nests (possible or occupied) and direct observations (calling birds, displaying birds, hunting birds, inter-specific aggression etc.). Locations of collected evidence or observations were recorded for subsequent visits and prey remains and pellets were collected, placed in a bag and labelled with the date, site and location (for subsequent analysis). Additional raptor species such as Kestrel, Sparrowhawk or Buzzard were noted. Evidence of species such as Long-Eared Owl (in the form of pellets) was also collected if recorded

Hen Harrier

Hen Harrier surveys, following methods used in the Irish Hen Harrier Winter Roost Survey (IHHWS [49]) were carried out at known roosts or areas with potential for roosts, within the study area. This focussed on 2 historically utilised roosts whose locations were provided from NPWS following consultation. Numbers of birds utilising these roosts, in addition to access routes to and from roosts and other flight activity was recorded over 2 winters (October 2012 to March 2014). Note: the location of any roosting activity by Hen Harrier was agreed to be kept confidential following consultation with NPWS.

Red Grouse

Red Grouse surveys were carried out at 2 (Windmill and Drehid-Hortland) of the 5 clusters which comprise the Maighne Wind Farm Development. The method employed followed published best practice utilised in the recent National Red Grouse survey [50]. Transects were walked through suitable habitat for this species and a tape lure of a calling male Red Grouse was played at set intervals. Any responses were noted. The use of a tape lure was carried out under license.

3.4.2 Terrestrial Mammals (excluding Bats)

Mammal surveys were carried out in tandem with winter walkover surveys over the winter period 2012/2013. Any sightings, tracks or signs (including droppings, resting places, burrows and setts) of mammals occurring within, or in the vicinity, of the site were recorded using field notes and/or hand held GPS units. All evidence of note in regard to mammals was recorded as target notes and subsequently digitised using ArcGIS Desktop 10.1.

In the case of Otter proposed access track water course crossings were visited in November/December 2014 when internal road layouts had been finalised to check for breeding sites or resting places. In addition watercourse crossings on the proposed MV cable route and Grid Connection route were surveyed for evidence of Otter.

3.4.3 Terrestrial Mammals (Bats)

Introduction

Bats utilise treeline and hedgerow boundaries of agricultural grasslands, sheltered minor roads and lanes, scrub and woodland edge habitats as foraging areas and commuting routes and large-scale development in such areas may adversely affect bats in a number of ways such as vegetation removal or new tracks which may impact bats through the creation of open space barriers that bats may be unwilling to cross. Bat roosts in trees or buildings may be lost if they have to be removed. The removal of hedgerows and treelines and the loss of mature trees, draining of wet areas and provision of artificial lighting all affect the availability of invertebrate prey and feeding areas. It is essential therefore that a comprehensive study of bat activity at affected sites be undertaken (as was for the current appraisal) to identify any conflict zones and hence to avoid or reduce impacts through mitigation to safeguard these animals.

Previously referenced guidelines recommend that the potential impacts of a proposed development on bats are assessed over several seasons in order to take into consideration the affect the planned development may have on the nightly and seasonal behaviour of bats including:

1. Post hibernation spring re-emergence
2. Peak summer activity
3. Autumnal mating behaviour and, where necessary
4. Winter hibernation.

Each method of surveying bats has its own specific merit in observing and identifying the different species, their occurrence and landscape use (roosts, flight paths, hunting areas). However, each method is selective. The best approach, therefore, is through using a strategic combination of techniques. As outlined below in Table 3.5.

Table 3.5: Bat Survey Timing Maighne Wind Farm

Month	May 2013	June 2013	September 2013	December 2013	December 2014
Survey Type	Spring Detector surveys	Summer Detector Surveys, onsite structure surveys and roost assessment	Autumn Identification of Leislers Bats Lekking areas, other mating sites	Winter Assessment of known hibernation sites and access of potential hibernacula if required	Structure Survey along proposed cable routes

Desktop Study

A desk study of extant bat records in the vicinity of the study area was also undertaken by evaluation of relevant literature and a review of *Bat Conservation Ireland's* National Bat Records Database and the *National Parks and Wildlife Service's* National Lesser Horseshoe Bat Roost Database.

Areas likely to be of interest for bats within Maighne Wind Farm site and in the wider landscape were identified and selected from mapping and ortho-photography before being assessed on the ground as the nature and type of habitats present are indicative of the species likely to be present. During site visits, landowners were also questioned in relation to bat observations within their farmyards, dwellings and outbuildings.

Field Methods

Habitats on each site were assessed for their favourability for bats and where possible, structures were surveyed for bat presence either externally via bat detector, internally by visual inspection or by a combination of both.

All accessible areas of such structures were inspected for bats and/or their signs using powerful torches. The presence of bats is often shown by grease staining, droppings, urine marks, corpses, feeding signs such as invertebrate prey remains and/or the presence of bat fly *Nycteribiidae* pupae, although direct observations are also occasionally made.

Bat droppings are often identifiable to species-level based on their size, shape and content and those of certain species, for example brown long-eared *Plecotus auritus* and lesser horseshoe *Rhinolophus hipposideros* bats, are very distinctive and unmistakable.

An assessment of potential bat roosts in trees will be undertaken at pre-construction stage when impacted trees are known. A survey of trees to be removed is best undertaken as near as possible to felling as bats are highly mobile animals that can move into affected trees between their survey and their removal if the period is a long one.

The winter 2013/2014 assessment of bat hibernation sites within or adjacent to the study areas found that veteran and mature trees, older buildings, bridges, farm outbuildings and derelict structures have potential for use as winter roosting sites in which bats can hibernate however no such hibernation site is currently known in the local area and none was identified during the assessment. In winter, bats can secrete themselves deep within such structures and so can be present without being visible. The exception is the lesser horseshoe bat which hangs in the open within structures and is easily seen but this species is absent from the Midlands. Bats in Ireland as elsewhere, are known to hibernate in natural caves especially in limestone areas but there are no known natural caves in Co. Kildare or Co. Meath (Drew 2004). Apart from natural underground features, manmade prehistoric underground structures - souterrains - are also known to be used by these animals and one potential such prehistoric site is present within the townland of Drehid (ref.: www.archaeology.ie) however the feature is buried and therefore not accessible to bats.

Transects through bat favourable habitats were walked in each of the planned development areas during which bat activity was recorded using heterodyne/frequency division (*Bat Box Duet - BatBox Electronics*) and heterodyne/frequency division/time expansion (*Echometer EM3+ - Wildlife Acoustics*) detectors while the wider area of the proposed development was surveyed from a vehicle driven at 20kph with a detector mounted on the hedge-side of the vehicle. Bats were identified by their ultrasonic calls coupled with behavioural and flight observations and on computer by sound analysis of recorded echolocation and social calls with dedicated software (*Kaleidoscope Viewer - Wildlife Acoustics*).

Nocturnal bat activity is mainly bi-modal taking advantage of increased insect numbers on the wing in the periods after dusk and before dawn, with a lull in activity in the middle of the night. This is particularly true of 'hawking' species – i.e. bats which capture prey in the open air. However, 'gleaning' species remain active throughout the night as prey is available on foliage for longer periods. The prime periods for detecting bat activity especially flight paths and commuting routes, therefore, are two hours after dusk and again for a shorter period before dawn.

Bat activity is governed by the activity of their insect prey and insect abundance is in turn governed by weather conditions and climate. Insects, and therefore bats, are unlikely to be abroad at temperatures below 6°C or during periods of strong winds or heavy rainfall so survey in such conditions is not possible.

All field surveys were undertaken within the active bat seasons and during good weather conditions.

Due to an iterative design layout process, some areas surveyed in 2013 are now no longer within the scheme.

Survey Constraints

There were no climatic or seasonal constraints to the onsite assessments as each was undertaken during optimal conditions however the prolonged winter of 2012/2013 and very cold spring of 2013 resulted in decreased numbers or indeed an absence of flying insects up to the end of May which affected bat activity.

In 2013, the Irish bat fauna experienced a second consecutive winter and spring of exceptionally low temperatures. In 2012, bat activity throughout the country was noticeably affected by the severely cold temperatures with bats remaining in hibernation far longer than usual. Some species remained underground until mid-May (pers. obs.); unlike, in 'normal' years, when bats are usually active from mid-March onwards.

The prolonged and record rainfall in the summer of 2012 which followed the long winter of 2011/2012 noticeably affected a range of animal species including bees, butterflies and moths and resulted in far fewer numbers of these invertebrates being on the wing than in other years. The reduction in prey items affected bat activity and would certainly have lead to malnourised animals entering hibernation. Any young born late in the summer of 2012 would likely have perished during the following winter having had less time for feeding and, consequently, low fat reserves. The negative impacts of the spring and summer weather were then exacerbated by a second prolonged winter which lasted until the end of May 2013 with night temperatures throughout the month of only 2°C to 6°C which is certain to have resulted in greater mortality of juveniles.

The prolonged winter of 2012/2013 also resulted in staggered and late birth of young, abandonment of pups, roost absence and poor foraging activity in 2013 and to compound matters further, the bats which survived the extended winter and finally emerged from hibernation two months later than usual at the end of May had only four to five hours of darkness in which to feed compared to eight or nine hours of darkness had they emerged from hibernation in mid-March as the nights in May are far shorter.

As a result of the weather conditions during 2012 and early 2013 as outlined above, bat activity and numbers across the country were noticeably lower in the summer and autumn of 2013 than in previous years with activity being especially poor through the month of June until temperatures rose sufficiently and stabilised. There were no seasonal or climatic constraints to survey in 2014.

3.4.4 Habitats

Field Survey

A walkover survey to identify habitats was carried out at the study site during July 2013. Habitats were visited and classified according to Fossitt (2000) [51] and following best practice as in Smith *et al*. 2011 [18].

Ortho-photographs of the subject site were annotated in the field to delineate each habitat type identified. Target notes were recorded for each habitat polygon. The minimum size of habitats mapped was 400m² for polygons, or 20m for linear habitats, in line with recommended guidance [18]. The position of notable small habitats and features of interest (e.g. springs) was marked using a GPS, and recorded as points of interest. The main plant species in each habitat type were recorded on a tick list, thereby enabling a full species list for each site to be compiled (Appendix 8). Any areas of habitat which were identified as having potential to be of Annex I quality were highlighted for further survey to confirm the Annex status.

Marsh Fritillary Habitat Assessment
Due to the Maighne Wind Farm being located within the potential dispersal zone of known populations of Marsh Fritillary; a habitat appraisal methodology was specifically designed or this species following consultation and training with Butterfly Conservation Ireland (BCI). Appraisal criteria was based on a number of factors such as percentage cover of food plant, aspect, slope etc. as advised by BCI. This enabled potential habitats for this species to be identified even if not currently being utilised.

3.4.5 Aquatic Ecology

Field survey work to inform the current ecological appraisal was undertaken during the period August to October 2013. Figure 3.1**,** gives the location of the five components of the proposed Maighne Wind Farm and with respect to water regions (Hydrometric Area and catchment).

Legislative Context

A diversity of flora and fauna, rare at a national level, are protected under the provisions of the Wildlife Acts, 1976 [52] and 2000 [53]; and the secondary legislation made thereunder, including the Flora Protection Order 1999 (S.I. No. 94 of 1999) [54]. The Habitats Directive 1992 is now transposed into Irish law by way of, *inter alia*, the European Communities (Birds and Natural Habitats) Regulations (2011 to 2013).

Under the Fisheries (Consolidation) Act, 1959, it is an offence to disturb the bed of a river; and written permission from Inland Fisheries Ireland is required to proceed with works in any areas where disturbance to the spawning and nursery areas of both salmonids and lampreys is predicted. Salmon, all lamprey species and their habitats are further protected under the EU Habitats Directive, 1992.

Under Section 3 of the Local Government (Water Pollution) Act, 1977 (as amended by Sections 3 and 24 of the 1990 Act) it is an offence to cause or permit any polluting matter to enter waters. Suspended solids would be a key parameter here. Likewise any visual evidence of oil/fuel in the river would constitute an offence.

Section 171 of the Fisheries (Consolidation) Act 1959 creates the offence of throwing, emptying, permitting or causing to fall onto any waters deleterious matter. 'Deleterious matter' is defined as not only as any substance that is liable to injure fish but is also liable to damage their spawning grounds or the food of any fish or to injure fish in their value as human food or to impair the usefulness of the bed and soil of any waters as spawning grounds or other capacity to produce the food of fish.

Selection of Watercourses for Assessment

All watercourses/water bodies which could be affected directly (i.e. within the Maighne Wind Farm Development) or indirectly (i.e. within 500 m of the site boundary) were considered as part of the current appraisal. Some of the sites assessed are located greater than 500 m from the site boundary. Generally only streams and other watercourses shown on the 1:50,000 Discovery Series Maps were examined, as watercourses smaller than this are not normally of fisheries or aquatic ecological significance.

A total of 10 sites were selected for detailed evaluation. The sites selected for assessment are stated in Table 3.6 and the location of these sites is shown in Figure 3.2.

The surveys completed at each site were at a level required to make an evaluation of biological water quality, fisheries value, aquatic habitat value, and presence of rare/protected/notable aquatic species at each site. Due to land access restrictions sampling could only be undertaken at sites within the land option areas. However, watercourses downslope of the proposed development were observed from public roads and this allowed such watercourses to be adequately evaluated for the purpose of the current appraisal.

Aquatic Habitat Appraisal

Habitat appraisal was carried out at the rivers/streams on, and in the vicinity of, the site using the methodology given in the Environment Agency's '*River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003*' [(55)] and the Irish Heritage Council's *'A Guide to Habitats in Ireland'* [(51)]. All the affected watercourses were evaluated in terms of:

1. Stream width and depth and other physical characteristics
2. Substrate type, listing substrate fractions in order of dominance, i.e. large rocks, cobble, gravel, sand, mud etc.
3. Flow type, listing percentage of riffle, glide and pool in the sampling area
4. In stream vegetation, listing plant species occurring and their percentage coverage of the stream bottom at the sampling site (as applicable) and on the bankside
5. Estimated cover by bankside vegetation, giving percentage shade of the sampling site.

The results of the physical habitat study were used in conjunction with the leaflet '*The Evaluation of habitat for Salmon and Trout*' (DANI Advisory leaflet No. 1) to assess habitat suitability for salmonids. Stream order is described using the classification system given in Strahler (1957) [(56)] which defines stream size based on a hierarchy of tributaries (with Ist order streams being the smallest).

The Water Framework Directive status of waterbodies in the study area was estimated with reference to the manual *'European waters — assessment of status and pressures'* by the European Environmental Agency (2012) [(57)].

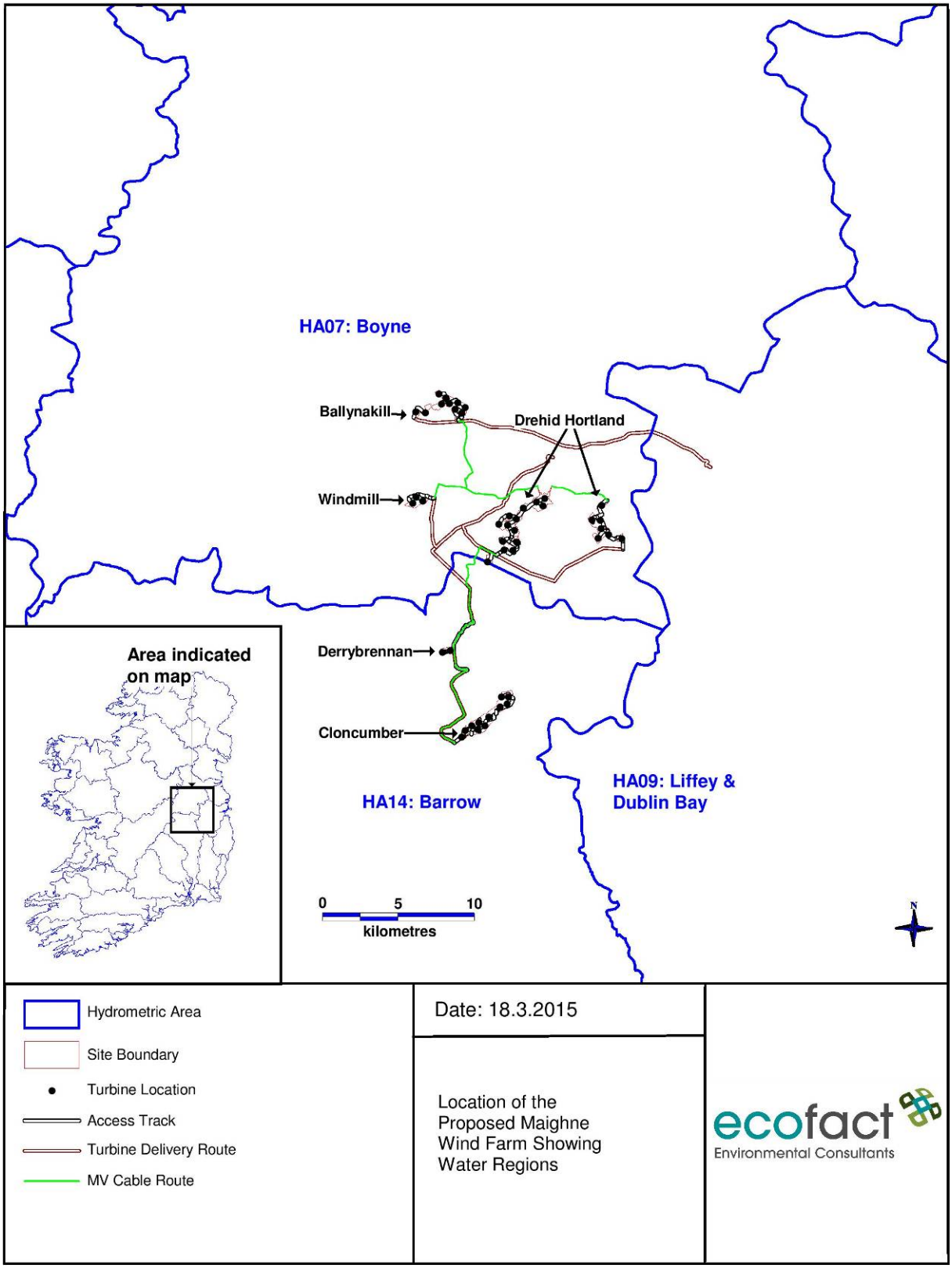

Figure 3.1: Water Regions within five Clusters of the Proposed Maighne Wind Farm

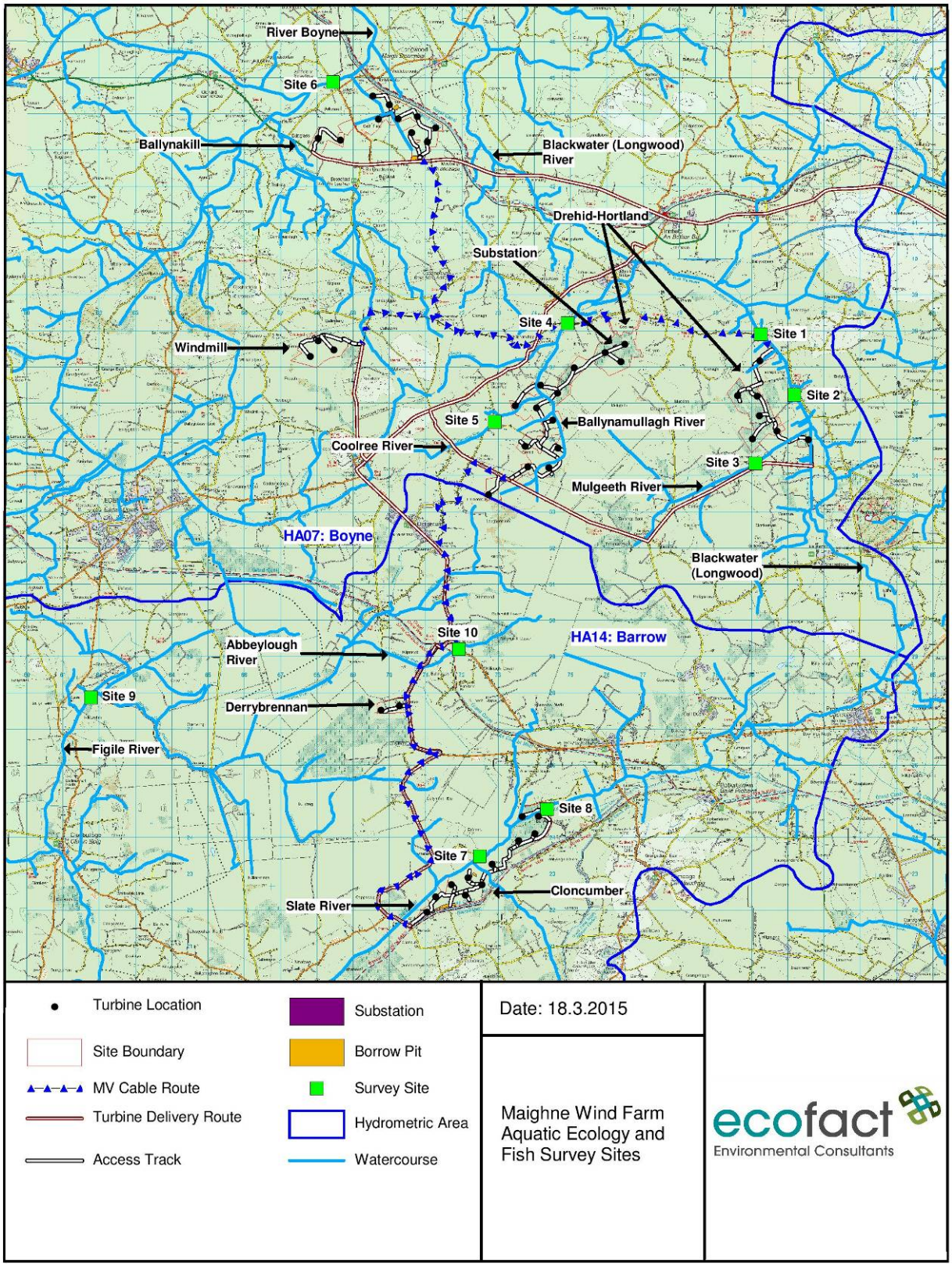

Figure 3.2: Maighne Wind Farm Aquatic Ecology and Fisheries Survey Sites

Table 3.6: Location of the Aquatic Ecology and Fisheries Survey Sites August/October 2013 Survey

Site No.	Catch-ment	Relevant component of wind farm	Sub-catchment	River	Tributary	Watercourse Name	Segment code	EPA code
1	Boyne	Drehid-Hortland	Blackwater (Longwood)	Blackwater (Longwood)		Blackwater (Longwood)	07_925	07B02
2	Boyne	Drehid-Hortland	Blackwater (Longwood)	Blackwater (Longwood)		Blackwater (Longwood)	07_1043	07H03
3	Boyne	Drehid-Hortland	Blackwater (Longwood)	Blackwater (Longwood)	Mulgeeth	Mulgeeth	07_1720	07M54
4	Boyne	Drehid-Hortland	Blackwater (Longwood)	Blackwater (Longwood)	Coolree 07	Coolree 07	07_1848	07C23
5	Boyne	Drehid-Hortland	Blackwater (Longwood)	Blackwater (Longwood)	Coolree 07	Coolree 07	07_1230	07C23
6	Boyne	Ballynakill, Windmill	Boyne	Boyne		Boyne	07_951	07B04
7	Barrow	Cloncumber	Figile	Slate		Slate	14_1574	14S01
8	Barrow	Cloncumber	Figile	Slate		Slate	14_235	14S01
9	Barrow	Derrybrennan	Figile	Figile		Figile	14_553	14F01
10	Barrow	Derrybrennan	Figile	Figile	Abbeylough	Abbeylough	14_1678	14A01

Aquatic macroinvertebrate surveys

Kick sampling

Qualitative sampling of benthic (or bottom dwelling) macroinvertebrates was undertaken at selected (index) sites using kick-sampling (Toner *et al.*, 2005) [58]. This procedure involved the use of a 'D' shaped hand net (mesh size 0.5mm; 350mm diameter) which was submerged on the river bed with its mouth directed upstream. The substrate upstream of the net was then kicked for one minute in order to dislodge invertebrates, which were subsequently caught in the net. This procedure was undertaken at three points along/across the watercourse. Stone washings and vegetation sweeps were also undertaken to ensure a representative sample of the fauna present at each site was collected.

All samples of invertebrates were combined for each site and live sorted on the river bank and identified to the level required to assign a Q-rating or Small Stream Risk Score (SSRS) score. Samples were also collected and fixed in ethanol for subsequent laboratory identification.

Biological water quality

The Quality Rating (Q) System (Toner *et al*, 2005 [58]) and the SSRS were used to obtain a water quality rating/risk assessment for each site.

The Quality Rating System (Q-Value) is based on the well-established sensitivities, abundance and diversity of macroinvertebrates and their relation to water quality. The changes brought about by organic pollution in the bottom dwelling (benthic) macroinvertebrate community in rivers are particularly well documented. These changes are due to the varying sensitivities of the different components of the community to the stresses caused by pollution. It is well documented that community diversity declines in the presence of pollution and that more tolerant forms progressively replace sensitive species as the level of pollution increases. The same basic Quality Rating System (Q-Value) has been used to assess the water quality of Irish rivers since 1971. It has provided the primary basis for mapping long-term trends of water quality in Irish rivers by the EPA. For the purposes of the Irish assessment procedure, benthic macroinvertebrates are divided into five indicator groups ranging from the most disturbance sensitive taxa to the most insensitive taxa as follows:

1. Group A, the sensitive forms
2. Group B, the less sensitive forms

3. Group C, the tolerant forms
4. Group D, the very tolerant forms
5. Group E, the most tolerant forms.

The Q-Value assigned to a site depends on inter alia, the degree of departure of the river fauna's taxonomic composition, diversity and abundance from its reference condition at close to natural, undisturbed conditions. A Q-Value of Q5 indicates that conditions are close to reference conditions whereas a Q-Value of Q1 indicates the presence of serious pollution. The Q-Value employs the ratio of disturbance sensitive to insensitive taxa to indicate the degree or extent of change from the natural reference conditions at a site.

The Quality Rating System (Q-Value) has been intercalibrated at European level in both the Northern Geographical Intercalibration Group (NGIG) and the Central/Baltic Geographical Intercalibration Group (CBGIG). The relationship between Q-Value and Ecological Status for macroinvertebrates is as shown in Table 3.7.

Table 3.7: Relationship between Q-Value and Ecological Status for Macroinvertebrates

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

** These values are based primarily on the relative proportions of pollution sensitive to tolerant macroinvertebrates (the young stages of insects primarily but also snails, worms, shrimps etc.) resident at a river site.*
*** "Condition" refers to the likelihood of interference with beneficial or potential beneficial uses*

Protected aquatic invertebrates

An assessment of the occurrence of rare protected species (e.g. white-clawed crayfish, freshwater pearl mussels) at sampling sites was assessed by underwater visual observation using bathyscopes.

Fisheries assessments

Visual surveys

Many of the streams on the proposed wind farm site were small first order streams or field drains that could be assessed visually and categorised as watercourses of insignificant fisheries importance that contained no fish. Other areas where access could not be provided (i.e. outside the option lands areas) were also assessed visually from publically accessible areas.

Dip netting surveys

Qualitative netting with a 'D' shaped dip net (35cm diameter, 2mm mesh) was carried out at selected sites to check for the presence/absence of small fish. This method was generally employed in drains and very small watercourses. The net was used in a circular motion to intercept small fish sheltering in instream vegetation stands and under the bank vegetation overhang.

Electrofishing surveys

An electrical fishing assessment was carried out at Site 9 on the Figile River under authorisation from the DCENR under Section 14 of the Fisheries Act (1980).

The purpose of this survey was to provide information on the presence of Annex II listed fish species (i.e. lampreys and salmon) and other fish (i.e. Brown Trout and Eels) at selected sites.

Sites were surveyed following the methodology outlined in the CFB guidance "*Methods for the Water Framework Directive - Electric fishing in wadable reaches*". A portable electrical fishing unit (Smith Root-LR 24 backpack or Marine Electrics Safari Researcher 660D) was used during the assessment. Fishing was carried out continuously for 5 minutes at each site and captured fish were collected into a container of river water.

Captured fish were then anaesthetised using a solution of 2-phenoxyethanol and measured to the nearest mm using a measuring board. Subsequent to this the fish were allowed to recover in a container of river water. All fish were released alive and spread evenly over the sampling area. Following completion of the fishing the dimensions and physical habitat characteristics of each site were recorded.

The evaluation criteria used in the current assessment follows the '*Guidelines for the Assessment of Ecological Impacts of National Realignments – Revision 2*' [59]. 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.

Following the guidance set out by the NRA (2009 [19]) the study area for the proposed development has been evaluated based on an identified zone of influence with regard to the potential for pathways for impacts affecting ecological features of interest (habitats, flora and fauna).

Ecological features are assessed on a scale ranging from international-national-county-local. The local scale is taken as corresponding to the zone of influence of the development and extending to a parish area. The evaluation criteria are presented below. Watercourses, evaluated following the NRA (2009 [19]) criteria were evaluated on the basis of a number of characteristics and features defined as follows:

1. Aquatic habitat refers to the in-water conditions of any watercourse; including substrate and stream structure (i.e. proportion of riffles, runs and pools)
2. The fisheries value of a watercourse refers to its suitability for fish, primarily salmonids (salmon and trout), and to the associated value for recreational angling purposes
3. Annex II species are those that are listed under the EU Habitats Directive (92/43/EEC)
4. Annex I habitats are those that are listed under the EU Habitats Directive, including Priority Habitats
5. The evaluation of water quality uses a five-point biotic index (Q-value) based on the presence and relative abundance of various invertebrates using the Environmental Protection Agency's (EPA) standard technique.

Other Taxa Investigations

Particular attention was given to Lepidoptera (butterflies and moths), Odonata (dragonflies and damselflies) and any other taxa occurring at or near the site, whilst conducting various surveys. Observations of note were recorded as target notes and locations recorded using a hand held GPS.

The conservation status of other taxa was assessed by checking if any are listed in one or more of the following: Wildlife Acts (1976-2012 [60]), the Irish Red Data List [61], the EU Habitats Directive [1] and other relevant sources.

4 DESCRIPTION OF EXISTING ECOLOGICAL ENVIRONMENT

4.1.1 Overall Site in Context

The proposed Maighne Wind Farm lies primarily within North Kildare (2 proposed turbine locations are in South County Meath). The landscape of north Kildare is stongly influenced by the Bog of Allen resulting in a mosaic of various habitats from improved agricultural farmland to raised bog, cutover bog and forestry in various stages of its lifecycle. The subject site consists of 5 clusters of proposed turbines. Of these clusters, two are located at the northern and southern extremity of the overall site in improved agricultural land, with the remaining clusters situated within or on the periphery of historical or existing raised bog basins. The majority of these basins have been exploited for resources such as peat extraction or forestry and this is reflected in the habitats within which the proposed turbines are to be placed.

The area is drained by a number of river catchments, primarily the Rivers Boyne and Blackwater (north) which drain the northern clusters of the proposed Wind Farm site whilst the River Slate and Figile (via the Cushaling and Crabtree Rivers) drain the southern clusters. Two canals, the Royal and the Grand transect the proposed development area. The M4 motorway also transects the greater area south of the northernmost cluster of proposed turbines which abuts the county boundary with Meath.

4.1.2 Designated Nature Conservation Sites

In total, there are 36 designated sites or proposed designated sites within 15km of the proposed development (see Table 4.1). Ten of these are Natura 2000 or 'European' sites. Of these 10 European sites, nine are candidate Special Areas of Conservation (cSACs) and one is designated as a Special Protected Area (SPA). It should be noted that a number of the cSAC sites are also designated as a Natural Heritage Areas (NHA). There are 20 proposed Natural Heritage Areas (pNHAs) and four additional, designated Natural Heritage Areas (NHAs). Table 4.1, overleaf, details the designated sites located within 15km of the proposed development, including their qualifying interests as well as the distances of these sites from the study area. Figure 7.1, Appendix 6, shows the location and extent of the designated nature conservation sites within 15km of the study area. The NPWS sites synopses for natura sites and available information on proposed and designated Natural Heritage Areas can be viewed on www.npws.ie [(62)].

The River Boyne and River Blackwater cSAC (site code: 002299) is located c.800m from the proposed wind farm development at its closest point (adjacent to the Ballinakill cluster). The cSAC is designated for aquatic species such as otter (*Lutra lutra*), river lamprey (*Lampetra fluviatilis*) and salmon (*Salmo salar*), as well alkaline ferns and alluvial forest. Some of the grassland areas along the Boyne and Blackwater are used by a nationally important winter flock of Whooper Swan (*Cygnus cygnus)*; although this species is not one for which the site has been selected for designation.

The River Boyne and River Blackwater SPA (site code: 004232) is located is located c.840m from the proposed development at its closest (adjacent to the Ballinakill cluster). The SPA is of high ornithological importance as it supports a nationally important population of kingfisher, a species that is listed on Annex I of the EU Birds Directive [(2)].

Ballynafagh Bog cSAC (site code 000391) is located 6.19km from the proposed development. The site is a raised bog situated c.1km west of Prosperous, Co. Kildare. The site contains the priority habitat active raised bog and also supports breeding Merlin.

Pollardstown Fen cSAC (site code 000396) is located 6.74km from the proposed development. Pollardstown Fen is situated on the northern margin of the Curragh of Kildare, approximately 3 km north-west of Newbridge. It lies in a shallow depression, running in a north-west/south-east direction. About 40 springs provide a continuous supply of water to the fen. These rise chiefly at its margins, along distinct seepage areas of mineral ground above the fen level. The continual inflow of calcium-rich water from the Curragh, and from the limestone ground to the north, creates waterlogged conditions which lead to peat formation. There are layers of calcareous marl in this peat, reflecting inundation by calcium-rich water. This peat-marl deposit reaches some 6m at its deepest point and is underlain by clay. The site contains a number of habitats/species listed on Annex I/II of the EU Habitats Directive, including the priority habitat *Cladium* Fens [7210].

The site supports important invertebrate species and is the only site in Ireland to support all three *Vertigo* snail species.

Ballynafagh Lake cSAC (site code 001387) is located 5.45km from Maighne Wind Farm. Ballynafagh Lake is located about 2km north-west of Prosperous in Co. Kildare. It is a shallow alkaline lake with some emergent vegetation. The Blackwood Feeder, which connects Ballynafagh Lake to the Grand Canal, is also included in the site. The site contains the Annex I habitat Alkaline fens [7230].

Rye Water Valley/Carton cSAC (site code 001398) is located 13.61km from Maighne Wind Farm. Rye Water Valley/Carton SAC is located between Leixlip and Maynooth, in Counties Meath and Kildare, and extends along the Rye Water, a tributary of the River Liffey. The site is designated for a number of habitats and/or species listed on Annex I/II of the EU Habitats Directive including the priority habitat [7220] Petrifying Springs.

The River Barrow and River Nore cSAC (site code 002162) is located 13.5km from Maighne. This site consists of the freshwater stretches of the Barrow and Nore River catchments as far upstream as the Slieve Bloom Mountains, and it also includes the tidal elements and estuary as far downstream as Creadun Head in Waterford. The site passes through eight counties – Offaly, Kildare, Laois, Carlow, Kilkenny, Tipperary, Wexford and Waterford. Major towns along the edge of the site include Mountmellick, Portarlington, Monasterevin, Stradbally, Athy, Carlow, Leighlinbridge, Graiguenamanagh, New Ross, Inistioge, Thomastown, Callan, Bennettsbridge, Kilkenny and Durrow. The larger of the many tributaries include the Lerr, Fushoge, Mountain, Aughavaud, Owenass, Boherbaun and Stradbally Rivers of the Barrow, and the Delour, Dinin, Erkina, Owveg, Munster, Arrigle and King's Rivers on the Nore. Within the context of the proposed wind farm connectivity exists with the River Barrow via the Slate River which flows south-westwards from the Cloncumber cluster and joins with the River Figile; connecting to the River Barrow further south. Overall, the site is of considerable conservation significance for the occurrence of good examples of habitats and of populations of plant and animal species that are listed on Annexes I and II of the E.U. Habitats Directive. Furthermore it is of high conservation value for the populations of bird species that use it. The occurrence of several Red Data Book plant species including three rare plants in the salt meadows and the population of the hard water form of the Freshwater Pearl Mussel, which is limited to a 10km stretch of the Nore, add further interest to this site.

Mouds Bog cSAC (site code 002331) is located 5.4km from the subject site. Mouds Bog is located about 3km north-west of Newbridge in Co. Kildare, close to the Hill of Allen, and includes amongst others, the townlands of Grangehiggin, Barretstown and Hawkfield. The site comprises a raised bog that includes both areas of high bog and cutover bog. Much of the margins of the site are bounded by trackways.

Mount Hevey Bog cSAC (site code 002342) is located 5.4km from the subject site. Mount Hevey Bog is situated approximately 4km north-east of Kinnegad, in the townlands of Cloncrave, White Island, Aghamore, Kilwarden and Kilnagalliagh. The Meath-Westmeath County boundary runs through the centre of the bog. The site comprises a raised bog that includes both areas of high bog and cutover bog. The Dublin-Sligo railway runs through the northern part of the bog isolating two northern lobes. The northern lobes are adjacent to the Royal Canal. The site contains the priority Annex Habitat [7110] Active Raised Bog. Mount Hevey Bog is a site of considerable conservation significance as it comprises a raised bog, a rare habitat in the E.U. and one that is becoming increasingly scarce and under threat in Ireland. The site supports a good diversity of raised bog microhabitats, including hummock/hollow complexes, pools, flushes and regenerating cutover, as well as a number of scarce plant species. Active raised bog is listed as a priority habitat on Annex I of the E.U. Habitats Directive. Priority status is given to habitats and species that are threatened throughout the E.U. Ireland has a high proportion of the total E.U. resource of this habitat type (over 60%) and so has a special responsibility for its conservation at an international level.

The Long Derries, Edenderry cSAC (site code 000925) is located 3.09km from the proposed development. The Long Derries is located approximately 5km south-east of Edenderry in Co. Offaly and is part of a low esker ridge running from Edenderry to Rathdangan. It consists primarily of glacial gravels interspersed with loam and peat soil. The site contains the priority Annex I habitat [6210] Orchid-rich Calcareous Grassland.

Ballina Bog pNHA (site code 000390) is located 940m from the proposed development. Ballina Bog is situated about 8km west of Enfield and just south-west of Moyvalley in an elongated valley in Co. Kildare. Much of the surface is of good quality and quite wet in spite of the presence of many drains. The drains cross the bog in a north-east to south-west direction and also a few run east-west. The former are shallow and of long standing. Many have been filled in by bog moss (*Sphagnum* spp.) growth but retain moving water towards the edges of the bog. Two much deeper drains were inserted in the early 1980s and may cause more long-term damage to the bog. The vegetation and structure of the surface is well developed, especially in the southern half.

Substantial areas of hummock and hollow topography exist, with pools and active *Sphagnum* growth. Much of the *Sphagnum* is *S. magellanicum*. Heather (*Calluna vulgaris*) and cottongrasses (*Eriophorum vaginatum* and *E. angustifolium*) are frequent on the surface.

A large part of the bog has remained unburned for 20-30 years and contains an abundance of the lichen *Cladonia impexa*. Marginal peat cutting has been carried out at the northern and eastern ends of the bog. Despite the presence of many drains, the condition of the vegetation and surface makes this bog of considerable scientific importance. It is one of the most easterly raised bogs which are relatively intact.

Ballynafagh Bog pNHA (site code 00391) is located 6.19km from the proposed development. The site is a raised bog situated c.1km west of Prosperous, Co. Kildare. The site contains the priority habitat active raised bog and also supports breeding Merlin.

Curragh (Kildare) pNHA (site code 000392) is located 7.35km from the proposed development. The Curragh is an extensive open plain which lies about 3km south west of Newbridge in Co. Kildare. It is bisected by the M7/N7 motorway and a railway line. The Curragh Camp and Curragh Racecourse are located within the plain. The site extends for some 10km in a north-west/south-east direction and is approximately 5km at its widest. The town and most of the racecourse are not included in the site.

The solid geology of the area consists of limestone bedrocks. Overlying this are quaternary deposits. Glacial and glaciofluvial (glacial meltwater) deposits are generally very thick in the Curragh, usually 20-70m. This over-burden forms part of what is known as the Mid-Kildare or Curragh Aquifer. In addition to groundwater flow from the aquifer, the principal surface discharges includes the River Liffey, the Tully Stream, the wetlands east of Monasterevin and the Milltown Feeder which supplies both Pollardstown Fen and the Grand Canal.

Mouds Bog pNHA (site code 00395) is located 5.4km from the subject site. Mouds Bog is located about 3km north-west of Newbridge in Co. Kildare, close to the Hill of Allen, and includes amongst others, the townlands of Grangehiggin, Barretstown and Hawkfield. The site comprises a raised bog that includes both areas of high bog and cutover bog. Much of the margins of the site are bounded by trackways.

Pollardstown Fen pNHA (site code 000396) is located 6.78km from the subject site. Pollardstown Fen is situated on the northern margin of the Curragh of Kildare, approximately 3km north-west of Newbridge. It lies in a shallow depression, running in a north-west/south-east direction. About 40 springs provide a continuous supply of water to the fen. These rise chiefly at its margins, along distinct seepage areas of mineral ground above the fen level. The continual inflow of calcium-rich water from the Curragh, and from the limestone ground to the north, creates waterlogged conditions which lead to peat formation. There are layers of calcareous marl in this peat, reflecting inundation by calcium-rich water. This peat-marl deposit reaches some 6 m at its deepest point and is underlain by clay. The site contains a number of habitats/species listed on Annex I/II of the EU Habitats Directive, including the priority habitat *Cladium* Fens [7210]. The site supports important invertebrate species and is the only site in Ireland to support all three *Vertigo* snail species.
Rathmoylan Esker pNHA (site code 000557) is located 9.6km from the subject site.

Rathmoylan Esker is a Natural Heritage Area comprising several segments on a series of north-west to south-east trending eskers located 7km south of Trim near the village of Rathmoylan in Co. Meath. Several parts of these eskers have been colonised by semi-natural deciduous and mixed woodland. Due to extensive quarrying operations, only three intact areas of wooded esker now remain. The most natural and undisturbed portion of woodland has developed on a narrow esker ridge surrounded by pasture on three sides and an abandoned quarry on the other. Ash (*Fraxinus excelsior*) is the dominant tree in the canopy with frequent Beech (*Fagus sylvatica*) present, particularly in the drier soils near the summit of the esker.

There is also a rich association of other tree species including Hawthorn (*Crataegus monogyna*), Hazel (*Corylus avellana*), Sycamore (*Acer psuedoplatanus*), Horsechestnut (*Aesculus hippocastanum*), birch (*Betula* spp.) and occasional oak (*Quercus* spp.) and a diverse shrub and herbaceous layer including Dog-rose (*Rosa canina*) and Elder (*Sambucus nigra*). A lot of rotting wood occurs on the woodland floor and there is a good byrophyte cover in many places. Rathmoylan Esker is an excellent example of this habitat type in an undisturbed and ungrazed state. It has good species diversity, a varied age structure and has retained its natural character.

The Long Derries, Edenderry pNHA (site code 000925) is located 3.09km from the proposed development.

The Long Derries is located approximately 5 km south-east of Edenderry in Co. Offaly and is part of a low esker ridge running from Edenderry to Rathdangan. It consists primarily of glacial gravels interspersed with loam and peat soil. The site contains the priority Annex I habitat [6210] Orchid-rich Calcareous Grassland.

Ballynafagh Lake pNHA (site code 001387) is located 5.5km from the proposed development. Ballynafagh Lake is located about 2km north-west of Prosperous in Co. Kildare.

It is a shallow alkaline lake with some emergent vegetation. The Blackwood Feeder, which connects Ballynafagh Lake to the Grand Canal, is also included in the site. The site contains the Annex habitat Alkaline fens [7230].

Donadea Wood pNHA (site code 001391) is located 1.99km from the proposed development. This site is located about 6km north of Prosperous in Co. Kildare. It is the old demesne woodland of Donadea Castle, and is now owned by Coillte. The soil of the area is glacial drift. The entire site has been planted with a mix of deciduous and coniferous trees. Ash (*Fraxinus excelsior*) is the predominant deciduous species, with some cherry (*Prunus* spp.), oak (*Quercus* spp.), Beech (*Fagus sylvatica*) and Sycamore (*Acer pseudoplatanus*). Occasional patches of Elder (*Sambucus nigra*), Hazel (*Corylus avellana*) and Hawthorn (*Crataegus monogyna*) are found. The site is notable for the presence of two rare species of Myxomycete fungus, namely *Diderma chondrioderma* and *Licea testudinacea*, the latter in one of only two known Irish sites.

Liffey at Oberstown pNHA (site code 001395) is located 13.28km from the proposed development. This site is located about 2km north-west of Naas, on the east bank of the River Liffey. The site, which was surveyed in 1976, is on a steep bank of about 10m in height. It is formed of a wet boulder-clay surface covered by mosses, willow (*Salix* spp.) scrub and some herbaceous species. The main plant of interest at the site was Dark-leaved Willow (*Salix myrsinifolia*), a rare plant in Ireland. By 1983 this site had been cleared of woodland and no Dark-leaved Willow was found. This site represented a good example of riverside vegetation, with two scarce plants.

Although cleared of woodland in 1983, remnants may remain or regeneration may have occurred.

Liffey Bank above Athgarvan pNHA (site code 001396) is located 14.92km from the proposed development. This site is located on the River Liffey about 3km north-west of Kilcullen in Co. Kildare. On one of the meanders above Athgarvan, the Liffey has cut into a very sandy patch of boulder clay, steepening its banks beyond the point where continuous vegetation can exist. The resulting unstable sandy slope faces south and is colonised by an interesting flora characteristic of unstable soil. Beds of harder rock boulder clay make small cliffs in places and the grassland above these is of Red Fescue (*Festuca rubra*) with Wild Garden (*Thymus polytrichus*), Oxeye Daisy (*Leucanthemum vulgare*),Carline Thistle (*Carlina vulgaris*) and Spring-sedge (*Carex caryophyllea*).

Rye Water Valley/Carton pNHA (site code 001398) is located 13.62km from the proposed development. Rye Water Valley/Carton pNHA is located between Leixlip and Maynooth, in Counties Meath and Kildare, and extends along the Rye Water, a tributary of the River Liffey. The site is designated for a number of habitats and/or species listed on Annex I/II of the EU Habitats Directive including the priority habitat [7220] Petrifying Springs.

Ballynabarny Fen pNHA (site code 001573) is located 1.52km from the proposed development. This fen lies in a small, deep, artificially-created valley between the embankments of the Royal Canal and the nearby railway, and is situated about 3km west-north-west of Longwood in Co. Meath. Ballynabarny Fen contains a good floral representation of a fen community. This habitat is relatively uncommon and the presence of Variegated Horsetail is a bonus.

The adjacent canal adds habitat diversity to the site.

Mount Hevey Bog pNHA (site code 001584) is located 5.4km from the proposed development. Mount Hevey Bog is situated approximately 4km north-east of Kinnegad, in the townlands of Cloncrave, White Island, Aghamore, Kilwarden and Kilnagalliagh. The Meath-Westmeath County boundary runs through the centre of the bog. The site comprises a raised bog that includes both areas of high bog and cutover bog. The Dublin-Sligo railway runs through the northern part of the bog isolating two northern lobes. The northern lobes are adjacent to the Royal Canal. The site contains the priority Annex Habitat [7110] Active Raised Bog. Mount Hevey Bog is a site of considerable conservation significance as it comprises a raised bog, a rare habitat in the E.U. and one that is becoming increasingly scarce and under threat in Ireland.

The site supports a good diversity of raised bog microhabitats, including hummock/hollow complexes, pools, flushes and regenerating cutover, as well as a number of scarce plant species. Active raised bog is listed as a priority habitat on Annex I of the E.U. Habitats Directive. Priority status is given to habitats and species that are threatened throughout the E.U. Ireland has a high proportion of the total E.U. resource of this habitat type (over 60%) and so has a special responsibility for its conservation at an international level.

The Royal Canal pNHA (site code 002103) is located immediately adjacenet to the proposed development at its closest.

The Royal Canal is a man-made waterway linking the River Liffey at Dublin to the River Shannon near Termonbarry Co. Longford. The canal has been designated as an NHA which is generally comprised of the central channel and the banks on either side of it.

Grand Canal pNHA (site code 002104) is located immediately adjacent to the proposed development at its closest. The Grand Canal is a man-made waterway linking the River Liffey at Dublin with the Shannon at Shannon Harbour and the Barrow at Athy Otter spraints are found along the towpath, particularly where the canal passes over a river or stream. The Common Newt breeds in the ponds on the bank at Gollierstown in Co. Dublin. The Rare and legally protected Opposite-leaved Pondweed (*Groenlandia densa*) (Flora Protection Order 1999 [54]) is present at a number of sites in the eastern section of the Main Line. The ecological value of the canal lies more in the diversity of species it supports along its linear habitats than in the presence of rare species.

Molerick Bog NHA (site code001582) is located 2.94km from the proposed development. Molerick Bog NHA is situated approximately 4 km south-west of Longwood in the townlands of Molerick, Anneville and Blackshade Co. Meath. The site comprises a raised bog that includes both areas of high bog and cutover bog. The site is bounded by the Dublin-Sligo railway line to the north and local roads to the east.

The site consists of a small basin bog with a dry surface. Cutover is found all around the site, there is broadleaved woodland located to the south-west, wet woodland is located to the north-west, scrub to the east, humid grassland to the south, a flush/fen area to the west and humid grassland on mineral soil to the north-west.

Black Castle Bog NHA (site code 000570) is locate 8.42km form the proposed development. Black Castle Bog NHA is situated approximately 8 km north-west of Edenderry, mainly in the townlands of Clonmore, Ballyheashill and Ballymacwilliam in County Meath. The site comprises a raised bog that includes both areas of high bog and cutover bog. The north-western margins of the site are bounded by roads and those on the south-east are bounded mainly by scrub and woodland. The site consists of one crescent-shaped lobe, which is quite flat. There is an absence of permanent pools on the high bog. The raised bog is of particular interest as it is one of the most easterly remaining raised bogs in the country. The peripheral area of abandoned cutover bog has developed into a range of different habitats.

Carbury Bog NHA (site code 001388) is located 1.43km from the proposed development. Carbury Bog NHA is situated 4 km north of Carbury, almost entirely within the townlands of Ardkill, Carbury and Knockcor, County Kildare. Carbury Hill, which rises to 142 m, lies directly south of the bog. This site originally consisted of two lobes but much of the large north-west lobe is actively cutover and has been excluded from the site.

The site consists of four sections separated by the old Edenderry railway line and the Carbury- Broadford road. Overall the southern section is quite wet with good hummock/hollow development. There is some marginal scrub woodland along the margins of the small western section. A narrow strip of deciduous woodland cuts through the main section in line with the old railway. Much of the high bog has vegetation typical of a Midland Raised Bog with Ling Heather (Calluna vulgaris) and Cottongrass (Eriophorum spp.). Other species present include Bog-rosemary (Andromeda polifolia) and Cranberry (Vaccinium oxycoccos).

Hodgestown Bog NHA (site code 001393) is located 3.67km from the proposed development. Hodgestown Bog NHA is located 4 km north-west of Prosperous, mostly in the townlands of Hodgestown, Coolearagh East and Garvoge in Co. Kildare. The site comprises a raised bog that includes both areas of high bog and cutover bog.

This raised bog was originally part of a much larger area of bog that has now been cutover and reclaimed for forestry and agriculture. Hodgestown Bog is separated by a mineral ridge from Ballynafagh SAC (391) and together these are two of the bogs at the eastern extreme of the range of raised bogs in Ireland.

Although Hodgestown bog has no pools there are hummocks throughout the high bog and there is also a small hummock/hollow complex. Cutover is found all around the high bog.

The Liffey Valley pNHA is located 7.8km from the proposed development. The main terrestrial habitat included within the site is mixed deciduous woodland on fertile, limey alluvium and boulder clay, in which Beech (*Fagus sylvatica)* is dominant in some areas. A wet marsh occurs on the strip of land between the Mill Race and the river east of the metal bridge and west of the paint factory.

Kilteel Wood pNHA is located 13.3km from the proposed development. This site is located about 10km north-east of Naas and immediately east of the village of Kilteel. The wood is situated on a hill which rises to 248m. The site is a small heathy wood mostly of oak (Quercus spp.) and Downy Birch (Betula pubescens). Other trees present include Beech (Fagus sylvatica), Sycamore (Acer pseudoplatanus), Ash (Fraxinus excelsior) and Scots Pine (Pinus sylvestris).

Slade of Saggart and Crooksling Glen pNHA is located 14km from the proposed development. This site is located in the south-west of Co. Dublin and stretches from Brittas northwards to approximately 2km south of Saggart. The northern half of the site comprises a river valley with steep tree-covered sides, while the southern side is flatter and contains two small lakes, the Brittas Ponds.

