UWF GRID CONNECTION

REFERENCE DOCUMENTS

UPPERCHURCH WINDFARM

VOLUME F9:

2013 EIS Ch13 – Ch16 &

2013 RFI Q1 – Q3

Volume A	Planning Application Documents – Application Form; Site/Newspaper Notice; Letters of Consent; Schedule of Submitted Documents etc.	
Volume B	Planning Drawings	
Volume C	UWF Grid Connection EIA Report (EIAR)	Volume C1: EIAR Non-Technical Summary Volume C2: EIAR Main Report Volume C3: EIAR Figures Volume C4: EIAR Appendices
Volume D	Environmental Management Plan for UWF Grid Connection	
Volume E	Appropriate Assessment Reporting	
VOLUME F	**REFERENCE DOCUMENTS FOR OTHER ELEMENTS OF THE WHOLE UWF PROJECT**	Volume F1 to F3: UWF Related Works EIA Report Volume F4: Environmental Management Plan For The UWF Related Works Volume F5 TO F7: 2018 UWF Replacement Forestry EIA Report Volume F8 to F10: Upperchurch Windfarm **VOLUME F9: 2013 EIS Ch13 – Ch16 & 2013 RFI Q1 – Q3** **DETAILS OVERLEAF**

Planning Application to An Bord Pleanála
by Ecopower Developments Limited, Zetec House, IDA Purcellsinch Business Park, Kilkenny.
Tel: 056-7750140. Email:office@ecopower.ie

Project Website: www.upperchurchwindfarmgridconnection.ie

Reference

REFERENCE DOCUMENTS DETAILS

Volumes F1 to F3: 2018 UWF Related Works EIA Report

Volume F1: EIAR Non-Technical Summary & EIAR Figures

Volume F2: EIAR Main Report (2 Parts)

Volume F3: EIAR Appendices (3 Parts)

Volume F4: Environmental Management Plan for the UWF Related Works

Volumes F5 to F7: 2018 UWF Replacement Forestry EIA Report

Volume F5: EIAR Non-Technical Summary & EIAR Figures

Volume F6: EIAR Main Report (2 Parts)

Volume F7: EIAR Appendices (3 Parts)

Volumes F8 to F10: Upperchurch Windfarm

Volume F8: 2013 EIS Ch1 – Ch12

Volume F9: 2013 EIS Ch13 – Ch16 & 2013 RFI Q1 – Q3

Volume F10: 2013 RFI Q4 – Q11 & 2014 ABP Inspector's Report & 2014 Grant Of Permission & Conditions

Reference

Malachy Walsh and Partners
Engineering and Environmental Consultants

CHAPTER 13
ECOLOGICAL IMPACT ASSESSMENT

UPPERCHURCH WINDFARM

MWP ENVIRONMENT AND PLANNING

Engineering and Environmental Consultants

13 Ecology Impact Assessment

13.1 INTRODUCTION

This chapter describes the ecology of the proposed Upperchurch development site, with emphasis on habitats, flora, fauna and water quality, and assesses the potential effects of the proposed windfarm development on these ecological receptors. The proposal is to construct a 22 Turbine wind farm 1.9 km west of Upperchurch in county Tipperary. An Appropriate Assessment has also been undertaken for the site and is presented in **Appendix 13-II** of this chapter.

This ecological impact assessment was carried out with regard to the following publications:

- Guidelines on the information to be contained in Environmental Impact Statements (EPA, 2002);
- Guidelines for Ecological Impact Assessment in the United Kingdom published by the Institute of Ecology and Environmental Management (IEEM, 2006); and
- Environmental Assessment and Construction Guidelines (NRA, 2009).

13.1.1 Scope of Assessment

The specific objectives of the study were to:

- Undertake a baseline ecological survey of the site and evaluate the nature conservation importance of the site;
- Assess the direct, indirect and cumulative ecological implications or impacts of the project during its lifetime;
- Where possible propose mitigation measures to remove or reduce those impacts at the design and construction stage; and
- Achieve the best possible biodiversity outcome from a change in current land use.

13.1.2 Study objectives

The specific objectives of the study were to:

- Undertake a baseline ecological survey of the Upperchurch Windfarm Site and evaluate the nature conservation importance of the site;
- Assess the construction, operational and cumulative ecological implications or impacts of the project during its lifetime;
- Where possible propose mitigation measures to remove or reduce those impacts at the design and construction stage; and
- Achieve the best possible biodiversity outcome from a change in current land use.

13.1.3 Methodology

This section details the steps and methodology employed to undertake an ecological impact assessment of the proposed Upperchurch Windfarm.

13.1.3.1 Desk study

A desk study was carried out to collate and review available information, datasets and documentation sources pertaining to the sites natural environment. Some of these sources included:

- OSI Aerial photography and 1:50000 mapping;
- National Parks and Wildlife Service (NPWS);
- New Atlas of the British and Irish Flora (Preston *et al.* 2002);
- Irish Red Data Book for Vascular Plants (Curtis and McGough, 1988);
- Teagasc Soil area maps;
- Geological Survey Ireland (GSI) area maps;
- Environmental Protection Agency (EPA) water quality data; and
- Shannon International River Basin District (ShIRBD) and the South Eastern River Basin District (SERBD) datasets (Water Framework Directive).

13.1.3.2 Habitat surveying, mapping and evaluation

The field surveys were conducted by ecologists during the month of June 2012. Habitats were categorised according to the Heritage Council's '*A Guide to Habitats in Ireland'* (Fossitt, 2000) to level 3.

The habitat mapping exercise had regard to the 'Best Practice Guidance for Habitat Survey and Mapping' (Smith *et al.* 2010) published by the Heritage Council. Laminated A3 aerial photography was used together with a GPS to accurately enable field navigation. Habitat categories, characteristic plant species and other ecological features and resources were recorded on waterproof field sheets.

Scientific and common names for plants follow Parnell *et al.* (2012) and Blamey *et al.* (1996), respectively. In addition to habitat identification, each habitat was assessed for its ecological significance, based on the National Roads Authority (NRA) Site Evaluation Scheme (NRA, 2009) (see section 13.1.4 below).

Habitat boundaries and associated attribute data were mapped using desk-based GIS software, namely ArcView 9.2, which was also used to calculate habitat areas and lengths.

Once the baseline ecological survey and mapping was complete, a constraints map highlighting important ecological features and resources was generated, indicating areas for preclusion from the final windfarm infrastructure layout. The ecological constraints map was used to design a windfarm layout with the least ecological impact.

13.1.3.3 Biological water quality and aquatic habitat assessment

Biological water quality monitoring refers to Q Value system of ranges where the relationship between water quality and the in-stream macroinvertebrate community is described in numerical terms. A Q value of 5 indicates very high water quality while a Q value of 1 indicates poor water quality.

TABLE 13-1: RELATIONSHIP BETWEEN BIOTIC INDEX (Q-VALUE) AND WATER QUALITY.

Biotic Index	EPA Water Quality	Water Framework Directive Ecological Status	Quality Status
Q5	Good	High	Unpolluted Waters
Q4-5	Fair - Good	High	
Q4	Fair	Good	
Q3-4	Doubtful - Fair	Moderate	Slightly Polluted Waters
Q3	Doubtful	Poor	Moderately Polluted Waters
Q2-3	Poor - Doubtful	Poor	
Q2	Poor	Bad	Seriously Polluted Waters
Q1-2	Bad - Poor	Bad	
Q1	Bad	Bad	

Kick sampling, where the river bed is disturbed using the foot immediately upstream of a kick net, which collects the sample, was conducted at six sampling stations just downstream of the study area. Macroinvertebrate samples were returned to the laboratory where species within each kick sample were identified to genus level. Differing macroinvertebrate species are assigned to a group according to its tolerance of or sensitivity to water pollution. A river is then assigned a Q value based on these groupings.

13.1.3.4 Bat survey

Surveys were conducted by ecologists on the night of 21st of June 2012 throughout the study area. Potentially important features for bats including mature trees, waterways, hedgerows, stonewalls and buildings were studied extensively for potential bat activity. Bat surveys were conducted along transect routes using a Frequency Division AnaBat Detector System (AnaBat SD2 Flash Card Bat Detector). Frequency Division is a technique used to convert the inaudible bat echolocation calls to audible sounds. The AnaBat unit also uses Zero-Crossing Analysis (ZCA) to make the real-time recorded calls visible for display purposes. It is these sonograms (2-d sound pictures) that are digitally stored on the CF card and downloaded for analysis. Each time a bat is detected, an individual time-stamped (date and time to the second) file is recorded. Evidence of bat roosts were searched for and information on all potential roosts shall be recorded according to roost identification guidelines '*Bat Survey Guidelines: Traditional Farm Buildings Scheme*', Aughney, T., Kelleher, C. & Mullen, D. (2008).

When investigating potential bat roosts best practise methodology referred to in *NRA Guidelines for the Treatment of Bats During Construction of National Road Schemes,* (2005) was implemented.

13.1.3.5 Ornithological surveys

Winter Hen Harrier Survey 2010/2011

Field surveys were undertaken at the proposed site in order to examine the usage and activity of hen harriers at the site during the winter of 2010/2011.

Vantage Point Observations

Vantage point observations were carried out in order to assess the level of raptor activity and purpose at the development site. These observations were carried out in accordance with NPWS hen harrier survey guidelines. Three (3) vantage point locations were selected in order to obtain maximum visibility of the site and habitats outside the site boundary.

Vantage point watches were of six (6) hours duration and the three vantage points were watched for a total of eighteen (18) hours per site visit. During the course of the survey from November 2010 to March 2011 the site was watched for a total of ninety (90) hours. The locations of the vantage points are illustrated in **Figure 13-7** at the end of this report.

Summer Hen Harrier Survey 2011

Vantage Point Observations

Vantage point observations were carried out in order to assess the level of raptor activity and purpose at the development site during the summer of 2011. These observations were carried out in accordance with NPWS hen harrier survey guidelines. The vantage point locations chosen for the summer hen harrier survey remained the same as those chosen for the winter hen harrier survey.

Vantage point watches were of six (6) hours duration and the three vantage points were watched for a total of eighteen (18) hours per site visit. During the course of the summer survey from April to July 2011 the site was watched for a total of seventy two (72) hours. The locations of the vantage points are illustrated in **Figure 13-7** at the end of this report.

Transect surveys

Winter Transect counts were undertaken on 19th January and 16th March 2011 at five locations across the site and their locations are illustrated in **Figure 13-8** at the end of this report. Transect counts were undertaken on 19th May and 12th July 2011 at the same five locations as the winter bird survey.

13.1.3.6 Mammal survey

A mammal survey of the site was carried out in conjunction with the habitat survey, which concentrated on protected species such as badger, Irish (mountain) hare, otter and red squirrel. The site was searched for tracks and signs of mammals.

13.1.3.7 Other fauna

During the course of the habitat survey at the proposed Upperchurch Windfarm site, other species of fauna were noted and included in the report.

13.1.4 Habitat and Species Evaluation

The value of the ecological resources and features or receptors was determined using the ecological evaluation guidance given in the National Roads Authority (NRA) Ecological Assessment Guidelines as outlined in Table 13.2 (NRA, 2009).

This evaluation scheme seeks to provide value ratings for ecological receptors, with values ranging from internationally to locally important. Internationally important receptors would include candidate Special Areas of Conservation (cSAC) or Special Protected Areas (SPA) while those of national importance would include Natural Heritage Areas (NHA).

This evaluation scheme is aimed at assessing the value of sites (see Table 13-2). It has been adapted here to assess the value of habitats and fauna within one site. The value of habitats is assessed based on its condition, size, rarity, conservation and legal status. The value of fauna is assessed on its biodiversity value, legal status and conservation status. Biodiversity value is based on its national distribution, abundance or rarity, and associated trends.

All Irish bat species are protected under the Wildlife (Amendment) Act 2000 and the EU Habitats Directive.

Some of the habitats and species identified were selected as key ecological receptors. The NRA (NRA, 2009) refer to key ecological receptors as those ecological features which are evaluated as Locally Important (higher value) or higher and are likely to be impacted significantly by the proposed development. The features that were evaluated as being of Local Importance (higher value) and higher in this study were selected as key ecological features and the impact significance on each of these features was assessed.

TABLE 13-2: EXAMPLES OF VALUATION AT DIFFERENT GEOGRAPHICAL SCALES (SOURCE NRA, 2009)

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

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

County Importance	• Area of Special Amenity.[6]
	• Area subject to a Tree Preservation Order.
	• Area of High Amenity, or equivalent, designated under the County Development Plan.
	• Resident or regularly occurring populations (assessed to be important at the County level)[7] of the following:
	    • Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;
	    • Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;
	    • Species protected under the Wildlife Acts; and/or
	    • Species listed on the relevant Red Data list.
	• Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance.
	• County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local BAP,[8] if this has been prepared.

	• Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county. • Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.

Locally Important (higher level)	• Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared;
	• Resident or regularly occurring populations (assessed to be important at the Local level)[9] of the following:
	  • Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;
	  • Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;
	  • Species protected under the Wildlife Acts; and/or
	  • Species listed on the relevant Red Data list.
	• Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality;
	• Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value

Locally Important (lower level)	• Sites containing small areas of semi-natural habitat that are of some local importance for wildlife; • Sites or features containing non-native species that are of some importance in maintaining habitat links.

[1] See Articles 3 and 10 of the Habitats Directive.
[2] It is suggested that, in general, 1% of the national population of such species qualifies as an internationally important population. However, a smaller population may qualify as internationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.
[3] Note that such waters are designated based on these waters' capabilities of supporting salmon (*Salmo salar*), trout (*Salmo trutta*), char (*Salvelinus*) and whitefish (*Coregonus*).
[4] It is suggested that, in general, 1% of the national population of such species qualifies as a nationally important population. However, a smaller population may qualify as nationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.
[5] A 'viable area' is defined as an area of a habitat that, given the particular characteristics of that habitat, was of a sufficient size and shape, such that its integrity (in terms of species composition, and ecological processes and function) would be maintained in the face of stochastic change (for example, as a result of climatic variation).
[6] It should be noted that whilst areas such as Areas of Special Amenity, areas subject to a Tree Preservation Order and Areas of High Amenity are often designated on the basis of their ecological value, they may also be designated for other reasons, such as their amenity or recreational value. Therefore, it should not be automatically assumed that such sites are of County importance from an ecological perspective.
[7] It is suggested that, in general, 1% of the County population of such species qualifies as a County important population. However, a smaller population may qualify as County important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.
[8] BAP: Biodiversity Action Plan
[9] It is suggested that, in general, 1% of the local population of such species qualifies as a locally important population. However, a smaller population may qualify as locally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

13.1.5 Assessing Impact Significance

Once the value of the identified ecological receptors (features and resources) was determined the next step was to assess the potential effect or impact of the proposed windfarm on the identified key ecological receptors. This was carried out with regard to the criteria outlined in various impact assessment guidelines (NRA, 2009; IEEM, 2006). The impacts were assessed under a number of parameters such as magnitude, extent, duration and reversibility.

In line with the EPA Guidelines (EPA, 2002), the following terms are defined when quantifying duration:

- Temporary: up to 1 year
- Short-term: from 1-7 years;
- Medium-term: 7-15 years;
- Long-term: 15-60 years; and
- Permanent: over 60 years.

Confidence levels of the impact predictions were also given based on the 4 point scale as given in both the IEEM (2006) and NRA (2009) guidelines. See Table 13-3 below.

TABLE 13-3: CONFIDENCE LEVELS OF PREDICTIONS OF IMPACTS AS OUTLINED IN NRA (2009) AND IEEM (2006).

Confidence level category	
Near certain	>95% chance of occurring as predicted
Probably	50-95% chance of occurring as predicted
Unlikely	5-50% chance of occurring as predicted
Extremely unlikely	<5% chance of occurring as predicted

Where impacts are assessed to be significant, mitigation measures have been incorporated into the project design to remove or reduce these impacts. The residual impacts after mitigation were then assessed.

The cumulative impact of the windfarm development was also assessed by discussing the impact of the windfarm in terms of other developments that have planning permission, that are under construction or are in existence in the area. The cumulative impact of forestry, agriculture and peat extraction practices in the greater area are also considered.

13.2 EXISTING ENVIRONMENT

13.2.1 Site Overview and Water Quality

The proposed Upperchurch Windfarm site is located in north Co. Tipperary, approximately 1.9 km west of the village of Upperchurch and a further 18 km west of Thurles town. The study area is made up of four sections with an overall area of 12 km².

The soil types found in the study area mostly surface water gleys / ground water gleys acidic in the lower areas and lithosols / regosols in the higher areas. Patches of podzols peaty, peaty gleys acidic and surface water gleys / ground water gleys shallow are found on the site.

The surrounding local landscape is dominated by 'Pasture' with 'Forestry, 'Bog', 'Other Agricultural Land' and 'Other' land located to the south of the proposed windfarm site (NPWS, online mapping 2012). The area is underlain by Silurian Metasediments and Volcanics with subsoils consisting of "Sandstone and shales till Devonian/Carboniferous"

The four sections of the site are located on a series of small hills or drumlins that reach elevations between 363mOD and 411mOD where the peaks are generally at heights of 100m above the intervening lower terrain. The highest peak is that of Knockmaroe at an elevation of 411mOD.

A large proportion of the site is within the South Eastern River Basin District and drains to the southeast into the Owenbeg and Turraheen Rivers and ultimately to the River Suir. The site is drained to the north by the Clodiagh River of which the Owenbeg is a tributary. The remaining part of the site at the south western extremity lies within the Shannon River Basin District and drains to the Aughvana River and ultimately to the Mulkear River.

The area originally would have had a shallow peat land cover but most of it has been reclaimed by deep ploughing and converted to pasture. The remaining peat areas are used mainly for commercial forestry. Some rock outcropping occurs, most notably at the northeast part of the site.

13.2.2 Designated Sites

13.2.2.1 Sites of International Importance

Candidate Special Areas of Conservation (cSACs) are protected under the European Union (EU) 'Habitats Directive' (92/43/EEC), as implemented in Ireland by the European Communities (Natural Habitats) Regulations, 1997. There are four cSACs within 10km of the proposed Upperchurch windfarm (see **Figure 13-1** below).

Special Protection Areas (SPAs) were initially designated under Directive 79/409/EEC, The Directive on the Conservation of Wild Birds ('The Birds Directive'), and are now protected as Natura 2000 Sites under the EU 'Habitats Directive'. There is one SPA within 10km of the study area (see **Figure 13-2** below).

REFERENCE DOCUMENTS

13.2.2.2 Sites of National Importance

Sites of National Importance in the Republic of Ireland are termed, Natural Heritage Areas (NHA) and proposed Natural Heritage Areas (pNHA). While the Wildlife (Amendment) Act 2000 has been passed into law, pNHAs will not have legal protection until the consultative process with landowners has been completed; this process is currently ongoing. One NHA and five pNHAs were recorded within 10km of the Study Area (see **Figure 13-3** below).

Table 13-4 presents details of the key ecological features of these sites, and gives their distance and direction from the study area.

TABLE 13-4: DESIGNATED SITES LOCATED WITHIN 10KM OF THE STUDY AREA (REFER TO FIGURES 13-1, 13-2 AND 13-3 FOR SITE LOCATIONS).

Name	**Site Code**	**Key Features**	**Distance (and direction) of the designated site from the proposed windfarm**
Lower River Shannon cSAC	002165	Freshwater pearl mussel (*Margaritifera margaritifera*) [1029] Sea lamprey (*Petromyzon marinus*) [1095] Brook lamprey (*Lampetra planeri*) [1096] River lamprey (*Lampetra fluviatilis*) [1099] Salmon (*Salmo salar*) [1106] Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] *Salicornia* and other annuals colonizing mud and sand [1310] *Spartina* swards (*Spartinion maritimae*) [1320] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Bottle-nosed dolphin (*Tursiops truncatus*) [1349] Otter (*Lutra lutra*) [1355] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Molinia meadows on calcareous, peaty or clavey-silt-laden soils (*Molinion caeruleae*) [6410] Alluvial forests with *Alnus glutinosa* and Fraxinus excelsior (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0]	2.7km west of the proposed windfarm site.
Bolingbrook Hill cSAC	002124	Northern Atlantic wet heaths with *Erica tetralix* [4010] European dry heaths [4030] Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in continental Europe) [6230]	6.9km north west of the proposed windfarm site.

Name	Site Code	Key Features	Distance (and direction) of the designated site from the proposed windfarm
Lower River Suir cSAC	002137	Freshwater pearl mussel (*Margaritifera margaritifera*) [1029] White-clawed crayfish (*Austropotamobius pallipes*) [1092] Sea lamprey (*Petromyzon marinus*) [1095] Brook lamprey (*Lampetra planeri*) [1096] River lamprey (*Lampetra fluviatilis*) [1099] Allis shad (*Alosa alosa*) [1102] Twaite shad (*Alosa fallax fallax*) [1103] Salmon (*Salmo salar*) [1106] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Otter (*Lutra lutra*) [1355] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Old sessile oak woods with *Ilex* and *Blechnum* in British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0] *Taxus baccata* woods of the British Isles [91J0]	2.8km east of the proposed windfarm site. 4.1km downstream of the proposed windfarm site.
Anglesey Road cSAC	002125	Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230]	2.55km south of the proposed windfarm site.
Slievefelim to Silvermines Mountains SPA	004165	Hen Harrier (*Circus cyaneus*) [A082]	Directly adjacent to the western boundary of windfarm site.
Mauherslieve Bog NHA	002385	Peatland [T010]	4.6km west of the proposed windfarm site.
Bilboa and Gortnageragh River Valleys pNHA	001851	The pNHA is located within the Lower River Shannon SAC and part of the Slievefelim to Silvermines Mountains SPA. There is no site synopsis available for this pNHA.	9.3km south west of the windfarm site.
Killavalla Wood pNHA	001178	Planted woodland with natural characteristic at present/ typical ground flora with some exotic species.	8.6km north of the proposed windfarm site.
Nenegh River Gorge pNHA	001133	Woodland/ grassland/ rich mosaic of unimproved semi-natural Habitats.	5km northwest of the proposed windfarm site.
Aughnaglanny Valley pNHA	000948	Semi-natural woodland in a steep-sided river/dry and wet broad-leaved woodland, humid grassland and scrub/ marshland/Red Squirrel and Fox/ woodland bird sps/ecological, botanical, zoological and ornithological interest	5.9km south of the proposed windfarm site.
Inchinsquillib and Dowling's Woods pNHA	000956	The site is located within the Lower Suir SAC. There is no site synopsis available for this pNHA.	8.7km southwest of the proposed windfarm site.

An Appropriate Assessment was undertaken to assess the potential impacts to the integrity of Natura 2000 Sites (SACs and SPAs) that might arise from the proposed development. This was done in accordance with Article 6 of the 'Habitats' Directive (92/43/EEC) and is presented in **Appendix 13-II** of this chapter.

13.2.2.3 Additional Sites

There are no Nature Reserves, Important Bird Areas (IBAs) or Ramsar sites within 10km of the study area.

13.2.3 Habitat Descriptions of the Proposed Upperchurch Development Site

This section describes the habitats recorded within the site boundary during the habitat survey. These habitats have been classified according to (Fossitt, 2000) and are described in detail in the following sections. A total of thirteen habitats have been identified within the proposed Upperchurch Windfarm site. The main habitats within the site are improved agricultural grassland, acidic grassland and conifer plantation. A list of species recorded from each habitat is presented in Table 13-5.

The site can be described as supporting a small amount of wet habitats such as wet heath and upland blanket bog with both often generally on higher ground and some on gentler lower slopes. There is evidence of where peat cutting has taken place in the past. Extensive land reclamation has taken place throughout the site where often these areas encroach into the wet heath, upland blanket bog and acidic grassland. Cattle grazing also influence the habitats types within the site often causing transitions between sites and creating mosaics of different habitat types. Grassland habitats include improved agricultural and acid grassland associated with present and past agricultural activity. Blocks of conifer plantation occur within the site. These consist of mature conifer plantations to just recently planted areas.

The habitat map is presented at the end of this chapter (see **Figures 13-4 Map 1, Map 2** and **Map 3**). Photographic plates are presented in **Appendix 13-I** of this chapter. Table 13-5 lists the identified habitats within the site that are described in the following sections. Table 13-6 lists identified habitat mosaics.

TABLE 13-5: LIST OF IDENTIFIED HABITATS FROM HABITAT SURVEY AT THE PROPOSED UPPERCHURCH SITE.

Habitat	**Habitat code**	**Spatial description within site**
Improved agricultural grassland	GA1	The most dominant habitat type within the site.
Wet grassland	GS4	Infrequent throughout the study area with the most extensive section to the north east of turbine T8.
Wet heath	HH3	Formed a mosaic with upland blanket bog with a section north west of turbine T2.
Acid grassland	GS3	This habitat occurs to the south east of turbines T3 and T4 and on steep slopes to the northwest of turbine T21.
Upland blanket bog	PB2	There are four small sections of upland blanket within the proposed site.
Conifer plantation	WD4	Occurs in all four sections of the proposed site.
Upland/eroding rivers and streams	FW1	A network of streams within the greater area drains the site. There are three waterways flowing within the site boundary. An unnamed stream drains to the southeast, approx. 200m to the north of T4. An unnamed stream drains to the south 60m southwest of T1. Another stream originates just inside the site boundary of the north eastern section at the southern end of this section, approximately 600m to the south of T9.

Habitat	Habitat code	Spatial description within site
Hedgerows	WL1	The dominant type for field boundary found in all four sections.
Drainage ditches	FW4	This habitat occurs to the east of turbine T7 flowing in a northerly direction.
Spoil and bare ground	ED2	There are farm buildings, tracks, and a farm yard located to the southeast of the turbine T18. There are several roads and farm tracks throughout the site which would also fall into this category.
Buildings and artificial surfaces	BL3	This category has been used to describe farm buildings, tracks, and a farm yard located to the southeast of the turbine T18. There are several roads and farm tracks throughout the site which would also fall into this category.
Treelines	WL2	Limited mainly to areas where the site bounds tree-lined roads, with very little of this habitat occurring within the site.
Neutral grassland	GS1	An area of land to the northwest of turbine T22, to the west of the conifer plantation is fenced off and is not managed as agricultural grassland.

TABLE 13-6: MOSAICS IDENTIFIED WITHIN THE STUDY AREA.

Habitat Mosaic	Habitat code
Mosaic of Improved Grassland & Wet Grassland	GA1 / GS4
Mosaic Wet Heath & Upland Blanket Bog	HH3 / PB3
Mosaic Upland Blanket Bog & Acidic Grassland	PB3 / GS3

13.2.4 Habitat Descriptions of Proposed Upperchurch Windfarm Site

13.2.4.1 Improved agricultural grassland (GA1)

This is the dominant habitat type within the proposed Upperchurch Windfarm site, and would be regarded as relatively high intensity in terms of management. These include areas that have been highly modified by man, which include areas that have been reclaimed where reseeding has occurred and would be regularly fertilised. Many of the fields were heavily grazed and harvested for silage. Evidence of both practises was observed during surveying. Typically Improved grassland habitats are species-poor with rye-grasses (*Lolium spp*.) being the dominant sward. A variety of grasses occurred throughout the site which included Yorkshire fog (*Holcus lanatus*), crested dog's-tail (*cynosures cristatus*), false oat-grass (*Arrhenatherum elatius*), meadow foxtail (*Alopecurus pratensis*) and particularly sweet vernal grass (*Anthoxanthum odoratum*) with perennial ryegrass (*Lolium perenne*) not very abundant. Common herbs include meadow buttercup (*Ranunculus arcis*), ribwort plantain (*Plantago lanceolata*), common ragwort (*Senecio jacobaea*) and common mouse-ear (*Cerastium fontanum*).

These habitats are more species rich towards the periphery along the margins and in drainage areas. Some species included foxglove (*Digitalis purpure*), soft rush (*Juncus effuses*), cuckoo flower (*Cardamine pratensis*) and ragged robin (*Lychnis viscaria*).

13.2.4.2 Wet Grassland (GS4)

This habitat occurs along the lower lying areas in the location of turbine T8. This habitat continues to the southeast along the bank of the unnamed stream. This habitat also occurs in the proximity of turbine T6. Species composition varied considerably within these wet grassland habitats. Species typical of wet grassland habitat that occur here include rush (*Juncus spp.*), with approximately eighty percent cover in some areas, such as compact rush (*Juncus conglomerates*), soft rush (*Juncus effusus*) and hard rush (*Juncus inflexus*). Outside of the *Juncus* dominant areas, grass species had an approximate cover of sixty percent which included Yorkshire fog (*Holcus lanatus*), sweet vernal grass (*Anthoxanthum odoratum*), with the occasional observations of purple moor-grass (*Molinia caerulea*), red fescue (*Festuca rubra*) and meadow foxtail (*Alopecurus pratensis*) towards the dryer areas. Mixed through these grass species include an approximate cover of forty percent cover of broadleaf herbs such as creeping buttercup (*Ranunculus repens*), spearwort (*Ranculus flammula*), meadowsweet (*Filipendula ulmaria*), cuckoo flower (*Cardamine pratensis*), marsh thistle (*Cirsium palustre*), marsh bedstraw (*gallium palustre*), red clover (*Trifolium pratense*), common ragwort (*Senecio jacobaea*) and broad-leaved dock (*Rumex obtusifolius*).

13.2.4.3 Wet heath (HH3)

This category is described by Fossitt (2000) as supporting vegetation with at least 25% cover of dwarf shrubs but can also be dominated by purple moor-grass (*Molinia caerulea*). The wet heath within the site has been damaged by overgrazing and the soils are quite shallow and relatively dry. Hence, the wet heath is not in optimal condition. However, an area just to the northwest of Turbine T2 supports a relatively good diversity of flora with a good representation of the typical species for this habitat. The vegetation is dominated by bell heather (*Erica cinerea*), purple moor-grass (*Molinia caerulea*), with cross-leaved heath (*Erica tetralix*) occasional. Other common species included heath rush (*Juncus squarrosus*), tormentil (*Potentilla erecta*) and sedges (*Carex* spp.) are frequent and *Cladonia* lichens occur occasionally.

13.2.4.4 Acid grassland (GS3)

This habitat occurs mainly outside of the enclosed grassland farm areas and in areas where no reclamation has taken place, but is extensively grazed by cattle. Often this habitat grades into or forms mosaics with the other habitats where cattle grazing takes place. This habitat occurs to the south east of turbines T3 and T4 and on steep slopes to the northwest of turbine T21. Some species recorded that characterise this habitat include sweet vernal grass (*Anthoxanthum odoratum*), a light scattering of purple moor-grass (*Molinia caerulea*), heath bedstraw (*Galium saxatile*), tormentil (*Potentilla erecta*) which was very common and yarrow (*Achillea millefolium*).

13.2.4.5 Upland Blanket Bog (PB2)

It was clear from the ecological survey that the extent of upland blanket bog habitat within the site boundary and the greater area was greater historically. Both the quality and extent of this habitat has been significantly reduced by peat-cutting and agricultural land management practises including drainage, grazing, fertilising and reseeding. A section of good quality upland blanket bog was recorded to the north of turbine T12 and T13. There was some evidence of infrequent grazing within the habitat by cattle but this was very localised and not abundant.

Species recorded within the habitat included bell heather (*Erica cinerea*), common heather (*Calluna vulgaris*), purple moor-grass (*Molinia caerulea*), heath bedstraw (*Galium saxatile*), tormentil (*Potentilla erecta*), devils-bit scabious (*Succisa pratensis*), deer-grass (*Trichophorum cespitosum*), star sedge (*Carex echinata*), glaucous sedge (*Carex flacca*) and cotton grass (*Eriophorum vaginatum*). An open area of peatland occurs to the north of turbine T19 (GPS location: 93382 61205) within the western section of the Proposed Upperchurch Site. This area is surrounded by improved agricultural grassland to the north, west and south and by conifer plantation to the east and has an average bank height of approximately 1.2 meters. At this particular area bell heather (*Erica cinerea*) has a cover of approximately 65%. Another section of upland blanket bog was recorded just to the west of turbine T3 on a plateau with an average bank height of approximately 1.5 meters and covers an area of approximately 500m^2. Most of the blanket bog is limited to the higher areas with shallow peat depth. Species included purple moor-grass (*Molinia caerulea*), cotton grass (*Eriophorum vaginatum*), tormentil (*Potentilla erecta*), bilberry (*Vaccinium myrtillus*) and with a low percentage cover of sphagnum moss species.

13.2.4.6 Conifer Plantation (WD4)

Commercial conifer plantation occurs in all four sections of the proposed site. These plantations are predominantly of sitka spruce (*Picea sitchensis*) and the odd scattering of larch species (*Larix* spp.). Some of these plantations have margins of alder (*Alnus glutinosa*), common ash (*Fraxinus excelsior*) and downy birch (*Betula pubescens*) that are up to six trees deep on the road side of these plantations. The ground flora is sparse under mature stands where the ground is covered in a layer of decaying pine needles with a little cover of mosses including *Sphagnum* spp., *Thuidium tamariscinum* and *Rhytidiadelphus* spp. In areas of less mature forestry, the ground layer vegetation is more representative of a wet heath and upland blanket bog habitat with species including bell heather (*Erica cinerea*), purple moor-grass (*Molina caerulea*), deergrass (*Trichophorum caespitosum*), and sedges (*Carex spp*.).

13.2.4.7 Upland/Eroding Rivers and Streams (FW1)

Three small, first order streams streams occur within the site. A stream drains to the southeast parallel to the boundary of the south eastern section approximately 200m to the north/north east of T4. A small shallow stream drains to the south, 60m to the southwest of T1. A small stream originates just inside the boundary of the north eastern section, approximately 600m to the south of T9. The greater area is drained by a network of streams and rivers which ultimately drain to the Lower River Suir to the south east and to the Lower River Shannon to

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the west. The Turraheen, Owenbeg and Clodiagh Rivers form part of the South Eastern River Basin District and ultimately join the River Suir to the southeast. The Aughvana River, which is part of the Shannon International River Basin District, joins the Mulkear River to the south west. A detailed description of the streams draining the study area is presented in section 13.2.9 below.

13.2.4.8 Hedgerow (WL1)

A number of hedgerows occur within the site marking field boundaries. The hedgerows varied from more diverse higher quality hedgerows to more species poor sections to stretches that varied in vegetation height and cover. Towards the centre of the western section hedgerows were described as grass dominated ditches. Other dominant species within the hedgerows include bramble (*Rubus fruticosus*), gorse (*Ulex europaeus*), willows (*Salix spp.*) and a thick fuchsia (*Fuchsia magellancia*) hedge was recorded along the western boundary of the western section. Other species included bilberry (*Vaccinium myrtillus*), nettle (*Urtica dioica*) and male fern (*Dryopteris filix-mas*). Occasional trees (some saplings) occur along the hedgerows which include sycamore (*Acer pseudoplatanus*) and oak (*Quercus robur*).