Table 4.1: Designated sites within 15 km of the Proposed Development

Site	Code	Features of Interest	Summary Description	Distance to Development
River Boyne and River Blackwater cSAC	002299	River lamprey (*Lampetra fluviatilis*) [1099] Salmon (*Salmo salar*) [1106] Otter (*Lutra lutra*) [1355] Alkaline fens [7230] Alluvial forests with *Alnus glutinosa* and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]	This site comprises most of the freshwater element of the River Boyne from upriver of the Boyne Aqueduct at Drogheda, the Blackwater River as far as Lough Ramor and the principal Boyne tributaries, notably the Deel, Stoneyford and Tremblestown Rivers. The rivers flow through a landscape dominated by intensive agriculture, mostly of improved grassland but also cereals. Much of the river channels were subject to arterial drainage schemes in the past. Natural flood-plains now exist along only limited stretches of river, though often there is a fringe of reed swamp, freshwater marsh, wet grassland or deciduous wet woodland. Along some parts, notably between Drogheda and Slane, are stands of tall, mature mixed woodland. Substantial areas of improved grassland and arable land are included in site for water quality reasons. The main channel of the Boyne contains a good example of alluvial woodland of the *Salicetum albo-fragilis* type which has developed on three alluvium islands. Alkaline fen vegetation is well represented at Lough Shesk, where there is a very fine example of habitat succession from open water to raised bog. The Boyne and its tributaries is one of Ireland's premier game fisheries and offers a wide range of angling, from fishing for spring salmon and grilse to sea trout fishing and extensive brown trout fishing. The site is one of the most important in eastern Ireland for Salmon (*Salmo salar*) and has very extensive spawning grounds. The site also has an important population of River Lamprey (*Lampetra fluviatilis*), though the distribution or abundance of this species is not well known. Otter (*Lutra lutra*) is widespread throughout the site. Some of the grassland areas along the Boyne and Blackwater are used by a nationally important winter flock of Whooper Swan (*Cygnus Cygnus*). Several Red Data Book plants occur within the site, with *Pyrola rotundifolia*, *Poa palustris* and *Juncus compressus*. Also occurring are a number of Red Data Book animals, notably Badger (*Meles meles*), Pine Marten *(Martes martes*) and *Rana temporaria*. The River Boyne is a designated Salmonid Water under the EU Freshwater Fish Directive.	0.80km

Site	Code	Features of Interest	Summary Description	Distance to Development
River Boyne and River Blackwater SPA	004232	Kingfisher (*Alcedo atthis*) [A229]	The River Boyne and River Blackwater SPA is a long, linear site that comprises stretches of the River Boyne and several of its tributaries; most of the site is in County Meath, but it extends also into Counties Cavan, Louth and Westmeath. It includes the following river sections: the River Boyne from the M1 motorway bridge, west of Drogheda, to the junction with the Royal Canal, west of Longwood, County Meath; the River Blackwater from its junction with the River Boyne in Navan to the junction with Lough Ramor in County Cavan; the Tremblestown River/Athboy River from the junction with the River Boyne at Kilnagross Bridge west of Trim to the bridge in Athboy, County Meath; the Stoneyford River from its junction with the River Boyne to Stonestown Bridge in County Westmeath; the River Deel from its junction with the River Boyne to Cummer Bridge, County Westmeath. The site includes the river channel and marginal vegetation. The site is a Special Protection Area (SPA) under the EU Birds Directive [(2)] of special conservation interest for the following species: Kingfisher (*Alcedo atthis*).	0.84km
Ballynafagh Bog cSAC	000391	[7110] Raised Bog (Active)* [7120] Degraded Raised Bog [7150] Rhynchosporion Vegetation	The site is a raised bog situated c.1km west of Prosperous, Co. Kildare. The site contains the priority habitat active raised bog and also supports breeding Merlin.	6.19km
Pollardstown Fen cSAC	000396	[7210] *Cladium* Fens* [7220] Petrifying Springs* [7230] Alkaline Fens [1013] Geyer's Whorl Snail (*Vertigo geyeri*) [1014] Narrow-mouthed Whorl Snail (*Vertigo angustior*) [1016] Desmoulin's Whorl Snail (*Vertigo moulinsiana*)	Pollardstown Fen is situated on the northern margin of the Curragh of Kildare, approximately 3 km north-west of Newbridge. It lies in a shallow depression, running in a north-west/south-east direction. About 40 springs provide a continuous supply of water to the fen. These rise chiefly at its margins, along distinct seepage areas of mineral ground above the fen level. The continual inflow of calcium-rich water from the Curragh, and from the limestone ground to the north, creates waterlogged conditions which lead to peat formation. There are layers of calcareous marl in this peat, reflecting inundation by calcium-rich water. This peat-marl deposit reaches some 6 m at its deepest point and is underlain by clay. The site contains a number of habitats/species listed on Annex I/II of the EU Habitats Directive, including the priority habitat *Cladium* Fens [7210].	6.74km

Site	Code	Features of Interest	Summary Description	Distance to Development
Ballynafagh Lake cSAC	001387	[7230] Alkaline Fens [1016] Desmoulin's Whorl Snail (*Vertigo moulinsiana*) [1065] Marsh Fritillary (*Euphydryas aurinia*)	Ballynafagh Lake is located about 2 km north-west of Prosperous in Co. Kildare. It is a shallow alkaline lake with some emergent vegetation. The Blackwood Feeder, which connects Ballynafagh Lake to the Grand Canal, is also included in the site. The site contains the Annex habitat Alkaline fens [7230].	5.45Km
Rye Water Valley/ Carton cSAC	001398	[7220] Petrifying Springs* [1014] Narrow-mouthed Whorl Snail (*Vertigo angustior*) [1016] Desmoulin's Whorl Snail (*Vertigo moulinsiana*)	Rye Water Valley/Carton SAC is located between Leixlip and Maynooth, in Counties Meath and Kildare, and extends along the Rye Water, a tributary of the River Liffey. The site is designated for a number of habitats and/or species listed on Annex I/II of the EU Habitats Directive including the priority habitat [7220] Petrifying Springs	13.61km
The River Barrow and River Nore cSAC	002162	[1130] Estuaries [1140] Tidal Mudflats and Sandflats [1310] *Salicornia* Mud [1330] Atlantic Salt Meadows [1410] Mediterranean Salt Meadows [3260] Floating River Vegetation [4030] Dry Heath [6430] Hydrophilous Tall Herb Communities [7220] Petrifying Springs* [91A0] Old Oak Woodlands [91E0] Alluvial Forests* [1016] Desmoulin's Whorl Snail (*Vertigo moulinsiana*) [1029] Freshwater Pearl Mussel (*Margaritifera margaritifera*) [1092] White-clawed Crayfish (*Austropotamobius pallipes*) [1095] Sea Lamprey (*Petromyzon*	This site consists of the freshwater stretches of the Barrow and Nore River catchments as far upstream as the Slieve Bloom Mountains, and it also includes the tidal elements and estuary as far downstream as Creadun Head in Waterford. The site passes through eight counties – Offaly, Kildare, Laois, Carlow, Kilkenny, Tipperary, Wexford and Waterford. Major towns along the edge of the site include Mountmellick, Portarlington, Monasterevin, Stradbally, Athy, Carlow, Leighlinbridge, Graiguenamanagh, New Ross, Inistioge, Thomastown, Callan, Bennettsbridge, Kilkenny and Durrow. The larger of the many tributaries include the Lerr, Fushoge, Mountain, Aughavaud, Owenass, Boherbaun and Stradbally Rivers of the Barrow, and the Delour, Dinin, Erkina, Owveg, Munster, Arrigle and King's Rivers on the Nore. Within the context of the proposed wind farm connectivity exists with the River Barrow via the Slate River which flows southwestwards from the Cloncumber cluster of proposed turbines and joins with the River Figile; further connecting to the River Barrow further south. Overall, the site is of considerable conservation significance for the occurrence of good examples of habitats and of populations of plant and animal species that are listed on Annexes I and II of the E.U. Habitats Directive. Furthermore it is of high conservation value for the populations of bird species that use it. The occurrence of several Red Data Book plant species including three rare plants in the salt meadows and the population of the hard water form of the Freshwater Pearl Mussel, which is limited to a 10 km stretch of the Nore, add further interest to this site.	13.5km

Site	Code	Features of Interest	Summary Description	Distance to Development
		marinus) [1096] Brook Lamprey (*Lampetra planeri*) [1099] River Lamprey (*Lampetra fluviatilis*) [1103] Twaite Shad (*Alosa fallax*) [1106] Atlantic Salmon (*Salmo salar*) [1355] Otter (*Lutra lutra*) [1421] Killarney Fern (*Trichomanes speciosum*) [1990] Nore Freshwater Pearl Mussel (*Margaritifera durrovensis*)		
Mouds Bog cSAC	002331	[7110] Raised Bog (Active)* [7120] Degraded Raised Bog [7150] Rhynchosporion Vegetation	Mouds Bog is located about 3 km north-west of Newbridge in Co. Kildare, close to the Hill of Allen, and includes amongst others, the townlands of Grangehiggin, Barretstown and Hawkfield. The site comprises a raised bog that includes both areas of high bog and cutover bog. Much of the margins of the site are bounded by trackways	5.4km
Mount Hevey Bog cSAC	002342	[7110] Raised Bog (Active)* [7120] Degraded Raised Bog [7150] Rhynchosporion Vegetation	The site comprises a raised bog that includes both areas of high bog and cutover bog. The site contains the priority Annex Habitat [7110] Active Raised Bog. Mount Hevey Bog is a site of considerable conservation significance as it comprises a raised bog, a rare habitat in the E.U. and one that is becoming increasingly scarce and under threat in Ireland.	5.4km
The Long Derries cSAC	000925	[6210] Orchid-rich Calcareous Grassland*	The Long Derries is located approximately 5 km south-east of Edenderry in Co. Offaly and is part of a low esker ridge running from Edenderry to Rathdangan. It consists primarily of glacial gravels interspersed with loam and peat soil.	3.09km
Ballina Bog pNHA	000390	Raised Bog Habitat	Ballina Bog is situated about 8km west of Enfield and just south-west of Moyvalley in an elongated valley in Co. Kildare. Much of the surface is of good quality and quite wet in spite of the presence of many drains.	0.94km

Site	Code	Features of Interest	Summary Description	Distance to Development
Ballynafagh Bog pNHA	00391	Raised Bog Habitat	The site is a raised bog situated c.1km west of Prosperous, Co. Kildare. The site contains the priority habitat active raised bog and also supports breeding Merlin.	6.19km
Curragh (kildare) pNHA	000392	Limestone Geology	The Curragh is an extensive open plain which lies about 3km south west of Newbridge in Co. Kildare. It is bisected by the M7/N7 motorway and a railway line. The Curragh Camp and Curragh Racecourse are located within the plain.	7.35km
Mouds Bog pNHA	00395	Raised Bog Habitat	Mouds Bog is located about 3 km north-west of Newbridge in Co. Kildare, close to the Hill of Allen, and includes amongst others, the townlands of Grangehiggin, Barretstown and Hawkfield. The site comprises a raised bog that includes both areas of high bog and cutover bog. Much of the margins of the site are bounded by trackways	5.4km
Pollardstown Fen pNHA	000396	[7210] *Cladium* Fens	Pollardstown Fen is situated on the northern margin of the Curragh of Kildare, approximately 3 km north-west of Newbridge. It lies in a shallow depression, running in a north-west/south-east direction. About 40 springs provide a continuous supply of water to the fen. These rise chiefly at its margins, along distinct seepage areas of mineral ground above the fen level. The continual inflow of calcium-rich water from the Curragh, and from the limestone ground to the north, creates waterlogged conditions which lead to peat formation. There are layers of calcareous marl in this peat, reflecting inundation by calcium-rich water. This peat-marl deposit reaches some 6 m at its deepest point and is underlain by clay. The site contains a number of habitats/species listed on Annex I/II of the EU Habitats Directive, including the priority habitat *Cladium* Fens [7210].	6.78km
Rathmoylan Esker pNHA	000557	Semi-natural deciduous and Mixed Woodland	Rathmoylan Esker is a Natural Heritage Area comprising several segments on a series of north-west to south-east trending eskers located 7km south of Trim near the village of Rathmoylan in Co. Meath. Several parts of these eskers have been colonised by semi-natural deciduous and mixed woodland.	9.6km
The Long Derries, Edenderry pNHA	000925	[6210] Orchid-rich Calcareous Grassland*	The Long Derries is located approximately 5 km south-east of Edenderry in Co. Offaly and is part of a low esker ridge running from Edenderry to Rathdangan. It consists primarily of glacial gravels interspersed with loam and peat soil.	3.09km

Site	Code	Features of Interest	Summary Description	Distance to Development
Ballynafagh Lake pNHA	001387	Shallow alkaline lake with emergent vegetation	Ballynafagh Lake is located about 2 km north-west of Prosperous in Co. Kildare. It is a shallow alkaline lake with some emergent vegetation. The Blackwood Feeder, which connects Ballynafagh Lake to the Grand Canal, is also included in the site. The site contains the Annex habitat Alkaline fens [7230].	5.5km
Donedea Wood pNHA	001391	Two rare species of Myxomycete fungus and woodland	This site is located about 6km north of Prosperous in Co. Kildare. The entire site has been planted with a mix of deciduous and coniferous trees. The site is notable for the presence of two rare species of Myxomycete fungus, namely *Diderma chondrioderma* and *Licea testudinacea*, the latter in one of only two known Irish sites	1.99km
Liffey at Oberstown pNHA	001395	Riverside Vegetation	This site represented a good example of riverside vegetation, with two scarce plants. Although cleared of woodland in 1983, remnants may remain or regeneration may have occurred.	13.28km
Liffey Bank above Athgarvan pNHA	001396	Flora of unstable soils	This site is located on the River Liffey about 3km north-west of Kilcullen in Co.Kildare. On one of the meanders above Athgarvan, the Liffey has cut into a very sandy patch of boulder clay, steepening its banks beyond the point where continuous vegetation can exist. The resulting unstable sandy slope faces south and is colonised by an interesting flora characteristic of unstable soil.	14.92km
Rye Water Valley/Carton pNHA	001398	[7220] Petrifying Springs* [1014] Narrow-mouthed Whorl Snail (*Vertigo angustior*) [1016] Desmoulin's Whorl Snail (*Vertigo moulinsiana*)	Rye Water Valley/Carton SAC is located between Leixlip and Maynooth, in Counties Meath and Kildare, and extends along the Rye Water, a tributary of the River Liffey. The site is designated for a number of habitats and/or species listed on Annex I/II of the EU Habitats Directive including the priority habitat [7220] Petrifying Springs	13.62km
Ballynabarny Fen pNHA	001573	Fen Community	This fen lies in a small, deep, artificially-created valley between the embankments of the Royal Canal and the nearby railway, and is situated about 3km west-north-west of Longwood in Co. Meath. Ballynabarny Fen contains a good floral representation of a fen community.	1.52km
Mount Hevey Bog pNHA	001584	[7110] Raised Bog (Active)* [7120] Degraded Raised Bog [7150] Rhynchosporion Vegetation	The site comprises a raised bog that includes both areas of high bog and cutover bog. The site contains the priority Annex Habitat [7110] Active Raised Bog. Mount Hevey Bog is a site of considerable conservation significance as it comprises a raised bog, a rare habitat in the E.U. and one that is becoming increasingly scarce and under threat	5.4km

Site	Code	Features of Interest	Summary Description	Distance to Development
			in Ireland.	
Royal Canal pNHA	002103	Aquatic Flora and Fauna, Corridor value	The Royal Canal is a man-made waterway linking the River Liffey at Dublin to the River Shannon near Termonbarry Co. Longford. The canal has been designated as an NHA which is generally comprised of the central channel and the banks on either side of it.	0km
Grand Canal pNHA	002104	Diversity of species, corridor value, Flora Protection Order Species	The Rare and legally protected Opposite-leaved Pondweed (*Groenlandia densa*) (Flora Protection Order 1999 [54]) is present at a number of sites in the eastern section of the Main Line. The ecological value of the canal lies more in the diversity of species it supports along its linear habitats than in the presence of rare species.	0km
Molerick Bog NHA	001582	Raised Bog Habitat	The site comprises a raised bog that includes both areas of high bog and cutover bog.	2.94km
Black Castle Bog NHA	000570	Raised Bog Habitat	The site comprises a raised bog that includes both areas of high bog and cutover bog. The north-western margins of the site are bounded by roads and those on the south-east are bounded mainly by scrub and woodland.	8.42km
Carbury Bog NHA	001388	Raised Bog Habitat	The site consists of four sections separated by the old Edenderry railway line and the Carbury- Broadford road. A narrow strip of deciduous woodland cuts through the main section in line with the old railway. Much of the high bog has vegetation typical of a Midland Raised Bog.	1.43km
Hodgetown Bog NHA	001393	Raised Bog Habitat	The site comprises a raised bog that includes both areas of high bog and cutover bog.	3.67km
Kilteel Wood pNHA	001394	Deciduous Woodland	This site is located about 10km north-east of Naas and immediately east of the village of Kilteel. The wood is situated on a hill which rises to 248m. The site is a small heathy wood mostly of oak (Quercus spp.) and Downy Birch (Betula pubescens). Other trees present include Beech (Fagus sylvatica), Sycamore (Acer pseudoplatanus), Ash (Fraxinus excelsior) and Scots Pine (Pinus sylvestris). In a clearing gorse (Ulex europaeus, U. gallii) and Heather (Calluna vulgaris) occur.	13.3km
Slade of Saggart and Crooksling Glen pNHA	000211	Woodlands and Wetlands	This site is located in the south-west of Co. Dublin and stretches from Brittas northwards to approximately 2km south of Saggart. The northern half of the site comprises a river valley with steep tree-	14km

Site	Code	Features of Interest	Summary Description	Distance to Development
			covered sides, while the southern side is flatter and contains two small lakes, the Brittas Ponds.	
Liffey Valley pNHA	000128	Aquatic and Terrestrial Habitats	The main terrestrial habitat included within the site is mixed deciduous woodland on fertile, limey alluvium and boulder clay, in which Beech (*Fagus sylvatica)* is dominant in some areas. A wet marsh occurs on the strip of land between the Mill Race and the river east of the metal bridge and west of the paint factory.	7.8km

4.1.3 Ballinakill

The Ballinakill cluster is located north of the village of Broadford, Co. Kildare and south west of the town of Longwood, County Meath. The Kildare/Meath County boundary runs through the site and therefore two of the proposed 10 turbines (T1 and T2) are located in Co. Meath. The remainder are in Co. Kildare. Note existing environment data on Aquatic Ecology and Bats are presented seperately.

4.1.3.1 Habitats

Turbine Land Folios

Habitat mapping was carried out at the subject site on July 5, 2013 following methods previously outlined. Habitat types identified within the study area are illustrated in Figure 7.9.0, Appendix 6 and described below.

Arable Crops (BC1) - A number of fields within the Ballinakill cluster are planted with cereal crops such as Barley or Wheat. Under the NRA site evaluation scheme [19], this habitat would be rated as Local Importance (lower value), as it is a highly modified habitat with low species diversity.

Drainage Ditches (FW4) - This classification refers to a drainage channel which leads towards the River Boyne in the northern half of the cluster. The channel is managed in places and the width varies from 2-2.5m on average. The channel has a gravel substrate and aquatic vegetation includes *Apium nodiflorum* and *Sparganium erectum.* Under the NRA site evaluation scheme, this habitat would be rated as Local Importance (Lower value).

Improved agricultural grassland (GA1) - A number of fields of improved agricultural grassland exist within the site boundary. Typically this habitat is dominated by *Lolium perenne.* Other species include *Poa annua*, *Ranunculus repens*, *Trifolium* spp. And *Rumex* spp. Under the NRA site evaluation scheme [19], this habitat would be rated as Local Importance (lower value), as it is a highly modified habitat with low species diversity.

Dry Calcareous and Neutral Grassland (GS1) - Improved dry calcareous and Neutral grassland occurs throughout the site. Grasses recorded included *Cynosausus cristatus, Phleum pratense, Alopecuris pratensis, Holcus lanatus, Lolium perenne, Agrostis stolonifera, Dactylis glomerate, Poa annua*. Herbs recorded included *Ranunculus repens, Ranunculus acris, Plantago spp., Leontodon autumnalis, Cerastium fontanum, Taraxacum spp., Rumex spp. ,Cirsium arvense.*In some places *Rhinanthus minor, Odontites vernus* are present. Some areas have a wet grassland influence with species such as *Potentilla anserina* and abundant *Ranculus repens*. No sedges or rushes are present in these sections however. Due to improved habitat quality is assessed as low. Under the NRA site evaluation scheme [19], this habitat would be rated as Local Importance (lower value), as it is a highly modified habitat with low species diversity.

Wet grassland (GS4) - This classification refers to species rich wet grassland which occurs within the site. This habitat type is underlain with a substrate of peaty soil. Two variations of this habitat type were recorded with varying degrees of improvement. A field immediately east of the proposed T5 location includes a discete area which contained species associated with a remnant flush type habitat e.g. *Eriophorium augustifolium, Menyanthes trifoliate, Hydrocotyle vulgaris*. However there was no Sphagnum moss present. Other wet grassland species recorded included *Agrostus stolonifera, Agrostis canina, Holcus lanatus, Succisa preatensis, Mentha aquatic, Juncus effuses, Juncus inflexus, Juncus conglomerate, Ranunculus repens, Juncus articulates, Juncus acutiflorus, Potentilla erecta, Cirsium palustre, Prunella vulgaris, Centaurea nigra, Anthoxanthum odoratum.* This field, due to its increased diversity and slightly high value for invertebrate fauna would be classified as local importance (higher value) under the NRA classification scheme. No turbines or development are proposed for this field.

Another field of more improved GS4 exists between the proposed locations of T6 and T7. This was found to be similar to that already described but included higher cover of species indicative of improvement such as *Holcus lanatus, Agrostis stolonifera, Ranunculus repens* etc. Due to improvement habitat quality is assessed as low. Under the NRA site evaluation scheme [19], this habitat would be rated as Local Importance (lower value), as it is a highly modified habitat with low species diversity.

Treelines (WL2) - The predominant field boundary within this cluster is treelines. These consist of *Fraxinus excelsior*, *Crataegus monogyna*, *Corylus avellana*, *Prunus spinosa* and *Sambucus nigra*. Due to its corridor value under the NRA site evaluation scheme, this habitat would be rated as Local Importance (higher value) as habitats of local importance for wildlife.

M4 Motorway Crossing

Due to its proximity to Ballinakill (c.500m south of the cluster boundary) the proposed M4 Motorway crossing at Moyvalley is included here. Habitats within 100m of either side of the likely crossing were mapped even though it is likely that the crossing will be undertaken with minimal habitat loss. Habitats present here, many of which reflect a high level of modification (e.g. amenity grassland, buildings and artificial surfaces and ornamental or non-native planting) and not already described include the following:

Buildings and Artifical surfaces (BL3) - Under the NRA site evaluation scheme, this habitat would be rated as Local Importance (lower value) as habitats of local importance for wildlife.

Amenity grassland (GA2) - Under the NRA site evaluation scheme, this habitat would be rated as Local Importance (lower value) as habitats of local importance for wildlife.

Ornamental/Non-native shrub (WS3 - Under the NRA site evaluation scheme, this habitat would be rated as Local Importance (lower value) as habitats of local importance for wildlife.

Dry Meadows and Grassy Verges (GS2) - Under the NRA site evaluation scheme, this habitat would be rated as Local Importance (higher value) as habitats of local importance for wildlife.

Immature woodland (WS2) - Under the NRA site evaluation scheme, this habitat would be rated as Local Importance (higher value) as habitats of local importance for wildlife.

Bog Woodland (WN7) - Under the NRA site evaluation scheme, this habitat would be rated as Local Importance (higher value) as habitats of local importance for wildlife.

4.1.3.2 Botanical Species

A full list of botanical species recorded within the subject site is detailed in Appendix F6. No FPO (Flora Protection Species) were noted within the cluster boundary. No invasive species were recorded.

4.1.3.3 Terrestrial Mammals

In addition to the designated Otter (*Lutra lutra*) and Badger (*Meles meles*) surveys, the following data incorporates casual terrestrial mammal observations from other ecological surveys undertaken within the subject area. Desktop review of information available from the National Biodiversity Data Centre (NDBC) suggests species such as Badger, Irish Hare, Red Fox, Otter, Irish Stoat, American Mink, West European Hedgehog and Red Squirrel are all present within the 10km squares (N64,N74) within which the subject cluster is located. Of these only Badger evidence was recorded within the Ballinakill cluster. Given the habitats present Irish Stoat, Irish Hare, Red Fox and Hedgehog are all likely to be present at the cluster. Otter and American Mink were not recorded however are likely to be present on the nearby River Boyne. Red Deer and Pine Marten, recorded in the 10km square N74, are unlikely to be present at the cluster due to lack of suitable habitat.

All terrestrial mammal species recorded from the Ballynakill cluster are of 'Least Concern' on Ireland's Red List of terrestrial mammals [(61)]. Badger (*Meles meles*), Red Deer (*Cervus elaphus*), Pine Marten (*Martes martes*) and Irish Hare (*Lepus timidus hibernicus*) are protected under the Wildlife Acts (1976-2012) [(63)] .

Badger

Evidence of Badger was recorded from three locations within the cluster. Two Badger setts, of which one was confirmed to be active, were recorded within the environs of the cluster (see Appendix 6 for maps). Locations of all recorded badger evidence are provided in Table 4.2, over.

Table 4.2: Locations of Badger Evidence Recorded during Ecological Field Surveys – Ballynakill Cluster

Species	Date	Nearest Turbine - Ballynakill	Description	Grid Reference
Badger	09/01/2013	T1	outlier sett	69149 44971
Badger	28/02/2013	T4	Tracks	
Badger	18/04/2013	T1&T10	Large active badger sett	69332 45033

Other Mammals
While not recorded during the current survey, species such as House Mouse (*Mus musculus domesticus*), Hedgehog (*Erinaceus eruopaeus*) and Wood Mouse (*Apodemus sylvaticus*) have a widespread distribution in Ireland are likely to be found within the cluster [61].Pygmy Shrew (*Sorex minutus*) is likely to be present throughout the cluster.

4.1.3.4 Avifauna

There were no records of the following target species from surveys carries out at the Ballinakill cluster: Whooper Swan, Golden Plover, Kingfisher, Whinchat, Greenland White-Fronted Goose, Hen Harrier, Black-Headed Gull, Common Gull, Curlew, Redshank, Lapwing, Woodcock, Lesser Black backed Gull or Mute Swan.

Peregrine

A single observation of this species was noted during winter walkover surveys (09/01/2013). No further sightings were recorded. No suitable breeding habitat exists within Ballinakill cluster. Peregrine breeding distribution in Ireland has increased by 276% in the period 1968-72 to 2007-11 [64]. The recorded flight height for the single observation was 30m.

Barn Owl

No observation was made of Barn Owl during the entire survey period.

Following the methods outlined previously, nine locations within 1.5km of the Ballinakill cluster were identified as having potential for breeding Barn Owls and were examined as part of the Breeding Barn Owl surveys. Of these, no site was confirmed to contain Breeding Barn Owl. Three of these locations were classified in the highest category for suitability (occupied or highly suitable) for breeding Barn Owl (*Tyto alba*) with multiple opportunities for nesting and/or roosting. These consisted of an abandoned kiln, a two storey house and an 18th century mill building.

In addition, there were two suitable breeding Barn Owl nest and/or roosting sites recorded within 1.5km of the Ballinakill cluster, which were classified as having limited access and/or limited number of nest and/or roost locations. No evidence of nesting and/or roosting was recorded within these sites. A further site were investigated which can be classified as suitable for roosting Barn Owl only. Three sites were investigated which were appraised as completely unsuitable for breeding Barn Owl, and as having no potential as a roosting and/or nest location.

The findings of the current study, in particular the low occupancy of highly suitable nest sites, reflect the current status of the species in Ireland, which has undergone a 47% decline in breeding distribution during the period 1968-72 to 2007-11 [64].

Yellowhammer

This species was recorded in low numbers from the early season CBS (Countryside Bird Survey) visit. It is likely to breed in low numbers at the Ballinakill cluster in suitable habitat.

Kestrel

Kestrel was recorded twice over the course of winter surveys. Individual birds were noted on two separate winter visits. No breeding was confirmed on site at Ballinakill. This species was not noted at locations suitable for breeding Barn Owls (often additionally utilised by kestrel).

Snipe

No occupied territories of the amber listed [36] species Snipe (*Gallinago gallinago*) were recorded in April to June 2013. A single bird was flushed from wet grassland during the April breeding waders visit however this was a passage migrant as no further evidence was noted at the location on subsequent visits. Snipe was recorded on four occasions during winter surveys, including a peak of 22 recorded in January 2013. These, wintering birds, were flushed from wet grassland between the two westernmost turbines in the cluster (turbine T4 and turbine T5). This reflects the habitat requirements of the species which favours habitats such as wetlands, bogs and wet tussocky grassland [64]. No further breeding was recorded within areas of the 500m envelope re-surveyed in 2014 (i.e. additional habitats within 500m of the proposed envelope as a result of design layout changes).

Buzzard

Common Buzzard was recorded on two occasions during winter surveys. Single birds were noted in January and February 2013. No breeding was recorded within the cluster.

General winter birds

The general assemblage of wintering birds recorded from the cluster reflects the managed nature of most of the farmland present.

A total of 38 species were recorded at the Ballinakill cluster during the modified Brown and Shepherd surveys (n=2) conducted during the defined winter period and are listed in Table 4.3, below. Of these, none are on the Birds of Conservation Concern in Ireland (BoCCI) red list [36] and 8 are on the BoCCI amber list [36]. All other species recorded, apart from Pheasant which is not considered for BOCCI, are on the BoCCI green list [36] (least conservation concern). A single Annex I species [3] (Peregrine) was recorded during the modified Brown and Shepherd surveys winter season 2013. Species which occurred in the highest abundance were Rook, Woodpigeon, Redwing, Fieldfare, and Starling; all reflective of general and widespread farmland birds in winter. Snipe, an Amber listed species was recorded in relatively high numbers (n=22) given the size of the cluster however this reflects the quality of the wet grassland within which birds were located.

Table 4.3: Bird species recorded at Ballinakill Winters 2012/13 and 2013/14

Species		Code	Visit 1	Visit 2	Total	BoCCI status	Annex I
Blackbird	*Turdus merula*	B	20	41	61	Green	No
Blue Tit	*Cyanistes caeruleus*	BT	1	1	2	Green	No
Bullfinch	*Pyrrhula*	BF	0	1	1	Green	No
Buzzard	*Buteo buteo*	BZ	2	2	4	Green	No
Chaffinch	*Fringilla coelebs*	CH	10	20	30	Green	No
Coal Tit	*Periparus ater*	CT	1	3	4	Green	No

Species		Code	Visit 1	Visit 2	Total	BoCCI status	Annex I
Dunnock	*Prunella modularis*	D	1	3	4	Green	No
Fieldfare	*Turdus pilaris*	FF	26	47	73	Green	No
Goldcrest	*Regulus*	GC	4	12	16	Amber	No
Goldfinch	*Carduelis*	GO	3	0	3	Green	No
Great Tit	*Parus major*	GT	14	9	23	Green	No
Greenfinch	*Carduelis chloris*	GR	0	1	1	Green	No
Hooded Crow	*Corvus cornix*	HC	2	6	8	Green	No
House Sparrow	*Passer domesticus*	HS	0	7	7	Amber	No
Jackdaw	*Corvus monedula*	JD	10	37	47	Green	No
Jay	*Garrulus glandarius*	J	1	1	2	Green	No
Kestrel	*Falco tinnunculus*	K	1	1	2	Amber	No
Lesser Redpoll	*Carduelis cabaret*	LR	18	0	18	Green	No
Linnet	*Carduelis cannabina*	Li	3	0	3	Amber	No
Long-tailed Tit	*Aegithalus caudatus*	LT	100	0	100	Green	No
Magpie	*Pica*	MG	12	5	17	Green	No
Meadow Pipit	*Anthus pratensis*	MP	4	0	4	Green	No
Mistle Thrush	*Turdus viscivorus*	M	1	2	3	Green	No
Moorhen	*Gallinula chloropus*	MH	0	1	1	Green	No
Peregrine	*Falco peregrinus*	PE	1	0	1	Green	Yes
Pied Wagtail	*Montacilla alba*	PW	2	2	4	Green	No
Redwing	*Turdus iliacus*	RE	8	101	109	Green	No
Reed Bunting	*Acrocephalus scirpaceus*	RB	8	0	8	Green	No
Robin	*Erithacus rubecula*	R	28	27	55	Amber	No
Rook	*Corvus frugilegus*	RO	125	178	303	Green	No
Siskin	*Carduelis spinus*	SK	5	0	5	Green	No
Skylark	*Alauda arvensis*	S	0	2	2	Amber	No
Snipe	*Gallinago*	SN	22	5	27	Amber	No
Song Thrush	*Turdus philomelos*	ST	0	7	7	Green	No
Sparrrowhawk	*Accipiter nisus*	SH	0	1	1	Green	No
Starling	*Sturnus vulgaris*	SG	3	357	360	Amber	No
Woodpigeon	*Columba palumbus*	WP	115	157	272	Green	No
Wren	*Troglodytes*	WR	40	23	63	Green	No

General Breeding Birds

The results of the CBS survey are presented in Table 4.4, below. As outlined previously, a 1km square was selected to sample the relevant habitats within the Ballinakill cluster. In this instance the square was located in the north west of the cluster in the townlands of Calf's Field and Roe's Bridge. This included areas of improved agricultural grassland, hedgerows, treelines, drains, scrub and a portion of the canal which runs adjacent to the north east. The relevant square was orientated as illustrated in Figure 7.5.0, Survey Squares, Appendix 6.

Early season visits (Early April to mid-May) recorded the expected assemblage of general countryside birds. Species such as Robin, Blackbird, Wren, Chaffinch, Woodpigeon, Jackdaw, and Willow Warbler occurred in the greatest numbers with the most dominant species being Robin (n=20); (Table 4.4).

Late season visits (mid-May to late June) reflected similar assemblages with the additional of migrant species such as Swallow, although not in great densities (n=2). A total of 24 avian species were recorded during the CBS surveys conducted between April and June 2013 (Table 4.4). Of these, one red listed species of conservation concern in Ireland (Yellowhammer) and four amber listed species (Robin, Swallow, Goldcrest and House Sparrow) of medium conservation concern were recorded [36] . No Annex 1 [2] species were recorded on the site during the CBS surveys.

A small Sand Martin (Amber) colony was noted south of the survey square during winter walkover surveys (Grid Reference 669149 744971); this was likely to be occupied although Sand Martins were not recorded during surveys.

Table 4.4: Bird Species recorded at Ballinakill during CBS surveys (Early and Late season visits)

Species Name		Code	Early	Late	Total	BoCCI status	Annex I
Swallow	*Hirundo rustica*	SL	0	2	2	Amber	No
Goldfinch	*Carduelis carduelis*	GO	0	3	3	Green	No
Hooded Crow	*Corvus cornix*	HC	1	0	1	Green	No
House Sparrow	*Passer domesticus*	SW	1	0	1	Amber	No
Yellowhammer	*Emberiza citronella*	Y	1	0	1	Red	No
Dunnock	*Prunella modularis*	D	1	7	8	Green	No
Bullfinch	*Pyrrhula pyrrhula*	BF	2	0	2	Green	No
Pheasant	*Phasianus colchicus*	PH	2	0	2	n/a	No
Magpie	*Pica pica*	MG	2	3	5	Green	No
Song Thrush	*Turdus philomelos*	ST	2	6	8	Green	No
Rook	*Corvus frugilegus*	RO	2	8	10	Green	No
Reed Bunting	*Acrocephalus scirpaceus*	RB	3	0	3	Green	No
Blue Tit	*Cyanistes caeruleus*	BT	3	1	4	Green	No
Great Tit	*Parus major*	GT	3	1	4	Green	No
Goldcrest	*Regulus regulus*	GC	3	4	7	Amber	No
Coal Tit	*Periparus ater*	CT	5	2	7	Green	No
Chiffchaff	*Phylloscopus collybita*	CC	5	3	8	Green	No
Willow Warbler	*Phylloscopus trochilus*	WW	12	9	21	Green	No
Jackdaw	*Corvus monedula*	JD	13	0	13	Green	No
Woodpigeon	*Columba palumbus*	WP	14	15	29	Green	No
Chaffinch	*Fringilla coelebs*	CH	15	5	20	Green	No
Wren	*Troglodytes troglodytes*	WR	17	9	26	Green	No
Blackbird	*Turdus merula*	B	18	5	23	Green	No
Robin	*Erithacus rubecula*	R	20	3	23	Amber	No

4.1.3.5 Other Taxa

No other taxa of note such as species of Lepidoptera (butterflies and moths) were recorded from the subject site. Both Common Frog and Common Lizard are protected by the Wildlife Acts (1976-2012) [60]. Common Frog is likely to be present throughout the site. Common Lizard, though not recorded, is likely present in suitable habitat.

4.1.4 Windmill Cluster

The Windmill cluster is located c.2km north of Carbury village in the townlands of Nurney and Ballinderry. Three turbines are proposed; which are to be located in an area of cutover bog under active commercial extraction. Note existing environment data on Aquatic Ecology and Bats are presented seperately.

4.1.4.1 Habitats

Habitat mapping was carried out at the subject site on July 3, 2013 following methods previously outlined. Habitat types identified within the study area are illustrated in Appendix 6 and detailed below:

Cutover Bog (PB4) - This classification refers to the main body of machine milled peat within which the three proposed turbines T24, T25 and T26 are to be located. As a commercially worked bog, no vegetation is present. Numerous drains are present throughout and along the edges. A drain, c.2.5m wide and 3m deep separates this section from the area of intact 'high bog' immediately adjacent to the south and outside the cluster site boundary. Under the NRA site evaluation scheme [19], this habitat would be rated as Local Importance (lower value), as it is a highly modified habitat with low species diversity.

Bog Woodland (WN7) - Bog woodland exists along the periphery of the cutover bog section of the site. Downy birch *Betula pubescens* and Scots Pine *Pinus sylvestris* predominate. Under the NRA site evaluation scheme [19], this habitat would be rated as Local Importance (Higher Value).

Built Surfaces (BL3) – This habitat includes the roadway into the peat milling site, currently existing buildings and storage areas for peat. Under the NRA site evaluation scheme [19], this habitat would be rated as Local Importance (lower value), as it is a highly modified habitat with low species diversity.

Scrub (WS1) – An area of scrub exists adjacent to the proposed site entrance. . Under the NRA site evaluation scheme [19], this habitat would be rated as Local Importance (Higher Value).

Raised Bog (PB1) - An area of raised bog exists to the south of the proposed wind farm cluster. This has been historically cut along its eastern margin with resultant drains in this area. Overall the surface of the bog is intact however the bog is only slightly wet underfoot. There are no extensive hummocks or hollow formations and the only pools present are dried out. Species present include *Calluna vulgaris, Erica tetralis, Eriophrum augustofulium, Eriophrium vaginatum, Tricophorum caespitosum, Narthecium ossifragum, Drasera rotundifolia, Cladonia portentosa, Cladonia floerkeana, Sphagnum spp., Hypnum jutlandicum.*

Due to its potential conformity with Annex Habitats such as active raised bog (Active Raised Bog 7110) or degraded raised bog (7120), this portion of bog adjacent to the proposed development site (within which no development is proposed and which is outside the cluster boundary) was further surveyed by a peatland specialist. The full results of this survey are presented in Appendix 7. A synopsis is presented below.

Windmill Bog – Raised Bog Site Report Synopsis

The site comprises an intact section of raised bog habitat located on a flat, low lying area that slopes gently to the east. The dominant vegetation recorded throughout the site comprises *Calluna vulgaris, Eriophorum vaginatum*, and *Narthecium ossifragum.* Other frequently encountered species include *Cladonia portentosa* and *Sphagnum* mosses. The high bog supports a small area (c 0.1ha) of active peat forming communities in the northeastern part of the site. This active area support sub-central ecotope dominated by *Sphagnum* mosses and *Eriophorum vaginatum* .There is a good cover of *Sphagnum* mosses (over 45%) including *Sphagnum magellanicum, Sphagnum papillosum, Sphagnum capillifolium, Sphagnum cuspidatum,* and *Sphagnum subnitens* Substrate conditions are soft underfoot.

The microtopography is relatively well developed with low hummocks. Conditions are progressively drier towards the edge of the bog, with marginal ecotope occurring throughout.

The report concluded that the bog is a remnant area of raised bog that has been severely impacted by long term peat extraction and associated drainage. The site continues to support a small area of active raised bog, a habitat that is rare throughout Ireland. The site is deemed to be of high conservation value due to the presence of Active Raised Bog, a priority habitat listed on Annex I of the EU Habitats Directive. The site is also of value for range, being one of the most eastern examples of the habitat in Ireland.

4.1.4.2 Botanical Species

A full list of botanical species recorded within the subject site is detailed in Appendix 8. No FPO (Flora Protection Species) were noted within the Windmill cluster. Details of species identified from the Peatland survey of the adjacent high bog are detailed in the relevant appendix of said report. The invasive species *Rhodendron Ponticum* was noted on the high bog to the south however this is c.1km from the nearest proposed turbine location.

4.1.4.3 Terrestrial Mammals

As to be expected from the habitats on site, very little evidence of terrestrial mammals was recorded. However, Badger tracks were noted in a milled peat area in April 2014. Irish Hare is present on the adjacent high bog within the cluster. Table 4.5, details the recorded Badger evidence.

Table 4.5: Locations of Badger Evidence Recorded during Ecological Field Surveys – Windmill Cluster

Species	Date	Nearest Turbine	Description	Grid Reference
Badger	17/04/2013	T24	Tracks	N68647 37441

4.1.4.4 Avifauna

There were no records of the following target species from surveys carried out at the Windmill cluster: Whooper Swan, Kingfisher, Peregrine, Whinchat, Greenland White-Fronted Goose, Hen Harrier, Black-Headed Gull, Common Gull, Curlew, Redshank, Lapwing or Mute Swan.

Golden Plover

Golden Plover (an Annex I species [2] were noted on two occasions in or near the cluster boundary. Table 4.6, below details the two observations. Both were in October 2012 and only one observation involved birds on site. Small numbers of wintering Golden Plover may occasionally perch on the milled peat present during daylight hours however due to the ongoing disturbance from commercial activities this is unlikely to constitute a regular roost or location which see a high frequency of occurrence of Golden Plover.

Table 4.6: Golden Plover Observations – Wind Mill Cluster

Site Name	Survey Type	Visit Number	Date	Start Time	End Time	Species	Number	Bird Notes
Windmill	B & S Winter	1	25/10/2012	10.22	11.4	Golden Plover_GP	3	
Windmill	B & S Winter	1	25/10/2012	10.22	11.4	Golden Plover_GP	200	Circling N of site (off site)

Merlin

No Merlin were recorded within the Windmill cluster site boundary during winter surveys. Following methods outlined previously the 1km square N6736 was selected as the breeding Merlin survey square for Windmill due to its habitat content including both foraging (open bog) and nesting habitat (conifer edge). The location of the survey square and digitised transect routes used to search for Merlin evidence are detailed in Figure 7.14.5, Appendix 6.

On the basis of the collected information, no usage of the selected habitat by Merlin could be extrapolated. Pellets and whitewash (droppings), attributed to Kestrel and Barn Owl (based on size and contents) were located. Buzzard was alo noted in woodland to the south of the area of high bog adjoining the site. Results of Merlin surveys are outlined below in Table 4.7 and illustrated in Figure 7.14.5 Merlin Survey Results.

Table 4.7: Results of Merlin Surveys

Visit Number	Date	Sighting / Structure / Sighting Grid Reference	sign / evidence type	No. Of prey items	Age of prey / evidence	Bird Notes
1	06/05/2013	67840/36820	P	1	<3weeks	Barn owl pellet
1	06/05/2013	67840/36820	P	2	<3weeks	2 Kestrel pellets and Kestrel observed
1	06/05/2013	67840/36820		2	<3weeks	2 Kestrel feathers
1	06/05/2013	67763/36655	PL	8	<3weeks	White feathers in Birch tree
1	06/05/2013	68052/37043	PL	1	<3weeks	Pellet on bog along margain with cutaway bog, Buzzard observed.
1	06/05/2013	67980/36980	W	1	<3weeks	Barn owl white wash under marking post
1	06/05/2013	68635/36882	P	1	<3weeks	Barn owl pellet under fence post
2	04/06/2013					No pellets or plucked items at any of previous locations or elsewhere in square
2	04/06/2013					Cuckoo x2 flying W to E
3	15/08/2013					No signs recorded

Red Grouse

A Red Grouse survey, following methods previously outlined, was carried out at the Windmill cluster on 27/3/2013. The results suggest that no Grouse may be present in suitable habitat on the high bog adjacent to the Windmill cluster. This reflects a general reduction in the breeding range of the species in Ireland which has contracted by 66% in the time period since 1968-72 [64]. Losses in the raised bogs of the midlands are mainly associated with factors such as habitat loss due to afforestation, large scale peat extraction and inappropriate burning [64].

Woodcock

There were two occupied breeding territories, of the red listed [36] Woodcock (*Scolopax rusticola*) recorded within or near the 500m turbine envelope (see Figure 7.14.4 Breeding Wader Results, Appendix 6).

A single male was recorded roding (in territorial display) on the edge of the 500m envelope to the southwest of the proposed turbine T26 in May 2013 (date of visit 6/5/2013 and 13/5/2013). A further male was recorded roding in June to the south east, outside the predicted 500m turbine envelope. Woodcock is Red listed on the BoCCCI list [36].

Barn Owl

No observation was made of Barn Owl during the entire survey period. Evidence of Barn Owl vis-à-vis pellets and feathers were found during Merlin surveys indicating that the area is utilised for foraging by at least one bird (see Figure 7.14.6, Appendix 6).

Following the methods outlined previously, 8 locations within 3km of the Ballinakill cluster were identified as having potential for breeding Barn Owls and were examined as part of the Breeding Barn Owl surveys.

An additional location was unsurveyable due to access restrictions. Of these, no site was confirmed to contain Breeding Barn Owl.

Two of the surveyed locations were classified in the highest category for suitability (occupied or highly suitable) for breeding Barn Owl (*Tyto alba*) with multiple opportunities for nesting and/or roosting.

These consisted of an old barn and Carbury Castle which is located c.2km south of the proposed development. In addition, there were 2 suitable breeding Barn Owl nest and/or roosting sites recorded within 1.5km of the Maighne Wind Farm subject site, which were classified as having limited access and/or limited number of nest and/or roost locations. No evidence of nesting and/or roosting was recorded within these sites. A number of other suitable buildings/trees exist in the greater hinterland and it may be that these contain birds which sporadically utilise the subject site for foraging.

The findings of the current study, in particular the low occupancy of highly suitable nest sites, reflect the current status of the species in Ireland, which has undergone a 47% decline in breeding distribution during the period 1968-72 to 2007-11 [64]. Barn Owl is Red listed on the BoCCCI list [36].

Kestrel

This species was recorded during the Merlin survey visit in May 2013. A bird was noted to the southeast of the Windmill cluster and additional evidence in the form of pellets and feathers were collected. Due to the unvegetated nature of most of the Windmill cluster, this species is unlikely to actively forage within the proposed turbine envelope.

Lesser Black-backed gull

A single flock of 16 birds was noted overflying the Windmill cluster in October 2012 during the first winter B&S visit.

Snipe

A single Snipe was recorded within the Windmill cluster during winter surveys (see Appendix 1). A peak of 21 birds were noted on the raised bog to the south on 18/1/2013. This reflects the habitat requirements of the species which favours habitats such as wetlands, bogs and wet tussocky grassland [64]. No breeding was noted during breeding wader surveys as very little breeding habitat exists within the 500m envelope. Snipe is Amber listed on the BoCCCI list [36].

Buzzard

Two Buzzards were noted in October 2012 during winter B&S surveys (recorded flight height was 10-50m). An additional sighting was observed to the southwest of the proposed Windmill cluster (outside the boundary) during breeding Merlin surveys on 6/5/2013.

General winter birds

A total of 25 species were recorded at the Ballinakill cluster during the Brown and Shepherd surveys conducted during the defined winter period and are listed in Table 4.8, below. Of these, three (Golden Plover, Grey Wagtail and Meadow Pipit) are on the Birds of Conservation Concern in Ireland (BoCCI) red list [36] and six (Robin, Goldcrest, Snipe, Sparrowhawk, Lesser Black-Backed Gull and Starling) are on the BoCCI Amber list [36]. All other species recorded are on the BoCCI green list [36] (least conservation concern). No Annex I species [3] was recorded within the cluster during the modified Brown and Shepherd surveys.

Abundance of those species recorded is typically low, reflecting the nature of the habitats present. As most of the site is bare peat, birdlife is mainly confined to the bog woodland fringing the cluster. Many of the species recorded in higher densities (e.g. Golden Plover, Redwing) were recorded outside the cluster boundary.

Table 4.8: Bird species Recorded during Winter 2012/13 – Windmill Cluster

Species		Code	Visit 1	Visit 2	Visit 3	Total	BoCCI status	Annex I
Chaffinch	*Fringilla coelebs*	CH	11	7	3	21	Green	No
Blackbird	*Turdus merula*	B	4	0	8	12	Green	No
Woodpigeon	*Columba palumbus*	WP	10	0	2	12	Green	No
Hooded Crow	*Corvus cornix*	HC	4	0	0	4	Green	No
Robin	*Erithacus rubecula*	R	9	1	2	12	Amber	No
Raven	*Corvus corax*	RN	4	0	0	4	Green	No
Meadow Pipit	*Anthus pratensis*	MP	2	0	0	2	Red	No
Goldcrest	*Regulus*	GC	4	5	1	10	Amber	No
Buzzard	*Buteo buteo*	BZ	2	0	0	2	Green	No
Snipe	*Gallinago gallinago*	SN	2	0	0	2	Amber	No
Golden Plover	*Pluvialis apricaria*	GP	203	0	0	203	Red	Yes
Wren	*Troglodytes troglodytes*	WR	7	4	4	15	Green	No
Sparrowhawk	*Accipiter nisus*	SH	1	0	0	1	Amber	No
Grey Wagtail	*Motacilla cinerea*	GL	1	0	0	1	Red	No
Lesser Redpoll	*Carduelis cabaret*	LR	7	1	0	8	Green	No
Blue Tit	*Cyanistes caeruleus*	BT	1	1	1	3	Green	No
Mallard	*Anas platyrhynchos*	MA	4	0	0	4	Green	No
Lesser Black-backed Gull	*Larus fuscus*	LB	16	0	0	16	Amber	No
Dunnock	*Prunella modularis*	D	0	1	0	1	Green	No
Redwing	*Turdus iliacus*	RE	0	33	23	56	Green	No
Great Tit	*Parus major*	GT	0	0	2	2	Green	No
Coal Tit	*Periparus ater*	CT	0	0	1	1	Green	No
Starling	*Sturnus vulgaris*	SG	0	0	12	12	Amber	No
Jackdaw	*Corvus monedula*	JD	0	0	1	1	Green	No
Magpie	*Pica pica*	MG	0	0	1	1	Green	No

General Breeding Birds

The results of the CBS survey are presented in Table 4.9, below. As outlined previously, a 1km square was selected to sample the relevant habitats within the Ballinakill cluster. In this instance the square (N6837) overlays the majority of the eastern portion of the cluster in the townland of Ballinderry. Two transects, orientated broadly east to west were utilised to sample breeding bird distribution and activity. The northern transect followed an existing track along the edge of the fringing woodland on the northern side of the cluster and the southern transect approximately follows the existing facebank thereby sampling the adjacent high bog in addition to the proposed folio within which the proposed turbines are to be located. The relevant square is illustrated in Figure 7.15.3 Survey Squares, Appendix 6.

A total of 25 avian species were recorded during the CBS surveys conducted between April and June 2013 (Table 4.9). Of these, one red listed species of high conservation concern in Ireland (Meadow Pipit) and six amber listed species (Goldcrest, Linnet, Mistle Thrush, Robin, Skylark and Swallow) of medium conservation concern were recorded [36] . No Annex 1 [2] species were recorded on the site during the CBS surveys. Typical woodland species such as Willow Warbler, Coal Tit and Chaffinch were found in good numbers on the northern transect, reflecting the woodland habitat adjoining.

Meadow pipit and Skylark, both recorded on the southern transect of the square; were recorded exclusively from the high bog adjacent to the south of the cluster. No breeding habitat for these species exists within the proposed red line boundary for the Windmill cluster.

Table 4.9: Bird Species Recorded during CBS surveys (Early and Late Season visits) – Windmill Clusters

CBS		Code	Early	Late	Total	BoCCI status	Annex I
Blackbird	*Turdus merula*	B	12	6	18	Green	No
Blue Tit	*Cyanistes caeruleus*	BT	1	3	4	Green	No
Bullfinch	*Pyrrhula*	BF	1	0	1	Green	No
Chaffinch	*Fringilla coelebs*	CH	11	4	15	Green	No
Chiffchaff	*Phylloscopus collybita*	CC	0	1	1	Green	No
Coal Tit	*Periparus ater*	CT	2	14	16	Green	No
Cuckoo	*Cuculus canorus*	CK	3	2	5	Green	No
Goldcrest	*Regulus regulus*	GC	0	1	1	Amber	No
Great Tit	*Parus major*	GT	3	0	3	Green	No
Jackdaw	*Corvus monedula*	JD	5	4	9	Green	No
Lesser Redpoll	*Carduelis cabaret*	LR	0	5	5	Green	No
Linnet	*Carduelis cannabina*	LI	7	2	9	Amber	No
Meadow Pipit	*Anthus pratensis*	MP	22	17	39	Red	No
Mistle Thrush	*Turdus viscivorus*	M	2	1	3	Amber	No
Pied Wagtail	*Montacilla alba*	PW	2	1	3	Green	No
Robin	*Erithacus rubecula*	R	5	2	7	Amber	No
Rook	*Corvus frugilegus*	RO	5	2	7	Green	No
Skylark	*Alauda arvensis*	S	12	6	18	Amber	No
Song Thrush	*Turdus philomelos*	ST	3	2	5	Green	No
Swallow	*Hirundo rustica*	SL	3	3	6	Amber	No

CBS		Code	Early	Late	Total	BoCCI status	Annex I
Whitethroat	*Sylvia communis*	WH	2	0	2	Green	No
Willow Warbler	*Phylloscopus trochilus*	WW	13	4	17	Green	No
Woodpigeon	*Columba palumbus*	WP	6	4	10	Green	No
Wren	*Troglodytes troglodytes*	WR	13	6	19	Green	No

4.1.4.5 Other Taxa

No other taxa of note such as species of Lepidoptera (butterflies and moths) were recorded from the subject site. Both Common Frog and Common Lizard are protected by the Wildlife Acts (1976-2012) [60]. Common Frog is likely to be present throughout the site and was recorded on the adjacent high bog during surveys. Common Lizard, though not recorded, is likely present in suitable habitat.

4.1.5 Drehid-Hortland

The proposed Drehid-Hortland cluster is located east and south of Kilshanchoe Village, Co. Kildare.

The two portions of Drehid-Hortland cluster will be dealt with individually within the following sections by turbine number. Note existing environment data on Aquatic Ecology and Bats are presented seperately.

4.1.5.1 Habitats

Drehid (Turbines 11-23, 47)

Habitat mapping was carried out at the subject site on July 9, 2013 following methods previously outlined. Habitat types identified within the study area are illustrated in Figure 7.16: Habitat Map, Appendix 6, and described below. Further Annex I surveys, of habitat identified as having the potential to conform to a type on Annex I of the Habitats directive was carried out on August 22, 2013.

Depositing/Lowland Rivers (FW2) - This habitat refers to two rivers which flow through the proposed development area for Turbines T11-23. The first is the Coolree River, which is a tributary of the River Blackwater and drains the southwestern portion of the cluster. Within the area recorded it is approximately 2m wide and 0.5m deep with a gravel or cobble substrate. The banks are steep in places. The river is treelined and contains limited aquatic vegetation.

The Ballynamullagh River which flows through the site rises in Parsonstown and flows northeastwards and then north to join with the Coolree to form the Fear English River. This river is 2-3m wide, with 2.5m high banks. Vegetation present includes *Sparganium erectum* and *Equisetum* spp.

Due to their high connectivity/corridor value, under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

Improved Agricultural Grassland (GA1) - This habitat type predominates in the southwestern portion of the cluster in the townlands of Drehid and Parsonstown. Some areas are very species poor with only *Lolium perenne* present. Other, more species rich fields also occur however even in these cases *Lolium* is still the dominant grass. Some areas of disturbed grassland contain wet grassland species due to poor drainage however the dominant habitat is still improved agricultural grassland. Species recorded include *Lolium perenne*, *Poa annua*, *Agrostis stolenifera*, *Agrostis canina*, *Holcus lanatus*, *Cynosurus cristatus*, *Phleum pratense*, *Alopecurus pratensis*, *Alopecurus geniculatus*, *Ranunculus repens*, *Trifolium* spp., *Plantago* spp., *Cirsium arvense* and *Urtica dioica*. In places *Juncus effusus* and *Juncus inflexus* are present. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Lower value).

Improved Agricultural Grassland/Wet Grassland mosaic (GA1/GS4) - This refers to improved agricultural grassland which grades into wet grassland; located south of the proposed location of T17.

Species present include *Lolium perenne, Agrostis stolonifera, Ranunculus repens, Ranculus acris* and abundant rushes such as *Juncus effuses, Juncus inflexus, Juncus articulates* and also *Trifolium* spp. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher value).

Raised Bog (PB1)
An area of raised bog exists to the south of the proposed locations of turbine T12 and turbine T13. Surrounded by plantation forestry and degraded cutover bog (PB4); this area does contain a smaller area of active raised bog which has sphagnum cover of approximately 80% within a discrete area. Overall the ground underfoot is quite dry however there are shallow pools with *Sphagnum cuspidatum* and hummocks. The ground is very sturdy and there is no quaking or significantly wet areas.

Species present include *Calluna vulgaris* and *Erica tetralix* in equal abundance. *Eriophrum augustifolium* and *Eriophorum vaginatum, Narthecium ossifragum, Trichophorum cespetisum, Rhynchospara alba, Drosera rotundifolia, Vaccinium oxycoccos, Andromeda polofolia, Cladonia portentosa, Cladonia floerkeana, Dicranum scoparium* and *Racometrium languginosum*. Sphagnum species include *Sphagnum magellanicium, Sphagnum capillifolium* and *Sphagnum papillosum*. Due to the presence of active raised bog, a priority Annex I habitat under the NRA site evaluation scheme [19], this habitat would be rated as of International Importance. As such an Annex assessment of the bog was carried out by a peatland specialist.

Cutover bog (PB4)
This area of bog contains a number of large deep drains (1.5m wide and 3-4m deep) and is dominated by cutover. The area has begun to regenerate and contains predominantly *Calluna vulgaris, Trichophorum caespitosum, Eriophorum vaginatum, Narthecium ossifragus, Molinia caerulea* and *Cladonia* spp. There is little if any sphagnum present. *Juncus effusus* is present in places.

The drains contain *Sphagnum cuspidatum, Potentilla palustris, Potamogetan* spp., *Hydrocotyle vulgaris, Osmunda regalis, Menyanthes trialiata*. Woodland on the bog comprises *Betula punscens, Pinus sylvestris* and *Salix* spp. Due to the extent of rengeneration and proximity to intact raised bog, under the NRA site evaluation scheme [19], this habitat would be rated as of County Importance.

Cutover Bog/Dry calcareous grassland (PB4/GS1)
Northeast of T15 is a small area (approximately 10mx10m) containing both acid and calcareous flora. The orchid *Gymnadenia conopsea* and helleborine *Epipactus palustris*, both indicative of calcareous grassland/fen are present in this location in large numbers. Other species include *Molinea caerulea, Briza media, Luzula multiflora, Juncus squarrosus, Juncus effuses, Juncus acutiflorus, Eriophorum augustifolium, Carex panacea, Carex nigra, Carex binervis, Succisia pratensis* and *Centaurea nigra*. Due to the profusion of orchids, under the NRA site evaluation scheme [19], this habitat would be rated as of County Importance.

Other artificial lakes and ponds (FL8) - This refers to a large area of open water which includes emergent vegetation such as *Typha latifolia* and *Juncus bulbosus*. Aquatic species such as *Hydrocotyle vulgaris, Sparganium erectum* are also found. On the edge of the pond *Molinia caerula, Eriophorum vaginatum, Juncus effuses* and some Sphagnum species are found. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher value).

Mixed) broadleaved woodland (WD1) - This consists of a broadleaf plantation of Fraxinus excelsior, with the height of trees above 5m. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher value).

Conifer plantation (WD4) - Conifer plantation exists at the Drehid portion of the Drehid-Hortland portion in varying age classes although mature stands predominate. The dominant species is *Pucea sitchensis* although *Pinus sylvestrus* is also present. Broadleaved species have been planted along the edges of tracks and include *Fraxinus excelsior, Betula pubescens, Fagus sylvatica, Ilex aquifolium, Quercus petraea* and *Salix cinerea.* Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Lower value).

Treelines (WL2) - Treelines occur at the site and mainly contain *Fraxinus excelsior, Crataegus monogyna, Salix* spp., *Pinus sylvestris* and *Corylus avellana.* Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher value) due to its value as a corridor for wildlife.

Scrub (WS1) - Recolonising areas of scrub exist where clearfelled forestry has not been replanted. Tree species present include *Picea sitchensis, Betula pubescens* and *Salix* spp.

Shrubs include *Sambucus nigra*, *Chanerion augustofolium*, *Epilobium hirsutum*, *Cirsium* spp., *Geranium robertianum* and *Taraxacum* spp. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher value).

Hortland (Turbines 40-46)

Habitat mapping was carried out at the subject site on July 10, 2013 following methods previously outlined. Habitat types identified within the study area are illustrated in Figure 7.15.7 Habitat Map, Appendix 6, and described below. Further Peatland surveys, of habitat identified as having the potential to conform to a type on Annex I of the Habitats directive was carried out on December 12, 2013.

Tilled Land (BC3) - A single, recently tilled field was recorded during habitat surveys. This was located in open farmland to the east of the proposed location of T43. Due to its highly modified nature, under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Lower Value).

Depositing/ Lowland Rivers (FW2) - This habitat classification pertains to the River Blackwater which flows adjacent to the site along the eastern edge of the proposed T40 land folio/forestry compartment. Although technically outside the site boundary this is considered in the current assessment due to its close proximity. The river at this stage is narrow and obscured by trees in places with limited aquatic vegetation. Aquatic vegetation recorded includes *Lemna minor*, *Phalaris arundinacea* and *Nasturtium officinale*. Due to its high connectivity/corridor value, under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

Drainage ditches (FW4) - Drainage ditches exist throughout the site, around most fields and forestry compartments. They often replace hedgerows as boundaries. This habitat would be rated as Local Importance (Lower value) as many exhibit signs of enrichment.

Improved agricultural grassland (GA1) - Improved agricultural grassland is found at the proposed location for T41. This improved and primarily grazed by sheep at the location in question. A full species list of the species present is included in the appended Botanical Species list (see Appendix 8). Due to its highly modified nature, under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Lower Value).

Wet Grassland (GS4) - Referring to a field of wet grassland to the east of the proposed Turbine (T49) at Mucklon, this is a field dominated by rushes and species such as *Potentilla anserina*, *Filipendula ulmaris*, *Mentha aquatica*, *Juncus effusus* and *Veronica beccabunga*. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

Cutover Bog (PB4) - Some small pockets of historically cutover bog exist within the main forestry compartments containing the proposed turbines T42-45. These are now succeeding to scrub with areas of bracken also. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

Conifer Plantation (WD4) - Conifer planatation dominated by *Picea sitchensis.* Due to low diversity under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Lower Value).

Hedgerows (WL1) - Hedgerows within the Hortland section (of Drehid-Hortland) are primarily comprised of *Crataegus monogyna* (Hawthorn), poor growing in many places and younger hedges of this species also occur. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

Treelines (WL2) - Hedgerows exist along main road boundaries, forest edges and bordering some drains within the site. Some very mature *Salix* spp. are present under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

Bog Woodlands (WN7) - Bog woodland, primarily Birch stands dominated by *Betula pendula,* exists as buffers between unplanted forestry compartments within the main grouping of turbines T41-45. Some wind blown areas of forestry have also succeeded to this habitat type. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

Recently Felled Woodland (WS5) - This refers to recently clearfelled areas of forestry. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Lower Value).

Buildings and Artificial Surfaces/ Dry Meadows and Grassy Verges (BL3/GS2) - This classification refers to forestry tracks internal to the main area of commercial forestry within the Hortland portion of the Drehid-Hortland cluster. Many tracks have a corresponding linear grassy verge which is best considered as the latter habitat type above i.e. Dry Meadows and Grassy Verges. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Lower Value).

Conifer Plantation/ Mixed Broadleaf and Conifer Plantation (WD4/WD2) - This classification refers to the specific forestry compartment within which the proposed T42 is to be located. In portions of this compartment a broadleaf component exists where existing Birch (*Petula* spp.) has not been thinned out resulting in a mosaic, dominated by WD4 but which smaller areas could be classified as WD2 due to the presence of Birch stands. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Lower Value).

Conifer Plantation/ Cutover Bog (WD4/PB4) - This habitat classification refers to Spruce (*Picea sitchensis*) planted on cutover bog. Due to the age of this young, first rotation forestry, resulting visible strata of young trees and rank heather are present. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Lower Value).

Raised Bog (PB1) - Although not present within the cluster boundary, an area of high bog exists immediately adjacent to the west. Due to the possibility of this corresponding with an Annex I habitat, dedicated peatland surveys by a specialist ecologist were undertaken to investigate the potential for impact. The results of the survey, including illustrations of the locations of Active Raised Bog, carried out in December 2013, are appended in Appendix 7: Peatland Survey Report.

The site comprises an intact section of raised bog habitat located on a flat low lying area surrounded by cutover bog and conifer forestry. The dominant vegetation recorded throughout the site comprises *Calluna vulgaris*, *Eriophorum vaginatum*, *Trichophorum cespitosum*, and *Narthecium ossifragum*. Other abundant species include *Cladonia portentosa* and *Sphagnum* mosses. The high bog supports two discrete areas of active peat forming communities in the south-western part of the bog. Active areas contain sub-central ecotope dominated by *Sphagnum* mosses.

The sub-central ecotope (active peat forming areas) are typically dominated by *Eriophorum vaginatum and Rhynchospora alba* together with a good diversity of *Sphagnum* mosses including *Sphagnum magellanicum*, *Sphagnum papillosum*, *Sphagnum capillifolium*, *Sphagnum cuspidatum*, *Sphagnum subnitens* and *Sphagnum fallax*. Areas supporting this ecotope type comprise 50-60% *Sphagnum* moss cover. Substrate is soft underfoot. The microtopography is relatively well developed and comprises low hummocks, *Sphagnum* lawns, and occasional pools. The formation of active peat forming areas is likely to be attributed to secondary re-wetting of the high bog caused by subsidence due to drainage and peat extraction activities. In addition, the site supports three other ecotope types that conform to degraded raised bog (face bank, marginal and sub-marginal).

Conditions are progressively drier towards the edge of the bog, with sub-marginal and marginal ecotopes prominent. The site is of conservation value for the presence of the priority EU Annex I habitat 'Active raised bog 7110'. Past drainage of the high bog is evident by the presence of functional drainage ditches in the southern part of the site.

The southern margins of the high bog comprise actively cut face banks that are progressively intruding into the high bog. An extensive area of industrially cutaway bog adjoins the western part of the site. Active cutting is no longer occurring along northern and eastern margins.

The bog is a remnant area of raised bog that has been severely impacted by long term peat extraction and associated drainage. The site continues to support a small area of active raised bog, a habitat that is rare throughout Ireland. The site is deemed to be of high conservation value due to the presence of 'Active Raised Bog (7110)', a priority habitat listed on Annex I of the EU Habitats Directive.

4.1.5.2 Annex I Appraisal

An Annex I appraisal of the raised bog south of the proposed location of T12, T13 was carried out on 22/8/2014. Two releves were undertaken to record in detail Flora species and respective cover of each present.

In summary this assessment found that the high bog present at the location is a remnant of a more extensive degraded/cutover raised bog which still has active raised bog (sphagnum cover >50%). The edge of the high bog is not defined by a face bank and the high bog surface has no drains; therefore it corresponds to the Annex I priority habitat "Active Raised Bog [7110]". This habitat, located outside the proposed development boundary, is of high conservation value.

4.1.5.3 Botanical Species

Lists of botanical species recorded within the Drehid-Hortland cluster are provided in Appendix 8. No FPO (Flora Protection Species) were noted within the cluster. Details of species identified from the Peatland survey of the adjacent high bog within the Hortland portion of the cluster are detailed in the relevant appendix of said report. A full list of botanical species recorded within the subject site is detailed in *Rhododendron Ponticum* was the only invasive species recorded; this species is found at the forestry entrance to the site at N79873/35724 (illustrated in Figure 7.15.7, Appendix 6).

4.1.5.4 Terrestrial Mammals

Badger
Evidence of Badger was noted at 3 locations within the proposed Drehid portion (T11-T23, T47) of the Drehid-Hortland cluster. An active sett with a single entrance was located in Parsonstown and Badger tracks were noted both on bog south of the proposed turbine T13 and also proximal to the proposed locations for Turbines 20 and 22. Locations of evidence are detailed below in Table 4.10. No evidence of Badger was recorded within the proposed T40-T46 at Hortland.

Table 4.10: Badger Records for Drehid Hortland

Date	Site	Species	Badger Signs	Turbine No./Folio/Location	Grid ref
22/04/2013	Drehid	Badger	Badger tracks throughout bog near T13.	Between T20 and T22	Badger sett 674815 734449

Otter

Otter evidence (spraints) was noted along drains on the bog adjacent to the red line boundary between T14 and T15. An Otter holt was located along a drainage channel located to the south of the proposed location of T40.

Table 4.11: Recorded Otter Evidence Drehid – Hortland

Date	Site	Species	Otter signs	Turbine No./Folio/Location	Grid ref
22/04/2013	Drehid	Otter	Otter spraints along drains on bog close to T14 and T15	T14/T15	N674957 736247
25/02/2015	Hortland	Otter	Holt; Active	T40	N681407 734727

Other Mammals
Irish Hare is present at the site. Wood mouse remains were found in raptor pellets collected during Merlin surveys. Deer species are also present. Red Fox is present.

4.1.5.5 Avifauna

There were no records of the following target species from surveys carried out at the Drehid-Hortland cluster: Greenland White fronted Goose, Kingfisher, Redshank, Black-Headed Gull or Common Gull.

Drehid (Turbines T11-T23, T47)

Whooper Swan

Occurrence within subject site winters 2012-2014
A single bird was noted in flight over the Drehid portion of Drehid-Hortland on the 18/3/2013, during winter B&S surveys. This bird traversed the site northwest to southeast, due east of the proposed location of T21 (see Figure 7.15.0. B&S Flightlines of Note).The flight height of the observed bird was 50m; total flight duration was 51s.

Golden Plover

Golden Plover (an Annex I species [2]) were noted on six occasions in or near the Drehid portion of Drehid-Hortland. All observations were during the winter period. Table 4.12, below details the six observations. For observations for which flight height was recorded (n=5) three of the five observations involved flight activity within the predicted rotor envelope. The recorded peak of 220 birds involved a flock off site to the northwest of Parsonstown at Coonagh.

Table 4.12: Golden Plover Observations Drehid – Hortland Turbines (T11-T23, T47)

Site Name	Survey Type	Visit Number	Date	Start Time	End Time	Species	Number	Bird Notes
Drehid	B & S Winter	1	25/10/2012	12.38	13.45	Golden Plover_GP	2	Flying 10-100m
Drehid	B & S Winter	2	15/01/2013	10.00	15.45	Golden Plover_GP	52	
Drehid	B & S Winter	2	15/01/2013	10.00	15.45	Golden Plover_GP	20	Flew E at 15-20m
Drehid	B & S Winter	2	15/01/2013	10.00	15.45	Golden Plover_GP	24	Flew S at 10-15m

Site Name	Survey Type	Visit Number	Date	Start Time	End Time	Species	Number	Bird Notes
Drehid	B & S Winter	2	15/01/2013	10.30		Golden Plover_GP	18	Flying c.100m then <60m. Landed briefly.
Drehid	B & S Winter	3	18/03/2013	08.55	16.00	Golden Plover_GP	220	120->180m

Merlin

No Merlin were recorded within the Drehid portion of Drehid-Hortland during winter surveys. Following methods outlined previously the 1km square N7536 was selected as the breeding Merlin survey square for Drehid due to its habitat content including both foraging (bog) and nesting habitat (conifer edge). The location of the survey square and digitised transect routes used to search for Merlin evidence are detailed in Figure 7.15.3 Survey squares.

On the basis of the collected information, no usage of the selected habitat by Merlin could be extrapolated. A single pellet, found in May is most likely Kestrel given that Kestrel was recorded in the vicinity during winter B&S surveys. Passerine feathers, found underneath a tree along a ditch is typical evidence from Sparrowhawk (also recorded at the site during winter surveys) and therefore unlikely to be Merlin. Insufficient evidence of the quantity and type expected at a Merlin site were located to consider the surveyed square as containing breeding Merlin or being part of a Merlin territory. Results of Merlin surveys are outlined below in Table 4.13 and illustrated in Figure 7.15.5.

Table 4.13: Results of Merlin Surveys N7536 – Drehid-Hortland Cluster

Visit Number	Date	Sighting / Structure / Sighting Grid Reference	sign / evidence type	No. Of prey items	Age of prey / evidence	Bird Notes
1	07/05/2013	74981/36105	P	1	>3weeks	Possible Kestrel Pellet
1	07/05/2013	75452/36105				Snipe x1
1	07/05/2013	75619/35533				Mallard x1
2	07/06/2013					No signs recorded
3	09/08/2013	675323/736879	Pl	15	<3weeks	Passerine feathers found under a birch tree along ditch
3	09/08/2013					Jay x2: pair in forestry

Hen Harrier

No Hen Harriers were recorded from surveys carried out at the Drehid portion of Drehid-Hortland.

Lapwing

A flock of 19 wintering Lapwing were recorded during winter B&S surveys. These were noted SE of the proposed location of T14 on cutaway bog, outside the cluster boundary.

Investigations during the 2013 breeding season (April to June) found no occupied territories within the 500 envelope (500m around each proposed turbine location).

Woodcock

There were two occupied breeding territories, of the red listed [36] Woodcock (*Scolopax rusticola*) recorded within or near the 500m turbine envelope (see Figure 7.15.4: Breeding Wader Results, Appendix 6). A single bird was recorded roding (in territorial display) within the 500m envelope, to the southeast of the proposed location of T14 in April 2013 (date of visit 22/4/2013 and 23/4/2013). A further bird was recorded roding in June to the east of the proposed location of T20, also within the predicted 500m turbine envelope.

Snipe

Three confirmed occupied territories (based on drumming or displaying males) and one possible territory (bird recorded in flight only) were noted during breeding wader surveys carried out in April-June 2013 (see Figure 7.15.4: Breeding Wader Results). The locations of birds exhibiting territorial behaviour in 2013 was exclusively outside the proposed 500m turbine envelope, and centred on the habitats fringing the large expanse of bog to the east of the cluster. An occupied territory (see Figure 7.15.4: Breeding Wader Results) was verified on the 29th April, 2014 when another male was noted drumming south of the proposed location of turbine T13.

This is assumed to be a separate territory to those recorded in 2013, and was within the proposed 500m turbine envelope.

Table 4.14: Snipe Breeding Observations Turbines (T11-T23, T47) – Drehid Hortland Cluster

Species	Number	Total pairs	Breeding Status	Sighting / Structure / Sighting Grid Reference	Bird Notes
Snipe_SN	1	1	OT	675236 736232	Drumming
Snipe_SN	1	1	OT	675494 735591	Possible breeder, flying no drumming
Snipe_SN	2	2	2OT	674964 733884	2 Drumming
Snipe_SN	1	1	OT	765 368	One drumming; 2014 visits to cover envelope changes

Barn Owl

No observation was made of Barn Owl during the entire survey period.

Following the methods outlined previously, 10 locations within 1.5km of the wind farm site were identified as having potential for breeding Barn Owls and were examined for evidence of Barn Owl. Of these, no site was confirmed to contain Breeding Barn Owl. Two of the surveyed locations were classified in the highest category for suitability (occupied or highly suitable) for breeding Barn Owl (*Tyto alba*) with multiple opportunities for nesting and/or roosting.

In addition, there were four suitable Barn Owl sites recorded within 1.5km of the subject site, which were classified as having limited access and/or limited number of nest and/or roost locations, an additional 2 sites were classified as suitable for roosting only. No evidence of nesting and/or roosting was recorded within these sites. Two sites were completely unsuitable for either roosting or breeding.

The findings of the current study, in particular the low occupancy of highly suitable nest sites, reflect the current status of the species in Ireland, which has undergone a 47% decline in breeding distribution during the period 1968-72 to 2007-11 [64]. Barn Owl is Red listed on the BoCCCI list [36].

Yellowhammer

This species, which is red listed in Ireland was recorded both during winter and breeding season surveys. All observations were from the southwest portion of the site, in particular the townlands of Drehid and Parsonstown. During winter a peak of eight birds were recorded in northern area of the cluster within which proposed turbines T11, T12 and T13 are to be located. Birds were also noted in this area during CBS (breeding season) surveys indicating that birds are present year round in suitable habitat.

Whinchat

No records of this species which has undergone a 76% range contraction in Ireland (most of which in the midlands) in the time period 1968-72 to present [64].

Kestrel

Kestrel was noted on two occasions during winter B&S surveys. Dates of observations were 25/10/2012 and 18/3/2013. No sightings were recorded during breeding season surveys however a single pellet found during Merlin surveys is attributable to Kestrel and points to resident birds outside the Drehid portion of Drehid-Hortland boundary.

Mute Swan

Two adults were recorded in flight over the Drehid portion of Drehid-Hortland on 18/3/2013 during winter B&S surveys. Observed flight height was 40m and flight duration was 68s.The birds were flying northeast to southwest between the proposed locations of T17 and T18.

Buzzard

There were three observations of this species during winter 2012/13 B&S surveys. Two observations involved single birds (in flight at 10-50m and 30m respectively) and the third, in March 2013 involved a pair in display over suitable breeding habitat east of the proposed location of T20 (see Figure 7.15.0 B&S Flightlines of Note, Appendix 6). This involved flight heights of up to 100m. There were no further observations during the breeding season.

General Wintering Birds

A total of 53 species were recorded from the site over the course of winter season B&S surveys. Of these, five species (Yellowhammer, Meadow Pipit, Grey Wagtail, Lapwing and Golden Plover) are on the BoCCI Red List [36], 11 species (Goldcrest, Robin, House Sparrow, Kestrel, Linnet, Mistle Thrush, Mute Swan, Tree Sparrow, Teal, Whooper Swan and Starling) are Amber listed; whilst the remaining species recorded are all Green listed.

Three species listed on Annex I of the EU Habitats Directive (Golden Plover, Little Egret and Whooper Swan) were recorded. Table 4.15, over details the species recorded.

Table 4.15: B&S Bird Survey Results – Drehid Hortland Cluster Turbines T11-T23, T47

B&S		Code	Visit 1	Visit 2	Visit 3	Total	BoCCI status	EU habitats Directive Annex I
Blackbird	*Turdus merula*	B	26	85	60	171	Green	No
Blue Tit	*Cyanistes caeruleus*	BT	8	7	7	22	Green	No
Bullfinch	*Pyrrhula pyrrhula*	BF	1	1	1	3	Green	No
Buzzard	*Buteo buteo*	BZ	3	1	3	7	Green	No
Chaffinch	*Fringilla coelebs*	CH	25	23	79	127	Green	No
Coal Tit	*Periparus ater*	CT	6	31	15	52	Green	No
Collared Dove	*Streptopelia decaocto*	CD	0	0	3	3	Green	No
Common Crossbill	*Loxia curvirostra*	CR	0	1	5	6	Green	No
Dunnock	*Prunella modularis*	D	2	11	8	21	Green	No
Feral Pigeon	*Columba livia*	FP	0	0	5	5	Green	No
Fieldfare	*Turdus pilaris*	FF	108	121	5	234	Green	No
Goldcrest	*Regulus regulus*	GC	15	19	14	48	Amber	No
Golden Plover	*Pluvialis apricaria*	GP	2	114	220	336	Red	Yes
Goldfinch	*Carduelis carduelis*	GO	53	0	0	53	Green	No
Great Tit	*Parus major*	GT	22	3	9	34	Green	No
Green Sandpiper	*Tringa ochropus*	GE	0	0	2	2	Green	No
Grey Heron	*Ardea cinerea*	H	0	0	1	1	Green	No
Grey Wagtail	*Motacilla cinerea*	GL	2	0	0	2	Red	No
Hooded Crow	*Corvus cornix*	HC	10	18	31	59	Green	No
House Sparrow	*Passer domesticus*	HS	26	0	3	29	Amber	No
Jackdaw	*Corvus monedula*	JD	3	10	6	19	Green	No
Jay	*Garrulus glandarius*	J	6	4	4	14	Green	No
Kestrel	*Falco tinnunculus*	K	1	0	1	2	Amber	No
Lapwing	*Vanellus vanellus*	L	19	0	0	19	Red	No
Lesser Redpoll	*Carduelis cabaret*	LR	50	3	25	78	Green	No
Linnet	*Carduelis cannabina*	Li	18	11	0	29	Amber	No
Little Egret	*Egretta garzetta*	ET	0	1	0	1	Green	Yes
Long-tailed Tit	*Aegithalus caudatus*	LT	2	9	3	14	Green	No
Magpie	*Pica pica*	MG	6	10	4	20	Green	No
Mallard	*Anas platyrhynchos*	MA	22	2	4	28	Green	No
Meadow Pipit	*Anthus pratensis*	MP	12	4	24	40	Red	No
Mistle Thrush	*Turdus viscivorus*	M	18	0	12	30	Amber	No
Mute Swan	*Cygnus olor*	MS	0	0	2	2	Amber	No
Pheasant	*Phasianus colchicus*	PH	14	0	5	19	Not assessed	No
Pied Wagtail	*Montacilla alba*	PW	2	1	5	8	Green	No
Raven	*Corvus corax*	RN	3	4	1	8	Green	No
Redwing	*Turdus iliacus*	RE	164	136	129	429	Green	No
Reed Bunting	*Acrocephalus*	RB	6	0	1	7	Green	No

B&S		Code	Visit 1	Visit 2	Visit 3	Total	BoCCI status	EU habitats Directive Annex I
	scirpaceus							
Robin	*Erithacus rubecula*	R	45	24	33	102	Amber	No
Rook	*Corvus frugilegus*	RO	61	114	61	236	Green	No
Siskin	*Carduelis spinus*	SK	43	0	0	43	Green	No
Snipe	*Gallinago gallinago*	SN	5	9	0	14	Amber	No
Song Thrush	*Turdus philomelos*	ST	1	4	13	18	Green	No
Sparrrowhawk	*Accipiter nisus*	SH	1	0	1	2	Green	No
Starling	*Sturnus vulgaris*	SG	1	533	1406	1940	Amber	No
Stonechat	*Saxicola torquata*	SC	0	1	0	1	Green	No
Teal	*Anas crecca*	TE	0	16	21	37	Amber	No
Tree Sparrow	*Passer montanus*	TS	0	0	22	22	Amber	No
Treecreeper	*Certhia familiaris*	TC	0	1	4	5	Green	No
Whooper Swan	*Cygnus cygnus*	WS	0	0	1	1	Amber	Yes
Woodpigeon	*Columba palumbus*	WP	185	20	154	359	Green	No
Wren	*Troglodytes troglodytes*	WR	33	24	25	82	Green	No
Yellowhammer	*Emberiza citronella*	Y	0	1	8	9	Red	No

General Breeding Birds

Table 4.16, details the species recorded on both early and late season CBS (Countryside Bird Survey) visits. Following methods outlined previously, two 1km squares (illustrated in Figure 7.5.0 Survey Squares, Appendix 6) were selected to sample breeding bird activity within the cluster. The northernmost square (N7436) was selected to sample agricultural habitats and forestry in different stages of its lifecycle and the southernmost square (N73 335) sampled agricultural lands.

Species recorded included general countryside birds. Yellowhammer, which is Red listed was recorded. Migrant species recorded included, Blackcap, Willow Warbler, Chiffchaff, Whitethroat and Swallow. Cuckoo (n=3) was recorded during the early season visit to N7335. In total 1 red, 6 amber and 30 green listed species were recorded.

Table 4.16: CBS Survey Results N7436 – Hortland Drehid Cluster (T11-T23, T47)

CBS		Code	Early	Late	BoCCI status	EU habitats Directive Annex I
Blackbird	*Turdus merula*	B	42	30	Green	No
Blackcap	*Sylvia atricapilla*	BC	3	1	Green	No
Blue Tit	*Cyanistes caeruleus*	BT	8	3	Green	No
Bullfinch	*Pyrrhula pyrrhula*	BF	0	3	Green	No
Chaffinch	*Fringilla coelebs*	CH	39	34	Green	No
Chiffchaff	*Phylloscopus collybita*	CC	5	5	Green	No
Coal Tit	*Periparus ater*	CT	13	8	Green	No
Collared Dove	*Streptopelia decaocto*	CD	4	0	Green	No
Cuckoo	*Cuculus canorus*	CK	3	0	Green	No
Dunnock	*Prunella modularis*	D	3	8	Green	No
Goldcrest	*Regulus regulus*	GC	16	16	Green	No
Goldfinch	*Carduelis carduelis*	GO	5	5	Green	No
Great Tit	*Parus major*	GT	10	2	Green	No
Greenfinch	*Carduelis chloris*	GR	1	6	Green	No
Hooded Crow	*Corvus cornix*	HC	4	0	Green	No
House Sparrow	*Passer domesticus*	HS	8	2	Amber	No
Jackdaw	*Corvus monedula*	JD	0	2	Green	No
Jay	*Garrulus glandarius*	J	1	0	Green	No
Lesser Redpoll	*Carduelis cabaret*	LR	8	0	Green	No
Long-tailed Tit	*Aegithalus caudatus*	LT	4	5	Green	No
Magpie	*Pica pica*	MG	0	1	Green	No
Mallard	*Anas platyrhynchos*	MA	1	1	Green	No
Mistle Thrush	*Turdus viscivorus*	M	2	7	Green	No
Moorhen	*Gallinula chloropus*	MH	1	0	Green	No
Pied Wagtail	*Montacilla alba*	PW	1	2	Green	No
Raven	*Corvus corax*	RN	2	0	Green	No
Robin	*Erithacus rubecula*	R	21	8	Amber	No
Rook	*Corvus frugilegus*	RO	49	4	Green	No
Song Thrush	*Turdus philomelos*	ST	17	12	Green	No

CBS		Code	Early	Late	BoCCI status	EU habitats Directive Annex I
Starling	*Sturnus vulgaris*	SG	0	7	Amber	No
Swallow	*Hirundo rustica*	SL	13	12	Amber	No
Treecreeper	*Certhia familiaris*	TC	1	0	Green	No
Whitethroat	*Sylvia communis*	WH	5	4	Green	No
Willow Warbler	*Phylloscopus trochilus*	WW	11	9	Green	No
Woodpigeon	*Columba palumbus*	WP	18	16	Green	No
Wren	*Troglodytes troglodytes*	WR	51	46	Green	No
Yellowhammer	*Emberiza citronella*	Y	7	4	Red	No

Hortland (Turbines T40 - T46)

Whooper Swan

No observations were made of this species within the study period.

Golden Plover

Golden Plover (an Annex I species [2]) were noted on a single occasion in or near the cluster boundary during the winter period. Table 4.17, details the observation. For observations for which flight height was recorded (n=1) none involved flight activity within the predicted rotor envelope.

Table 4.17: Golden Plover Observations – Drehid Hortland Turbines (T40-T46)

Site Name	Survey Type	Date	Species	Number	Duration (s)	<30	<50	30-170	50-170	>170
Hortland	B & S Winter	25/01/2013	Golden Plover_GP	438	600		600	600		

Merlin

No Merlin were recorded during winter surveys. Following methods outlined previously the 1km square N7935 (see Figure 7.15.3 Survey Squares, Appendix 6) was selected as the breeding Merlin survey square for the Hortland portion of the Drehid-Hortland cluster due to its habitat content including both foraging (bog) and nesting habitat (conifer edge). Results are presented in Table 4.18 over.

Table 4.18: Results of Merlin Surveys N7935 – Drehid – Hortland Cluster (T40-T46)

Visit Number	Date	Sighting / Structure / Sighting Grid Reference	sign / evidence type	No. Of prey items	Age of prey / evidence	Bird Notes
1	11/04/2013	N79372 35481	Pellets, Plucked item	2	>/<3weeks	frog, bird
1	11/04/2013	N79356 35500	Pellets, Plucked item	1	<3weeks	frog
1	11/04/2013	N79347 35507	Plucked item	2	>/<3weeks	frog, bird
1	11/04/2013	N79200 35164	Plucked item	1	<3weeks	frog
1	11/04/2013		Hen Harrier x1			male, hunting/flying. Mobbed by hooded crows
1	11/04/2013		Buzzard x1			
1	11/04/2013		Kestrel x2			male and female
2	04/06/2013	N79369 35482	Plucked item	1	<3weeks	bird
2	04/06/2013	N79364 35493	Pellets		>3weeks	
2	04/06/2013	N79356 35501	Plucked item		>3weeks	
2	04/06/2013	N79352 35508	Plucked item	2	<3weeks	bird and mammal
2	04/06/2013	N78882 35407	Plucked item, pellets	1	>3weeks	feather
2	04/06/2013	N79202 35168	Moth Wings	1	previous season	dragon fly wings
3	10/07/2013	N7928 3567				

Results of the analysis of collected prey remains and pellets is presented below in Table 4.19. Where possible, all species discovered were identified to the specific level.

A number of assumptions have been made, as follows: (1) all small passerines up to the size of thrush species (Song Thrush, Redwing and Blackbird), and Snipe, are considered potential Merlin prey where feather 'scatters' were discovered (note that where remains of small passerines were found in pellets, then the nature of the pellet is considered before assigning it to Merlin or another bird of prey species); (2) small mammal remains found in pellets have not been assigned to Merlin, as all such pellets were identifiable as belonging to Kestrel or Long-eared Owl; (3) Frog remains found in pellets (or otherwise) have not been assigned to Merlin (although see *Irish Birds* 9: 510-511), pellets containing Frog are assigned to Kestrel.

Although studies suggest that Frogs are not a common feature of Kestrel diet; (4) Frogs appear to be more often taken by Kestrels than by Merlins; Table 4.19, below shows the results of the pellet analysis for N7935.

Table 4.19: Prey Item/Pellet Analysis N7935 Merlin Square

Site Name	Date Collected	Grid Reference	Contents	Refers to Merlin Presence Y/N
Hortland N7935	11-Apr-13	N79372 35489	Meadow Pipit feathers	Yes
			LEO pellet (44x22): Wood Mouse (2)	No
Hortland	11-Apr-13	N79356 35500	Kestrel pellet (23x11): Pygmy Shrew	No
Hortland	11-Apr-13	N79347 35507	Meadow Pipit feathers	Yes
Hortland	05-Jun-13	N79364 35493	Kestrel pellet (33x14.5): Wood Mouse & Pygmy Shrew	No
Hortland	05-Jun-13	N79352 35508	Passerine feathers, possibly Chaffinch	No
Hortland	05-Jun-13	N79369 35482	Siskin; possibly Greenfinch	Yes
Hortland	05-Jun-13	N79202 35168	Dragonfly	Yes
Hortland	05-Jun-13	N78882 35407	Linnet or Redpoll feathers	Yes
			Kestrel/Merlin pellet (38x18); small passerine, possibly Linnet	No
			Kestrel pellet: very small pellet, mammal fur, but no bone	No
Hortland	05-Jun-13	N79356 35501	Frog/Lizard backbone	Possibly

On the basis of the collected information, the subject square does show evidence of potential usage by Merlin and consequently may form part of a territory. Many of the prey items can be attributed to Merlin and therefore on a precautionary basis the square is assigned as showing evidence of occupancy by Merlin. It should be noted that no observations where made of birds, and no suitable nest sites (such as old corvid nests) were recorded; however research shows that this does not preclude the presence of Merlin. Nonetheless one might expect that if breeding were occurring in the square which was surveyed (or in the area of the square closest to the proposed turbines) some observations of territorial behaviour such as mobbing the observer, mobbing other birds of prey etc. might have been recorded. It should be noted that the area was also surveyed three times for breeding waders, with no observations of Merlin. Kestrel Hen Harrier and Buzzard however, were observed in the same square over the same survey period. Results of Merlin surveys are illustrated in Figure 7.15.5, Appendix 6.

Red Grouse

A Red Grouse survey, following methods outlined previously was carried out at the subject site in late March 2013 (date: 27/3/2013). An east-west transect through suitable habitat (high bog west of the proposed development) was walked and a tape lure simulating the territorial call of a male Red Grouse was played. No responses were received and it is therefore assumed that no Red Grouse are present on the high bog surveyed.

Hen Harrier

A single Hen Harrier was observed during Merlin surveys on April 11, 2013. The sighting involved a male bird which was noted hunting and interacting with Hooded Crows before flying out of sight to the west (see Figure 7.15.5 Merlin Transects and Additional Sightings, Appendix 6). As the subject site is outside the current range of breeding Hen Harrier in Ireland [65], this is assumed to have been a late wintering bird possibly en route to one of the known roosts located to the south of the site (see 4.1.6.5).

Curlew

A single record of five birds during winter B&S surveys on 21/1/2013. No further sightings during winter visits and no evidence of breeding.

Lapwing

No Lapwing were recorded on site during breeding wader surveys carried out in April, May and June 2013. Lapwing were recorded on site during winter B&S surveys carried out in winter 2012/13. Birds were noted on two days in the vicinity of the proposed location of T46, in the townland of Bishop's Chair. Recorded flight activity and numbers are detailed in Table 4.20, below.

Table 4.20: Lapwing Observations Drehid-Hortland Turbines T40-T46

Site Name	Survey Type	Visit Number	Date	Species	Number	Duration (s)	<50	50-170	>170
Hortland	B & S Winter	1	01/11/2012	Lapwing_L.	58				
Hortland	B & S Winter	2	24/01/2013	Lapwing_L.	110	250	250		
Hortland	B & S Winter	2	24/01/2013	Lapwing_L.	105	350	350		
Hortland	B & S Winter	2	25/01/2013	Lapwing_L.	105	330		330	

Total recorded flight duration was 9s of which all was below the predicted rotor envelope of 50-170m. A further breakdown finds that 600s was at heights less than 20m, whilst 330s was at 50m. Birds were also noted in this area on the first B&S visit in lower numbers (n=58). The maximum number recorded on site was 110, noted on January 21, 2013.

Woodcock

No woodcock were recorded during winter surveys.

There were four occupied breeding territories, of the red listed [36] Woodcock (*Scolopax rusticola*) recorded within or near the 500m turbine envelope (see Figure 7.15.4: Breeding Wader Results, Appendix 6).

Surveys were carried out during the time period April-June 2013, following methods outlined previously. Dates of surveys were April 11, 24 and 27; May 23 and 24 and June 19 and 25. Results of surveys are detailed below in Table 4.21, and illustrated in Figure 7.15.4 Breeding waders survey results, Appendix 6.

Table 4.21: Breeding Woodcock Territories – Drehid / Hortland Turbines T40-T46

Site Name	Survey Type	Species	Number	Breeding Status	Grid Reference	Bird Notes
Hortland	Breeding wader	Woodcock_WK	1	CBA	N800 356	Roding and flushed 27/04/2013
Hortland	Breeding wader	Woodcock_WK	1	CBA	N801 348	Roding
Hortland	Breeding wader	Woodcock_WK	2	CBA	N804 351	Roding
Hortland	Breeding wader	Woodcock_WK	1	CBA	N805 357	Roding

Snipe

Four occupied territories (based on drumming or chipping birds), including one confirmed breeding attempt, were noted during breeding wader surveys carried out in April-June 2013 (see Figure 7.15.5: Breeding Wader Results, Appendix 6).

Three of these were outside the 500m turbine envelope on high bog adjacent to the west whilst the remaining territory was within the 500m boundary line to the south east of the proposed T40 location. In total, four pairs of Snipe are thought to have bred or held territory close to the proposed windfarm, all but one outside the proposed turbine envelope.

Table 4.22: Locations of Snipe Breeding Observations Hortland Turbines T40-T26

Survey Type	Species	Number	Breeding Status	Sighting / Structure / Sighting Grid Reference	Bird Notes
Breeding wader	Snipe_SN	1	OT	N795 356	Chipping
Breeding wader	Snipe_SN	1	OT	N793 357	Chipping
Breeding wader	Snipe_SN	2	CBA	N818 347	Drumming both visits
Breeding wader	Snipe_SN	1	OT	N789 352	Chipping

Barn Owl

No observation was made of Barn Owl during the entire survey period. Following the methods outlined previously, 21 locations within 1.5km of the wind farm site were identified as having potential for breeding Barn Owls and were examined for evidence of Barn Owl. Of these, no site was confirmed to contain Breeding Barn Owl. Three of the surveyed locations were classified in the highest category for suitability (occupied or highly suitable) for breeding Barn Owl (*Tyto alba*) with multiple opportunities for nesting and/or roosting. In addition, there were 11 suitable Barn Owl sites recorded within 1.5km of turbines T40-46, which were classified as having limited access and/or limited number of nest and/or roost locations, an additional five sites were classified as suitable for roosting only. No evidence of nesting and/or roosting was recorded within these sites. Two sites were completely unsuitable for either roosting or breeding. The findings of the current study, in particular the low occupancy of highly suitable nest sites, reflect the current status of the species in Ireland, which has undergone a 47% decline in breeding distribution during the period 1968-72 to 2007-11 [(64)]. Barn Owl is Red listed on the BoCCCI list [(36)].

Yellowhammer

This species, which is red listed in Ireland, was not recorded from the Hortland portion of Drehid-Hortland cluster during winter and breeding season surveys.

Whinchat

This species which has undergone a 76% range contraction in Ireland (most of which in the midlands) in the time period 1968-72 to present [64]. A breeding pair was noted on June 19, 2013; west of the proposed turbine T40 location. Both male and female birds were noted in wet grassland habitat, located outside the proposed development boundary.

Kestrel

Kestrel was noted on two occasions during winter B&S surveys. Dates of observations were 01/11/2012 and 24/1/2013. One of these occasions was a female commuting through the site at a flight height of 30m. Observations during the summer months included a pair in April, noted hunting the high bog and forest edge west of the proposed location of T42. Single sightings were also noted close to this location in May indicating a potential breeding territory. However, no occupied nests or proof of breeding was recorded within the Hortland portion of Drehid-Hortland.

Lesser Black-backed gull

A single observation during winter months. A flock of 5 was noted on 22/3/2013 during winter B&S surveys.

Buzzard

There were six observations of this species during surveys within the Hortland portion of the Drehid-Hortland cluster. Four observations, of up to two birds were noted during winter surveys. Birds were also observed in the area of forestry south west of the proposed location of turbine T44 in April and May 2013. This included birds perched and sightings of more than one individual, indicating a possibly occupied territory. A potential nest site may have been present at N801 363 however this was not investigated so as to avoid disturbing breeding birds if present. Observed flight heights ranged from 10m to 100m.

General Wintering Birds

A total of 44 species were recorded from the site over the course of winter season B&S surveys. Of these, four species (Curlew, Meadow Pipit, Lapwing and Golden Plover) are on the BoCCI Red List [36], 10 species (Goldcrest, Sparrowhawk, Robin, House Sparrow, Kestrel, Linnet, Mistle Thrush, Lesser Black Backed Gull, Snipe and Starling) are Amber listed; whilst the remaining species recorded are all Green listed. One species listed on Annex I of the EU habitats directive (Golden Plover) was recorded. Table 4.23, below details the species recorded.

Table 4.23: Bird Species Recorded during Winter B&S surveys Hortland T40-T46

B&S		Code	Visit 1	Visit 2	Visit 3	BoCCI status	EU habitats Directive Annex I
Blackbird	*Turdus merula*	B	19	14	12	Green	No
Blue Tit	*Cyanistes caeruleus*	BT	3	23	1	Green	No
Bullfinch	*Pyrrhula pyrrhula*	BF	4	6	0	Green	No
Buzzard	*Buteo buteo*	BZ	5	1	0	Green	No
Chaffinch	*Fringilla coelebs*	CH	24	20	4	Green	No
Coal Tit	*Periparus ater*	CT	9	4	3	Green	No

B&S		Code	Visit 1	Visit 2	Visit 3	BoCCI status	EU habitats Directive Annex I
Common Crossbill	*Loxia curvirostra*	CR	8	0	0	Green	No
Curlew	*Numenius arquata*	CU	0	5	0	Red	No
Dunnock	*Prunella modularis*	D	2	82	0	Green	No
Fieldfare	*Turdus pilaris*	FF	2	40	3	Green	No
Goldcrest	*Regulus regulus*	GC	7	25	5	Amber	No
Golden Plover	*Pluvialis apricaria*	GP	0	438	0	Red	Yes
Goldfinch	*Carduelis carduelis*	GO	3	28	0	Green	No
Great Tit	*Parus major*	GT	5	5	1	Green	No
Greenfinch	*Carduelis chloris*	GR	0	3	0	Green	No
Grey Heron	*Ardea cinerea*	H	1	0	0	Green	No
Hooded Crow	*Corvus cornix*	HC	9	2	3	Green	No
House Sparrow	*Passer domesticus*	HS	3	8	0	Amber	No
Jackdaw	*Corvus monedula*	JD	65	58	4	Green	No
Jay	*Garrulus glandarius*	J	0	2	0	Green	No
Kestrel	*Falco tinnunculus*	K	1	11	0	Amber	No
Lapwing	*Vanellus vanellus*	L	58	111	0	Red	No
Lesser Black-backed Gull	*Larus fuscus*	LB	0	0	5	Amber	No
Lesser Redpoll	*Carduelis cabaret*	LR	1	45	1	Green	No
Linnet	*Carduelis cannabina*	LI	0	35	0	Amber	No
Long-tailed Tit	*Aegithalus caudatus*	LT	7	1	0	Green	No
Magpie	*Pica pica*	MG	2	6	1	Green	No
Meadow Pipit	*Anthus pratensis*	MP	1	1	0	Red	No
Mistle Thrush	*Turdus viscivorus*	M	2	2	2	Amber	No
Pheasant	*Phasianus colchicus*	PH	1	1	0	N/A	No
Pied Wagtail	*Montacilla alba*	PW	2	2	0	Green	No
Raven	*Corvus corax*	RN	2	0	1	Green	No
Redwing	*Turdus iliacus*	RE	7	1	40	Green	No
Reed Bunting	*Acrocephalus scirpaceus*	RB	2	4	0	Green	No
Robin	*Erithacus*	R	22	27	3	Amber	No

B&S		Code	Visit 1	Visit 2	Visit 3	BoCCI status	EU habitats Directive Annex I
	rubecula						
Rook	*Corvus frugilegus*	RO	49	80	15	Green	No
Siskin	*Carduelis spinus*	SK	2	3	0	Green	No
Snipe	*Gallinago gallinago*	SN	1	1	0	Amber	No
Song Thrush	*Turdus philomelos*	ST	1	0	0	Green	No
Sparrrowhawk	*Accipiter nisus*	SH	1	105	1	Amber	No
Starling	*Sturnus vulgaris*	SG	235	0	0	Amber	No
Treecreeper	*Certhia familiaris*	TC	2	1	0	Green	No
Woodpigeon	*Columba palumbus*	WP	22	49	7	Green	No
Wren	*Troglodytes troglodytes*	WR	12	4	5	Green	No

General Breeding Birds

Table 4.24, over, details the species recorded on both early and late season CBS (Countryside Bird Survey) visits. Following methods outlined previously, a 1km square (illustrated in Figure 7.15.2, Survey Squares, Appendix 6) was selected to sample breeding bird activity. The selected square (N7835) was selected to sample agricultural habitats, forestry and raised bog habitats. Species recorded included general countryside birds for the most part. Some late wintering Redwing were recorded on the early season (April to mid-May visit). Meadow Pipit, which is Red listed was recorded on high bog sections of the square although it should be noted that no development arise proposed on high bog. Migrant species recorded included, Blackcap, Willow Warbler, Wheatear and Swallow. In total one red, seven amber and 22 green listed species were recorded.

Table 4.24: CBS Results N7835 Drehid-Hortland Cluster

Species		Code	Early	Late	BoCCI status	EU habitats Directive Annex I
Blackbird	*Turdus merula*	B	10	16	Green	No
Blackcap	*Sylvia atricapilla*	BC	0	1	Green	No
Bullfinch	*Pyrrhula pyrrhula*	BF	1	0	Green	No
Chaffinch	*Fringilla coelebs*	CH	12	3	Green	No
Coal Tit	*Periparus ater*	CT	2	0	Green	No
Goldcrest	*Regulus regulus*	GC	1	0	Amber	No
Goldfinch	*Carduelis carduelis*	GO	0	6	Green	No
Great Tit	*Parus major*	GT	1	0	Green	No
Hooded Crow	*Corvus cornix*	HC	5	1	Green	No
Jackdaw	*Corvus monedula*	JD	0	5	Green	No
Long-tailed Tit	*Aegithalus caudatus*	LT	0	1	Green	No

Species		Code	Early	Late	BoCCI status	EU habitats Directive Annex I
Magpie	*Pica pica*	MG	0	2	Green	No
Mallard	*Anas platyrhynchos*	MA	5	0	Green	No
Meadow Pipit	*Anthus pratensis*	MP	10	19	Red	No
Mistle Thrush	*Turdus viscivorus*	M	0	1	Amber	No
Pheasant	*Phasianus colchicus*	PH	2	1	n/a	No
Pied Wagtail	*Montacilla alba*	PW	1	0	Green	No
Raven	*Corvus corax*	RN	0	1	Green	No
Redwing	*Turdus iliacus*	RE	7	0	Green	No
Robin	*Erithacus rubecula*	R	11	7	Green	No
Rook	*Corvus frugilegus*	RO	0	6	Green	No
Skylark	*Alauda arvensis*	S	2	3	Amber	No
Snipe	*Gallinago gallinago*	SN	1	0	Amber	No
Song Thrush	*Turdus philomelos*	ST	3	2	Green	No
Starling	*Sturnus vulgaris*	SG	0	1	Amber	No
Swallow	*Hirundo rustica*	SL	1	3	Amber	No
Wheatear	*Oenanthe oenanthe*	W	0	1	Amber	No
Willow Warbler	*Phylloscopus trochilus*	WW	1	7	Green	No
Woodpigeon	*Columba palumbus*	WP	5	4	Green	No
Wren	*Troglodytes troglodytes*	WR	8	7	Green	No

4.1.5.6 Other Taxa

Both Common Frog and Common Lizard are protected by the Wildlife Acts (1976-2012) [60]. Common Frog is likely to be present throughout the site in suitable habitat. Common Lizard, though not recorded, is likely present in suitable habitat. In addition, the following species of Lepidoptera (Butterflies) were recorded.

Lepidoptera
Small Tortoiseshell (*Aglais urticae*)
Peacock (*Inachis io*)
Speckled wood (*Pararge aegeria*)
Meadow Brown *Maniola jurtina*

Ringlet *Aphantopus hyperantus*
Green-veined White *Pieris napi*
Large Heath *Coenonympha tullia*

Odonota
Brown Hawker *Aeshna grandis*
Ruddy Darter *Sympetrum sanguineum*
Four-spotted chaser *Libellula quadrimaculata*
Banded demoiselle *Calopteryx splendens*
Large Red Damselfly *Pyrrhosoma nymphula*

4.1.6 Derrybrennan

The Derrybrennan cluster comprises two turbines (numbered T27-T28). These are proposed to be located on the south side of the R403 and the Grand Canal c.5km northwest of Allenwood, Co. Kildare. The two turbines are located in the townland of Derrybrennan. Note existing environment data on Aquatic Ecology and Bats are presented seperately.

4.1.6.1 Habitats

Proposed Turbine Folios

Habitat mapping was carried out at the proposed turbine locations on July 8, 2013 and July 12, 2013. Habitat types identified within the study area are illustrated in Figure 7.16.20, Habitat Map, Appendix 6, and described below.

Arable Crops BC1 - This designation refers to the habitat within which the northernmost of the cluster. This comprises a number of fields used for arable crops, namely Barley or Wheat. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Lower Value).

Improved Agricultural Grassland GA1 - The southernmost of the cluster is to be located in improved agricultural grassland. This is currently grazed by cattle. Species present include *Taraxacum* spp., *Lolium perenne* (dominant), *Alopecurus pratensis*, *Poa annua*, *Holcus lanatus*, *Agrostis stolonifera*, *Ranunculus repens*, *Potentilla anserine*, *Trifolium* spp., *Rumex crispus*, *Rumex obtusifolius*, *Ranunculus acris*, *Festuca* spp. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Lower Value).

Conifer Plantation WD4 - This comprises Sitka spruce (2-4m high) with some broadleaf trees around the edges mainly *Salix cinerea*, *Alnus glutinosa*, *Betula* spp. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Lower Value).

Mixed Conifer woodland WD3 - This refers to small stands of Scots Pine *Pinus sylvestris* with scattered Cyprus *Cupressus* species. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

Treelines WL2 - A treeline comprising Scots Pine *Pinus sylvestris* and Willow *Salix* spp. forms a field boundary in the southern half of the land folio. Tree lines are also found on either side of the canal to the north of the cluster. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

Dry Calcareous and Neutral Grassland GS1 - A small area of dry calcareous neutral grassland exists in the southeastern corner of the land folio. Species include *Holcus lanatus*, *Cynosurus cristatus*, *Phleum pratense*, *Anthaxanthum odoratum*, *Alopecurus pratensis*, *Trifolium* spp., *Prunella vulgaris*, *Lotus corniculatus*, *Leucanthemum vulgare*, *Plantago* spp., *Dactylorhiza fuchsia*. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

Hedgerows WL1 - The eastern boundary of the cluster is comprised of Hawthorn *Crataegus monogyna* hedgerow. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

Mixed) Broadleaf Woodland WD1 - A narrow band (c.30m) of this habitat has been planted in the north west of the cluster. Trees present include *Fraxinus excelsior*, *Picea sylvestris*, *Picea sitchensis*, *Crataegus monogyna.* Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

Farm Buildings BL3 - A number of farm buildings exist in the northeastern corner of the land folio. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Lower Value).

Proposed Canal Crossing

In addition to the above, the lands on either side of the canal crossing along the access road into the proposed Derrybrennan cluster was mapped in November 2014 (illustrated in Figure 7.16.20, Appendix 6). Habitats of interest here mainly refer to those fringing the canal on either side of the proposed crossing.

In particular treelines which may require modification for the widening of the existing/works to facilitate access. Habitats found at this location, not already described are as follows:

Canals (FW3) - As the canal is an NHA under the NRA site evaluation scheme [19], this habitat would be rated as of National Importance.

Amenity Grassland (GA2) - Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Lower Value).

Immature woodland (WS3) - Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

4.1.6.2 Annex I Appraisal

No Annex I appraisal was required for the Derrybrennan cluster as no habitats likely to conform with those listed on Annex I were found to occur.

4.1.6.3 Botanical Species

A full list of Botanical species recorded is included in Appendix 8. No Flora Protection Order (FPO) or invasive species were recorded from the subject site.

4.1.6.4 Terrestrial Mammals

Badger
No badger evidence was recorded within the proposed Derrybrennan cluster.

Otter
Otter spraint was located at the south west corner of the cluster in January 2013. The evidence was at the insection point of a perimeter drain and small stream that runs north to south outside the cluster boundary.

Table 4.25: Otter Sighting/Evidence Information – Derrybrennan Cluster

Species	Latin Name	Date	Mammal notes	Grid ref
Otter	Lutra lutra	28/01/2013	Spraint on ditch at stream/drain junction	N 69521 27263

Other Mammals - Pine Marten is present within the cluster; an individual was observed in woodland to the south. Fox evidence in the form of scat was noted on a number of occasions. Deer are present in surrounding woodland. Irish Hare evidence was also noted on site in January 2013.

4.1.6.5 Avifauna

There were no observations of the following target species during surveys carried out at the Derrybrennan cluster, Kingfisher, Merlin, Red Grouse, Black Headed Gull, Curlew, Redshank, Whinchat, Common Gull, Lesser Black Backed Gull or Mute Swan.

Whooper Swan

Occurrence within subject site winters 2012-2014
There were no records of this Annex I species within the cluster boundary. A small family party of three birds was noted to the southwest, c.1km from turbine T28, on 22/11/2012. These were birds feeding in stubble.

Birds may occasionally utilise the existing water feature at Lullymore Heritage Park, c.2.5km from T28, during the winter months however the frequency of occurrence is low as is the frequency of occurrence in fields within the hinterland of the same location.

Flight Activity Winter 2013/14
Following the occurrence of birds in the winter of 2012/13 in close proximity to the proposed turbine locations; a flight activity survey was undertaken in winter 2013/2014. A vantage point (Grid Reference N69680 29664) was selected to the southwest at Lullymore which enabled views of the proposed turbine locations (T27 and T28) to the north but also the lake at Lullymore Heritage Park which was identified as a possible roost. Watches each of three hours duration, were carried out at dawn and dusk during the period November 2013 to April 2014. A total of 36hrs of effort was undertaken. The dates, times and results of each watch are detailed in Appendix 11.

During this period, there were no observations of Whooper Swan flight activity within the proposed rotor envelope. Other species recorded included Peregrine, Golden Plover and Hen Harrier. Flightlines recorded during vantage point surveys at Lullymore are illustrated in Appendix 6.

Golden Plover

There were no records of this Annex I species within the site boundary. Birds do use the hinterland of the Derrybrennan cluster and were observed on two occasions from VP watches conducted at Lullybeg (c.2.5km south). This included flight activity of birds within 1km of the proposed turbines T27 and T28. All recorded flight activity was below the predicted rotor envelope of 50-170m. See Table 4.26, below for flight activity records. The lowest recorded flight activity was at 20m.

Table 4.26: Golden Plover Records – Derrybrennan Cluster (T27 & T28)

Survey Type	Date	Species	Number	Obs Time	Duration (s)	<50m	50-170m	>170m
Winter Dusk VP	22/11/2014	Golden Plover_GP	8	16.00	27	27	0	0
Spring VP	04/04/2014	Golden Plover_GP	43	07.01	55	55	0	0

Hen Harrier

Individual Hen harriers were recorded on four occasions during dawn watches at Lullymore over the course of Winter 2013/2014. These sightings most likely refer to birds commuting from a nearby known roost. Recorded flight activity was all <20m or below the predicted rotor envelope of 50-170m. Details of observations are provided in Table 4.27, below. Note, none of these sightings are within the proposed turbine T27, or turbine T28, 500m envelope.

Table 4.27: Hen Harrier Observations – Derrybrennan Cluster (T27 & T28)

Date	Species	No.	VP Grid Ref	Obs Time	Duration (s)	<50	50-170	>170	Bird Notes
27/11/2013	Hen Harrier_HH	1	N69340/24450	09.39	104	104	0	0	female
23/12/2012	Hen Harrier_HH	1	N69680 29664	09.58	25	25	0	0	juv
22/12/2013	Hen Harrier_HH	1	N69680 29664	10.03	78	78	0	0	juv
18/02/2014	Hen Harrier_HH	1	N69680 29664	07.37	25	25	0	0	Female type from north;

Observations at dawn are attributed to birds dispersing from roosts in the greater hinterland (5-10km) of the proposed Derrybrennan cluster. These roosts are further dealt with subsequently. In addition to the above observations, a female Hen Harrier was seen in stubble fields' c.1km south of the proposed turbine folio on 30/10/2013. This bird was noted hunting stubble mid-afternoon.

Roosts
Information on two known winter roosts in the hinterland of the proposed Derrybrennan cluster was provided by Dr. Barry O Donoghue, NPWS. The locations of these roosts was agreed to be kept confidential and therefore recorded flight activity/roost locations are to be provided separately to the competent authority. For the purpose of this assessment the roosts are referred to as Roost A and Roost B.

Following identification of roosting locations, surveys, following the Irish Hen Harrier Winter Roost Survey methodology [49] were undertaken to determine levels of Hen Harrier numbers and respective flight activity. Particular note was made to directions of arrival and departure to and from roosts; as this may indicate preferred foraging areas during daytime and heights utilised during commuting flights to and from same.

- Roost A - Roost A is located c.5km from Derrybrennan cluster. A total of 14 watches, each of two hours duration were carried out at this roost over winters 2012/13 and 2013/14. There were four observations of Hen Harrier, either of birds flying to or from the known roost location, or birds loafing in the area having left the roost. Watches were conducted at either dawn or dusk. Within separate winters, two observations were noted from six watches over the winter period 2012/13 (January to March); whilst two observations were also noted from eight watches during the winter period 2013/14 (October to April inclusive). Observations included a wing tagged individual.

- Roost B - Roost B is located 6-10km from the Derrybrennan cluster. A total of 10 watches, each of two hours duration were carried out following methods as outlined previously. There were three observations of Hen Harrier, including an adult male, and a wing tagged individual different to the previously mentioned.

From those observations (n=6) where flight duration was recorded, a total of 290s of Hen Harrier flight activity was noted. All flight activity was below the predicted rotor envelope (the highest recorded flight height was 20m). Recorded flight activity is provided in Table 4.28, overleaf.

Table 4.28: Hen Harrier Observations at Winter Roosts A and B (locations confidential)

Date	Species	Number	VP Name	Obs Time	Height	Duration (s)	<50	50-170	>170	Bird Notes
30/01/2013	Hen Harrier_HH	1	Roost A	07.58	10m	140	140	0	0	
30/01/2013	Hen Harrier_HH	1	Roost A	17.10	10m	60	60	0	0	Flying NW
27/11/2013	Hen Harrier_HH	1	Roost B	15.08	<10m	10	10	0	0	Perched and flys N through trees, wing tagged-white tag on left wing, yellow tag on right wing
27/11/2013	Hen Harrier_HH	1	Roost B	16.35	<10	24	24	0	0	In from N East settled at 16.35, dropping to roost. Settling location N 808/287. Wing tagged-white tag on left wing, yellow tag on right wing
13/12/2013	Hen Harrier_HH	1	Roost A	08.22	10	25	25	0	0	In from SE, flew through. Wing tags-white on left wing, probably blue on right wing
17/01/2014	Hen Harrier_HH	1	Roost B	08.02		0	0	0	0	Circling up and away. Pale adult male bird
17/10/2013	Hen Harrier_HH	1	Roost A	09.10	20	0	0	0	0	Flew SW, perched in tree-NB not a roost. Ringtail
15/03/2014	Hen Harrier_HH	1	Roost B	18.39	0-10	31	31	0	0	Flew into roost

Peregrine

A total of two observations of this Annex I species was noted during winter and/or spring migration surveys in 2014. Recorded flight activity (t=53s) was outside the predicted rotor envelope. Peregrine breeding distribution in Ireland has increased by 276% in the period 1968-72 to 2007-11 [64]. No breeding was recorded on site.