13.2.4.9 Drainage Ditches (FW4)

There was a small network of manmade drainage ditches around the edges of both the wet and improved agricultural grassland fields throughout most of the site. This habitat occurs to the east of turbine T7 flowing in a northerly direction. This had a relatively moderate flow which drained water from the conifer plantation to the south to an unnamed stream outside the site boundary which drains to the east into the Owenbeg River. The width of this feature varied from 0.3m up to 1m and had a bank depth of approximately 1.2m. The shape varied from u shaped to v shaped in places. During time of survey water level had a maximum level of approximately 10 cm. However, it is considered highly likely that the volume of water within features such as this throughout the site would increase during periods of higher precipitation especially during the winter months. Recolonising wetland plants at this area, included rushes (*Juncus spp.*), great willowherb, (*Epilobium hirsutum*), marsh thistle (*Cirsium palustre*) and ragged robin (*Lychnis flos-cuculi*). These drainage ditches have been constructed to drain these fields allowing for the improvement of pasture land for grazing. Drainage ditches also occurred along the margins of the conifer plantations which enhance the flow of water. The central section which is under first and second rotation forestry, is drained by a network of ditches (dry at time of surveying) that drain to a main drainage ditch flowing to the north, parallel to the hedgerow which bounds an overgrown forest track (firebreak), to east of T22. Some areas of these habitats lacked water and were overgrown with vegetation such as bramble (*Rubus fruticosus*) and purple moor-grass (*Molinia caerulea*) and are not included in this habitat.

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13.2.4.10 Spoil and Bare Ground (ED2)

The forestry and farm roads within the proposed site fall into this habitat category and are dominated by compact gravel which is naturally occurring to the area. These roads came about by removing the top soil and the subsoil of sandstone and shale till formed the roads, which has a distinctive brown reddish colour. Other areas that fall into this habitat category include previous borrow pits and areas that have been cleared within other habitats such as entrances to fields where turn points exist and areas of disturbance where heavy trampling has occurred. These areas are readily invaded by plants. Some of the vegetation that does occur includes rough meadow-grass (*Poa trivialis*), germander speedwell (*Veronica chamaedrys*), common nettle (*Urtica dioica*) and dandelion (*Taraxacum officinale* agg.).

13.2.4.11 Buildings and artificial surfaces (BL3)

This category includes buildings, areas of land that are covered with artificial surfaces of tarmac, cement, paving stones, etc. (Fossitt, 2000). Within the Upperchurch Windfarm site, this category has been used to describe farm buildings, tracks, and a farm yard located to the southeast of the turbine T18. There are several roads and farm tracks throughout the site which would also fall into this category. Swallows, jackdaws and hooded crows were recorded in the vicinity of the farm buildings making them probable nesting sites.

13.2.4.12 Treelines WL2

A treeline is a narrow row or single line of trees that is greater than 5m in height. For the most part this habitat is limited to where the proposed site is bounded by tree-lined public roads. Two treelines occur in the north eastern section, between T10 and T11. Another section of treeline habitat recorded within the site occurs along the western boundary of the western section to the northwest of T19. Dominant species include sycamore (*Acer pseudoplatanus*), hawthorn (*Crataegus monogyna*) and oak (*Quercus robur*). There have been single rows of conifer planted along the hedgerows of agricultural grassland, to the southeast of turbine T1, but they are still juveniles and are not considered as part of this habitat.

13.2.4.13 Neutral grassland GS1

An area of land to the northwest of turbine T22, to the west of the conifer plantation is fenced off and is not managed as agricultural grassland. The sward was dominated by Yorkshire fog (*Holcus lanatus*) other grassland species included false-oat's grass (*Arrhenatherum elatius*), sweet vernal grass (*Anthoxanthum odoratum*) meadow foxtail (*Alopecurus pratensis*) and couch grass (*Agropyron repens*). Broadleaved herbs such as daisy (*Bellis perennis*), clovers (*Trifolium spp.*) and dandelion (*Taraxacum spp.*) were common.

TABLE 13-7: SPECIES OF FLORA RECORDED WITHIN THE STUDY AREA.

Common name	Latin name	Habitat
Alder	*Alnus glutinosa*	FW1 and WD4 (perimeter)
Annual meadow-grass	*Poa annua*	BL3, GA1, ED2and GS4
Ash	*Fraxinus excelsior*	WL2 (roadside)
Bell heather	*Ericea cinerea*	PB2, WL1, WD4 and HH3
Bilberry	*Vaccinium myrtillus*	PB2, HH3 and WL1
Black bog rush	*Schoenus nigricans*	PB2
Blackthorn	*Bursaria spinosa*	WL1
Bog myrtle	*Myrica gale*	PB2,WL1 and HH3
Bog-moss	*Sphagnum spp*	PB2, WL1 WD4 and HH3
Bramble	*Rubus fruticosus*	WL1 and WS1
Broad-leaved dock	*Rumex obtusifolius*	GA1, GS4 and WL1
Bulbous rush	*Juncus bulbosus*	PB2(pools) and FW4
Bush vetch	*Vicia sepium*	WL1 and roadside margins
Cleavers	*Galium asparine*	WL1 and roadside
Cocksfoot	*Dactylis glomerata*	GA1, ED2 and WL1
Common cotton-grass	*Eriophorum angustifolium*	PB2 and HH3
Common haircap	*Polytrichum commune*	PB2 and WD4
Common liverwort	*Marchantia polymorpha*	FW4
Common milkwort	*Polygala vulgaris*	HH3 and PB2 and stream bank
Common mouse-ear	*Cerastium fontanum ssp. vulgare*	GA1,GS4, WL1 and roadside
Common ragwort	*Senecio jacobaea*	GA1 and GS4
Common sedge	*Carex montana*	PB2 and HH3
Common spotted orchid	*Dactylorhiza fuchsii*	ED2,GS4 and PB2
Compact rush	*Juncus conglomerates*	GS4, GS3 and WD4
Cotton grass	*Eriophorum vaginatum*	PB2
Couch grass	*Agropyron repens*	GS1, GS1 and roadside
Cowslip	*Primula veris*	Roadside
Creeping bent	*Agrostis stolonifera*	GS4 and GA1
Creeping buttercup	*Ranunculus repens*	GA1, GS3 and GS4
Creeping thistle	*Cirsium arvense*	GA1 and GS4
Crested dog’s-tail	*cynosures cristatus*	GA1, GS4 and GS3
Cross-leaved heath	*Erica tetralix*	PB2 and HH3 (Very little)
Cuckoo flower	*Cardamine pratensis*	GS4, GA1 and FW4
Cup lichen	*Clodonia spp.*	PB2 and HH3
Daisy	*Bellis perennis*	GA1, GS1, GS4, WL1, ED2 and GS3
Dandelions	*Taraxacum officinale agg.*	GA1.GS4, GS1 and ED2
Deergrass	*Trichophorum cespitosum*	PB2 and HH3
Downy Birch	*Betula pubescens*	Roadside
False oats-grass	*Arrhenatherum elatius*	GA1, GS1, WL1 and roadside verges
Fool's parsley	*Aethusa cynapium*	WL1 and roadside verges
Foxglove	*Digitalis purpurea*	WL1, GA1 by margins and road sides
Fuchsia	*Fuchsia magellancia*	WL1
Germander speedwell	*Veronica chamaedrys*	GA1, ED2 and WL1
Goat willow	*Salix caprea*	WL1, HH3, PB2 and FW1
Gorse	*Ulex europaeus*	WL1 and HH3(at margins)
Great willowherb	*Epilobium hirsutum*	GS4, BL3 and FW4

Common name	Latin name	Habitat
Greater plantain	*Plantago major*	GA1
Grey willow	*Salix cinerea*	WL1, and PB2
Hard fern	*Blechnum spicant*	HH3, WL1 and roadside
Hard rush	*Juncus inflexus*	GA1 and GS4
Harestail cotton-grass	*Eriophorum vaginatum*	PB3
Hart's-tongue fern	*Phyllitis scolopendrium*	WL1
Hawk's bit spp.	*Leontodon* spp.	WL1 and GA1 margin
Hawthorn	*Crataegus monogyna*	WL1
Hazel	*Corylus avellana*	WD1
Heath bedstraw	*Galium saxatile*	GS3
Heath milkwort	*Polygala serphyllifolia*	HH3 and PB2
Heath rush	*Juncus squarrosus*	HH3
Herb-robert	*Geranium robertianum*	WL1 and roadside (just outside site)
Himalayan balsam	*Impatiens glandulifera*	FW1 (Downstream of site)
Ivy	*Hedera helix*	WL2 and roadside
Japanese knotweed	*Fallopia japonica*	Roadside
Larch species	*Larix spp.*	WD4
Lesser spearwort	*Ranculus flammula*	GS4
Lesser stitchwort	*Stellaria graminea*	GA1, GS3 and WL1
Lichen (matchsticks)	*Cladonia florakena*	In disturbed peat area ED2
Liverwort sp.	*Marchantiophyta*	PB3
Lousewort	*Pedicularis sylvatica*	PB2 and HH3
Male fern	*Dryopteris Filix-Mas*	WL1 and WD4
Marsh bedstraw	*Gallium palustre*	HH3, GS4 and WL1
Marsh foxtail	*Alopercurus geniculatus*	GS4
Marsh lousewort	*Pedicularis palustris*	PB2
Marsh thistle	*Cirsium palustre*	GS4 and FW4
Marsh willowherb	*Epilobium palustre*	GS4
Meadow buttercup	*Ranunculus acris*	GA1, GS3 ,GS1, WL1 and GS4
Meadow foxtail	*Alopecurus pratensis*	GA1 and GS1
Meadow sweet	*Filipendula ulmaria*	GS4 , WL1 and roadside
Meadow thistle	*Cirsium dissectum*	GS4
Mountain ash	*Sorbus aucuparia*	WL1 and WL2
Mountain fern	*Oreopteris limbosperma*	FW1 (bank)
Nettle	*Utrica dioica*	GA1,ED2, WL1 and roadside
Oak	*Quercus robur*	WL2
Perennial rye-grass	*Lolium perenne*	GA1
Primrose	*Primula vulgaris*	WL1 and roadside
Purple loosestrife	*Lythrum salicaria*	GS4 and FW4
Purple moor-grass	*Molinia caerulea*	HH3, GS3 and PB2
Ragged robin	*Lychnis viscaria*	GA1, GS4 and FW4
Red bog-moss	*Sphagnum capillifolium*	PB2, WD4 and HH3 wet areas
Red clover	*Trifolium pratense*	GA1, GS4 and WL1
Red fescue	*Festuca rubra*	GA1, WL1, PB2 and HH3
Red-stemmed feather-moss	*Pleurozium schreberi*	PB3, WD4 and HH3
Ribwort plantain	*Plantago lanceolata*	GA1,GS1, ED2 and GS4
Rough meadow-grass	*Poa trivialis*	GA1, GS4 and ED2
Round-leaved crowfoot	*Ranunculus omiophyllus*	FW1 and FW4
Selfheal	*Prunella vulgaris*	ED2 and GA1

Common name	Latin name	Habitat
Sheep sorrel	*Rumex acetosella*	GA1, GS3 and GS4
Shepherds purse	*Capsella bursis-pastoris*	Roadside and ED2
Sitka spruce	*Picea sitchensis*	WL2 and WD4
Smooth meadow-grass	*Poa pratensis*	GA1
Soft rush	*Juncus effusus*	GA1, GS4, WD4, HH3, WL1 and PB2
Spear thistle	*Cirsium vulgare*	GA1
St. John's wort	*Hypericum sp.*	WL1 and ED2
Star sedge	*Carex echinata*	PB2, GS4, GS3 and HH3
Sweet vernal grass	*Anthoxanthum odoratum*	GA1, GS4, GS1, GS3, HH3, GS1, WD4 and HH3
Sycamore	*Acer pseudoplatanus*	WL2
Tormentil	*Potentilla erecta*	GA1, GS4, GS3, HH3, GS1, WD4 and PB2
Water mint	*Mentha aquatica*	GS4 and FW1
Watercress	*Rorippa nasturtium-aquaticum*	FW1
Water-starwort	*Callitriche sp.*	FW1
Wavy bittercress	*Cardamine flexuosa*	Roadside
White clover	*Trifolium repens*	GA1,GS4 and WL1
White willow	*Salix alba*	WL1
Wild angelica	*Angelica sylvestris*	GS4, GA1 and WL1
Yarrow	*Achillea millefolium*	GS3 and ED2
Yorkshire fog	*Holcus lanatus*	GA1, GS4, GS1 and WL1

13.2.5 Habitat Evaluation

Habitats have been evaluated below in Table 13-8 for their conservation importance based on the NRA evaluation scheme (see Table 13-2 above).

Those selected as key ecological receptors are those which are evaluated to be of at least local importance (higher value). The impacts of the proposed windfarm on these receptors are assessed below in section 13.3. The summary in Table 13-8 below illustrates the evaluation rating given to each habitat. The rationale behind these evaluations is also given.

TABLE 13-8: EVALUATION OF HABITATS WITHIN THE STUDY AREA.

Habitat (code)	Evaluation	Rating	Rationale	Ecological receptor
Improved Agricultural Grassland (GA1)	There is an extensive cover of Improved agricultural Grassland throughout the site. The habitat is species rich (as per agricultural grassland) and is of value to species which forage within it.	Locally important (higher value)	A species poor common habitat which has been given a higher rating due to the utilisation of the habitat by badger.	Yes
Wet Grassland (GS4)	This habitat is common in the lower lying areas and along margins of streams of the site. The wet grassland habitat has been modified by the building of drains around the field boundaries, reseeding and the application of fertiliser. While generally species poor the habitat is	Locally important (higher value)	Valuable habitat in itself but also forms transitions or mosaics with other habitats.	Yes

Habitat (code)	Evaluation	Rating	Rationale	Ecological receptor
	considered to be of some ecological value.			
Mosaic of Improved Grassland & Wet Grassland (GA1 / GS4)	Small sections found throughout the study area.	Locally important (higher value)	A species poor common habitat.	Yes
Mosaic Wet Heath & Upland Blanket Bog (HH3 / PB3)	Small sections scattered throughout the study area.	Locally important (higher value)	Good examples of this habitat mosaic in areas where disturbance has been limited.	Yes
Mosaic Upland Blanket Bog & Acidic Grassland (PB3 / GS3)	Mainly confined to one section of the study area.	Locally important (higher value)	Good examples of this habitat mosaic in areas where disturbance has been limited.	Yes
Wet Heath (HH3)	An area to the west of T2 in the south eastern section is classified as wet heath. This area was dominated by bell heather and purple moor-grass. This area would be subject to cattle grazing. Peat depth is low, approximately 0.3m. Formed due to peat extraction.	Local Importance (higher value)	Habitat has undergone disturbance by cattle grazing and reclamation. This is one example of good quality habitat within the study area.	Yes
Acid Grassland (GS3)	This habitat occurs mainly outside of the enclosed grassland farm areas in areas where no reclamation has taken place but is extensively grazed by cattle. This habitat occurs to the south east of turbines T3 and T4 and on steep slopes to the northwest of turbine T21. Scarce	Local Importance (higher value)	Habitat has undergone disturbance by Cattle grazing and reclamation. However there are good examples of the habitat within the study area.	Yes
Upland Blanket Bog (PB3)	Upland blanket bog is one of the least occurring habitats within the study area. The habitat has been degraded by previous peat extraction, land reclamation, conifer plantation, grazing and drainage.	County Importance	Good examples of this habitat in areas where disturbance has been limited.	Yes
Coniferous Plantation (WD4)	There are 7 stands of conifer plantation within the study area planted on heath/upland blanket bog habitat. The dense growth within this habitat means there is very little light penetration reducing the diversity of plant species at ground level. Some areas have been felled and replanted. The younger stands have much more diverse vegetation undergrowth.	Locally important (lower value)	Highly modified habitat.	No
Eroding/Upland River (FW1)	There are 3 small streams within the study area. These streams are quite small. Extensive man made drainage features drain into these habitats to dry out the surrounding low lying landscape.	Local Importance (higher value)	Low order streams whose water quality has been compromised land reclamation.	Yes

Habitat (code)	Evaluation	Rating	Rationale	Ecological receptor
Hedgerow (WL1)	There is a network of hedgerows along the improved grassland field boundary throughout the site.	Local Importance (higher value)	Some good examples of hedgerow habitat in conifer plantation margins and along road margins. Some within the study area have no tree or shrub coverage and are of lower ecological value.	Yes
Drainage Ditches (FW4)	Man-made features extending around the boundaries of lower lying agricultural fields and conifer plantation within the study area. Many are large with some vegetation.	Local Importance (higher value)	Some are not a good example of this habitat type but given a higher rating due to their potential following recolonisation.	Yes
Spoil and Bare Ground (ED2)	The forestry and farm roads within the site fall into this habitat category and are dominated by compact gravel which is naturally occurring to the area	Local Importance (lower value)	Modified habitat with potential with recolonisation to be of higher ecological value.	No
Buildings and Artificial Surfaces (BL3)	Habitat of very low ecological value.	Local Importance (lower value)	Highly modified habitat.	No
Treelines (WL2)	There are some small sections of treelines within the study area which mostly occur along tree-lined roads, This habitat occurs in the north eastern section between T 10 and T 11. Also a section of this habitat occurs along the western boundary of the western section.	Local Importance (higher value)	Some treelines particularly the broadleaved species offer potential roosting habitat for bats.	Yes
Neutral Grassland (GS1)	One small section of habitat within the study area.	Locally important (higher value)	Modified habitat.	Yes

The habitats listed in the tables above that are selected as key ecological receptors (based on an evaluation of at least local importance (higher value) are looked at in more detail below in terms of impact assessment (see section 13.3).

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13.2.6 Flora

13.2.6.1 Rare and Protected Flora

The Study Area lies within Ordnance Survey National Grid 10km Squares R95 and R96. A plant species list for these 10km squares was generated from the CD-Rom version of the New Atlas of British and Irish Flora (Preston *et al.* 2002). Each 10km grid square was searched for records of plant species. This list was then compared to the lists of species protected under the Flora (Protection) Order of 1999 and the Irish Red Data Book (Curtis and McGough, 1988).

There were four plant species of conservation interest recorded within the 10 km grid squares R95 and R96. All four species are listed within the proposed new red data book list compiled by Naomi Kingston of the National Parks and Wildlife Service (2005). Table 13-9 presents details of the rare and protected plant species found within the 10km squares R95 and R96.

TABLE 13-9: RARE OR PROTECTED PLANT SPECIES RECORDED FROM 10KM SQUARE R95 INDICATED IN PRESTON *ET AL.* (2002).

Name	Most Recent Record Date (Preston *et al.*, 2002)	Notes
Bog Rosemary *Andromeda polifolia*	1987-1999	Irish Red Data Book (1988) IUCN = not threatened IRDB TN = 6 (Rare) Irish Red Data Book (2006) LC (Least Concern)
Cowslip *Primula veris*	1987-1999	Irish Red Data Book (1988) IUCN = not threatened IRDB TN = 8 (Rare) Irish Red Data Book (2006) LC (Least Concern)

Rare or Protected Plant Species recorded from 10km square R96 indicated in Preston *et al.* (2002).

Name	Most Recent Record Date (Preston *et al.*, 2002)	Notes
Greater Butterfly Orchid *Platanthera chlorantha*	1970-1986	Irish Red Data Book (2006) LC (Least Concern)
Small-white Orchid *Pseudorchis albida*	1970-1986	Irish Red Data Book (1988) IUCN = Endangered (Vulnerable) IRDB TN = 10 (Vulnerable) FPO 1999 Irish Red Data Book (2006) Endangered

13.2.6.2 Flora Protection Order species

Small White Orchid (*Pseudorchis albida*)

One species was recorded within the 10 km grid square R96 which is protected under the Flora Protection Order and is the species known as Small White Orchid (*Pseudorchis* *albida*), also known as the White Mountain Orchid, it is a rather rare species found in dry rough pasture in upland or coastal areas. It is a small plant, rarely over six inches, and bears small white flowers in a fairly tight spike from mid-June. The flowers have a sweet scent and carry nectar in the spurs which attract a wide variety of insects. The main centres of occurrence of this species are in the northern parts of Europe. Found in upland pastures and heaths in Ireland. The species was not recorded during surveying.

13.2.6.3Species of Conservation Interest

Bog Rosemary (Andromeda polifolia)

This is a very small undershrub which grows in some of our acid bogs, mostly in the centre of Ireland. It scarcely reaches 40 cm high, and can easily be missed as it grows surrounded by mosses. The species was not recorded during surveying.

Cowslip (Primula veris)

A perennial herb of well-drained, herb-rich grasslands on mesic to calcareous soils; is also found less commonly on seasonally flooded soils, in scrub or woodland rides and edges, and on calcareous cliffs (Preston *et al*. 2002). *P. veris* suffered a marked decline between 1930 and 1980 due to the ploughing or agricultural improvement of grassland. It has, however, recently become more frequent on road verges sown with this species or with wild-flower mixtures. Parnell *et al*. (2012) describes the species as being found in '*pastures; frequent in the centre, rather rare in the north-east and south-west*'. The species was not recorded during surveying.

Greater Butterfly Orchid (Platanthera chlorantha)

Greater butterfly-orchid is a perennial herb found in a wide variety of habitats, usually on well-drained calcareous soils. Typical habitats include downland, rough pasture, hay meadows, scrub, woodland and young plantations. It sometimes occurs on sand dunes and railway embankments. Rarely, it grows on slightly acidic soils in moorland and wet, heathy pasture (Preston *et al*. 2002). *P. chlorantha* was lost from many sites during the 20th century. Reasons include the felling, disturbance and coniferisation of woodland, and the agricultural improvement of pasture and scrub. It may be lost from woodland if the canopy becomes too dense (Preston *et al*. 2002 and Parnell *et al*. 2012). Records for the species date from 1970 – 1986. The greater butterfly-orchid was not recorded during surveys within the study area.

13.2.7 Mammals

Records for terrestrial mammals were retrieved from the NPWS and the National Biodiversity Data Centre online mapping. The publication "Exploring Irish Mammals" (Hayden and Harrington, 2000) was also used to access records of mammals within the Study Area. Species' distributions are shown by 20 kilometre squares, each of which consists of four OS 10km grid squares. The proposed windfarm is spread over two 20km squares, composed of 10km OS grid squares R95 and R96. A number of protected native mammal species are recorded for these 20km squares. Table 13-10 below lists these, and summarises their protected status and potential for occurrence within the Study Area. Bats are discussed in section 13.2.8.

TABLE 13-10: TERRESTRIAL MAMMAL SPECIES RECORDED WITHIN THE 10KM OS NATIONAL GRID SQUARES R95 AND R96.

Species	Identification of National Distribution	Source of Records	Level of Protection
Fallow Deer (*Dama dama*)	Scattered throughout Ireland.	R95 recorded on the 31/12/2008 (source *Irish Deer Database*) R96 recorded on the 25/10/2011 (source *Atlas of Mammals in Ireland 2010-2015*)	Wildlife (Amendment) Act (2000).
Irish Hare (*Lepus timidus hibernicus*)	Throughout Ireland	Hayden and Harrington (2000) R95 recorded on the 28/02/1990 (source *Badger and Habitats Survey of Ireland*) R96 recorded on 08/05/1990 (source *Badger and Habitats Survey of Ireland*)	Irish Red Data Book: 'Least Concern'. Wildlife (Amendment) Act (2000). Annex V Habitats Directive. Berne Convention Appendix III.
Otter (*Lutra lutra*)	Throughout Ireland	Hayden and Harrington (2000) R95 recorded on the 05/06/1980 (source *Otter survey of Ireland 1982*) R96 recorded on the 05/06/1980 (source *Otter survey of Ireland 1982*)	Irish Red Data Book 'Near Threatened'. Habitats Directive Annex II and IV. Berne Convention Appendix III. Wildlife (Amendment) Act (2000).
Pine Marten (*Martes martes*)	Throughout Ireland	R95 recorded on the 17/07/2009 (source *Atlas of Mammals in Ireland 2010-2015*) R96 recorded on the 14/11/2011 (source *Atlas of Mammals in Ireland 2010-2015*)	Irish Red Data Book: 'Least Concern'. Wildlife (Amendment) Act (2000). Habitats Directive Annex V
Badger (*Meles meles*)	Throughout Ireland	Hayden and Harrington (2000) R95recorded on the 19/05/2009 (source *Irish National Badger Set Datatbase*) R96 recorded on the 16/09/2008 (source *Irish National Badger Set Datatbase*)	Irish Red Data Book: 'Least Concern'. Wildlife (Amendment) Act (2000).
European Rabbit (*Oryctolagus cuniculus*)	Throughout Ireland	Hayden and Harrington (2000) R95 recorded on the 28/02/1990 (source *Badger and Habitats Survey of Ireland*) R96 recorded on the 08/05/1990 (source *Badger and Habitats Survey of Ireland*)	Irish Red Data Book: 'Least Concern'.
Red Fox (*Vulpes vulpes*)	Throughout Ireland	Hayden and Harrington (2000) R95 recorded on the 28/02/1990 (source *Badger and Habitats Survey of Ireland*) R96 recorded on the 08/05/1990	Mammal Red List for Ireland 2009: 'Least Concern'

Species	Identification of National Distribution	Source of Records	Level of Protection
		(source *Badger and Habitats Survey of Ireland*)	
Irish Stoat (*Mustela erminea subsp. Hibernica*)	Throughout Ireland	Hayden and Harrington (2000) R95 recorded on the 31/01/2012 Atlas of Mammals in Ireland 2010-2015	Wildlife (Amendment) Act (2000). Berne Convention Appendix III.
Hedgehog (*Erinaceus europaeus*)	Throughout Ireland	Hayden and Harrington (2000)	Irish Red Data Book: 'Least Concern'. Wildlife (Amendment) Act (2000). Berne Convention Appendix III.
Pygmy shrew (*Sorus minutes*)	Throughout Ireland	Hayden and Harrington (2000)	Irish Red Data Book: 'Least Concern'. Wildlife (Amendment) Act (2000). Berne Convention Appendix III.

There were no records of fallow deer (*Dama dama*), pine marten (*Martes martes*), hedgehog (*Erinaceus europaeus*) and Irish stoat (*Mustela erminea subsp. Hibernica*) during surveying. The habitats within the study area offer potential habitat for the species.

13.2.7.1 Badger

During the field survey badger activity was recorded in the south eastern section of the site. A trail was followed through a field which led to a gap in the hedgerow at the north eastern corner of the field where T7 is located. Fresh droppings were found at this site (GPS R96274 60423).

13.2.7.2 Otter

There were no signs of otter utilising habitats within the site during ecological surveys. However the stream south of turbines T9 and 10 and the section of stream downstream from the proposed development offer potential habitat for the species.

13.2.7.3 Irish (mountain) hare

Records presented on the National Biodiversity Ireland Website interactive map indicate that Irish hare have been recorded in grid square R95 and R96. There were no observations of Irish hare or associated field signs during the field survey within the study area. However the improved agricultural grassland fields, heath and upland blanket bog within the study area offer potential habitats for the species.

13.2.7.4 Red Fox

During the field survey there were several records of red fox (*Vulpes vulpes*) droppings within the study area. Fox trails were found skirting the edges of fields throughout the site, and a trail of fox prints was found on the north western edge of the western section of improved agricultural grassland (GPS R93006 61352). It is considered highly likely that fox are utilising the habitats within the site for foraging, shelter and potentially breeding.

13.2.7.5 Other mammals recorded

Field mice (*Apodemus sylvaticus*) and a pygmy shrew (*Sorus minutes*) were observed just outside the south eastern section of the site during a bat survey. There was no evidence of other mammal species of conservation interest within the study area.

13.2.8 Bats

Records for bat were retrieved from the NPWS and the National Biodiversity Data Centre online mapping. The proposed windfarm is spread over two 20km squares, composed of 10km OS grid squares R95 and R96. Table 13-11 below lists bat species recorded on the National Biodiversity Data centre online mapping, and summarises their protected status and potential for occurrence within the Study Area.

Table 13-11: Bat species recorded on National Biodiversity Data centre online mapping

Species	Source of Records	Level of Protection
Daubenton's Bat (*Myotis daubentonii*)	R95 recorded on the 08/08/2009 National Bat Database of Ireland	Protected Species: EU Habitats Directive. Annex IV Protected Species: Wildlife (Amendment) Act (2000).
Leisler's Bat (*Nyctalus leisleri*)	R95 recorded on the 08/08/2009 National Bat Database of Ireland	Protected Species: EU Habitats Directive. Annex IV Protected Species: Wildlife (Amendment) Act (2000).
Soprano Pipistrelle (Pipistrellus pygmaeus)	R95 recorded on the 08/08/2009 National Bat Database of Ireland R95 recorded on the 08/08/2009 National Bat Database of Ireland	Protected Species: EU Habitats Directive. Annex IV Protected Species: Wildlife (Amendment) Act (2000).
Brown Long-eared Bat (*Plecotus auritus*)	R96 recorded on the 08/08/2009 National Bat Database of Ireland	Protected Species: EU Habitats Directive. Annex IV Protected Species: Wildlife (Amendment) Act (2000).
Pipistrelle (*Pipistrellus pipistrellus sensu lato*)	R96 recorded on the 08/08/2009 National Bat Database of Ireland	Protected Species: EU Habitats Directive. Annex IV Protected Species: Wildlife (Amendment) Act (2000).

13.2.8.1 Ecology

Bats in Ireland feed exclusively on insects and in the summer they generally emerge from their roosts at dusk to feed. The distances covered while foraging varies considerably between species. They are known to use a number of different foraging sites in the same night and move between them to locate areas of high insect density. They are also known to exhibit a level of site loyalty and will frequently return to the same foraging sites night after night (Joint Nature Conservancy Committee JNCC, 2001).

13.2.8.2 Results of bat survey

Driven bat transect surveys were carried out on the 21st of June 2012 around the perimeter of all sections of the proposed site to get a snapshot of bat species that use the area. During previous on-site ecological daytime surveys, possible roost sites, such as buildings and structures were highlighted. When designing potential surveying locations around each section of the proposed site and the surrounding habitats, features of particular interest to bat species were identified, namely linear habitats, such as buildings, water features (rivers and streams), hedgerows and treelines. Features such as these, could be used by bats to commute and hunt. No signs of activity were recorded during daytime surveys. However one old building/farm buildings and farmyard was flagged as offering potential bat roosting sites. The old farm house and buildings are located outside the site. Table 13-12 below summarises the details of the bat transect surveys conducted. The results of the bats surveys carried out around the perimeter of each section and the surrounding habitats are shown in Table 13-12.

REFERENCE DOCUMENTS

TABLE 13-12: DETAILS AND RESULTS OF THE BAT SURVEY CARRIED OUT AT UPPERCHURCH

Survey Location	Start time	Finish time	Details of results
Bat Transect 1	00:55	01:06	2 Brown long eared bat calls. 2 recorded at end of transect along hedgerow and broadleaf treeline
Bat Transect 2	01:09	01:29	31 common pipistrelle calls recorded for the most part of the transect. Commuting and hunting along hedgerow and roadside treeline
			1 Brown long eared bat recorded towards end of transect feeding along forest edge habitat
Bat Transect 3	01:35	01:51	10 common pipistrelle calls recorded. Commuting and hunting along hedgerows
Bat Transect 4	01:52	02:02	5 common pipistrelle calls recorded along hedgerow with some broadleaf tree cover
Bat Transect 5	02:04	02:13	36 confirmed common pipistrelle calls. Observed commuting along forest edge and hedgerows. This species was recorded for the most part of the transect.
			2 Soprano pipistrelle calls commuting and hunting
			1 whiskered/Brandts bat
Bat Transect 6	02:18	02:39	1 common pipistrelle call in commuting/hunting along broadleaf treeline
			2 brown long eared bat calls one recorded commuting/hunting along hedgerow. One recorded at the end of the western leg of this transect just east of conifer treeline and farmyard
Bat Transect 7	02:40	03:00	1 whiskered/Brandts bat recorded at beginning of transect where forest edge and hedgerow merged.
			6 common pipistrelle calls recorded along hedgerow habitat with dwelling houses close by
Bat Transect 8	02:52	03:05	5 common pipistrelle calls recorded along hedgerow and broadleaf treeline

13.2.8.3 Discussion of results

Four species of bat were recorded in all during the survey namely common pipistrelle (*Pipistrellus pipistrellus*), Soprano pipistrelle (*Pipistrellus pygmaeus*), brown long eared bat (*Plecotus auritus*) and either a whiskered (*Myotis mystacinus*) or Brandt's bat (*Myotis brandtii*). The *Myotis* species, the whiskered/Brandt's bat was recorded during Bat Transect (BT) 5 along a hedgerow and a mix of broadleaf and conifer treeline located to the north-east of the western section. Two calls were heard during the entire transects routes, with the second pass recorded at the beginning of BT 7, just to the south of the western section. The calls were not identified to species during the survey due to the difficulty in distinguishing the difference in whiskered and Brandt's bat. Although the whiskered bat is widely distributed throughout Ireland, there are relatively few records (NPWS, 2009). O'Sullivan (1994) recorded that whiskered bats are found in houses during the summer, roosting in small numbers in the roof space, often between the rafters and felt or in narrow slits where timbers meet, where they are difficult to observe. Surveys in east cork conducted by Pat Smiddy

(1991) found a male and female whiskered bat roosting in a bridge, a behaviour also recorded at a bridge in co. Leitrim (Shiel, 1999).

As already stated Brandt's bat is very similar and closely related to the whiskered bat so it is possible that the two have been confused in the past. This species is very rare and has only been confirmed from one location in Ireland to-date (Co. Wicklow, 2003). On the continent it is considered a forest bat and is less associated with human settlements than the whiskered bat. It often hunts over water and in forest. Its roosting and foraging preferences in Ireland are unknown (BCI, 2012).

Overall 6 passes of brown long eared bat were recorded, along transects BT 1, BT 2 and BT 6, commuting and hunting along the foliage of hedgerows and forest edge. Brown long□eared bats rely heavily on artificial roosts (Swift, 1998). The natural summer roosts of this species are generally tree holes. However, artificial roosts such as attic spaces have replaced many natural structures and in some ways may even be more beneficial than natural tree holes. Attics can provide the more stable thermal conditions necessary for maternity roosts while allowing young bats to practice flying safely before leaving the roost. This species is described as a 'fissure rooster' maintaining constant contact with roof beams on both sides. As a result, brown long□eared bats are more frequently found roosting in the apex of the roof, in the angle between the ridge beam and the rafters or at the gable ends between stone walls and wooden beams (Swift, 1998). The brown long□eared bat is often known as the 'whispering bat' because its sensitive hearing enables it to locate prey by passive listening (Anderson & Racey, 1993). As a consequence, its echolocation calls are of low intensity (Russ, 1999). Brown long□eared bats typically produce short duration (2ms) frequency modulated (FM) echolocation calls sweeping from about 80 to 20 kHz with a prominent second harmonic (Ahlén, 1981). The low intensity calls of the brown long□eared bat means that the detection of such calls by bat detectors is limited to a distance of approximately 0.7m and the main axis of sound emitted by the bat is directed within approximately 120° of the front of the receiving microphone of the bat detector (Anderson & Racey, 1993). Therefore, relying on bat detectors to monitor hunting brown long□eared bats is problematic and, as a result, a foot or car□based transect bat monitoring survey for this species will not yield sufficient data to allow full monitoring of species.