Table 4.29: Peregrine Observations – Derrybrennan Cluster (T27 & T28)

Date	Species	Number	Obs Time	Height	Duration (s)	<50	50-170	>170	Bird Notes
02/01/2014	Peregrine	1	09.57	0-30	35	35	0	0	One immature bird, hunting woodpigeon
12/04/2014	Peregrine	1	19.26	10-20	18	18	0	0	

Lapwing

One observation during the winter period of birds within the Derrybrennan cluster. A flock of 17 was recorded on November 2, 2013 when birds were flushed from a ploughed field adjacent to turbine T27. Birds were noted on a number of occasions in stubble field to the southwest and a maximum of 40 was recorded in March 2013.

Investigations during the 2013 breeding season (April to June) found no occupied territories within the target envelope (500m around each proposed turbine - T27 and T28). A number of occupied territories were located in stubble fields to the south west, c.1.5km from the Derrybrennan cluster.

Woodcock

There were no breeding territories, of the red listed [36] Woodcock (*Scolopax rusticola*) recorded within the 500m turbine envelope at Derrybrennan during breeding wader surveys carried out in April-June 2013 (see Figure 7.16.9: Breeding Wader Results, Appendix 6). An occupied territory was noted to the southeast, outside the cluster boundary.

Snipe

There were no confirmed occupied territories (based on drumming or displaying males) recorded within the proposed turbine 500m envelope, during breeding wader surveys carried out in April-June 2013 (see Figure 7.16.9: Breeding Wader Results, Appendix 6). An occupied territory, based on a drumming bird was located just outside the 500m envelope (and cluster boundary) to the southeast of the two proposed turbines T27 & T28).

Barn Owl

No observation was made of Barn Owl during the entire survey period. Results of breeding Barn Owl surveys are illustrated in Fig 7.16.12 Barn Owl Survey Results, Appendix 6.

Following the methods outlined previously, locations within 1.5km of the Derrybrennan cluster that were identified as having potential for breeding Barn Owls were further examined for evidence. Of these, no site was confirmed to contain Breeding Barn Owl. None of the surveyed locations were classified in the highest category for suitability (occupied or highly suitable) for breeding Barn Owl (*Tyto alba*) with multiple opportunities for nesting and/or roosting. Due to the expansive nature of the surrounding peatlands very few older houses or structures exist which could be utilised by Barn Owl.

There was a single suitable Barn Owl sites recorded within 1.5km of the subject site, which was classified as having limited access and/or limited number of nest and/or roost locations, an additional site was classified as suitable for roosting only. No evidence of nesting and/or roosting was recorded within these sites. The findings of the current study, in particular the low occupancy of highly suitable nest sites, reflect the current status of the species in Ireland, which has undergone a 47% decline in breeding distribution during the period 1968-72 to 2007-11 [64]. Barn Owl is Red listed on the BoCCCI list [36].

Yellowhammer

This species, which is red listed in Ireland was recorded during breeding season surveys. A single bird was recorded in the late season CBS visit from the square centred on the location of the proposed turbines T27 and T28.

Kestrel

A pair of Kestrel nested at N670530 727780; this location is outside the cluster boundary in a treeline of Scots Pine located across the road from farm buildings in the north east corner of the cluster. Birds were noted in this location, alarm calling, and observed using a nearby plucking post suggesting breeding took place.

A total of 12 observations were made involving flight activity by Kestrel. These include observations both within and without the Derrybrennan cluster. Observations from vantage point surveys at Lullymore, targeted at Whooper Swan, are included as they provide information on typical flight heights utilised by the species. Total duration recorded was 473s, of which 100% was below the predicted rotor envelope (50-170m). Apart from one observation, all recorded flight height was at 20m or less Table 4.30, below provides detail on the observations.

Table 4.30: Kestrel Flight Activity Observations – Derrybrennan Cluster (T27 & T28)

Date	Species	No.	Obs Time	Height (m)	Duration (s)	<50	50-170	>170	Bird Notes
30/01/2013	Kestrel_K.	1	10.06	10-12	32	32	0	0	Flying 1-3m above road then moved over forestry flying 10-12m. Hovered over bog for 24 secs
26/03/2013	Kestrel_K.	1	13.35	0-10	111	111	0	0	Male max 10m. Landed.
22/11/2013	Kestrel_K.	1	15.50	0-10	32	32	0	0	
27/11/2013	Kestrel_K.	1	09.14	10-0	5	5	0	0	
27/11/2013	Kestrel_K.	1	09.28	0-10	8	8	0	0	
23/12/2013	Kestrel_K.	1	14.13	<10	16	16	0	0	
23/12/2013	Kestrel_K.	1	15.40	<10	42	42	0	0	
23/12/2013	Kestrel_K.	1	16.07	<10	27	27	0	0	
18/02/2014	Kestrel_K.	1	16.37	20	20	20	0	0	
18/02/2014	Kestrel_K.	1	17.25	40	180	180	0	0	SN x2 drumming after sunset at VP.

Buzzard

Buzzard was observed within the study area on one occasion during winter B&S surveys when an individual was noted feeding in stubble (presumably on earthworms- a known behaviour) close to the northernmost proposed turbine location (turbine T27). The date of the observation was January 28, 2013 and the bird was observed feeding in this manner for 21 minutes.

Flight activity by Buzzard was also noted, both from winter walkover surveys of proposed turbine locations T27 and T28 and also from vantage point effort as described previously. Observations from vantage point surveys at Lullymore, targeted at Whooper swan, are included as they provide information on typical flight heights utilised by the species however it should be noted that some of the recorded flight activity was outside the proposed cluster boundary.

Total recorded flight duration was 504s of which 63.5% (t=320s) was below the predicted rotor envelope (50-170m). Remaining flight activity (t=184s) was within the predicted rotor envelope (50-170m). Table 4.31, below shows all recorded flight activity.

Table 4.31: Buzzard Flight Activity – Derrybrennan Cluster T27 & T28

Date	Species	No.	Obs Time	Height	Duration (s)	<50	50-170	>170	Bird Notes
28/01/2013	Buzzard	1	10.27-10.48						Mostly in field eating invertebrates (worms?)
30/01/2013	Buzzard	1							Out of forestry, circling & calling.
26/03/2013	Buzzard	2							Pair of BZ flew N to S into WD4
09/05/2013	Buzzard								
22/11/2013	Buzzard								On ground, never seen in flight
23/12/2013	Buzzard	2	10.37	0-30	122	122	0	0	105s@10-20m, 17s@20-30m
18/02/2014	Buzzard	1	15.40	25	60	60	0	0	
18/02/2014	Buzzard	1	15.49	20	30	30	0	0	Interacting with HC
20/03/2014	Buzzard	2	17.12		231	47	184	0	Pair soaring or displaying
12/04/2014	Buzzard	1	19.11	20-40	61	61	0	0	

General Winter Birds

A total of 37 species were recorded from the Derrybrennan cluster from winter season B&S surveys. Of these, nine species (Goldcrest, Robin, Mistle Thrush, Kestrel, Linnet, Skylark, Sparrowhawk, Starling) are Amber listed; three are Red Listed (Lapwing, Meadow pipit and Woodcock) whilst the remaining species recorded are all Green listed. No species listed on Annex I of the EU habitats directive were recorded within the site boundary. Table 4.32, overleaf, details the species recorded.

Table 4.32: Winter Bird Survey Results – Derrybrennan Cluster (T27 & T28)

B&S		Code	Visit 1	Visit 2	Visit 3	BoCCI status	EU habitats Directive Annex I
Blackbird	*Turdus merula*	B	6	11	9	Green	No
Blue Tit	*Cyanistes caeruleus*	BT	4	6	1	Green	No
Bullfinch	*Pyrrhula pyrrhula*	BF	4	2	0	Green	No
Buzzard	*Buteo buteo*	BZ	0	2	2	Green	No
Chaffinch	*Fringilla coelebs*	CH	52	87	32	Green	No
Coal Tit	*Periparus ater*	CT	5	9	3	Green	No
Common Crossbill	*Loxia curvirostra*	CR	1	0	0	Green	No
Dunnock	*Prunella modularis*	D	4	0	0	Green	No
Fieldfare	*Turdus pilaris*	FF	0	156	49	Green	No
Goldcrest	*Regulus regulus*	GC	10	15	8	Amber	No
Great Tit	*Parus major*	GT	4	0	0	Green	No
Hooded Crow	*Corvus cornix*	HC	5	3	0	Green	No
Jay	*Garrulus glandarius*	J	1	6	2	Green	No
Kestrel	*Falco tinnunculus*	K	1	2	1	Amber	No
Lapwing	*Vanellus vanellus*	L	17	0	40	Red	No
Lesser Redpoll	*Carduelis cabaret*	LR	2	1	0	Green	No
Linnet	*Carduelis cannabina*	Li	0	12	0	Amber	No
Long-tailed Tit	*Aegithalus caudatus*	LT	9	0	8	Green	No
Magpie	*Pica pica*	MG	5	9	0	Green	No
Meadow Pipit	*Anthus pratensis*	MP	0	26	1	Red	No
Mistle Thrush	*Turdus viscivorus*	M	1	15	9	Amber	No
Pheasant	*Phasianus colchicus*	PH	5	3	0	N/A	No
Pied Wagtail	*Montacilla alba*	PW	6	3	0	Green	No
Raven	*Corvus corax*	RN	1	0	0	Green	No
Redwing	*Turdus iliacus*	RE	2	32	47	Green	No
Reed Bunting	*Acrocephalus scirpaceus*	RB	2	3	2	Green	No
Robin	*Erithacus rubecula*	R	21	6	4	Amber	No
Rook	*Corvus frugilegus*	RO	68	130	5	Green	No
Siskin	*Carduelis spinus*	SK	16	0	0	Green	No
Skylark	*Alauda arvensis*	S	0	18	9	Amber	No
Snipe	*Gallinago gallinago*	SN	0	2	0	Amber	No
Song Thrush	*Turdus philomelos*	ST	0	5	0	Green	No
Sparrrowhawk	*Accipiter nisus*	SH	3	2	0	Amber	No
Starling	*Sturnus vulgaris*	SG	623	7	0	Amber	No
Woodcock	*Scolopax rusticola*	WK	0	1	0	Red	No
Woodpigeon	*Columba palumbus*	WP	273	42	2	Green	No
Wren	*Troglodytes troglodytes*	WR	15	8	3	Green	No

Breeding Birds

The survey square undertaken to sample breeding birds is illustrated in Figure 7.5.0 Survey squares, Appendix 6. This illustrates transects walked through the cluster, which was surveyed following methods outlined previously. A total of 36 species were recorded. Of these, one was a red listed species (Yellowhammer). Eight Amber listed species (Goldcrest, House Sparrow, Linnet, Mistle Thrush, Robin, Sparrowhawk, Starling and Swallow) were recorded. All remaining species recorded are Green listed.

Table 4.33: CBS Survey Square Results – Derrybrennan Cluster (T27 & T28)

CBS		Code	Early	Late	BoCCI status	EU habitats Directive Annex I
Blackbird	*Turdus merula*	B	23	10	Green	No
Blue Tit	*Cyanistes caeruleus*	BT	3	0	Green	No
Bullfinch	*Pyrrhula pyrrhula*	BF	0	2	Green	No
Buzzard	*Buteo buteo*	BZ	1	0	Green	No
Chaffinch	*Fringilla coelebs*	CH	41	14	Green	No
Chiffchaff	*Phylloscopus collybita*	CC	0	1	Green	No
Coal Tit	*Periparus ater*	CT	3	4	Green	No
Cuckoo	*Cuculus canorus*	CK	1	0	Green	No
Dunnock	*Prunella modularis*	D	2	0	Green	No
Goldcrest	*Regulus regulus*	GC	7	12	Amber	No
Goldfinch	*Carduelis carduelis*	GO	9	6	Green	No
Great Tit	*Parus major*	GT	4	1	Green	No
Greenfinch	*Carduelis chloris*	GR	0	5	Green	No
Hooded Crow	*Corvus cornix*	HC	1	0	Green	No
House Sparrow	*Passer domesticus*	SW	2	11	Amber	No
Lesser Redpoll	*Carduelis cabaret*	LR	5	0	Green	No
Linnet	*Carduelis cannabina*	LI	0	4	Amber	No
Long-tailed Tit	*Aegithalus caudatus*	LT	2	0	Green	No
Magpie	*Pica pica*	MG	3	0	Green	No
Mallard	*Anas platyrhynchos*	MA	0	2	Green	No
Mistle Thrush	*Turdus viscivorus*	M	7	5	Amber	No
Pheasant	*Phasianus colchicus*	PH	1	0	n/a	No
Pied Wagtail	*Montacilla alba*	PW	3	3	Green	No
Reed Bunting	*Acrocephalus scirpaceus*	RB	2	2	Green	No
Robin	*Erithacus rubecula*	R	6	7	Amber	No
Rook	*Corvus frugilegus*	RO	6	2	Green	No
Siskin	*Carduelis spinus*	SK	6	0	Green	No
Song Thrush	*Turdus philomelos*	ST	1	2	Green	No
Sparrrowhawk	*Accipiter nisus*	SH	0	1	Amber	No
Starling	*Sturnus vulgaris*	SG	0	3	Amber	No
Swallow	*Hirundo rustica*	SL	9	19	Amber	No
Whitethroat	*Sylvia communis*	WH	9	5	Green	No
Willow Warbler	*Phylloscopus trochilus*	WW	10	5	Green	No

CBS		Code	Early	Late	BoCCI status	EU habitats Directive Annex I
Woodpigeon	*Columba palumbus*	WP	5	13	Green	No
Wren	*Troglodytes troglodytes*	WR	16	22	Green	No
Yellowhammer	*Emberiza citronella*	Y	0	1	Red	No

4.1.6.6 Other Taxa

The following species of Lepidoptera were recorded; note this includes observations from outside the red-line boundary from areas which, due to design layout changes, are no longer included. This includes turbines which were removed from the proposed layout due to their proximity to important butterfly habitats.

Lepidoptera:
Meadow Brown *Maniola jurtina*
Ringlet *Aphantopus hyperantus*
Green-Veined White *Pieris napi*
Large White *Pieris brassicae*
Brimstone *Gonepteryx rhamni*
Speckled Wood *Pararge aegeria*

Odonota:
Azure Damselfly *Coenagrion puella*
Blue-tailed damselfly *Ischnura elegans*
Large Red Damselfly *Pyrrhosoma nymphula*
Brown Hawker *Aeshna grandis*
Common Hawker *Aeshna junca*
Four Spotted Chaser *Libellula quadrimaculata*

In addition to the above Marsh Fritillary was noted off site at known locations such as at the Lullymore West IPCC (Irish Peatland Conservation Council) reserve and the Butterfly Conservation Ireland reserve at Lullymore. None were observed within the proposed development land folio and no suitable habitat is present.

4.1.7 Cloncumber

The proposed Cloncumber cluster lies to the south west of Allenwood village and approximately 3km northwest of the Hill of Allen. It is bordered on its south side by the Barrow Line of the Grand Canal. The Slate River forms the northern boundary of the cluster. Note existing environment data on Aquatic Ecology and Bats are presented seperately.

4.1.7.1 Habitats

Habitat mapping was carried out at the subject site on July 17, 2013 following methods previously outlined. Habitat types identified within the cluster are illustrated in Figure 7.17.13: Habitat Map, Appendix 6, and described below:

BC1	Arable crops
BC3	Tilled land
FW2	Depositing/lowland rivers
FW3	Canals
FW4	Drainage ditches
GA1	Improved agricultural grassland

WD1	(Mixed) broadleaved woodland	
WD4	Conifer plantation	
WL2	Treelines	
GA1/GS4	Improved agricultural grassland/ grassland	Wet
GS4/GS1	Wet grassland/ Dry calcareous and neutral grassland	

Arable Crops BC1
Some fields of arable crops are found within the cluster; these primarily consist of Wheat and Barley. Other species recorded include *Poa annua, Papaver rhoem, Matricaria discoidea*. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Lower Value).

Tilled Land BC3
Some unplanted tilled land was present on site at the time of survey. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Lower Value).

Depositing/Lowland Rivers FW2
A river, c.5-6m wide broadly splits the cluster in two from east to west. This feature which flows into the River Slate at the northern side of the cluster has banks c.3m high and is slow flowing. Banks are vertical. Instream vegetation includes *Schoenoplectus lacustris, Glyceria fluitans, Sparganium emersum, Rancunculus flammula, Apium nodiflorum, Phragmites australis, Phalaris arundinacea, Glyceria maxima, Iris Pseudacorus, Lemna* spp. Bankside vegetation includes *Epilobium hirsutum, Arrhenatherum elaticus, Dactylis glomerata, Filipendula ulmaria, Potentilla anserine, Equisetum* spp., *Cirsium arvense, Centaurea nigra, Anthriscus sylvestris.* Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

Drainage Ditches FW4
Drainage ditches run throughout the site between fields. Typical species recorded include *Phalaris arundinacea, Phragmites australis, Arrhenatherum elatius, Mentha aquatic, Succisa pratens, Centaurea nigra, Cirsium* sp, *Apium nodiflorum, Viccia cracca, Equisetum sp., Molinia caerulea, Galium verium, Hypericum perforatum, Menyanthes trifoliate, Iris pseudacorus*. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Lower Value).

Improved Agricultural Grassland GA1
Improved agricultural grassland is present on site. Species present include *Lolium perenne* (dominant), *Poa annua, Plantago major, Ranunculus repens, Trifolium* spp., *Cirsium vulgare, Ranunculus Acris, Taraxacum spp., Juncus effusus* (occasional). Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Lower Value).

(Mixed) Broadleaf Woodland (WD1)
A small stand of deciduous trees composed of mature Beech *Fagus sylvatica, Sambucus nigra, Crataegus monogyna* and *Picea sitchensis*, is locate centrally in the cluster on the location of a ringfort or historical enclosure (indicated on Discovery series maps). Another small group of deciduous trees exists to the southwest within the existing field complex. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

Conifer Plantation WD4
The eastern portion of the cluster contains significant cover of Conifer plantation. Dominant species are Sitka Spruce, Scots Pine in patches. There are broadleaf trees on the outside edges of forestry compartments in places. These include Silver Birch and *Salix* spp. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

Treelines WL2
Field boundaries in the majority of the cluster comprise mainly treelines. Species include *Fraxinus excelsior* (dominant), *Crataegus monogyna, Salix* spp., *Acer Pseudoplatanus, Pinus sylvestruis*. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

Improved Agricultural/Wet Grassland GA1/GS4
Improved grassland grading into wet grassland. Species include *Juncus acutiflorus, Juncus Effusus, Potentilla anserine, Ranunculus repens, Ranunculus flammula, Agrostis stolonifera, Lolium perenne, Carex panacea, Holcus lanatus, Prunella vulgaris.* Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

Wet/ Dry Calcaerous and Neutral Grassland GS4/GS1
This classification refers to a number of fields of Wet Grassland grading into neutral grassland. Species present include *Lolium perenne, Holcus lanatus, Anthoxanthum odoratum, Agrostis capillaris, Agrostis stolonifera, Alopecurus geniculatus, Phleum pratense, Poa annua, Cynosurus cristatus, Ranuculus repens, Potentilla anserine, Ranunculus acris, Juncus inflexus, Juncus effuses and Achillea millefolium.* Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

4.1.7.2 Annex Assessment

No habitats were identified within the cluster that had the potential to conform with Annex habitats.

4.1.7.3 Botanical Species

A full list of Botancal species recorded is provided in Appendix F1: Botanical Species. No Flora Protection Order species was recorded from the cluster. No invasive species were recorded.

4.1.7.4 Terrestrial Mammals

Badger
A badger sett was located in woodland in the northeastern portion of the cluster. This constituted an outlier sett (occasionally used single entrance setts). Additional evidence was also noted in two separate locations and included tracks and evidence of foraging. Locations of Badger evidence are illustrated in Figure 7.17.22 Mammal observations. Further detail on Badger observations is provided below in Table 4.34.

Table 4.34: Badger Observations – Cloncumber Cluster

Species	Latin Name	Description	Grid Reference
Badger	Meles meles	Outlier badger sett	N73235 23752
Badger	Meles meles	Badger foraging	N71690 22788
Badger	Meles meles	Badger tracks	N72513 23118

Otter
Otter evidence in the form of spraints, slides was noted at a number of locations throughout the site. Locations of recorded evidence was primarily along river/stream banks (Slate and Cloncumber) but also along the adjacent canal. An individual was observed along the Slate River on February 1, 2013. A suitable holt location was located in the wooded copse to the southwest of turbine T33 however no evidence of occupancy by Otter was present (indicating Fox may be an alternative).

Table 4.35: Otter Observations – Cloncumber Cluster

Species	Latin Name	Otter signs	Grid Reference
Otter	Lutra lutra	Tracks at river (see map)	
Otter	Lutra lutra	Otter slide	N72021 22102
Otter	Lutra lutra	Otter seen along Slate River between T44 and T45 Spraints and tracks.	N73204 24007
Otter	Lutra lutra	Evidence of otter at river	
Otter	Lutra lutra	Slides	N 72021 22102
Otter	Lutra lutra	Spraint & slides at bridge.	N 72546 23463
Otter	Lutra lutra	Spraint widespread small bridges	
Otter	Lutra lutra	Signs widespread	

Other Mammals
Evidence of American Mink was noted along both internal rivers and the adjacent canal. Red Fox is present and evidence (scat) was noted within the cluster and along the adjacent canal (including a possible den).

4.1.7.5 Avifauna

There were no observations or records of the following target species from the proposed Cloncumber cluster, Hen Harrier, Merlin, Red Grouse, Black Headed Gull, Redshank, Whinchat, Common Gull or Lesser Black Backed Gull.

Whooper Swan

There were six observations in total of this Annex 1 species from surveys conducted at the Cloncumber cluster. Two involved small groups of 2-4 birds *in situ* feeding on improved agricultural grassland. Both of these observations involved birds at the south western end of the proposed cluster. Locations were birds noted are illustrated in Figure 7.3, Appendix 6.

There were four observations of flying birds; two of which were birds flying in to roost at Lullymore Heritage Park Ponds in November 2013. Flightpaths are illustrated in Figure 7.4.0, Appendix 6. A vantage point at N71550/21740 was utilised over the winter period October 2013 to April 2014 to sample levels of flight activity within the cluster. Total hours of watch was 36hrs. Recorded flight activity was 690s, from three No. observations. Of this, 68.5% (t=490s) was below the predicted rotor envelope (50-170m). Remaining flight activity (31.4% of overall or 217s) was at the predicted rotor height.

Golden Plover

There were ten observations of this Annex I species within or near the Cloncumber cluster. All observations were within the period November to April (therefore wintering birds only). No suitable breeding habitat exists at Cloncumber for this species. For those observations where flight activity was recorded (n=9), a total of 1314s of flight activity was noted, including both on and off site records. Of the recorded total flight duration 63% (t=827s) was within the predicted rotor envelope; 29% (t=379s) was below the predicted rotor envelope and 8% (t=108s) was above the predicted rotor envelope (50-170m). The maximum flock size recorded was 180 birds (on January 24, 2014); average flock size recorded from all observations was 47 birds (range = 1-180). Locations of recorded flight activity are illustrated in Appendix 6.

The details of all Golden Plover observations at the subject site are outlined below in Table 4.36.

Table 4.36: Golden Plover Observations Cloncumber

Survey Type	Date	Species	No.	Duration (s)	<50m	50-170m	>170 m	Bird Notes
B & S Winter	02/11/2012	Golden Plover_GP	1					Over
B & S Winter	21/03/2013	Golden Plover_GP	4	72	72	0	0	20m
Winter Dusk VP	18/11/2013	Golden Plover_GP	6	148	148	0	0	122s@ 60-120m, 6s@60-10m, 20s@10-0m
Winter Dawn VP	10/12/2013	Golden Plover_GP	90	34		34	0	
Winter Dusk VP	10/12/2013	Golden Plover_GP	7	10	10	0	0	
Winter Dawn VP	24/01/2014	Golden Plover_GP	180	59	14	45	0	
Winter Dawn VP	07/02/2014	Golden Plover_GP	125	728	15	605	108	Constantly changing height over fields. Climbs higher as they fly west
Spring VP	16/04/2014	Golden Plover_GP	50	129	12	117	0	
Spring VP	16/04/2014	Golden Plover_GP	1	9	9	0	0	
Spring VP	17/04/2014	Golden Plover_GP	10	125	99	26	0	

Kingfisher

No Kingfisher were recorded from Cloncumber cluster during breeding season surveys. Two observations of single birds were noted during winter season surveys. The first was of a bird along the Slate River on 21/3/2013; the second observation was of a bird at the canal bridge to the north east of the Griffith Aqueduct on November 18, 2013.

Peregrine

Two observations were noted of this Annex I species was noted during surveys in 2013. All records were during the winter months (January 2013 and November 2013). Both observations involved brief views of birds outside the cluster boundary, to the north and south respectively. Total flight duration recorded was 16s of which 100% was below the predicted rotor envelope (50-170m) at 10-20m. Peregrine breeding distribution in Ireland has increased by 276% in the period 1968-72 to 2007-11 [64].

Curlew

No Curlew were recorded from the Cloncumber cluster during winter surveys. A number of birds were recorded overflying the site in June during the late season CBS survey. Over the course of the survey small groups ranging from 1-5 birds flew over the site heading towards the northwest. No suitable breeding habitat or evidence of breeding was found within the proposed turbine envelope (T29 – T39) and these sightings are attributed to non-breeding birds.

Curlew have been recorded breeding at Lodge Bog at Lullymore East, c.2.5km northwest of the proposed Cloncumber cluster.

Lapwing

Winter
Lapwing were recorded from the cluster during both winter and breeding season surveys. The first observation of this species was on November 2, 2012 when a bird was present in fields where turbines T34-T37 are proposed to be situated. Further to this Lapwing were observed on six more occasions during winter surveys. Birds were present in March and showing signs of territorial behaviour such as display and mobbing of predators. Total flight activity recorded from five observations during the winter period (Oct-March) was 425s of which 100% was below the predicted rotor envelope (50-170m). Table 4.37 below further details winter season observations of this species.

Table 4.37: Cloncumber Lapwing Observations Winter – Cloncumber Cluster

Survey Type	Date	Number	Height	Duration (s)	<50	50-170	>170	Bird Notes
B & S Winter	02/11/2012	1						
B & S Winter	21/03/2013	12						Including 2 displaying. All subsequently flushed but none left area, circled calling= breeding.
Winter Dusk VP	18/11/2013	105	30-40	52	52	0	0	
Winter Dusk VP	18/11/2013	30	0-10	84	84	0	0	
Winter Dawn VP	22/11/2013	7	20-40m	65	65	0	0	23s@30-40m, 42s@20-30m
Winter Dawn VP	22/11/2013	29	0-20m	46	46	0	0	
Winter Dawn VP	22/11/2013	29	0-40m	178	178	0	0	116s@0-20m, 62s@20-40m

Breeding Season
An occupied territory was identified in arable farmland c.300m to the northwest of the proposed location of T33. Birds were noted in this location on all three breeding wader survey visit dates (27/4/2013, 27-28/5/2013 and 27-29/6/2013). Recorded behaviour included birds in active territorial display (April) and alarm calling and agitated behaviour in May and June respectively. Breeding was not proved but the agitated behaviour in the latter stages of the breeding season suggests breeding may have taken place. Figure 7.17.9 Breeding Wader Survey Results, Appendix 6 shows the location of the occupied territory. No further breeding was recorded within areas of the 500m envelope re-surveyed in 2014 (i.e. additional habitats within 500m of the proposed envelope as a result of design layout changes). Potentially suitable wet grassland for breeding waders does exist to the south east of the proposed location of T31, within the adjacent pNHA, however this area had no breeding waders present on survey dates in 2014 (25/4/14, 30/5/14, 24/6/14). This is attributed to the heavy regime of grazing by cattle and horses which renders the area currently unsuitable.

Woodcock

There was one breeding territory, of the red listed [36] Woodcock (*Scolopax rusticola*) recorded within the 500m turbine envelope (T29-39) during breeding wader surveys carried out in April-June 2013 (see Figure 7.17.9, Appendix 6).

Evidence of occupied territories in the form of a roding or displaying male was noted in May (27-28/5/2013) within the boundary of the cluster (to the west of the proposed location of T32) but also outside in adjacent bog woodland. It is likely that breeding may have occurred outside the site in adjacent bog woodland. No further breeding was recorded within areas of the entire 500m envelope re-surveyed in 2014 (i.e. additional habitats within 500m of the proposed envelope as a result of design layout changes).

Snipe

There was one confirmed occupied territory (based on drumming or displaying males) recorded within the proposed turbine 500m envelope, during breeding wader surveys carried out in April-June 2014 (see Figure 7.17.9, Appendix 6). This was based on a drumming or displaying bird to the southwest of the proposed location of T29, recorded in May 2013. No further breeding was recorded within areas of the entire 500m envelope re-surveyed in 2014 (i.e. additional habitats within 500m of the proposed envelope as a result of design layout changes). Potentially suitable wet grassland does exist to the SE of the proposed location of T31, within the adjacent pNHA, however this area had no breeding waders present on survey dates in 2014 (25/4/14, 30/5/14, 24/6/14). This is attributed to the heavy regime of grazing by cattle and horses which renders the area currently unsuitable.

Barn Owl

No observation was made of Barn Owl during the entire survey period. Results of breeding Barn Owl surveys are illustrated in Fig 7.17.12 Barn Owl Survey Results, Appendix 6.

Following the methods outlined previously, 13 locations within 1.5km of the wind farm site were identified as having potential for breeding Barn Owls were further examined for evidence. Of these, no site was confirmed to contain Breeding Barn Owl. None of the surveyed locations were classified in the highest category for suitability (occupied or highly suitable) for breeding Barn Owl (*Tyto alba*) with multiple opportunities for nesting and/or roosting.

There were 11 suitable Barn Owl sites classified as having limited access and/or limited number of nest and/or roost locations. No additional sites were classified as suitable for roosting only. No evidence of nesting and/or roosting was recorded within these sites. The findings of the current study, in particular the low occupancy of suitable nest sites of any type, reflect the current status of the species in Ireland, which has undergone a 47% decline in breeding distribution during the period 1968-72 to 2007-11 [(64)]. Barn Owl is Red listed on the BoCCCI list [(36)].

Yellowhammer

This species, which is red listed in Ireland was recorded on seven occasions within the winter season survey period. Birds were noted in stubble fields and a peak of 30 was present on24/1/2014. Birds also breed in suitable habitat within the cluster and were recorded from both early and late season CBS surveys.

Kestrel

There were three observations of Kestrel within the cluster, all during the period November to February. Proof of breeding was not obtained within the cluster. Recorded flight activity (t=34s) was all the <20m height band.

Mute Swan

There were four observations of this species during surveys at the Cloncumber cluster. Birds were recorded from the River Slate on two occasions during winter walkover surveys. In addition a pair was recorded from the adjacent canal on both early and late season CBS surveys.

Buzzard

Buzzard was observed within the study area on 23 occasions in total. Observations included birds both onsite and offsite. Winter season sightings predominate (n=22) however flight activity in March (n=11) which is effectively winter season is often courtship or territorial flight in the case of Buzzard which breeds early compared to other species. Part of the cluster is assessed as being within the territory of a breeding pair of Buzzard however no evidence of breeding on site was noted and only a single observation was recorded during the breeding season.

Sightings involved 1-3 birds and recorded behaviour included birds foraging on the ground (including scavenging dead sheep) as well as soaring and a display indicative of birds holding territory. Total recorded flight duration was 3,678s of which 84.5% (t=3108s) was below the predicted rotor envelope (50-170m). Remaining flight activity (t=570s) was within the predicted rotor envelope (50-170m). Table 4.38, below details the recorded flight activity. Flightlines are illustrated in Figures 7.16.1 to 7.17.5, Appendix 6.

Table 4.38: Buzzard Flight Activity – Cloncumber Cluster

Date	No.	Obs Time	Height	Duration (s)	<50	50-170	>170	Bird Notes
21/03/2013	1	11.34	30	10	10	0	0	30m
21/03/2013	2	12.03	20-30	2200	2200	0	0	Soaring and calling together at 25m then 1 off hunting at 12.08. Both together soaring 12.09 - 12.43 at 30m
24/01/2014	1	17.26	10-30	65	65	0	0	
07/02/2014	1	9.05	10-20	54	54	0	0	
07/02/2014	3	15.23	0-60	230	188	42	0	Scavenging on dead sheep
07/02/2014	1	15.46	0-10	27	27	0	0	
07/02/2014	1	16.3	0-10	16	16	0	0	
07/02/2014	2	17.27	10-30	117	117	0	0	
16/04/2014	1	18.43		133.00	3.00	130.00	0	
31/03/2014	1	8.19		158.00	37.00	121.00	0	
31/03/2014	1	18.48		25.00	25.00	0	0	
05/03/2014	1	7.17		94.00	94.00	0	0	
05/03/2014	1	7.32		17.00	17.00	0	0	
05/03/2014	1	7.44		72.00	72.00	0	0	
05/03/2014	1	7.51		16.00	16.00	0	0	
05/03/2014	2	8.29		18.00	18.00	0	0	Considered a pair; in close association
05/03/2014	1	17.08		38.00	38.00	0	0	
05/03/2014	1	17.57		113.00	23.00	90.00	0	
05/03/2014	3	18.08		275.00	88.00	187.00	0	

General Winter Birds

A total of 53 species were recorded from the cluster from winter season B&S surveys. Of these, 14 species (Goldcrest, Robin, Mistle Thrush, Merlin, Skylark, Starling, House Sparrow, Tree Sparrow, Kingfisher, Kestrel, Sparrowhawk, Snipe, Teal, Whooper Swan) are Amber listed; five are Red Listed (Golden Plover, Meadow pipit, Lapwing, Woodcock and Yellowhammer) whilst the remaining species recorded are all Green listed. Four species listed on Annex I of the EU Habitats Directive were recorded (Kingfisher, Whooper Swan, Peregrine and Golden Plover) although it should be noted that Peregrine and Kingfisher were recorded off site. Table 4.39, over, detail the species recorded.

Table 4.39: Modified B&S Survey Results – Cloncumber Cluster

B&S		Code	Visit 1	Visit 2	Visit 3	BoCCI status	EU Habitats Directive Annex I
Blackbird	*Turdus merula*	B	33	15	9	Green	No
Blue Tit	*Cyanistes caeruleus*	BT	33	10	3	Green	No
Bullfinch	*Pyrrhula pyrrhula*	BF	2	0	2	Green	No
Buzzard	*Buteo buteo*	BZ	2	3	3	Green	No
Chaffinch	*Fringilla coelebs*	CH	33	6	4	Green	No
Coal Tit	*Periparus ater*	CT	18	14	4	Green	No
Common Crossbill	*Loxia curvirostra*	CR	0	2	0	Green	No
Dunnock	*Prunella modularis*	D	2	7	1	Green	No
Fieldfare	*Turdus pilaris*	FF	90	155	93	Green	No
Goldcrest	*Regulus regulus*	GC	13	34	17	Amber	No
Golden Plover	*Pluvialis apricaria*	GP	1	0	4	Red	Yes
Goldfinch	*Carduelis carduelis*	GO	4	0	0	Green	No
Great Tit	*Parus major*	GT	11	5	1	Green	No
Grey Heron	*Ardea cinerea*	H	0	0	1	Green	No
Grey Wagtail	*Motacilla cinerea*	GL	0	1	0	Green	No
Hooded Crow	*Corvus cornix*	HC	6	15	10	Green	No
House Sparrow	*Passer domesticus*	HS	20	7	0	Amber	No
Jackdaw	*Corvus monedula*	JD	0	5	9	Green	No
Jay	*Garrulus glandarius*	J	2	2	0	Green	No
Kestrel	*Falco tinnunculus*	K	1	1	0	Amber	No
Kingfisher	*Alcedo atthis*	KF	0	0	11	Amber	Yes
Lapwing	*Vanellus vanellus*	L	1	0	12	Red	No
Lesser Redpoll	*Carduelis cabaret*	LR	3	0	0	Green	No
Long-tailed Tit	*Aegithalus caudatus*	LT	8	32	7	Green	No
Magpie	*Pica pica*	MG	0	4	3	Green	No
Mallard	*Anas platyrhynchos*	MA	0	0	2	Green	No
Meadow Pipit	*Anthus pratensis*	MP	20	20	40	Red	No
Mistle Thrush	*Turdus viscivorus*	M	9	5	3	Amber	No
Moorhen	*Gallinula chloropus*	MH	0	1	0	Green	No
Mute Swan	*Cygnus olor*	MS	0	2	1	Amber	No
Peregrine	*Falco peregrinus*	PE	0	1	0	Green	Yes

B&S		Code	Visit 1	Visit 2	Visit 3	BoCCI status	EU Habitats Directive Annex I
Pheasant	*Phasianus colchicus*	PH	0	1	1	N/A	No
Pied Wagtail	*Montacilla alba*	PW	0	2	2	Green	No
Raven	*Corvus corax*	RN	1	0	0	Green	No
Redwing	*Turdus iliacus*	RE	222	81	119	Green	No
Reed Bunting	*Acrocephalus scirpaceus*	RB	3	6	0	Green	No
Robin	*Erithacus rubecula*	R	14	29	5	Amber	No
Rook	*Corvus frugilegus*	RO	30	65	16	Green	No
Siskin	*Carduelis spinus*	SK	2	0	0	Green	No
Skylark	*Alauda arvensis*	S	53	13	5	Amber	No
Snipe	*Gallinago gallinago*	SN	12	5	5	Amber	No
Song Thrush	*Turdus philomelos*	ST	2	21	3	Green	No
Sparrrowhawk	*Accipiter nisus*	SH	2	4	0	Amber	No
Starling	*Sturnus vulgaris*	SG	276	439	200	Amber	No
Stonechat	*Saxicola torquata*	SC	1	0	0	Green	No
Teal	*Anas crecca*	TS	1	0	5	Amber	No
Tree Sparrow	*Passer montanus*	TS	7	0	0	Amber	No
Treecreeper	*Certhia familiaris*	TC	1	1	0	Green	No
Whooper Swan	*Cygnus cygnus*	WS	2	0	0	Amber	Yes
Woodcock	*Scolopax rusticola*	WK	0	1	0	Red	No
Woodpigeon	*Columba palumbus*	WP	37	29	13	Green	No
Wren	*Troglodytes troglodytes*	WR	28	11	4	Green	No
Yellowhammer	*Emberiza citronella*	Y	13	1	4	Red	No

General Breeding Birds

A total of 39 species were recorded from breeding season CBS surveys, carried out as previously outlined. Of these, four are Red listed (Curlew, Lapwing, Meadow Pipit and Yellowhammer). Ten Amber listed species were recorded (Goldcrest, House Sparrow, Mistle Thrush, Mute Swan, Robin, Swallow, Sand Martin, Skylark, Starling, Wheatear). All remaining species are Green listed. It should be noted that Curlew and Wheatear were recorded as non-breeding or passage birds only as no breeding habitat for these species exists within the cluster.

Table 4.40: CBS Square N7222 Results – Cloncumber Cluster

CBS		Code	Early	Late	BoCCI status	EU habitats Directive Annex I
Blackbird	*Turdus merula*	B	27	2	Green	No
Blue Tit	*Cyanistes caeruleus*	BT	0	1	Green	No
Buzzard	*Buteo buteo*	BZ	0	1	Green	No
Chaffinch	*Fringilla coelebs*	CH	14	7	Green	No
Chiffchaff	*Phylloscopus collybita*	CC	1	0	Green	No
Coal Tit	*Periparus ater*	CT	1	5	Green	No

CBS		Code	Early	Late	BoCCI status	EU habitats Directive Annex I
Common Crossbill	*Loxia curvirostra*	CR	1	0	Green	No
Cuckoo	*Cuculus canorus*	CK	1	0	Green	No
Curlew	*Numenius arquata*	CU	0	13	Red	No
Dunnock	*Prunella modularis*	D	1	2	Green	No
Goldcrest	*Regulus regulus*	GC	2	2	Amber	No
Goldfinch	*Carduelis carduelis*	GO	0	3	Green	No
Great Tit	*Parus major*	GT	2	0	Green	No
Greenfinch	*Carduelis chloris*	GR	0	3	Green	No
Grey Heron	*Ardea cinerea*	H	1	0	Green	No
Hooded Crow	*Corvus cornix*	HC	1	6	Green	No
House Sparrow	*Passer domesticus*	SW	6	3	Amber	No
Jackdaw	*Corvus monedula*	JD	1	1	Green	No
Lapwing	*Vanellus vanellus*	L	1	2	Red	No
Magpie	*Pica pica*	MG	1	3	Green	No
Mallard	*Anas platyrhynchos*	MA	4	0	Green	No
Meadow Pipit	*Anthus pratensis*	MP	2	8	Red	No
Mistle Thrush	*Turdus viscivorus*	M	6	0	Amber	No
Mute Swan	*Cygnus olor*	MS	2	2	Amber	No
Pied Wagtail	*Montacilla alba*	PW	1	0	Green	No
Reed Bunting	*Acrocephalus scirpaceus*	RB	1	1	Green	No
Robin	*Erithacus rubecula*	R	9	4	Amber	No
Rook	*Corvus frugilegus*	RO	1	123	Green	No
Sand Martin	*Riparia riparia*	SM	0	7	Amber	No
Sedge Warbler	*Acrocephalus schoenobaenus*	SW	1	0	Green	No
Skylark	*Alauda arvensis*	S	3	6	Amber	No
Song Thrush	*Turdus philomelos*	ST	4	2	Green	No
Starling	*Sturnus vulgaris*	SG	0	3	Amber	No
Swallow	*Hirundo rustica*	SL	17	14	Amber	No
Wheatear	*Oenanthe oenanthe*	W	10	0	Amber	No
Willow Warbler	*Phylloscopus trochilus*	WW	6	9	Green	No
Woodpigeon	*Columba palumbus*	WP	5	8	Green	No
Wren	*Troglodytes troglodytes*	WR	13	9	Green	No
Yellowhammer	*Emberiza citronella*	Y	8	3	Red	No

4.1.7.6 Other Taxa

The following species of Lepidoptera (butterflies) were recorded:

Lepidoptera:
Small Tortoiseshell *Aglais urticae*
Peacock *Inachis io*
Small white *Pieris rapae*
Wall Brown *Lasiommata megera*

4.1.8 Aquatic Ecology

The study area is described below in terms of

- affected catchments
- designated sites with aquatic dependant key conservation interests
- waterbody types in the study area
- protected aquatic flora and fauna

- fish communities and fisheries
- aquatic macroinvertebrates
- biological water quality and
- aquatic plant communities

Each of the above are discussed in relation to the Ballynakill, Drehid-Hortland, Windmill, Derrybrennan and Cloncumber clusters of the proposed Maighne Wind Farm.

4.1.8.1 Affected catchments

A brief overview of the two Hydrometric Areas (or part of) affected by the proposed Maighne Wind Farm is given below.

Hydrometric Area 07 Boyne

Hydrometric Area 07 consists of the River Boyne catchment. The River Boyne main channel rises near Edenderry on the borders of Counties Offaly and Kildare and flows in a north-easterly direction for 112 km before entering the Irish Sea at Drogheda. Together with its tributaries, it drains a catchment of approximately 2,500 km^2. The River Boyne corridor together with its tributary the Kells Blackwater River are designated as a Special Area of Conservation (SAC) (SAC Code 002299). In addition, the River Boyne main channel is also a designated salmonid river under the EU Freshwater Fish Directive (78/659/EEC).

The Boyne has eleven major tributary sub-catchments. The watercourses in the Boyne catchment affected by the proposed Maighne Wind Farm are the Boyne River and Glash River (Ballynakill), the Balrinnet and Glash Rivers (Windmill), and the Coolree, Ballynamullagh, Mulgeeth and Longwood Blackwater Rivers (Drehid-Hortland), where the names in parenthesis are components of the proposed development in the various sub-catchments.

Most of the Boyne catchment is underlain by limestone-based glacial till (O'Grady 1998 [66]). The Boyne catchment drains a mainly lowland area, and consequently all sub-catchments are fed by percolating ground water to a greater extent rather than by runoff. Farming practices in the catchment include dairy, beef production and tillage. There are many large towns in the catchment, including Slane, Navan, Kells, Trim, Athboy and Ballivor.

O'Grady (1998) reported that three major ecological impacts on the Boyne catchment have occurred in 'recent' times. These are (1) excavation of peat lands in the headwater area of the catchment to fuel power stations, (2) the 1980's arterial drainage scheme which affected virtually the entire catchment, and (3) the onset of serious eutrophication problems on Lough Ramor in the Kells Blackwater sub catchment.

The excavation of the peat bogs in headwater areas led to a runoff of fine peat silt particles causing siltation of the headwater tributaries and excessive growth of reeds on these lateral silt beds. This led to a narrowing and deepening of the stream channels; particularly in the catchment area above Trim (O'Grady 1998).
The second major event to impinge on the system was the implementation of an arterial drainage programme throughout the catchment. This programme commenced in 1969 and continued until 1985 (O'Grady 1998). The only major section of this catchment which was not drained was the lower reaches of the main Boyne channel - from Navan downstream, and a section of the Kells Blackwater.

The Ballynakill, Drehid-Hortland and Windmill cluster of the proposed Maighne Wind Farm are within the Boyne catchment and watercourses draining these areas are discussed below.

Drehid-Hortland

The Drehid-Hortland cluster is drained by the Blackwater (Longwood) River (EPA code 07B02). The western extent of the Drehid-Hortland cluster is drained by the Coolree River (EPA code 07C23). This river rises to the east of the site and flows into the 4th order Blackwater (Longwood) from the south as a 3rd order watercourse. The 3rd order Ballynamullagh River rises within the Drehid-Hortland site and flows into the Coolree River from the south.

The Mulgeeth River (EPA code 07M54) rises within the southern extent of the Drehid-Hortland cluster of the proposed development. It has a channel length of c. 8km and flows east into the Blackwater (Longwood) River a 2nd order watercourse.

Ballynakill

The Ballynakill cluster is located to the southwest of Longwood. This cluster is drained by the River Boyne (EPA code 07B04, segment code 07_951) to the north, the Boolykeagh River (EPA code 07B44) and the Glash River (EPA code 07G02) to the west. The River Boyne within the study area is a large drained 5th order river with little physical variation. The Boolykeagh River is a 2nd order watercourse that is formed by the joining of two 1st order streams that are within the Ballynakill cluster. These streams join and the Boolykeagh River flows north for approximately 2km before flowing into the River Boyne. The Glash River is a 4th order watercourse that is formed by numerous tributaries to the south west of the site. A 1st order stream of c. 1.5km in length (Mulphedder Stream, EPA code 07M18) within the Glash River sub-catchment flows approximately 0.5km to the west of the site. The Ashfield Stream (EPA code 07A14) drains the north eastern portion of the site. This 1st order watercourse has a channel length of c. 2km and flows into the River Boyne approximately 1km downstream of the Royal Canal crossing.

Windmill

The Windmill cluster is located in the Glash River sub-catchment where the lands are drained by the 2nd order Balrinnet River (EPA code 07B26). The Balrinnet River is formed by two 1st order streams that rise approximately 1km north and 1.5km south-east of the Windmill cluster (Glash Stream to the south east). The Balrinnet River flows into the Kilrainy River (EPA code 07K22) to form the Glash River which flows into the River Boyne. The headwaters of the Glash Stream flow within 0.2km from the cluster. The overland hydrological distance from the proposed Windmill cluster to the River Boyne is approximately 8.5km.

Hydrometric Area 14 Barrow

Hydrometric Area 14 is the Barrow catchment, which is one of the largest river catchments in Ireland. The River Barrow itself is 192kmlong and drains a catchment of 2,983km^2. It rises on sandstones in the Slieve Bloom Mountains at an elevation of 580m to flow south to confluence with the River Suir estuary at Waterford Harbour. The River Barrow corridor (together with the adjacent River Nore) is a SAC (SAC Code 002162).

The Barrow has eleven major tributary sub-catchments. The main tributaries, on the left bank, are the Cushina, Figile and Slate, all of which form one tributary at Monasterevin, the Greese, Lerr, Burren, Mountain and Pollmounty; those on the right bank are the Owenass, Triogue, Stradbally, Douglas, Fushoge, Gowran, Powerstown and Duiske. The current proposed development affects the Cushina, Figile, Slate, Stadbally and Triogue River sub-catchments. A number of other minor sub-catchments draining directly into the main channel of the River Barrow are also affected.

The River Barrow has been the subject of an arterial drainage scheme (1926 – 1934) with 210km of main rivers and tributaries and 175km of smaller drains deepened and widened, to improve conveyance, in the course of the works programme. The extent of the drainage programme was largely confined to the catchment upstream of Athy and included the extensive Figile-Slate systems.

There are extensive areas of peat in the catchment, bogland having an area in excess of 159 km^2 in the catchment. The Cushina – Philipstown – Figile – Slate system in particular drains extensive areas of flat land with large-scale commercial peat workings present.

The Cloncumber, Derrybrennan, Drehid-Timahoe clusters are located in this sub-catchment where these areas are drained by the Slate and Abbeylough Rivers.

To accommodate navigation, as well as providing hydropower to a number of industrial units, the River Barrow was regulated by a number of major weirs, creating a series of very low gradient reaches between each weir. Navigation at each weir was accommodated through a network of 23 lock gates. Downstream of Athy, the Grand Canal – Barrow Line navigation switches from being an exclusively canal-like channel to one where navigation takes place within the riverine channel.

The Cloncumber and Derrybrennan clusters rm are within the Barrow catchment and watercourses draining these areas are discussed below.

Cloncumber

The Cloncumber cluster is located in the Slate River (EPA code 14S01) sub-catchment within the Barrow catchment. Much of the northern boundary of the this cluster, a stretch of approximately 4km is defined by the stretch of the 3rd order Slate River upstream of Agar Bridge. An external road is proposed to access the proposed Cloncumber cluster from the north which would involve a crossing of the Slate River. The Cloncumber Stream (EPA code 14C17) flows north through proposed Cloncumber cluster of the proposed development to meet the Slate River from the south. The Cloncumber Stream is a highly modified low gradient 2nd order channel. The 3rd order Slate River joins the 4th order Figile River approximately 12km downstream of the Cloncumber cluster. Approximately 1km downstream, the Figile River is fed from the west by the 3rd order Cushina River (EPA code 13C04). A further 7km or so downstream the Figile River flows into the River Barrow (EPA code 14B01).

Derrybrennan

The Figile River (EPA code 14F01) drains the Derrybrennan cluster. The Abbeylough River (EPA code 14A01) is a 1st order watercourse of approximately 6km long. This watercourse flows in an easterly direction and to within 1.2km north of the proposed Derrybrennan cluster. It flows into the 2nd order Figile River approximately 2km north west of the proposed development site. The 3rd order Slate River joins the 4th order Figile River.

4.1.8.2 Designated Sites

cSACs designated for aquatic interests

There are two Natura 2000 river systems in the study area. These are the River Barrow and River Nore cSAC (Site Code 002162) and the River Boyne and River Blackwater cSAC (Site Code 002299). These two Natura 2000 or European sites are discussed hereunder with reference to the Drehid-Hortland, Ballynakill and Windmill clusters of the proposed Maighne Wind Farm in Hydrometric Area 04 and with reference to the Cloncumber and Derrybrennan clusters of the site in Hydrometric Area 14.

River Boyne and the River Blackwater cSAC

Drehid-Hortland

The Drehid-Hortland cluster of the proposed development is within the Blackwater (Longwood) River sub-basin and approximately 10km to the southeast at its closest. The Blackwater (Longwood) River flows into River Boyne and the River Blackwater cSAC. The shortest pathway between the Drehid-Hortland cluster and the River Boyne and the River Blackwater cSAC is the overland hydrological distance from the eastern portion of the Drehid-Hortland cluster and the River Boyne and the River Blackwater cSAC is approximately 18.9km via the Blackwater (Longwood) River.

The distance from the western portion of the proposed development site to the River Boyne within the cSAC is approximately 19km where the Coolree River drains the western extent of the site and flows into the Blackwater (Longwood) River before discharging to the River Boyne.

Ballinakill

The upper limit of the River Boyne and River Blackwater cSAC on the main channel of the River Boyne is approximately 2km west of Longwood where the royal Canal crosses the River Boyne. The Ballynakill cluster lies approximately 1km due south of this part of the River Boyne and River Blackwater cSAC. This part of the cSAC is a receptor for Ballynakill cluster as the Boolykeagh River flows from the Ballynakill site into the River Boyne. The western extent of the Ballynakill site also drains into the River Boyne and River Blackwater cSAC via the Glash River.

Windmill

The Windmill cluster is located in the Glash River sub-catchment which discharges to the River Boyne approximately 1.5km upstream of the designation.

The closest watercourse to the Windmill cluster of the proposed development is a 1st order tributary of the Balrinnet River which flows approximately 0.2km to the east of the proposed development site. This stream would be crossed by the proposed MV cable. The distance from this location to the River Boyne and River Blackwater cSAC is approximately 11km via the Balrinnet River which flows into the Glash River before meeting the River Boyne.

River Barrow and the River Nore cSAC

Cloncumber

The Cloncumber cluster is in the Slate River catchment so the River Barrow within the River Barrow and River Nore cSAC is receiving water for this part of the proposed Maighne Wind Farm. The Cloncumber cluster is located approximately 18km to the north west of the River Barrow cSAC where the main channel of the Rive Barrow is within the designation. The closest part of the proposed Cloncumber cluster of the proposed development to the River Barrow and River Nore cSAC hydrologically is where the MV cable route crosses the Slate River. This crossing location is approximately 18km upstream of the River Barrow and River Nore cSAC where the lower reach of the Figile River is part of the designation.

Derrybrennan

The Derrybrennan cluster is within the Figile River sub-catchment. At its closest, the Derrybrennan component of the proposed development is located 17.5km to the north east of the River Barrow and River Nore cSAC. The proposed MV cable would cross the Abbeylough River and the Lullymore East Stream, these stream crossings located approximately 34km via watercourse pathways.

4.1.8.3 Designated salmonid waters

Boyne catchment

The River Boyne main channel is a designated Salmonid Water under the European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. No. 293/1988).

Ballinakill

The River Boyne is located approximately 1km north of the proposed Ballynakill cluster of the proposed development. The Boolykeagh River flows from the northern boundary of the proposed development site to the River Boyne. The Glash River system to the west of the proposed development which drains part of the site also flows into the main channel of the River Boyne.

Windmill

The Windmill cluster of the proposed development is located in the Glash River sub-catchment and is located approximately 9.5km upstream of the main channel of the River Boyne.

Drehid-Hortland

The Drehid-Hortland cluster is drained by the Blackwater (Longwood) River. The Blackwater (Longwood) River flows into River Boyne approximately 18.9km downstream of this cluster.

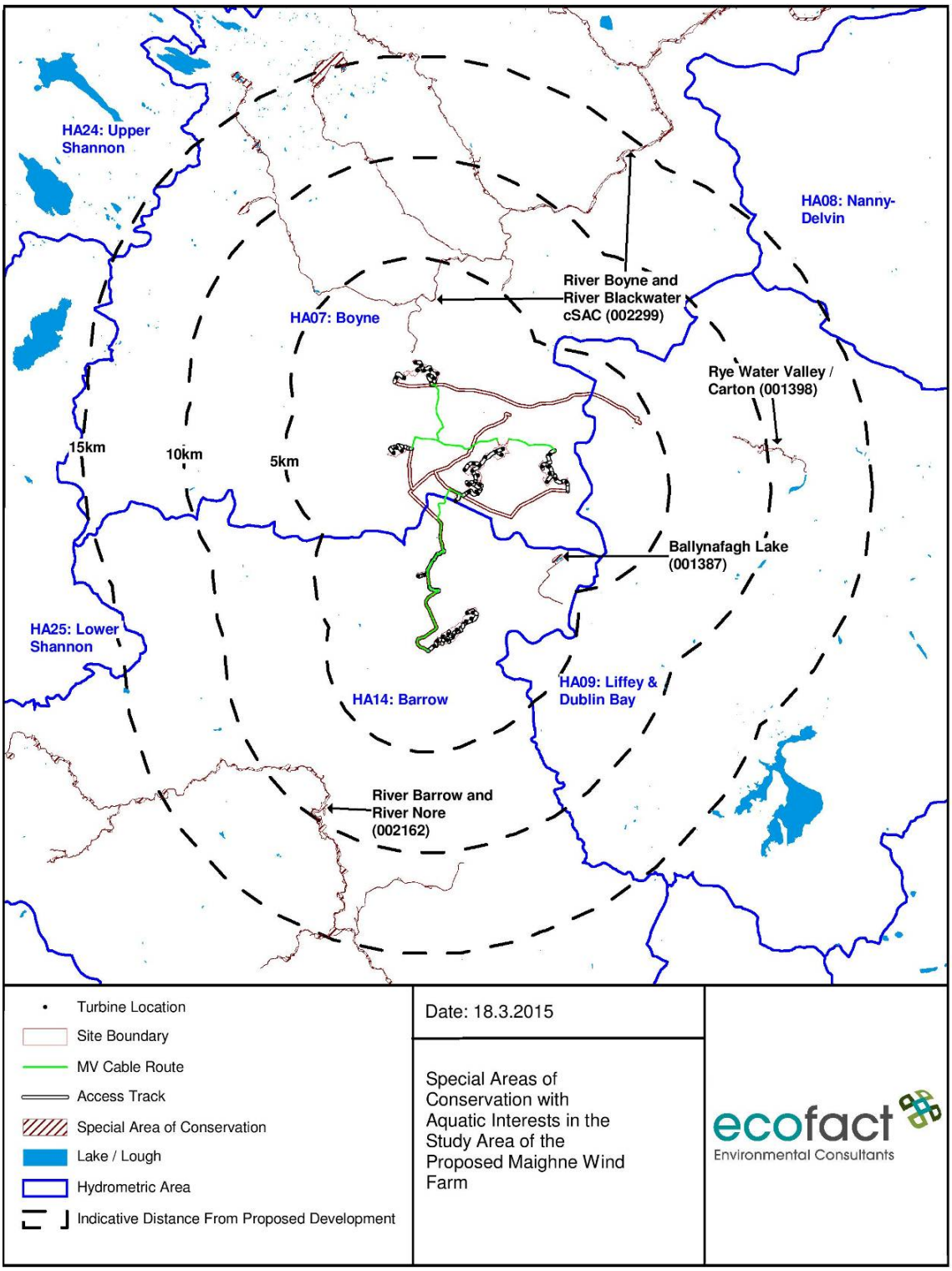

Figure 4.1: Proposed Wind Farm in relation to Natura 2000 river sites and Special Areas of Conservation with aquatic interests

Barrow catchment

There are no designated Salmonid Waters in the Barrow catchment.

4.1.8.4 Waterbody types

Figure 3.2 shows the principal watercourses in the study area for the proposed Maighne Wind Farm. These water features correspond with rivers and streams shown on the EPA map viewer where spatial data such as watercourse locations can be downloaded from the EPA geoportal website. These watercourses are also indicated on the 1:50, 000 scale Discovery Series maps. Watercourses in the study area are discussed below under drains (FW4) and depositing/lowland rivers (FW2). These are the only habitat types in the study area following the classifications given in Fossitt (2000 [(51)]). A significant proportion of 1st order watercourses in the region correspond to the habitat drainage ditch owing to the low gradient topography of the study area. Indeed, there is no clear delineation between Hydrometric Area 7 (Barrow) and Hydrometric Area 14 (Barrow) with respect to surface water features, some 1st order streams crossing from one of these water regions to another. For example, the Clonkeen Stream (EPA code 07C36) rises within the Barrow catchment and flows north into the River Boyne approximately 2km east of Edenderry.

Drains (FW2)

There are a number of highly modified waterbodies within the proposed Maighne Wind Farm corresponding to the habitat 'Drainage ditch (FW4)'. These waterbodies include drainage ditches, field drains and channelised streams. The drainage ditch and depositing lowland river habitats in the study areas of the Drehid-Hortland, Ballynakill and Windmill clusters within the Boyne catchment, and the Cloncumber and Derrybrennan clusters within the Barrow catchment are discussed below.

Typical characteristics of waterbodies classified as drains are evidence of significant, and modification including deepening and straightening, absence of any visible flow, dominance of mud or silt substrate, and choking by aquatic vegetation. This category of waterbody is highly modified and generally not of any significant aquatic ecological importance, and rarely of any fisheries importance. These watercourses usually contain populations of three-spined stickleback (*Gasterosteous aculeatus)* however. This fish species can be expected to occur in most of the watercourses in the proposed Maighne Wind Farm. The land drainage network in the proposed Maighne Wind Farm has many drainage ditches that are not indicated by the EPA i.e. watercourses smaller than 1st order.

Drainage ditches in the proposed Maighne Wind Farm are evaluated as being of Local Importance (lower value). It is noted that these waterbodies can be of importance to amphibians (i.e. frogs and newts) and the presence of frogs and/or newts would raise their overall ecological value. It is also possible that whorl snails (*Vertigo moulinsiana*) could use these habitats in some limited areas. Small drains can also occasionally be used by white-clayed crayfish (*Austropotamobius* pallipes); however this species was not found in the current study. However, most of the drains assessed during the current study were physically degraded and organically enriched.

Drehid-Hortland

The Mulgeeth River at southern extent of the Drehid-Hortland cluster is a sluggish watercourse of trapezoidal cross section. It flows into the Blackwater (Longwood) River.

Ballinakill

Two 1st order watercourses within the Ballynakill cluster are channelised and deepened and classified as a drainage ditches.

Windmill

Two 1st order streams that rise approximately 1km north and 1.5km south-east of the proposed Windmill cluster and join to form the Balrinnet River are classified as drainage ditches. These linear watercourses drain predominantly peaty soils and are slowing flowing.

Cloncumber

There are three minor 1st order tributaries within / adjoining the proposed Cloncumber cluster that flows into the Slate River from the north of the Slate River and fall into the habitat category 'drainage ditch. The longest of these has a channel length of c. 4km.

Derrybrennan

The Abbeylough River which drains the Derrybrennan cluster and the Lullymore Stream to the south are classified as drainage ditches, being artificial /deeply drained linear channels.

Depositing/lowland rivers (FW2)

Larger watercourses in the proposed Maighne Wind Farm are low gradient with deposits of fine sediments on the river bed with slow water flow. All watercourses in the study area have been modified to one degree or another, with many channels subjected to severe modifications in part as a result of the OPW arterial drainage schemes. Such reaches of these watercourses would typically hold populations of small fish such as Minnow, Stone loach, Pike, perch and brown trout. Atlantic salmon *Salmo salar*, Brook lamprey *Lampetra planeri* and White-clawed crayfish could also potentially be present in these stretches. The lowland depositing rivers in the study area are evaluated as being of Local Importance (higher value).

Drehid-Hortland

The Drehid-Hortland cluster is drained by the Blackwater (Longwood) River which corresponds to the habitat lowland/depositing river. This watercourse has a trapezoidal cross section and banks of up to 2m high.

Ballinakill

The Boolykeagh and Glash Rivers downstream of the proposed Ballynakill clsuter are lowland/depositing rivers, having been drained/highly modified in the past.

Windmill

The Balrinnet, Boolykeagh and Glash Rivers downstream of the proposed Ballynakill cluster are lowland/depositing rivers that have been drained/highly modified in the past.

Cloncumber

The Slate River and the Cloncumber Stream correspond to the habitat lowland/depositing river. The Slate River has encroaching marginal vegetation and large stands of instream club rush. The Cloncumber Stream is artificially deepened and widened and has a large proportion of instream emergent vegetation.

Derrybrennan

The Figile River which is the receiving water for the Derrybrennan cluster corresponds to the habitat lowland/depositing river.

4.1.8.5 Protected aquatic flora and fauna

The proposed Maighne Wind Farm is within the 10km Grid squares N62, N63, N64, N72, N73 and N83. Every six years, Member States of the European Union are required to report on the conservation status of all habitats and species listed on the annexes of the Habitats Directive as required under Article 17 of the Directive. Following a period of public consultation Ireland submitted these status assessments to the European Commission in June 2013.

Table 4.41 shows the current distribution of protected aquatic fauna in the 10km grid squares relevant to the Drehid-Hortland, Ballynakill, Windmill, Cloncumber and Derrybrennan cluster based on the 2013 Article 17 Assessments (NPWS, 2013 [67] [68] [69] [70] [71]).

Table 4.41: Distribution of protected aquatic species relevant to the proposed Development

	Component of windfarm and Relevant 10km grid square(s)				
	Drehid-Hortland (N73, N83)	Ballynakill (N64, N74)	Windmill (N63)	Cloncumber (N72)	Derrybrennan (N62, N72)
Atlantic salmon (1106)	✓	✓	✓	✓	✓
Freshwater pearl mussel (1029)	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded
White-clawed crayfish (1092)	✓*	✓	✓	✓	✓
Brook lamprey	✓ (N83 only)	✓ (N74 only)	✓		
River lamprey	✓ (N83 only)	✓ (N74 only)	✓		
Sea lamprey					

*Indicated as occurring by NBDC.
Table based on NPWS (2013) Article 17 Assessments

Atlantic salmon

The Atlantic salmon is listed under Annexes II and V of the EU Habitats Directive and Appendix III of the Bern Convention. It is an economically important species and salmon recreational and commercial fisheries occur throughout Ireland. Atlantic salmon are present in the main river channels and tributaries of the Boyne and Barrow catchments. Atlantic salmon are an anadromous species, meaning they are spawned in freshwater habitats and then migrate to the sea. Salmon habitats are usually fast flowing riffle and glide habitats with cobble or gravel substrates. Salmon angling areas are usually located on main river channels or small rivers in deep glides of 1.5m depth or more.

Crisp (2000 [72]) notes that salmon spawning site selection is governed by a complex of environmental factors including intra-gravel flow, gravel size, water depth as well as stream velocity and cover, which are all essential for successful spawning, egg survival and hatching. One of the most important factors for salmon egg survival is oxygen supply, which is dependent upon dissolved oxygen concentration and inter-gravel flow. High concentrations of suspended solids in the river are undesirable as they are likely to result in infilling of the gravel pores with fine material (Cowx and Fraser, 2003 [73]). Watercourses in the study area including the Boyne, Blackwater (Longwood), Slate and Figile Rivers are unsuitable/suboptimal with regard to salmonid spawning considering the lack of gravel substrates, poor aeration due to sluggish flows and degree of siltation. It is noted that many of these watercourses drain the Bog of Allen and that the substrate in many watercourses in the study area have artificially high levels of suspended solids during flood events and peaty deposits on the river beds. These conditions do not coincide with the habitat requirements of salmon spawning.

McGinnity *et al.* (2003 [74]) give the distribution of salmon in watercourses in Ireland and indicate that the species is present in all rivers of equal or greater than 2nd order in both the Boyne and Barrow catchments (with the exception of the upper reaches of the Owenass River in the upper Barrow catchment).

Within the study area these waters include the Blackwood (Longwood), and the lower reaches of the Glash, Coolree and Mulgeeth Rivers in the Boyne catchment and the in the Barrow catchment. The Figile, Abbeylough, Lullymore and Slate Rivers and Cloncumber Stream area within the Barrow catchment are also indicated as supporting salmon.

Atlantic salmon populations in Ireland have been recently assessed as being 'unfavourable - inadequate' by NPWS in the 2013 Article 17 Conservation Status Assessments (2013) [68].

Boyne Catchment

Atlantic salmon are widely distributed in the Boyne catchment and main tributaries, and the Boyne is subject to famous folklore stories about the great warrior Fionn mac Cumhaill and the mythical "*salmon of Knowledge*" that was caught on the River Boyne. Unfortunately as it is put in the book '*A celebration of salmon rivers*' published by NASF (2007 [75]) "*the salmon is no longer an image associated with the Boyne, nor is wisdom a quality to be associated with the management of this natural resource*".

The main problem currently facing salmon in the Boyne catchment is water quality. The catchment was also significantly affected in the past by a major extended OPW arterial drainage scheme that involved deepening and channelisation works affecting almost every channel in the catchment above Navan. O'Grady (1998) argued that this drainage scheme may have inadvertently improved salmonid production in the catchment. He concluded that this was due to (a) the restoration of a natural river form in the middle reaches of the main channel as a result of the removal of a series of large weirs and (b) the post-drainage fishery enhancement programmes. However, few anglers in the Boyne catchment would agree with this hypothesis, and it is clear that the scheme had a devastating effect on the physical ecological diversity of the river corridors in this catchment. The lower reaches of the main Boyne channel, from Navan to Drogheda, was not subject to arterial drainage and this coupled with the lengthy nature (17 years) of the drainage scheme was also probably advantageous in terms of maintaining salmonid production (O'Grady 1998 [66]). However, the delay in this scheme was apparently due to budgetary constraints rather than a mitigation measure and does not take into account other ecological impacts. O'Grady (1998 [66]) reported that spawning sites for both salmon (and trout) in the Boyne catchment are confined principally to the tributaries as there are very limited gravel deposits in the main channel. He also noted that sub-tributaries in the catchment are generally not of importance in fisheries terms; probably a legacy of the arterial drainage scheme. O'Grady (1998 [66]) states that the tributaries function as nursery areas for salmonids and the larger of these channels, and the main Boyne channel, support substantial populations of salmon parr (and adult brown trout). According to Inland Fisheries Ireland the River Boyne catchment contains 5.93% of the accessible juvenile salmon habitat in Ireland, comprising 6.69 million m^2 of suitable juvenile salmon habitat. Salmon angling areas in the River Boyne are largely limited to the main Boyne downstream of Navan and the lower reaches of the Kells Blackwater. Adult salmon seldom move upstream of this point in the channel until late in the year, after the angling season (O'Grady 1998 [66]; O'Reilly 2002 [76]).

Barrow Catchment

The Barrow is a highly modified river with the lower and middle reaches of the river canalised for navigation. The river still has a good run of salmon which spawn downstream of the weirs on the main channel, and also run into the tributaries. Most of the tributaries have been subjected to arterial drainage schemes and water quality is a significant pressure in the catchment. It is a river that has had recurring serious water pollution problems in recent times, and fish kills have occurred. Despite this salmon stocks are improving according to Inland Fisheries Ireland. A catchment wide electrofishing survey of juvenile salmon abundance was undertaken on the River Barrow during summer 2011 by Inland Fisheries Ireland. The mean catch in 2011 at 79 sites was 24.75 salmon fry per 5 minute fishing which is considered a high abundance level. The mean catch over the four years sampled was 15.35 salmon fry per five minute fishing. It is clear that all the 2nd order and larger streams in the study area of the proposed wind farm site have salmon populations. According to Inland Fisheries Ireland the River Barrow catchment contains 5.75% of the accessible juvenile salmon habitat in Ireland, comprising 6.49 million m^2 of suitable juvenile salmon habitat. The salmon fishing in the River Barrow is generally regarded as poor, and what fish are taken are mostly grilse, taken either during the summer or late in the season. The salmon fisheries on the River Barrow are located well downstream of the study area.

Freshwater Pearl Mussel

The freshwater pearl mussel (*Margaritifera margaritifera* (L.)) is a large bivalve species found in oligotrophic, soft to neutral waters of rivers and, occasionally, in lakes. In Ireland, the species is concentrated along the western sea-board, but also occurs in the south and east where geology allows. However, the Freshwater Pearl Mussel does not occur in the study area or in downstream areas.

The biology and ecology of the species are particularly notable in that individuals can grow to very large sizes relative to other freshwater molluscs, building up thick calcareous valves, in rivers with relatively soft water and low levels of calcium. Their shell building is consequently very slow, and individuals in natural conditions live to over a hundred years of age.

In Ireland, a total of 27 populations have been designated within 19 SAC areas for *Margaritifera margaritifera.* NPWS (2013 [67]) note that the freshwater pearl mussel (FPM) is found in 162 rivers in 104 catchments/sub-catchments across 14 counties (Carlow, Cavan, Clare, Cork, Donegal, Galway, Kerry, Limerick, Mayo, Sligo, Tipperary, Waterford, Wexford and Wicklow). As stated previously, the Freshwater Pearl Mussel does not occur in the study area or in downstream areas. Freshwater Pearl Mussel populations in Ireland have been recently assessed as being 'unfavourable - bad' by NPWS in the 2013 Article 17 Conservation Status Assessments (2013 [67]).

Boyne Catchment

The Drehid-Hortland, Ballynakill and Windmill clusters are located within the Boyne catchment. The Drehid-Hortland and Windmill clusters are located in Co. Kildare as is the bulk of the Ballynakill cluster. A small portion of the northern extent of the Ballynakill cluster is located in Co. Meath. There are no records of FPM in these counties and the species does not occur in the study area. The Article 17 report (NPWS, 2013 [67]) which shows the current distribution of FPM shows the Boyne catchment to be outside the known distribution of FPM in Ireland.

Barrow Catchment

The Cloncumber and Derrybrennan clusters are located within the Barrow catchment in Co. Kildare. Co. Kildare is not listed in NPWS (2013 [77]) as an area where FPM is found and the study area is not indicated within the current distribution of FPM.

Lucey (1993 [78]) gives the distribution of *Margaritifera margaritifera* in southern Irish rivers and streams. This study area encompassed Hydrometric Areas 11 to 24. The distribution of FPM given in Lucey (1993 [78]) for the River Barrow is within the distribution given in NPWS (2013 [77]). Again, the proposed development is outside of this distribution range (see below).

Tributaries of the Barrow, Nore and Suir River were examined for freshwater pearl mussels *Margaritifera margaritifera* and *M. m. Durrovensis* from June to August 1991 (Moorkens *et al.,* 1992 [79]). Rivers surveyed included the Figile, Cushina, Lerr and Greese in the upper Barrow catchment. Of the 79 rivers surveyed, only four were found to have living freshwater pearl mussels. Two of these rivers were in the Barrow catchment: the Mountain River and the Ballymurphy River. In the 1991 study (Moorkens *et al.,* 1992 [79]), mussels were found in sandy gravel towards the river banks, and under overhanging trees. It is noted in Moorkens *et al.* (1992 [79]) that alteration in a river's flow regime, such as that caused by drainage for forestry or agriculture, may result in summer flows being insufficient to support Freshwater Pearl Mussel. The same can be said of drainage carried out for harvesting of peat. A large proportion of rivers in the study area have soft substrates deemed unsuitable for FPM, beds of these rivers thought to be influenced by peat runoff from peat harvesting, suspended solids from ploughed lands and diffuse enrichment from agricultural activities, all known pressures on FPM (Moorkens, 1999 [80]).

There are three *Margaritifera margaritifera* populations in the Barrow catchment within the River Barrow and River Nore cSAC (002162). These mussels are present in the Mountain, Ballymurphy and Aughavaud Rivers and are in excess of 65km to the south of the Cloncumber cluster.

White-clawed crayfish

The white-clawed crayfish is the only freshwater crayfish recorded in Ireland. Populations of the species in the rest of Europe have declined dramatically and Ireland is seen as a unique stronghold for this species in a European context (Reynolds 1998 [81]). The white-clawed crayfish is protected under both European and Irish legislation. It is protected by the Wildlife Act, 1976 and has been classified as endangered in the IUCN Red List. It is also listed under Appendix III of the Bern Convention and Annexes II and V of the EU Habitats Directive (1992). The white-clawed crayfish is Ireland's only crayfish species. Ireland is understood to hold some of the best European stocks of this species, under least threat from external factors.

Irish stocks are therefore of substantial conservation importance (Reynolds, 1998 [81]). Throughout its natural range across Western Europe, the distribution and abundance of white-clawed crayfish has been dramatically reduced in the last 150 years due to human disturbances such as overfishing, habitat destruction, pollution and the introduction of foreign crayfish species (Reynolds, 1998 [81]). In Britain, the North American signal crayfish (*Pacifastacus leniusculus*) was introduced for aquaculture and subsequently escaped into the wild, where it has had a devastating effect on white-clawed crayfish populations. While this species has not been recorded in Ireland, there is a real threat that this alien crayfish species will reach this country. The crayfish plague, which was transmitted by introduced crayfish species and is caused by the fungus *Aphanomyces astaci*, has been found in Ireland since the late 1980s.

White-clawed crayfish is widespread in areas which are underlain by Carboniferous limestone, or its derivative - glacial drift (Reynolds, 1998 [81]). Demers *et al.* (2005 [82]) reported that white-clawed crayfish are still widespread in the rivers of the Irish midlands, where the geology is predominantly limestone. However, these authors also report that the distribution of white-clawed crayfish in rivers has been restricted since the mid-1980s. This was attributed in part to an outbreak of the crayfish plague. Recent data from the EPA suggests a decline in crayfish populations in the north midlands (Reynolds, 2006 [83]).
According to Reynolds (1998), the main threats to the white-clawed crayfish in Ireland are stream drainage, pollution and the introduction of predators, competitors or diseases. Ongoing drainage maintenance on arterially drained rivers in Ireland has also been identified as having a significant adverse effect of this species (O'Connor & McDonnell, 2008 [84]). The overall Article 17 assessment for white-clawed crayfish is Unfavourable-Inadequate (NPWS, 2013).

Boyne Catchment

White-clawed crayfish is generally considered to be widespread in lowland rivers such as the River Boyne and tributaries (e.g. Lucey and McGarrigle, 1987 [85]). Demers *et al*. (2005 [82]) also reported that crayfish populations in the lakes and rivers of the Boyne catchment were likely to have been affected by crayfish plague, but are currently recuperating, according to Reynolds (2007). However, this effect is geographically isolated (Gallagher *et al*., 2006 [86]). All components of the proposed development within the Boyne catchment are located within 10km grid squares within the current distribution of White-clawed crayfish (as in Table 4.44). This species can be expected to occur in the watercourses draining the Drehid-Hortland, Ballynakill and Windmill clusters.

Barrow Catchment

All components of the proposed development within the Barrow catchment are located within 10km grid squares within the current distribution of White-clawed crayfish (see Table 4.44). This species can be expected to occur in the watercourses draining the Cloncumber and Derrybrennan clsuters.

Brook lamprey

The brook lamprey is the smallest of the three lampreys native to Ireland and it is the only one of the three species that is non-parasitic and spends all its life in freshwater (Maitland & Campbell 1992 [87]). Brook lamprey is listed in Annex II of the EU Habitats Directive and in Appendix III of the Bern Convention. Brook lampreys are the most common and widespread of the three Irish lamprey species (Kurtz & Costello, 1999 [88]). They are found in most 2nd order and larger streams and rivers throughout the study area. Brook lampreys live for up to five years burrowed into silt deposits in rivers. They metamorphose into adults and spawn in the early spring in fast flowing streams with gravel substrates. Unlike the other two Irish lamprey species they are not parasitic as adults, and undertake only localised migrations.

Lampreys show a preference for gravel-dominated substratum for spawning, and mainly silt and sand-dominated substratum for nursery habitat (Harvey & Cowx, 2003 [89]). The spawning season of brook lampreys starts when the water temperatures reach 10–11ºC (Maitland, 2003 [90]). This usually occurs in March/April.

Although still common in Ireland they are under significant threat from drainage and navigation maintenance works and also from water quality deterioration. Brook lampreys are also doing less well across the rest of European Union. In this regard Irish populations of Brook lampreys are of International Importance. Ireland has failed to protect lampreys with a close season for instream works during their spawning season so they are vulnerable due to the lack of this type of protection.

Responsibility for protecting lampreys in Ireland falls within the remit of Inland Fisheries Ireland; although there are none and never have been any fisheries for this species in Ireland. Brook lamprey populations in Ireland have been recently assessed as being 'favourable' by NPWS in the 2013 Article 17 Conservation Status Assessments (2013 [91]).

Boyne Catchment

During a survey of juvenile lamprey populations in the Boyne Catchment (O'Connor, 2006 [92]), brook lampreys were found to be widely distributed in the catchment. Lampreys were present at 70 out of the 91 sites investigated (77%). Mean minimum densities of river/brook juveniles recorded was 5.16 ± 2.43 juvenile lampreys per m^2, which was considered high in the context of Irish rivers. These were considered to be primarily brook lampreys, although river lampreys were also likely to be represented in samples taken from the lower reaches of the Boyne main channel.

Drehid Hortland
During the O'Connor (2006 [92]) survey of juvenile lampreys in the River Boyne catchment, juvenile lampreys were recorded in the Blackwater (Longwood) River. This species can be expected to occur in the Mulgeeth and Coolree Rivers which drain the Drehid-Hortland cluster.

Ballinakill
Juvenile lampreys occurred in the main channel of the Boyne upstream and downstream of the Boolykeagh River confluence when surveyed in 2005 (O'Connor, 2006 [92]).

Windmill
The main channel of the River Boyne was found to have suitable habitat for lampreys at surveyed locations both upstream and downstream of the Glash River confluence, the watercourse draining the Windmill cluster. This species can be expected to occur in the Glash River also.

Barrow Catchment

King (2006 [93]) gives the distribution of the three species of lampreys in the River Barrow cSAC and found brook lampreys to be widely distributed in the main channel of the River Barrow. Taking into account the spawning requirements of the brook lamprey, this species can be expected to occur in only low densities within the study area, the lack of suitable spawning areas considered a limiting factor. Drained rivers such as those in the study area have a much reduced lateral heterogeneity and a lower availability of flow refugia and backwater habitats than un-drained rivers and this can be expected to restrict lamprey production.

Cloncumber
The Abbeylough, Cloncumber and Slate Rivers are likely to support brook lamprey in low densities. These watercourses are regarded as suboptimal for this species however with consideration for the spawning requirements.

Derrybrennan
The Figile and Lullymore Rivers may support small populations of brook lampreys. These watercourses are regarded as suboptimal for this species however with regard to the spawning requirements of the species. These watercourses generally have soft substrates and little gravelly substrates, the latter essential for successful spawning.

River lamprey

The river lamprey is larger in size than the brook lamprey and exhibits an anadromous life cycle. River lamprey is listed in Annex II and IV of the Habitats Directive and also in Appendix III of the Bern Convention. River lampreys are poor swimmers and climbers and are confined to the lower reaches of the Boyne catchment - well downstream of the study area of the proposed Maighne Wind Farm.

King (2006 [93]) notes the presence of river/brook lampreys in the Barrow upstream of Portarlington. It is considered that these lampreys were most likely brook lampreys, taking account of the distance from the tide and the number of weirs on the river.

River lamprey populations in Ireland have been recently assessed as being 'favourable' by NPWS in the 2013 Article 17 Conservation Status Assessments (2013 [77]). However, this has been based on the fact that they have been grouped together with Brook lamprey populations due to identification difficulties.

Sea lamprey

The sea lamprey is the largest of the Irish lamprey species and again has an anadromous life cycle. They are also listed in Annex II of the Habitats Directive and Appendix III of the Bern Convention. In the NPWS Irish Wildlife Manuals No. 21 (King, 2006 [93]), the sea lamprey is indicated as occurring as far upstream as Carlow on the main channel of the River Barrow. Although more capable than river lampreys, sea lampreys are again poor swimmers and climbers would be confined to the lower reaches of the Boyne and Barrow Rivers, if present - well downstream of the study area of the currently proposed wind energy development. Indeed, NPWS (2013) notes that in several sea lamprey rivers, (e.g. the Mulkear, the Feale, the Fergus, the Barrow) severe barriers to passage occur at the upstream end of the tidal freshwater and that this does not represent a favourable situation. Sea lamprey populations in Ireland have been recently assessed as being 'unfavourable' by NPWS in the 2013 Article 17 Conservation Status Assessments (2013 [71]).

Floating river vegetation

The plants characteristic of this habitat include a number of *Ranunculus* species and all *Callitriche* species, including other submerged aquatic plants. The community Callitricho–Batrachion includes species of the *Ranunculus* subgenus *Batrachium* and two species of *Callitriche*, *C. hamulata* and *C. platycarpa* as diagnostic species. There are few published records for descriptions of this habitat in Ireland and no comprehensive island-wide descriptions. According to NPWS (2013 [94]) the EU definition of this habitat is very broad, especially when the presence of aquatic mosses is taken into account. Using this broad definition the habitat will be found in most watercourses in Ireland. There is to date no satisfactory definition of the habitat and its sub-types or their distribution in Ireland.

Consequently there is a lack of relevant monitoring data concerning the habitat. What is clear is that the habitat can occur over a wide range of physical conditions, from acid, oligotrophic, flashy upland streams dominated by bryophytes to more eutrophic, slow flowing streams dominated by Ranunculus and Callitriche species. While the former will be sensitive to diffuse pollution the latter, especially in shallow streams, will be relatively more resistant. Flora associated with the Annex I habitat 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation' (3260) includes *Ranunculus saniculifolius, Ranunculus trichophyllus, Ranunculus fluitans, Ranunculus penicillatus ssp. penicillatus, Ranunculus penicillatus* ssp. *Pseudofluitantis, Ranunculus aquatilis, Myriophyllum* spp., Callitriche spp., *Sium erectum* (or *Berula erecta*), *Zannichellia palustris, Potamogeton* spp., and the moss *Fontinalis antipyretica*. *Groenlandia densa* (Opposite leaved pondweed) is also included in the list. The flowering rush *Butomus umbellatus* may be present as part of the bank flora where floating river vegetation has been identified. The habitat 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation' in Ireland has been recently assessed as being 'inadequate' by NPWS in the 2013 Article 17 Conservation Status Assessments (2013 [94]).

4.1.8.6 Fish Communities and Fisheries

This section includes results of desk studies carried out for fish surveys in the Boyne and Barrow catchments as well as results of the field assessments carried out specifically for the proposed development. Table 4.42 presents the results of the physical habitat assessments at the aquatic ecology and fisheries survey sites, Table 4.43 presents the results of the River Habitat Survey (RHS) assessments, Table 4.44 presents the results of the fisheries habitat assessments and Table 4.45 presents the biological water quality and WFD status at the aquatic ecology and fisheries survey sites examined during the current field survey work. The results of the aquatic ecology and fisheries survey are also presented on Figure 4.2.

Boyne catchment

A single site was surveyed in the River Boyne catchment within the Eastern River Basin District as part of WFD fish surveillance monitoring in 2010 (Kelly *et al, 2011* [95]). This site was located close to the river's source, approximately 1.5km north of Edenderry.

This location is approximately 18km upstream of the Fear English River confluence with the River Boyne, the Fear English River draining the Drehid-Hortland clsuter. A total wetted area of 936m^2 was surveyed at Boyne Bridge by IFI in 2010 (117m m long channel of wetted width 8m). Emergent macrophyte vegetation was abundant throughout this stretch, while submerged and floating species were also present. Three fish species were recorded in the River Boyne at Boyne Bridge: brown trout (0.05/m^2), three-spined stickleback (0.004/m^2) and minnow (0.002/m^2). It is noted that the stretch of the River Boyne surveyed during 2010 (Kelley *et al*, 2010 [95]) was drained, corresponding to channel characteristics of some watercourses in the current survey area.

Barrow Catchment

During the current assessment, electrical fishing was carried out at Site 9 on the Figile River in July 2014. A total of three fish species were recorded at this location: brown trout, European eel and pike.

A site on the main channel of the River Barrow was surveyed in the River Barrow catchment within the Eastern River Basin District as part of WFD fish surveillance monitoring in 2009 (Kelly *et al., 2010* [95]), so data from this site was also considered in the current assessment. This site was located at Pass Bridge in Monasterevin, Co. Kildare, approximately 10km downstream of the Figile-Slate confluence, or approximately 22km downstream of Cloncumber, the nearest cluster (Cloncumber). One electric-fishing pass was conducted using four boat-based electric-fishing units on the 6th of July 2009 along a 426m length of channel. The mean wetted width of the surveyed stretch was 25.6m and the mean depth was 96.0cm. Riffle and glide dominated the habitat, while the substrate was a mixture of cobble, gravel and sand. Macrophyte vegetation consisted mostly of riparian grasses but some submerged species were also present. A total wetted area of 10906m^2 was surveyed. A total of eleven fish species were recorded in the River Barrow (Pass Bridge) site (as well as roach x bream hybrids). Gudgeon *Gobio* was the most abundant species (0.0037/m^2), followed by roach *Rutilus rutilus*(0.0031/m^2), salmon *Salmo salar* (0.0031/m^2), perch *Perca fluviatilis* (0.0026/m^2), pike *Esox lucius* (0.0024/m^2), minnow *Phoxinus* (0.0013/m^2), brown trout *Salmo trutta* (0.0009/m^2), stone loach *Barbatula* (0.0007/m^2), European eel *Anguilla* (0.0006/m^2), dace *Leuciscus* (0.0006/m^2), roach x bream hybrids *Rutilus* x *Abramis brama* (0.0004/m^2) and bream *A. Brama* (0.0001/m^2).

Gudgeon ranged in length from 8.2cm to 12.0cm (Fig. 4.12). Roach ranged in length from 5.5cm to 25.0cm. Four age classes (2+, 3+, 4+ and 5+) were present, accounting for approximately 14.7%, 35.3%, 29.4% and 17.6% of the total roach catch respectively. Salmon ranged in length from 9.0cm to 14.0cm. All individuals were aged 1+. Perch ranged in length from 10.6cm to 36.0cm. Six age classes (1+, 2+, 3+, 4+, 5+ and 8+) were present. Pike ranged in length from 17.5cm to 59.0cm.

Three age classes (1+, 2+ and 3+) were present, accounting for approximately 77%, 8% and 15% of the total pike catch respectively. Brown trout ranged in length from 12.0cm to 38.5cm. Three age classes (1+, 2+ and 3+) were present, accounting for approximately 20%, 70% and 10% of the total brown trout catch respectively. Mean brown trout L1, L2 and L3 were 10.6cm, 18.3cm and 19.4cm respectively, indicating a fast rate of growth for brown trout in this river site according to the classification scheme of Kennedy and Fitzmaurice (1971 [96]). Eels ranged in length from 46.0cm to 58.0cm.

Salmonid habitats and fisheries

As well as salmon (already discussed), brown trout also occur in the study area. Arterial drainage programmes dating from the 19th and first half of the 20th century impacted on many catchments throughout Ireland. Brown trout occur in virtually every catchment in Ireland with suitable water quality and spawning grounds, and are one of the most common and recognisable fish species in Ireland. Indeed, they have less protection in Ireland from anglers than non-native invasive cyprinid fish species such as the dace and roach, presumably due to their abundance. Brown trout occur as resident 'brown trout' and also as an anadromous form, the 'sea trout'. In many catchments throughout Ireland trout make extensive migrations between spawning grounds in streams and feeding grounds in lakes or larger rivers.

The Boyne catchment was severely affected by these schemes which degraded habitats for species such as trout. In many cases trout populations were more affected than salmon, with the removal of features such as undercut banks, large woody debris etc. from these channels. The larger river channels in the study area are still considered to be important trout fisheries, i.e. the Boyne, Blackwater (Longwood), Slate and Figile are all still noted for the quality and size of brown trout that they produce (O'Reilly, 2004 [76]).

Coarse fish habitats and fisheries

Coarse fish are essentially any freshwater fish other than salmon and trout and generally include members of the cyprinidae family (i.e. roach, dace, rudd, bream, tench), pike and perch. The term coarse fishing originated in the United Kingdom in the early 19th century. Prior to that time, recreational fishing was a sport of the gentry, who angled for salmon and trout which they called game fish. Other fish were disdained as coarse fish.
Almost all coarse fish in Ireland are considered to be non-native species. However, there is recent evidence that pike may be native to Ireland (Pedreschi *et al*, 2013 [97]). Coarse fish in Ireland are afforded a higher level of protection in Ireland than native brown trout, with strict limits on the number and sizes of these fish that can be killed by anglers. Coarse fisheries are of significant economic value in Ireland, particularly for tourist anglers. Coarse fisheries and coarse fish spawning areas are generally located in large lowland rivers and lakes. The main channel of Moynalty is important in this regard.

Eel habitats

The European eel *Anguilla anguilla* is a native fish of significant ecological importance. In recent decades, this species has undergone a dramatic decline throughout its range. In response to the decline in European eel populations European Council Regulation 1100/2007 "Establishing measures for the recovery of the stock of European eel" has now been adopted in member states. European eel is listed as 'Critically endangered' and is now 'Red Listed' according to the recently published 'Red List No. 5: Amphibians, Reptiles & Freshwater Fish' (King *et al*., 2011 [98]).

Eels are considered present throughout the proposed wind farm site, but are generally only found in larger watercourses, rivers and lakes. Eels have a catadromous life cycle, which means they spawn in the sea and migrate into freshwater to feed and grow. This is opposite of the life cycle of the salmon, for example. The upstream migration of eels in rivers is restricted by weirs and their obstacles. However unlike lampreys they are able to climb over weirs. Despite the international decline in this species, they are still common in the main rivers in the study area.

Lamprey habitats

The most common lamprey species in the study area is Brook lamprey and they are generally common and widespread in the study area in 2nd order and larger streams and rivers.

Others

The majority of the watercourses within the proposed wind farm site are small fish populations dominated by species such as the three-spined stickleback, nine-spined stickleback, minnow and stone loach. These small fish communities are not of significant ecological or economic importance.

These small fish populations, and particularly ones dominated by sticklebacks, can be present in even small drains that have permanent water.

4.1.8.7 Aquatic macroinvertebrates

Macroinvertebrate communities

The aquatic macroinvertebrate community in Ireland is impoverished due to glaciation with many species not reaching Ireland following the retreat of the ice and sea level changes. Macroinvertebrate assemblages were recorded from Site 2 on the Longwood Blackwater in the Boyne catchment, and Site 8 on the Slate River and Site 9 on the Figile River in the Barrow catchment as indicated on Figure 4.2. The macronivertebrates recorded at these locations are provided in Table 4.46.

The macroinvertebrate communities in the study area were typically associated with slow flowing watercourses. Pollution tolerant macroinvertebrates were found to dominate the macroinvertebrate assemblage at these sites. Watercourse morphology including physical characteristics such as depth and wetted width, as well as gradient, substrate conditions and instream/emergent vegetation coupled with water quality all dictate the macroinvertebrate families and relative abundance at the sites surveyed.

The macroinvertebrate community assemblages recorded on the Longwood Blackwater, Slate River and Figile River are considered to be representative of the watercourses in the study area at large. Owing to their large size, these sites probably support the richest aquatic macroinvertebrate communities in the study area, as the smaller watercourses (drainage ditches) in the study area are prone to fluctuations and have less diverse structural diversity. The only protected macroinvertebrate in the study area is white clawed crayfish. This species was not recorded during the current assessment but is likely to occur.

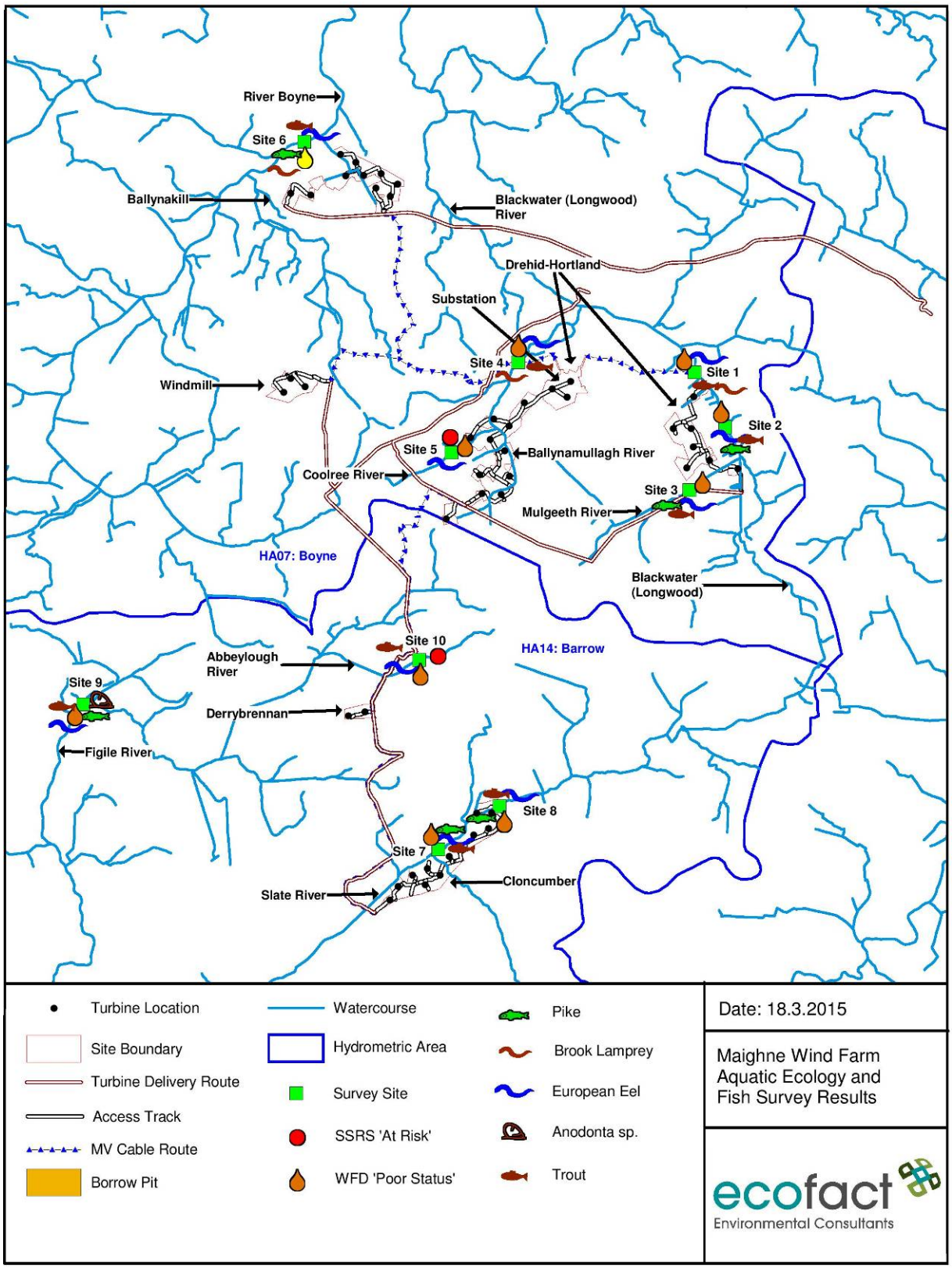

Figure 4.2: Aquatic Ecology and Fisheries Survey Sites and Results

Boyne Catchment

Drehid-Hortland

Site 2 (as indicate on Figure 4.4) was located on the Blackwater (Longwood) River in the Boyne catchment to the east of the proposed Drehid-Hortland cluster. A macroinvertebrate family diversity of eight was recorded at this site. The pollution tolerant crustaceans *Gammarus deubeni* and *Asellus aquaticus*, as well as the snail *Bithynia tentaculata* were common. The snail *Lymnaea peregra* and beetles *Potamonectes depressus elegans* and *Stictotarsus duodecimpustulatus* were also recorded. The only Trichopteran recorded was *Hydropsyche sp.* (common).

Barrow catchment

Cloncumber

Site 8 was located on the Slate River at the eastern estent of the proposed Cloncumber cluster. Macroinvertebrates in 10 families were recorded here. The only Ephemeropteran recorded was larval *Baetis rhodani*, a pollution tolernat indicator. Fair numbers and small numbers of *A. Aquaticus* and *Gammarus duebeni* were recorded respectively. The non-native snail *Potamopyrgus jenkinsi* was numerous. The leeches *Glossiphonia complanata* and the fish parasite *Piscicola geometra* as well as Aquatic worm (Lumbriculidae) were present at this site.

Derrybrennan

Site 9 was located on the Figile River downstream of the Derrybrennan cluster. The macroinvertebrate family diveristy at this location was 16. Trivhopterans were well represented with cased larvae of Group (less sensitive) *Phryganea sp.* (scarce) and caseless larvae of *Hydropsyche sp.* (fair numbers) and *Polycentropus* sp. (scarce). Larvae of the banded jewelwing damselfly *Agrion splendens* the true fly *Dicranota* sp. were recorded in small numbers. Molluscs were the most diverse group with the following recorded: *Planorbis carinatus, P. Jenkinsi, Lymnaea stagnalis* and freshwater duck mussel *Anodonta anatina.*

A. anatina has been previously recorded from the Figile River (based on distribution maps in Byrne *et al,* 2009 [99]). Its habitat in Ireland is lowland lake, slow moving rivers and canals. Microhabitat for this species in Ireland comprises muddy or silty beds in areas of still or slow flow. The Slate River is also considered to support this species. There are a total of 31 Irish non-marine molluscan species that either have a threat status or with important Irish populations (Moorkens, 2006 [100]), including Duck Mussel. The IUCN status of *A. anatina* is 'Vulnerable' (Byrne *et al,* 2009 [101]) and its threat status is 'Vulnerable' (Moorkens, 2006 [100]).

4.1.8.8 Biological water quality

Water quality has been monitored in the River Boyne and Barrow main stem and in selected tributaries by the Environmental Protection Agency (EPA) and its predecessors since 1971. As part of its rollover monitoring programme, biological sampling is carried out periodically by the EPA. Below is an account of biological water quality in the study area based on EPA data. Table 4.47 gives the biological water quality ratings of watercourses assessed in August / September 2013. Figure 4.5 gives the most EPA Biological Water Quality Results for Watercourses Draining the Proposed Maighne Wind Farm.

Hydrometric Area 07 (Boyne)

Drehid-Hortland

The Drehid-Hortland cluster is drained by the Blackwater (Longwood) River and was most recently monitored by the EPA in 2012. The uppermost EPA biological surrey location on this river in 2012 is at the bridge south of Hortland (07B02 60), to the east of the proposed development. Biological water quality at this location was rated Q3 at this time, equivalent to WFD poor status. Biological water quality at the bridge at Johnstown was rated Q3-4 in 2012, equivalent to WFD moderate status.

The following is the most recent EPA assessment of the Blackwater (Longwood) River based on the 2012 results: *the dominance of pollution tolerant and paucity of pollution sensitive macroinvertebrate taxa indicated unsatisfactory ecological conditions at all sites surveyed on the Blackwater (Longwood) River in September 2012. Enriched conditions were evident with enhanced macrophyte growth noted downstream of Johnstown at Longwood (0300) and in the lower reaches (0600).*

Ballinakill

A stretch of the River Boyne between the EPA biological monitoring station at Ashfield Bridge (07B04 600) and Inchamore Bridge (07B04 800) lies approximately 1km north of the Ballynakill component of the proposed development site. At the upstream location (Ashfield Bridge), biological water quality was rated Q3-4 in 2012, corresponding to WFD moderate status. At the downstream location (Inchamore Bridge), biological water quality was rated Q4 in 2012, corresponding to WFD good status.

The following is the most recent EPA assessment of the Blackwater (Longwood) River based on the 2012 results: *the majority of the fifteen stations surveyed on the Boyne River remain in an unsatisfactory ecological condition in 2012. The macroinvertebrate fauna indicated satisfactory ecological conditions at six of the stations examined. An unwelcome decline in ecological status was noted at three stations. The macroinvertebrate fauna indicated a decline from good to moderate ecological conditions in the upper reaches at Boyne Bridge (0200) and at Scarriff Bridge (0900) and a decline from high to good ecological conditions at Inchamore Bridge (0800). A welcome improvement from moderate to good ecological conditions was noted downstream of Broadboyne Bridge (2010). Unsatisfactory ecological conditions continue downstream of Edenderry (0300), at Ashfield Bridge downstream of the Glash River confluence (0600), downstream of the Blackwater (Longwood) confluence (0900), at Trim and downstream (1200, 1400), at Bective Bridge downstream of the Knightsbrook and Boycetown confluences (1500), Kilcarn Old Bridge, downstream of the Clady and Skane river confluences (1700) and at Obelisk Bridge, upstream of Drogheda (2200)*.

The Mulphedder Stream drains the western extent of the proposed development site and flows in to the Glash River upstream of Bunglass Bridge (07G02 600). Biological water quality at this site was rated Q3-4 in 2012, corresponding to WFD moderate status.

Windmill

The Windmill cluster is drained by the Glash River system River which most recently monitored by the EPA in 2012. Biological monitoring is carried out at four locations within this sub-basin. The uppermost location is at the bridge NW of Calfstown (07G02 200) which is ca. 1km to the northeast of the proposed development site. Biological water quality at all locations surveyed by the EPA in 2012 were rated Q3, equivalent to WFD poor status.

The following is the most recent EPA assessment of the Glash River based on the 2012 results: *the dominance of pollution tolerant macroinvertebrate taxa, complete lack of pollution sensitive taxa and excessive instream siltation continues to indicate unsatisfactory poor ecological conditions at all stations surveyed on the Glash River in 2012. Excessive peat siltation of the instream substratum was noted in particular near Calfstown (0200) and at Clonuff Bridge (0400).*

Hydrometric Area 14 Barrow

Cloncumber

The Cloncumber cluster is drained by the Slate River and the Cloncumber Stream and these watercourses were most recently monitored by the EPA in 2011.

The Slate River is monitored at Ford Bridge (14S01 50) upstream of the proposed development and at Agar Bridge (14S01 100) downstream. Biological water quality at both of these locations were rated Q3-4 in 2011, equivalent to WFD moderate status.

The following is the most recent EPA assessment of the Slate River based on the 2011 results: *Only one of the six stations surveyed on the Slate River was in a satisfactory ecological condition in 2011.*

Poor ecological conditions persist downstream of Prosperous (0020) and Allenwood (0050). A slight improvement from poor to moderate ecological conditions was noted at Agar Bridge (0100) and downstream of Rathangan (0210). The increased diversity of sensitive macroinvertebrate fauna indicated a welcome improvement in the lower reaches (0300) however signs of enrichment (heavy siltation, enhanced instream algal growth, elevated dissolved oxygen and pH readings) were still evident.

Only a single site is monitored on the Cloncumber Stream, at Old River Bridge (14C17 0200), c. 3km upstream of the proposed development site. Biological water quality at this site was rated Q3-4 in 2011, equivalent to WFD moderate status. The following is the most recent EPA assessment of the Cloncumber Stream based on the 2011 results: *the macroinvertebrate fauna continues to indicate unsatisfactory moderate ecological conditions on the Cloncumber Stream at Old River Bridge (0200) when surveyed in May 2011.*

Derrybrennan

The Derrybrennan cluster is drained by the Figile River and was most recently monitored by the EPA in 2011. The Slate River is assessed by the EPA both upstream and downstream of the proposed development: at Ticknevin Bridge (14F01 200) and Cushaling Bridge (14F01 100) respectively. In 2011, biological water quality was rated Q, equivalent to WFD poor status at Ticknevin Bridge, and Q3-4, equivalent to WFD moderate status at Cushaling Bridge.

The following is the most recent EPA assessment of the Figile River based on the 2011 results: *The dominance of pollution tolerant macroinvertebrate species, enhanced instream plant and algal growth and excessive siltation indicated continued unsatisfactory ecological conditions in the upper reaches (0050, 0100, 0200) of the Figile River in May 2011. The increased diversity and abundance of sensitive macroinvertebrate species indicated good ecological conditions at Clonbulloge (0300), Derrygarran (0400) and Andra Bridge (0500) although the enhanced macrophyte and algal growth continues to indicate some enrichment.*

4.1.8.9 Aquatic plant communities

Plants recorded during the current surveys consisted of *Sparganium erectum*, *Apium nodiflorum*, *Rorippa nasturtium-aquaticum*, *Glyceria maxima*, *Phalaris arundinacea*, *Mentha aquatica*, *Myosotis scorpioides*, *Iris pseudacorus*, *Schloenoplectus lacustris*, *Nuphar lutea*, *Callitriche* spp., *Lemna* spp. and *Potamegeton* sp. The moss *Fontinalis antipyretica* is widespread the Boyne catchment while the filamentous green algae *Cladophora glomerata* is common in both the Boyne and Barrow catchments, especially in the enriched lower reaches of rivers and some tributaries within the study area.