Common pipistrelle, were the most recorded species with 73 passes throughout the whole survey. This is one Ireland's most common species and was recorded along all transects, except for transect BT 1. The relatively recent discovery that the species formerly known as the pipistrelle (*Pipistrellus pipistrellus*) was in fact two separate but cryptic species, the common pipistrelle and the Soprano pipistrelle, has been well documented (Barratt *et al.*, 1997). O'Sullivan (1994) found 584 pipistrelle bat roosts during the National Bat Survey, the highest number for any species, and described it as the most abundant in Ireland and widely distributed. It is worth noting however that both species were considered to be the same at that time. It has been established following their separation that the common and Soprano pipistrelles were the most common and second most common species encountered respectively (Roche *et al.*, 2007). Two passes of Soprano pipistrelle was recorded along transect BT 5. Both species were observed hunting midges and moths along hedgerows and treelines, flying rapidly and twisting in flight. A single pipistrelle (weighing approximately 5-

6g) may consume as many as 3,500 of these insects in one night (BCI, 2012). Summer roosts of Soprano and common pipistrelles are normally in buildings (NPWS, 2009). Pipistrelles are frequently found roosting in houses, although they also roost in other locations such as tree holes. In houses they prefer to occupy confined spaces such as behind hanging tiles and soffit boards or between roofing felt and roof tiles, rather than the main attic space (BCI, 2012, McGuire, 1998 and Allen *et al*., 2000).

The majority of the activity was recorded along BT 5, recording all species that were encountered during the whole survey. This route runs parallel with the western section of the site and is adjacent to most habitats that occur within the site. The weather conditions at the time of the survey were favourable for bats. Following the survey it can be concluded that the habitats at the Upperchurch site support a healthy population of common pipistrelle and to a lesser extent brown long eared bat, Soprano pipistrelle and whiskered/Brandts bat. Table 13-13 below shows the species recorded during the bat survey at the Upperchurch site.

TABLE 13-13 BAT SPECIES RECORDED DURING SURVEY

Common name	Scientific name
Common pipistrelle	*(Pipistrellus pipistrellus)*
Soprano pipistrelle	*(Pipistrellus pygmaeus)*
Brown long eared bat	*(Plecotus auritus)*
Whiskered/Brandts bat	*(Myotis sp.)*

Table 13-14 summarises the description of the transects carried out at the Upperchurch windfarm site. See **Figure 13-6** at the end of this report for locations of the bat transect routes.

TABLE 13-14: DESCRIPTION OF TRANSECTS

Transect code	GPS start	GPS finish	Description of each transect and associated habitat
BT 1	96896 59485	95392 59954	Driven transect. Approximately 2.94km in length. Split the south eastern section of the site. Habitats included hedgerows, approximately 350m of treeline of mostly broadleaf, second rotation conifer plantation, improved grassland and 6 houses
BT 2	95748 61133	97218 62928	Driven transect. Approximately 4km in length that for most part ran parallel to north eastern section. Habitats included; hedgerows, approximately 500m of mostly broadleaf treeline and agricultural grassland. The second leg of transect ran along the northern boundary through 1.25km of conifer plantation
BT 3	96257 63623	97090 61704	Driven transect. Approximately 4.33km in length that looped from northwest to eastern boundary of the location of turbines T9 to T16. Finished at old farm yard. Habitats included; hedgerows, approx. 270m of treeline, second rotation conifer plantation and improved grassland
BT 4	96493 60911	94345 60759	Driven transect. Approx. 3.30km in length. Bisected north eastern (turbines T9-T16) and south eastern (turbines T1-T8) sections. Split central section towards end of transect. Habitats include buildings/farm buildings, improved agricultural grassland, single broadleaf trees and stream.
BT 5	94034	94824	Driven transect. Approx. 2.50km. Ran along the east/northeast

Transect code	GPS start	GPS finish	Description of each transect and associated habitat
	60664	62635	of the western section. Habitats included approx. 750 of conifer plantation, hedgerows and improved agricultural grassland.
BT 6	94824 62635	94117 61866	Driven transect. Approx. 2.80km. Looped from the northeast to the west of the western section. The second leg of this transect ran through the northern part of this section. Habitats included agricultural grassland, peatland and hedgerows
BT 7	92585 59719	94034 60664	Driven transect. Approx. 1.96km. Parallel along the southern boundary of the western section. Habitats included; improved agricultural grassland, hedgerows, dwelling houses, and approx. 30m of conifer plantation towards the end of the transect
BT 8	94217 58634	96896 59485	Driven transect. Approx.3.42km. Looped around south eastern section, from the south to linking up with the starting point of BT 1. Habitats included; improved grassland, hedgerows, dwelling houses, and approx. 50m stretch of a broadleaf treeline.

13.2.9 Aquatic Ecology

A water quality assessment was undertaken of the waterways draining the study area of the proposed wind farm to provide baseline water quality, fisheries and riparian habitat data. Watercourses in the vicinity of the proposed development were surveyed by an ecologist on the 11th of June and the 22nd of August 2012.The survey results will provide a baseline for future monitoring to ensure that the existing water and habitat quality of watercourses within and adjacent to the site are maintained during the construction and operational phase of the proposed wind farm development.

The study area is situated on hills or drumlins with a number of streams that support the upper reaches of the Owenbeg, Clodiagh and Turraheen River catchments which drain to the Suir. Tributaries of the Clodiagh River drain the northern and central locations of the site while the southern and eastern portion of the site are drained by tributaries of the Owenbeg and Turraheen Rivers. The Aughvana River drains the site to the west and southwest, which is part of the Shannon River Basin District and joins the Mulkear River to the south west.

A total of six sampling points were strategically identified at locations within the catchment area of the proposed Upperchurch Windfarm site in order to assess and give an indication on the water quality in the immediate area surrounding the proposed site. Table 13-15 details the grid references of each Q value sampling station on which the survey was undertaken. The locations of these sampling stations are shown in **Figure 13-5** at the end of this chapter.

Table 13-15: Location of Sampling Stations for the water quality survey.

Sampling Station	Grid Reference	Location
1	97973 61082	Unnamed stream (east of site) which flows to the Owenbeg River
2	97336 59293	Owenbeg river (east of site)
3	94363 59329	Unnamed stream (southern section of the site) which flows to the Turraheen River
4	95056 62330	Unnamed stream (central area of site) which flows to the Clodiagh River
5	94623 63001	Unnamed stream (northern section of the site) which flows to the Clodiagh River
6	93464 59759	Unnamed stream (southern section of the site) which flows to the Aughvana River

13.2.9.1 Results of Q sampling survey

Table 13-16 outlined the characteristics of the sampling stations.

TABLE 13-16: CHARACTERISTICS OF THE SAMPLING STATIONS

Station number 1					
Date	11th June 2012	**DO%**	103.4	**Conductivity (µS)**	173
GPS Location	97973 61082	**DO mg/L**	11.31	**pH**	7.5
GPS Accuracy	4m	**Temp (°C)**	11.28	**TDS (g/L)**	0.043
Bank Width	1.8m				
Wet Width	1.5m				
River Depth:	16.5cm				
Velocity:	V. slow				
Clarity :	Slightly turbid				
Colour:	Slight				
Dominant substrate:	Gravel & Mud				
Filamentous Green Algae:	None				
Macrophytes :	Normal growth				
Sewage Fungus:	None				
Siltation:	Heavy				
Surrounding land type:	Pasture				
Outflow pipes:	None				
Shading:	Medium				
Cattle Access:	Yes				
Stream flow type:	Slow flow				
Sampled in minutes	*Stone wash*	1 minute	*Kick sampling*	2 minutes	
Further comments	Depth of mud in areas up to 10cm During time of sampling field to east closed for silage. Field to west wet grassland/no fencing Evidence of cattle encroachment Geology- Silurian meta-sediments & volcanic with shallow peat top soil				

Station number 2					
Date	11th June 2012	**DO%**	108.0	**Conductivity (µS)**	157
GPS Location	97336 59239	**DO mg/L**	11.64	**pH**	7.6
GPS Accuracy	4m	**Temp (°C)**	11.98	**TDS (g/L)**	0.33
Bank Width	1.9m- 2.0m				
Wet Width	1.80m				
River Depth:	Avg - 16.5cm Max - 30cm				
Velocity:	Fast				
Clarity :	Clear				
Colour:	Peat Stained/slight				
Dominant substrate:	(Cobbles 65%) (Boulder 15%) sand/gravel				
Filamentous Green Algae:	None				
Macrophytes :	Normal growth				
Sewage Fungus:	None				
Surrounding land type:	To south riparian woodland/ to north improved grassland				
Outflow pipes:	None				
Shading:	Moderate				
Cattle Access:	None				
Stream flow type:	Riffle and glide				
Sampled in minutes	*Stone wash*	1 minute	*Kick sampling*	2 minutes	
Further comments	Slightly peat stained water Field to north cattle grazing Species note: Brown trout, freshwater limpet. To immediate south WN5 with alder and willow				

Station number 3					
Date	11th June 2012	**DO%**	102.8	**Conductivity (µS)**	261
GPS Location	94363 59329	**DO mg/L**	11.58	**pH**	7.2
GPS Accuracy	4m	**Temp (°C)**	10.03	**TDS (g/L)**	0.49
Bank Width	1.9m- 2.0m				
Wet Width	1m				
River Depth:	Avg - 12.5cm Max - 20cm				
Velocity:	Fast				
Clarity :	Clear				
Colour:	Peat Stained/slight				
Dominant substrate:	(Cobbles 40%) (Boulder 15%) sand/gravel				
Filamentous Green Algae:	Trace				
Macrophytes :	Normal growth				
Sewage Fungus:	None				
Surrounding land type:	To northwest improved wet grassland. Steep bank to south west then conifer plantation				
Outflow pipes:	None				
Shading:	Medium				
Cattle Access:	Yes				
Stream flow type:	Riffle and glide				
Sampled in minutes	*Stone wash*	1 minute	*Kick sampling*	2 minutes	
Further comments	Slightly peat stained water Field to northwest cattle grazing. To south east steep bank (5m) with narrow stretch of conifer plantation (Sitka spruce) 4 trees deep Species note: Water starwort in pool areas (light cover)				

<table>
<tr><th colspan="6">Station number 4</th></tr>
<tr><td>Date</td><td>11th June 2012</td><td>DO%</td><td>104.3</td><td>Conductivity (µS)</td><td>188</td></tr>
<tr><td>GPS Location</td><td>95056 62330</td><td>DO mg/L</td><td>11.15</td><td>pH</td><td>7.77</td></tr>
<tr><td>GPS Accuracy</td><td>4m</td><td>Temp (°C)</td><td>12.29</td><td>TDS (g/L)</td><td>0.29</td></tr>
</table>

<table>
<tr><td>Bank Width</td><td>2.0 - 2.30m</td><td colspan="3" rowspan="15"></td></tr>
<tr><td>Wet Width</td><td>2.10m avg</td></tr>
<tr><td>River Depth:</td><td>Avg - 16.5cm
Max - 30cm</td></tr>
<tr><td>Velocity:</td><td>Fast</td></tr>
<tr><td>Clarity :</td><td>Clear</td></tr>
<tr><td>Colour:</td><td>Peat Stained/slight</td></tr>
<tr><td>Dominant substrate:</td><td>(Cobbles 60%)
(Boulder 10%)
sand/gravel</td></tr>
<tr><td>Filamentous Green Algae:</td><td>Trace</td></tr>
<tr><td>Macrophytes:</td><td>Normal growth</td></tr>
<tr><td>Sewage Fungus:</td><td>None</td></tr>
<tr><td>Surrounding land type:</td><td>Pasture</td></tr>
<tr><td>Outflow pipes:</td><td>None</td></tr>
<tr><td>Shading:</td><td>medium</td></tr>
<tr><td>Cattle Access:</td><td>None</td></tr>
<tr><td>Stream flow type:</td><td>Riffle and glide</td></tr>
<tr><td>Sampled in minutes</td><td>Stone wash</td><td>1 minute</td><td>Kick sampling</td><td>2 minutes</td></tr>
<tr><td>Further comments</td><td colspan="4">Fields to west saved for silage harvesting. Field to east recent cattle grazing wet grassland with areas of scrub.
Geology- Silurian metasediments & volcanic. Soils mineral alluvium. Immediate bank areas very wet.</td></tr>
</table>

Station number 5					
Date	11th June 2012	**DO%**	105.0	**Conductivity (µS)**	146
GPS Location	94623 63001	**DO mg/L**	11.20	**pH**	7.6
GPS Accuracy	4m	**Temp (°C)**	12.45	**TDS (g/L)**	0.26
Bank Width	4 - 4.5m				
Wet Width	4.1m				
River Depth:	Avg - 14.5cm Max - 25cm				
Velocity:	Fast				
Clarity :	Clear				
Colour:	Peat Stained/slight				
Dominant substrate:	(Cobbles 55%) (Boulder 20%) sand/gravel				
Filamentous Green Algae:	Trace				
Macrophytes :	Normal growth				
Sewage Fungus:	None				
Surrounding land type:	Pasture to west/woodland N/NE				
Outflow pipes:	None				
Shading:	Medium				
Cattle Access:	Yes				
Stream flow type:	Riffle and glide				
Sampled in minutes	*Stone wash*	1 minute	*Kick sampling*	2 minutes	
Further comments	Slightly Peat stained Water. Animals were observed crossing river downstream of survey site. Species note: Very species diverse				

Station number 6					
Date	22nd August 2012	**DO%**	101.1	**Conductivity (μS)**	169
GPS Location	93464 59759	**DO mg/L**	11.35	**pH**	7.6
GPS Accuracy	2m	**Temp (°C)**	12.10	**TDS (g/L)**	0.041

Bank Width	2.2m
Wet Width	1.3m
River Depth:	Avg 12cm Max 20cm
Velocity:	Fast
Clarity :	Slightly turbid
Colour:	Slight
Dominant substrate:	Cobble50% Gravel 20% Boulder5% & fine gravel
Filamentous Green Algae:	Trace
Macrophytes :	Normal growth
Sewage Fungus:	None
Siltation:	Slight
Surrounding land type:	Pasture
Outflow pipes:	None
Shading:	Medium
Cattle Access:	Yes
Stream flow type:	Riffle/Glide

Sampled in minutes	*Stone wash*	1 minute	*Kick sampling*	2 minutes
Further comments	During time of sampling field to east had recent cattle grazing. Field to west improved grassland/steep bank. No fencing on either bank. Evidence of cattle encroachment. Shading during time of survey was 25%. Further downstream on the west of R497 the stream in used as roadway. Geology- Silurian metasediments & volcanic with shallow peat top soil.			

13.2.9.2 Results of Q sampling survey

Table 13-17 below lists the results of the Q sampling survey.

TABLE 13-17: RESULTS OF Q SAMPLING SURVEY

Sampling Station	Common Name	Latin Name	Frequency	Count	Group	Q-Value Indicated
1	Stonefly larvae	Leuctra spp.	Small numbers	6	B	Q3
	Caddis fly larvae	*Trichoptera spp.*	Fair numbers	13	B	
	Mayfly larvae	*Baetidae spp.*	Common	18	B	
	Cased caddis fly larvae	*Trichoptera spp.*	Small numbers	7	C	
	Snail	*Planorbidae spp.*	Scarce	3	C	
	Shrimp	*Gammarus duebeni*	Common	15	C	
	Midge larvae	*Chironomidae spp.*	Common	12	C	
	Cranefly	*Tipulidae spp.*	Scarce	3	C	
	Water beetle	*Coleoptera spp.*	Fair numbers	10	C	
	Leech	*Hirudinea spp.*	Fair numbers	8	D	
	Midge larvae	*Chironomus spp.*	Scarce	3	D	
	Brown trout	*Salmo trutta fario.*	Present	2	n/a	
2	Caddisfly	*Trichoptera spp.* (Uncased)	Common	58	*C*	Q4
	Crustacean	*Gammarus duebeni*	Numerous	180	*C*	
	Limpet	*Gastropoda spp.*	Scarce	6	*N/a*	
	Blackfly	*Simuliidae spp.*	Fair numbers	45	*C*	
	Mayfly	*Heptageniidae spp.*	Fair numbers	30	*A*	
	Mayfly	*Siphlonuridae spp.*	Small numbers	8	*A*	
	Caddisfly	*Trichoptera spp. (Cased)*	Common	67	*B*	
	Stonefly	*Leuctra spp.*	Scarce	3	*B*	
	Mayfly	*Baetidae spp.*	Common	49	*B*	
	Midge larvae	*Chironomidae spp.*	Small numbers	18	C	
	Mayfly	*Ephemerellidae spp.*	Scarce	5	C	
	Brown Trout	*Salmo trutta fario*	Present	1	*N/a*	
3	Mayfly	*Heptageniidae spp.*	Common	88	A	Q4
	Caddisfly	*Trichoptera spp.* (Cased)	Common	70	B	
	Stonefly	*Leuctra spp.*	Small	20	B	

Sampling Station	Common Name	Latin Name	Frequency	Count	Group	Q-Value Indicated
			numbers			
	Mayfly	*Baetidae spp.*	Dominant	560	*B*	
	Shrimp	*(Gammarus duebeni)*	Fair numbers	60	C	
	Caddisfly	*Trichoptera spp.* Uncased spp	Small numbers	20	C	
	Blackfly	*Simuliidae spp.*	Small numbers	15	C	
	Midge larvae	*Chironomidae spp.*	scarce	5	C	
	Cranefly	*Tipulidae spp.*	Present	1	C	
	Snail	*Planorbidae spp.*	Present	2	C	
	Leaf beetle	Chrysomelidae spp.	Present	1	C	
4	Mayfly	*Heptageniidae spp.*	Numerous	150	A	Q4
	Mayfly	*Siphlonuridae spp.*	Small numbers	10	A	
	Stonefly	*Nemouridae spp.*	Small numbers	10	A	
	Caddisfly	*Trichoptera spp.* (Cased)	Fair numbers	35	B	
	Stonefly	*Leuctra spp.*	Small numbers	5	B	
	Mayfly	*Baetidae spp.*	Common	50	B	
	Shrimp	*Gammarus duebeni*	Fair numbers	20	C	
	Caddisfly	*Trichoptera spp. (Uncased)*	Small numbers	10	C	
	Cranefly	*Tipulidae spp.*	Small numbers	5	C	
	Blackfly	*Simuliidae spp.*	Numerous	125	C	
	Water beetle	*Coleoptera spp.*	Scarce	2	C	
5	Mayfly	*Heptageniidae spp.*	Numerous	120	A	Q4-5
	Stonefly	*Perla bipuncata*	Scarce	4	A	
	Stonefly	*Nemouridae sp*	Scarce	5	A	
	Caddisfly	*Trichoptera spp.* (Cased)	Common	65	B	
	Mayfly	*Baetidae spp.*	Scarce	5	B	
	Stonefly	*Leuctra spp.*	Scarce	5	B	
	Shrimp	*Gammarus duebeni*	Scarce	5	C	
	Uncased caddisfly larvae	*Trichoptera*	Small numbers	10	C	
	Cranefly larvae	*Tipulidae spp.*	Small numbers	13	C	
	Blackfly larvae	*Simuliidae spp.*	Small numbers	10	C	
	Water beetle larvae	*Coleoptera spp.*	Scarce	5	C	
	Mayfly larvae	*Ephemerellidae*	Common	27	C	

Sampling Station	Common Name	Latin Name	Frequency	Count	Group	Q-Value Indicated
		spp.				
	Mayfly larvae	*Caenidae spp.*	Small numbers	7	C	
	Limpet	*Gastropoda spp.*	Scarce	4	N/a	
6	Stonefly larvae	*Leuctra spp.*	Present	2	B	Q3
	Caddis fly larvae	*Trichoptera spp.(cased)*	Small numbers	35	B	
	Mayfly larvae	*Baetis rhodani*	Common	75	C	
	Cased caddis fly larvae	*Trichoptera spp.*	Scarce/Few	5	C	
	Mud snail	*Hydrobiidae spp.*	Present	2	C	
	Shrimp	*Gammarus duebeni*	Dominant	300	C	
	Midge larvae	*Chironomidae spp.*	Small numbers	10	C	
	Black fly	*Simuliidae spp.*	Dominant	360	C	
	Limpet	*Gastropoda spp.*	Present	1	N/A	

Sampling station 1: Q value
The water quality at sampling station 1 was Q3. This sampling site is a first order stream which eventually forms part of the Owenbeg River. Group A sensitive macroinvertes were absent, groups B less sensitive forms were numerous represented by two species of stonefly (*Leuctra spp.*), cased caddisfly larvae (*Trichoptera spp.*), and mayfly (*Baetidae spp.*). Group C relatively tolerant species were also numerous with the sample including the water shrimp (*Gammarus duebeni*), and midge larvae (*Chironomidae spp.*). Group D tolerant species of macroinvertebrates were present in small numbers represented by a species of leech (*Hirudinea spp.*). Group E, the most tolerant species of macroinvertebrates were scarce with only a few midge larvae (*chironomus spp.*) collected. When a silt plume test was carried out heavy siltation was observed, which also indicates Q3. This kick sampling station is located on agricultural land that is used for cattle grazing with the field to the east of the sampling station being closed for silage during time of sampling and the field to the west of the sampling station having just being recently grazed with cattle dung observed throughout the site. The stream is fenced off from farm animals to the east at this sampling station with a line of thorny wire. Animals would have access to the stream from the west of the sampling point as fencing was absent. There were areas along the west side of the stream (at the sampling station) where recent encroachment by cattle to the stream was observed. This would influence the water quality in the immediate area and downstream because of siltation and the introduction of cattle excrements.

Sampling station 2: Q value
The water quality at sampling station 2, a tributary of the Owenbeg river (east of site), was Q4. Eleven taxa were recorded within the kick sample with species from group C, relatively tolerant species dominating, these included the water shrimp (*Gammarus duebeni*), uncased caddisflys (*Trichoptera spp.*), blackfly (*Simuliidae spp.*), midge larvae (*Chironomidae sp*) and mayflies (*Ephemerellidae spp.*). Group A the most sensitive species were common with mayflies (*Heptageniidae spp.*) and (*Siphlonuriidae spp.*) recorded in the sample. The presence of these taxa in waterbodys would indicate a relatively pristine habitat. Group B less sensitive species were numerous in the sample and included cased caddisfly species (*Trichoptera spp.*), stonefly (*Leuctra spp.*) and a species of mayfly (*Baetidae spp.*). Groups D and E tolerant species were not recorded in the sample. There was a slight growth of filamentous algae on boulders and cobbles within the stream. The silt plume test recorded slight siltation and no sewage fungus was seen to be present within the sampling area. Macrophytes were mostly confined to near bank areas as stream flow would be normally fast in this area of the stream. Macrophytes included species of moss (*Sphagnum spp.*). Dissolved oxygen saturation levels of 108% were recorded.

Sampling station 3: Q value
The water quality at sampling station 3 was Q4. This stream forms part of the Turraheen River. Eleven taxa were recorded within the kick sample. Of the group A taxa, two species of mayfly (*Heptageniidae spp.*) were common within the sample. Group B less sensitive species were dominant in the sample which included species of cased caddisfly (*Trichoptera spp.*), stonefly (Leuctra spp.) and a species of mayfly (*Baetidae spp.*) which was the overall

dominant species within the sample. Group C relatively tolerant taxa had fair numbers with the water shrimp (*Gammarus duebeni*), uncased caddisfly (*Trichoptera spp.*) and species of blackfly (*Simuliidae spp.*) having small numbers. Non biting midge larvae (*Chironomidae spp.*) were scarce and the rams horn snail (*planorbidae spp.*) and a leaf beetle (*chrysomelidae spp.*) were present with one or two individuals. Groups D and E the most tolerant species were absent. No sewage fungus was recorded along the sampling area. Macrophytes were mostly confined to near bank areas as stream flow would normally be fast in this area. Macrophytes included brooklime (*Veronica beccabunga*), moss species (*Sphagnum spp.*) and a slight growth of filamentous algae on stones and boulders. A silt plume test recorded slight siltation and dissolved oxygen saturation showed levels of 102.8% DO.

Sampling station 4: Q value

The water quality at sampling station 4 was Q4. Eleven taxa were recorded within the kick sample. Group A sensitive species were dominant which included three species of mayfly (*Heptageniidae spp.*), (*Siphlonuridae spp.*) and a species of stonefly (*Nemouridae spp.*). Group B less sensitive species were common with cased caddisfly (*Trichoptera spp.*) and mayfly (*Baetidae* spp.) having fair numbers and small numbers of stonefly (*Leuctra spp.*). Group C relatively tolerant species were numerous with blackfly species (*Simuliidae spp.*) being the most dominant taxa within this group. The water shrimp (*Gammarus duebeni*), uncased caddisfly (*Trichoptera spp.*) had small numbers. Cranefly (*Simuliidae spp.*) and the water beetle (*Coleoptera spp.*) were present within the kick sample. The silt plume test recorded moderate siltation which could be because of quite an amount of erosion which was observed 300 meters upstream. Macrophytes included moss species (*Sphagnum spp.*) and a slight growth of filamentous algae on cobbles and boulders. Emergent macrophytes were limited to Yorkshire fog (*Holcus lanatus*) in this sampling area, confined to near bank areas as stream flow would be normally fast in this area of the stream. Sewage fungus was not observed at the sampling location and dissolved oxygen saturation had levels of 104.3%.

Sampling station 5: Q value

The water quality at sampling station 5 was Q4-5. This stream also flows to the Clodiagh River. Fourteen taxa were recorded within the kick sample. Group A the most sensitive species were dominant with mayfly (*Heptageniidae spp.*) having the largest abundance being numerous within the sample. Taxa from this group also consisted of two species of stonefly (*Perla bipuncata*) and (*Nemouridae spp.*). Group B less sensitive species were numerous which included cased caddisfly species (*Trichoptera spp.*) making up the larger proportion of this group, with mayfly (*Baetidae spp.*) and stonefly (*Leuctra spp.*) having small numbers within the sample. Group C, relatively tolerant species included water shrimp (*Gammarus duebeni*), uncased caddisflys (*Trichoptera spp.*), black fly (*Simuliidae spp.*), water beetle (*Coleoptera spp.*), mayfly species (*Caenidae spp.*) and (*Ephemerellidae spp.*) with the latter having fair numbers within the overall sample. Limpet species were scarce within the sample but are not considered in the Q value scheme. Groups D and E the most tolerant species were not present. The silt plume test recorded slight siltation. Macrophytes included Moss species (*Sphagnum spp.*) and a slight growth of filamentous algae on boulders and cobbles. No emergent mocrophytes were observed along the sampling area. This would be normal in this area as stream flow was fast.

Sampling station 6: Q value

The water quality at sampling station 6 was Q3. This stream also flows to the Aughvana River and lies within the Shannon International River Basin District (SIRBD). Nine taxa were recorded within the kick sample. No Group A taxa were recorded within the sample. Two families of Group B taxa were recorded namely *Leuctra spp.* and *Trichoptera spp.* (cased). Of the these families *Trichoptera spp.* (cased) were the most common. The most common taxa recorded were from Group C with 6 families recorded dominated by the blackfly larvae (*Simuliidae spp.*) and to a lesser extent by the freshwater shrimp (*Gammarus duebeni*). A single limpet species was recorded within the sample but is not considered in the Q value scheme. Groups D and E the most tolerant species were not present. The silt plume test recorded slight siltation. Macrophytes included Moss species (*Sphagnum spp.*) and a slight growth of filamentous algae on boulders and cobbles. Sewage fungus was not observed at the sampling location and dissolved oxygen saturation had levels of 101.1%.

13.2.9.3 Physiochemical Water Quality

TABLE 13-18: PHYSIOCHEMICAL WATER QUALITY RECORDED AT THE UPPERCHURCH SITE, CO. TIPPERARY.

Parameter	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Salmonid Regulations S.I. No. 293 of 1988	Surface Water Regulations S.I. No. 272 of 2009
pH	7.5	7.6	7.2	7.7	7.6	7.7	>6 & <9	
Alkalinity, mg/L as CaCO3	72.5	62.9	91.1	81.0	56.6	119		
Temperature	11.28	11.98	10.03	12.29	12.46	12.10		
Suspended solids mg/L	3	2	6	<2	<2	18	<25	
BOD (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	1.4	<5	<2.2
Nitrate(mg/L)NO3-N	1.08	0.73	2.07	1.23	0.65	1.95		
Nitrite (mg/L)NO2-N	<0.005	<0.005	<.005	<.005	<.005	0.01	<0.05	
Sulphate (mg/L)	5.14	4.85	5.70	4.78	4.56	4.36		
MRP, mg/L P	0.01	0.01	0.01	0.02	0.01	0.06		≤0.035
Total phosphorous P (mg/L)	0.09	<0.04	0.16	0.06	0.04	<0.04		
Total dissolved phosphorous P (mg/L)	0.09	<0.04	0.12	0.06	0.04	<0.04		
Particulate phosphorous (mg/L)	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04		

Ammonia	0.03	0.02	<0.02	0.03	0.02	<0.02	≤ 1	
Ammonia (unionised)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	≤ 0.02	
Metals								
Iron (mg/L)	0.251	0.146	0.025	0.089	0.110	0.16		
Aluminium (mg/L)	0.019	0.042	0.023	0.037	0.024	0.05		

Physiochemical water quality testing was undertaken at six sampling stations on six streams outside the immediate site that drain the study area on the 11th of June and 22nd of August 2012 to establish the baseline water quality of watercourses just downstream of the proposed windfarm infrastructure catchment area.

Dissolved oxygen levels were good in all the watercourses that were surveyed (>11mg/L), indicating that all of the surface waters in the catchment areas had levels of oxygen present capable of supporting healthy salmonid populations as per the Salmonid Water Regulations (SI No. 293 of 1988) implementing the Freshwater Fish Directive (78/659/EEC).

Levels of unionised ammonia and nitrite that are known to be particularly toxic to fish were within the thresholds specified in the Salmonid Regulations (S.I. No. 293 of 1988) at <0.02 and <0.005 respectively (see Table 13-18). Similarly the BOD levels were low with sites 1 through 5 inclusive, recording <1.0mg/L BOD and site 6 recording the highest levels; 1.4mg/L BOD. All sites were in compliance with the Salmonid Water Regulations (see Table 13-18).

Ortho-phosphate (MRP) levels were similar across sampling sites with 0.01mg/L levels recorded at sites 1, 2, 3 and 5 with site 4 recording 0.2mg/L and site 6 recording the highest levels of 0.06mg/L. Sites 1 through 5 levels are below the levels recommended in the Surface Water Regulations (S.I. No. 272 of 2009) meeting the requirements of the regulation, however site 6 exceeds the ≤0.035 recommended levels.

The suspended solid levels were also very low for streams 1 through 5, with levels recorded at <2mg/l at sampling stations 4 and 5. Sampling station 2 recorded 2mg/L. Sampling stations 1 and 3 were slightly higher with levels of 3mg/L and 6mg/L respectively. Sampling station 6 recorded the highest levels of 18 mg/L. The levels for sampling stations 1 and 6 follow the Q value results with these two streams having the lower Q values recorded. All streams were in compliance with the threshold of <25mg/l required under the Salmonid Water Regulations (S.I. No. 293 of 1988).

As the catchment is dominated by siliceous rocks the buffering capacity of water can change rapidly over the season especially when water levels are higher, resulting in the dilution of background mineral salts. As a result H+ ions are not easily neutralized, meaning a reduction in the pH. In addition rain water that is naturally low in pH (circa 5.5) can scavenge acidic ions from pine needles and peat and wash them into receiving water bodies causing local reductions in pH. The pH levels at all sampling stations range between 7.5 and 7.7. These fall within the threshold (>6 & <9) required under the Salmonid Water Regulations (S.I. No.

293 of 1988), required for balanced and healthy fish populations in the Salmonid Regulations.

13.2.10 Fish

13.2.10.1 Salmonids

There are two species of salmonid associated with freshwater habitats in Ireland Atlantic salmon (*Salmo salar*) and brown trout (*Salmo trutta fario*). The Atlantic salmon is listed as an Annex II species under the Habitat Directive. Atlantic salmon is a species of qualifying interest for the River Suir cSAC (site code: 002137) and the Lower River Shannon cSAC (site code: 002165). This is an anadromous species, living in freshwater for at least the first 2 or 3 years of life before migrating to sea. Relatively large cool rivers with extensive gravelly bottom headwaters are essential during their early life. Smolts migrate to sea, where they may live for 1 or 2 years before returning to freshwater. The species are unlikely to utilise waterways within the site boundary as they are quite shallow and small. A fisheries survey of the River Suir catchment carried out by the Regional Fisheries Board to establish the ecology of the River Suir and its tributaries found that all tributary catchments and the main channel itself supported salmon fry and parr. The survey noted that the sub-catchment of the Owenbeg branch of the upper Clodiagh had an important role in salmon production. In 2006 the River Suir was ranked as the fourth best 'Salmoid River' in Ireland.

13.2.10.2 Twaite Shad

Twaite shad spend their adult life at sea or in the lower reaches of estuaries and normally spawn near the tidal limits (NPWS, 2008). Weirs and dams are known to be obstacles to the migration of Twaite shad upstream. The current conservation status of the species is bad (NPWS, 2008). Because Favourable Reference Range Mapping for this species is only available in 50km grid cells the resolution is less fine than that which is available for other species. However, mapping of the Current Distribution of this species, which is available at 10km grid resolution, indicates that the species is not recorded within the Lower River Shannon cSAC and the species is not thought to spawn within the Lower River Shannon cSAC. The mapping also indicates that the species is confined to the lower reaches of the Suir system at a linear distance of in excess of 60km south east of the proposal site and separated from it by a watercourse of considerably greater length. Therefore on the basis of the distribution mapping, and the evidence sited in the site synopsis, it is considered unlikely that this species occurs within 15km of the proposed development. On the basis of the evidence outlined in this paragraph it is concluded that no significant impacts on this species, within either cSAC, are reasonably foreseeable as a result of the proposal considered in this document.

13.2.10.3 Allis shad

Allis shad spend their adult life at sea or in the lower reaches of estuaries, ascending to freshwater to spawn in early summer. The spawning females shed their eggs into the water where they either drop into the gravel bed or begin to drift downstream. Those eggs that fall into gravels hatch after several days and then drift downstream. The young fish may remain in estuarine waters during their second year before finally going to sea where they mature. While European populations have a recorded capacity for significant migration upstream, this capacity seems more constrained in Irish populations (King *et al.*, 2004). Weirs and dams are known to be obstacles to the migration of Allis shad upstream. The current conservation status of the species is 'Unknown' (NPWS, 2008). As Current Range mapping for this species is only available in 50km grid cells the resolution is less fine than that which is available for other species. However, mapping of the Current Distribution of this species, which is available at 10km grid resolution, indicates that the species is confined to the lower reaches of the Suir system (NPWS, 2008) which is a linear distance of in excess of 60km south east of the proposal site and separated from it by a watercourse of considerably greater length. Therefore, on the basis of the distribution mapping, and bearing in mind the constrained capacity for upstream migration referred to previously, it is considered unlikely that this species occurs within 15km of the proposed development. On the basis of the evidence outlined in this paragraph it is concluded that no significant impacts on this species, within the cSAC, are reasonably foreseeable as a result of the proposal considered in this document.