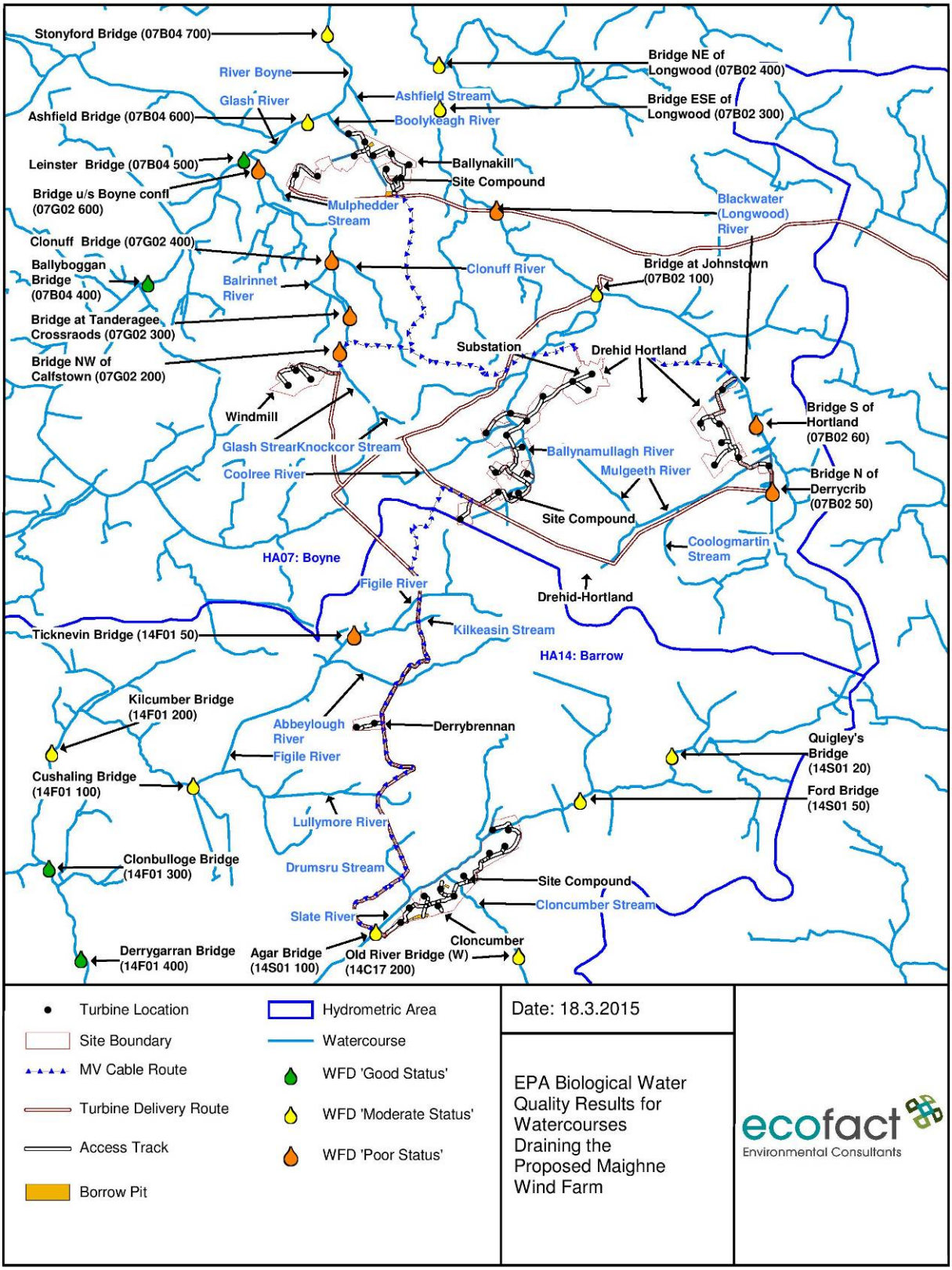

Figure 4.3: EPA Biological Water Quality Results for Watercourses Proposed Maigne Wind Farm

Table 4.42: Results of the Physical Habitat Assessments* of Aquatic Ecology and Fisheries Survey Sites

Site	Watercourse Name	Wetted width (m)	Mean Depth (cm)	Max Depth (cm)	Instream vegetation (%)	Bank Height (m)	Bank slope (°)	Bank Cover (%)	Canopy Cover (%)	Riffle (%)	Glide (%)	Pool(%)	Flow Velocity (m/s)	Rock (%)	Cobble(%)	Gravel (%)	Fine(%)	Shade(%)
1	Blackwater (Longwood)	3	30	50	40	4	45	100	85	0	100	0	0.2	20	20	20	40	50
2	Blackwater (Longwood)	2.5	30	40	20	0.5	45	100	20	0	100	0	0.02	0	0	0	100	20
3	Mulgeeth	2.5	30	40	20	0.5	45	100	20	0	100	0	0.02	0	0	0	100	20
4	Coolree 07	2	15	20	40	1	90	100	40	20	80	0	0.3	20	20	10	50	40
5	Coolree 07	0.5	5	20	0	1.5	80	95	95	30	40	30	0.2	0	30	40	30	95
6	Boyne	6	1	1.8	8	2	20	100	0	0	50	50	0.2	0	5	70	25	0
7	Slate	1.2	40	50	80	2.5	75	100	0	0	100	0	0.03	0	0	20	80	0
8	Slate	2.5	30	40	20	0.5	45	100	20	0	100	0	0.02	0	0	0	100	20
9	Figile	6	50	100	40	1.8	75	100	0	0	100	0	0.02	0	10	80	10	0
10	Abbeylough	1.5	15	20	40	1	80	100	70	0	100	0	0.01	10	40	40	10	70

**Assessment follows Environment Agency (2003) River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003.*

Table 4.43: Results of the River Corridor Survey (RHS) Assessments of Survey Sites

Site	Watercourse Name	EPA code	Drained	Wetted width (m)	Gradient (Low / Med / High)*	Siltation (Heavy / Moderate / Normal / Free)*	Filamentous algae (Y / N)	Eroding banks (Y / N)	Braided channel (Y / N)	Artificial features (Y / N)
1	Blackwater (Longwood)	07B02	Yes	3	L	H	N	N	N	Y
2	Blackwater (Longwood)	07H03	Yes	2.5	L	H	N	N	N	Y
3	Mulgeeth	07M54	Yes	2.5	L	H	N	N	N	Y
4	Coolree 07	07C23	Yes	2	L	H	N	N	N	Y
5	Coolree 07	07C23	Yes	0.5	L	M	Y	N	N	Y
6	Boyne	07B04	Yes	6	L	M	Y	N	N	Y
7	Slate	14S01	Yes	1.2	L	M	Y	N	N	N
8	Slate	14S01	Yes	2.5	L	H	N	N	N	Y
9	Figile	14F01	Yes	6	L	N	N	N	N	Y
10	Abbeylough	14A01	Yes	1.5	L	M	N	N	N	Y

**Visual assessment.*

Table 4.44: Results of the Fisheries Habitat Evaluation of Survey Sites

Site	Watercourse Name	Salmonid nursery (Y/N)	Salmonid fishery (Y/N)	Coarse nursery (Y/N)	Coarse fishery (Y/N)	Salmon (P/A)	Trout (P/A)	Coarse fish (P/A)	Eel (P/A)	Lamprey Habitat (P/A)	Lamprey (P/A)	Crayfish (P/A)	FWPM (P/A)	Floating river vegetation (Y/N)
1	Blackwater (Longwood)	N	N	N	N	A	P	A	L	P	L	A	A	N
2	Blackwater (Longwood)	N	N	N	N	A	L	L	L	A	A	A	A	N
3	Mulgeeth	N	N	N	N	A	L	L	L	A	A	A	A	N
4	Coolree 07	Y	N	N	N	A	L	A	L	P	L	A	A	N
5	Coolree 07	N	N	N	N	A	A	A	L	A	A	A	A	N
6	Boyne	Y	Y	Y	Y	P	P	P	P	P	P	P	A	Y
7	Slate	Y	N	Y	N	P	P	P	P	A	A	A	A	N
8	Slate	N	N	N	N	A	L	L	L	A	A	A	A	N
9	Figile	Y	Y	Y	N	A	A	P	A	A	A	A	A	N
10	Abbeylough	Y	N	N	N	A	P	P	P	A	A	A	A	N

Y = Yes, N= No, P = Present, A = Absent, L = not recorded but likely to occur in the waterbody

Table 4.45: Biological Water Quality and WFD Status at the Aquatic Ecoloy and Fisheries Survey Sites

Site	Watercourse Name	EPA code	EPA Q-value	ECOFACT Q-value	ECOFACT SSRS	WFD status	Morphological status* (High / Good / Moderate / Poor / Bad)	Biological status* (High / Good / Moderate / Poor / Bad)	Fisheries status* (High / Good / Moderate / Poor / Bad)
1	Blackwater (Longwood)	06B02	N/A	Q3	N/A	Poor	P	M	M
2	Blackwater (Longwood)	06B02	Q3/Q3-4	Q3	N/A	Poor/Moderate	P	P	P
3	Mulgeeth	07M54	N/A	Q3	N/A	Poor	P	P	P
4	Coolree 07	07C23	N/A	Q3	N/A	Poor	P	P	P
5	Coolree 07	07C23	N/A	Q3	Bad	Poor	P	P	P
6	Boyne	07B04	Q3-4	Q3-4	N/A	Moderate	P	M/G	M/G
7	Slate	14S01	Q3-4	Q3	N/A	Poor/Moderate	P	P	G
8	Slate	14S01	N/A	Q3	N/A	Poor	P	P	P
9	Figile	14F01	N/A	Q3	N/A	Poor	G	G	G
10	Abbeylough	14A01	N/A	Q3	Bad	Poor	P	P	P

**categories follow EEA (2012).*

Table 4.46: Macroinvertebrates Recorded during the Biological Surveys

	Pollution sensitivity group	Functional group	Site 2- Longwood Blackwater	Site 8 - Slate River	Site 9 - Figile River
MAYFLIES (Uniramia, Ephemeroptera)					
Large dark olive Baetis rhodani	C	Scraper & gathering collector		****	
CASED CADDIS FLIES (Trichoptera)					
Northern caddisflies (Limnephilidae)				**	
Phryganeidae					
Phryganea sp.	B	Shredder			**
CASELESS CADDIS FLIES (Trichoptera)					
Grey flags (Hydropsychidae)					
Hydropsyche sp.	C	Filtering Collector	*****	****	****
Trumpet-net caddisflies (Polycentopodidae)					
Polycentropus sp.	C	Filtering collector			**
DAMSELFLIES (Odonata, Zygoptera)					
Jewelwings/Demoiselles (Agriidae)					
Banded jewelwing *Agrion splendens*	B	Predator			***
TRUE FLIES (Diptera)					
Craneflies (Tipulidae)	C	Shredder			
Dicronata sp.	C	Shredder			***
Family Chironomidae					
BEETLES (Coeloptera)					
Gyrinidae					
Whirligig beetle larvae (Gyrinidae)					
Common whirligig beetle *Gyrinus sp.*	C	Predator			**
Haliplidae	C	Predator			
Diving beetles (Dytiscidae)					
Sub family Hydroporinae					
Stictotarsus duodecimpustulatus	C	Predator	***		
Potamonectes depressus elegans	C	Predator	**		
SNAILS (Mollusca, Gastropoda)					
Family Lymnaeidae					
Wandering Snail *Lymnaea peregra*	D	Shredder	**		
Great Pond Snail *Lymnaea stagnalis*	C	Shredder			**
Family Planorbiidae					
Keeled Ramshorn Snail *Planorbis carinatus*	C	Scraper			*****
Hydrobiidae					
Bithynia tentaculata	C	Shredder	*****		
Jenkins spire shell *Potamopyrgus jenkinsi*	C	Grazer		******	*****
Family Ancylidae					
River limpet *Ancylus fluviatilis*	C		****	**	
MUSSELS (Mollucsa,					

	Pollution sensitivity group	Functional group	Site 2- Longwood Blackwater	Site 8 - Slate River	Site 9 - Figile River
Lamellibranchiata)					
Duck mussel Anodonta anatina					*
Orb/Pea Mussels (Family Sphaeridae)	D	Filtering Collector	**		
CRUSTACEANS (Crustacea)					
Amphipods (Amphipoda, Gammaridae)					
Freshwater shrimp *Gammarus sp*	C	Shredder	*****	***	**
Isopods, Asellidae					
Hog louse *Asellus aquaticus*	D	Shredder	*****	****	***
LEECHES (Hirudinae)					
Piscicolidae					
Piscicola geometra	C	Predator		*	*
Glossiphonidae					
Glossiphonia complanata	D	Predator		*	
BUGS (Hemiptera)					
Lesser Water Boatmen (Corixidae)		Predator			**
Notonectidae					
Notonecta sp.	C	Predator			*
ALDERFLIES (Megaloptera)					
Alderfly larvae (Sialidae)					*
OLIGOCHAETAE					
Aquatic worm (Lumbriculidae)	D	Collector		*	

**Present (1 or 2 individuals), **Scarce/Few (<1%), ***Small Numbers (<5%), ****Fair Numbers (5-10%), *****Common (10-20%), ******Numerous (25-50%), *******Dominant (50-75%), ********Excessive (>75%).*

Table 4.47: Biological Water Quality Results

Site	Catchment	Relevant component of wind farm	Sub-catchment	River	Watercourse	Q-value	WFD Status	SSRS
1	Boyne	Drehid-Hortland	Blackwater (Longwood)	Blackwater (Longwood)	Blackwater (Longwood)	Q3	Poor	-
2	Boyne	Drehid-Hortland	Blackwater (Longwood)	Blackwater (Longwood)	Hortland	Q3	Poor	-
3	Boyne	Drehid-Hortland	Blackwater (Longwood)	Blackwater (Longwood)	Mulgeeth	Q3	Poor	-
4	Boyne	Drehid-Hortland	Blackwater (Longwood)	Blackwater (Longwood)	Coolree 07	Q3	Poor	-
5	Boyne	Drehid-Hortland	Blackwater (Longwood)	Blackwater (Longwood)	Coolree 07	Q3	Poor	Bad
6	Boyne	Ballynakill, Windmill	Boyne	Boyne	Boyne	Q3-4	Moderate	-
7	Barrow	Cloncumber	Figile	Slate	Slate	Q3	Poor	-
8	Barrow	Cloncumber	Figile	Slate	Slate	Q3	Poor	-
9	Barrow	Derrybrennan	Figile	Figile	Figile	Q3	Poor	-
10	Barrow	Derrybrennan	Figile	Figile	Abbeylough	Q3	Poor	-

4.1.9 Bats

4.1.9.1 Desktop Review

A review of existing bat records within 30km and 10km of the study areas (sourced from BCIreland's National Bat Records Database) reveals that, currently, eight of the ten known Irish species have been observed within a 30km radius. These include common, soprano and Nathusius' pipistrelles, Leisler's, brown long-eared, Daubenton's *Myotis daubentonii,* whiskered *M. mystacinus* and Natterer's *M. nattereri* bats as shown in Tables 4.48 to 4.59 below. Roosts of several of these species, as shown in the tables, have also been identified within these radii but none are within or immediately adjacent to any of the study areas.

The two remaining Irish species; lesser horseshoe and Brandt's *M. brandtii* bats have not been recorded in the local area to date. Of these, the lesser horseshoe bat is not known to occur in either county as the species' distribution range is confined to the west of Ireland and only a single confirmed specimen of Brandt's bat has been found in Ireland (Mullen 2007 [102]).

Tables 4.48 to 4.59 below outline the adjudged status of each bat species within a 30km and a 10km radius of each of the respective clusters indicated.

Table 4.48: Adjudged status of Irish bat species within a 30 km radius of the Ballynakill Cluster

Common name	Scientific name	30km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus pipistrellus*	Present	12 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	22 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Present	0 known	BCIreland
Unknown pipistrelle	*Pipistrellus* spp.		12 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	10 known	BCIreland/Pers. Obs.
Brown long-eared bat	*Plecotus auritus*	Present	23 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	3 known	BCIreland/Pers. Obs.

Common name	Scientific name	30km radius	Known roosts	Source
Natterer's bat	*Myotis nattereri*	Present	1 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Present	1 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland
Unknown species			18 known	BCIreland

Table 4.49: Adjudged status of Irish bat species within a 10 km radius of the Ballynakill Cluster

Common name	Scientific name	10km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus pipistrellus*	Present	1 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	2 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Potential	0 known	BCIreland
Unknown pipistrelle	*Pipistrellus* spp.		3 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	4 known	BCIreland/Pers. Obs.
Brown long-eared bat	*Plecotus auritus*	Present	4 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	0 known	BCIreland/Pers. Obs.
Natterer's bat	*Myotis nattereri*	Potential	0 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Potential	1 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland

Table 4.50: Adjudged status of Irish bat species within a 30km radius of the Windmill Cluster

Common name	Scientific name	30km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus pipistrellus*	Present	10 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	17 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Present	0 known	BCIreland
Unknown pipistrelle	*Pipistrellus* spp.		10 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	8 known	BCIreland/Pers. Obs.
Brown long-eared bat	*Plecotus auritus*	Present	25 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	4 known	BCIreland/Pers. Obs.
Natterer's bat	*Myotis nattereri*	Present	0 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Present	1 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland
Unknown species			17 known	BCIreland

Table 4.51: Adjudged status of Irish bat species within a 10 km radius of the Windmill Cluster

Common name	Scientific name	10km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus pipistrellus*	Present	10 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	17 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Potential	0 known	BCIreland
Unknown pipistrelle	*Pipistrellus* spp.		10 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	3 known	BCIreland/Pers. Obs.
Brown long-eared bat	*Plecotus auritus*	Present	3 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	0 known	BCIreland/Pers. Obs.
Natterer's bat	*Myotis nattereri*	Present	0 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Present	1 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland
Unknown species			2 known	BCIreland

Table 4.52: Adjudged status of Irish bat species within a 30 km radius of the Drehid Cluster

Common name	Scientific name	30km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus pipistrellus*	Present	14 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	20 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Present	0 known	BCIreland
Unknown pipistrelle	*Pipistrellus* spp.		20 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	12 known	BCIreland/Pers. Obs.
Brown long-eared bat	*Plecotus auritus*	Present	32 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	3 known	BCIreland/Pers. Obs.
Natterer's bat	*Myotis nattereri*	Present	3 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Present	2 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland
Unknown species			20 known	BCIreland

Table 4.53: Adjudged status of Irish bat species within a 10km radius of the Drehid Cluster

Common name	Scientific name	10km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus pipistrellus*	Present	1 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	1 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Potential	0 known	BCIreland
Unknown pipistrelle	*Pipistrellus* spp.		3 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	2 known	BCIreland/Pers. Obs.
Brown long-eared bat	*Plecotus auritus*	Present	3 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	0 known	BCIreland/Pers. Obs.
Natterer's bat	*Myotis nattereri*	Potential	0 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Potential	0 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland

Table 4.54: Adjudged status of Irish bat species within a 30 km radius of the Hortland Cluster

Common name	Scientific name	30km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus pipistrellus*	Present	18 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	18 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Present	0 known	BCIreland
Unknown pipistrelle	*Pipistrelle* spp.		18 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	27 known	BCIreland/Pers. Obs.
Brown long-eared bat	*Plecotus auritus*	Present	35 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	4 known	BCIreland/Pers. Obs.
Natterer's bat	*Myotis nattereri*	Present	4 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Present	2 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland
Unknown species			21 known	BCIreland

Table 4.55: Adjudged status of Irish bat species within a 10 km radius of the Hortland Cluster

Common name	Scientific name	10km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus pipistrellus*	Present	2 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	3 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Potential	0 known	BCIreland
Unknown pipistrelle	*Pipistrellus* spp.		2 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	2 known	BCIreland/Pers. Obs.
Brown long-eared bat	*Plecotus auritus*	Present	2 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	0 known	BCIreland/Pers. Obs.
Natterer's bat	*Myotis nattereri*	Potential	0 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Potential	0 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland
Unknown species			1 known	BCIreland

Table 4.56: Adjudged status of Irish bat species within a 30 km radius of the Derrybrennan Cluster

Common name	Scientific name	30km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus pipistrellus*	Present	1 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	23 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Present	0 known	BCIreland
Unknown pipistrelle	*Pipistrelle* spp.		11 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	11 known	BCIreland/Pers. Obs.
Brown long-eared bat	*Plecotus auritus*	Present	26 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	3 known	BCIreland/Pers. Obs.
Natterer's bat	*Myotis nattereri*	Present	0 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Present	1 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland
Unknown species			19 known	BCIreland

Table 4.57: Adjudged status of Irish bat species within a 10 km radius of the Derrybrennan Cluster

Common name	Scientific name	10km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus pipistrellus*	Present	1 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	0 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Potential	0 known	BCIreland
Unknown pipistrelle	*Pipistrellus* spp.		1 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	3 known	BCIreland/Pers. Obs.
Brown long-eared bat	*Plecotus auritus*	Present	5 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	0 known	BCIreland/Pers. Obs.
Natterer's bat	*Myotis nattereri*	Potential	0 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Present	1 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland
Unknown species			1 known	BCIreland

Table 4.58: Adjudged status of Irish bat species within a 30 km radium of the Cloncumber Cluster

Common name	Scientific name	30km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus pipistrellus*	Present	17 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	24 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Present	0 known	BCIreland
Unknown pipistrelle	*Pipistrellus* spp.		1 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	3 known	BCIreland/Pers. Obs.
Brown long-eared bat	*Plecotus auritus*	Present	32 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	2 known	BCIreland/Pers. Obs.
Natterer's bat	*Myotis nattereri*	Present	4 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Present	3 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland
Unknown species			21 known	BCIreland

Table 4.59: Adjusted status of Irish bat species within a 10 km radius of the Cloncumber Cluster

Common name	Scientific name	10km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus pipistrellus*	Present	0 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	0 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Potential	0 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	0 known	BCIreland/Pers. Obs.
Brown long-eared bat	*Plecotus auritus*	Present	3 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	0 known	BCIreland/Pers. Obs.
Natterer's bat	*Myotis nattereri*	Present	0 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Potential	0 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland
Unknown species			2 known	BCIreland

4.1.9.2 Field Study Findings

In 2013, onsite bat activity surveys were undertaken during the spring, summer and autumn seasons in May, June and September. A total of 21 nights of onsite survey were undertaken which identified five bat species; common and soprano pipistrelle, Leisler's, brown long-eared and Daubenton's bat.

Bat Activity Survey Findings

The key locations of importance for bats in the local area include water bodies, watercourses, woodlands, treelines and hedgerows. Additional habitats include scrub and scattered trees. The bat fauna present onsite is typical of the habitats present, with the predominantly pasture grassland landscape providing a limited range of habitats. Faunal diversity is greater in areas dominated by semi-natural vegetation.

Common and soprano pipistrelles were the most commonly recorded species onsite and were ubiquitous along hedgerows, treelines and the edges of forests throughout the area.

Brown long-eared bat was encountered in several areas but this species may be present without being detected as it is a very quiet species and sometimes hunts without echolocating.

Leisler's bat, which forages over agricultural landscapes, scrub and woodland as well as urban areas, was widespread across the area.

Daubenton's bat, which forages over open water, was observed on the Grand Canal adjacent to the Cloncumber cluster and one of the larger rivers in the area. This species travels over considerable distances along watercourses and is also found on smaller water bodies such as ponds and pools. It often roosts beneath stone masonry bridges, taking advantage of cracks and crevices. In such locations, roosts are vulnerable through infilling of fissures during maintenance works, impacts of lighting etc.

The bat observations recorded at the proposed locations of each turbine of Maighne Wind Farm are shown in Table 4.60 over.

Table 4.60: Bat Observations at Proposed Turbine Locations with adjudged risk and impact

Turbine number	Habitat Code	Bat species	Comments
1	GA1, WL1	Common pipistrelle	Low activity
2	GA1, WL1	Common pipistrelle	Low activity
3	GA1, WL1	Common pipistrelle Soprano pipistrelle Brown long-eared	Low activity
4	GA1, WL1	Common pipistrelle Soprano pipistrelle Brown long-eared Leisler's	Low activity
5	GA1, WL1	Common pipistrelle Leisler's	Low activity
6	GA1, WL1	Common pipistrelle Soprano pipistrelle Leisler's	Low activity
7	GA1, WL1	Common pipistrelle Soprano pipistrelle	Low activity
8	GA1, WL1	Common pipistrelle Soprano pipistrelle Leisler's	Low activity
9	GA1, WL1	Common pipistrelle Soprano pipistrelle	Low activity
10	GA1, WL1	Common pipistrelle Soprano pipistrelle Leisler's	Low activity
11	WD4	Common pipistrelle Soprano pipistrelle	High activity
12	WD4	Common pipistrelle Soprano pipistrelle Leisler's	High activity
13	WS1	Common pipistrelle Soprano pipistrelle	Low activity
14	WS1	Soprano pipistrelle Leisler's	Low activity
15	WS1	Common pipistrelle Soprano pipistrelle	Low activity
16	WS4, WL1	Common pipistrelle Soprano pipistrelle	Low activity
17	GA1, WL1	Common pipistrelle Soprano pipistrelle Leisler's	Low activity
18	GA1, WL1	Common pipistrelle Soprano pipistrelle	Low activity
19	GA1, WL1	Common pipistrelle Soprano pipistrelle	Low activity
20	GA1, WL1	Common pipistrelle Soprano pipistrelle	Low activity
21	GA1, WL1	Common pipistrelle	Low activity
22	GA1, WL1	Common pipistrelle Soprano pipistrelle	Low activity
23	GA1, WL1	Common pipistrelle Soprano pipistrelle	Low activity
24	PB4	Common pipistrelle Soprano pipistrelle	Low activity
25	PB4	Common pipistrelle Soprano pipistrelle	Low activity

Turbine number	Habitat Code	Bat species	Comments
26	PB4	Common pipistrelle Leisler's	Low activity
27	GA1	Common pipistrelle Leisler's	Low activity
28	WD4	Common pipistrelle	Low activity
29	WD4	Common pipistrelle Soprano pipistrelle Leisler's	Low activity
30	WD4	Common pipistrelle Soprano pipistrelle Leisler's	Low activity
31	WD4	Common pipistrelle Soprano pipistrelle	Low activity
32	WD4	Common pipistrelle Leisler's	Low activity
33	GA1	Common pipistrelle Soprano pipistrelle	Low activity
34	GA1, WL1	Common pipistrelle Soprano pipistrelle Leisler's	High activity
35	GA1, WL1	Common pipistrelle Soprano pipistrelle Leisler's	Low activity
36	GA1	Common pipistrelle Soprano pipistrelle	Low activity
37	GA1	Common pipistrelle Soprano pipistrelle Leisler's bat	Low activity
38	GA1	Soprano pipistrelle	Low activity
39	GA1	Common pipistrelle Soprano pipistrelle	Low activity
40	WD4	Common pipistrelle Soprano pipistrelle Leisler's	Low activity
41	GA1	Common pipistrelle Soprano pipistrelle Leisler's	Low activity
42	WD4	Common pipistrelle Soprano pipistrelle Leisler's	High activity
43	WD4	Common pipistrelle Soprano pipistrelle Leisler's	High activity
44	WD4	Common pipistrelle Soprano pipistrelle	Low activity
45	WD4	Common pipistrelle	Low activity
46	GA1	Common pipistrelle	Low activity
47	GA1, WL1	Common pipistrelle Soprano pipistrelle	Low activity
48	WD4	Soprano pipistrelle	Low activity
49	GA1, WL1	Soprano pipistrelle	Low activity

Roost Survey Findings

During survey, a soprano pipistrelle roost was identified in a waste water treatment plant to the west of Longwood village but this is outside the study area.

High and Medium Voltage Cable Routes Structure Survey Findings

Several structures along the proposed HV and MV cable routes were inspected for their potential to harbour bat roosts. These included 23 culverts and 9 bridges as shown in Table 4.61 below with their adjudged potential to be used by bats. Note the codes in Table 4.61 used to identify structures are unique to the Bat Survey.

The structures varied in their favourability for use by bats. Some have been completely sealed by concrete which prevents bat use while others have crevices between stonework in which bats can secrete themselves.

Three culverts and seven bridges have uncluttered access for bats, are high enough to off-set the risks of predation and complete inundation and have crevices that are favourable for bat use.

Table 4.61: Bat Roost Potential within Impacted Structures along the HV and MV Cable Routes

Code	Structure	Bat potential	Location	Comments
ST1	Bridge	Nil	N705 215	Low, prone to predation and flooding
ST2	Bridge	Nil	N703 216	Sealed – no available crevices for bat-use
ST3	Culvert	Nil	N711 233	Low, prone to predation and flooding
ST4	Culvert	Nil	N708 242	Low, prone to predation and flooding
ST5	Culvert	Nil	N704 255	Low, prone to predation and flooding
ST6	Culvert	Nil	N706 266	Low, prone to predation and flooding
ST7	Bridge	Potential	N710 287	Some crevices present
ST8	Bridge	Potential	N716 293	Some crevices present
ST9	Bridge	Low	N719 293	Low, prone to predation and flooding
ST10	Culvert	Low	N715 305	Low, prone to predation and flooding
ST11	Culvert	Low	N715 313	Low, prone to predation and flooding
ST12	Culvert	Nil	N736 336	Low, prone to predation and flooding
ST13	Culvert	Nil	N770 322	Low, prone to predation and flooding
ST14	Culvert	Nil	N778 333	Low, prone to predation and flooding
ST15	Culvert	Nil	N717 348	Low, vegetated, prone to predation and flooding
ST16	Culvert	Nil	N710 362	Low, prone to predation and flooding
ST17	Bridge	Potential	N921 342	Some crevices present
ST18	Culvert	Nil	N895 342	Low, prone to predation and flooding
ST19	Culvert	Nil	N885 340	Low, prone to predation and flooding
ST20	Culvert	Nil	N877 337	Low, prone to predation and flooding
ST21	Culvert	Nil	N851 332	Low, prone to predation and flooding
ST22	Culvert	Limited	N827 342	Low, prone to predation and flooding
ST23	Culvert	Nil	N824 348	Low, prone to predation and flooding
ST24	Culvert	Nil	N816 357	Low, prone to predation and flooding
ST25	Bridge	Potential	N807 374	Some crevices present
ST26	Culvert	Nil	N795 379	Low, prone to predation and flooding

Code	Structure	Bat potential	Location	Comments
ST27	Culvert	Nil	N839 384	Low, prone to predation and flooding
ST28	Bridge	Potential	N876 404	Some crevices present
ST29	Bridge	Potential	N881 405	Some crevices present
ST30	Culvert	Nil	N939 452	Low, prone to predation and flooding
ST31	Culvert	Nil	N946 463	Low, prone to predation and flooding
ST32	Culvert	Nil	N949 467	Low, prone to predation and flooding

There are no known bat hibernation sites within the study areas or along the proposed cable routes. Minor hibernation sites certainly occur but these are of single specimens or small numbers of bats that find winter refugia in older stone structures, trees and unheated modern buildings where they over-winter beneath slates, lead flashing and ridge tiles or within cavity walls etc. No hibernation site was identified during the present assessments.

4.1.9.3 Overall Assessment of Scientific Interest of Area for Bats

The habitats in the area of the proposed Maighne Wind Farm may be considered in terms of extent, diversity, naturalness, rarity, fragility, typicalness, recorded history, position, potential value and intrinsic appeal (Regini, 2000 [103]). The potential of these habitats for bat fauna is considered in this framework also.

The area may be considered in terms of the principal habitats or land use zones present and the principal areas of ecological interest in relation to bats present on or near the study areas include:

1. Deciduous woodlands, treelines, hedgerows and scrub provide potential roosting, foraging and commuting opportunities for bats. Considered as of high local value.

2. Coniferous woodlands, although non-native, provide shelter belts for foraging and commuting bats and are considered to have low local value.

3. The Boyne, Slate and Blackwater rivers and their tributaries provide foraging habitat and commuting routes across the area for bats. Such watercourses are considered as of high local or national value.

Agricultural Areas and Associated Hedgerows and Treelines

Most of the agricultural areas may be considered as of low or negligible interest from a bat perspective. The habitats onsite are low-grade and widespread. However, many of the onsite hedgerows are relatively diverse and therefore of moderate local value being used for both commuting and foraging.

Woodland and Scrub

Deciduous woodland and scrub habitats provide areas where insect prey can accumulate for bat foraging and are considered as of high local value in relation to bats. Coniferous woodland is much poorer being non-native and mono-cultural and so is considered as of moderate value.

Blanket Bog

Being an open habitat, blanket bog is poor for bats unless taller scrub is present in places to act as shelter for insect swarms. These are considered as of low value in relation to bats.

Rivers, Canals, Streams and Drains

Rivers and streams and their associated riparian habitat provide important wildlife corridors for a number of mammalian (including bats), avian and invertebrate species of conservation interest and their quality should be maintained.

4.1.10 MV Cable / HV Grid Connection Routes

Proposed MV cable routes and the proposed HV cable options were surveyed in November and December 2014. It should be noted that cables are proposed to be placed underneath public roads. The primary target therefore for these studies was the structures along the proposed routes (in terms of Otter and Bats) and habitats at proposed crossings underneath canals and motorways where off-line works are anticipated. Bats have been dealt with in section 7.3.9. Structures surveyed are illustrated in Figure 7.11, Appendix 6.

Structure Surveys for Otter

A total of 55 structures (results are illustrated in Figure 7.22, Appendix 6) were surveyed in November (26/11/14) and December (3/12/14) for evidence of Otter. Additional target notes on other ecological items of note such as Dipper, Kingfisher, Invasive species etc. was also recorded. In addition to structures on cable routes as described a number of structures or proposed internal river crossings (where new bridges are proposed) were surveyed for completeness.

Otter evidence (in the form of Spraints, runs or slides) was found at 17 structures. A suitable holt location was found at Structure 8 (ST8) at N71333/37909 however no evidence of occupation by Otter was present. Another suitable holt location was located at structure 26 (ST26) however again, no evidence of usage was present. All other structures had no evidence of Otter in close proximity.

No invasive flora species were noted.

American Mink, an invasive mammal species was noted at structures ST8, ST29 and ST30.

Evidence of Dipper (droppings on rocks) was noted at structure ST31 and the habitat present is suitable for the species.

Habitat mapping along proposed Cable Route and TDR

Habitat mapping of the crossing points at Canals and Motorways, including both MV and HV grid options, was also carried out. Two canal crossings and two motorway crossings, where off-road trenchless techniques are proposed to be utilised were mapped.

All but the proposed crossing of the M4 motorway near Enfield were mapped in the field; the former was mapped from desktop. Nodes along the proposed turbine delivery route where landtake is proposed were also mapped from desktop orthophotography. Habitats are mapped in figures 7.16A.1, 7.20.1 of Appendix 6. Habitats at the M4 crossing south of the Ballinakill cluster and the canal crossing on the access road to the Derrybrennan cluster are addressed in their respective cluster sections. Habitats at the canal crossing proximal to Kilcock and the M4 crossing proximal to Enfield are addressed here

Canal crossing at Kilcock/Motorway crossing at Enfield
Habitats recorded at the proposed crossings are illustrated in 7.16A.1, 7.20.1, Appendix 6 and described as follows:

Buildings and Artifical Surfaces (BL3)
This refers to roadways, rail lines and buildings present at both crossing locations. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Lower Value).

Flower Beds and Borders (BC4)
This refers to planted borders proximal to the proposed canal crossing at Kilcock. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Lower Value).

Treelines (WL2)
Treelines are present on the western side of the canal at Kilcock and form field boundaries at the proposed Enfield Crossing. Treelines also exist along motorway embankments. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

Scrub (WS1)
Scrub is present in a number of locations, especially where the canal goes under the R148. A small area of scrub is also located close to the proposed Enfield motorway crossing. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

Improved agricultural Grassland (GA1)
Occurs in fields surrounding the crossing locations and at nodes on the TDR. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Lower Value).

Hedgerows (WL1)
Occurs as field boundaries in fields surrounding the crossing locations and at nodes on the TDR. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

Dry Meadows and Grassy Verges (GS2)
Found as fringing habitat along roadsides and also at the rear of a house adjacent to the canal at Kilcock. At the Enfield crossing this habitat occurs as fringing habitat along the motorway. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

Canal (FW3)
Refers to the royal canal. As a proposed Natural Heritage Area, under the NRA site evaluation scheme [19], this habitat would be rated as of National Importance.

Amenity Grassland (GA2)
Occurs both as gardens and also amenity grassland adjacent to the canal near Kilcock. This habitat also occurs as a roadside habitat at the overpass adjacent to the proposed motorway crossing at Enfield. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Lower Value).

Ornamental and non-Native Shrub (WS3)
This habitat occurs on the northern side of the R148, to the east of the canal at Kilcock. This habitat is also Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Lower Value).

Stone Walls (BL1)
Stone walls occur where the R148 passes over the Royal Canal to the west of Kilcock. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Lower Value).

Immature Woodland (WS2)
This habitat is found on the sloping embankment and roadside verge along the overpass at the proposed motorway crossing near Enfield. A field to the south of the proposed route is also planted with young deciduous trees which best fits this classification. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

(Mixed) Deciduous Woodland (WD1)
This habitat is found immediately southeast of the proposed crossing route of the M4 near Enfield. Existing more mature trees intergrade into younger deciduous trees planted along the sloping embankment of the motorway overpass. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

Wet Grassland (GS4)
A large field of this habitat is found to the east of the proposed cable route underneath the M4 near Enfield. This is currently separated from the proposed route by a buffer comprising the existing overpass and associated planting. Under the NRA site evaluation scheme [19], this habitat would be rated as of Local Importance (Higher Value).

Table 4.62: Structure Otter Survey Results – MV & HV Cable Routes

Structure Number	Structure Grid References	Otter Evidence (Yes / No / Possible)	Target Notes
ST1	N69974/43979	No	
ST2	N71371/41644	No	
ST3	N71294/41350	No	No structure under road but one either side of road here.
ST4	N71203/40864	No	No structure under road but two adjacent structures on west side of road here. To south of location marked on map.
ST5	N71212/40765	No	Old hole in bank considered likely to be mink
ST6	N71233/40603	No	Larger structure under road not mapped
ST7	N71241/40380	No	Hole beside bridge considered old mink or even rat hole
ST8	N71333/37909	Possible	Old hole of otter or mink 1.5m from bridge, no fresh trails, no spraints
ST9	N71359/37420	No	
ST10	N71045/36211	No	Under road
ST11	N71039/36183	No	West side of road
ST12	N69292/38281	No	
ST13	N71784/34835	No	
ST14	N72649/34237	No	
ST15	N73620/33680	No	Wrong location on map
ST16	N74082/33460	No	
ST17	N75013/32972	No	Level crossing, no stream here.
ST18	N77016/32230	No	
ST19	N77848/33273	Yes	Run & slip at N77792/33302; run, slide & spraints at N77867/33280 close to bridge
ST20	N81636/34258	Yes	Runs south of bridge
ST21	N70327/21678	No	
ST22	N72100/26244	No	No water here.
ST23	N71903/29213	No	
ST24	N70897/28706	Yes	Spraints on top of concrete culvert and runs to river both sides of track
ST25	N71530/30513	No	No structure, no water

Structure Number	Structure Grid References	Otter Evidence (Yes/No/Possible)	Target Notes
ST26	N71567/31222	Yes	Original stone bridge filled in and dry - west side: spraints at entrance & within bridge on stones used to block it up. Holt possible within these stones. Runs both sides of bridge. East side: suitable entrance but no spraints.
ST27	N74525/35972	Yes	Spraints on west bank, runs and slides, remnants of small bird on small rock with spraint. Footprints downstream c. 100m
ST28	N95045/46799	No	Small spraints on rocks on river considered mink
ST29	N94788/46271	Yes	Single otter spraint. Several mink spraints & tracks. Droppings on rocks considered from Dipper, very suitable stream.
ST30	N93946/45180	Yes	Otter tracks and runs. Also mink present
ST31	N91750/45311	Yes	Otter spraint c.300m up stream. Suspect Dipper may use this stream here with several droppings on rocks. Structure not strictly on route but adjacent to road.
ST32	N89686/43162	No	
ST33	N89231/42190	No	
ST34	N88428/40770	No	
ST35	N88081/40612.	Yes	Otter spraints, runs & slides
ST36	N87670/39163	No	
ST37	N87005/39266	No	No structure under road. Stream runs from grid ref' east adjacent to road with small residential entrance structures along road.
ST38	N83944/38374	No	No structure under road here
ST39	N80764/37355	Yes	Otter spraints and tracks. Also lots of mink tracks.
ST40	N80641/37457	No	
ST41	N80384/37725	Yes	Small otter print nearer structure but spraints and tracks at Blackwater River close by.
ST42	N79428/37970	No	
ST43	N92125/34589	No	
ST44	N89415/34180	No	
ST45	N88596/34020	No	
ST46	N87902/33720	No	
ST47	N85051/33133	Yes	Otter spraint on top of pipe under the bridge and on rock downstream.
ST48	N82370/34880	No	
ST49	N81651/35685	No	
ST50	N81200/36496	No	Grey Wagtail - 1
ST51	N81041/37175	No	
ST52	N73292/29794	Yes	Single spraint, several runs and slides
ST53	N72862/29541	Yes	Distinct otter runs, must be very active.
ST54	N72837/29339	Yes	Less obvious activity here
ST55	N72772/29181	Yes	Runs and slides

4.1.11 Habitat Evaluation

Habitat Evaluation Summary

The following summary table outlines the ecological resources in the form of habitat types found at the subject site (within the proposed red line boundary for all 5 clusters). Key receptors as per NRA guidance [19], for which impact assessment is to be carried out, are also indicated.

The most dominant habitats at the subject site are Improved Agricultural Grassland (GA1) and commercial forestry (WD4) which together account for 61% of the habitats present.

Note: for area calculations of linear features such as Hedgerows, treelines and mosaics of both, an average hedgerow width of 2.2m has been assumed. This follows published mean hedgerow widths [104].

Table 4.63: Summary of Habitat Evaluations, Habitats by Area and Key Receptors

Fossitt Code	Area in Hectares (ha)	Percentage of Total Area	Evaluation	Key Receptor
BC1: Arable crops	57	4.58	Local Importance (Lower Value)	No
BC3: Tilled land	5	0.38	Local Importance (Lower Value)	No
BL3: Buildings and artificial surfaces	3	0.27	Local Importance (Lower Value)	No
GA1: Improved agricultural grassland	455	36.56	Local Importance (Lower Value)	No
GA1/GS4: Mosaic	28	2.29	Local Importance (Higher Value)	Yes
GA2: Amenity grassland (improved)	0	0.01	Local Importance (Lower Value)	No
GS1: Dry calcareous and neutral grassland	139	11.14	Local Importance (Lower Value)	No
GS4: Wet grassland	21	1.66	Local Importance (Higher Value)	Yes
GS4/GS1: Mosaic	11	0.90	Local Importance (Higher Value)	Yes
PB1: Raised bog	17	1.35	International Importance	Yes
PB4: Cutover bog	86	6.91	Local Importance (Lower Value)	No
PB4/GS1: Mosaic	0	0.00	County Importance	Yes
Pond/FL8: Mosaic	0	0.03	Local Importance (Higher Value)	Yes
WD1: (Mixed) broadleaved woodland	9	0.75	Local Importance (Higher Value)	Yes
WD3: (Mixed) conifer woodland	1	0.07	Local Importance (Higher Value)	Yes
WD4: Conifer plantation	304	24.45	Local Importance (Lower Value)	No
WD4/PB4: Mosaic	1	0.08	Local Importance (Lower Value)	No
WD4/WD2: Mosaic	16	1.27	Local Importance (Lower Value)	No
WN7: Bog woodland	33	2.64	Local Importance (Higher Value)	Yes
WS1: Scrub	13	1.03	Local Importance (Higher Value)	Yes
WD4/WS2: Mosaic	7	0.58	Local Importance (Lower Value)	No
WS5: Recently-felled woodland	28	2.22	Local Importance (Lower Value)	No
BL3/GS2: Mosaic	0	0.01	Local Importance (Lower Value)	No
FW2 : Depositing/lowland rivers	1	0.06	Local Importance (Higher Value)	Yes
FW4: Drainage ditches	2	0.14	Local Importance (Lower Value)	No

Fossitt Code	Area in Hectares (ha)	Percentage of Total Area	Evaluation	Key Receptor
WL1: Hedgerows	2	0.19	Local Importance (Higher Value)	Yes
WL2: Treelines	5	0.42	Local Importance (Higher Value)	Yes
WL2/WL1: Mosaic	0	0.01	Local Importance (Higher Value)	Yes

4.1.12 Terrestrial Fauna Evaluation

The basis of impact assessment should be a determination of which ecological resources within the zone of influence of the proposed development are of sufficient value to be material in decision making and therefore, included in the assessment [19], [17]. Table 4.64, over, outlines the key receptors selected for assessment and the rationale for same; taken from NRA guidance [19].

Table 4.64: Evaluation of Fauna

Common name	Conservation Status	NRA Evaluation	Rationale	Key Ecological Receptor
Smooth Newt	Protected Species: Wildlife Acts [63]	National Importance	Present Historically	Yes
Common Frog	Protected Species: EU Habitats Directive Annex V [1]; Protected Species: Wildlife Acts [60]	National Importance	Recorded as present and assessed as likely to occur throughout in suitable habitat.	Yes
Common Lizard	Protected Species: Wildlife Acts [60]	National Importance	Recorded historically and assed as likely to occur in suitable habitat	Yes
West European Hedgehog	Protected Species: Wildlife Acts [60]	Local Importance (Higher Value)	Recorded historically and assessed as likely to occur throughout	Yes
European Otter	Protected Species: EU Habitats Directive Annex II[4]; Protected Species: EU Habitats Directive Annex IV[4]; Protected Species: Wildlife Acts [60]	National Importance	Recorded throughout in suitable habitats.	Yes
Eurasian Red Squirrel	Protected Species: Wildlife Acts [60]	County Importance	Present in 4 of 7 10km squares within which proposed wind farm is to be located since 2010.	Yes
Eurasian Badger	Protected Species: Wildlife Acts [60]	County Importance	Recorded as present. A number of setts located including a main sett.	Yes
Pine Marten	Protected Species: EU Habitats	County Importance	One observation and likely to occur in suitable habitat	Yes

Common name	Conservation Status	NRA Evaluation	Rationale	Key Ecological Receptor
	Directive Annex V[4]; Protected Species: Wildlife Acts [60]		throughout.	
Irish Hare	Protected Species: Wildlife Acts [60]	National Importance	Assessed as present throughout site	Yes
Bats	Protected Species: EU Habitats Directive Annex IV[4]; Protected Species: Wildlife Acts [60]	National Importance	Legal status and ecological sensitivity	Yes
Marsh Fritillary	Protected Species: EU Habitats Directive Annex II[4];	National Importance	Present during survey period proximal to Derrybrennan cluster study site overlaps known range in Ireland.	Yes

4.1.13 Avifauna Evaluation

Table 4.65 below, outlines the key receptors selected for assessment and the rationale for same based on NRA guidance [19]; the overall importance or sensitivity evaluation for each key receptor, taken from guidance such as Percival 2007 [105] is also illustrated.

Table 4.65: Avifauna Key Receptor Evaluation

Common name	Conservation Status	NRA Evaluation	Rationale	Key Receptor	Receptor Evaluation for Impact Assessment (Sensitivity)
Whooper Swan	Protected Species: Wildlife Acts [60] Annex I [2], Amber Listed [36]	International Importance	Sporadically occurring population at low numbers within the site (max = 6); flight activity recorded.	Yes	Very High
Golden Plover	Protected Species: Wildlife Acts [60] Annex I [2], Red Listed [36]	County Importance	Recorded at 3/5 clusters during winter (max recorded flock size 438)	Yes	Medium
Kingfisher	Protected Species: Wildlife Acts [60] Annex I [2], Amber Listed [36]	National Importance	No proved breeding but likely to breed in suitable habitat in surrounding hinterland. One winter record Cloncumber.	Yes	High
Common Snipe	Protected Species: Wildlife Acts [60] ;Amber Listed [36]	Local Importance (Higher Value)	Recorded breeding inside 500m envelope at 2/5 clusters. Known sensitivity.	Yes	Medium due to published 34% decline in national breeding distribution since

Common name	Conservation Status	NRA Evaluation	Rationale	Key Receptor	Receptor Evaluation for Impact Assessment (Sensitivity)
					1968-72 [64].
Eurasian Curlew	Protected Species: Wildlife Acts [60] Annex II [2], Red Listed [36]	County Importance	Not recorded breeding within the proposed development 500m turbine envelope, but may breed nearby at Lodge Bog; included on a precautionary basis	Yes	High
Lapwing	Protected Species: Wildlife Acts , Red Listed [36]	County Importance	Recorded breeding in low numbers (n=1 pair) at Cloncumber. Wintering at 3/5 clusters.	Yes	Medium
Peregrine	Protected Species: Wildlife Acts [60] Annex I [2], Green Listed [36]	County Importance	A number of observations of birds (n=5); no breeding recorded on site	Yes	High
Yellowhammer	Protected Species: Wildlife Acts , Red Listed [36]	County Importance	Recorded from CBS survey and suitable habitat throughout site; breeding at 4/5 clusters.	Yes	Medium
Merlin	Protected Species: Wildlife Acts ,Annex I Amber Listed [36]	Local Importance (Higher Value)	Occurs in winter in low numbers; possible occupied territory at Hortland.	Yes	High
Kestrel	Protected Species: Wildlife Acts , Amber Listed [36]	Local Importance (Higher Value)	Breeding in low numbers on or near site. Known sensitivity.	Yes	Low
Whinchat	Protected Species: Wildlife Acts , Red Listed [36]	County Importance	One pair located at Hortland outside site boundary.	Yes	Medium
Woodcock	Protected Species: Wildlife Acts , Red Listed [36]	Local Importance (Higher Value)	Breeding in 500m envelope at 3/5 clusters. Up to 9 territories recorded.	Yes	Medium
Buzzard	Protected Species: Wildlife Acts , Green Listed [36]	Local Importance (Higher Value)	Widespread throughout site. Recorded at 5/5 clusters.	Yes	Low
Barn Owl	Protected Species: Wildlife Acts , Red Listed [36]	National Importance	No breeding recorded or evidence of occupied sites. A single record of pellets within the Merlin square at Windmill ensures a precautionary approach given low national population.	Yes	High

Common name	Conservation Status	NRA Evaluation	Rationale	Key Receptor	Receptor Evaluation for Impact Assessment (Sensitivity)
Hen Harrier	Protected Species: Wildlife Acts ,Annex I Amber Listed [36]	National Importance	Winter Roost within hinterland of site; recorded foraging in winter & early Spring at 2 sites. No breeding.	Yes	High

5 STAGE ONE - SCREENING REPORT

5.1 Brief Description of the Project

A brief description of the proposed wind farm development is provided in Section 1.1 and associated Figure 1.1.

5.2 Brief Description of the Relevant Natura 2000 Sites

There are ten Natura 2000 sites within 15km of the proposed wind farm site. Of these, nine are cSACs and one is a SPA. There are no Natura 2000 or 'European' sites within the proposed development area. Table 5.1 lists the designated sites located within 15km of the proposed wind farm site, including their qualifying interests, conservation objectives, unit size in hectares and known threats (according to the NPWS [62]) to these sites. Figure 1.2, Appendix 6, shows the location and extent of the designated nature conservation sites within 15km of the study area.

For the avoidance of doubt, the proposed wind farm development is not directly connected with or necessary to any European site.

5.2.1 Summaries of the Natura 2000 Sites

The following summary descriptions for each Natura 2000 site are extracted from the site synopses available on the NPWS website [62]. The NPWS sites synopses for the designated areas can be viewed in full on www.npws.ie and are included in Appendix 1.

River Boyne and Blackwater cSAC
The shortest distance between the nearest points of the River Boyne and River Blackwater cSAC (site code: 002299) and the proposed development is c.660m (closest distance via hydrological links to the red line boundary adjacent to the Ballinakill cluster). The cSAC is designated for aquatic species such as otter (*Lutra lutra*), river lamprey (*Lampetra fluviatilis*) and salmon (*Salmo salar*), as well alkaline ferns and alluvial forest. Some of the grassland areas along the Boyne and Blackwater are used by a nationally important winter flock of Whooper Swan (*Cygnus cygnus)*; although this species is not one for which the site has been selected for designation.

River Boyne and Blackwater SPA
The River Boyne and River Blackwater SPA (site code: 004232) is located c.700m from the proposed development (closest distance via hydrological links to the red line boundary adjacent to the Ballinakill cluster). The SPA is of high ornithological importance as it supports a nationally important population of kingfisher, a species that is listed on Annex I of the EU Birds Directive [2].

Balynafagh Bog cSAC
Ballynafagh Bog cSAC (site code 000391) is located 6.19km from the proposed development. The site is a raised bog situated c.1km west of Prosperous, Co. Kildare. The site contains the priority habitat active raised bog and also supports breeding Merlin. This site is located upstream of the proposed development.

Pollardstown Fen cSAC
Pollardstown Fen cSAC (site code 000396) is located 6.74km upstream from the proposed development. Pollardstown Fen is situated on the northern margin of the Curragh of Kildare, approximately 3 km north-west of Newbridge. It lies in a shallow depression, running in a north-west/south-east direction. About 40 springs provide a continuous supply of water to the fen. These rise chiefly at its margins, along distinct seepage areas of mineral ground above the fen level. The continual inflow of calcium-rich water from the Curragh, and from the limestone ground to the north, creates waterlogged conditions which lead to peat formation. There are layers of calcareous marl in this peat, reflecting inundation by calcium-rich water. This peat-marl deposit reaches some 6m at its deepest point and is underlain by clay.

The site contains a number of habitats/species listed on Annex I/II of the EU Habitats Directive, including the priority habitat *Cladium* Fens [7210]. The site supports important invertebrate species and is the only site in Ireland to support all three *Vertigo* snail species.

Ballynafagh Lake cSAC
Ballynafagh Lake cSAC (site code 001387) is located 5.45km from the proposed development (closest cluster Drehid-Hortland). Ballynafagh Lake is located about 2km north-west of Prosperous in Co. Kildare. It is a shallow alkaline lake with some emergent vegetation. The Blackwood Feeder, which connects Ballynafagh Lake to the Grand Canal, is also included in the site. The site contains the Annex habitat Alkaline fens [7230]. This site is located upstream of the proposed development.

Rye Water Valley/Carton cSAC
Rye Water Valley/Carton cSAC (site code 001398) is located c.8km downstream from the proposed development (at its closest at the Rye Water River crossing on the proposed HV grid connection route west of Kilcock). Rye Water Valley/Carton SAC is located between Leixlip and Maynooth, in Counties Meath and Kildare, and extends along the Rye Water, a tributary of the River Liffey. The site is designated for a number of habitats and/or species listed on Annex I/II of the EU Habitats Directive including the priority habitat [7220] Petrifying Springs.

The River Barrow and River Nore cSAC
The River Barrow and River Nore cSAC (site code 002162) is located 13.5km downstream from the proposed development (nearest turbine) and 17.8km via hydrological links. This site consists of the freshwater stretches of the Barrow and Nore River catchments as far upstream as the Slieve Bloom Mountains, and it also includes the tidal elements and estuary as far downstream as Creadun Head in Waterford. The site passes through eight counties – Offaly, Kildare, Laois, Carlow, Kilkenny, Tipperary, Wexford and Waterford. Major towns along the edge of the site include Mountmellick, Portarlington, Monasterevin, Stradbally, Athy, Carlow, Leighlinbridge, Graiguenamanagh, New Ross, Inistioge, Thomastown, Callan, Bennettsbridge, Kilkenny and Durrow. The larger of the many tributaries include the Lerr, Fushoge, Mountain, Aughavaud, Owenass, Boherbaun and Stradbally Rivers of the Barrow, and the Delour, Dinin, Erkina, Owveg, Munster, Arrigle and King's Rivers on the Nore. Within the context of the proposed wind farm connectivity exists with the River Barrow via the Slate River which flows south-westwards from the Cloncumber cluster and joins with the River Figile; connecting to the River Barrow further south. Overall, the site is of considerable conservation significance for the occurrence of good examples of habitats and of populations of plant and animal species that are listed on Annexes I and II of the E.U. Habitats Directive. Furthermore it is of high conservation value for the populations of bird species that use it. The occurrence of several Red Data Book plant species including three rare plants in the salt meadows and the population of the hard water form of the Freshwater Pearl Mussel, which is limited to a 10km stretch of the Nore, add further interest to this site.

Mouds Bog cSAC
Mouds Bog cSAC (site code 002331) is located 5.4km from the proposed development. Mouds Bog is located about 3km north-west of Newbridge in Co. Kildare, close to the Hill of Allen, and includes amongst others, the townlands of Grangehiggin, Barretstown and Hawkfield. The site comprises a raised bog that includes both areas of high bog and cutover bog. Much of the margins of the site are bounded by trackways. This site is not connected hydrologicaly to the proposed wind farm.

Mount Hevey Bog cSAC
Mount Hevey Bog cSAC (site code 002342) is located 5.4km from the proposed development. Mount Hevey Bog is situated approximately 4km north-east of Kinnegad, in the townlands of Cloncrave, White Island, Aghamore, Kilwarden and Kilnagalliagh. The Meath-Westmeath County boundary runs through the centre of the bog. The site comprises a raised bog that includes both areas of high bog and cutover bog. The Dublin-Sligo railway runs through the northern part of the bog isolating two northern lobes. The northern lobes are adjacent to the Royal Canal. The site contains the priority Annex Habitat [7110] Active Raised Bog. Mount Hevey Bog is a site of considerable conservation significance as it comprises a raised bog, a rare habitat in the E.U. and one that is becoming increasingly scarce and under threat in Ireland. The site supports a good diversity of raised bog microhabitats, including hummock/hollow complexes, pools, flushes and regenerating cutover, as well as a number of scarce plant species.

Active raised bog is listed as a priority habitat on Annex I of the E.U. Habitats Directive. Priority status is given to habitats and species that are threatened throughout the E.U. Ireland has a high proportion of the total E.U. resource of this habitat type (over 60%) and so has a special responsibility for its conservation at an international level. This site is not connected hydrologically to the proposed wind farm.

The Long Derries cSAC

The Long Derries, Edenderry cSAC (site code 000925) is located 3.09km from the proposed development. The Long Derries is located approximately 5km south-east of Edenderry in Co. Offaly and is part of a low esker ridge running from Edenderry to Rathdangan. It consists primarily of glacial gravels interspersed with loam and peat soil. The site contains the priority Annex I habitat [6210] Orchid-rich Calcareous Grassland. This site is upstream of the proposed development.

Table 5.1: Summary of the Natura 2000 Sites (SPA and cSACs) within 15km of the Proposed Development)

Site	Code	Features of Interest	Summary Description	Distance to proposed development
River Boyne and River Blackwater cSAC	002299	River lamprey (*Lampetra fluviatilis*) [1099] Salmon (*Salmo salar*) [1106] Otter (*Lutra lutra*) [1355] Alkaline fens [7230] Alluvial forests with *Alnus glutinosa* and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]	This site comprises most of the freshwater element of the River Boyne from upriver of the Boyne Aqueduct at Drogheda, the Blackwater River as far as Lough Ramor and the principal Boyne tributaries, notably the Deel, Stoneyford and Tremblestown Rivers. The rivers flow through a landscape dominated by intensive agriculture, mostly of improved grassland but also cereals. Much of the river channels were subject to arterial drainage schemes in the past. Natural flood-plains now exist along only limited stretches of river, though often there is a fringe of reed swamp, freshwater marsh, wet grassland or deciduous wet woodland. Along some parts, notably between Drogheda and Slane, are stands of tall, mature mixed woodland. Substantial areas of improved grassland and arable land are included in site for water quality reasons. The main channel of the Boyne contains a good example of alluvial woodland of the *Salicetum albo-fragilis* type which has developed on three alluvium islands. Alkaline fen vegetation is well represented at Lough Shesk, where there is a very fine example of habitat succession from open water to raised bog. The Boyne and its tributaries is one of Ireland's premier game fisheries and offers a wide range of angling, from fishing for spring salmon and grilse to sea trout fishing and extensive brown trout fishing. The site is one of the most important in eastern Ireland for Salmon (*Salmo salar*) and has very extensive spawning grounds. The site also has an important population of River Lamprey (*Lampetra fluviatilis*), though the distribution or abundance of this species is not well known. Otter (*Lutra lutra*) is widespread throughout the site. Some of the grassland areas along the Boyne and Blackwater are used by a nationally important winter flock of Whooper Swan (*Cygnus Cygnus*). Several Red Data Book plants occur within the site, with *Pyrola rotundifolia, Poa palustris* and *Juncus compressus*. Also occurring are a number of Red Data Book animals, notably Badger (*Meles meles*), Pine Marten *(Martes martes*) and *Rana temporaria*. The River Boyne is a designated Salmonid Water under the EU Freshwater Fish Directive.	0.8km

Site	Code	Features of Interest	Summary Description	Distance to proposed development
River Boyne and River Blackwater SPA	004232	Kingfisher (*Alcedo atthis*) [A229]	The River Boyne and River Blackwater SPA is a long, linear site that comprises stretches of the River Boyne and several of its tributaries; most of the site is in County Meath, but it extends also into Counties Cavan, Louth and Westmeath. It includes the following river sections: the River Boyne from the M1 motorway bridge, west of Drogheda, to the junction with the Royal Canal, west of Longwood, County Meath; the River Blackwater from its junction with the River Boyne in Navan to the junction with Lough Ramor in County Cavan; the Tremblestown River/Athboy River from the junction with the River Boyne at Kilnagross Bridge west of Trim to the bridge in Athboy, County Meath; the Stoneyford River from its junction with the River Boyne to Stonestown Bridge in County Westmeath; the River Deel from its junction with the River Boyne to Cummer Bridge, County Westmeath. The site includes the river channel and marginal vegetation. The site is a Special Protection Area (SPA) under the EU Birds Directive [(2)] of special conservation interest for the following species: Kingfisher (*Alcedo atthis*).	0.84km
Ballynafagh Bog cSAC	000391	[7110] Raised Bog (Active)* [7120] Degraded Raised Bog [7150] Rhynchosporion Vegetation	The site is a raised bog situated c.1km west of Prosperous, Co. Kildare. The site contains the priority habitat active raised bog and also supports breeding Merlin.	6.19km
Pollardstown Fen cSAC	000396	[7210] *Cladium* Fens* [7220] Petrifying Springs* [7230] Alkaline Fens [1013] Geyer's Whorl Snail (*Vertigo geyeri*) [1014] Narrow-mouthed Whorl Snail (*Vertigo angustior*) [1016] Desmoulin's Whorl Snail (*Vertigo moulinsiana*)	Pollardstown Fen is situated on the northern margin of the Curragh of Kildare, approximately 3 km north-west of Newbridge. It lies in a shallow depression, running in a north-west/south-east direction. About 40 springs provide a continuous supply of water to the fen. These rise chiefly at its margins, along distinct seepage areas of mineral ground above the fen level. The continual inflow of calcium-rich water from the Curragh, and from the limestone ground to the north, creates waterlogged conditions which lead to peat formation. There are layers of calcareous marl in this peat, reflecting inundation by calcium-rich water. This peat-marl deposit reaches some 6 m at its deepest point and is underlain by clay. The site contains a number of habitats/species listed on Annex I/II of the EU Habitats Directive, including the priority habitat *Cladium* Fens [7210].	6.74km

Site	Code	Features of Interest	Summary Description	Distance to proposed development
Ballynafagh Lake cSAC	001387	[7230] Alkaline Fens [1016] Desmoulin's Whorl Snail (*Vertigo moulinsiana*) [1065] Marsh Fritillary (*Euphydryas aurinia*)	Ballynafagh Lake is located about 2 km north-west of Prosperous in Co. Kildare. It is a shallow alkaline lake with some emergent vegetation. The Blackwood Feeder, which connects Ballynafagh Lake to the Grand Canal, is also included in the site. The site contains the Annex habitat Alkaline fens [7230].	5.45km
Rye Water Valley/ Carton cSAC	001398	[7220] Petrifying Springs* [1014] Narrow-mouthed Whorl Snail (*Vertigo angustior*) [1016] Desmoulin's Whorl Snail (*Vertigo moulinsiana*)	Rye Water Valley/Carton SAC is located between Leixlip and Maynooth, in Counties Meath and Kildare, and extends along the Rye Water, a tributary of the River Liffey. The site is designated for a number of habitats and/or species listed on Annex I/II of the EU Habitats Directive including the priority habitat [7220] Petrifying Springs	13.61km
The River Barrow and River Nore cSAC	002162	[1130] Estuaries [1140] Tidal Mudflats and Sandflats [1310] *Salicornia* Mud [1330] Atlantic Salt Meadows [1410] Mediterranean Salt Meadows [3260] Floating River Vegetation [4030] Dry Heath [6430] Hydrophilous Tall Herb Communities [7220] Petrifying Springs* [91A0] Old Oak Woodlands [91E0] Alluvial Forests* [1016] Desmoulin's Whorl Snail (*Vertigo moulinsiana*) [1029] Freshwater Pearl Mussel (*Margaritifera margaritifera*) [1092] White-clawed Crayfish (*Austropotamobius pallipes*) [1095] Sea Lamprey (*Petromyzon marinus*) [1096] Brook Lamprey (*Lampetra*	This site consists of the freshwater stretches of the Barrow and Nore River catchments as far upstream as the Slieve Bloom Mountains, and it also includes the tidal elements and estuary as far downstream as Creadun Head in Waterford. The site passes through eight counties – Offaly, Kildare, Laois, Carlow, Kilkenny, Tipperary, Wexford and Waterford. Major towns along the edge of the site include Mountmellick, Portarlington, Monasterevin, Stradbally, Athy, Carlow, Leighlinbridge, Graiguenamanagh, New Ross, Inistioge, Thomastown, Callan, Bennettsbridge, Kilkenny and Durrow. The larger of the many tributaries include the Lerr, Fushoge, Mountain, Aughavaud, Owenass, Boherbaun and Stradbally Rivers of the Barrow, and the Delour, Dinin, Erkina, Owveg, Munster, Arrigle and King's Rivers on the Nore. Within the context of the proposed wind farm connectivity exists with the River Barrow via the Slate River which flows southwestwards from the Cloncumber cluster of proposed turbines and joins with the River Figile; further connecting to the River Barrow further south. Overall, the site is of considerable conservation significance for the occurrence of good examples of habitats and of populations of plant and animal species that are listed on Annexes I and II of the E.U. Habitats Directive. Furthermore it is of high conservation value for the populations of bird species that use it. The occurrence of several Red Data Book plant species including three rare plants in the salt meadows and the population of the hard water form of the Freshwater Pearl Mussel, which is limited to a 10 km stretch of the Nore, add further interest to this site.	13.5km

Site	Code	Features of Interest	Summary Description	Distance to proposed development
		planeri) [1099] River Lamprey (*Lampetra fluviatilis*) [1103] Twaite Shad (*Alosa fallax*) [1106] Atlantic Salmon (*Salmo salar*) [1355] Otter (*Lutra lutra*) [1421] Killarney Fern (*Trichomanes speciosum*) [1990] Nore Freshwater Pearl Mussel (*Margaritifera durrovensis*)		
Mouds Bog cSAC	002331	[7110] Raised Bog (Active)* [7120] Degraded Raised Bog [7150] Rhynchosporion Vegetation	Mouds Bog is located about 3 km north-west of Newbridge in Co. Kildare, close to the Hill of Allen, and includes amongst others, the townlands of Grangehiggin, Barretstown and Hawkfield. The site comprises a raised bog that includes both areas of high bog and cutover bog. Much of the margins of the site are bounded by trackways	5.4km
Mount Hevey Bog cSAC	002342	[7110] Raised Bog (Active)* [7120] Degraded Raised Bog [7150] Rhynchosporion Vegetation	The site comprises a raised bog that includes both areas of high bog and cutover bog. The site contains the priority Annex Habitat [7110] Active Raised Bog. Mount Hevey Bog is a site of considerable conservation significance as it comprises a raised bog, a rare habitat in the E.U. and one that is becoming increasingly scarce and under threat in Ireland.	5.4km
The Long Derries cSAC	000925	[6210] Orchid-rich Calcareous Grassland*	The Long Derries is located approximately 5 km south-east of Edenderry in Co. Offaly and is part of a low esker ridge running from Edenderry to Rathdangan. It consists primarily of glacial gravels interspersed with loam and peat soil.	3.09km

*Known threats are obtained from the NPWS website www.npws.ie

5.3 Screening Assessment Criteria

Throughout this section, the line items in *italics* refer to guidelines as to information to be contained in a screening assessment, from the guidance document '*Assessment of Plans and Projects significantly affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*', European Commission, 2001 [4]. The standard 'Screening Matrix' and 'Finding of No Significant Effects Report Matrix' in Annex 2 of this guidance document are also followed.

In considering whether the proposed development, by itself or in combination with other plans and projects, has the potential to affect the conservation objectives of the designated sites within 15km of the proposed development, the following documents were considered:

1. "Wind Energy Development Planning Guidelines" published by the Department of the Environment, Heritage and Local Government (2006) [106]
2. "Best Practice Guidelines for the Irish Wind Energy Industry", Irish Wind Energy Association (2012) [107]
3. Environmental Protection Agency (2002) "Guidelines on the Information to be Contained in Environmental Impact Statements" [14]
4. Environmental Protection Agency (2003) "Advice Notes on Current Practice in the preparation of Environmental Impact Statements" [15]
5. Water Framework Directive (2000/60/EC)
6. Eastern River Basin Management Plan 2009 - 2015 [108]
7. Neagh Bann River Basin Management Plan 2009 - 2015 [109]
8. Meath County Development Plan 2013 – 2019 [6]
9. Geological Survey of Ireland, County Meath Groundwater Protection Scheme
10. UK Pollution Prevention Guidelines (PPG):
    I. PPG1: Good Environmental Practices (2013) [110]
    II. PPG2: Above ground oil storage tanks (2011) [111]
    III. PPG3: Use and design of oil separators in surface water drainage systems (2006) [112]
    IV. PPG4: The disposal of sewage where no foul sewer is available (2006) [113]
    V. PPG5: Works and maintenance in or near water (2007) [114]
    VI. PPG6: Working at construction and demolition sites (2012) [115]
    VII. PPG7: The safe operation of refuelling facilities (2011) [116]
    VIII. PPG8: Safe storage and disposal of used oil (2004) [117]
    IX. PPG21: Incident response planning (2009) [118]
    X. PPG22: Dealing with Spills (2011) [119]
    XI. PPG26: Drums and Intermediate Bulk Containers (2011) [115]
11. Eastern Regional Fisheries Board "Requirements for the Protection of Fisheries Habitat During Construction and Development Works at River Sites" [120]
12. Forest Service, Department of Marine and Natural Resources (2000) "Forestry and Water Quality Guidelines" [121]
13. Forest Service, Department of Marine and Natural Resources (2000) "Forest Harvesting and Environmental Guidelines" [122]
14. CIRIA (2001) "Control of Water Pollution from Construction Sites. Guidance for Consultants and Contractors" (C532) [123]
15. The assessment also takes account of '*Guidelines for Ecological Impact Assessment in the United Kingdom* [17]';
16. Relevant guidance published by the National Roads Authority (NRA) such as 'Guidelines for Assessment of Ecological Impacts of National Road Schemes [19]', '*Guidelines for Assessment of Ecological Impacts of National Road Schemes, Revision 1* [20]', '*Environmental Impact Assessment of National Road Schemes – A practical guide*' [21] and '*Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*' [22] have also been followed.
    - Sustainable Development: A Strategy for Ireland, Department of the Environment, 1997 [124]
    - Kildare County Development Plan 2011-2017 [125]
    - Greater Dublin Strategic Drainage Study (GDSDS): Technical Documents of Regional Drainage Policies, March 2005 [126]

- Eastern Regional Fisheries Board - Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites [120]
- Environmental Good Practice on Site - Construction Industry Research and Information Association (UK) [127]
- Best Practice Guide BPGCS005 Oil Storage Guidelines [128]
- Control of Water Pollution from Linear Construction Sites (C648) - Construction Industry Research and Information Association (UK) [129]
- Control of Water Pollution from Construction Sites. Guidance for Consultants and Contractors (C532) - Construction Industry Research and Information Association (UK) [123]
- Sustainable Construction Procurement. A Guide to Delivering Environmentally Responsible Projects (C571) - Construction Industry Research and Information Association (UK) [130]
- Eastern River Basin District River Basin Management Plan 2009-2015 [108]
- South Eastern International River Basin Management Plan 2009 – 2015 [131]Biological River Water Quality Data, (Environmental Protection Agency (EPA) [132]
- Code of Best Forest Practice – Ireland, (Forest Service and Department of Marine and Natural Resources – 2000) [122]
- Forest Road Manual, Guidelines for the Design, Construction and Management of Forest Roads, (COFORD 2004) [133]

Further scientific literature, utilised to identify potential impacts, is cited where relevant within the individual matrices.

5.3.1 Description of the elements of the project likely to give rise to impacts on Natura 2000 sites.

'Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the Natura 2000 sites'.

As set out in the NPWS Guidance [3], the task of establishing whether a plan or project is likely to have an effect on a Natura 2000 site(s) is based on an evaluation using available information and data, and other available environmental information (e.g. water quality data), supplemented as necessary by local site information and ecological surveys. This results in a determination by the competent authority as to whether there may be a significant effect on the designated site. A precautionary approach is required.

Some examples given in the NPWS Guidance [3] of effects that are likely to be significant are:

1. Any impact on an Annex I habitat

2. Causing reduction in the area of the habitat or Natura 2000 site

3. Causing direct or indirect damage to the physical quality of the environment (e.g. water quality and supply, soil compaction) in the Natura 2000 site

4. Causing serious or ongoing disturbance to species or habitats for which the Natura 2000 site is selected (e.g. increased noise, illumination and human activity)

5. Causing direct or indirect damage to the size, characteristics or reproductive ability of populations on the Natura 2000 site

6. Interfering with mitigation measures put in place for other plans or projects.

The individual elements of the Maighne Wind Farm development (either alone or in combination with other plans or projects) likely to give rise to significant impacts on the Natura 2000 sites within 15km of the site of the proposed development are as follows:

The proposed wind farm will comprise of up to 47 turbines and a maximum export capacity of up to 125MW.

The proposed development will primarily consist of the following:

- Erection of up to 47 no. wind turbines with an overall tip height of up to 169m
- Construction of foundations and hardstanding areas in respect of each turbine
- Construction/upgrade of 9 no. site entrances from public roads
- Construction of approximately 31km of new site access tracks and associated drainage
- Upgrade of approximately 10km of existing access tracks and, where required, upgrade of associated drainage
- Excavation of 3 no. borrow pits
- Establishment of 4 no. temporary construction site compounds and associated parking areas
- Construction of drainage and sediment control systems
- Construction of 1 no. electricity substation (which will operate at a voltage up to 220kV) including:
    - 2 no. control buildings containing worker welfare facilities
    - electrical infrastructure
    - parking
    - fencing
    - appropriate landscaping
- Installation of approximately 75km of medium voltage (MV) underground cabling (which will operate at a voltage up to 33kV) between the proposed turbines and proposed on-site substation. Approximately 36km will be laid within the public roadway
- Installation of high voltage (HV) underground cabling (which will operate at a voltage up to 220kV) between the proposed on-site substation and either the existing substation at Woodland, Co. Meath (totalling approximately 29km, of which approximately 28km will be laid within the public roadway) or the existing substation at Maynooth, Co. Kildare (totalling approximately 23km, of which approximately 17km will be laid in the public roadway)
- Installation of joint bays along the cable route
- Installation of underground communication cables
- Installation of a permanent meteorological mast up to 100m in height
- Temporary alterations to the public road at identified locations to accommodate the delivery of turbines
- Associated site works including landscaping
- Tree felling
- Peat excavation
    - Clearance of buffer zones around selected turbines to avoid collision risk to Bats

The potential impact of these elements on Natura 2000 sites is presented in Table 5.2 below.

Table 5.2: Summary of the Main Elements of the Project and their Potential Impacts on Natura 2000 Sites

Project Element	Potential Impact on Natura 2000 Sites
Construction of up to 47 turbine wind farm including construction of new access tracks including stream crossings, the construction of temporary compounds, the placement of underground MV and HV cables, the upgrading of existing access tracks, tree removal and trimming, construction works along cable routes on structures, the construction of borrow pits, peat extraction and ancillary works.	1. Potential for siltation of the River Blackwater and tributaries due to construction works. 2. Potential for siltation of tributaries of the River Barrow such as the Figile, Slate Rivers due to construction works. 3. Potential for siltation of the Rye Water River upstream from the Rye Water cSAC due to construction works. 4. Potential for eutrophication due to contaminated run-off entering the River Blackwater and tributaries, the tributaries of the river Barrow within the 15km buffer and the Rye Water River during construction works. 5. Potential pollution of the River Blackwater and tributaries, River Barrow and Tributaries and Rye Water River resulting from wet concrete operations, fuel spillages/leaks or leaking of foul effluent.
Project Element	**Potential Impact on Natura 2000 Sites**

Project Element	Potential Impact on Natura 2000 Sites
Operation of Wind Farm	6. The main potential impact operation of the proposed wind farm is on water quality due to a potential (albeit low) increase in run-off from a storm event, resulting from the change in land use and an increase in impermeable ground conditions.
Decommissioning of wind farm	7. Potential impacts similar to construction phase

5.3.2 Description of the likely impact of the project on Natura 2000 Sites

'Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the Natura 2000 site by virtue of:'

Size and Scale

As the proposed development is not located within any European site, then no direct impact is predicted as a result of size and scale of the project.

There are downstream hydrological links between the proposed development and the River Boyne and River Blackwater cSAC and the River Boyne and River Blackwater SPA, in addition to the River Barrow and River Nore cSAC and the Rye Water/Carton cSAC. Indirect impacts which may potentially occur by virtue of the size and scale of the project on these sites are:

1. Installation, upgrading and/or extension of an internal road network on a wind farm site and excavations can result in increased silt runoff. Suspended solids in even quite small quantities may have a serious effect on the spawning sites of salmonids (O'Connor & Andrew, 1998 [134]; Turnpenny & Williams, 1980 [135]; Shackle *et al.*, 1999 [136]).

2. Inappropriate site management of excavations could lead to loss of silt laden run-off and/or suspended solids to surface waters.

3. Inappropriate management of the drainage of concrete washdown areas could lead to loss of contaminants to surface waters.

4. Additionally, the nutrient status of some of the soils at the site are likely to be elevated, compared to non-agricultural sites. Some of the turbine locations are located on agricultural grassland, and fertiliser and slurry applications would have been part of the routine land management practices. Inappropriate surface water management may result in increased nutrient runoff.

5. The positions, size and scale of stilling ponds may affect drainage regimes on site and hence downstream, via hydrological links.

6. Runoff from borrow excavation areas or temporary material storage areas may result in increased suspended sediments downstream.

7. Increase in run-off/flood event following storms or bad weather, due to the change in land use and an increase in impermeable ground conditions. Predicted increases in run-off are detailed in Chapter 9: Hydrology, of the main EIS and are predicted as low (<1%) in the event of a flood.

Ballynafagh Lake cSAC, which includes the Blackwood Feeder to the Grand Canal does have a hydrological connection to the development as part of the Natura site overlaps the canal at the confluence of the Blackwood Feeder and the Canal. Proposed works in or near the canal, upstream of the site therefore have the potential to impact indirectly on lands within the cSAC boundary.

It should be noted however that these waters are within the free flowing section of the Grand Canal , are separated from the feeder and are not suitable habitat for any of the conservation interests of the Ballynafagh Lake cSAC (Marsh Fritillary or Desmoulins Whorl Snail) nor do they constitute habitats for which the site has been selected (Alkaline Fens). It can therefore, be concluded with certainty that, the proposed development will have no appreciable effect on the Natura site in light of the conservation objectives of the site, and no significant impacts will occur by virtue of size and scale of the proposed development on the cSAC.

Ballnafagh Bog cSAC, Mount Hevey Bog cSAC, Mouds Bog cSAC, Pollardstown Fen cSAC and the Long Derries cSAC are located either upstream from the subject site or are unconnected hydrologically. No appreciably impact is predicted due to the size and scale of the proposed development by virtue of distance, the upstream nature of the hydrological connection, or lack of hydrological connection.

Land-take

The proposed wind farm development does not lie within any European site and consequently there will be no direct impact on any Natura 2000 site by way of land-take associated with this development.

There are downstream hydrological links between the proposed development and the River Boyne and River Blackwater cSAC and the River Boyne and River Blackwater SPA, in addition to the River Barrow and River Nore cSAC and the Rye Water/Carton cSAC. Indirect impacts which may potentially occur by virtue of land take on these sites are:

New access tracks will be built to provide access to turbines where required. Temporary construction site compounds will also be constructed. The proposed works will comprise trenching to facilitate the laying of cabling which would have potential impacts on downstream aquatic environments (disturbance and degradation of fluvial and riparian habitats) including designated sites.

There is potential for releases of suspended solids associated with upgrading, realigning and construction of access tracks and trenching within the site and also during the excavation work associated with proposed borrow pits. Installation, upgrading and/or extension of an internal access track network on a wind farm site and excavations can result in increased silt runoff and /or suspended solids. Alterations to public roads along turbine delivery route may also result in increased silt runoff. Suspended solids in even quite small quantities may have a serious effect on the spawning sites of salmonids (O'Connor & Andrew, 1998 [134]; Turnpenny & Williams, 1980 [135]; Shackle et al., 1999 [136]).

Engineering works in the vicinity of streams and at stream crossings also have the potential to impact directly on physical habitat, for example the spawning or nursery areas of fish. Permanent loss of aquatic habitats can also occur where access roads are constructed over or in close proximity to streams/rivers or where streams/rivers are permanently diverted to new channels. Obstruction to upstream movement of fish, particularly salmon and trout, due to construction of culverts can also potentially occur.

Any operations which result in loss of sediment will also result in increased nutrients being released from the soil. This has the potential to cause eutrophication of streams thereby lowering the capacity of the streams to support fish and invertebrate fauna which may be indirectly connected to the River Blackwater.

Any engineering works which cause runoff of sediments can also increase the levels of nutrients in receiving streams. This can result in the enrichment or eutrophication of the affected streams and catchment areas further downstream, and a possible change in overall water quality status. Suspended solids or sediment in a river is also a major concern and can have serious negative impacts on aquatic invertebrate and in stream flora. Aquatic species listed on Annex II of the EU Habitats Directive within the study area include the Atlantic salmon and the White-Clawed Crayfish. Potential impacts affecting these species could occur as a result of water quality impacts arising through accidental pollution events which may give rise to elevated suspended solids and siltation effects.

Tree felling or trimming could lead to an increase in sediment in the surface water run-off, if the brash is left in place in the riparian buffer zones.

Excavation of peat could lead to an increase in suspended solids in the surface water run-off and from exposed mineral soils.

The positions, size and scale of settlement ponds may affect drainage regimes on site and hence downstream via hydrological links.

Uncontrolled runoff from disposal sites including temporary material storage areas may result in increased suspended sediments downstream.

Ballynafagh Lake cSAC, which includes the Blackwood Feeder to the Grand Canal does have a hydrological connection to the development as part of the site overlaps the canal at the confluence of the Blackwood Feeder and the Canal. Proposed works in or near the canal, upstream of the site therefore have the potential to impact indirectly on lands within the cSAC boundary. It should be noted however that these waters are within the free flowing section of the Grand Canal , are separated from the feeder and are not suitable habitat for any of the conservation interests of the Ballynafagh Lake cSAC (Marsh Fritillary or Desmoulins Whorl Snail) nor do they constitute habitats for which the site has been selected (Alkaline Fens).

Ballnafagh Bog cSAC, Mount Hevey Bog cSAC, Mouds Bog cSAC, Pollardstown Fen cSAC and the Long Derries cSAC are located either upstream from the subject site or are unconnected hydrologically. No appreciable impact is predicted due to the size and scale of the proposed development by virtue of land take due to the upstream nature of the hydrological connection, or lack of hydrological connection.

Distance from Natura 2000 Site or key features of the site

The River Boyne and River Blackwater cSAC and the River Boyne and Blackwater SPA are both within 1km of the proposed development and therefore most likely to be impacted by virtue of proximity. All other Natura sites under consideration are a minimum of 3km from the proposed development thus reducing potential impacts by virtue of distance. Those Natura sites with hydrological links to the proposed development occur up to 13km from the proposed development; on a precautionary basis indirect impacts on these sites are assumed as possible given the scale of any sediment release or runoff likely to affect water quality cannot be determined.

Excavation and Resource requirements (water abstraction etc.)

As the proposed wind farm development are outside any Natura 2000 site there are no direct impacts as a result of excavation and resource requirements.

There are downstream hydrological links between the proposed development and the River Boyne and River Blackwater cSAC and the River Boyne and River Blackwater SPA, in addition to the River Barrow and River Nore cSAC and the Rye Water/Carton cSAC. Indirect impacts which may potentially arise through excavation requirements from the proposed project on these sites are:

New tracks will be built at proposed turbine locations where no access tracks currently exist. Four temporary construction compounds will also be constructed. The proposed works may comprise trenching to facilitate the laying of MV and HV cabling which would have potential impacts on downstream aquatic environments (disturbance and degradation of fluvial and riparian habitats).

There is potential for release of suspended solids and other substances associated with excavation works within the site such as the four borrow pits and other excavations as detailed above. Installation, upgrading and/or extension of an internal road network on a wind farm site and excavations can result in increased silt laden runoff. Suspended solids in even quite small quantities may have a serious effect on the spawning sites of salmonids (O'Connor & Andrew, 1998 [134]; Turnpenny & Williams, 1980 [135]; Shackle *et al*., 1999 [136]).

Excavation works in the vicinity of streams and at stream crossings can also impact directly on physical habitat, for example the spawning or nursery areas of fish. This includes both internal access tracks and also excavation of cable trenches (internal and external along roadways). Permanent loss of aquatic habitats can also occur where access tracks are constructed over or in close proximity to streams/rivers or where drainage channels are permanently diverted to new channels. Obstruction to upstream movement of fish, particularly salmon and trout, due to construction of culverts can also potentially occur.

Indirect water quality impacts can potentially occur during trenching work. This would involve machines digging linear trenches and would result in excavated material being accumulated. This material could be a source of uncontrolled contaminated runoff particularly if it were to be stockpiled near a sensitive

watercourse during a period of wet weather. The trenching works could also generate a significant amount of excavated material which is not suitable for backfilling and this would be a risk to adjoining watercourses if not stored and disposed of appropriately. Trenches can also become flooded (i.e. during a high rainfall event) and if this water was pumped under uncontrolled conditions into an adjoining sensitive watercourse then significant water quality impacts could be realised.

Trenching works at watercourses may potentially damage existing facilities present such as sewerage or other sub-ground drains resulting in contamination.

For off line cabling methods temporary diversions of watercourses may be required potentially affecting movement of aquatic species.

The use of construction equipment instream may result in potential contamination through fuel leaks, oil spillage.

Alternative trenchless techniques may result in indirect impacts downstream on designated sites. Although these are a less intrusive construction method than traditional open cut for crossing watercourses; there is the possibility of surface disturbance if a 'frac out' (inadvertent release of drilling fluid or a release of sediment laden groundwater) occurs into a watercourse.
There is also the potential for sediment laden water or other deleterious substances to enter a surface water feature as a result of grading, drilling excavations, equipment washing, or other construction related activities during boring.

Excavation of peat could lead to an increase in suspended solids in the surface water run-off and from exposed mineral soils.

Inappropriate site management of excavations could lead to loss of suspended solids to surface waters from uncontrolled run-off.

Spoil heaps from the excavations for the turbine bases will be stored temporarily; if left exposed, this could lead to an increase in silt-laden run-off draining off site.

Run-off from the borrow pit areas could be silt laden, with the risk of draining into adjacent streams, given the exposed nature of the borrow pit areas due to the excavation and haulage of stone from the area.

A blockage in the proposed roadside drains could allow a break out of silt laden run-off to reach adjacent watercourses or streams.

Works to structures such as bridges and culverts along turbine delivery and cable routes may result in pollution events from accidental spillages or runoff of sediments and/or stone debris.

Ballynafagh Lake cSAC, which includes the Blackwood Feeder to the Grand Canal does have a hydrological connection to the development as part of the site overlaps the canal at their confluence. Proposed works in or near the canal, upstream of the site therefore have the potential to impact indirectly on lands within the cSAC boundary. It should be noted however that these waters are within the free flowing section of the Grand Canal , are separated from the feeder and are not suitable habitat for any of the conservation interests of the Ballynafagh Lake cSAC (Marsh Fritillary or Desmoulins Whorl Snail) nor do they constitute habitats for which the site has been selected (Alkaline Fens).

Ballnafagh Bog cSAC, Mount Hevey Bog cSAC, Mouds Bog cSAC, Pollardstown Fen cSAC and the Long Derries cSAC are located either upstream from the subject site or are unconnected hydrologically. No likely impacts by virtue of excavation or resource requirements are predicted.

Emission (disposal to land, water or air)

As the proposed site is not located within the boundary of any Natura 2000 site, no direct impacts by way of emission (disposal to land, water or air) are predicted.

There are downstream hydrological links between the proposed development and the River Boyne and River Blackwater cSAC and the River Boyne and River Blackwater SPA, in addition to the River Barrow and River Nore cSAC and the Rye Water/Carton cSAC.

Indirect impacts which may potentially arise via emission (disposal to land, water or air) from the proposed project on these sites are:

Accidental spillage of cement or hydrocarbons used on site impacting upon water quality.

Eutrophication due to uncontrolled run-off entering the River Blackwater and tributaries during construction works.

Effluent from on-site welfare and canteen facilities could also potentially impact on aquatic ecology downstream in designated sites.

Indirect water quality impacts can potentially occur during MV and HV cabling trenching work. This would involve machines digging linear trenches which could result in excavated material being accumulated or temporarily stockpiled. This material could be a source of contaminated runoff particularly if it were to be stockpiled near a sensitive watercourse during a period of wet weather. The trenching works could also generate a significant amount of waste material if not suitable for backfilling and this would be a risk to adjoining watercourses if not stored and disposed of appropriately.
Trenches can also become flooded (i.e. during a high rainfall event) and if this water was pumped into an adjoining sensitive watercourse in an uncontrolled manner then significant water quality impacts could be realised.

Alternative trenchless techniques which involve drilling may result in indirect impacts downstream on designated sites. Although trenchless techniques are a less intrusive construction method than traditional open cut for crossing watercourses; there is the possibility of surface disturbance if a 'frac out' (inadvertent release of drilling fluid or a release of sediment laden groundwater) occurs into a watercourse. There is also the potential for sediment laden water or other deleterious substances to enter a surface water feature as the result of grading, drilling excavations, equipment washing, or other construction related activities during boring.

Wet concrete operations could lead to contamination of receiving waters.

Refuelling activities could result in fuel spillages which may affect downstream sites.

There is a potential risk of some hydrocarbons polluting the watercourses following run-off from the impermeable trafficked areas.

During the operation phase of the wind farm, small quantities of oil will be used in cooling the transformers. There is potential for small oil spills.

The possibility of increased public access may result in the potential for pollution events via dumping which may impact downstream aquatic ecology. As most of the proposed wind farm is in private, actively farmed land which will have to be secured post construction, the likelihood of this is considered extremely low.

Any potential pollution events and resultant fish population changes may affect prey availability for Otter. Pollution events may also result in increased pollutant burden for downstream Otter populations. Otter are listed as a qualifying interest of the River Boyne and River Blackwater cSAC. As described in Section 4.1.6 Otter have also been recorded historically in the 10km grid squares N87, N88, N77 in which the proposed site is located. Signs of Otter (spraints and slides) were also found within the proposed development site.

Ballynafagh Lake cSAC, which includes the Blackwood Feeder to the Grand Canal does have a hydrological connection to the development as part of the site overlaps the canal at their confluence. Proposed works in or near the canal, upstream of the site therefore have the potential to impact indirectly on lands within the cSAC boundary. It should be noted however that these waters are within the free flowing section of the Grand Canal , are separated from the feeder and are not suitable habitat for any of the conservation interests of the Ballynafagh Lake cSAC (Marsh Fritillary or Desmoulins Whorl Snail) nor do they constitute habitats for which the site has been selected (Alkaline Fens).
It can therefore, be concluded with certainty that, in light of the conservation objectives of the site, no significant impacts will occur by virtue of emissions.

Ballnafagh Bog cSAC, Mount Hevey Bog cSAC, Mouds Bog cSAC, Pollardstown Fen cSAC and the Long Derries cSAC are located either upstream from the subject site or are unconnected hydrologically.

No likely impacts via emission are predicted on these sites.

Transportation requirements

As the proposed site is not located within the boundary of any Natura 2000 site, no direct impacts by way of transportation requirements are predicted.

There are downstream hydrological links between the proposed development and the River Boyne and River Blackwater cSAC and the River Boyne and River Blackwater SPA, in addition to the River Barrow and River Nore cSAC and the Rye Water/Carton cSAC.

Indirect impacts which may potentially result from transportation requirements from the proposed project on these sites are:

Refuelling activities could result in fuel spillages which may affect downstream sites.

Crushing of stone in access tracks by heavy vehicles, creates fines and consequent oozing of soluble material in very wet weather out from the tracks and into the drainage network.

Silt/mud carried on the wheels of vehicles leaving the site could be carried onto the public road and subsequently into the existing roadside drainage network.

There is a risk that machinery or materials brought onto the site could act as a vector for introducing or dispersing non-native invasive species. As described in Section 4.1.3 and shown on Table 4.3, a number of invasive plant species have been found in the 10km grid squares (N87, N88, N77 and N78) within which the wind farm site occurs.

Ballynafagh Lake cSAC, which includes the Blackwood Feeder to the Grand Canal does have a hydrological connection to the development as part of the site overlaps the canal at their confluence. Proposed works in or near the canal, upstream of the site therefore have the potential to impact indirectly on lands within the cSAC boundary. It should be noted however that these waters are within the free flowing section of the Grand Canal , are separated from the feeder and are not suitable habitat for any of the conservation interests of the Ballynafagh Lake cSAC (Marsh Fritillary or Desmoulins Whorl Snail) nor do they constitute habitats for which the site has been selected (Alkaline Fens). It can therefore, be concluded with certainty that, in light of the conservation objectives of the site, no significant impacts will occur by virtue of transportation requirements.

Ballnafagh Bog cSAC, Mount Hevey Bog cSAC, Mouds Bog cSAC, Pollardstown Fen cSAC and the Long Derries cSAC are located either upstream from the subject site or are unconnected hydrologically. Haulage routes for materials do not utilise roadways adjacent to these sites. Turbine deliveries will utilise the M4 motorway as close as 1.5km to Rye Water/Carton cSAC however predicted emissions for turbine deliveries are assessed as not significant.

Duration of construction, operation, decommissioning

Duration of Construction is anticipated to be 23 months, duration of operation 30 years and duration of decommissioning 12 months.

Disturbance and displacement

There will not be any direct disturbance or displacement impacts on any Natura 2000 site as a result of the proposed development, due to the distance of the development site from the Natura 2000 sites.

There are downstream hydrological links between the proposed development and the River Boyne and River Blackwater cSAC and the River Boyne and River Blackwater SPA, in addition to the River Barrow and River Nore cSAC and the Rye Water/Carton cSAC.

Potential indirect impacts which may result from disturbance and displacement from the proposed project on these sites are:

Engineering works in the vicinity of streams and at stream crossings could impact directly on physical habitat, for example the spawning or nursery areas of fish. Permanent loss of aquatic habitats can also occur where access roads are constructed over or in close proximity to streams/rivers or where streams/rivers are permanently diverted to new channels. Disturbance or displacement of upstream moving fish, particularly salmon and trout, due to construction of culverts can also potentially occur.

Engineering works at bridges or streams could impact on breeding or resting sites of Otter; which although outside the boundary of the designated site could be population sources for the River Blackwater population and those present in tributary rivers of the Barrow such as the Barrow and Figile. Disturbance to Otters, even animals from which may forage upstream towards the subject site, is unlikely as most foraging takes place at night. In addition, unpublished observations by Kruuk (published in [137]) and colleagues indicate that Otters will rest under roads, in industrial buildings, close to quarries, and at other sites close to high levels of human activity. These observations clearly indicate that Otters are very flexible in their use of resting sites and do not necessarily avoid 'disturbance' in terms of noise or proximity to human activity.

Ballynafagh Lake cSAC, which includes the Blackwood Feeder to the Grand Canal does have a hydrological connection to the development as part of the site overlaps the canal at their confluence. Proposed works in or near the canal, upstream of the site therefore have the potential to impact indirectly on lands within the cSAC boundary. It should be noted however that these waters are within the free flowing section of the Grand Canal , are separated from the feeder and are not suitable habitat for any of the conservation interests of the Ballynafagh Lake cSAC (Marsh Fritillary or Desmoulins Whorl Snail) nor do they constitute habitats for which the site has been selected (Alkaline Fens). It can therefore, be concluded with certainty that, in light of the conservation objectives of the site, no significant impacts will occur by virtue of disturbance or displacement.

Ballnafagh Bog cSAC, Mount Hevey Bog cSAC, Mouds Bog cSAC, Pollardstown Fen cSAC and the Long Derries cSAC are located either upstream from the subject site or are unconnected hydrologically. Due to distance and lack of hydrological connection no significant impacts will occur by virtue of disturbance or displacement.

Cumulative and In-Combination Effects

Cumulative or in-combination impacts may occur if there are effects which occur as the result of the likely effects of the proposed development interacting with the impacts of other plans or projects in the relevant locality.. To inform the current appraisal, planning searches were carried out on the relevant planning authority webpages. Planning searches and a review of the IWEA webpage were also utilised to search for other wind farm developments in the area.

Existing or Proposed Wind farms
The following existing/planned wind farms within 15km of the proposed development were examined for potential cumulative impacts on water quality and avifauna with the proposed development (Emlagh wind farm is being considered following a request from NPWS for inclusion):

1. Crowinstown Wind Farm, a 3 turbine permitted wind farm at Delvin, Co. Westmeath
2. Dryderstown Wind Farm, a 1 turbine wind permitted farm at Delvin, Co. Westmeath
3. Mountlucas Wind Farm, a 28 turbine existing wind farm at Derrylesk, Co. Offaly
4. Yellowriver Wind Farm, a 32 turbine permitted wind farm at Rhode, co. Offaly.
5. Emlagh Wind Farm, a proposed 46 turbine wind farm near Kells County Meath (c.35km from the subject site)

The existing wind farms outlined above are not located within any of the same waterbody catchments as the proposed Maighne Wind Farm development. The potential cumulative impact on water quality is therefore considered to be nil as there is no cumulative risk of an increase in sediment to waterbodies.

Flight height or the flight heights which birds habitually use along either migration or local flight paths is an influencing factor in determining whether the proposed development will combine with additional wind farms to produce additive, synergistic or antagonistic effects.

These effects include increased Barrier Effect (potentially obstructing migratory flightpaths), increased collision risk (through combined mortality in species susceptible) and increased disturbance to birds utilising foraging grounds whilst on migration, and are considered further below.

In combination Collision Risk to Whooper Swans:

In a study of on the migration routes of Whooper Swans and geese in relation to wind farm footprints in the UK [138]; the mean recorded flight height for Whooper Swan migration over land was 80m ±134m, at ground speeds of 63kph ±16kph (n=226). Median flight height (i.e. the most frequently recorded altitude of flight) over land during migration was 40m in spring and 6m in autumn; 40m overall. Local movements are often likely to occur at lower heights depending on topography. This is reflected in the flight observations from the study site which recorded the highest proportion of flight activity at the <50m height interval. Predicted mortality rates (within a worst case scenario model) from the proposed Emlagh wind farm are c.1 bird per annum. It should be noted that this is located c.35km from the proposed Maighne wind farm.

In relation to nocturnal flight activity recent studies utilising radar on both offshore and coastal wind farms in Europe have recorded macro-avoidance rates in wildfowl at least as high, or higher at night than during the day, implying that diurnal avoidance rates are comparable to those in periods of lower visibility [139]. Best scientific knowledge therefore suggests comparable if not higher avoidance rates by wildfowl during perceived periods of poor visibility.

A population model has already been described for Whooper Swan in relation to predicting the population level effects of elevated mortality resulting from wind turbine collisions. This model, produced by SNH [140], is based on the same breeding population as the birds found in Ireland and is therefore comparable (note the population simulations were run on the assumption of survival rates for the Scottish population and a closed population model with no immigration or emigration). The model predicts that 4% of the population has to be removed annually to cause a population decline.

Applying this rate of population removal to the Irish wintering population (10520 birds [65]) results in 420 individuals having to be removed on an annual basis to cause population decline. Given the low frequency of occurrence of this species at the Maighne Wind Farm Development and low numbers recorded, the predicted in combination mortality from collision both at the other wind farms, the proposed N-S interconnector, and other sources such as overhead wires is appraised as negligible given the distances involved from the proposed Maighne site, the high avoidance rates of wind farms and turbines by Whooper Swans and low numbers of birds utilising the Maighne site.

In combination Barrier Effect
The proposed Maighne Wind Farm development does have the potential to combine with other wind farms in an additive manner although this is unlikely to be synergistic. Distance is important to note in this regard and the proposed Emlagh wind farm is c.35km from the proposed Maighne wind farm. The main effect of Barriers on birds is resulting energy expenditure (as a result of having to circumvent obstacles) and it has been suggested that multiple wind farms along migration routes may result in energy expenditure rates sufficient to affect breeding success (i.e. through loss of body condition) [141] It should be noted, in relation to the energetic capacity of swans for example, that Whooper Swans can make the crossing from Ireland to Iceland, a distance of 800-1200km, in 1.5days [138]. Therefore the relative increase in energy expenditure and fuel loss through flying over or through an obstacle is important. In the case of the Maighne wind farm the dispersed nature of the clusters will serve to reduce energy expenditure through the provision of transit corridors between clusters. This also applies to other species of migrating wildfowl such as Geese. Swans have been shown to exhibit both macro and micro avoidance of turbines; in one study in the Netherlands swans were noted flying through windfarms [142] suggesting that in instances where the predicted rotor envelope is above typical flight heights, swans are not deterred from commuting through wind farms.

Any in combination collision risk due to the barrier effect of these wind farms is appraised as negligible.

Land Use:
Construction of the proposed wind farm poses a potential risk to watercourses in terms of alteration of drainage regimes, silt run-off and pollution events originating from site works which gives rise to the potential for impacts affecting fish and fisheries, as well as aquatic invertebrate communities within the study area. Further enrichment from land use patterns could give rise to the potential for cumulative

indirect impacts on the aquatic environment, including the downstream designated sites.

Bord na Móna carries out peat extraction in the vicinity of the Derrybrennan cluster, the Drehid-Hortland cluster and the Cloncumber cluster. Bord na Móna turf extraction works traverse access points into the Derrybrennan and Cloncumber clusters.
Whereas a small portion of the bogs owned by Bord na Móna traverse the study area of the Drehid-Hortland cluster. Silt protection controls in the area will mitigate any potential impacts of sediment discharges to watercourses. A peat milling operation is in place at Windmill (Clairstone Ltd).

Turbary rights in the townlands of Mulgeeth and Allenwood South are located outside the site boundary, with no turbary access within the proposed development site boundary. However, there are turbary rights within the Drehid and Hortland clusters.

Turbary rights in the Hortland townland are located in close proximity to turbine 9. Turbary rights within the Drehid cluster site boundary are located with the Drehid townland. They form part of the Drehid House estate and are located close to turbines 9 and 11.

Recreational Pressure:
The general area is drained by a series of rivers and streams, many of which are important for angling and water sports, including the Blackwater and its tributaries, and the canals present.

Infrastructure:

The Cork – Dublin high pressure gas transmission pipeline runs through counties Kildare and Meath. Responsibility of the gas pipeline infrastructure lies with Bórd Gáis Eireann. There are currently no existing high pressure gas transmission pipelines with the study area of the proposed Maighne Wind Farm. According the Commission of Energy Regulation there are no pipeline planned or under construction within the site boundary of this proposed development.[2]

The Leinster Orbital Route (LOR), previously known as the Dublin Outer Orbital Route (DOOR), is a proposed motorway around the County of Dublin. The orbital route proposes to connect Drogheda, Navan and Naas with links to the N2, M3 and M4/M7.

A Corridor Protection Study was issued to Meath and Kildare County Councils to identify zones along the key radial routes from Dublin where junctions with the proposed LOR may be constructed in future in order to protect areas from development which could compromise the deliverability of the proposed scheme.[3] The feasibility study for the proposed LOR has been undertaken, however no route corridor selection or preliminary design has been undertaken or progressed. It is not anticipated that this project will commence in the near future.

Factories and other Businesses:
There are a number of industries in the vicinity of the proposed Maighne Wind Farm development, namely Carbury Compost Ltd, Bord na Móna Drehid Waste Management Facility, Allenwood Business Park, Monaghan Mushrooms, Clairstone Ltd, Moyvalley Meats, Brady's Family Ham, Doran Nurseries and Irish Industrial Explosives Ltd. These were examined for potential cumulative impacts on water quality.

Carbury Compost Ltd is located south of Derrinturn, off the R403 and is approximately 3.1 km from the nearest turbine no. 27 in the Derrybrennan cluster. Carbury Compost Ltd produces mushroom substrate (compost) at its facility.

This facility is registered and licensed by the Environment Protection Agency (EPA) under Waste Licence Registration No. W0124-01. It is located in the same waterbody catchment as turbine no. 27 in the Derrybrennan cluster and is upstream of the cluster. Any drainage from the mushroom compost facility would drain to a different tributary of the Cushaling River. There is an EPA monitoring point downstream of the compost facility and upstream of the cluster.

[2] http://www.cer.ie/
[3]http://kildare.ie/CountyCouncil/Planning/DevelopmentPlans/LocalAreaPlans/NewbridgeLAP2013-2019/SubmissionstoDraftLAP/21%20NRA.pdf

Drehid Waste Management Facility is located within the townlands of Parsontown, Loughnacush, Kilkeaskin, Drumond, Timahoe West, Coolcarrigan, Killinagh Lower and Killnagh Upper and Carbury in County Kildare. It is owned and operated by Bord na Móna plc. This facility is registered and licensed by the EPA under an Industrial Emissions Licence Register No. W0201-03. This facility is located between the Drehid-Hortland cluster and the Derrybrennan cluster. It is approximately 1.8km from the nearest turbine T48. It is in the same waterbody catchment as turbine T27 and Carbury Compost Ltd. The MV cable route also runs through this catchment. There are two monitoring points located upstream of the Derrybrennan cluster and downstream of the Drehid waste management facility.

The licensees are required to monitor groundwater and surface water up and down stream of their facilities and in addition Drehid landfill has attenuation to mitigate the potential impact of sediment on nearby watercourses. The potential cumulative impact on water quality is therefore considered to be negligible.

Allenwood Business Park is situated northeast of Allenwood village and is north of the Cloncumber cluster. Allenwood Business Park is located approximately 2.5km from the nearest turbine (T30). It is located in the same waterbody catchment as turbine T30, T29 and T31.

Any drainage from the business park is combined with other surface water flows in the area. The potential cumulative impact on water quality is therefore considered to be negligible.

Monaghan Mushrooms, Moyvalley Meats and Clairstone Ltd. are all located in the vicinity of the Windmill cluster. Monaghan Mushrooms merged with Carbury Mushrooms in 2004[4]. Their facility is located in Carbury village at Carbury Farm. There are no turbines in this catchment but two short sections of the MV cable route run through it. The cable route is approximately 2.5 km upstream of Carbury Farm.

Moyvalley Meats is located off the L5005, in Taneragee, and is approximately 2.1km north of the nearest turbine T24 in the Windmill cluster. Moyvalley Meats is licensed by the EPA under an Industrial Emissions Licence Register No. P0192-02. Clairstone Ltd. gravel pit is located to the north of the Windmill cluster and is approximately 0.9 km to turbine T25. Both Moyvalley Meats and Clairestone Ltd. are located in the same waterbody catchment as the turbines in the Windmill cluster. The turbines are upstream of the two industrial sites. There is a monitoring point downstream of the cluster and upstream of the industrial sites and there is a further 2 monitoring points within a short distance downstream of the industrial facilities. Moyvalley Meats operates as an IPC licensed facility and has discharges limits, for its onsite WWTP. The potential cumulative impact on water quality is therefore considered to be negligible.

Brady's Family Ham, together with Doran's Nurseries next door, are located approximately 1.2km north of the Timahoe Cross Roads between the townlands of Coologmartin, Derryvarroge and Timahoe. Brady's Family Ham produces traditional Deli ham. It is located approximately 2.2km from its nearest turbine (T40 in the Drehid-Hortland cluster). Doran's Nurseries, which is one of Ireland's leading nurseries dedicated to providing their customers with a wide range of heathers. Neither of these facilities is located in the same waterbody catchment as any turbines or the MV Cable Route. The potential cumulative impact on water quality is therefore considered to be negligible.

Irish Industrial Explosives Ltd is located in the townland of Clonagh, Co. Kildare and operates under an IPC Licence from the EPA, Licence Register No. P0055-01. It is situated adjacent to the Drehid-Hortland cluster but not within any of the cluster boundaries. It is located approximately 0.9km west of T46. It is in the same waterbody catchment as 8 of the turbines in this cluster along with a short section of the MV cable route. The turbines are all located upstream of the facility. As an IPC licence holder, the licensee is required to carry out regular monitoring of surface water and groundwater in the environment. These controls coupled with the proposed mitigation measures for the operation of the windfarm mean that the cumulative impacts on water quality are considered to be negligible.

[4] https://www.monaghan-mushrooms.com

5.3.3 Description of the likely changes to the site

'Describe any likely changes to the site arising as a result of:

- *reduction of habitat area*
- *disturbance to key species*
- *habitat or species fragmentation*
- *reduction in species density*
- *changes in key indicators of conservation value (water quality etc.)'*

Reduction in habitat area

No direct reduction in habitat area from the sites under consideration is predicted. There is a potential for a decline in water quality at the River Boyne and River Blackwater cSAC, the River Boyne and River Blackwater SPA, the River Barrow and Nore cSAC, the Rye Water/Carton cSAC and Ballynafagh Lake cSAC as a result of the proposed development. This indirect impact could potentially represent effective habitat loss for aquatic species that require good water quality (e.g. Atlantic Salmon). Indirect impacts on water quality within the Rye Water/Carton cSAC may result in effective habitat loss for species such as *Vertigo angustior* and *Vertigo moulinsiana* should marsh vegetation supporting same be affected by changes in water quality, although these species are located at Louisa Bridge, c12.km from any proposed works. Petrifying Spring habitats, where hard waters reach the surface and form deposit formations known as tufa, are based on mineral springs and will not be affected due to distance (c.12km) from the upstream works (a trenchless crossing of the Rye Water west of Kilcock) and by virtue of draining downwards to the Rye Water.

Ballnafagh Bog cSAC, Mount Hevey Bog cSAC, Mouds Bog cSAC, Pollardstown Fen cSAC and the Long Derries cSAC are located either upstream from the subject site or are unconnected hydrologically. Due to the distances and the absence or upstream nature of hydrological links, there will be no reduction in habitat area at these sites as a result of the proposed development.

Disturbance to key species

No direct disturbance to aquatic species within the River Boyne and River Blackwater cSAC, the River Boyne and River Blackwater SPA, the River Barrow and Nore cSAC, the Rye Water/Carton cSAC and Ballynafagh Lake cSAC is predicted. In relation to Otter, animals which may forage upstream of the River Blackwater, River Barrow and River Nore cSAC could possibly encounter disturbance should construction works occur at a stream crossing. However disturbance to Otters, even animals which may forage upstream towards the subject site, is unlikely as most foraging takes place at night. In addition, unpublished observations by Kruuk (published in [137]) and colleagues indicate that Otters will rest under roads, in industrial buildings, close to quarries, and at other sites close to high levels of human activity. The proposed development will not have an appreciable effect on Otters in the River Blackwater, River Barrow and River Nore cSACs. Indirect disturbance on spawning salmonids upstream of River Boyne and River Blackwater cSAC / SPA, the River Barrow and River Nore cSAC and the Rye Water/Carton cSAC may occur due to works at bridges and/or culverts. No disturbance is predicted on species of *Vertigo* snail found within the Rye Water/Carton cSAC at Louisa Bridge. No disturbance is predicted on Marsh Fritillary at Ballynafagh Lake cSAC due to distance from the proposed development. No disturbance is predicted on Kingfisher within the River Boyne and Blackwater cSAC.

No disturbance is predicted on either form of *Margaritifera (*Freshwater pearl mussel) within the River Barrow and River Nore cSAC as the Freshwater Pearl Mussel does not occur in the study area or in the immediate downstream areas. Tributaries of the Barrow, Nore and Suir River were examined for freshwater pearl mussels *Margaritifera margaritifera* and *M. m. Durrovensis* from June to August 1991 (Moorkens *et al.,* 1992 [79]). Rivers surveyed included the Figile, Cushina, Lerr and Greese in the upper Barrow catchment. Of the 79 rivers surveyed, only four were found to have living freshwater pearl mussels. Two of these rivers were in the Barrow catchment: the Mountain River and the Ballymurphy River. In the 1991 study (Moorkens *et al.,* 1992 [79]), mussels were found in sandy gravel towards the river banks, and under overhanging trees.

It is noted in Moorkens *et al.* (1992 [79]) that alteration in a river's flow regime, such as that caused by drainage for forestry or agriculture, may result in summer flows being insufficient to support Freshwater Pearl Mussel. The same can be said of drainage carried out for harvesting of peat.

A large proportion of rivers in the study area have soft substrates deemed unsuitable for FPM, beds of these rivers thought to be influenced by peat runoff from peat harvesting, suspended solids from ploughed lands and diffuse enrichment from agricultural activities, all known pressures on FPM (Moorkens, 1999 [80]).

There are three *Margaritifera margaritifera* populations in the Barrow catchment within the River Barrow and River Nore cSAC (002162). These mussels are present in the Mountain, Ballymurphy and Aughavaud Rivers and are in excess of 65km to the south of the Cloncumber cluster. No significant impacts are therefore predicted due to disturbance.

Although not listed as a conservation interest for the River Boyne and River Blackwater cSAC, Whooper Swans are described in the site synopsis for said site as occurring within the greater area. Potential impacts on this species are as follows (Note these have also been assessed in the accompanying EIS).

Disturbance/Displacement to Whooper Swans: Potential disturbance includes disturbance from feeding sites should the construction period overlap the wintering period (Oct-March) and availability of food resources (e.g. potatoes). Effective habitat loss may occur should birds be displaced from foraging areas due to disturbance during construction.

Collision Risk to Whooper Swans: During the operational phase of the proposed development, the potential for mortality due to collision with moving rotors/turbine exists.

Barrier Effect on Whooper Swans: Birds and their flight paths may be potentially affected through avoidance of the wind farm footprint, causing increased energy expenditure.

Ballnafagh Bog cSAC, Mount Hevey Bog cSAC, Mouds Bog cSAC, Pollardstown Fen cSAC and the Long Derries cSAC are located either upstream from the proposed development or are unconnected hydrologically. Due to the distances the absence or upstream nature of hydrological links, there will be no effects on these sites as a result of the proposed development. No disturbance to *Vertigo* snails at Pollardstown fen is predicted due to distance from the proposed development and the upstream nature of its hydrological connection.

Habitat or species fragmentation

No habitat or species fragmentation is expected. No significant impact or likely changes to any Natura 2000 site are predicted. The dispersed nature of the clusters and lack of Marsh Fritillary habitat on site will ensure no ex-situ impacts on Marsh Fritillaries from Ballynafagh Lake cSAC in the event of dispersive movements.

No habitat or species fragmentation is predicted on either form of *Margaritifera (*Freshwater pearl mussel) within the River Barrow and River Nore cSAC as the Freshwater Pearl Mussel does not occur in the study area or in downstream areas.

There are two types of barrier effect; those to migrating birds along migration routes and daily barrier effects due to placement of turbines between feeding and roosting sites. Barrier effect can be related to perceived collision risk [143]. Barrier effects along migration routes of wildfowl have been shown to cause only small effects on total migration distance [141].

Swans have been shown to exhibit horizontal avoidance as they fly past the outer edge of wind farms [142] and distances of up to 200m have been noted for whooper swans. In the Netherlands, Bewicks Swans have been recorded adjusting their flight paths to the presence of turbines during both light and darkness, with no large deflections or panic reactions recorded and birds were recorded flying around and between rows of turbines [142]. Distances between turbines at the referenced site (300-400m) [142] are comparable to those at Maighne (350-500m) with the dispersed nature of clusters increasing this further.

In relation to nocturnal flight activity recent studies utilising radar on both offshore and coastal wind farms in Europe have recorded macro-avoidance rates in wildfowl at least as high, or higher at night than during the day, implying that diurnal macro-avoidance rates are comparable to those in periods of lower visibility [139]. There are therefore no likely significant effects in respect of barrier effect.

Reduction in species density

A reduction in species density could potentially occur as a result of reduction in water quality. Aquatic species such as River Lamprey, Salmon and Otter may be potentially indirectly affected in the River Boyne and River Blackwater cSAC, the River Barrow and River Nore cSAC and the Rye Water/Carton cSAC. This is primarily based on indirect impacts such as increased turbidity due to discharges which would affect the foraging behaviour of aquatic species and hence result in impacts on body condition and reproductive success.

No reduction in species density is predicted on either form of *Margaritifera (*Freshwater pearl mussel) within the River Barrow and River Nore cSAC as the Freshwater Pearl Mussel does not occur in the study area or in downstream areas.

Semi-aquatic *Vertigo* snails at Louisa Bridge within the Rye Water/ Carton cSAC could be impacted should the marsh habitat within which they occur be damaged indirectly through pollution events/increased sedimentation. Given that the fen habitats within which they occur in this location drain downwards into the Rye Water this is not considered significant.

Studies on wintering swans have found low levels of collision mortality, even in sites with a high degree of transit flights (n=1664 in one case) through the operational wind farm and relatively high numbers (>500) of birds regularly present [142]. Recommended avoidance rates from SNH are 98% [144], based on literature reviews of recorded fatalities; this suggests a high micro-avoidance of turbines.

A population model has been described for Whooper Swan [140] in relation to predicting the population level effects of elevated mortality resulting from wind turbine collisions. This model, produced by SNH, is based on the same breeding population as the birds found in Ireland and is therefore comparable (note the population simulations were run on the assumption of survival rates for the Scottish population and a closed population model with no immigration or emigration). The model predicts that 4% of the population has to be removed annually to cause a population decline. Applying this rate of population removal to the Irish wintering population (10520 birds [65]) results in 420 individuals having to be removed on an annual basis to cause population decline. Although this is considered unlikely on a precautionary basis impacts via collision mortality are not screened out.

There could be an indirect reduction in key species at the River Boyne and River Blackwater SPA as a result of an increase in turbidity due to discharges, which would make hunting more difficult for Kingfisher, or a reduction in Kingfisher prey species as a result of increased turbidity; affecting in turn reproductive rates.

Ballnafagh Bog cSAC, Mount Hevey Bog cSAC, Mouds Bog cSAC, Pollardstown Fen cSAC and the Long Derries cSAC are located either upstream from the subject site or are unconnected hydrologically. No significant reduction in species density is predicted as a result of the proposed development.

Changes in key indicators of conservation value

The key indicators of conservation value for the River Boyne and River Blackwater cSAC would be a reduction in the numbers of the following:

1. Atlantic Salmon
2. River Lamprey
3. Otter.

The key indicators of conservation value for the River Boyne and River Blackwater SPA would be a reduction in the number of breeding pairs of Kingfisher at the site or reductions in the number of successfully fledged young due to a reduction in foraging resources for adults.

The key indicators of conservation value for the River Barrow and River Nore cSAC would be a reduction in the numbers of the following:

1. Atlantic Salmon
2. River Lamprey
3. Otter
4. White Clawed Crayfish
5. Freshwater Pearl Mussel
6. Nore Freshwater Pearl Mussel
7. Floating River Vegetation
8. Other aquatic habitats and species occurring downstream for which the site is designated.

The key indicators of conservation value for the River Boyne and River Blackwater SPA would be a reduction in the number of breeding pairs of Kingfisher at the site (the River Boyne and Blackwater SPA) or reductions in the number of successfully fledged young due to a reduction in foraging resources for adults.

The key indicators of conservation value for the Rye Water/Carton cSAC would be a reduction in the following:

1. Population numbers of Vertigo Snails for which the site is designated
2. Habitat area of Petrifying Springs for which the site is designated.

The key indicators of conservation value for Ballynafagh Lake cSAC would be a reduction in the following:

1. Habitat area of Alkaline fens for which the site is designated
2. Population decrease in Marsh Fritillary for which the site is designated
3. Population decrease in Vertigo Snails for which the site is designated.

Ballnafagh Bog cSAC, Mount Hevey Bog cSAC, Mouds Bog cSAC, Pollardstown Fen cSAC and the Long Derries cSAC are located either upstream from the subject site or are unconnected hydrologically. No significant reduction in key indicators of conservation value is predicted as a result of the proposed development.