13.2.10.4River lamprey, brook lamprey and sea lamprey

Sea lampreys spend their adult life in marine and estuarine waters, living as external parasites on other fish species. They migrate up rivers to spawn in areas of clean gravels. Once they have spawned, they die. After hatching, the young larvae settle in areas of fine sediment in still water, where they burrow. They live as filter feeders and may remain in fine sediments for several years before transforming into adult fish. Sea lamprey, which can grow up to 1m in length, are widely distributed around the coast of Ireland. However they tend to occur in low densities. Overall, the conservation status of the sea lamprey in Ireland is considered to be poor (NPWS, 2008).

The river lamprey grows to 30cm and has a similar life history to the sea lamprey. The brook lamprey is the smallest of the three lampreys native to Ireland at 15 to 20cm. It is also the only one of the three which is non-parasitic and spends all its life in freshwater. Despite the difference in ecology, brook and river lamprey are very similar genetically and cannot be distinguished by visual means. Juvenile river and brook lampreys cannot be discriminated and metamorphosed individuals can only be distinguished on the basis of dentition (King *et al.*, 2004). As a result, for the purposes of this assessment, the brook and river lampreys have been treated together. The current status and future prospects of these species in Ireland appears to be good (NPWS, 2008).

Currently no records are retained online at the National Biodiversity Data Centre for these species within the extended river systems of either cSAC. The current known distribution for these species includes the 10km squares within which the proposal considered in this document occurs and the grid squares which incorporate the extended river systems which drain to both cSACs. O Connor (2006) confirmed the presence of these species within the Multeen, upstream of its point of confluence with the Aughnaglanny River, at a site approximately 18km downstream of the proposal site. The same survey recorded these species on the Owenbeg and Clodiagh rivers at sites located up stream of their point of confluence which is situated approximately 9km downstream on the Owenbeg and 19km downstream on the Clodiagh.

REFERENCE DOCUMENTS

It is presumed in light of the aforementioned evidence and on the basis of the precautionary principle, that these species are potentially present within the zone of impact influence of the proposal. There is a risk that the water quality of the local watercourses, that drain the site, could be impaired during the construction stage of the proposed wind farm. It is possible that this could impact negatively on lamprey within the Lower River Suir cSAC downstream of the proposal site.

13.2.11 Birds

13.2.11.1 Habitat Assessment of the Study Area

Improved agricultural grassland is the dominant habitat at the site and the surrounding area and is not considered suitable breeding habitat for hen harrier. However this habitat is considered suitable foraging habitats for wintering hen harrier.

13.2.11.2 Winter vantage point observations

Winter vantage point observations were carried out in order to assess the level of raptor activity and purpose at the development site between 15th November 2010 and 16th March 2011. These observations were carried out in accordance with NPWS hen harrier survey guidelines. Three (3) vantage point locations were selected in order to obtain maximum visibility of the site and habitats outside the site boundary.

Vantage point watches were of six (6) hours duration and the three vantage points were watched for a total of eighteen (18) hours per site visit. During the course of the survey from November 2010 to March 2011 the site was watched for a total of ninety (90) hours. The locations of the vantage points are illustrated in (See **Figure 13-7** at the end of this chapter)

13.2.11.3 Winter Hen Harrier Survey Results

There was one observation of hen harrier during the vantage point surveys carried out in the winter of 2010 and 2011.

The observation concerned an adult male, observed from VP-3 on the 19th January 2011. The bird was observed at the northeast part of the site in the townland of Knockaviltoge, foraging in a westerly direction for the most part, over improved agricultural grassland, approximately 3m above ground, for 180 seconds (See **Figure 13-10** at the end of this chapter).

13.2.11.4 Other Raptor Observations

In addition to the hen harrier observed, there were four observations of Kestrel *Falco tinnunculus* and one observation of Sparrowhawk *Accipiter nisus* during the course of the vantage point surveys. Their flight paths are illustrated in (See **Figure 13-10** at the end of this chapter).

REFERENCE DOCUMENTS

13.2.11.5 Winter Transect Bird Counts and Other Bird Observations

Transect counts were undertaken on 19th January and 16th March 2011 at five locations across the site and their locations are illustrated in **Figure 13-8**. A total of 34 bird species were recorded during the winter transect counts in 2010/2011 and during the course of the vantage point surveys. The results are summarised in Table 13-19 below. Species highlighted in orange represent species that are species of European Conservation Concern. They are Amber-listed because of their unfavourable conservation status but not concentrated in Europe. The remaining species are Green-listed, species of favourable conservation status (Newton *et al*. 1999).

TABLE 13-19: RESULTS OF TRANSECT COUNTS AND OTHER BIRD OBSERVATIONS IN WINTER 2010/2011

Species	VP Survey November 2010	VP December 2010	VP Survey January 2011 and Transect Survey 1	VP Survey February 2011	VP Survey March 2011 and Transect Survey 2
Wood Pigeon ***Columba palumbus***	**4**	**1**	**5**	**3**	**8**
Meadow Pipit ***Anthus pratensis***	**2**	**2**	**3**	**2**	**3**
Skylark ***Alauda arvensis***			**1**		**1**
Rook ***Corvus frugilegus***	**2**		**1**		**2**
Jackdaw ***Corvus monedula***	**2**				**5**
Hooded Crow ***Corvus corone***	**3**	**2**	**6**	**2**	**5**
Raven ***Corvus corax***	**1**	**3**		**1**	
Magpie ***Pica pica***	**1**	**2**	**2**	**1**	**1**
Wren ***Troglodytes troglodytes***	**1**	**1**	**2**	**1**	**3**
Dunnock ***Prunella modularis***			**1**		
Hen Harrier ***Circus cyaneus***			**1**		
Sparrowhawk ***Accipiter nisus***			**1**		
Kestrel ***Falco tinnunculus***		**1**	**1**		**2**
Pheasant ***Phasianus colchicus***		**1**			**1**
Pied Wagtail ***Motacilla alba yarrelli***		**1**	**2**		**1**
Robin ***Erithacus rubecula***	**1**		**5**	**1**	**4**
Starling ***Sturnus vulgaris***			**63**		
Mistle Thrush ***Turdus viscivorus***					**2**

Species	VP Survey November 2010	VP December 2010	VP Survey January 2011 and Transect Survey 1	VP Survey February 2011	VP Survey March 2011 and Transect Survey 2
Fieldfare ***Turdus pilaris***			61		
Song Thrush ***Turdus philomelos***		1			1
Redwing ***Turdus iliacus***			6	2	
Blackbird ***Turdus merula***		3	2	1	2
Goldcrest ***Regulus regulus***	1		5		3
Great Tit ***Parus major***		1	1		1
Blue Tit ***Cyanistes caeruleus***		1			
Coal Tit ***Periparus ater***	1	1	9		7
Siskin ***Carduelis spinus***	7	1	15	2	12
Crossbill ***Loxia curvirostra***			4		8
Lesser Redpoll ***Carduelis cabaret***	4		4		6
Linnet ***Carduelis cannabina***	6		4		5
Goldfinch ***Carduelis carduelis***		4		2	
Chaffinch ***Fringilla coelebs***	8	23	16	7	8
Bullfinch ***Pyrrhula pyrrhula***			11	4	
Reed Bunting ***Emberiza schoeniclus***	1		4		2

The assemblage of species recorded in winter is typical of the habitats occurring at the site. Chaffinch was the commonest species observed at the site with resident birds supplemented by immigrants from Britain and mainland Europe. Relatively high numbers of Fieldfare and Starling observed in January 2011 possibly reflected the cold conditions experienced during this period. Five amber-listed species were observed during the course of the winter bird survey.

13.2.11.6 Summer Hen Harrier Survey 2011

Vantage Point Observations

Vantage point observations were carried out in order to assess the level of raptor activity and purpose at the development site during the summer of 2011. These observations were carried out in accordance with NPWS hen harrier survey guidelines. The vantage point locations chosen for the summer hen harrier survey remained the same as those chosen for the winter hen harrier survey.

Vantage point watches were of six (6) hours duration and the three vantage points were watched for a total of eighteen (18) hours per site visit. During the course of the summer survey from April to July 2011 the site was watched for a total of seventy two (72) hours. The locations of the vantage points are illustrated at the end of this report.

Results

Summer Hen Harrier Survey Results

There was one observation of hen harrier during the vantage point surveys carried out in the summer of 2011.

The observation concerned a moulting adult female, observed from VP-2 on the 10th June 2011. The bird was observed at the southeast part of the site, foraging in a southerly and then a southeasterly direction, over improved agricultural grassland for approximately thirty seconds and second rotation forestry for approximately one hundred and fifty seconds, in the townland of Shevry (**Figure 13-10**).

There was no evidence of hen harriers breeding at the study site in the summer of 2011.

13.2.11.7 Other Raptor Observations

In addition to the hen harrier observed, there were two observations of kestrel *Falco tinnunculus* and one observation of peregrine falcon *Falco peregrinus* during the course of the vantage point surveys. Their flight paths are illustrated in **Figure 13-10**.

13.2.11.8 Summer Transect Bird Counts and Other Bird Observations

Transect counts were undertaken on 19th May and 12th July 2011 at the same five locations as the winter bird survey. A total of 37 bird species were recorded during the transect counts during the summer of 2011 and during the course of the vantage point surveys. The results are summarised in Table 13-20 below. Species highlighted in orange represent species that are species of European Conservation Concern. They are Amber-listed because of their unfavourable conservation status but not concentrated in Europe. The remaining species are Green-listed, species of favourable conservation status (Newton *et al*. 1999).

TABLE 13-20: RESULTS OF TRANSECT COUNTS AND OTHER BIRD OBSERVATIONS BIRD OBSERVATIONS IN SUMMER 2011.

Species	VP Survey April 2011	VP Survey May 2011 and Transect Survey 1	VP Survey June 2011	VP Survey July 2011 and Transect Survey 2
Wood Pigeon ***Columba palumbus***	**2**	**4**		**5**
Meadow Pipit ***Anthus pratensis***	**2**	**5**	**9**	**11**
Skylark ***Alauda arvensis***		**2**	**1**	**3**
Rook ***Corvus frugilegus***	**6**	**9**	**13**	**12**
Jackdaw ***Corvus monedula***	**4**	**3**	**8**	**10**
Hooded Crow ***Corvus corone***	**4**	**3**	**6**	**5**
Raven ***Corvus corax***	**2**	**3**	**1**	**4**
Magpie ***Pica pica***	**1**	**4**	**3**	**2**
Wren ***Troglodytes troglodytes***	**4**	**2**	**6**	**8**
Dunnock ***Prunella modularis***	**1**	**3**	**2**	**3**
Her Harrier ***Circus cyaneus***			**1**	
Peregrine Falcon ***Falco peregrinus***			**1**	
Kestrel ***Falco tinnunculus***		**1**	**1**	
Pheasant ***Phasianus colchicus***	**1**	**1**	**1**	**2**
Swallow ***Hirundo rustica***	**6**	**18**	**8**	**22**
Sand Martin ***Riparia riparia***	**2**			
Cuckoo ***Cuculus canorus***	**3**	**4**		
Whitethroat ***Sylvia communis***	**4**	**6**	**4**	**7**
Blackcap ***Sylvia atricapilla***	**2**	**5**	**2**	**6**
Willow Warbler ***Phylloscopus trochilus***	**6**	**12**	**4**	**6**

Species	VP Survey April 2011	VP Survey May 2011 and Transect Survey 1	VP Survey June 2011	VP Survey July 2011 and Transect Survey 2
Robin *Erithacus rubecula*	2	4	3	5
Starling *Sturnus vulgaris*				1
Stonechat *Saxicola torquata*	2	3	2	
Mistle Thrush *Turdus viscivorus*	1		1	2
Blackbird *Turdus merula*	2	5	4	4
Goldcrest *Regulus regulus*		6		8
Great Tit *Parus major*	1	4		6
Blue Tit *Cyanistes caeruleus*		5		9
Coal Tit *Periparus ater*		10		12
Siskin *Carduelis spinus*	1	6	1	7
Crossbill *Loxia curvirostra*		6		9
Lesser Redpoll *Carduelis cabaret*	3	7	3	12
Linnet *Carduelis cannabina*	1	6	`7	12
Goldfinch *Carduelis carduelis*		2	1	4
Chaffinch *Fringilla coelebs*	4	6	5	10
Bullfinch *Pyrrhula pyrrhula*			1	2
Reed Bunting *Emberiza schoeniclus*	1	2	2	2

The assemblage of species recorded in summer is typical of the habitats occurring at the proposed windfarm site. Bird activity appeared to be more evident in summer than in winter, with birds being more vocal and breeding activity more evident. Eight amber-listed species were observed during the course of the summer bird survey.

13.2.11.9Summary and Conclusions

MWP were commissioned by Ecopower Ltd. to carry out and report on hen harrier and breeding bird activity for a proposed wind farm 2km west of Upperchurch, Co. Tipperary.

Winter field surveys were carried out between November 2010 and March 2011 and summer field surveys were carried out between April and July 2011. Hen harrier vantage point surveys were conducted according to the National Parks & Wildlife Service for assessing the impact of proposed windfarm developments on hen harriers.

The survey work entailed the following:

- Winter and summer vantage point surveys to determine hen harrier usage at the proposed windfarm area

- Winter and summer transect bird surveys

The dominant habitats occurring at the proposed Upperchurch windfarm site is improved agricultural grassland and coniferous forest plantations.

Hen harrier surveys included a total of ninety (90) hours observation from 3 vantage points for the winter survey and seventy two (72) hours observation from the same vantage points for the summer bird survey.

There was one observation of an adult male hen harrier in January 2010, during the winter vantage point survey and one observation of an adult female hen harrier in June 2011, during the summer bird survey.

There was no evidence of hen harriers breeding at the study site in the summer of 2011.

The randomness and low number of hen harrier observations during the vantage point surveys in 2010 and 2011 suggests that the proposed windfarm site at Upperchurch is used infrequently by hen harriers.

A total of 34 bird species were recorded using the site during the winter bird survey, of which five species are amber listed.

A total of 37 bird species were recorded using the site during the summer bird survey, of which eight species are amber listed

13.2.12 Other Vertebrates

13.2.12.1 Common lizard (Lacerta vivipara)

Common lizard (*Lacerta vivipara*) was not recorded during surveys within the study area. The heath and blanket bog habitats within the study site offer potential habitats for the species but these habitats are not extensive and are fragmented within the area mainly confined to small sections with improved agricultural land and forestry in between. Recent studies of the population of lizards in Ireland have indicated that bog habitats (15% of all habitats recorded) are very important for the species due to the large abundance of invertebrates that inhabit these areas (IWT, 2007).

13.2.12.2 Common frog (Rana temporaria)

There were some scattered observations of common frog throughout the site. There were several records of frogs within the drains, bog holes, bog trenches and water filled depression within the site. The trenches and drains that occur on the proposed site offer potential breeding habitat for the species.

13.2.13 Invertebrates

13.2.13.1 Freshwater pearl mussel (Margaritifera margaritifera)

Ireland is said to support up to 46% of the known populations of the freshwater pearl mussel (*Margaritifera margaritifera*) within the European Union (Shannon International River Basin District, 2009). The freshwater pearl mussel is listed under Annex II of the EU Habitats Directive and is one of the species for which the Lower River Shannon cSAC and the Lower River Suir cSAC has been designated. Freshwater pearl mussel is listed as critically endangered in the Republic of Ireland in the most recent review of local IUCN threat status of Irish molluscs. Its overall conservation status in Ireland is 'Unfavourable' (NPWS, 2008)

Freshwater pearl mussels have a complex life cycle. They mature between seven and 15 years of age and can have a prolonged fertile period lasting into old age. The larvae (glochidia) initially attach to the gills of salmonid fish hosts which provide nourishment, before they become large enough for independent development in the river bed. After excysting from host fish juvenile mussels survive in the interstices of the substrate, comprised of a stable combination of sand, gravels and cobbles, where good oxygen exchange occurs. A covering of fine silt may prevent this and cause heavy mortalities. In summary, the freshwater pearl mussel requires very high quality rivers with clean river beds and waters with very low levels of nutrients without artificially elevated levels of siltation.

Current distribution for this species in the Lower River Suir cSAC includes 10km grid squares R94 and S05 which incorporate the Clodiagh River into which first order stream adjacent to the proposal site drain. The distribution mapping also includes 10km grid squares S04, S02 and S01 which contain a significant stretch of the main channel of the Suir further downstream of the proposal site. In addition records from 2006, retained at the National Biodiversity Data Centre on line data resource, indicate that the species was then recorded in several locations on the Multeen River. An unnamed stream adjacent to the proposal site drains to the Turraheen River which in turn drains to the Multeen. The nearest record retained is for 1km grid square R9844 situated approximately 21km downstream of the proposal site. It is presumed in light of the aforementioned direct evidence and on the basis of the precautionary principle, that this species is potentially present within the zone of impact influence of the proposal.

With regard for the lower River Shannon cSAC, the published current distribution for this species does not include any 10km square which incorporates any stretch of river downstream of the location of the proposal considered in this document. Mapping of the distribution in this cSAC indicates that the species is restricted to the Feale system a separate tributary which drains to the Shannon Estuary via the Cashen River in North County Kerry. No records for the river system downstream of the proposal site are retained at the NBDC on line data resource. On the basis of the evidence outlined in this paragraph it is concluded that no impacts on this species, within the Lower River Shannon cSAC downstream of the proposal site, are reasonably foreseeable as a result of the proposed windfarm.

13.2.13.2 White-clawed crayfish (Austropotamobius pallipes)

The Lower River Suir cSAC and the Lower River Shannon cSAC are both designated for the protection of this species. In Ireland, the white-clawed crayfish most commonly occurs in small and medium-sized lakes, large rivers, streams and drains, wherever there is sufficient lime (Reynolds, 2007). The species prefers relatively cool temperatures and adequate dissolved oxygen and lime, although it is capable of tolerating significant fluctuations. Juveniles live among submerged tree-roots, gravel or aquatic plants, while larger crayfish need stones to hide under, or earthen banks in which to burrow. Crayfish show little activity during the winter period (December to March), spending most of their time torpid in refuges. They become more active when the water temperature increases. Females carry their eggs over winter attached in a dense cluster under their tails (Peay, 2003) and they require undisturbed shelter over a prolonged winter-spring period.

White-clawed crayfish eat a wide range of food including fallen leaves, aquatic vegetation, dead fish, aquatic invertebrates such as snails and caddis-fly larvae, and other dead or alive crayfish. They have a wide range of predators; juveniles are eaten by fish, birds and invertebrate predators while adults are taken by large predators such as heron, otter and mink. The crayfish try to avoid predation by hiding in refuges by day and coming out at night, when most birds and fish are resting.

The overall conservation status of the white-clawed crayfish in Ireland is poor, due to the reduction of range and the continuing pressures that it faces (NPWS, 2008).

The most recently published Current Range and Current Distribution mapping for this species includes both 10km grid squares (R95 and R96), which incorporate the proposal considered in this document. In addition, records retained at the NBDC include one location within the Turraheen system and several locations on the Owenbeg system all of which are downstream of the proposal site considered in this document. The record on the Turraheen is located approximately 8km downstream of the site. The nearest location on the Owenbeg is approximately 4km downstream of the site. O Connor (2007) noted that crayfish were abundant at Munroe Bridge which is situated on the Cromoge River which drains to Clodiagh at a point upstream of the point of confluence of the Clodiagh and Owenbeg. Taken together these various records indicate the strong likelihood of the presence of significant population(s) within the upper Clodiagh/Owenbeg system. It is presumed in light of the aforementioned direct evidence and on the basis of the precautionary principle, that this species is potentially present within the zone of impact influence of the proposal.

There is a risk that the water quality of the local watercourses, that drain the site, could be impaired during the construction stage of the proposed wind farm. It is possible that this could impact negatively on the white-clawed crayfish.

13.2.13.3Other invertebrates

The Large white, a butterfly species (*Pieris brassicae*) was recorded within the site on agricultural grassland in the western section of the site.

A drinker moth (*Euthrix potatoria*) was recorded where the wet heath intergrates with agricultural grassland, just north of T2 and a large amount of lycosid spiders were found throughout the site in all habitats. Other invertebrates recorded within the study area are caddis fly larvae (*Trichoptera spp.*), and mayfly (*Ephemeroptera spp.*).

13.2.14 Fauna Evaluation

Fauna have been evaluated below in Table 13-21 for their conservation importance based on Table 13-2 above.

TABLE 13-21: EVALUATION OF FAUNA

Species	Evaluation	Rationale	Key Ecological Receptor
Bats	National Importance	There were no roosts recorded within the study area however the mature tree-lines within and adjacent to the site offer potential roosting habitat for bats. Bats are Annex IV species under the EU Habitats' Directive and are also listed as protected species under the Irish Wildlife Act (Amendment) 2000. Although no evidence of roosting was found within the proposed Upperchurch site, the legal status and ecological sensitivity of these species merits their evaluation as nationally important species.	Yes
Fallow deer	High Local Importance	Evidence of fallow deer was not recorded within the study area. It is not likely that this species use the habitats within the Upperchurch site on a frequent basis due to high disturbance from agriculture and forestry.	Yes
Otter	National Importance	Evidence of otter was not found within the study area, however, the rivers and streams further downstream offer potential habitat for the species.	Yes
Badger	National Importance	Badger droppings were recorded at the base of a hedgerow in the south eastern section of the site. A trail was followed through a grassland field to the west of T7 towards the conifer plantation to the south. No Badger setts were recorded during time of survey.	Yes
Pine marten	National Importance	No evidence of pine marten was recorded during surveys within the site. This species was recorded in grid square R95 on the 17/07/2009 and in grid square R96 on the 14/11/2011 (source *Atlas of Mammals in Ireland 2010-2015*), This species is protected under the Wildlife (Amendment) Act (2000) and under Annex V of the Habitats Directive Pine martens inhabit forests of coniferous or mixed tree types but in the west of Ireland they can be found on open rocky areas which contain scrub with good ground cover. Pine martens are solitary territorial animals.. Male's territorial ranges can cover up to 80ha with females occupying areas up to 30ha	Yes
Irish stoat	National Importance	There was no evidence of this species recorded within the study area during field surveys. Irish stoat are protected under Wildlife (Amendment) Act (2000) and under the Berne Convention Appendix III. Irish stoats have adapted to a large number of different habitat types but prefer an area that provides some cover. These habitats occur within the site in the form of forestry, hedgerows,	Yes
Red fox	High Local Importance	Droppings and trails were recorded throughout the south eastern and western sections of the site.	Yes
Irish (mountain) hare	National Importance	Irish hare were recorded during ecological surveys north of turbine T11 and there are potential habitats throughout the study area. A record from NBDB indicates that an Irish hare was observed 1.9 km west and 3.3 km east of the study area.	Yes
Common frog	National Importance	Adult and juvenile frogs were observed within the site. This is a protected species under the Wildlife Act and under Annex V of the EU Habitats' Directive.	Yes
Common lizard	National importance	This species was not recorded during field surveys within the site. The site offers potential habitats where this species could utilise, such as heathland and bogland.	Yes

Species	Evaluation	Rationale	Key Ecological Receptor
Pygmy shrew	National importance	This species was recorded outside the site during bat transects. This species could avail of habitats such as coniferous forests and areas with good ground cover such as grasslands, heaths, hedgerows, peatlands	Yes
Atlantic salmon	National Importance	There is low potential habitat for Atlantic salmon within the small streams flowing through the site. However, there is potential habitat for the adult and juvenile salmon with potential spawning and nursery habitats of the Clodiagh, Owenbeg and the Turraheen rivers further downstream of the study area.	Yes
Lamprey spp.	National Importance	There is low potential habitat for Lamprey within the small streams flowing through the site. However, there is potential habitat for the adult and juvenile lamprey with potential spawning and nursery habitats of the Clodiagh, Owenbeg and the Turraheen rivers further downstream of the study area.	Yes
Twaite shad	National Importance	There is no potential habitat for Twaite shad within the small streams flowing through the site. However, there is potential habitat for the adult and juvenile fish with potential spawning and nursery habitats of the Clodiagh, Owenbeg and the Turraheen rivers further downstream of the study area.	Yes
Allis-shad	National Importance	Current distribution for this species which is available at 10 km resolution, indicates that this species is confined to the lower reaches of the Suir which is a linear distance of in excess of 60km south east of the proposal site and separated from it by a watercourse of considerably greater length. It is unlikely that this species occur within 15 km of the proposed development because of its constrained capacity for upstream migration, referred to previously. On the basis of the evidence outlined it is concluded that no significant impacts on this species, within the cSAC, are reasonably foreseeable as a result of the proposal considered in this document.	Yes
White-clawed crayfish	National Importance	There is low potential habitat for white-clawed crayfish within the small streams flowing through the site. However, there is potential habitat for the adult and juvenile crayfish with potential breeding habitats in the Clydagh River further downstream of the study area.	Yes
Freshwater pearl mussel	National Importance	There is low potential habitat for Freshwater pearl mussel within the small streams flowing through the site. However there is potential habitat for this species further downstream of the proposed development.	
Hen harrier	National Importance	Two observations were recorded in total within the site during ornithological surveys conducted during the breeding and winter period. There was no evidence of nesting within the site and the level of activity indicates that the site is of low importance for the species	Yes
Kestrel	County Importance	There were four observations of kestrel during winter surveys and two during breeding bird surveys. The species is considered unlikely to be breeding within the site but appear to using the site infrequently for foraging.	Yes

In summary, the bat species, Freshwater pearl mussel, White-clawed crayfish, Allis-shad, Twaite shad, Atlantic salmon and the hen harrier are of the greatest conservation value. There was evidence that badger, Irish hare, kestrel, pygmy shrew and common frog use the site. Other species which potential may utilise habitats within the site include common lizard, Irish (mountain) hare, Irish stoat, fallow deer, otter and pine marten.

13.3 POTENTIAL IMPACTS

13.3.1 Introduction

Windfarm developments are typically large developments that may potentially impact on the natural environment (habitats, flora, fauna, water quality and fisheries). For windfarm projects, the construction phase is likely to have the most significant effect. Impacts include surface run-off from roads and earth works particularly on peat. This section will identify in detail the impact of the construction and operational phases of the windfarm development on the local natural environment.

13.3.2 Construction Phase

The following are the main elements of the proposed windfarm construction:

13.3.2.1 Primary Construction Activities

The development is characterised by the following civil engineering works which will be undertaken to provide the necessary infrastructure to complete the wind farm:

- Excavation for the construction of 22 turbine bases with a minimum depth of 2.00m and 225m^2 plan area and hardstands with and excavation depth of 0.60m and 1,040m^2 plan area;
- Erection of 22 turbines with a hub height of up to 85m and a tip height of up to 126.60m;
- Construction of 8.0km of 5.00m wide new roads;
- Widening and upgrading of 3.6km of existing farm roads (average 2m widening);
- Construction of a surface water drainage system along the road edges;
- Importation of stone from local quarries for construction of access roads and hard standings;
- Construction of an electrical substation and the installation of associated equipment; and
- The laying of electrical cables between turbines and the substation compound.

13.3.3 Construction Impacts

The main construction impacts will be associated with the construction of these elements and are likely to include:

- Habitat removal due to construction
- Increased dust and pollutant levels from construction vehicles
- Increased noise levels from vehicular movement and construction

13.3.3.1 Designated Sites

An Appropriate Assessment has been undertaken to identify any potential impacts to Natura 2000 sites (SACs and SPAs) as a result of the proposed development. This assessment is required under Article 6 of the Habitats Directive (92/43/EEC) and such assessments, according to guidance, should be clearly distinguishable and identified within an environmental statement. For this reason a separate Appropriate Assessment was undertaken (see **Appendix 13-II** at the end of this chapter). In this section only the potential impacts to sites that are outside SPAs and SACs have been identified for assessment. Many NHA designations overlap with SAC and SPA designations, having been designated to protect the same ecological resource and for that reason impacts to these sites are addressed in the Appropriate Assessment. One NHA and six pNHAs were recorded within 10km of the Study Area.

Two sites lie within Natura 2000 site namely Inchinsquillib and Dowling's Woods pNHA and Inchinsquillib and Bilboa and Gortnageragh River valleys pNHA. Dowling's Woods pNHA is located within the Lower Suir SAC and lies 8.7 km to the south of the proposed site. The Bilboa and Gortnageragh River valleys pNHA lies 9.3 km to the south west of the site and is located within the Lower River Shannon SAC and is part of the Slievefelim to Silvermines Mountains SPA.

Sites that lie outside Natura 2000 sites include the Mauherslieve Bog NHA, Co. Tipperary (site code: 002385); Killavalla Wood pNHA Co. Tipperary (site code: 001178) Aughnaglanny Valley pNHA (site code: 000948) and Nenegh River Gorge pNHA Co. Tipperary (site code: 001133).

The Aughnaglanny Valley pNHA lies 5.9 km to the south of the proposed site. It is a semi-natural woodland in a steep-sided river. The Mauherslieve Bog NHA 4.6 km west of the proposed site contains a good example of sloping mountain blanket bog with most of the vegetation still intact. The Irish Red Data Book species, Irish Hare, occurs on the site. The Killavalla Wood pNHA occurs 8.6km north of the proposed windfarm site consists of a native woodland and has a moderate conservation value (Perrin *et al*, 2008).The Nenegh River Gorge pNHA which is a main cultural feature of the Templederry forest is located 5 km to the northwest. None of these three pNHAs and one NHA are linked to the proposed site either across land or by waterways and there is no impact envisaged as a result of the proposed development.

13.3.3.2 Impact to habitats

Habitats and fauna are listed in order of ecological importance i.e. habitats of National Importance shall be discussed firstly followed by habitats of County Importance, etc. Table 13-22 summarises the habitat loss as a result of the proposed development. Table 13-24 and Table 13-25 below assess the impacts using NRA criteria (see Table 13-2 and Table 13-3 above) of the proposed windfarm development on the sites' habitats and species of value during construction phase. Estimated areas and lengths of habitat removal are given where relevant.

The construction of access roads, foundations and hardstandings around the turbines will result in habitat damage and loss. The habitat loss will be the total area covered by the upgrading of existing farm roads and tracks. The construction of new access roads, plus the footprint of each of the twenty two proposed turbines and the windfarm substation compound and all other windfarm infrastructure. This is expected to amount to approximately 1.79 % of the proposed development site.

TABLE 13-22: TABLE SUMMARISING HABITAT LOSS AS A RESULT OF THE PROPOSED DEVELOPMENT.

Habitat	Selection as key ecological receptor	Total area of habitat (ha) within the study area.	Percentage of total habitat within the study area (%)	Area of habitat to be lost (ha).	Percentage of total habitat loss (%)
Improved Agricultural Grassland (GA1)	Yes	228.34	42.53	5.98	1.11
Wet Grassland (GS4)	Yes	19.94	3.71	0.5	0.09
Mosaic of Improved Grassland (GA1) & Wet Grassland (GS4)	Yes	11.44	2.13	0.3	0.06
Mosaic Wet Heath (HH3) & Upland Blanket Bog (PB3)	Yes	15.54	2.89	0.01	0.002
Acid Grassland (GS3)	Yes	20.34	4.68	0.57	0.11
Mosiac Upland Blanket Bog (PB3) & Acidic Grassland (GS3)	Yes	3.16	3.79	0.45	0.08
Upland Blanket Bog (PB2)	Yes	25.13	0.59	0	0
Coniferous Plantation (WD4)	No	202.2	37.66	1.18	0.22
Spoil and Bare Ground (ED2)	No	4.3	0.80	0.66	0.12
Buildings and Artificial Surfaces (BL3)	No	4.2	0.78	-	-
Neutral Grassland (GS1)	Yes	2.25	0.42	0	0.00
Total (ha) (excluding FW1, FW4, WL1 and WL2)		**536.84 ha**	**100%**	**9.65Ha**	**1.79%**

TABLE 13-23: SUMMARISING LINEAR LENGTH OF HABITAT LOST AS A RESULT OF THE PROPOSED DEVELOPMENT.

Habitat	Selection as key ecological receptor	Total linear length of habitat (meters) within the study area..	Percentage of total habitat within the study area (%)	Area of habitat to be lost (m).	Percentage of total habitat loss (%)
Eroding/Upland River (FW1)	Yes	1486.88	-	0	-
Drainage Ditches (FW4)	Yes	1258.5	-	48.1	-
Hedgerow (WL1)	Yes	24968.69	-	980.77	-
Treelines (WL2)	Yes	668.73	-	-	-

13.3.3.3Impacts on Fauna

The potential impact of wind turbines on fauna may be considered as:

- Loss of habitats / Alteration of habitats;
- Potential impairment of water quality due to construction works; and
- Disturbance and/or displacement of fauna.

Habitat Loss or Alteration:

The resultant loss of habitat will have a slight impact to fauna within the local area. The habitats lost within the footprint of the development are plentiful throughout the greater area.

There is the potential that aquatic habitats within the proposed site (i.e. waterways) maybe altered as a result of pollutants and/or sediment entering these systems. This potential impact is discussed further below.

Potential impairment of water quality due to construction works

The potential significant impacts of the proposed development on aquatic ecology (without mitigation) are summarised as follows:

- *Pollution of watercourses with suspended solids due to runoff of soil from construction areas:*
  In the absence of adequate mitigation measures, contamination of water courses with suspended solids may have the potential to impact on aquatic flora and fauna within the waterways downstream of the proposed site.
- *Pollution of watercourses with nutrients due to ground disturbance during construction.*
  The main potential sources of nutrient inputs to freshwater due to ground disturbance are from nutrients adsorbed or chemically bound to eroded suspended solids.
- *Pollution of watercourses with nutrients due to decomposition of plant material after vegetation clearance.*
- *Pollution of watercourses, during construction phase, with other substances such as fuels, lubricants, waste concrete, waste water from wash facilities, etc.*
- *Pollution of watercourses with surface drainage water from paved areas and road surfaces.*
  There is a risk of pollution of surface waters with hydrocarbons from paved areas after the construction is complete.

Displacement and/or disturbance to fauna

Another potential impact during construction is disturbance of breeding, sheltering or foraging species of fauna by human activity and the operation of machinery. Turbine erection and access road construction can take several months. Work taking place during the summer months could cause disturbance to breeding and could lead to temporary displacement of some species from the site during construction. It is expected that this effect would be temporary and would not extend beyond the construction phase.

TABLE 13-24: ECOLOGICAL IMPACT ASSESSMENT OF HABITATS SELECTED AS KEY ECOLOGICAL RECEPTORS DURING THE CONSTRUCTION PHASE (WITHOUT MITIGATION)

Habitat	**Evaluation**	**Construction impact**	**Magnitude**	**Duration**	**Reversibility**	**Timing / Frequency**	**Positive/ Negative**
Improved Agricultural Grassland (GA1)	Locally important (higher value)	There shall be habitat lost as a result of the proposed development. Approximately 42.53% of the proposed site is classified as this habitat the amount of habitat to be lost is 1.11% of the total site.	Low	Permanent	Irreversible	n/a	Negative
Wet Grassland (GS4)	Locally important (higher value)	There shall be a small amount of this habitat lost as a result of the proposed development. Approximately 3.71% of the proposed site is classified as this habitat. The amount of habitat to be lost is 0.09% of the total site.	Low	Permanent	Irreversible	n/a	Negative
Mosaic of Improved Grassland (GA1) & Wet Grassland (GS4)	Locally important (higher value)	There shall be a small amount of this habitat lost as a result of the proposed development. Approximately 2.13% of the proposed site is classified as this habitat. The amount of habitat to be lost is 0.06% of the total site.	Low	Permanent	Irreversible	n/a	Negative
Mosaic of Wet Heath (HH3) & Upland Blanket Bog (PB3)	Locally important (higher value)	There shall be no loss of the habitat as a result of the proposed development.	n/a	n/a	n/a	n/a	Neutral
Acid Grassland (GS3)	Locally important (higher value)	There shall be a small amount of this habitat lost as a result of the proposed development. Approximately 4.68% of the proposed site is classified as this habitat. The amount of habitat to be lost is 0.11% of the total site.	Low	Permanent	Irreversible	n/a	Negative
Upland Blanket Bog (PB2)	County importance	There shall be no loss of the habitat as a result of the proposed development.	n/a	n/a	n/a	n/a	Neutral
Mosaic Upland Blanket Bog (PB3) &	Locally important (higher value)	There shall be a small amount of this habitat lost as a result of the proposed development. Approximately 3.79%	Low	Permanent	Irreversible	n/a	Negative

Habitat	Evaluation	Construction impact	Magnitude	Duration	Reversibility	Timing / Frequency	Positive/ Negative
Acidic Grassland (GS3)		of the proposed site is classified as this habitat. The amount of habitat to be lost is 0.08% of the total site.					
Eroding/ Upland River (FW1)	County Importance	There is the potential without mitigation that chemicals and sediment used/produced during the construction phase entering rivers and streams within the site and reducing the quality of the habitat.	Medium	Temporary	Reversible	n/a	Negative
Hedgerows (WL1)	Locally important (higher value)	There shall be some direct habitat lost as a result of the proposed development. 980.77m of this habitat shall be removed during the development.	Low	Permanent	Irreversible	n/a	Negative
Drainage Ditches (FW4)	Locally important (higher value)	There shall some direct habitat lost as a result of the proposed development, with 48.1m being removed during the development.	Low	Permanent	Irreversible	n/a	Negative
Treelines (WL2)	Locally important (higher value)	There shall be no loss of the habitat as a result of the proposed development.	n/a	n/a	n/a	n/a	Neutral
Neutral Grassland (GS1)	Locally important (higher value)	There shall be no loss of the habitat as a result of the proposed development.	n/a	n/a	n/a	n/a	Neutral

TABLE 13-25: SUMMARY OF IMPACT SIGNIFICANCE AND CONFIDENCE LEVELS IN THE PREDICTED IMPACTS ON THE KEY HABITATS DURING THE CONSTRUCTION PHASE (WITHOUT MITIGATION)

Habitat	Characterisation of unmitigated impact on the feature	Significance without mitigation and confidence levels
Improved Agricultural Grassland (GA1)	There shall be a direct loss of habitat within the footprint of the development.	Although the construction impact will result in permanent, irreversible loss of improved agricultural grassland habitat, the extent is relatively low particularly as there is an abundance of this habitat within the region and the low ecological value of this habitat. Therefore, it is ***near certain*** that the impact on this habitat will ***not be significant.***
Wet Grassland (GS4)	There shall be a direct loss of habitat within the footprint of the development.	Although the construction impact will result in permanent, irreversible loss of wet grassland habitat, the quality of the habitat was low and the extent is relatively low particularly as there is an abundance of this habitat within the region. Therefore, it is ***near certain*** that the impact on this habitat will

Habitat	Characterisation of unmitigated impact on the feature	Significance without mitigation and confidence levels
		not be significant.
Mosaic of Improved Grassland (GA1) & Wet Grassland (GS4)	There shall be a direct loss of habitat within the footprint of the development.	Although the construction impact will result in permanent, irreversible loss of this habitat, the quality of the habitat was low and the extent is relatively low particularly as there is an abundance of this habitat within the region. Therefore, it is ***near certain*** that the impact on this habitat will ***not be significant.***
Acid Grassland (GS3)	There shall be a direct loss of habitat within the footprint of the development.	Although the construction impact will result in permanent, irreversible loss of acid grassland habitat, the quality of the habitat was low and the extent is relatively low particularly as there is an abundance of this habitat within the region. Therefore, it is ***near certain*** that the impact on this habitat will ***not be significant.***
Mosaic Upland Blanket Bog (PB3) & Acidic Grassland (GS3)	There shall be a direct loss of habitat within the footprint of the development.	Although the construction impact will result in a small percentage of permanent, irreversible loss of this habitat, it is ***near certain*** that the impact on this habitat will ***not be significant.***
Eroding/ Upland River (FW1)	There is the potential without mitigation that chemicals and sediment used/produced during the construction phase entering rivers and streams within the site and reducing the quality of the habitat.	Without mitigation it is ***probable*** that the impact would ***be significant***.
Drainage Ditches (FW4)	There shall be a direct loss of habitat within the footprint of the development.	The proposed development will result in the small permanent, irreversible loss of drainage ditches. However the extent is relatively low particularly as there is an abundance of this habitat within the region and a net gain will result in this habitat as a result of the installation of new drainage systems to facilitate the proposed development. Therefore, it is ***near certain*** that the impact on this habitat will ***not be significant.***
Hedgerows (WL1)	There shall be a direct loss of habitat within the footprint of the development.	The proposed development will result in the permanent, irreversible loss 980.77m of hedgerow habitat. However the extent is relatively low particularly as there is an abundance of this habitat and many of the hedgerows dividing fields have very little cover within the region. Therefore, it is ***near certain*** that the impact on this habitat will ***not be significant.***

TABLE 13-26: ECOLOGICAL IMPACT ON FAUNA DURING THE CONSTRUCTION PHASE (WITHOUT MITIGATION)

Fauna	Description of Construction Impact	Magnitude/ Extent	Duration	Reversibility	Timing / Frequency	Positive/ Negative
Bats	There shall be loss of potential foraging habitat	Low	Permanent	Reversible	Bats are most active	Negative

Fauna	Description of Construction Impact	Magnitude/ Extent	Duration	Reversibility	Timing / Frequency	Positive/ Negative
	within the site. However, this loss of habitat is not considered to be significant given the availability of extensive foraging habitat outside the site. Some noise and anthropogenic disturbance during construction may occur.				during the summer (May-Sept).	
Otter	There is the potential without mitigation for sediment and pollutants entering the stream and waterways within the site to be washed downstream reducing water quality within the sections of rivers and streams where otter may forage. An increase in sediment and pollutants entering the stream could potentially lead to an impact to aquatic species of prey on which otter feed.	Low	Temporary	Reversible	Likely to be present all year round.	Negative
Badger	Some noise and anthropogenic disturbance during the construction phase of the development. Loss of foraging habitat within the improved agricultural grassland in the south eastern section of the proposed site where a badger trail and droppings were observed.	Low	• Temporary disturbance • Permanent habitat loss	• Impact from disturbance is expected to be mostly reversible post construction • Habitat loss is irreversible	Likely to be present all year round	Negative
Pine marten	There shall be loss of potential suitable habitat, due to the loss of conifer plantation and disturbance during construction phase.	Low	• Temporary disturbance • Permanent habitat loss	• Habitat loss is irreversible	Likely to be present all year round	Negative
Red fox	There shall be loss of potential foraging habitat within the site. However, this loss of habitat is not considered to be significant given the availability of extensive foraging habitat outside the site. Some noise disturbance during the construction phase of the development.	Low	• Temporary disturbance • Permanent habitat loss	• Impact from disturbance is expected to be mostly reversible post construction • Habitat loss is irreversible	Likely to be present all year round	Negative
Irish stoat	There shall be loss of potential foraging habitat	Low	• Temporary disturbance	• Impact from disturbance is	Likely to be present	Negative

Fauna	Description of Construction Impact	Magnitude/ Extent	Duration	Reversibility	Timing / Frequency	Positive/ Negative
	within the site. However, this loss of habitat is not considered to be significant given the availability of extensive foraging habitat outside the site. Some noise disturbance during the construction phase of the development.		• Permanent habitat loss	expected to be mostly reversible post construction • Habitat loss is irreversible	all year round	
Irish (mountain) hare	There shall be loss of potential foraging habitat within the site. However, this loss of habitat is not considered to be significant given the availability of extensive foraging habitat outside the site. Some noise disturbance during the construction phase of the development.	Low	• Temporary disturbance • Permanent habitat loss	• Impact from disturbance is expected to be mostly reversible post construction • Habitat loss is irreversible	Likely to be present all year round	Negative
Pygmy shrew	There shall be loss of potential foraging habitat within the site. However, this loss of habitat is not considered to be significant given the availability of extensive foraging habitat outside the site. Some noise disturbance during the construction phase of the development.	Low	• Temporary disturbance • Permanent habitat loss	• Impact from disturbance is expected to be mostly reversible post construction • Habitat loss is irreversible	Likely to be present all year round	Negative
Common frog	Potential loss of habitat due to possible loss of pools and water filled depressions within the site. Some noise and anthropogenic disturbance during the construction phase of the development.	Low	• Temporary disturbance • Permanent habitat loss	• Impact from disturbance is expected to be mostly reversible post construction • Habitat loss is irreversible	Likely to be present all year round	Negative
Atlantic salmon	There is the potential without mitigation for sediment and pollutants entering the stream and waterways within the site to be washed downstream reducing water quality within the section of the stream where Atlantic salmon could occur. An increase in sediment entering the stream could potentially lead to the smothering of spawning	High	Temporary	Reversible	Likely to be present all year round. Spawning occurs between Oct and Feb.	Negative

Fauna	Description of Construction Impact	Magnitude/ Extent	Duration	Reversibility	Timing / Frequency	Positive/ Negative
	ground further downstream.					
Lamprey spp.	There is the potential without mitigation for sediment and pollutants entering the stream and waterways within the site to be washed downstream reducing water quality within the section of the stream where lamprey spp. could occur. An increase in sediment entering the stream could potentially lead to the smothering of spawning ground further downstream.	High	Temporary	Reversible	Likely to be present all year round.	Negative
Twaite shad	There is the potential without mitigation for sediment and pollutants entering the stream and waterways within the site to be washed downstream reducing water quality within the section of the stream where twaite shad could occur. An increase in sediment entering the stream could potentially lead to the smothering of spawning ground further downstream.	High	Temporary	Reversible	Likely to be present all year round.	Negative
Allis shad	There is the potential without mitigation for sediment and pollutants entering the stream and waterways within the site to be washed downstream reducing water quality within the section of the stream where allis shad could occur. An increase in sediment entering the stream could potentially lead to the smothering of spawning grounds further downstream.	High	Temporary	Reversible	Likely to be present all year round.	Negative
White-clawed crayfish	There is the potential without mitigation for sediment and pollutants entering the stream and waterways within the site to be washed downstream reducing water quality within the section of the stream where crayfish	High	Temporary	Reversible	Likely to be present all year round.	Negative

Fauna	Description of Construction Impact	Magnitude/ Extent	Duration	Reversibility	Timing / Frequency	Positive/ Negative
	could occur.					
Freshwater pearl mussel	There is the potential without mitigation for sediment and pollutants entering the stream and waterways within the site to be washed downstream reducing water quality within the section of the stream where freshwater pearl mussel could occur. An increase in sediment entering the stream could potentially lead to the smothering of spawning ground further downstream.	High	Temporary/ Long term	Reversible	Likely to be present all year round.	Negative
Hen harrier	Loss of foraging habitat due to habitat loss and displacement. Potential risk of collision.	Low	Permanent	Reversible	Likely to be present all year round.	Negative
Kestrel	Loss of foraging habitat due to habitat loss and displacement. Potential risk of collision.	Low	Permanent	Reversible	Likely to be present all year round.	Negative

TABLE 13-27: SUMMARY OF SIGNIFICANCE OF THE EXPECTED IMPACTS AND THEIR ASSOCIATED CONFIDENCE LEVELS ON KEY FAUNA SPECIES DURING THE CONSTRUCTION PHASE (WITHOUT MITIGATION)

Fauna	Characterisation of unmitigated construction impact on the feature	Significance without mitigation and confidence levels
Bats	Some loss of potential foraging habitat. There is the potential that bat species could be temporarily impacted by disturbance during construction.	It is ***probable*** that a negative impact to bats **will not be significant**.
Otter	There is the potential without mitigation for sediment and pollutants entering the stream and waterways within the site to be washed downstream reducing water quality within the section of the stream where otter forage. An increase in sediment and pollutants entering the stream could potentially lead to an impact to aquatic species of prey on which otter feed.	It is ***probable*** that a negative impact to otter **will not be significant**.
Badger	Some loss of potential foraging habitat. There is the potential that badgers could be temporarily impacted by disturbance during construction.	It is ***probable*** that a negative impact to badger **will not be significant**.
Irish (mountain) hare	Some noise disturbance during the construction phase of the development. Some loss of habitat within the footprint of the proposed windfarm.	It is ***probable*** that a negative impact to Irish (mountain) hare **will not be significant**.
Red fox	There shall be loss of potential foraging habitat within the site. However, this loss of habitat is not considered to be	It is ***near certain*** that a negative impact to the red fox

Fauna	Characterisation of unmitigated construction impact on the feature	Significance without mitigation and confidence levels
	significant given the availability of extensive foraging habitat outside the site. Some disturbance during the construction phase of the development.	**will not be significant**
Common frog	Potential loss of habitat due to loss of temporary pools / wet areas within the site. Some disturbance during the construction phase of the development.	It is ***probable*** that a negative impact to common frog **will not be significant**.
Atlantic salmon	There is the potential without mitigation for sediment and pollutants entering the small drains within the site to be washed downstream reducing water quality within the section of the stream where Atlantic salmon could potentially occur. An increase in sediment entering the stream could potential lead to the smothering of spawning ground further downstream.	It is ***probable*** that a negative impact to Atlantic salmon **will not be significant**.
Lamprey spp.	There is the potential without mitigation for sediment and pollutants entering the stream and waterways within the site to be washed downstream reducing water quality within the section of the stream where lamprey spp. could occur. An increase in sediment entering the stream could potentially lead to the smothering of spawning ground further downstream.	It is ***probable*** that a negative impact to lamprey spp. **will not be significant**.
Twaite shad	There is the potential without mitigation for sediment and pollutants entering the stream and waterways within the site to be washed downstream reducing water quality within the section of the stream where twaite shad could occur. An increase in sediment entering the stream could potentially lead to the smothering of spawning ground further downstream.	It is ***probable*** that a negative impact to twaite shad **will not be significant**.
Allis shad	There is the potential without mitigation for sediment and pollutants entering the stream and waterways within the site to be washed downstream reducing water quality within the section of the stream where allis shad could occur. An increase in sediment entering the stream could potentially lead to the smothering of spawning ground further downstream.	It is ***probable*** that a negative impact to allis shad **will not be significant**.
White-clawed crayfish	There is the potential without mitigation for sediment and pollutants entering the stream and waterways within the site to be washed downstream reducing water quality within the section of the stream where crayfish could occur.	It is ***probable*** that a negative impact to crayfish **will not be significant**.
Hen harrier	Loss of foraging habitat due to habitat loss and displacement. Potential risk of collision.	It is ***probable*** that a negative impact to hen harrier **will not be significant**.
Kestrel	Loss of foraging habitat due to habitat loss and displacement. Potential risk of collision.	It is ***probable*** that a negative impact to kestrel **will not be significant**.

13.3.4 Operational Phase

The operational phase will have a lesser impact on the local ecology than the construction phase. The following section outlines the potential risk to the local environment during the operational phase of the development.

13.3.4.1 Designated conservation sites

The operational phase of the proposed development will not have an impact upon NHAs not covered by other designations. The impact of the proposed windfarm on Natura 2000 sites (and indirectly on pNHAs covered by these designations) is discussed further in the Appropriate Assessment (see **Appendix 13-II** at the end of this chapter).

13.3.4.2 Habitats

There is the potential impact (without mitigation) to the water quality of the drains and streams within the site due to sediment erosion and runoff during the early operational phase. No further impact to habitats is expected during the operational phase of the windfarm.

13.3.4.3 Fauna

The main operational impacts of the windfarm will arise from the rotation of the wind turbine blades and, to a lesser extent, from occasional vehicular movement along access roads. The rotation of the blades is likely to result in displacement of local wildlife due to the avoidance of birds in particular of the area immediately around the turbines. In addition, the rotating blades present a potential collision hazard to the Hen harrier and to local bat species. The rotation of the blades of the turbines will result in increased noise levels which may cause disturbance to local wildlife.

<u>Collision Risk: Bats</u>

Collision risk is an issue in relation to bats, particularly in relation to *Myotis* spp. which exhibit swarming behaviour (JNCC, 2001). Natural England has produced guidance on the impacts of windfarms to bats (Natural England, 2012). In this guidance, they have assessed the risk of collision to different species and placed them into low, medium or high risk categories based on a number of factors such as flight patterns and foraging strategies. This risk assessment is summarised below in Table 13-28 where the information of species that occur in Ireland has been extracted. In contrast to JNCC (2001), Natural England has classified *Myotis* species as being at low risk of collision.

TABLE 13-28: ASSESSMENT OF THE LIKELY LEVEL OF RISK TO UK BAT SPECIES FROM COLLISION WITH WIND TURBINES (INFORMATION ON SPECIES THAT OCCUR IN IRELAND EXTRACTED). SOURCE: NATURAL ENGLAND (2012).

Risk of turbine impact			
Factor	**Low Risk**	**Medium Risk**	**High Risk**
Habitat preference	Bats preferring cluttered habitat	Bats able to exploit background cluttered space	Bats preferring to use open habitat
Echolocation characteristics	Short range High frequency Low intensity Detection distance ~15m	Intermediate – more plastic in their echolocation	Long range Low frequency High intensity Detection distance ~80m
Weight	Lightest	Medium	Heaviest
Wing shape	Low wing loading Low aspect ratio Broadest wings	Intermediate	High wing loading High aspect ratio Narrow wings
Flight speed	Slow	Intermediate	Fast
Flight behaviour and use of landscape	Manoeuvre well will travel in cluttered habitat Keeps close to vegetation Gaps may be avoided	Some flexibility	Less able to manoeuvre May avoid cluttered habitat Can get away from unsuitable habitat quickly Commute across open landscape
Hunting techniques	Hunt close to vegetation Exploit richer food sources in cluttered habitat Gleaners	Hunt in edge and gap habitat Aerial hawkers	Less able to exploit insect abundance in cluttered habitat Aerial hawker Feed in open
Migration	Local or regional movements	Regional migrant in some parts of range	Long-range migrant in some parts of range
Conclusion: Categorisation of Bat found in Ireland	***Myotis* species** **Long eared-bats** **Horseshoe bats**	**Common pipistrelle** **Soprano pipistrelle**	**Leisler's bat** **Nathusius' pipistrelle**

Given a relative population size for each species and the likely risk posed by turbines, it may be possible to determine the level of threat posed to populations of bats. Most effort should be expended on populations likely to be at high risk of collisions and that may be most threatened. Table 13-29 below lists the likely level of risk considering the population size in the UK. Species present in Ireland have been extracted from Natural England's list. It should be noted however that Leisler's bat are more common in Ireland due to the lack of competition from the Noctule bat which is absent from Ireland.

TABLE 13-29: ASSESSMENT OF THE LIKELY LEVEL OF RISK TO THE POPULATIONS OF UK BAT SPECIES FROM COLLISION WITH WIND TURBINES (INFORMATION ON SPECIES THAT OCCUR IN IRELAND EXTRACTED). SOURCE: NATURAL ENGLAND (2012).

Low Risk	**Medium Risk**	**High Risk**
Myotis species		Leisler's bat
Long-eared bats		Nathusius' pipistrelle
Horseshoe bats		
Common pipistrelle		

Soprano pipistrelle		

There was four species of bats recorded during transects around and through the proposed site. These were common pipistrelle, Soprano pipistrelle, the brown long eared bat and the *Myotis* species, of either a whiskered/Brandt's bat.

TABLE 13-30: ASSESSMENT OF THE LIKELY LEVEL OF RISK TO THE POPULATIONS OF BAT SPECIES FOUND AT THE PROPOSED WINDFARM SITE

Low Risk	**Medium Risk**	**High Risk**
Myotis species		
Long-eared bats		
Common pipistrelle		
Soprano pipistrelle		

Collision Risk: Birds

Collision risk behavioural observations of birds in relation to operational wind farms provide the basis of assessments of collision risk. Fixed point observations of flight behaviour, flight lines into, through, and out of the area and information about the birds' use of the area help to inform the environmental assessment of the proposed wind farm. Bird mortality may result from bird collision with turbine structures or turbine blades.

There are many examples illustrating bird collision with wind turbine rotor blades and significant mortality has been recorded at some areas. The best documented areas are Tarifa (Spain) and Altamont Pass (California). Collision risk depends on a range of factors including species, bird abundance, bird behaviour, weather, topography and wind farm design (Percival, 2003). The examples mentioned are from areas with very high numbers and densities of birds (particularly large birds such as raptors) and are located in known key migration routes.

The evidence to date indicates that the effects are extremely species and site specific. Not all species are equally sensitive to collision. Large birds such as raptors and wildfowl are considered to be at greater risk of collision due to their flight behaviour and mobility (Percival, 2003). Percival notes that in Ireland, wind farms are most likely to have a serious negative impact on birds in areas of high concentrations of seabirds, wintering wildfowl or breeding raptors.

Relatively little is known about collision as a threat to birds. One problem is that most studies rely on the number of corpses found, but this can be extremely unreliable, since it is known that corpses are quickly removed by predators. At a wind farm site in Co. Wexford, during post-construction monitoring of seabirds, it was found that 90% of bird corpses left out were removed in two days (private report for Hibernian Windpower, by Joe Adamson Senior Ornithologist with MWP).

Passerines

Collision by resident passerines is not considered to be a significant issue as their breeding activity is generally well below the height of rotor blades and the significance of the risk of collision is considered to be very low.

Birds of Prey

As aforementioned, hen harrier was observed on two occasions at Upperchurch during the course of the winter and summer raptor vantage point surveys. The randomness and low number of hen harrier observations during the vantage point surveys in 2010 and 2011 suggests that the proposed windfarm site 2km west of Upperchurch is used infrequently by hen harriers. The very low number of observations would suggest that the significance of the risk of collision as a result of the construction of the wind farm is considered very low.

Kestrel were recorded to frequent the site on an infrequent basis with six observation in total over the two seasons. Observations of kestrel at a windfarm in Co. Wexford showed that kestrel occasionally hunted within the study area. The potential for collision on this species, as a result of the wind farm construction, is considered to be not significant.

Disturbance or Displacement

There is evidence that wind turbines can displace or exclude some species, which effectively results in habitat loss for these birds. Percival (2003) cites studies which indicate that this is a problem for larger wildfowl and some raptors. Disturbance can depend on a range of issues including seasonal bird use, diurnal bird use, location, availability of alternative habitats, bird life cycle, flock size, habituation and turbine and wind farm specifications (Percival, 2003).

Available evidence suggests that breeding passerines are not adversely affected by the presence of wind turbines. For example, a German study found no effect on numbers or spatial distribution of skylarks within 1km of turbines (Drewitt and Langston, 2006).

No birds of prey were observed to breed within the development site. Whitfield and Madders (2006), suggest that most studies do not detect any significant displacement of raptor species by wind turbines.

Observations of cormorant at a wind farm site in Co. Wexford during post-construction seabird monitoring in 2003 showed that cormorants completely avoided the wind farm and flew around it in a wide berth when passing close to the wind farm. The wind farm had been operating for a year in 2003. Subsequent observations of cormorant at the same wind farm in summer 2010 showed that cormorants flew between turbines at rotor height or above. The birds observed in 2010 may have been some of the same birds observed in 2003 that have habituated to the new land marks or were birds born after 2003 that have always been familiar with the wind farm (pers. obs. Joe Adamson Senior Ornithologist MWP). The results of this survey indicate that while some birds may initially exhibit avoidance behaviour they will probably habituate to its existence in the environment over time.

Disturbance or Displacement: Other fauna

It is considered highly likely that once the construction phase of the proposed development has been completed all terrestrial fauna will utilise the habitats within the site within a short period of time. The newly cleared areas of forestry, drains and sediment ponds shall offer new potential habitat for many of these species.

The operational impacts are summarised below in Table 13-31 and Table 13-32. None of the habitats are expected to be impacted during the operation of the windfarm. Hence the impacts are focused on the key faunal species in the area.

TABLE 13-31: ECOLOGICAL IMPACT ON FAUNA DURING THE OPERATIONAL PHASE OF THE PROPOSED DEVELOPMENT (WITHOUT MITIGATION).

Fauna	Description of Operational Impact	Magnitude/ Extent	Duration	Reversibility	Timing / Frequency	Positive/ Negative
Bats	There is the potential risk of collision to bat species which fly through the site.	Medium	Permanent	Irreversible	Bats are active during the summer (May-Sept).	Negative
Otter	There is the potential without mitigation for sediment and pollutants entering the stream and waterways within the site to be washed downstream reducing water quality within the section of the stream where otter forage. An increase in sediment and pollutants entering these streams could potentially lead to an impact to aquatic species of prey on which otter feed.	Medium	Temporary	Reversible	Likely to be present downstream on the river all year round.	Negative
Badger	No impact is envisaged during the operational phase of the proposed development.	n/a	n/a	n/a	n/a	Neutral
Red fox	No impact is envisaged during the operational phase of the proposed development.	n/a	n/a	n/a	n/a	Neutral
Irish stoat	No impact is envisaged during the operational phase of the proposed development	n/a	n/a	n/a	n/a	Neutral
Pine marten	No impact is envisaged during the operational phase of the proposed development	n/a	n/a	n/a	n/a	Neutral
Irish (mountain) hare	No impact is envisaged during the operational phase of the proposed development.	n/a	n/a	n/a	n/a	Neutral
Pygmy shrew	No impact is envisaged during the operational phase of the proposed development.	n/a	n/a	n/a	n/a	Neutral
Common frog	No impact is envisaged during the operational phase of the proposed development.	n/a	n/a	n/a	n/a	Neutral

REFERENCE DOCUMENTS

Fauna	Description of Operational Impact	Magnitude/ Extent	Duration	Reversibility	Timing / Frequency	Positive/ Negative
Atlantic salmon	There is the potential without mitigation during the early operational phase before exposed areas are re-vegetated for sediment and pollutants entering the stream and waterway within the site to be washed downstream reducing water quality within the section of the stream where Atlantic salmon occur. An increase in sediment entering the stream could potentially lead to the smothering of spawning grounds further downstream.	Medium	Temporary	Reversible	Likely to be present downstream on the river all year round. Spawning occurs between Oct and Feb.	Negative
Lamprey sp.	There is the potential without mitigation during the early operational phase before exposed areas are re-vegetated for sediment and pollutants entering the stream and waterway within the site to be washed downstream reducing water quality within the section of the stream where lamprey occur. An increase in sediment entering the stream could potentially lead to the smothering of spawning grounds further downstream.	Medium	Temporary	Reversible	Likely to be present downstream on the river all year round.	Negative

Fauna	Description of Operational Impact	Magnitude/ Extent	Duration	Reversibility	Timing / Frequency	Positive/ Negative
Twaite shad	There is the potential without mitigation during the early operational phase before exposed areas are re-vegetated for sediment and pollutants entering the stream and waterway within the site to be washed downstream reducing water quality within the section of the stream where Twaite shad occur. An increase in sediment entering the stream could potentially lead to the smothering of spawning grounds further downstream.	Medium	Temporary	Reversible	Likely to be present downstream on the river all year round.	Negative
Allis shad	There is the potential without mitigation during the early operational phase before exposed areas are re-vegetated for sediment and pollutants entering the stream and waterway within the site to be washed downstream reducing water quality within the section of the stream where Allis shad might occur. An increase in sediment entering the stream could potentially lead to the smothering of spawning grounds further downstream	Medium	Temporary	Reversible	Likely to be present downstream on the river all year round.	Negative

Fauna	Description of Operational Impact	Magnitude/ Extent	Duration	Reversibility	Timing / Frequency	Positive/ Negative
White-clawed crayfish	There is the potential without mitigation during the early operational phase before exposed areas are re-vegetated for sediment and pollutants entering the stream and waterway within the site to be washed downstream reducing water quality within the section of the stream where crayfish occur.	Medium	Temporary	Reversible	Likely to be present downstream on the river all year round.	Negative
Freshwater pearl mussel	There is the potential without mitigation during the early operational phase before exposed areas are re-vegetated for sediment and pollutants entering the stream and waterway within the site to be washed downstream reducing water quality within the section of the stream where pearl mussel occur.	Medium	Temporary	Reversible	Likely to be present downstream on the river all year round.	Negative
Hen harrier	There is the potential risk of collision to bird species which fly through or utilise habitat within the site.	Low	Permanent	Irreversible	Likely to be present all year round.	Negative
Kestrel	There is the potential risk of collision to bird species which fly through or utilise habitat within the site.	Very Low	Permanent	Irreversible	Likely to be present all year round.	Negative

TABLE 13-32: SUMMARY OF SIGNIFICANCE IN THE EXPECTED IMPACTS DURING THE OPERATIONAL PHASE AND THEIR ASSOCIATED CONFIDENCE LEVELS ON KEY FAUNA SPECIES DURING THE OPERATIONAL PHASE (WITHOUT MITIGATION).

Fauna	**Characterisation of unmitigated operational impact on the feature**	**Significance without mitigation and confidence levels**
Bats	There is the potential risk of collision with bat species which fly through the site.	It is ***probable*** that a negative impact to bats **will not be significant**.
Otter	There is the potential without mitigation for sediment and pollutants entering the stream and waterways within the site to be washed downstream reducing water quality within the section of the stream where otter forage. An increase in sediment and pollutants entering these streams could potentially lead to an impact to aquatic species of prey on which otter feed.	It is considered ***probable*** that a negative impact to the otter **will not be significant**.
Atlantic salmon	There is the potential without mitigation during the early operational phase before exposed areas are re-vegetated for sediment and pollutants entering the stream and waterway within the site to be washed downstream reducing water quality within the section of the stream where Atlantic salmon occur. An increase in sediment entering the stream could potentially lead to the smothering of spawning grounds further downstream.	It is considered ***probable*** that a negative impact to the Atlantic salmon **will not be significant**.
Lamprey spp.	There is the potential without mitigation during the early operational phase before exposed areas are re-vegetated for sediment and pollutants entering the stream and waterway within the site to be washed downstream reducing water quality within the section of the stream where lamprey occur. An increase in sediment entering the stream could potentially lead to the smothering of spawning grounds further downstream.	It is considered ***probable*** that a negative impact to the lamprey **will not be significant**.
Twaite shad	There is the potential without mitigation during the early operational phase before exposed areas are re-vegetated for sediment and pollutants entering the stream and waterway within the site to be washed downstream reducing water quality within the section of the stream where Twaite shad occur. An increase in sediment entering the stream could potentially lead to the smothering of spawning grounds further downstream.	It is considered ***probable*** that a negative impact to the Twaite shad **will not be significant**.
Twaite shad	There is the potential without mitigation during the early operational phase before exposed areas are re-vegetated for sediment and pollutants entering the stream and waterway within the site to be washed downstream reducing water quality within the section of the stream where Twaite shad occur. An increase in sediment entering the stream could potentially lead to the smothering of spawning grounds further downstream.	It is considered ***probable*** that a negative impact to the Twaite shad **will not be significant**.
White-clawed crayfish	There is the potential without mitigation during the early operational phase before exposed areas are re-vegetated for sediment and pollutants entering the stream and waterways within the site to be washed downstream reducing water quality within the section of the stream where white-clawed crayfish could occur. An increase in sediment entering the stream could potentially lead to the smothering of young crayfish further downstream.	It is considered ***probable*** that a negative impact to the white-clawed crayfish **will not be significant**
Freshwater pearl	There is the potential without mitigation during the early operational phase before exposed areas are re-vegetated for	It is considered ***probable*** that a negative impact to the

Fauna	Characterisation of unmitigated operational impact on the feature	Significance without mitigation and confidence levels
mussel	sediment and pollutants entering the stream and waterways within the site to be washed downstream reducing water quality within the section of the stream where freshwater pearl mussel could occur.	freshwater pearl mussel **will not be significant**
Hen harrier	There is the potential risk of collision to hen harriers which fly through or utilise habitat within the site.	It is ***probable*** that a negative impact to hen harrier **will not be significant**.
Kestrel	There is the potential risk of collision to kestrels which fly through or utilise habitat within the site.	It is ***probable*** that a negative impact to kestrel **will not be significant**.

13.3.5 Cumulative Impact

The EC (2001) guidelines on the provision of Article 6 of the Habitats' Directive state that the phrase 'in combination with other plans or projects' in Article 3(3) of the Habitats Directive refers to the cumulative impacts due to plans or projects 'that are currently under consideration together with the effects of any existing or proposed projects or plans.' According to the Scottish Natural Heritage, '*the cumulative effect of a set of developments is the combined effect of all the developments, taken together'* (SNH, 2005).

A cumulative impact arises from incremental changes caused by other past, present or reasonably foreseeable actions together with the proposed windfarm development. The surrounding environment is dominated by agricultural land, conifer plantation and some peatland.

The main damaging operations and threats to the greater regions ecological resources are agriculture, overgrazing and afforestation. Extensive land reclamation has been carried out in this area in the recent past. The area has come under major disturbance by man. Afforestation also threatens the site. Forestry affects habitat uniformity, lake and river catchments, nesting and feeding habitats for animals, and landscape integrity. Overgrazing by cattle is also another problem, with many of the acidic grassland habitats and semi improved areas being over grazed, with erosion of shallow peat ensuing. The above operations are the most extensive but other threats and potentially damaging operations to valuable habitats include land drainage, fertilization, previous quarrying and some dumping that was seen just outside the proposed site. There are 10 windfarms in the vicinity of the proposed development. The proposed development will not add to these damaging operations and threats.

13.3.5.1 Other windfarms

There are a number of operating, permitted and windfarms that are currently under construction in the vicinity of the proposed Upperchurch windfarm site. These windfarm sites have received planning permission or an extension to duration of planning permission within the last 5 years or are in construction or are in operation. (See **Figure 13-9: Permitted and Existing Windfarms in the Area**)

Falleennafinoga Windfarm is a 2-turbine development at Turraheen Upper which is 2km south of the proposed site in South Tipperary. Construction has commenced on this project.
Hollyford Windfarm is a 3-turbine development at Glenough Upper which is 2km south of the proposed site in South Tipperary. Construction has not yet commenced on this project.
Glenough Windfarm is an operating windfarm of 13 turbines at Glenough Upper/Lower and Turraheen Upper/Lower which is located 3km to the southeast of the proposed site in South Tipperary. This windfarm was commissioned during 2011. Planning permission was granted in 2011, for a 1-turbine extension to the windfarm. Construction commenced on this turbine in August 2012.