5.3.4 The likely impacts on the European site as a whole

'Describe any likely impacts on the Natura 2000 site as a whole in terms of:

- *Interference with the key relationships that define the structure of the site;*
- *Interference with key relationships that define the function of the site.'*

No direct impacts are predicted on any Natura 2000 site as a result of the proposed development. In the hypothetical scenario of a large release of suspended solids or silt into onsite watercourses during construction works, there could be significant indirect impacts downstream of the development area. As the River Boyne and River Blackwater cSAC, the River Boyne and River Blackwater SPA, the River Barrow and River Nore cSAC, the Rye Water/Carton cSAC and Ballynafagh Lake cSAC are downstream of the development area, there could be indirect impacts, via water quality, on the key species and key habitats for which these Natura 2000 sites have been designated. In the event of siltation or pollution of watercourses resulting from uncontrolled run-off from the Maighne Wind Farm development, the aquatic habitats and species of these sites could be indirectly damaged by changes to water turbidity and water quality. This could in turn reduce prey availability of breeding Kingfisher in the River Boyne and River Blackwater SPA, densities of Vertigo snails within the Rye Water/Carton cSAC and Ballynafagh Lake cSAC or reduce the habitat area of Petrifying springs at Rye Water/Carton cSAC. Although not expected to be likely to occur, impacts on *Vertigo* snails/Petrifying springs within the Rye Water /Carton cSAC cannot be screened out following the precautionary principle.

Due to the downstream hydrological connection to Ballynafagh Lake cSAC where it joins the Grand Canal, and both the proximity of borrow pits to the Grand Canal at Cloncumber and upstream works at the canal crossing at Derrybrennan, potential impacts on this site are not screened out on a precautionary basis. Although not a conservation interest for the River Boyne and River Blackwater cSAC, potential impacts on Whooper Swan via collision risk are not screened out. Therefore, the possibility of there being a significant impact on these sites cannot be screened out and hence an appropriate assessment must be undertaken by An Bord Pleanála on the implication of the proposed development for the conservation objective of these European sites.

There will not be any impacts on the key relationships that define the structure or function of the remaining sites considered (Ballnafagh Bog cSAC, Mount Hevey Bog cSAC, Mouds Bog cSAC, Pollardstown Fen cSAC and the Long Derries cSAC).

5.3.5 Indicators of Significance of Potential Impacts

'Provide indicators of significance as a result of the identification of effects set out above in terms of:

- *loss*
- *fragmentation*
- *disruption*
- *disturbance*
- *change to key elements of the site (e.g. water quality etc.)'*

In circumstances where the possibility of there being a significant effect or effects exists only in relation to the River Boyne and River Blackwater SPA , the River Boyne and River Blackwater cSAC, Ballynafagh Lake cSAC and the Rye Water/ Carton cSAC, then only the significance of those potential impacts is considered.

Table 5.3: Indicators of Significance of the Potential Impacts

Potential Impact	Significance indicator
1. Reduction in prey densities for Kingfisher as a result of changes in water quality (key element of site) in the River Boyne and River Blackwater SPA 2. Reduction in water quality (key element of site) and foraging potential for aquatic species such as River Lamprey, Atlantic Salmon and Otter in the River Boyne and River Blackwater cSAC 3. Reduction in water quality (key element of site) and foraging potential for aquatic species such as River Lamprey, Atlantic Salmon and Otter in the River Barrow and River Nore cSAC 4. Reduction in water quality (key element of site) and consequent impacts on *Vertigo* snails within the Rye Water/Carton cSAC; reduction in water quality of portion of canal which is overlapped by site boundary. 5. Reduction in water quality (key element of site) and consequent reduction in area or Petrifying springs habitat in Rye Water/Carton cSAC. 6. Reduction in water quality (key element of site) within portion of Ballynafagh Lake which overlaps Grand Canal. 7. Collision mortality of Whooper Swans	1. Decline in breeding numbers or lower reproductive success of Kingfisher 2. Reduced numbers or reduced breeding success of River Lamprey, Atlantic Salmon or Otter 3. Reduced numbers or reduced breeding success of aquatic species such as River Lamprey, Atlantic Salmon or Otter 4. Reduced numbers of Vertigo snails 5. Reduced area of Petrifying Springs Habitat 6. No predicted impacts on conservation interests due to location of overlap being unsuitable habitat, included on a precautionary basis. 7. Reduction in numbers of Whooper Swans within the River Boyne and Blackwater cSAC as a result of ex-situ mortality.

5.3.6 The likely Significance of the Potential Impacts

'Describe from the above those elements of the project or plan, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts are not known.'

Sections 5.3.4 and 5.3.5 outline the indirect impacts on listed sites above which may be of potential significance.

5.4 Stage One Screening Conclusion

There is the possibility that there could be effects on the River Boyne and River Blackwater cSAC, the River Boyne and River Blackwater SPA, the River Barrow and River Nore cSAC, the Rye Water/Carton cSAC and Ballynafagh Lake cSAC as a result of indirect impacts from the proposed Maighne Wind Farm development (predicated on hydrological links). In the absence of mitigation measures (which have not been considered at this screening stage), these potential impacts could be of significance. As a result, there is an obligation on the competent authority to carry out an appropriate assessment (i.e., Stage Two of the AA process) and, in this context, a Natura Impact Statement has been completed by the developer in respect of the above sites (see Section 6).

No potential impacts on (Ballnafagh Bog cSAC, Mount Hevey Bog cSAC, Mouds Bog cSAC, Pollardstown Fen cSAC and the Long Derries cSAC were identified. Therefore these sites have been 'Screened Out' at Stage One of the AA process. In accordance with the recommendations of the guidance document, '*Assessment of Plans and Projects significantly affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*', European Commission, 2001 [(4)], a Finding of No Significant Effects Report has been recorded in respect of these completed for these Natura 2000 sites (see Appendix 2).

6 STAGE TWO – APPROPRIATE ASSESSMENT REPORT

This section of the Natura Impact Statement addresses the possibility of there being a significant effect or effects on five European sites which were identified during Stage One screening (Section 5):

1. River Boyne and River Blackwater cSAC (002299)
2. River Boyne and River Blackwater SPA (004232)
3. River Barrow and River Nore cSAC (002162)
4. Rye Water/Carton cSAC (001398)
5. Ballynafagh Lake cSAC (000391)

6.1 Assessment of the Effects of the Project or Plan on the Integrity of the Sites

'Describe the elements of the project or plan (alone or in combination with other projects or plans) that are likely to give rise to significant effects on the site (from screening assessment)'

Construction works associated with the proposed wind farm development have the potential to cause a decline in water quality in the sites identified above, with consequent negative impacts on the qualifying interests of these sites (see Section 5.3.2 above for further details).

Although not a conservation interest for the River Boyne and River Blackwater cSAC, potential ex-situ collision mortality of Whooper Swans is being considered.

6.2 The Conservation Objectives of the Natura 2000 Sites

'Set out the conservation objectives of the site'.

The conservation objectives of the European sites concerned are to maintain the favourable conservation status of the key species and habitats for which the sites have been designated. These are laid out in Table 6.1 below

Table 6.1: Key Species and Habitats for Natura 2000 Sites Potentially Impacted by the Development

Designated Site	Conservation Objectives
River Boyne and River Blackwater cSAC	Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and the Annex II species for which the cSAC has been selected: River Lamprey (*Lampetra fluviatilis*) Atlantic Salmon (*Salmo salar*) Otter (*Lutra lutra*) Alkaline fens Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)
The River Boyne and River Blackwater SPA	Objective: to maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:

Designated Site	Conservation Objectives
	Kingfisher (*Alcedo atthis)* [breeding]
The River Barrow and River Nore cSAC	Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and the Annex II species for which the cSAC has been selected: 1016 Desmoulin's whorl snail Vertigo moulinsiana 1029 Freshwater pearl mussel Margaritifera margaritifera 1092 White-clawed crayfish Austropotamobius pallipes 1095 Sea lamprey Petromyzon marinus 1096 Brook lamprey Lampetra planeri 1099 River lamprey Lampetra fluviatilis 1103 Twaite shad Alosa fallax 1106 Atlantic salmon (Salmo salar) (only in fresh water) 1130 Estuaries 1140 Mudflats and sandflats not covered by seawater at low tide 1310 Salicornia and other annuals colonizing mud and sand 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) 1355 Otter Lutra lutra 1410 Mediterranean salt meadows (Juncetalia maritimi) 1421 Killarney fern Trichomanes speciosum 1990 Nore freshwater pearl mussel Margaritifera durrovensis 3260 Water courses of plain to montane levels with the Ranunculion fluitan tis and Callitricho-Batrachion vegetation 4030 European dry heaths 6430 Hydrophilous tall herb fringe communities of plains and of the montan e to alpine levels 7220 * Petrifying springs with tufa formation (Cratoneurion) 91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles 91E0 * Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)
Rye Water/Carton cSAC	Objective: To maintain or restore the favourable conservation conditi on of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected: Vertigo angustior [1014] Vertigo moulinsiana [1016] * Petrifying springs with tufa formation (Cratoneurion) [7220]
Ballynafagh Lake cSAC	Objective: To maintain or restore the favourable conservation condition of the Annex I habita t(s) and/or the Annex II species for which the SAC has been selected: Vertigo moulinsiana [1016] Euphydryas (Eurodryas, Hypodryas) aurinia [1065] Alkaline fens [7230]

6.3 Potential Impacts on Key Species and Key Habitats

'Describe how the project or plan will affect key species and key habitats. Acknowledge uncertainties and any gaps in information'.

Stage 2 European Sites:

6. River Boyne and River Blackwater cSAC (002299)
7. River Boyne and River Blackwater SPA (004232)
8. River Barrow and River Nore cSAC (002162)
9. Rye Water/Carton cSAC (001398)
10. Ballynafagh Lake cSAC (000391)

No direct impacts are predicted on any Natura 2000 site as a result of the proposed development.

In the event of a large release of suspended solids and/or silt laden run-off into onsite watercourses during construction works, there is the potential for significant indirect impacts downstream of the development area. As the River Boyne and River Blackwater cSAC and the River Boyne and River Blackwater SPA are <1km downstream of the development area, there could be indirect impacts, via water quality, on the key species and key habitats for which these Natura 2000 sites have been designated. In the event of siltation or pollution of watercourses from the site, the aquatic habitats and species of the River Boyne and River Blackwater cSAC could be indirectly damaged by changes to water turbidity and water quality. This could in turn reduce prey availability of breeding Kingfisher in the River Boyne and River Blackwater SPA.

The Rye Water/Carton cSAC is c.7km from the proposed development at its closest and, whilst no direct impacts are predicted, potential impacts due to the trenchless crossing of the Rye Water on the HV route west of Kilcock may occur. It is unlikely that the conservation interests of the site will be affected due to their location and hydrological separation from the Rye Water, however they are included on a precautionary basis. Part of this site overlaps the Royal Canal at Louisa Bridge which is also crossed using trenchless techniques to the west of Kilcock.

Ballynafagh Lake cSAC overlaps the Grand Canal at the confluence of the canal and the Blackwood Feeder. The portion of the cSAC overlapping the canal is not suitable habitat for the conservation interests of the cSAC however is included on a precautionary basis due to works upstream of the canal.

The River Barrow and River Nore cSAC may be similarly impacted as the River Boyne and Blackwater cSAC in the event of a large release of sediment during construction although it should be noted that it is located a minimum of 13.5km downstream from the closest proposed works (crossing of River Slate on MV cable route at western side of Cloncumber cluster).

Collision mortality on Whooper Swans is considered and appraised on a precautionary basis in respect of the River Boyne and River Blackwater cSAC.

Collision Risk Assessment for Whooper Swans

Impacts on avifauna can be assessed following guidance in Percival 2007 [105]. As outlined previously, key avian receptors have been assigned an evaluation of importance (or sensitivity) for assessment. Following this the significance of potential impacts are rated as a product of both the magnitude of the predicted effect and the importance value (sensitivity) of the key receptor affected, based on the probability of the likely impact occurring. The criteria for defining Magnitude, Probability of Impact and consequent Significance as outlined in the above referenced guidance [105] are outlined overleaf in Tables 6.2-6.6.

Table 6.2: Definition of Terms Relating to Magnitude

Magnitude	Description
Very high	Total loss or very major alteration to key elements/ features of the baseline conditions such that the post development character/ composition/ attributes will be fundamentally changed and may be lost from the site altogether. *Guide: < 20% of population / habitat remains*
High	Major loss or major alteration to key elements/ features of the baseline (pre-development) conditions such that post development character/ composition/ attributes will be fundamentally changed. *Guide: 20-80% of population/ habitat lost*
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition/attributes of baseline will be partially changed. *Guide: 5-20% of population/ habitat lost*
Low	Minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of baseline condition will be similar to pre-development circumstances/patterns. *Guide: 1-5% of population/ habitat lost*
Negligible	Very slight change from baseline condition. Change barely distinguishable, approximating to the "no change" situation. *Guide: < 1% population/ habitat lost*

Table 6.3: Risk Classifications or Likelihood that an Impact will occur on a Three Point Scale from Low to Medium to High, from Percival 2007

Probability	Description	Comments
High	Impact is likely to occur (>50% likelihood)	Species known to be vulnerable to specific impact
Medium	Impact may occur (5-50% likelihood)	Species may be affected by specific impact
Low	Impact is very unlikely (<5% likelihood)	Species known to be tolerant to specific impact

Table 6.4: Significance Matrix for High Probability Impacts (species known to be vulnerable to specific impact [105])

Significance		Sensitivity			
		Very high	**High**	**Medium**	**Low**
Magnitude	**Very high**	Very high	Very high	High	Medium
	High	Very high	Very high	Medium	Low
	Medium	Very high	High	Low	Very low
	Low	Medium	Low	Low	Very low
	Negligible	Low	Very low	Very low	Very low

Table 6.5: Significance Matrix for Medium Probability Impacts (species may be affected by specific impact [105])

Significance		Sensitivity			
		Very high	High	Medium	Low
Magnitude	Very high	High	High	Medium	Low
	High	High	High	Low	Very low
	Medium	High	Medium	Low	Very low
	Low	Medium	Low	Very low	Very low
	Negligible	Low	Very low	Very low	Very low

Table 6.6: Significance Matrix for Low Probability Impacts (species known to be tolerant of specific impact [105])

Significance		Sensitivity			
		Very high	High	Medium	Low
Magnitude	Very high	Medium	Medium	Medium	Low
	High	Medium	Medium	Low	Very low
	Medium	Medium	Low	Very low	Very low
	Low	Medium	Very low	Very low	Very low
	Negligible	Low	Very low	Very low	Very low

Collision Risk Assessments, as outlined in the accompanying EIS, following the referenced guidance are summarised overleaf for the relevant species in Table 6.7 over.

Table 6.7: Collision Risk Assessment

Key Receptor (Sensitivity)	Operational Direct Impact Character	Significance without Mitigation
Whooper Swan (Very High)	**Collision:** No flight activity was recorded within the proposed Turbine envelope. Recommended avoidance rates from SNH are 98% [144], based on literature reviews of recorded fatalities. Studies on wintering swans have found low levels of collision mortality, even in sites with a high degree of transit flights (n=1664 in one case) through the operational wind farm and relatively high numbers (>500) of birds regularly present [142]. In a review of swan and goose fatalities at wind farms only 2 whooper swans were recorded as fatalities from monitoring undertaken at 46 different wind farms across 8 countries [145]. Recommended avoidance rates from SNH are 98% [144], based on literature reviews of recorded fatalities; this suggests a high micro-avoidance of turbines. In relation to nocturnal flight activity recent studies utilising radar on both offshore and coastal wind farms in Europe have recorded macro-avoidance rates in wildfowl at least as high, or higher at night than during the day, implying that diurnal avoidance rates are comparable to those in periods of lower visibility [139]. Best scientific knowledge suggests comparable if not higher avoidance rates by wildfowl during perceived periods of poor visibility. Best scientific knowledge therefore suggests overall a high avoidance rate and consequent low fatality estimate for wind turbines in relation to Whooper Swans both in relation to diurnal flight activity and activity in crepuscular and nocturnal periods. In addition to this the indicative numbers of this species recorded at the subject site further reduces collision risk estimates to a negligible level.	**Collision:** Probability of Impact **Low**, based on recorded flight activity, height of proposed envelope (50-170m), published best scientific knowledge in relation to avoidance rates and low frequency of occurrence at the site**,** Magnitude assessed as **negligible**, overall significance assessed as **low**.

6.4 Potential Impacts on the Integrity of the Sites

'Describe how the integrity of the site (determined by structure and function and conservation objectives) is likely to be affected by the project and plan (e.g. loss of habitat, disturbance, disruption, chemical changes, hydrological changes and geological changes etc.). Acknowledge uncertainties and any gaps in information'.

The integrity of the River Boyne and River Blackwater cSAC could be indirectly affected by the proposed development through a potential reduction in water quality and foraging potential for aquatic species such as River Lamprey, Atlantic Salmon and Otter. This could in turn lead to reduced numbers or reduced breeding success of River Lamprey, Atlantic Salmon or Otter which are qualifying interests of the cSAC. Changes to water quality could also lead to a reduction in prey densities for Kingfisher in the River Boyne and River Blackwater SPA. This could then lead to a decline in breeding numbers or lower reproductive success of breeding Kingfisher which is the qualifying interest of the SPA.

The integrity of the River Barrow and River Nore cSAC could be indirectly affected by the proposed development through a potential reduction in water quality and foraging potential for aquatic species such as River Lamprey, Atlantic Salmon and Otter. This could in turn lead to reduced numbers or reduced breeding success of aquatic species such as White Clawed Crayfish, River Lamprey, Atlantic Salmon or Otter which are qualifying interests of the cSAC and which may occur within 15km of the proposed development.

Impacts on the River Boyne and River Blackwater cSAC, through ex-situ collision of Whooper Swan with moving parts of turbines is appraised as low and therefore will not adversely affect the integrity of the site. Although considered unlikely to be significant, possible collision risk from guy wires associated with the proposed met mast is acknowledged and mitigation will be presented to further avoid any possible impacts.Although considered unlikely to be significant, possible collision risk from guy wires associated with the proposed met mast is acknowledged and mitigation will be presented to further avoid any possible impacts.Although considered unlikely to be significant, possible collision risk from guy wires associated with the proposed met mast is acknowledged and mitigation will be presented to further avoid any possible impacts.Although considered unlikely to be significant, the possibility of collision risk from guy wires associated with the proposed met mast is acknowledged and mitigation will be presented to further avoid any possible impacts.

6.5 Mitigation Measures to be Implemented

'Describe what mitigation measures are to be introduced to avoid or reduce the adverse effects on the integrity of the site. Acknowledge uncertainties and any gaps in information'

- *List measures to be introduced*
- *Explain how the measures will avoid the adverse effects on the integrity of the site*
- *Explain how the measures will reduce the adverse effects on the integrity of the site*
- *Provide evidence of how they will be implemented and by whom.*

The following mitigation measures will be implemented in order to reduce or avoid potential adverse effects on the integrity of the above sites, having regard to the sites' respective conservation objectives. The mitigation measures are listed on Table 6.2, along with information on when they will be implemented, how the measures will avoid or reduce adverse impacts on the Natura 2000 sites, who will implement the measures and the degree of confidence in their successful implementation. The proposed monitoring measures associated with the mitigation measures are also included in Table 6.8.

Table 6.8: Details of Mitigation Measures for Proposed Development

Mitigation Measure	How Measure will Avoid/Reduce Adverse Effects	Implementation of Mitigation Measure and Likely Success	Monitoring scheme to prevent mitigation failure
Mitigation Measures to be Implemented Prior to Construction			
In advance of any works taking place, a method statement for protecting watercourses and waterbodies on the site, will be prepared following further consultation with the IFI and NPWS and detailed in the final Construction Environmental Management Plan (CEMP). An outline Construction Environmental Management Plan (CEMP) has been prepared and is included as an appendix to this NIS.	The Method Statement will be distributed and discussed with all parties involved in the construction of the wind farm development (including any sub-contractors) in order to protect aquatic conservation interests within the study area. The CEMP 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.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor. All required mitigation measures will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works. A suitably qualified person will be appointed by the developer to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process.	Mitigation measures shall be adhered to at all times as part of the site CEMP (an outline of which is appended to this NIS). A maintenance schedule will be established by the appointed Contractor for the implementation of the silt and pollution control measures during the construction period, in consultation with the relevant authorities. Site inspections will be undertaken to ensure adherence to the mitigation measures and to confirm the implementation and efficacy of the agreed mitigation measures.
The works programme for the site will incorporate erosion and sediment control to be detailed in the CEMP including the installation of drainage and runoff controls before starting site clearance and earthworks; minimisation of the area of exposed ground; preventing runoff entering the site from adjacent ground; provision of appropriate control and containment measures on site; monitoring and maintenance of erosion and sediment controls throughout the project; and establishing vegetation as soon as practical	The detailed CEMP for the site will effectively result in the control of erosion and siltation on the site. This is considered to be the key mitigation measure for the protection of aquatic species located in downstream receiving waters.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor. All required mitigation measures will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works.	Erosion control and attenuation facilities, namely stilling ponds, silt fences and silt curtains will be regularly maintained during the construction phase as part of the site CEMP (an outline of which is appended to this NIS).

on all areas where soil has been exposed. The design of all silt and erosion control measures on the site including silt traps and siltation ponds, culverts and cross-drains will be based on the peak flood flows determined using the procedure set out in CIRIA (2006) [146].			
Due to fact that the proposed site is located within the catchment areas of important salmonid rivers, effective water runoff protection methods will be integrated into the CEMP and contractor's Method Statement. Run-off prevention measures that will be utilised in the CEMP for the development (detailed in the outline CEMP appended to this NIS) will include the following: The proposed three-stage treatment train (swale – stilling pond – diffuse outflow) will retain and treat the discharges from hard surface areas as a result of the development. Site tracks will drain to grassed swales (some of which are existing). These grassed swales will serve to detain flows and reduce the velocities of surface water flows. All track widening will be undertaken using clean uncrushable stone with a minimum of fines. Silt fencing will be provided at strategic locations to further protect the watercourses during the construction stage. The implementation of the water quality protection measures will be incorporated into an Environmental Commitments audit	The provision of a detailed CEMP will result in the effective control of erosion and siltation on the site. This is considered to be the key mitigation measure for the protection of aquatic species located in downstream receiving waters.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor. All required mitigation measures will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works.	Mitigation measures will be adhered to at all times as part of the site CEMP (an outline of which is appended to this NIS).

checklist for the site.			
Mitigation Measures to be Implemented During Construction			
All access tracks will be designed to minimise excavation on the site and reduce the risk of sediment runoff. Site access roads have been designed to reduce the longitudinal slope of roadside drains where possible. Where roadside drains are laid at slopes greater than 2%, check dams will be provided. Where agricultural tracks, bog tracks and forestry tracks will be used to access the development, the roadside drains alongside these roads will be cleared of obstructions, should it be found that debris and vegetation are impeding flows. Stilling ponds will be provided at regular intervals to reduce the concentration of suspended solids in the surface water run-off which may result from vehicles trafficking these roads from the construction areas. Swales for turbine bases and hard standings will be constructed. Overland flows will not be obstructed to any great extent as a result of the layout of the wind farm, however where required, interceptor channels will collect overland flows on the upslope side of the access tracks and hard standing areas. The interceptor channels will cross the access tracks in cross-drains which will be provided at regular intervals.	The roadside drains will only carry the site access road run-off and so avoid carrying large volumes of water and concentrating flows. These measures will avoid the risk of significant sediment runoff from the site during construction works. This in turn will reduce the risk of sediment runoff reaching downstream waters and avoid subsequent impacts on water quality in the downstream Natura 2000 sites.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor. All required mitigation measures will be included as a contractual obligation on the contractor, in combination with competent supervisory staff overseeing the works.	Erosion control and attenuation facilities, namely silt fences and silt curtains will be regularly maintained during the construction phase as part of the site CEMP(an outline of which is appended to this NIS)
All infrastructure will be set back 50 m from all streams within the site exception for the main crossings. There are two	These measures will avoid the risk of sediment runoff from the site during construction works. This in turn will	Mitigation measures will be implemented by the developer through the mechanism of its	Erosion control and attenuation facilities, namely silt fences and silt curtains will be regularly

exceptions, the access road to the proposed T40 at Hortland and an access road at Cloncumber, additional mitigation for these is presented separately. The contractor will also ensure that trafficking on site is kept to a minimum and the routes of haul roads are kept away from watercourses as far as possible. Additional silt fencing will be placed downslope where required and at existing streams during construction.	reduce the risk of sediment runoff reaching downstream waters and subsequent impacts on water quality in the downstream Natura 2000 sites.	contract with the Contractor.	maintained during the construction phase as part of the site CEMP(an outline of which is appended to this NIS)
Cross-drains of 450mm diameter will be provided to prevent a risk of clogging for drainage crossings and conveying flows from agricultural drains and forestry drains across the access roads.	This will prevent blockages and consequent flooding and concentration of flows. This will avoid the risk of pollutants reaching downstream watercourses. This in turn will avoid adverse impacts on water quality of downstream Natura 2000 sites.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor.	Mitigation measures will be adhered to at all times as part of the site CEMP (an outline of which is appended to this NIS)
A Method Statement for stream crossings (roads and cables) will be prepared and will follow the guidelines set out in (Murphy, 2004 [147]) and the NRA (2008) [148] '*Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*' and also the latest IFI guidelines. These guidelines are provided in Appendix 3.	These measures will avoid the risk of sediment or pollutants entering onsite watercourses and will prevent adverse impacts on aquatic flora and fauna in onsite watercourses. This in turn will avoid adverse impacts on water quality and on aquatic flora and fauna in downstream Natura 2000 sites.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor.	The contractor shall ensure that all mitigation measures such as silt fences and silt curtains are regularly maintained during the construction phase, this shall be detailed in the final site CEMP (an outline of which is appended to this NIS)
In the event that trenchless techniques utilize drilling; a biodegradable fluid such as CLEARBORE will be used rather than Bentonite. In addition a contingency and resource protection plan to include the following will be prepared: 1. Drilling operations to be limited to daytime hours and conditions when low levels of rainfall are forecast. 2. Drilling fluid materials and their	These measures will avoid the risk of sediment or pollutants entering onsite watercourses and will prevent adverse impacts on aquatic flora and fauna in onsite watercourses. This in turn will avoid adverse impacts on water quality and on aquatic flora and fauna in downstream Natura 2000 sites.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor.	contractor shall ensure that all mitigation measures such as silt fences and silt curtains are regularly maintained during the construction The phase as part of the site CEMP (an outline of which is appended to this NIS) Full training is provided for onsite personnel and monitors and this will be updated during

respective data sheets shall be included in the method statement for waterways or stream crossings. 3. Any site specific investigation results shall be disclosed. Investigations will include review of all available data from utility owners, site investigations, trial holes, ground penetrating radar as might be appropriate for the location. 4. Materials such as suitable biodegradable absorbent material, silt fencing and gravel bags (plastic, gravel filled bags) shall be kept at boring sites in sufficient quantities to contain any release of drilling fluid. 5. A visual inspection shall be undertaken of the planned bore path prior to the boring operation to ensure any or all utilities and substructures have been identified and test holes have been properly prepared. 6. At stream crossings with flowing water, water monitors will be placed upstream and downstream of the crossing point, access permitting. 7. Onsite training shall be provided for all monitors, and names and phone numbers provided to site supervisors. 8. Upon completion of each drill rod, the monitoring person/team will be provided with information in relation to position of entry and exit of drilling head, amount of fluid utilized or pumped, equipment breakdowns or repairs, any abnormal drilling pressures recorded and			the construction phase to accommodate any change of personnel.

any change of drilling fluid contents. 9. A field response plan to minimize loss of returns of drilling fluid and actions to restore returns shall be provided. 10. Equipment required to clean up and contain any released drilling fluid in the event of hydrofracture will be available at the work site or at an offsite location at the temporary construction compounds. 11. In the event of a release of drilling fluid; the directional boring will stop immediately, the bore stem shall be pulled back to relieve pressure and the site supervisor notified to ensure adequate actions are taken and notifications made. In addition terrestrial releases shall be cleaned up using on site equipment and a terrestrial berm will be constructed around any terrestrial release. 12. Silt fences will be constructed around proposed work areas prior to commencement of works. 13. Refueling of equipment will take place at the temporary construction compounds bowzer a minimium of 100m from watercourses. 14. Pre-construction Ecological surveys shall take place at drilling sites to determine whether any sensitive species or species requiring derogations (such as Otter) are present. 15. Works will be monitored by the project ecologist.			

6. Any dewatering of the pits will be pumped to land as far from the watercourse as possible to allow it to infiltrate through the field or to a stilling pond or alternative to a holding tank, tested and appropriately discharged under licence .			
Tenmporary ppoil heaps from the excavations for the turbine bases and trenches (if 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. If cables will be installed in trenches, they will be located underneath and directly adjacent to access tracks as far as possible. Trenches will be excavated during dry periods where possible in short sections and left open for minimal periods to avoid acting as a conduit for surface water flows. Clay bunds will be constructed within any cable trenches at intervals.	These measures will avoid the risk of sediment runoff or runoff of pollutants from the site during construction works. This in turn will avoid the risk of sediment or pollutant runoff reaching downstream waters and subsequent impacts on water quality in the downstream Natura 2000 sites.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor.	Erosion control and attenuation facilities, namely silt fences and silt curtains will be regularly maintained during the construction phase as part of the site CEMP (an outline of which is appended to this NIS)
An Emergency Silt Control and Spillage Response Procedure will be included as a contingency in the CEMP which will detail the required measures for the Contractor to implement in the event of a 'worst case' scenario on the site. All personnel working on site will be trained in pollution incident control response. An emergency response plan will be prepared which will ensure that appropriate information will be available on site outlining the spillage response procedure and a contingency plan to contain silt. This shall include the following:	These measures will avoid the risk of sediment runoff or runoff of pollutants from the site during construction works. This in turn will avoid the risk of sediment or pollutant runoff reaching downstream waters and subsequent impacts on water quality in the downstream Natura 2000 sites.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor.	Adequate security will be provided to prevent spillage as a result of vandalism. A regular review of weather forecasts of heavy rainfall is required and a contingency plan will be prepared for before and after such events. A record will be kept of daily visual examinations of watercourses which receive flows from the proposed development, during and for an agreed period after the construction phase. Water samples will be taken and

Accidental spillage from leaking or damaged fuel lines In the event of an accidental spillage, emergency drip trays and spill kits will be kept available on site for use in emergencies to ensure that any spills from vehicles are contained and removed off site. Each refuelling station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site. In the event of pollution or potential risk of pollution Meath/Kildare County Council will be informed immediately. In the case of water pollution in addition to the Local Authority, Inland Fisheries Ireland will also be informed immediately. In the event of an accidental spillage from leaking or damaged fuel lines, the spillage will be cleaned up with absorbent material e.g. sand or turf mould and placed in a designated bunded location while awaiting removal offsite by a permitted contractor. In the event of an emergency, the stilling ponds will provide a temporary holding area for any accidental spills on site as it will be possible to block off the outflow from these ponds for a limited period. Accidental break out of silt During the construction period an emergency facility will be provided to			water quality will be monitored in accordance with a water monitoring programme which will be agreed with Meath County Council

control any accidental discharge from the stilling ponds. This will mitigate the risk of any accidental spillage with the potential to affect watercourses. A suitably qualified person will be appointed by the developer to ensure the effective operation and maintenance of drainage and other mitigation measures during the construction process. The operations management of the wind farm will include regular monitoring of the drainage system and maintenance as required. Additional silt fencing will be kept on site for use in emergencies. An emergency preparedness and response procedure will be produced to prevent environmental pollution incidents.			
A designated area for concrete wash-down will be located at the temporary site compounds. A lined settlement lagoon will be provided to receive all run-off from the concrete wash down area.	These measures will avoid the risk of concrete entering onsite watercourses during construction works. This in turn will avoid the risk of pollutant runoff reaching downstream waters and subsequent impacts on water quality in the downstream Natura 2000 sites.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor.	Designated areas will be adhered to at all times and best practice followed as part of the site CEMP (an outline of which is appended to this NIS)
Standing water, which could arise in excavations, has the potential to contain an increased concentration of suspended solids as a result of the disturbance to soils. The excavations for turbines will be pumped into the site drainage system (including stilling ponds), which will be constructed at site clearance stage, in advance of excavations for the turbine bases.	These measures will avoid the risk of sediment entering onsite watercourses and will prevent adverse impacts on aquatic flora and fauna in onsite watercourses. This in turn will avoid adverse impacts on water quality and on aquatic flora and fauna in downstream Natura 2000 sites.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor.	Mitigation measures will be adhered to at all times as per the site CEMP (an outline of which is appended to this NIS)
Wheel washing facilities will be provided at	These measures will avoid the risk of	Mitigation measures will be	The appointed contractor shall

the site entrance draining to silt traps. Additional silt fencing will be kept on site in case of an emergency break out of silt laden run-off from these facilities. Portaloos and/or containerised toilets and welfare units will be used to provide toilet facilities for site personnel. Sanitary waste will be removed from site via a permitted waste disposal contractor.	sediment runoff or runoff of pollutants from the site during construction works. This in turn will reduce the risk of sediment or pollutant runoff reaching downstream waters and subsequent impacts on water quality in the downstream Natura 2000 sites.	implemented by the developer through the mechanism of its contract with the Contractor.	ensure that erosion control and attenuation facilities, namely silt fences and silt curtains are regularly maintained during the construction phase
Any diesel or fuel oils stored at the temporary site compound will be bunded. The bund capacity will be sufficient to contain 110% of the tank's maximum capacity. Where there is more than one tank within the bund, the capacity will be sufficient to accommodate 110% of the largest tank's maximum capacity or 25% of the total maximum capacities of all tanks, whichever is the greater. Design and installation of fuel tanks will be in accordance with best practice guidelines BPGCS005 (Oil Storage Guidelines). Refuelling of plant during construction will be carried out at a number of dedicated refuelling station locations on site, typically at each compound or at least 100m from a watercourse using mobile bowsers. Each station will be fully equipped for a spill response and a specially trained and dedicated environmental and emergency spill response team will be appointed before commencement on site. Only emergency breakdown maintenance will be carried out on site. Drip trays and spill kits will be kept available on site, to ensure that any spills from the vehicle are contained and removed off site.	These measures will avoid the risk of pollutants from fuels entering onsite watercourses and will prevent adverse impacts on aquatic flora and fauna in onsite watercourses. This in turn will avoid adverse impacts on water quality and on aquatic flora and fauna in downstream Natura 2000 sites.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor.	Mitigation measures will be adhered to at all times as part of the site CEMP.
Appropriate preventative measures will be detailed within the CEMP to ensure that	This measure will prevent the introduction and/or spread of non-	Mitigation measures will be implemented by the developer	The contractor shall ensure that mitigation measures are

non-native aquatic/riparian species are not introduced into the site. These measures will follow as relevant the manual '*The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads*' by NRA (2010) [149].	native aquatic/riparian species on the site which could eventually reach downstream Natura 2000 sites.	through the mechanism of its contract with the Contractor.	adhered to at all times as part of the site CEMP.
A monitoring programme will be established to ensure that the water quality is maintained. This is further detailed in section 6.5.1.	This measure will prevent the risk of significant sediment runoff or runoff of pollutants from the site during construction works. This in turn will avoid the risk of sediment or pollutant runoff reaching downstream waters and subsequent impacts on water quality in the downstream Natura 2000 sites.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor.	Daily visual inspections of drains and outfalls will be performed during the construction period to ensure suspended solids are not entering the streams and rivers of the site, to identify any obstructions to channels, and to allow for appropriate maintenance of the drainage regime. If excessive suspended solids are noted, construction work will be stopped and remediation measures will be put in place immediately. Fortnightly visual inspections will be continued during the operation period until satisfactory vegetation is established on site.
There will no excavations in close proximity to watercourses/riparian habitats where possible, in stream works will not be undertaken during the salmonid close season (October–March annually) and only in watercourses or features not identified in the EPA's blue line database. Any upgraded bridges or culverts will be designed to be passable by fish.	Not carrying out in-stream works during the salmonid close season will protect spawning salmonids, incubating ova and emerging fry. All measures to prevent impacts on fish will in turn avoid risks to salmonids downstream.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor.	The developer/contractor shall ensure that mitigation measures are adhered to at all times as part of the site CEMP (an outline of which is appended to this NIS)
For off-line cabling methods where a temporary diversion of a watercourse may be required (only in watercourses or features not identified in the EPA's blue line database) silt curtains and floating booms	This measure will prevent the risk of sediment runoff or runoff of pollutants from the site during construction works. This in turn will avoid the risk of sediment or pollutant runoff reaching	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor.	The developer/contractor shall ensure that mitigation measures are adhered to at all times as part of the site CEMP (an outline of which is appended to this

will be utilised to prevent impacts. The use of construction machinery in-stream will be minimised as much as practical, any such machinery will be checked on a daily basis to be mechanically sound and clean to avoid risk of leaks of oils, hydraulic fluid, etc. prior to commencement of in-stream works. Instream works will take place from July to September only when water levels are lowest to minimise impacts.	downstream waters and subsequent impacts on water quality in the downstream Natura 2000 sites. All measures to prevent impacts on fish will in turn avoid risks to salmonids downstream.		NIS)
Stilling ponds will be put in place in advance as construction progresses across the site. The stilling ponds with a diffuse outflow detail will mitigate any increase in run-off. Individual stilling ponds will be provided at borrow pit locations.	The three-stage treatment train (swale – stilling pond – diffuse outflow) proposed to retain and treat the discharges from hard surface areas as a result of the development will avoid any risk of flooding downstream. This will reduce the potential for water quality impacts on downstream Natura 2000 sites.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor.	Erosion control and retention facilities, including stilling ponds will be regularly maintained during the construction phase.
Site access tracks have been laid out to reduce the longitudinal slope of roadside drains where possible. Where roadside drains are laid at slopes greater than 2%, check dams will be provided. The construction of roadside drains for site access road drainage follows natural flow paths on site where possible.	This will reduce effective slope and run-off velocities and prevent any consequent erosion. The control of erosion and siltation on the site is considered to be the key mitigation measure for the protection of aquatic species located in downstream receiving waters and Natura 2000 sites.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor.	The developer/contractor shall ensure that mitigation measures are adhered to at all times as part of the site CEMP (an outline of which is appended to this NIS)
Where agricultural tracks and forestry tracks will be used to access the development, the roadside drains alongside these roads will be cleared of obstructions, should it be found that debris and vegetation are impeding flows. Stilling ponds will be provided at regular intervals	The control of erosion and siltation on the site is considered to be the key mitigation measure for the protection of aquatic species located in downstream receiving waters and Natura 2000 sites.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor.	Erosion control and attenuation facilities, namely silt fences and silt curtains will be regularly maintained during the construction phase and this maintenance will be detailed within the site CEMP (an outline

to reduce the concentration of suspended solids in the surface water run-off which may result from vehicles trafficking these roads from the construction areas.			of which is appended to this NIS)
All open water bodies adjacent to proposed construction areas will be protected by fencing, including the proposed stilling ponds. Where haul roads pass close to watercourses, silt fencing will be used to protect the streams. Silt traps will also be provided at outfalls from roadside swales to existing drains. Silt traps will be kept upstream of outfalls to allow a buffer zone to the outfall.	These measures will avoid the risk of sediment entering onsite watercourses and will prevent adverse impacts on aquatic flora and fauna in onsite watercourses. This in turn will avoid adverse impacts on water quality and on aquatic flora and fauna in downstream Natura 2000 sites.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor.	Erosion control and attenuation facilities, namely silt fences and silt curtains will be regularly maintained during the construction phase and this maintenance will be detailed within the site CEMP (an outline of which is appended to this NIS)
During the construction period an emergency facility will be provided to control the discharge from the stilling ponds. This will entail a method of shutting the weir attached to each stilling pond.	This will prevent accidental spillage on site from reaching/affecting watercourses.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor.	Mitigation measures will be adhered to at all times as part of the site CEMP (an outline of which is appended to this NIS)
Roads will be capped as soon as practicably possible to cover exposed subsoils and as such reduce the concentration of suspended solids in the run-off.	The control of erosion and siltation on the site is considered to be the key mitigation measure for the protection of aquatic species located in downstream receiving waters and Natura 2000 sites.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor.	All mitigation measures will be adhered to at all times as part of the site CEMP (an outline of which is appended to this NIS)
The felling will be undertaken in accordance with the specifications set out in the Forest Service Forestry and Water Quality Guidelines (2000)i and Forest Harvesting and Environmental Guidelines (2000)ii, (both available in Appendix 3) to ensure a tree clearance method that reduces the potential for sediment and nutrient runoff. A decision on whether turbulence felling is required is not possible	The control of erosion and siltation on the site is considered to be the key mitigation measure for the protection of aquatic species located in downstream receiving waters and Natura 2000 sites.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor.	All mitigation measures will be adhered to at all times as part of the site CEMP (an outline of which is appended to this NIS)

at this stage and will be taken at a later stage in conjunction with the preferred turbine supplier. Trees will be felled away from aquatic zones where possible. Branches, logs or debris will not be allowed to accumulate in aquatic zones and will be removed as soon as possible. Additional silt fencing will be erected along the banks of any streams at the location of the proposed tree felling to provide additional protection to the watercourses in this area. Felling around the required infrastructure, made up of a corridor of approximately 30m through forestry for access tracks and an approximate radius of 60m around turbines, is proposed for the site. The rate of absorption of a felled site, and therefore rate of run-off, is expected to be slightly higher than that of a forested site. However the area of proposed felling is small relative to the overall planted area and is expected to develop a vegetation ground cover relatively quickly. Thus, no significant increase in the rate of run-off is anticipated as a result of felling or risk of downstream flooding.			
Silt fencing will be erected at the location of stream crossings along the MV and HV cable route. For off-line cabling methods, a temporary diversion of the watercourse may be required. Silt curtains and floating booms will also be used where deemed to be appropriate, in consultation with IFI and this will be assessed separately at each individual location. Water course diversions will follow published best practice by the NRA [(22)](see Appendix 3).	These measures will prevent sediment entering onsite watercourses and will prevent adverse impacts on aquatic flora and fauna in onsite watercourses. This in turn will avoid adverse impacts on water quality and on aquatic flora and fauna in downstream Natura 2000 sites.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor.	The appointed contractor shall ensure that mitigation measures are adhered to at all times as part of the site CEMP (an outline of which is appended to this NIS)

At Cloncumber, where the excavation areas are 70mOD from the Barrow Line of the Grand Canal, the opening of borrow pits at Cloncumber will be from the east and from the west where the borrow pits are located to the north of the Barrow Line of the Grand Canal. There will be no opening of or access to these borrow pits from the south (canal side). It is proposed to drain the borrow pits to stilling ponds. At the upslope side of the borrow pits overland flows will be intercepted in channels which will discharge diffusely over vegetated areas. There will be no opening of these borrow pits from the south (canal side). It is proposed to excavate the borrow pits to a maximum depth of 5m. Excavations will remain above the water table, hence the lower parts of the fields will be avoided. Where works will be required to modify the bridges onsite to facilitate the delivery of turbines, pre-cast concrete will be used whenever possible, to eliminate the risk to all forms of aquatic life. Should cast-in-place concrete be required, all work will be done in the dry and effectively isolated from any water that may enter the drainage network for a period sufficient to cure the concrete. Debris containment netting will be used to arrest and contain falling objects. Silt curtains will be used where there is a risk of fine sediment getting into the stream or canal. Partial isolation may be undertaken using caissons or cofferdams.	These measures will ensure no contamination of the Canal in the event of a potential hydrological connection. These methods will ensure no contamination via debris or sedimentation during bridge works.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor.	The developer/contractor shall ensure that mitigation measures are adhered to at all times as part of the site CEMP (an outline of which is appended to this NIS).

At Drehid-Hortland, the entrance access road into the location of turbine T40 to the east of the site runs within 50m of the Clogheraun Stream, tributary of the River Blackwater. The track here is partially an existing track. There is the potential risk of the ingress of silt, into the stream during the construction the turbine cluster which will be accessed from this entrance. Silt fencing will be provided along the full length of the access track where it coincides with the bank of the Clogheraun Stream.	These measures will prevent sediment entering onsite watercourses and will prevent adverse impacts on aquatic flora and fauna in onsite watercourses. This in turn will avoid adverse impacts on water quality and on aquatic flora and fauna in downstream Natura 2000 sites.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor.	The contractor shall ensure that mitigation measures are adhered to at all times as part of the site CEMP (an outline of which is appended to this NIS)
Mitigation Measures during the Operational Phase			
The operational wind farm will have a negligible effect on aquatic ecological interests and fisheries, as there are no further potential impacts on 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 site. However, the transformers will be bunded to over 110% of the volume of oil within them.	This bunding measure will prevent the risk of pollutants from fuels entering onsite watercourses. This in turn will reduce/avoid adverse impacts on water quality and on aquatic flora and fauna in downstream Natura 2000 sites.	Mitigation measures will be implemented by the developer.	The developer shall ensure that mitigation measures are adhered to at all times.
It is not envisaged that maintenance will involve any significant impacts on the hydrological regime of the area. Weekly inspections of the erosion and sediment control measures on site will be carried out during the operational period, followed by fortnightly inspections until the risk of erosion or siltation has declined following the successful establishment of vegetation during the operational phase.	Maintenance and monitoring will ensure that siltation and pollution of watercourses will not occur during the operational period. This will in turn prevent a reduction in water quality in the downstream Natura 2000 sites.	Mitigation measures will be implemented by the developer.	The maintenance regime will include inspecting the following: 1. drains, cross-drains and culverts for any blockages 2. outfalls to existing field drains and watercourses 3. existing access track swales for any obstructions 4. swales and stilling ponds progress of the re-

			establishment of vegetation The maintenance regime will also include implementing appropriate remedial measures as required after the above inspections and testing the water quality at the outfalls at appropriate intervals. Monthly monitoring will continue following the completion of construction until full re-vegetation has occurred.
The conceptual drainage management system has been designed to operate effectively during the operation period. The stilling ponds will be a permanent feature, and will continue to be effective in filtering the run-off from the site should any accidental release of silt combine with the surface water run-off during operational activities. During the operation period the swales will have vegetated and will serve to attenuate flows and remove any suspended solids from the run-off.	The conceptual drainage design will ensure that siltation and pollution of watercourses will not occur during the operational period. This will in turn prevent a reduction in water quality in the downstream Natura 2000 sites.	Mitigation measures will be implemented by the developer.	The developer shall ensure that mitigation measures are adhered to at all times.
Bird Diverters shall be placed on guy wires for the permanent met mast on site. These will follow published specifications from Scottish Natural Heritage and will be maintained over the lifetime of the project. Maintenance shall be yearly, prior to the beginning of the winter season when Swans may potentially arrive in the area.	This will avoid mortality due to collision by swans (and general birds).	Placement of diverters at a location in the UK for a Mute Swan study [150] resulted in significant decreases in local mortality. In a similar study in the Netherlands to the above, decreases in collision rates of up to 80% were recorded with flight diverters	The developer/contractor shall ensure that bird diverters are put in place and maintenance measures are adhered to at all times as part of the site CEMP (an outline of which is appended to this NIS).

		installed at 5m intervals. Additional research shows that the attachment of line markers can reduce bird collisions on overhead lines by at least 50-60% (Jenkins *et al.*, 2010 [151]; Barrientos *et al.*, 2011 [152]; Martin, 2011 [153]; APLIC, 2012 [154]).	
Mitigation Measures during the Decommissioning Phase			
As in the construction phase silt protection controls will again be put in place. The drainage system will remain operational during the decommissioning phase.	These measures will serve to treat any sediment-laden surface water run-off due to a renewed disturbance of soils. This will in turn prevent a reduction in water quality in the downstream Natura 2000 sites.	Mitigation measures will be implemented by the developer through the mechanism of its contract with the Contractor.	The appointed contractor shall ensure that mitigation measures are adhered to at all times as part of the site CEMP (an outline of which is appended to this NIS)

6.5.1 Additional Mitigation - Water Quality Monitoring Programme

A monitoring programme will be established to ensure that the water quality is maintained. The details of this programme are outlined hereunder. This programme will ensure that designed measures are working to ensure water quality is not affected during construction and operation.

- Daily visual inspections of drains and outfalls from interceptor drains will be performed during the construction period to ensure suspended solids are not entering the streams and rivers of the site, to identify any obstructions to channels, and to allow for appropriate maintenance of the drainage regime. If excessive suspended solids are noted, construction work will be stopped and remediation measures will be put in place immediately.
- Fortnightly visual inspections will be continued during the operation period until satisfactory vegetation is established on site
- Turbidity meters will be installed up and downstream of the construction area to determine any impacts. They will be in place for the duration of the works for each particular phase before being moved to the next phase. Should the turbidity levels measured during construction be greater downstream than upstream, the source of the turbidity will be identified and additional mitigation measures will be implemented
- Grab samples, will be undertaken during the construction phase of the development at representative locations so as to ensure the effective implementation of the proposed mitigation measures. Appropriate locations will be chosen to monitor the water quality of the receiving environment for each construction area. Field measurements will be recorded at each site and will include measurement of the following parameters, electrical conductivity, pH, temperature and dissolved oxygen. The field measurements will be taken on a weekly basis during the site clearance and earthworks stage of the construction period
- Following site clearance and earthworks, the field measurements will be taken on a monthly basis until full re-vegetation has occurred, unless otherwise directed by the planning authority, Inland Fisheries Ireland (IFI) or Waterways Ireland. Grab samples were taken for this EIS from seven locations during a dry weather and storm event to provide a baseline against which samples taken during the construction stage can be measured. Trigger values will be defined for indicator parameters based on the pre-construction monitoring results and results will also be compared to the maximum guideline values specified in the table below.

Table 6.9: Surface Water Quality Monitoring Parameters

Parameter	Maximum Guideline Value
Conductivity (µs/cm)	1,000
Turbidity (NTU)	20
pH	6.0 < pH < 9.0
Dissolved Oxygen (% saturation)	80 – 120 (%ile)
Total Suspended Solids (mg/l)	25
Total Ammonia (mg/l N)	0.14 (95%ile)
Nitrite (NO_2) (mg/l)	0.05
Molybdate Reactive Phosphorus (mg/l P)	0.075 (95%ile)
Total Phosphorus (mg/l P)	0.5
Chloride (mg/l)	250

6.6 Efficacy of the Proposed Mitigation Measures

Provide evidence of the degree of confidence in the likely success of the mitigation measures

Mitigation measures were devised in consideration of the following guidelines:

- Sustainable Development: A Strategy for Ireland, Department of the Environment, 1997 (124)
- Meath County Development Plan 2013-2019 (6)
- Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a Framework for Community Action in the Field of Water Policy (155)
- Flood Mapping Website http://www.floodmaps.ie (156)
- OPW preliminary flood risk assessment (PFRA) indicative mapping website www.cfram.ie (157)
- Greater Dublin Strategic Drainage Study (GDSDS): Technical Documents of Regional Drainage Policies, March 2005 (126)
- Eastern Regional Fisheries Board - Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites (120)
- The Planning System and Flood Risk Management - Guidelines for Planning Authorities - Department of Environment, Heritage and Local Government (DoEHLG) and the Office of Public Works (OPW) (158)
- Environmental Good Practice on Site - Construction Industry Research and Information Association (UK) (127)
- Best Practice Guide BPGCS005 Oil Storage Guidelines (128)
- Control of Water Pollution from Linear Construction Sites (C648) - Construction Industry Research and Information Association (UK) (129)
- Control of Water Pollution from Construction Sites. Guidance for Consultants and Contractors (C532) - Construction Industry Research and Information Association (UK) (123)
- Sustainable Construction Procurement. A Guide to Delivering Environmentally Responsible Projects (C571) - Construction Industry Research and Information Association (UK) (130)
- UK Pollution Prevention Guidelines (PPG):
    - PPG1: Understanding your environmental responsibilities – good environmental practice (110)
    - PPG2: Above ground oil storage tanks (111)
    - PPG3: Pollution Prevention Guidelines (112)
    - PPG4: The disposal of sewage where no mains drainage is available (113)
    - PPG5: Works in, near or liable to affect watercourses (114)
    - PPG6: Working at construction and demolition sites (115)
    - PPG8: Safe storage and disposal of used oil (117)
    - PPG21: Pollution incident response planning (118)
    - PPG26: Drums and intermediate bulk containers (159)
- Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes - National Roads Authority, 2005 (160)
- Design Manual for Roads and Bridges (National Roads Authority (NRA) DMRB), March 2013.) (70)
- Neagh Bann International River Basin Management Plan 2009-2015 (109)
- Eastern River Basin District River Basin Management Plan 2009-2015 (108)
- Biological River Water Quality Data, (Environmental Protection Agency (EPA) (132)
- Code of Best Forest Practice – Ireland, (Forest Service and Department of Marine and Natural Resources – 2000) (122)
- Forestry and Water Quality Guidelines (Forest Service and Department of Marine and Natural Resources 2000) (121)
- Forest Road Manual, Guidelines for the Design, Construction and Management of Forest Roads, (COFORD 2004) (133)

Accordingly, given the provenance of the mitigation measures as set out above, those mitigation measures (when properly implemented) will be successful in ensuring that the European sites are preserved at a favourable conservation status by ensuring the lasting preservation of the constitutive characteristics of those sites.

In circumstances where the mitigation measures have been developed in the light of the best scientific knowledge, no reasonable scientific doubt remains to the *absence* of any adverse effects caused by the proposed development on the integrity of the sites under consideration in circumstances where those mitigation measures are implemented.

Table 6.10: Results of Consultation

A summary of correspondence with relevant agencies or bodies is included below.

Name of Agency or body consulted	Summary of Response
NPWS	In: Response to EIS Scoping Report Dated 12/12/2014: "The EIS scoping has not mentioned appropriate assessment. In accordance with article 6.3 of the Habitats Directive (Council Directive 92/43/EEC), this project should be subject to appropriate assessment (AA) screening and if necessary a NIS should be produced. Please refer to our previous scoping comments on AA. Please note however that the guidance documents referred to in that submission have been clarified by CJEU case law which should be consulted. For example case C-258/2011 on the N6, Galway City Outer Bypass and the Briels Case, C-521/12." In: DAU correspondence dated 6/2/2013 (Ref: Gre 00199/2012): "*As the project that has the potential to significantly impact on the integrity of several Natura 2000 sites, an Appropriate Assessment as outlined in Article 6(3) of the EU Habitats Directive (Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora) is required as part of this proposal. The Appropriate Assessment should focus on the potential impacts in view of the site's conservation objectives (qualifying interests/special conservation interests), and should include measures that will avoid, reduce and mitigate for any such impacts. Potential impacts must be considered in combination with other plans or projects, including other wind farm development. The Appropriate Assessment must establish and conclude that the proposed development does not pose a significant threat to the conservation objectives of the Natura 2000 site, if the proposal/project is to proceed. Guidance on the preparation of an Appropriate Assessment is available at www.npws.ie (see Planning and Appropriate Assessment, Department of the Environment, Heritage & Local Government (2009): Appropriate Assessment of Plans and Projects in Ireland - Guidance for Planning Authorities).*" In: DAU correspondence dated 25/6/2012 (Ref: Gre 00199/2012): "*In accordance with article 6.3 of the Habitats Directive, this project should be subject to appropriate assessment screening and if necessary appropriate assessment. We refer you to the Departmental guidance document on Appropriate Assessment, which is available on the NPWS website at: http://www.npws.ie/media/npws/publications/codesofpractice/AA%20Guidance%2010-12-09.pdf.and the marine document entitled "Marine Natura Impact Statements in Irish Special Areas of Conservation - A Working Document" which is available online at http://www.npws.ie/planning/appropriateassessment/ or http://www.npws.ie/marine/marinelicencing/. We also refer you to the EU Commission guidance entitled "Assessment of plans and projects significantly affecting Natura 2000 sites. Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC", which can be downloaded from http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/natura_2000_assess_en.pdf. In order to carry out the appropriate assessment screening and/or prepare a NIS you will need to collect information about the relevant Natura 2000 sites including their*

Name of Agency or body consulted	Summary of Response
	conservation objectives. Details of designated sites and species can be found on www.npws.ie while conservation objectives, if not yet available on our web site, can be obtained upon request by completing the data request form on our website at: http://www.npws.ie/media/npws/publications/Data%20request%20form.doc. We note however that you intend to keep cable routes as close to roads as possible and use bridges where possible for river crossings. Ex-situ impacts should be considered, particularly in relation to SPAs where the flight paths of birds to and from SPAs may be over the proposed wind farm locations. We recommend that you consult with the relevant Local Authorities to determine if there are any projects or plans which alone or in combination could impact on any Natura sites."

6.7 Addressing Mitigation Failure

Explain how any mitigation failure will be addressed

An Emergency Silt Control and Spillage Response Procedure will be included as a contingency in the CEMP which will detail the required measures for the Contractor to implement in the event of a 'worst case' scenario (i.e. an outbreak of silt or excessive spillage) on the site. All personnel working on site will be trained in pollution incident control response. An emergency response plan will ensure that appropriate information will be available on site outlining the spillage response procedure and a contingency plan to contain silt. Information to be contained in these are outlined in Table 6.8.

A Contingency and Resource Protection Plan will detail monitoring measures for during operations and containment measures to be used in the event of a 'frac out' during drilling associated with trenchless techniques and included in the CEMP. Containment measures to be utilized in the event of a 'frac out' are provided in Table 6.8.

Turbidity meters, as part of water monitoring programme, will be installed during construction downstream of the site. Levels of turbidity will be monitored pre-construction to determine existing levels in the water bodies. Should the turbidity levels measured during construction be higher than the existing levels, additional mitigation measures will be put in place and the source of the silt will be determined.

6.8 Conclusion

In summary, whilst it has been acknowledged that there is the potential for the proposed Maighne wind farm development to have significant indirect impacts on a number of European sites, with the implementation of the detailed mitigation measures identified in this NIS, the integrity of those sites as natural habitats will not be adversely affected. In particular, with the implementation of the detailed mitigation measures identified in this NIS, there is no scientific doubt remaining as to the absence of potential adverse effects.

7 REFERENCES

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