Glencarbry Windfarm is a 9-turbine development at Glencarbry/ Piperhill/ Glenpaudeen/ Foilmacduff/ Glenough Lower which is 6km south of the proposed site in South Tipperary. Construction commenced on this project in August 2012.
Cappawhite Windfarm 8-turbine development, which was later combined with permission for 10 turbines, at Cappagh, Parkroe, Kilmore, Oldcastle and Moher which is 10km to the southwest of the proposed site in South Tipperary. Construction has not yet commenced on this project.
Garracummer Windfarm is a 13-turbine development at Curraghmarky, Birchgrove, Moanvaun, Garracummer, Cummer More and Cummer Beg which was later combined with permission for 2 turbines at Tooreen. This area is 4km southwest of the proposed site in South Tipperary. Construction commenced on this project in 2011.
Mienvee Windfarm is an operational windfarm of 1 wind turbine at Parkroe, 9km South West of the Site in South Tipperary.
Knockastanna Windfarm is an operational windfarm of 4 wind turbines at Curraghafoil, Doon, which is 8.1km to the soutwest of the proposed site in County Limerick.
Knockmeale Windfarm was granted Planning permission for 2 turbines at Lisgarriff, Knockmeale. in 2009. This area is 7km north west of the proposed site in North Tipperary. Construction has not yet commenced on this project.
Curraghgraigue Windfarm was extended to 6-turbines. This area is 9km north west of the proposed site in North Tipperary. This windfarm is operational.
It is considered that a negative cumulative impact to habitats is ***unlikely to be significant***.
:

Table 13-33 below presents windfarms that are in operation, being constructed or permitted within the Upperchurch area and greater surroundings.

TABLE 13-33: NEIGHBOURING WINDFARMS IN THE VICINITY, EXISTING AND PERMITTED.

Windfarm	Number of Turbines	Distance and direction from proposed site	Status
Knockastanna, Co Limerick	4	8.1km S	Operating
Mienvee	1	9km SW	Operating
Garracummer	15	3.5km SW	In Construction
Falleennafinoga	2	5.5km S	In Construction
Hollyford	3	5.5km S	Permitted
Glencarbry	9	6.3kn S	Permitted
Glenough	14	3.2kn S	Operating
Cappagh White	18	8.5km S	Permitted
Curraghgraigue	6	9.5km N	Operating
Knockmeale	2	8.2km NW	Permitted
Knockastanna, Co Limerick	4	8.1km S	Operating

13.3.5.2 Peat extraction

There is evidence that peat extraction has occurred in this region in the past. The expected ecological impacts from this activity would be loss of and alteration of habitat. This can be seen in the south eastern section just to the west of Turbine 3 where an area of blanket bog exists with banks of up to 1.2m in depth. Also to the north of Turbine 19 a larger area and good example of this habitat remains with banks of the same size. The drainage and cutting associated with peat extraction has in the past resulted in loss of intact Upland blanket bog which is likely to have dominated the area before human activities altered the region. The expected ecological impacts from this activity would be loss of and alteration of habitat. The resultant activity has led to the habitat alteration and shallow peat depths. The peat extraction impacts have led to recolonised areas of damaged or bare peat to be altered from its original habitat. The predominant resulting habitats are acidic grassland, wet heath and wet grassland. The main potential impacts of the proposed windfarm are habitat loss, habitat alteration and disturbance to wildlife. With such a small proportion of these habitats remaining and all proposed Turbine locations staying clear of these areas further drainage to this habitat will be avoided. It is considered that a negative cumulative impact to habitats is ***unlikely to be significant***.

13.3.5.3 Forestry

A relatively small proportion of the proposed site is under conifer plantation, with all sections of the site having areas of either mature or young conifer plantations. One of the impacts of this on the local environment is habitat loss, habitat alteration and potential reduction in water quality. Historically, it can be assumed that the forestry in the area has resulted in a loss of degraded Upland blanket bog and most likely other peatland habitats such as wet heath. This would have also reduced the habitat available for certain fauna species. While forestry may have resulted in a reduction in water quality within the site water quality in the surrounding catchment supports good status as dictated by the Water Framework Directive.

There is potential for the proposed windfarm to contribute to a cumulative impact on water quality in local watercourses within and downstream of the site through the potential of sedimentation and other pollutants entering the watercourses as a result of felling to accommodate new access track, construction activities and neighbouring forestry operations. It is considered that without proper mitigation a negative cumulative impact to water quality is ***unlikely to be significant***.

13.3.5.4 Farming

Agriculture is one of the main land uses within the area; there are large sections of improved agricultural grassland pastures for cattle in all sections of the site and the surrounding area. These fields have in the past been transformed by agricultural practices from bog, wet heath, wet grassland and acid grassland. The biodiversity of flora within these habitats have been reduced dramatically by drainage, reseeding, fertilisation and intensive grazing by cattle. The main potential impacts would be in terms of potential increase in nutrient levels of local watercourses. There is potential for the proposed windfarm to contribute to a cumulative impact on water quality in drains within the site and local watercourses further downstream of the site through the potential of sedimentation and other pollutants entering the watercourses as a result of felling, construction activities and farming operations. It is considered that without proper mitigation a negative cumulative impact to water quality is ***unlikely to be significant***.

13.4 MITIGATION MEASURES

13.4.1 Introduction

Construction of the windfarm is expected to cause a temporary (disturbance) adverse impact on the local ecology as outlined in the impact assessment in section 13.3 above. A number of planned mitigation measures detailed below will reduce these impacts significantly. Many of the mitigation measures below have been based on CIRIA technical guidance on water pollution control (Murnane, E., Heap, A., and Swain, A., 2006).

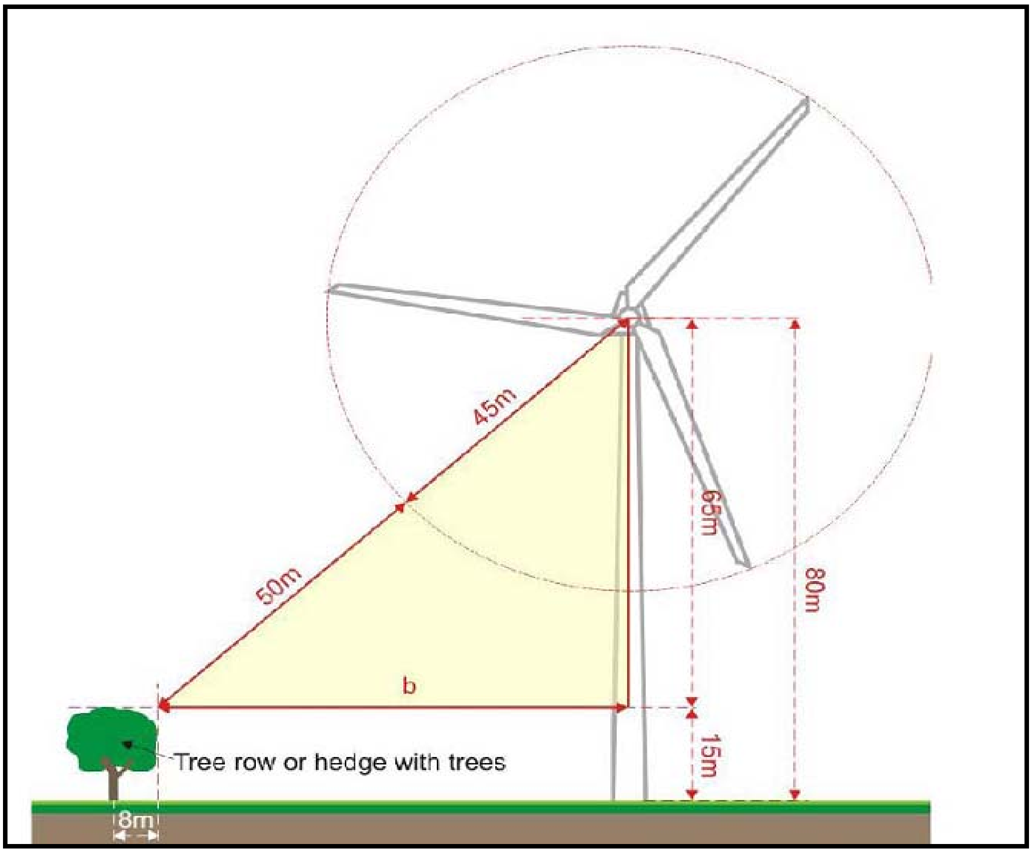
13.4.2 Mitigation by Design

The layout of the proposed windfarm has been designed to ensure that there is a sufficient buffer between windfarm infrastructure and the natural watercourses and streams within the study area.

The layout of turbines, access roads and other infrastructure associated with the proposed wind farm has been devised in order to minimise the risk to species of flora and fauna as a result of the proposed development. The layout of the turbines and the route of the access roads was also based on the results of site investigations, and for the most part the turbines and roads have been located on the least ecologically sensitive areas found during the investigations.

13.4.3 Mitigation Measures for Bats

Natural England (2012) has advised that predicted harm to bats could be minimised by altering locations of turbines within a site. According to Natural England (2012) "*To minimise risk to bat populations our advice is to maintain a 50 m buffer around any feature (trees, hedges) into which no part of the turbine intrudes. This means the edge of the rotor-swept area needs to be at least 50 m from the nearest part of the habitat feature. Therefore, 50 m should be the minimum stand-off distance from blade tip to the nearest feature. It is incorrect to measure 50 m from the turbine base to habitat feature at ground level as this would bring the blade tips very close to the canopy of a tall hedgerow tree and potentially put bat populations at risk. Instead, it is necessary to calculate the distance between the edge of the feature and the centre of the tower.*" These distances were taken into account during the design phase of the windfarm. The following formula was used:



$b = \sqrt{\{(50 + bl)^2 - (hh - fh)^2\}}$

where:
b = the distance on the ground between the edge of the canopy and the turbine (m)
bl = blade length (m)
hh = hub height (m)
fh = feature height (m)

Six of the 22 turbines (T3, T9, T12, T14 and T22) will require the felling of some conifer plantation for the installation of turbine and or hardstanding areas. While enclosed conifer plantations are of low value to bat species, the area of clear-felling required was calculated using the recommended formula. It is recommended that this distance be taken into account when applying for the felling licence should the proposed windfarm receive planning. The calculations are shown below give an example of the recommended distance for felling of tree within a plantation with an average tree height of 5m:

$b = \sqrt{\{(50 + 45)^2 - (80 - 15)^2\}}$

$b = \sqrt{4800}$

$b = 69.3\text{m}$

Hedgerows in close proximity to wind turbines will be removed to reduce the risk of bats potentially commuting and foraging along these linear features being drawn into the sweeping distance of turbine blades. The amount of hedgerow removal required will be identified by the project ecologist prior to construction. Hedgerow removal is discussed further in section 13.4.12. The following mitigation measures will be carried out to increase the value of the study area for bats:

- Native species (including hawthorn, blackthorn, hazel and oak) will be planted within new hedgerows to increase their value as foraging habitat to bats. Native species offer higher quality habitat for invertebrates the main prey item for bat species. All planting and hedgerow reinstatement will be carried out following the guidelines and recommended methodology reference in Knowles, (1995) and JNCC, (2001).

- Gaps within existing hedgerows shall be planted with native species to encourage the use of hedgerows as flight paths.

13.4.4 Runoff and Sediment Control

Mitigation measures shall be implemented to ensure that pollutants and sediment are not deposited within drains/streams which could be washed downstream during wetter periods. Erosion control where runoff is prevented from flowing across exposed ground and sediment control where runoff is slowed to allow suspended sediment to settle are important elements in runoff and sediment control. An erosion and sediment control plan has been prepared and will be implemented (see Chapter 15 Hydrological and Hydrogeological Impact Assessment – **Appendix 15-I Sediment & Erosion Control Plan**) to prevent sediment and pollutant runoff into the river during the construction phase. The plan will:

- Implement erosion control to prevent runoff flowing across exposed ground and becoming polluted by sediments;
- Intercept and divert clean water runoff away from construction site runoff to avoid cross-contamination of clean water with soiled water;
- Implement sediment control to slow down runoff allowing suspended sediments to settle in situ particularly on roads;
- When working at each stage and section (e.g. access road, each turbine base, etc) of the development the associated erosion and sediment controls at each section will be put in place prior to construction of each section of road. Access roads will need to be constructed to access the proposed site for drains, sediment traps and settling ponds. The associated erosion and sediment controls will be constructed alongside these roads and in a conscious manner to ensure that the potential risk to water quality is minimised;
- Minimise area of exposed ground by maintaining existing vegetation that would otherwise be subject to erosion in the vicinity of the windfarm infrastructure and keeping excavated areas to a minimum;
- Avoid working near watercourses during or after prolonged rainfall or an intense rainfall event and cease work entirely near drains when it is evident that pollution is occurring;

- Install a series of silt fences or other appropriate silt retention measure where there is a risk of erosion runoff to watercourses from construction related activity particularly if working during prolonged wet weather period or if working during intense rainfall event;
- Implement sediment control measures that includes for the prevention of runoff from adjacent intact ground that is for the separation of clean and 'dirty' water;
- Install appropriate silt control measures such as silt-traps, check dams and sedimentation ponds;
- Provide recommendations for public road cleaning where needed particularly in the vicinity of drains; and
- Controls need to be regularly inspected and maintained otherwise a failure may result, such as a build up of silt or tear in a fence, which will lead to water pollution so controls must work well until the vegetation has re-established; inspection and maintenance is critical after prolonged or intense rainfall.

13.4.5 Fuel and Oil

It is also recommended to implement a fuel management plan which should incorporate the following elements:

- Mobile bowsers, tanks and drums should be stored in secure, impermeable storage area, away from drains and open water;
- Fuel containers must be stored within a secondary containment system e.g. bund for static tanks or a drip tray for mobile stores;
- Ancillary equipment such as hoses, pipes must be contained within the bund;
- Taps, nozzles or valves must be fitted with a lock system;
- Fuel and oil stores including tanks and drums should be regularly inspected for leaks and signs of damage;
- Only designated trained operators should be authorised to refuel plant on site and emergency spill kits will be present at equipment for all refuelling events;
- Procedures and contingency plans need to be set up to deal with an emergency accidents or spills; and
- An emergency spill kit with oil boom, absorbers etc. is to be kept on site in the event of an accidental spill.

13.4.6 Wheel Wash, Dewatering and Concrete

In order to reduce the potential for the roads to the south and east of the site being dirtied by heavy vehicle traffic, it is recommended that a wheel wash area is provided and the resultant waste water is diverted to a siltation pond for settling out of solids. It is important that any pumping dewatering system is well planned and pumped water will need to be treated in the adequate settlement pond and silt trap. It is important to prevent concrete from entering waterways within and in close proximity to the site and always to prevent it entering watercourses. Concrete will be used for construction of the turbine foundations and the site control building and the following measures should be implemented:

- Designate a concrete washout area away from drains and watercourses for washing out the chutes;
- Washout of concrete trucks should occur off site at a designated, contained impermeable area;

- A designated trained operator experienced in working with concrete will be employed during the concrete pouring phase; and
- Large volumes of concrete water can be pumped into a skip to settle out; settled solids will need to be appropriately disposed of off-site. The total volume will be reduced by only permitting concrete chutes to be washed on site.

13.4.7 Habitats and Stream Crossing

There will be one new stream crossing required for the proposed development and a stream crossing method statement will be developed in consultation with the Inland Fisheries Ireland.

13.4.8 Felling

4.35 hectares of felling will take place of young conifer trees to facilitate the construction of the parts of the turbine foundation and hardstand areas for T3, T9, T12, T14 and T22. All associated tree felling will be undertaken using good working practices as outlined by the Forest Service in their 'Forestry Harvesting and Environment Guidelines' (2000a) and the 'Forestry and Water Quality Guidelines '(2000b). The latter guidelines deal with sensitive areas, erosion, buffer zone guidelines for aquatic zones, ground preparation and drainage, chemicals, fuel and machine oils.

All excess felled brash should be removed off site to avoid release and runoff of phosphorous into sensitive watercourses. pre-felling bird survey will be carried out prior to felling to ensure that potential nesting birds are not impact if felling is carried out within the breeding bird season (April to July).

13.4.9 Replanting and Reinstatement of Site

Exposed areas of the site that are slow to revegetate may need to be replanted with suitable vegetation. This will be decided by the developer in consultation with the project ecologist near the end of the construction phase.

As a result of permanent felling works areas surrounding the windfarm infrastructure will be bare and it is proposed to incorporate these areas into an Ecological Management Plan for the site (see section 13.4.10 below).

13.4.10 Ecological Management Plan

An Ecological Management Plan (EMP) will be developed prior to construction to provide a framework for the conservation and enhancement of valuable features within the site. The main emphasis of the programme of works will be on monitoring the impacts, if any, to the local aquatic ecology. Hence, the mitigation outlined above will be co-ordinated as part of the EMP. These are:

- Water Quality Measures
- Routine inspection and maintenance of sediment and erosion measures
- Water quality monitoring for years 1 and 2 of operation. Monitoring of water quality parameters will be conducted monthly in Year 1. If thresholds are not exceeded in Year 1, then the effort may be reduced in Year 2.
- A number of suitable sediment ponds will be retained in situ and may require modification to enhance the suitability of the site for invertebrates.
- The removal of excess brash and trees off site and disposal at an appropriate location to minimise nutrient leaching to the soil.
- The allowance for the natural establishment of wet grassland, scrub and possibly wet heath vegetation within the proposed site.
- Where natural establishment of vegetation is slow, purple-moor grass (*Molinia caerulea*) and other suitable species should be planted within the bare felled areas.

13.4.11 Lights on Turbines

It appears that the lighting on top of wind turbines may have an impact on the likelihood of bats colliding with turbines. Research on this topic, which is reviewed in Powelsland (2009), indicates that intermittent lighting is less likely to cause species to collide with turbines. The use of “white lights” on the turbines should be avoided as these can attract night flying birds such as migrants, and insects, which in turn can attract bats. Any form of lighting on the turbines or other structures will have to be agreed in advance with the Irish Aviation Authority.

13.4.12 Hedgerow Removal

Approximately 360m of hedgerows will be removed as part of the construction of infrastructure and mitigation measures to reduce the potential risk of bats colliding with turbines blades. As part of the proposed development approximately 360m of new hedgerow will be planted to mitigate this loss of habitat. Existing hedgerows in poor condition will be planted with native species to increase there ecological value. The location of new hedgerow shall be identified by the project ecologist prior to construction. Native species will be replanted within the proposed new hedgerows. A list of potential species is presented in Table 13-34 below.

REFERENCE DOCUMENTS

TABLE 13-34: LIST OF SPECIES TO BE USED FOR NEW HEDGEROWS.

Common name	Latin name
Ash	*Fraxinus excelsior*
Bay Willow	*Salix pentandra*
Black Alder	*Alnus glutinosa*
Blackthorn/Sloe	*Prunus spinosa*
Crab apple	*Malus sylvestris*
Common/Wild Cherry	*Prunus avium*
Downey Birch	*Betula pubescens*
Goat Willow	*Salix caprea*
Grey Willow	*Salix atrocinerea*
Hawthorn	*Crataegus monogyna*
Mountain Ash/Rowan	*Sorbus aucuparia*
Pedunculate Oak	*Quercus robur*
Sessile Oak	*Quercus petraea*
Wych Elm	*Ulmus glabra*
Yew	*Taxus baccata*

13.5 RESIDUAL IMPACTS

Residual impacts are impacts that remain once mitigation has been implemented or that cannot be mitigated. Table 13-35 below provides a summary of the impact assessment for identified Habitats of National Importance Local Importance (higher value) which are the most ecologically valuable. Table 13-36 provides a summary of the residual impacts to fauna, and fisheries and water quality.

Provided all mitigation measures are implemented in full and remain effective throughout the construction phase, and given the low risk nature of the site, no significant residual impacts are expected from the development of Upperchurch Windfarm on the nearby designated nature conservation sites and local ecology.

TABLE 13-35: RESIDUAL IMPACTS OF THE WINDFARM DEVELOPMENT HABITATS THAT ARE CLASSIFIED AS KEY ECOLOGICAL RECEPTORS.

Habitat	**Evaluation**	**Characterisation of unmitigated impact**	**Significance of impact without mitigation**	**Mitigation**	**Residual impact**
Eroding/ Upland River	County Importance	There is the potential without mitigation that chemicals and sediment used/produced during the construction phase entering streams both within the site and further downstream reducing the quality of the habitat.	It is ***probable*** that the unmitigated impact would ***be significant***.	• Mitigation by design. • Erosion and sediment plan. • Implementation of a fuel management plan. • Control of wheel wash, dewatering and concrete. • The recommendation for the composition of an ecological management plan prior to construction.	A negative impact is ***extremely unlikely to be*** **significant.**

TABLE 13-36: RESIDUAL IMPACTS OF THE WINDFARM DEVELOPMENT ON FAUNA, AND FISHERIES AND WATER QUALITY

Species	Evaluation	Characterisation of unmitigated impact	Significance of impact without mitigation	Mitigation	Residual impact
Bats	National Importance	Construction Phase • Loss of foraging habitat • Temporary disturbance and/or displacement of species Operational Phase Risk of collision with turbines	Construction Phase It is ***probable*** that a negative impact to bats **will not be significant**. Operational Phase It is ***probable*** that a negative impact to bats **will not be significant**.	• Best practise methodology shall be adhered to for hedgerow removal and clear-felling. This shall ensure that the potential impact to bats within the site is minimised. • Lighting on turbines (not white lighting) • The management and planting of hedgerows within the study area	It is ***probable*** that a negative impact to bats **will not be significant**.
Otter	National Importance	Construction Phase • Potential without mitigation for reduction in water quality downstream of the development. Operational Phase • Potential without mitigation for reduction in water quality downstream of the development.	Construction Phase It is ***probable*** that a negative impact to otter **will not be significant**. Operational Phase It is ***probable*** that a negative impact to otter **will not be significant**.	Implementation of erosion and sediment plan and the fuel management plan.	It is ***near certain*** that a negative impact to otter **will not be significant**.
Badger	National Importance	Construction Phase • Loss of foraging habitat • Temporary disturbance and/or displacement of species Operational Phase No impact envisaged	Construction Phase It is ***near certain*** that a negative impact to badger **will not be significant.** Operational Phase No impact is envisaged.	Recommendation for the composition of an environmental management plan prior to construction.	It is ***near certain*** that a negative impact to badger **will not be significant.**
Red fox	High local importance	Construction Phase • Temporary disturbance and/or displacement of species • Loss of habitat Operational Phase No impact envisaged	Construction Phase It is ***near certain*** that a negative impact to the red fox **will not be significant.** Operational Phase No Impact is envisaged.	Recommendation for the composition of an environmental management plan prior to construction.	It is ***near certain*** that a negative impact to the red fox **will not be significant.**
Irish (mountain)	National Importance	Construction Phase	Construction Phase It is ***probable*** that a	Recommendation for the composition of an	It is ***probable*** that a

Species	Evaluation	Characterisation of unmitigated impact	Significance of impact without mitigation	Mitigation	Residual impact
hare		• Temporary disturbance and/or displacement of species • Loss of habitat Operational Phase No impact envisaged	negative impact to Irish (mountain) hare **will not be significant**. Operational Phase No Impact is envisaged.	environmental management plan prior to construction.	negative impact to Irish (mountain) hare **will not be significant**.
Common frog	National Importance	Construction Phase • Temporary disturbance and/or displacement of species • Loss of habitat Operational Phase No impact envisaged	Construction Phase It is ***probable*** that a negative impact to common frog **will not be significant.** Operational Phase No Impact is envisaged.	Recommendation for the composition of an environmental management plan prior to construction.	It is ***probable*** that a negative impact to common frog **will not be significant.**
Atlantic salmon	National Importance	Construction Phase • Potential without mitigation for reduction in water quality downstream of the development. Operational Phase • Potential without mitigation for reduction in water quality downstream of the development.	Construction Phase It is ***probable*** that a negative impact to Atlantic salmon **will not be significant**. Operational Phase It is ***probable*** that a negative impact to Atlantic salmon **will not be significant**.	Implementation of erosion and sediment plan and the fuel management plan.	It is ***near certain*** that a negative impact to the Atlantic salmon **will not be significant.**
Lamprey spp.	National Importance	Construction Phase • Potential without mitigation for reduction in water quality downstream of the development. Operational Phase • Potential without mitigation for reduction in water quality downstream of the development.	Construction Phase It is ***probable*** that a negative impact to lamprey spp. **will not be significant**. Operational Phase It is ***probable*** that a negative impact to lamprey spp. **will not be significant**.	Implementation of erosion and sediment plan and the fuel management plan.	It is ***near certain*** that a negative impact to the lamprey species **will not be significant.**
Twaite shad	National Importance	Construction Phase	Construction Phase It is ***probable*** that a	Implementation of erosion and sediment	It is ***near certain*** that a

Species	Evaluation	Characterisation of unmitigated impact	Significance of impact without mitigation	Mitigation	Residual impact
		• Potential without mitigation for reduction in water quality downstream of the development. Operational Phase • Potential without mitigation for reduction in water quality downstream of the development.	negative impact to twaite shad **will not be significant**. Operational Phase It is ***probable*** that a negative impact to twaite shad **will not be significant**.	plan and the fuel management plan.	negative impact to the twaite shad **will not be significant.**
Allis shad	National Importance	Construction Phase • Potential without mitigation for reduction in water quality downstream of the development. Operational Phase • Potential without mitigation for reduction in water quality downstream of the development.	Construction Phase It is ***probable*** that a negative impact to allis shad **will not be significant**. Operational Phase It is ***probable*** that a negative impact to allis shad **will not be significant**.	Implementation of erosion and sediment plan and the fuel management plan.	It is ***near certain*** that a negative impact to the allis shad **will not be significant.**
White-clawed crayfish	National Importance	Construction Phase • Potential without mitigation for reduction in water quality downstream of the development. Operational Phase • Potential without mitigation for reduction in water quality downstream of the development.	Construction Phase It is ***probable*** that a negative impact to crayfish **will not be significant**. Operational Phase It is ***probable*** that a negative impact to crayfish **will not be significant**.	Implementation of erosion and sediment plan and the fuel management plan.	It is ***near certain*** that a negative impact to the white-clawed crayfish **will not be significant.**
Freshwater pearl mussel	National Importance	Construction Phase • Potential without mitigation for	Construction Phase It is ***probable*** that a negative impact to freshwater pearl mussel **will not be**	Implementation of erosion and sediment plan and the fuel management plan.	It is ***near certain*** that a negative impact to the freshwater

Species	Evaluation	Characterisation of unmitigated impact	Significance of impact without mitigation	Mitigation	Residual impact
		reduction in water quality downstream of the development. Operational Phase • Potential without mitigation for reduction in water quality downstream of the development.	**significant**. Operational Phase It is ***probable*** that a negative impact to freshwater pearl mussel **will not be significant**.		pearl mussel **will not be significant.**
Hen harrier	National Importance	Construction Phase • Loss of foraging habitat • Temporary disturbance and/or displacement of species Operational Phase Risk of collision with turbines	Construction Phase It is ***probable*** that a negative impact to hen harrier **will not be significant**. Operational Phase It is ***probable*** that a negative impact to hen harrier **will not be significant**.	• Pre-felling bird surveys • Recommendation for the composition of an environmental management plan prior to construction.	It is ***probable*** that a negative impact to hen harrier **will not be significant**.
Kestrel	County Importance	Construction Phase • Loss of foraging habitat • Temporary disturbance and/or displacement of species Operational Phase Risk of collision with turbines	Construction Phase It is ***probable*** that a negative impact to kestrel **will not be significant**. Operational Phase It is ***probable*** that a negative impact to kestrel **will not be significant**.	• Pre-felling bird surveys • Recommendation for the composition of an environmental management plan prior to construction.	It is ***probable*** that a negative impact to kestrel **will not be significant**.

13.6 MONITORING

Water quality monitoring will take place during the construction phase of the Upperchurch Windfarm and for years 1 and 2 of operation. Monitoring of water quality parameters will be conducted monthly in Year 1. If thresholds are not exceeded in Year 1, then the effort may be reduced in Year 2. The scope of this monitoring will be developed in consultation with Inland Fisheries Ireland.

Routine inspection and maintenance of sediment and erosion control measures will take place regularly during the construction phase and during the operational life of the project.

- It is recommended the following post-construction Ornithological surveys are undertaken including the following elements:
    - Vantage point surveys
    - Transect surveys

The full scope and timing of these surveys will be in consultation with NPWS prior to the completion of the construction phase.

13.7 CONCLUSION

The main points of the ecological impact assessment are summarised below:

- The habitats identified within the proposed 22-turbine windfarm study area are the improved agricultural grassland (GA1), wet grassland (GS4), coniferous plantation (WD4), wet heath (HH3), upland blanket bog (PB2), acid grassland (GS3) upland/eroding streams (FW1), spoil and bare ground (ED2), buildings and artificial surfaces (BL3), neutral grassland (GS1), hedgerows (WL1), drainage ditches (FW4) and treelines (WL2).
- The proposed windfarm lies within 10 km of Lower River Shannon cSAC (site code 002165), Bolingbrook Hill cSAC (site code 002124), Lower River Suir cSAC (site code 002137), Anglesey Road cSAC (site code 002125), Slievefelim to Silvermines Mountains SPA (site code 004165), Mauherslieve Bog NHA (site code 002385), Bilboa and Gortnageragh River Valleys pNHA (site code 001851), Killavalla Wood pNHA (site code 001178), Nenegh River Gorge pNHA (site code 001133), Aughnaglanny Valley pNHA (site code 000948) and Inchinsquillib and Dowling's Woods pNHA (site code 000956). An Appropriate Assessment has been undertaken to determine the significance of the impact on Natura 2000 sites. No adverse impact is expected to arise to NHAs not covered by Natura 2000 sites.
- The main potential negative impacts identified relate to habitat loss, disturbance to fauna during construction phase of the development, risk of collision for the local bird and bat populations and the pollution of waterways downstream of the drains/streams within the proposed site.

- A comprehensive erosion and sediment plan has been developed and this will reduce the likelihood of any potential pollution event occurring which could impact on protected sites downstream of the development. Other mitigation measures include the implementation of a fuel management plan, control of wheel wash, dewatering and concrete, and the recommendation for the composition of an ecological management plan prior to construction.
- Pre-construction monitoring will be undertaken for birds and post construction monitoring will be undertaken for the first two year of operation.
- No significant ecological residual impacts are expected as a result of the construction and operational phase of the proposed Upperchurch Windfarm.

13.8 BIBLIOGRAPHY

Ahlén, I. (1981) Identification of Scandinavian bats by their sounds. Report No. 6, Department of Wildlife and Ecology, Swedish University of Agricultural Science, Sweden.

Allen, P., Forsyth, I., Hale, P. & Rogers, S. (2000). Bats in Northern Ireland. *Irish Naturalists' Journal*. Special Zoological Supplement.

Anderson, M. E. & Racey, P. A. (1993) Discrimination between fluttering and non□fluttering moths by brown long□eared bats Plecotus auritus. Animal Behaviour, 4f: 1151□1155.

Aughney, T., Kelleher, C. & Mullen, D. (2008). *Bat Survey Guidelines: Traditional Farm Buildings Scheme*',

Barratt, E.M., Deaville, R., Burland, T.M., Bruford, M.W., Jones, G., Racey, P.A., & Wayne, R.K. (1997). DNA answers the call of pipistrelle bat species. *Nature*, **387**: 138-139.

BCI, (2009). Bat Conservation Ireland website accessed August 2012.
www.batconservationireland.org/

Blamey, M., Fitter, R. & Fitter, A. (2003). Wild Flowers of Britain and Ireland. London: A & C Black.

Central Fisheries Board. (2006) Central Fisheries Board Research Division Project summaries, December 2006

Curtis, T.G.F. and McGough, H.N. (1988). *The Red Data Book 1: Vascular Plants*. Dublin: The Stationery Office.

Drewitt, A.L. & Langston, R. H.W. (2006). Assessing the impacts on wind farms and birds. Ibis 148, 29-42. British Ornithologists Union.

EPA (2002). *Guidelines on information to be contained in Environmental Impact Statements*. Published by the Environmental Protection Agency, Ireland.

EPA 2012, Environmental Protection Agency online interactive map. www.epa.ie. Accessed August 2012

Forest Service (2000a). Forest Harvesting and the Environment Guidelines. Department of Agriculture, Fisheries and Food.

Forest Service (2000b). Forest and Water Quality Guidelines. Department of Agriculture, Fisheries and Food.

Fossitt, J. A. (2000). A Guide to Habitats in Ireland. Kilkenny: The Heritage Council.

GSI (2012), Geology Survey Ireland online interactive map. www.GSI.ie. Accessed August 2012.

Hayden, T. and Harrington, R. (2000). Exploring Irish Mammals. Published by Town House Dublin.

IEEM (2006). *Guidelines for Ecological Impact Assessment in the United Kingdom*. Institute for Ecology and Environmental Management.

Irish Wildlife Trust (2007). The IWT National Survey of the Common Lizard (Lacerta vivipara) in Ireland 2007: National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

JNCC, (2001). Entwhistle, A.C., Harris, S., Hutson, A.M., Racey, P.A., Walsh, A. Habitat management for bats - A guide for land managers, land owners and their advisors (Joint Nature Conservation Committee)

King, J.L., Marnell, F., Kingston, N., Rosell, R., Boylan, P., Caffrey, J.M., FitzPatrick, Ú., Gargan, P.G., Kelly, F.L., O'Grady, M.F., Poole, R., Roche, W.K. and Cassidy, D. (2011). Ireland Red List No. 5: Amphibians, Reptiles and Freshwater Fish. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland

Kingston, N. (2005). Proposed Red Data List for Vascular Plants. A Consultation Document from the National Parks and Wildlife Service, Department of Environment, Heritage and Local Government.

Knowles, M (1995). *An introduction to wildlife conservation*. Small holder practical series, Kings Lynn

McGuire, C. (1998). Survey of lesser horseshoe bats *Rhinolophus hipposideros* (Bechstein) and other bat species in north Co. Clare. *Irish Naturalists' Journal*. Vol. **26**: 43-50.

Murnane, E., Heap, A., and Swain, A., (2006). Control of water pollution from linear construction projects. Technical guidance. CIRIA **C648**. Published by CIRIA, UK.

NBDC. (2012) National Biodiversity Data Centre online mapping. http://maps.biodiversityireland.ie/Map.aspx. Accessed August 2012

Natural England (2012). *Bats and onshore wind turbines: Interim guidance*. Natural England Technical Note TIN051. Second edition 29th February 2012. Peterborough: Natural England. Available at www.naturalengland.org.uk.

National Parks and Wildlife Service website http://www.npws.ie/en/ accessed August 2012.

Newton S., Donaghy A., Allen D. & Gibbons D. (1999). Birds of Conservation Concern in Ireland. Irish Birds, **6**: 333-342.

NPWS (2008). The conservation status of EU protected habitats and species in Ireland. Dublin: NPWS.

NPWS, (2009). Threat Response Plan: Vesper bats (2009-2011). National Parks & Wildlife Service, Department of the Environment, Heritage & Local Government, Dublin.

NRA (2009). *Environmental Assessment and Construction Guidelines*. Published by the National Roads Authority.

O'Connor, W. (2006). A baseline survey of juvenile lamprey populations in the River Feale catchment. *Irish Wildlife Manuals*, No. 22. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

O'Connor, W. (2007) A Survey of Juvenile Lamprey Populations in the Corrib and Suir Catchments. Irish Wildlife Manuals No. 26. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

O'Sullivan, P. (1994). Bats in Ireland. *Irish Naturalists' Journal*. **24**: Special Zoological Supplement.

Parnell, J: Curtis, T; and Cullen, E. (2012): Webb's an Irish Flora. Hardback, 8th Edn (March 2012), Trinity College Dublin.

Powelsland, R.G. (2009). Impacts of windfarms on birds: a review. *Science for Conservation,* **289**. Wellington, New Zealand: Publishing Team, Department of Conservation.

Peay, S. (2003). Guidance on habitats for white-clawed crayfish. R&D Technical report WI-067/TR, Bristol: Environment Agency. In: Reynolds, J. D. (2007). Conservation Assessment of the White-Clawed Crayfish Austropotamobius Pallipes (Lereboullet, 1858) in Ireland. Report to National Parks and Wildlife Service.

Percival S.M. (2003). Birds and Windfarms in Ireland: A Review of Potential Issues and Impact Assessment. Sustainable Energy Ireland.

Preston, C. D., Pearman, D. A., and T.D. Dines (2002). New Atlas of the British and Irish Flora. Oxford University Press.

Roche, N., Langton, S., & Aughney, T. (2007). The Car-based Bat Monitoring Scheme for Ireland: Report for 2007. Unpublished report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government. Dublin, Ireland.

Russ, J. M. (1999) The Bats of Britain and Ireland: Echolocation, Sound Analysis and Species Identification. Alana Ecology Books, Powys.

Scottish Natural Heritage (2005). *Cumulative effect of windfarms: guidance document*. Scottish Natural Heritage.

Shannon International River Basin District (2009). Full report for waterbody Oolagh, tributary of Feale.

Shiel, C.B. McAney, C.M. & Fairley, J.S. (1991) Analysis of the diet of Natterer’s bat Myotis nattereri and the common long□eared bat Plecotus auritus in the west of Ireland. J. Zool. Lond. 223: 299□305.

Smiddy, P. (1991). Bats and Bridges. *Irish Naturalists’ Journal*. Vol. **23**: 425-426.

Smith, G.F., O’Donoghue, P, O’Hora K., and Delaney, E. (2010). Best Practice Guidance for Habitat Survey and Mapping. Published by the Heritage Council.

Swift, S. M. (1998) Long□eared Bats. T & AD Poyser Ltd., London.

Whitfield, D.P. & Madders, M. (2006). *Upland Raptors and the Assessment of Windfarm Impacts*. Ibis 148, 43-56. British Ornithologists Union.

FIGURE 13-1: SPECIAL AREAS OF CONSERVATION (SAC) WITHIN 10KM OF THE STUDY AREA

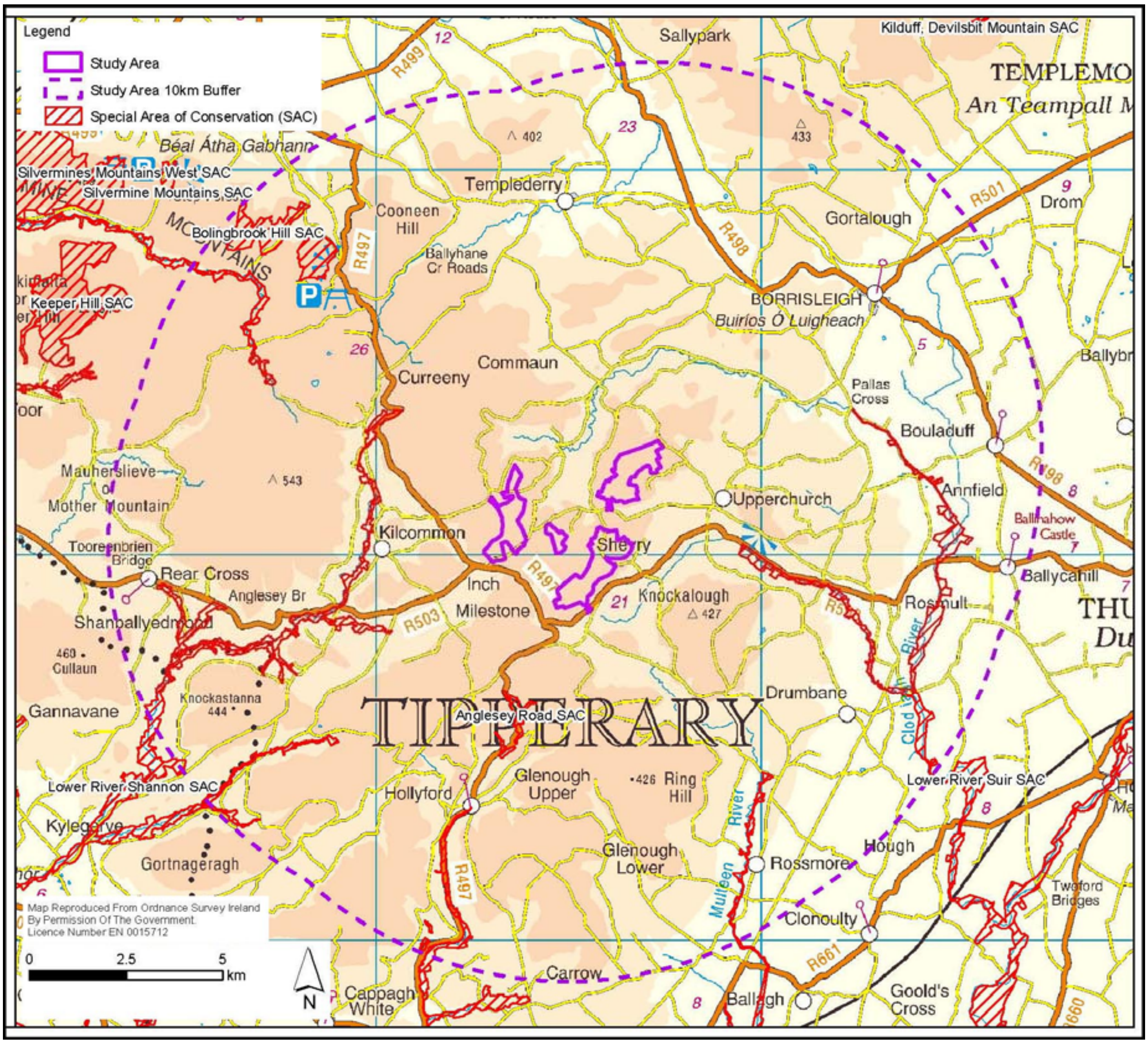


FIGURE 13-2: SPECIAL PROTECTION AREAS (SPA) WITHIN 10KM OF THE STUDY AREA

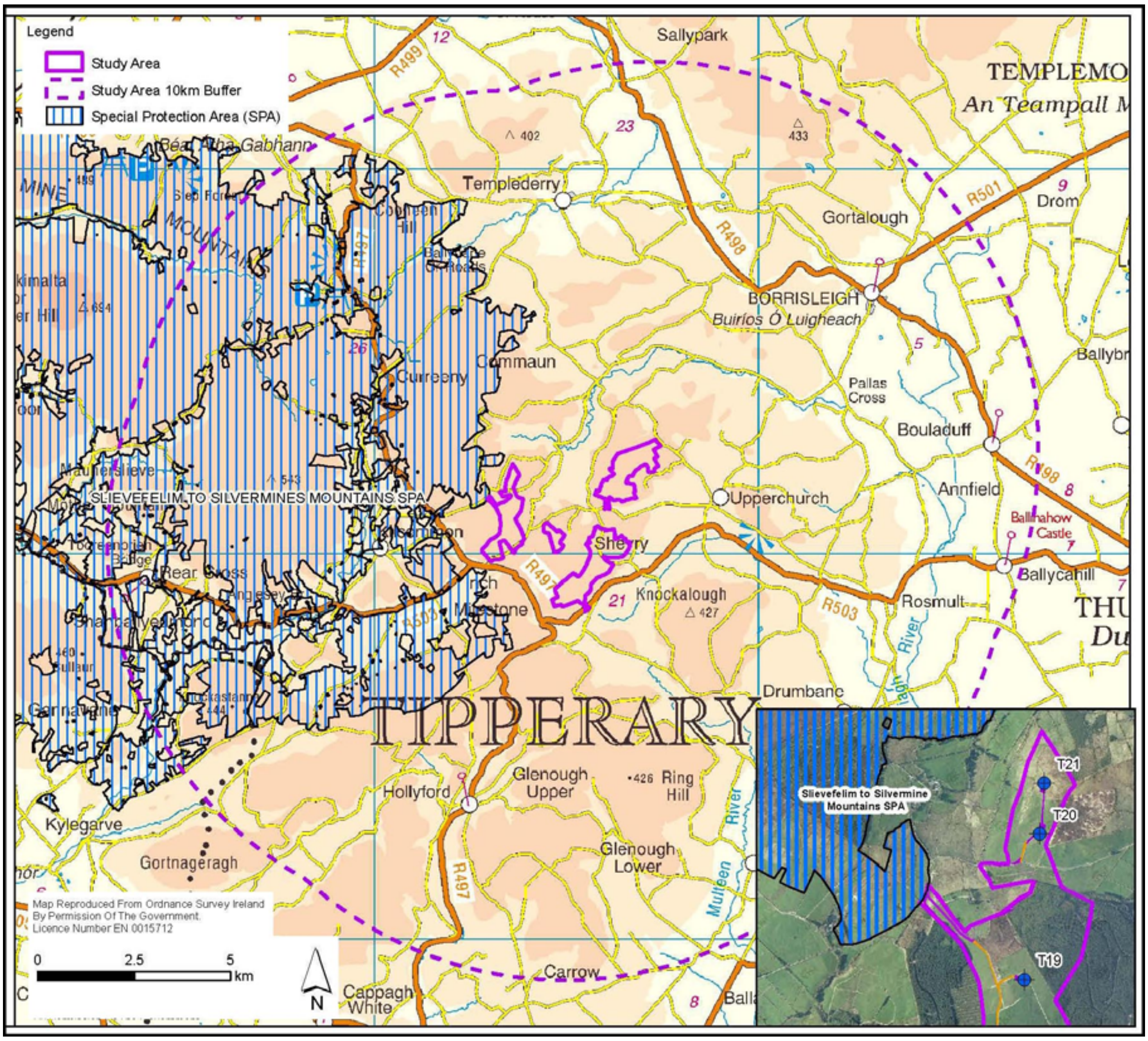


FIGURE 13-3: NHA AND PNHA WITHIN 10KM OF THE STUDY AREA

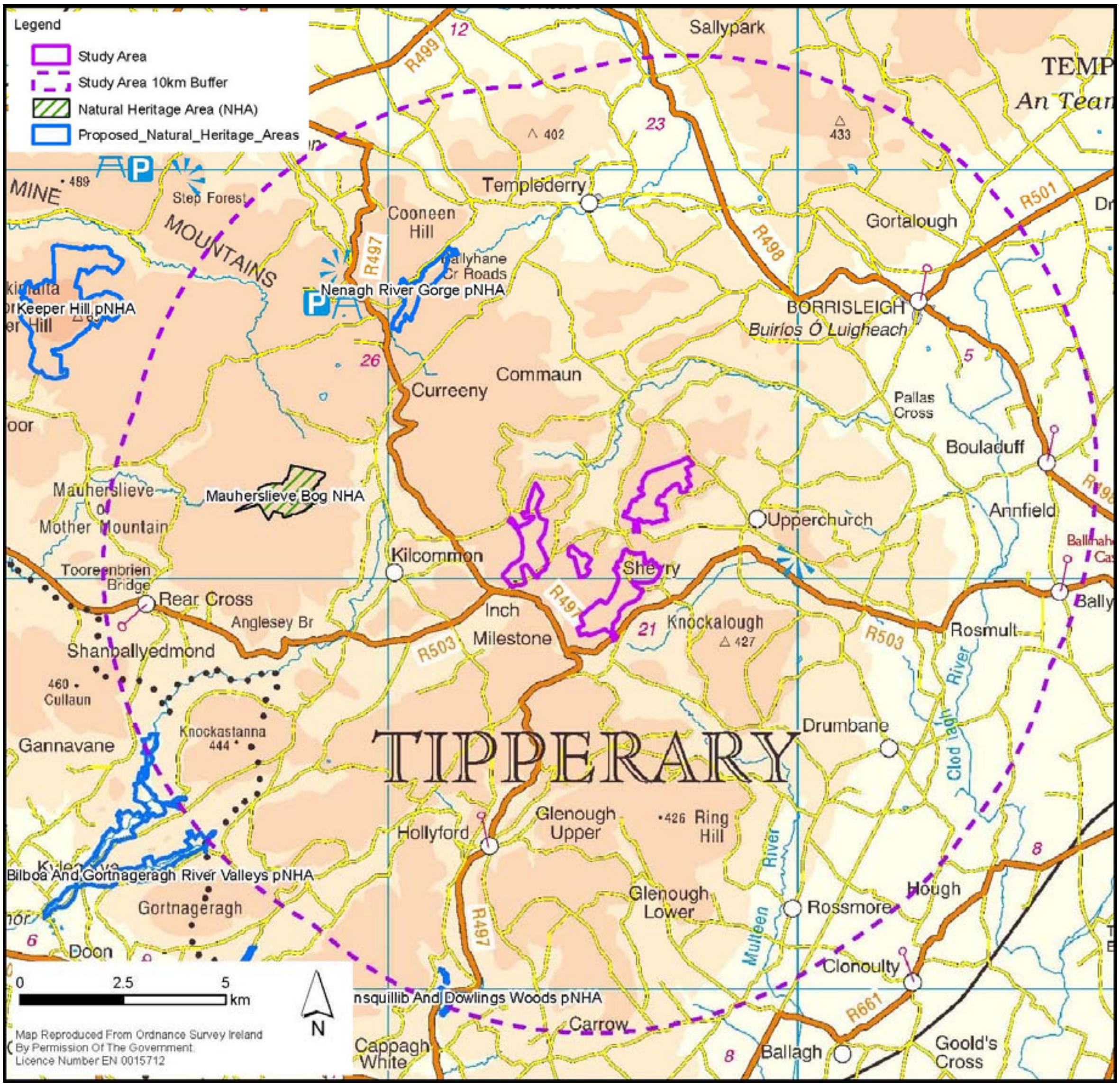


FIGURE 13-4: HABITAT MAP 1 OF 3

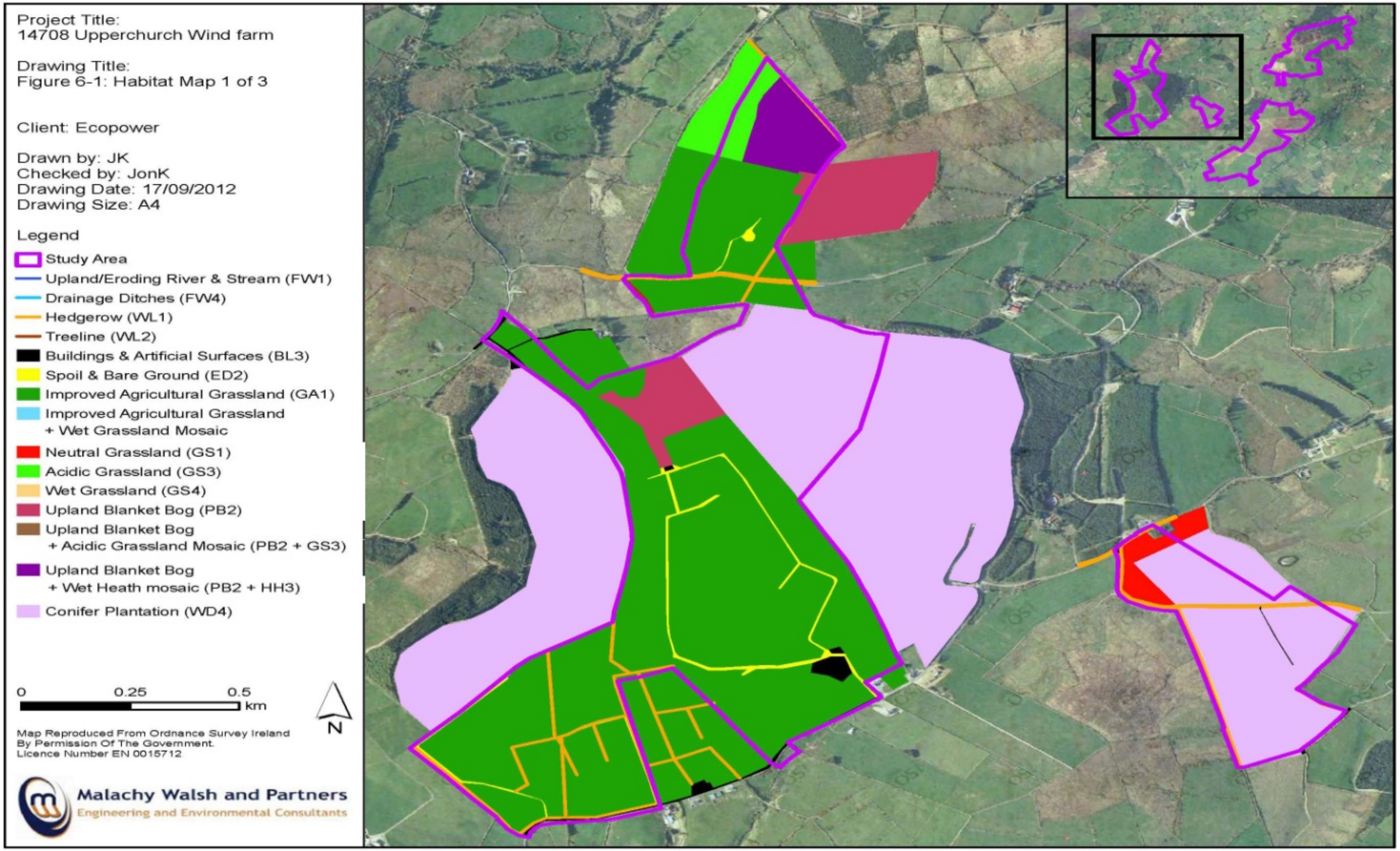
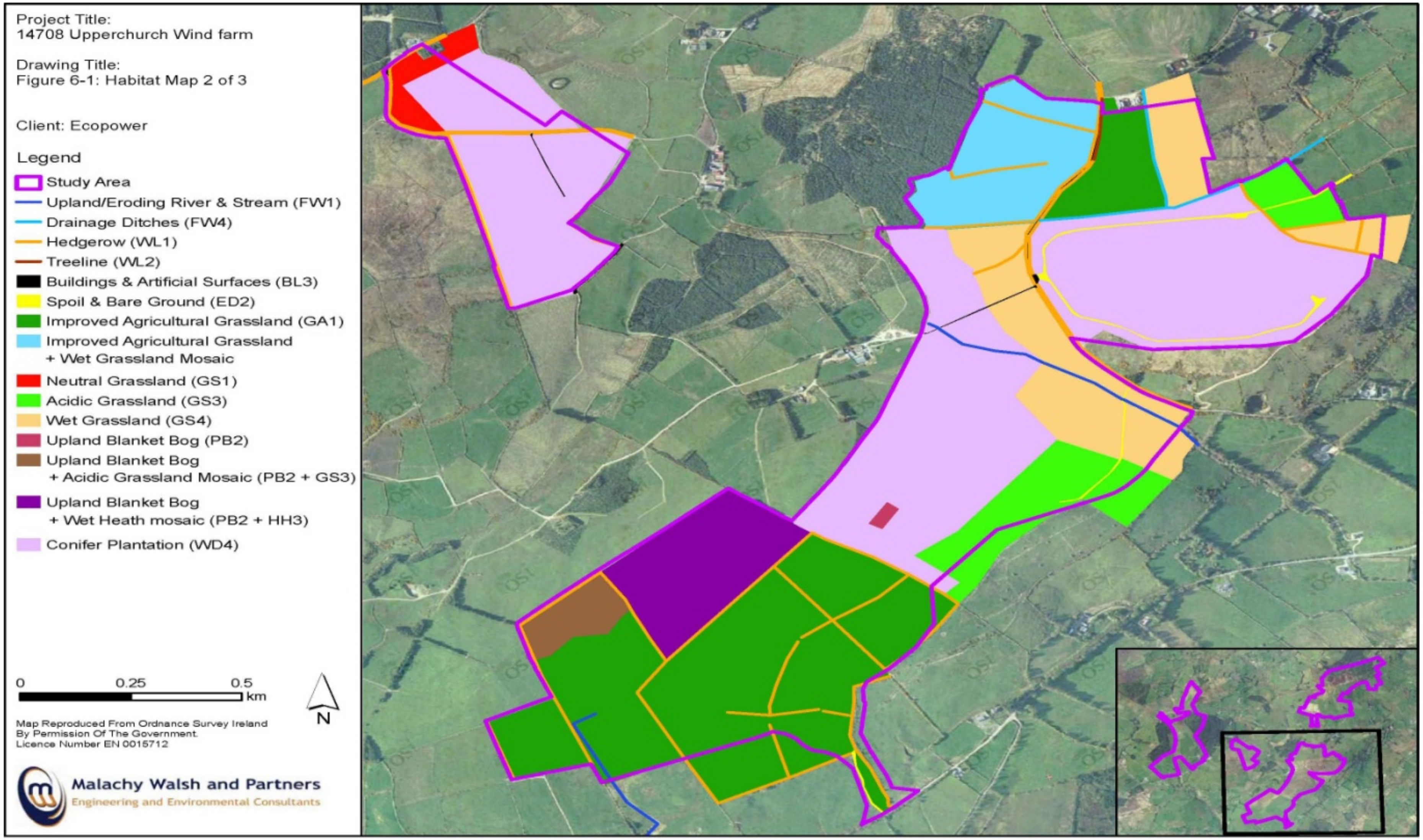


FIGURE 13-4: HABITAT MAP 2 OF 3



REFERENCE DOCUMENTS

FIGURE 13-4: HABITAT MAP 3 OF 3

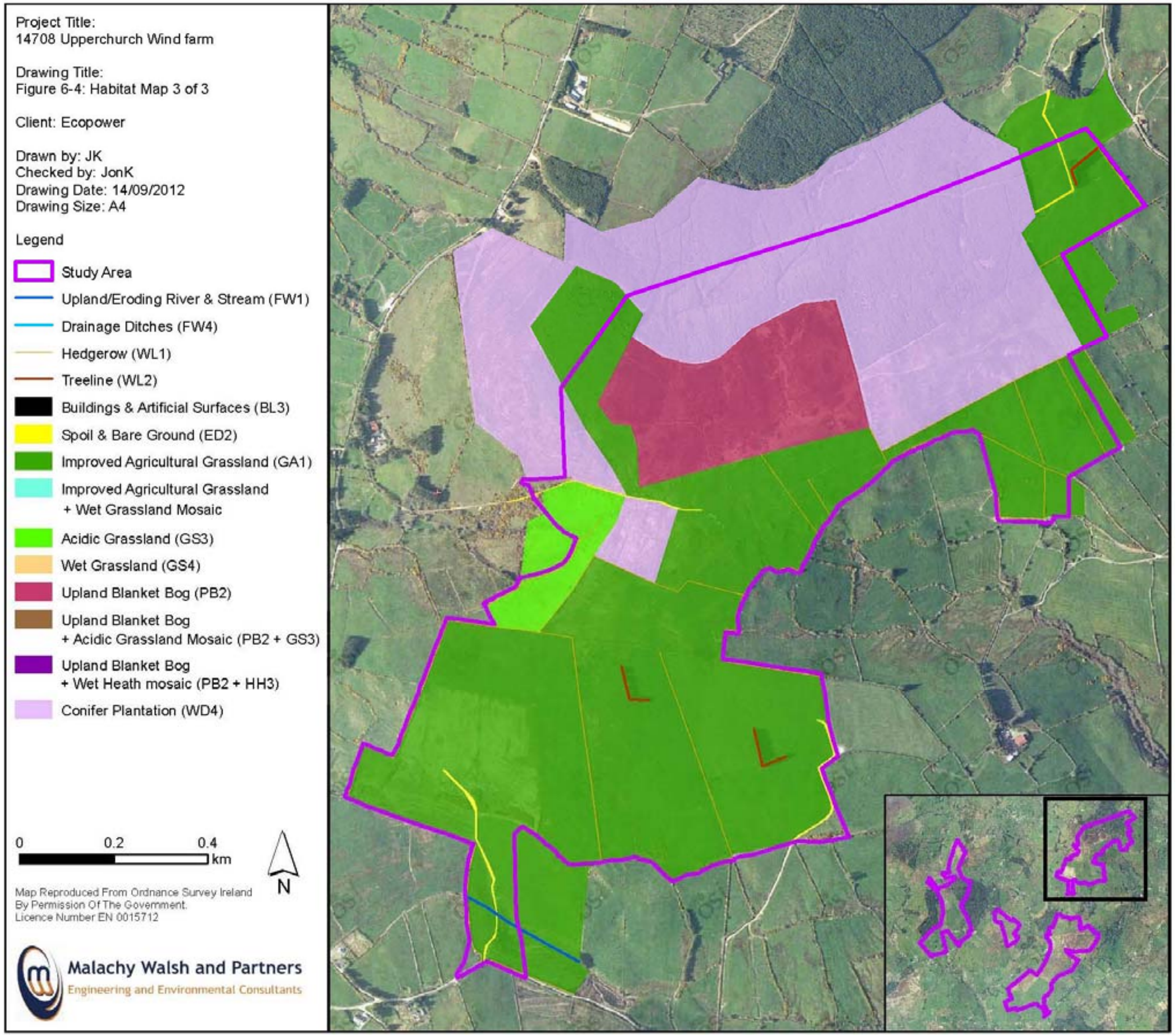


FIGURE 13-5: LOCATION OF SAMPLING STATIONS

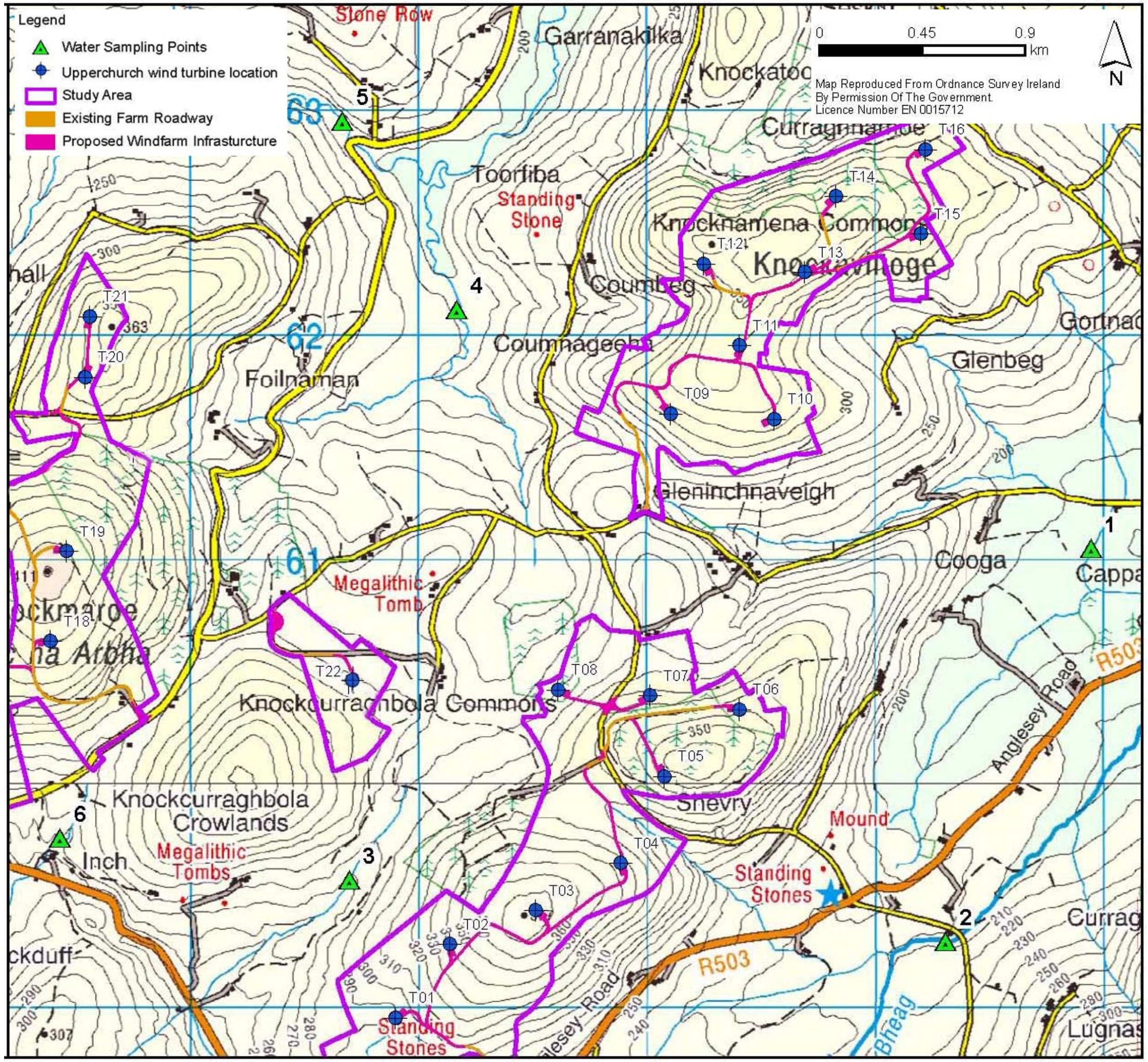


FIGURE 13-6: BAT TRANSECT ROUTES

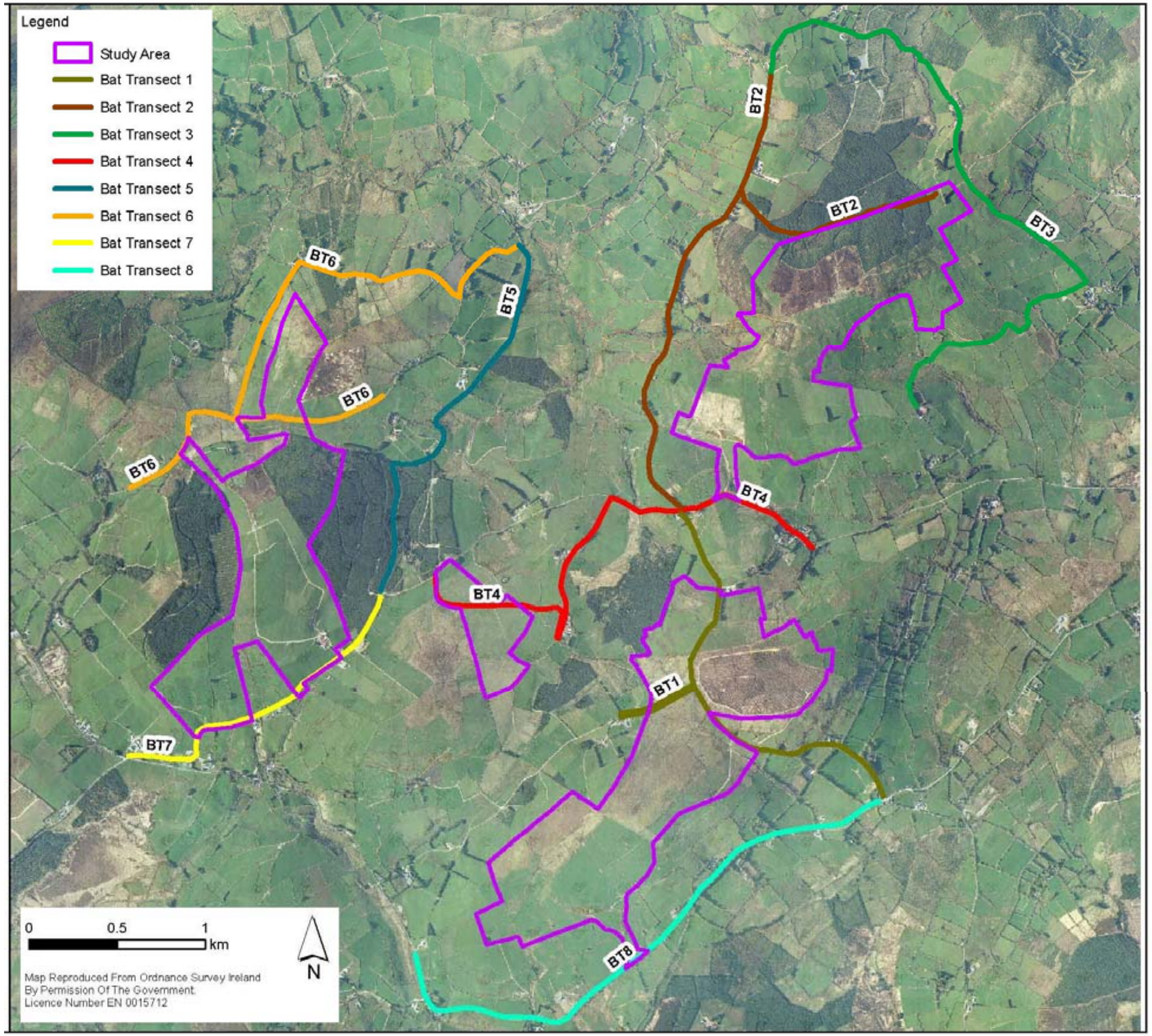


FIGURE 13-7: VANTAGE POINTS

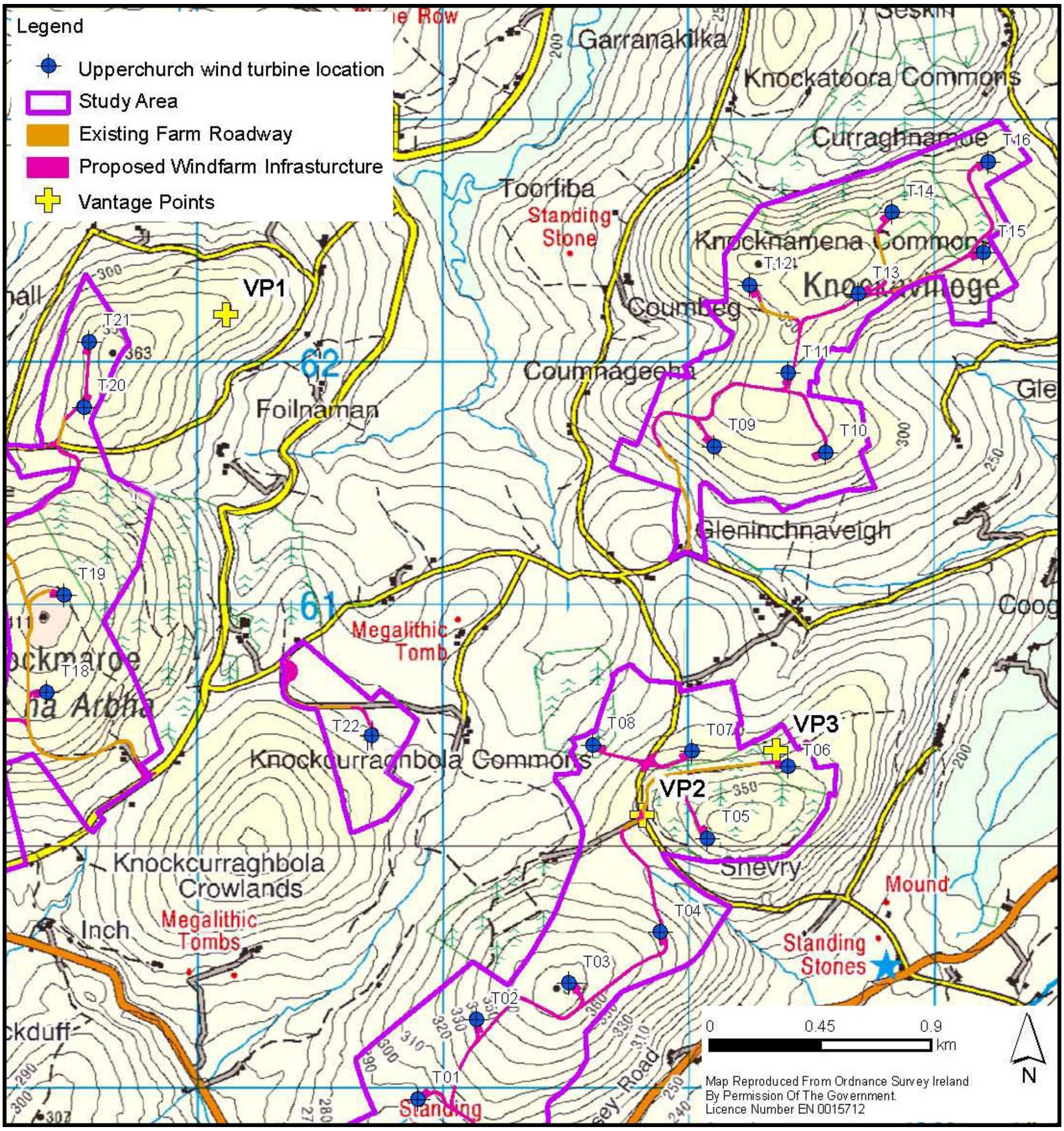


FIGURE 13-8: BIRD TRANSECT ROUTES

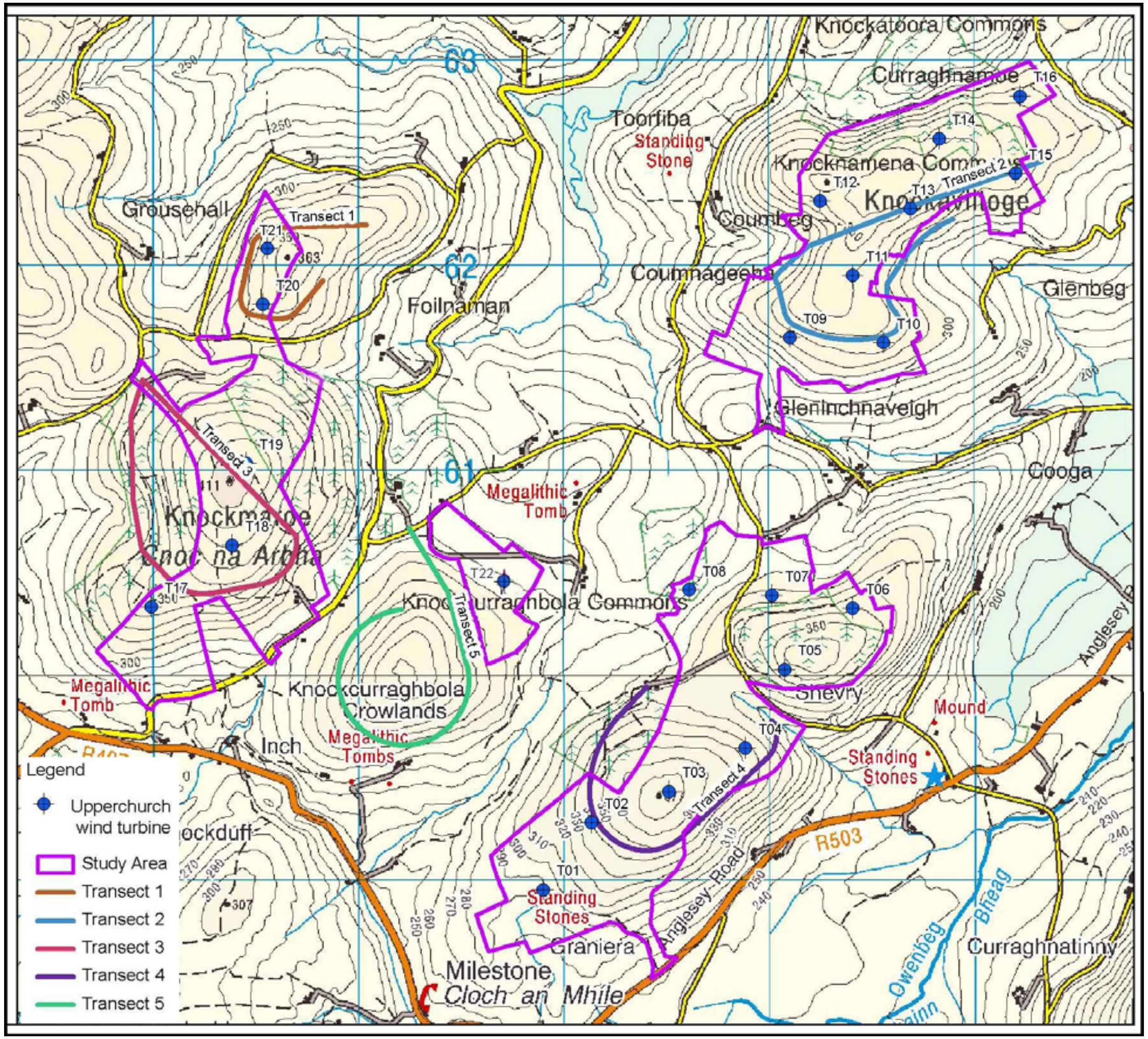


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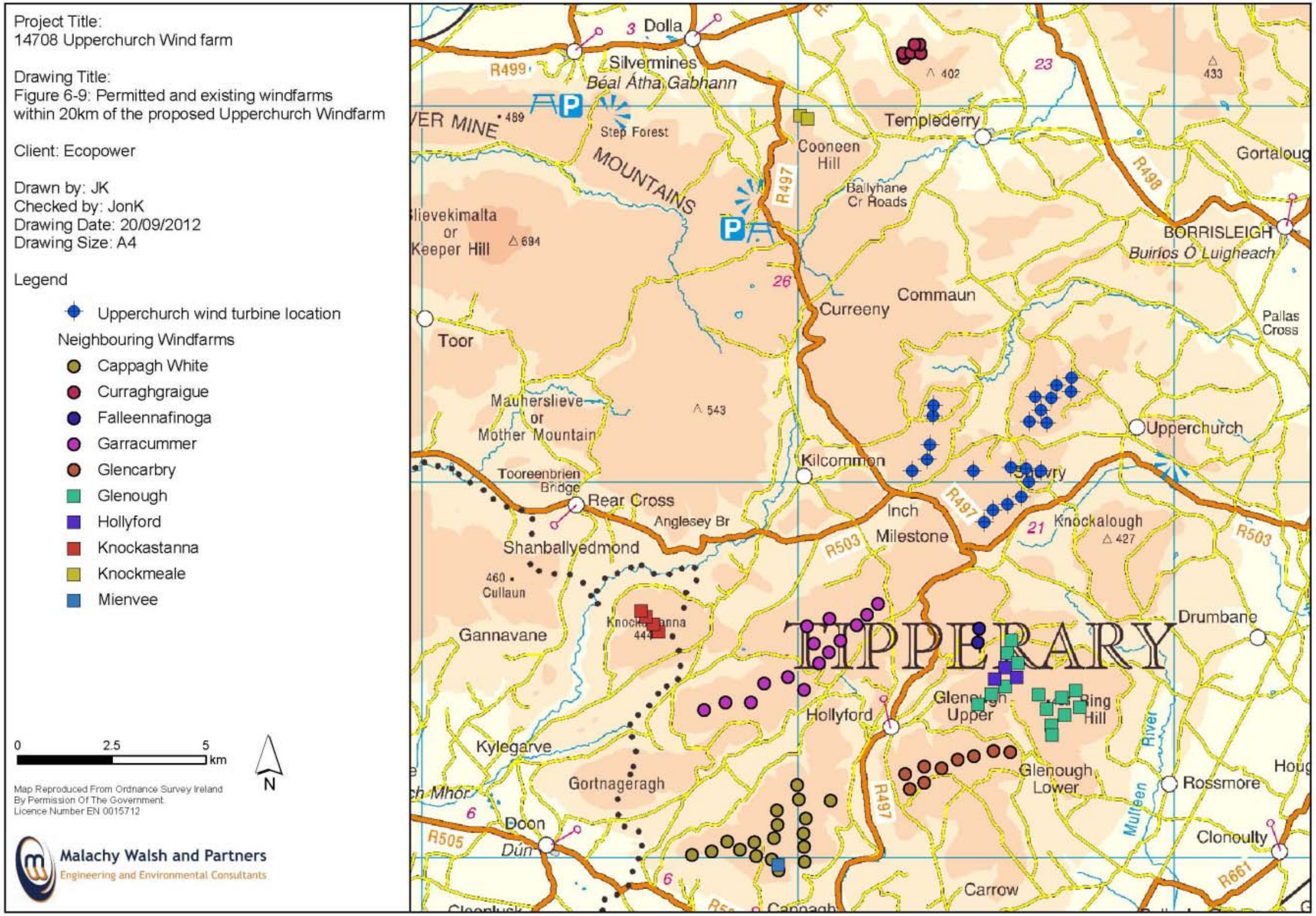
FIGURE 13-9: PERMITTED AND EXISTING WINDFARMS IN THE AREA



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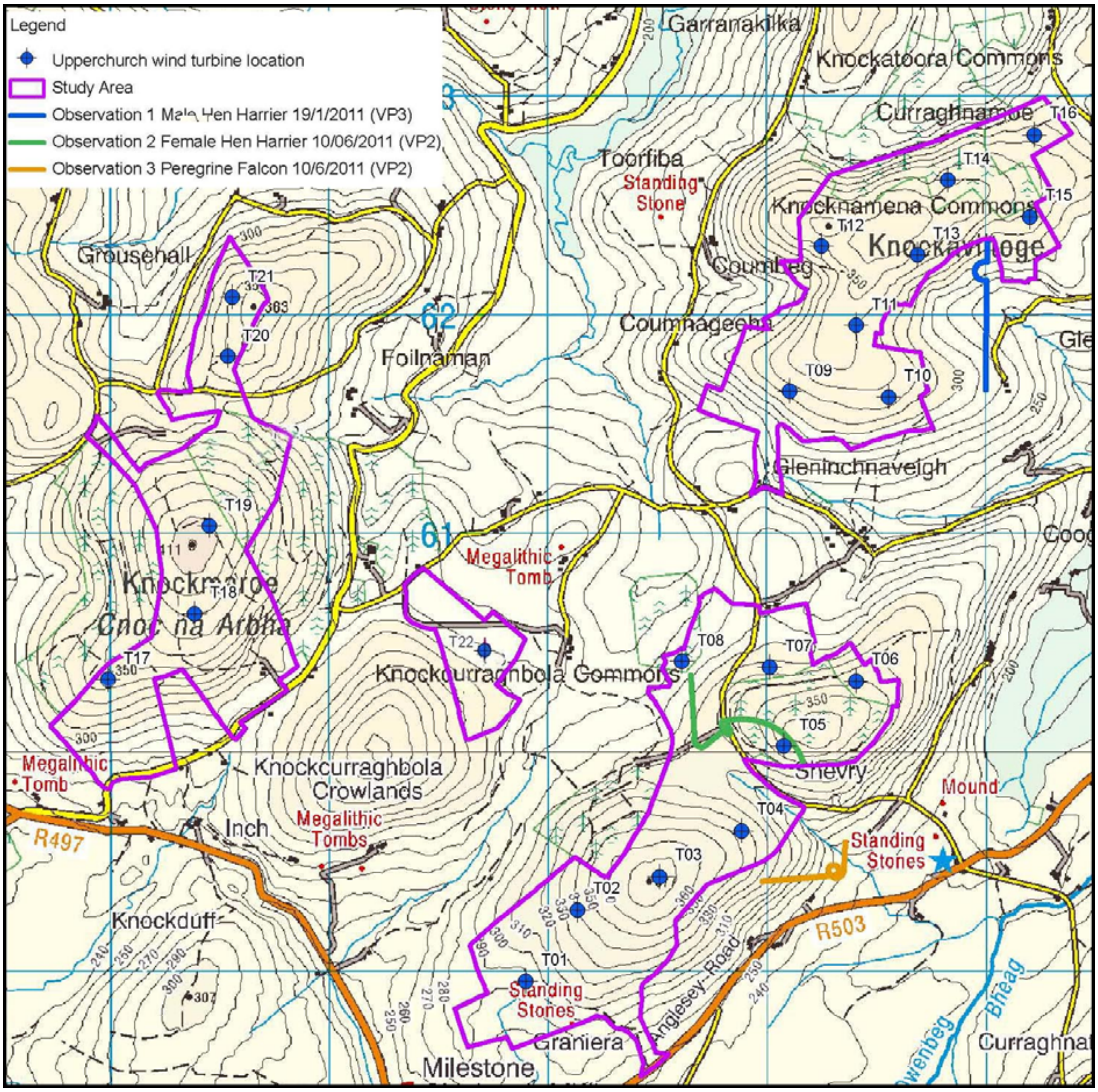
REFERENCE DOCUMENTS

FIGURE 13-10: BIRD OBSERVATIONS



APPENDIX 13-I PHOTOGRAPHS


Plate 1: Improved agricultural grassland in the location of T 17 with conifer plantation running along the western boundary.


Plate 2: Typical hedgerow that is found in the western section of the site. With gorse being the dominant species.


Plate 3: Farm track that runs through the centre of the western section.


Plate 4: Farm track which does not have any imported material. This habitat is readily colonised by plants with little disturbance.


Plate 5: At the location of T 19. Dairy farming has influenced the the area greatly.


Plate 6: Improved agricultural grassland adjacent to upland blanket bog located to the west of T 22.


Plate 7: Acidic grassland occurring to the north west of T 21.


Plate 8: Field to the east of T 8 with wet grassland and improved agricultural grassland on higher ground.


Plate 9. Wet grassland to east of T 8. Rushes were abundant. Other species included creeping buttercup and cuckoo flower.


Plate 10: Drainage ditch to the east of T 7 draining to the north.


Plate 11. Drainage ditch draining from east to west, which had very little water during time of survey. Located to the west of T 7.


Plate 12: Spruce conifer plantation to the west of T 7 and acidic grassland to the south/south west.

Plate 13: Common mouse with water filled depression in background. Located to east of T 7.

Plate 14: Neutral grassland located in the central section to the south of T 23.

Plate 15: Roadway which runs through the central section

Plate 16: Cuckoo flower found in wetter areas throughout the site.

Plate 17: Lousewort, present on wet heath and upland blanket bog.

Plate 18: Tormentil, Present on many habitats within site. Sign of acidic conditions.

Upperchurch Windfarm Enviromental Impact Statement

Malachy Walsh and Partners
Engineering and Environmental Consultants

APPENDIX 13-II
NATURA IMPACT STATEMENT

UPPERCHURCH WINDFARM

14708

September 2012

Job number	Revision	Prepared by	Checked by	Status	Date
14708 - 6005	Rev A	CON	JK	Draft	17th September 2012

1 Introduction

1.1 BACKGROUND

Member States are required to designate Special Areas of Conservation (SACs) and Special Protected Areas (SPAs) under the EU Habitats and Birds Directives, respectively. SACs and SPAs are collectively known as Natura 2000 sites. An 'Appropriate Assessment' (AA) is a required assessment to determine the likelihood of significant impacts, based on best scientific knowledge, of any plans or projects on Natura 2000 sites. A screening for AA determines whether a plan or project, either alone or in combination with other plans and projects, is likely to have significant effects on a Natura 2000 site in view of its conservation objectives.

This AA screening has been undertaken to determine the potential for significant impacts of a proposal to construct a 22 turbine windfarm, 1.9 km west of Upperchurch and a further 18 km west of Thurles in county Tipperary, on nearby Sites with European conservation designations (i.e. Natura 2000 Sites). The purpose of this assessment is to determine, the appropriateness, or otherwise, of the proposed project in the context of the conservation objectives of such sites. For clarity of nomenclature this proposal will be described, hereinafter, as the Upperchurch Windfarm.

This Screening for Appropriate Assessment has been undertaken by Malachy Walsh and Partners ecologists.

Assessment of potential impacts on other species of national and community interest does not fall within the scope of this report.

An Environmental Impact Statement has also been carried out in association with the proposed windfarm.

1.2 LEGISLATIVE CONTEXT

The Habitats Directive (92/43/EEC) seeks to conserve natural habitats and of wild fauna and flora by the designation of SACs and the Birds Directive (79/409/EEC) seeks to protect birds of special importance by the designation of SPAs. It is the responsibility of each member state to designate SPAs and cSACs, both of which will form part of Natura 2000, a network of protected sites throughout the European Community.

An Appropriate Assessment is required under Article 6 of the Habitats Directive where a project or plan may give rise to significant effects upon a Natura 2000 Site, and paragraphs 3 and 4 state that:

6(3) *Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with* *other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.*

6(4) *If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted. Where the site concerned hosts a priority natural habitat type and/or a priority species, the only considerations which may be raised are those relating to human health or public safety, to beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest.*

The current assessment was conducted within this legislative framework and also the recent DoEHLG (2009) guidelines. As outlined in these, it is the responsibility of the proponent of the project developer to provide a comprehensive and objective Screening for Appropriate Assessment, which can then be used by the competent authority in order to conduct the Appropriate Assessment (DoEHLG, 2009).

1.3 STAGES OF AA

A Screening for Appropriate Assessment (AA) has been prepared by Malachy Walsh and Partners, to determine the likelihood of significant impacts, if any, of the proposal to construct a 22 turbine windfarm and all associated works located 1.9km west of Upperchurch village and a further 18km west of Thurles in County Tipperary, on nearby sites with European conservation designations (i.e. Natura 2000 sites). A Natura Impact Statement (NIS) has also been undertaken and is presented in this report after the screening stage.

The AA process is a four-stage process to complete the AA, with issues and tests at each stage. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required. This proposal has proceeded as far as Stage 2 only.

The first stage of the AA process and that undertaken to determine the likelihood of significant impacts of this proposal is:

- Stage 1: *Screening.*

The second stage of the AA process assesses the impact of the proposal (either alone or in combination with other projects or plans) on the integrity of the Natura 2000 site with respect to the conservation objectives of the site and its ecological structure and function. A Natura Impact Statement was prepared for this proposed development. A Natura Impact Statement containing a professional scientific examination of the proposal is required and includes any mitigation measure to avoid, reduce or offset negative impacts:

- Stage 2: *Natura Impact Statement (NIS).*

If the outcome of Stage 2 is negative i.e. adverse impacts to the sites cannot be scientifically ruled out, despite mitigation, the plan or project should proceed to Stage 3 or be abandoned. This stage examines alternative solutions to the proposal:

- Stage 3: *Assessment of alternative solutions.*

The final stage is the main derogation process examining whether there are imperative reasons of overriding public interest (IROPI) for allowing a plan or project to adversely affect a Natura 2000 site where no less damaging solution exists:

- Stage 4: *Assessment where no alternative solutions exist and where adverse impacts remain.*

In summary, the purpose of the Screening stage is to determine the necessity or otherwise for a NIS. Screening for AA examines the likely effects of a project or plan, alone and in combination with other projects or plans, upon a Natura 2000 site and considers whether it can be objectively concluded that these effects will not be significant. If it is determined during screening that the proposal may have a significant effect on a Natura 2000 site then a NIS will need to be prepared. A Screening exercise has been undertaken and concluded that a NIS was required. The Screening is outlined in section 2 below as it now forms part of the overall NIS. The NIS is presented in Section 3 below.

1.4 SCREENING STEPS

This Screening for AA, or Stage 1 of AA, has been undertaken in accordance with the European Commission Methodological Guidance on the provision of Article 6(3) and 6(4) of the 'Habitats' Directive 92/43/EEC (EC, 2001) and the European Commission Guidance 'Managing Natura 2000 sites' (EC, 2000).

Screening for AA involves the following:

- Establish whether the plan is necessary for the management of a Natura 2000 site;
- Description of the Plan;
- Identification of Natura 2000 sites potentially affected;

- Identification and description of individual and cumulative impacts likely to result from the plan;
- Assessment of the significance of the impacts identified above on site integrity; and
- Exclusion of sites where it can be objectively concluded that there will be no significant effects.

Stage 1, Screening, examines whether or not likely effects upon a Natura 2000 site will be significant and determines whether the AA process for the proposed windfarm needs to proceed to Stage 2.

1.5 ASSESSMENT METHODOLOGIES

1.5.1 In house Consultation with Design Engineers

Consultation with the client, Ecopower Developments, and with Malachy Walsh and Partners' in-house engineering team was conducted on an ongoing basis in order to formulate a project design which would avoid, by design and at source, any construction activities that could initiate potential water quality impacts. As a consequence, all aspects of the construction of the proposed windfarm and its layout adopted an avoidance by design approach. An example of this aspect of the avoidance by design approach is the fact that the windfarm roads and the turbine sites for the most part were located on the least ecologically sensitive areas found during the site investigation in order to minimise potential impacts. In addition, it was decided to remove if possible, from the projects design, all elements that could impinge on the conservation interests of the nearby Lower River Suir cSAC and the Lower River Shannon cSAC located downstream thereby avoiding impacts at source.

1.5.2 Desk Study

A desk study was carried out to collate available information on the proposal site's natural environment. This comprised a review of the following publications and datasets:

- OSI Aerial photography and 1:50000 mapping;
- National Parks and Wildlife Service (NPWS);
- BirdWatch Ireland;
- Teagasc soil area maps (NBDC website);
- Geological Survey Ireland (GSI) area maps;
- Environmental Protection Agency (EPA) water quality data;
- Shannon River Basin District (ShRBD) datasets (Water Framework Directive);
- South Eastern River Basin District (SERBD) datasets (Water Framework Directive); and
- National Biodiversity Centre (NBDC) (on-line map-viewer).

1.5.3 Ecological Site Surveys

1.5.3.1 Habitat surveying, mapping and evaluation

Field surveys were conducted by ecologists during the month of June 2012. Habitats were categorised according to the Heritage Council's '*A Guide to Habitats in Ireland'* (Fossitt, 2000) to level 3.

The habitat mapping exercise had regard to the 'Best Practice Guidance for Habitat Survey and Mapping' (Smith *et al.* 2011) published by the Heritage Council. Laminated A3 aerial photography was used together with a GPS to accurately enable field navigation. Habitat categories, characteristic plant species and other ecological features and resources were recorded on waterproof field sheets.

Scientific and common names for plants follow Parnell *et al*. (2012) and Blamey *et al*. (1996), respectively. Habitat boundaries and associated attribute data were mapped using desk-based GIS software, namely ArcView 9.2.

1.5.3.2 Water quality and aquatic habitat assessment

In order to to collect baseline water quality data and in order to conduct fisheries and riparian habitat evaluations, a programme of biological and physico-chemical water quality assessments were undertaken in the waterways draining the area of the proposed windfarm. Streams in the vicinity of the proposed development were surveyed by an ecologist on the 11th of June and 22nd of August, 2012. A total of six sampling points were strategically identified at locations within the catchment areas of the proposed Upperchurch Windfarm site in order to assess and give an indication on the water quality in the immediate area surrounding the proposed windfarm site.

Biological water quality monitoring refers to Q Value system of ranges where the relationship between water quality and the in-stream macroinvertebrate community is described in numerical terms. A Q value of 5 indicates very high water quality while a Q value of 1 indicates poor water quality. Kick sampling, where the river bed is disturbed using the foot immediately upstream of a kick net, which collects the sample, was conducted at five sampling stations just downstream of the study area. Macroinvertebrate samples were returned to the laboratory where species within each kick sample were identified to genus level. Differing macroinvertebrate species are assigned to a group according to its tolerance of or sensitivity to water pollution. A river is then assigned a Q value based on these groupings. Table 1, below indicates the relationship between Q values and water quality.

TABLE 1: RELATIONSHIP BETWEEN BIOTIC INDEX (Q-VALUE) AND WATER QUALITY.

Biotic Index	EPA Water Quality	Water Framework Directive Ecological Status	Quality Status
Q5	Good	High	Unpolluted Waters
Q4-5	Fair - Good	High	
Q4	Fair	Good	
Q3-4	Doubtful - Fair	Moderate	Slightly Polluted Waters
Q3	Doubtful	Poor	Moderately Polluted Waters
Q2-3	Poor - Doubtful	Poor	
Q2	Poor	Bad	Seriously Polluted Waters
Q1-2	Bad - Poor	Bad	
Q1	Bad	Bad	

1.5.3.1 Ornithological surveys

Winter Hen Harrier Survey 2010/2011

Field surveys were undertaken at the proposed site in order to examine the usage and activity of hen harriers at the site during the winter of 2010/2011.

Vantage Point Observations

Vantage point observations were carried out in order to assess the level of raptor activity and purpose at the development site. These observations were carried out in accordance with NPWS hen harrier survey guidelines. Three (3) vantage point locations were selected in order to obtain maximum visibility of the site and habitats outside the site boundary.

Vantage point watches were of six (6) hours duration and the three vantage points were watched for a total of eighteen (18) hours per site visit. During the course of the survey from November 2010 to March 2011 the site was watched for a total of ninety (90) hours. The locations of the vantage points are illustrated in **Figure 13-7** at the end of Chapter 13.

Summer Hen Harrier Survey 2011

Vantage Point Observations

Vantage point observations were carried out in order to assess the level of raptor activity and purpose at the development site during the summer of 2011. These observations were carried out in accordance with NPWS hen harrier survey guidelines. The vantage point locations chosen for the summer hen harrier survey remained the same as those chosen for the winter hen harrier survey.

Vantage point watches were of six (6) hours duration and the three vantage points were watched for a total of eighteen (18) hours per site visit. During the course of the summer survey from April to July 2011 the site was watched for a total of seventy two (72) hours. The locations of the vantage points are illustrated in **Figure 13-7** at the end Chapter 13.

Transect surveys

Winter Transect counts were undertaken on 19th January and 16th March 2011 at five locations across the site and their locations are illustrated in **Figure 13-8** at the end of Chapter13. Transect counts were undertaken on 19th May and 12th July 2011 at the same five locations as the winter bird survey.

1.5.3.2 Otter survey

A survey for signs of otters, including scat and evidence of otter holts, was carried out in conjunction with the programme of water quality assessments described above and during the ecological site visits.

1.5.4 Assessment of Potential Impact Significance

Once the potential impacts that may arise from the proposal are identified the significance of these is assessed through the use of key indicators:

- Habitat loss;
- Habitat alteration;
- Habitat or species fragmentation;
- Disturbance and/or displacement of species; and
- Water quality and resource.

In line with the EPA Guidelines (EPA, 2002), the following terms are defined when quantifying duration:

- Temporary: up to 1 year;
- Short-term: from 1-7 years;
- Medium-term: 7-15 years;
- Long-term: 15-60 years; and
- Permanent: over 60 years.

The criterion for confidence levels of the predicted likely impacts are given here in Table 1 as recommended by IEEM, (2006) and NRA, (2009).

TABLE 2: CONFIDENCE LEVELS OF PREDICTIONS OF LIKELY IMPACTS AS OUTLINED IN NRA (2009) AND IEEM (2006).

Confidence level category	
Near certain	>95% chance of occurring as predicted
Probably	50-95% chance of occurring as predicted
Unlikely	5-50% chance of occurring as predicted
Extremely unlikely	<5% chance of occurring as predicted

The impact significance criteria follow EPA guidance (EPA, 2002).

TABLE 3: SIGNIFICANCE OF IMPACT (EPA, 2002).

Significance of Impacts	**Definition**
Imperceptible Impact	An impact capable of measurement but without noticeable consequences.
Slight Impact	An impact which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate Impact	An impact that alters the character of the environment in a manner that is consistent with existing and emerging trends.
Significant Impact	An impact which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Profound Impact	An impact which obliterates sensitive characteristics.

2 Stage 1 Screening

2.1 MANAGEMENT OF NATURA 2000 SITE

The proposal is not connected with or necessary to the conservation management of a Natura 2000 site.

2.2 DESCRIPTION OF PROJECT

2.2.1 Brief Project Description

It is proposed to construct the 22 turbine windfarm at a location situated approximately 1.9 km west of the village of Upperchurch and a further 18 km west of Thurles in County Tipperary. The turbines are numbered T01 to T22 and are arranged in four clusters as follows:

- T01 to T08 are arranged around two hills at Shevry;
- T09 to T16 are arranged around the hill at Knocknamena;
- T17 to T21 are arranged around two hills at Knockmaroe and Foilnaman; and
- T22 is a single turbine on the northeast side of the hill at Knockcurraghbola.

The individual clusters occur within a series of small hills or drumlins and are distributed over an area of $12km^2$. The hills are at elevations of between 363mOD and 411mOD and the peaks are generally at heights of 100m above the intervening lower terrain. The highest peak is that of Knockmaroe at an elevation of 411mOD (Grid Ref: R193372 160945). All of the proposed wind turbine locations are on elevated sloping ground with good natural drainage to the streams in the surrounding valley.

2.2.2 Purpose of the Project Proposal

The purpose of the project is to generate electricity from wind energy and to export to the national grid. It will produce pollution free electricity with the capacity to provide power, generating 150 million kWh, for up to 23,070 homes.

2.2.3 Description of the Site

The principal land uses within the greater area are pasture (dairy farming and dry cattle) and some blocks of conifer plantation occur within the site. The surrounding local landscape is a mixture of predominantly improved agricultural grassland, acidic grassland, upland blanket bog with some of this habitat forming mosaics with wet heath.

An ecological survey, conducted as part of the EIS associated with the proposed windfarm, determined that the habitats listed at Table 4, below, comprise the habitats in the area of the proposed windfarm.

It was clear from the ecological survey that the extent of upland blanket bog habitat within the site boundary and the greater geographical area was larger historically. Both the quality and extent of this habitat has been significantly reduced by peat-cutting and agricultural land management practises including drainage, grazing, fertilisation and reseeding. There is evidence of peat harvesting in the past with small areas of this habitat occurring within limited sections of the site where peat banks of up to 1.3 m can be seen.

The soil composition within the turbine cluster areas is, variously comprised of mosaics of 'Surface water Gleys / Ground water Gleys acidic' ,'Lithosols / Regosols', 'Podzols Peaty', 'Shallow Peaty Gleys' and 'Acid Brown Earths/ Brown Podzolics'. Bedrock at the location is 'Silurian Metasediments and Volcanics' with some rock outcropping, most notably at the northeast part of the site.. The Corine Landcover classes 'Pasture', 'Bog', 'Other' and 'Forestry' are the dominant types in the area around the windfarm and in the greater geographical area extending away from the proposal site[1].

Three first order streams situated adjacent to the proposed windfarm site drain into streams that form the upper reaches of the Turraheen, Owenbeg, Clodiagh and Aughvana Rivers. The first three of these rivers form part of the South Eastern River Basin District and ultimately join the River Suir to the southeast. The Aughvana River, which forms part of the Shannon River Basin District, joins the Mulkear River and ultimately flows into the River Shannon to the east of Limerick City.

The site drains to the different rivers as follows:

<u>Suir Catchment</u>

- The area around turbines T01 and T02 drains towards the west to an unnamed tributary of the Turraheen River.
- The area around turbines T03, T04, T05 and T06 drains to the southeast to the Owenbeg River and its tributaries.
- The area around turbines T07, T08 and T09 drains to the north to the streams that form the upper reaches of the Clodiagh River.
- The area around turbines T10, T11, T13 and T15 drains to the south and southeast to tributaries of the Owenbeg River.
- The area around turbines T12, T14 and T16 drain to the west and north to the Clodiagh River.
- The areas around turbines T19, T20, T21 and T22 drain in different directions to unnamed tributaries of the Clodiagh River to the north.

[1] Data in this paragraph from http://maps.biodiversityireland.ie/#/Map [accessed 06/09/2012]

Shannon Catchment

- The area around turbines T17 and T18 drains south to an unnamed tributary of the Aughvana River. This is the only part of the overall site that forms part of the Shannon River Basin District.

2.2.4 Ecological description of the proposed Upperchurch Windfarm Site

2.2.4.1 Terrestrial Ecology

Habitat surveys were conducted by ecologists during the month of June 2012. Habitats were categorised according to the Heritage Council's 'A Guide to Habitats in Ireland' (Fossitt, 2000) to level 3. A total of 13 habitats types were identified within the proposed Upperchurch Windfarm EIS study area. The predominant habitats within the site are improved agricultural grassland and conifer plantation.

See **Figure 13-4 Map 1, Map 2** and **Map 3** at the end of Chapter 13 for habitat maps of the proposed Upperchurch Windfarm site. Site photographs of habitats are presented in **Appendix13-I**.

Table 4, below, lists the habitats recorded during the habitat survey with a qualitative description.

TABLE 4 SUMMARY LIST OF HABITATS RECORDED WITH SPATIAL DESCRIPTION

Habitat (code)	Evaluation
Improved Agricultural Grassland (GA1)	There is an extensive cover of Improved Agricultural Grassland throughout the site. The habitat is not species rich (as per agricultural grassland) but is of value to species which forage within it.
Coniferous Plantation (WD4)	There are 5 stands of conifer plantation within the study area planted on heath/upland blanket bog habitat. The dense growth within this habitat means there is very little light penetration reducing the diversity of plant species at ground level. Some areas have been felled and replanted. The younger stands have much more diverse vegetation undergrowth.
Wet Grassland (GS4)	This habitat is common in the lower lying areas and along margins of streams of the site. The wet grassland habitat has been modified by the building of drains around the field boundaries, reseeding and the application of fertiliser. While generally species poor the habitat is considered to be of some ecological value.
Wet Heath (HH3)	An area to the west of T2 in the south eastern section is classified as wet heath. This area was dominated by bell heather and purple moor-grass. This area would be subject to cattle grazing. Peat depth is low, approximately 0.3m. Formed due to peat extraction.
Acid Grassland (GS3)	This habitat occurs mainly outside of the enclosed grassland farm areas in areas where no reclamation has taken place but is extensively grazed by cattle. This habitat occurs to the south east of turbines T3 and T4 and on steep slopes to the northwest of turbine T21.
Upland Blanket Bog (PB2)	Upland blanket bog is one of the least dominant habitats within the study area. The habitat has been degraded by previous peat extraction, land reclamation, conifer plantation, grazing and drainage.
Eroding/Upland River (FW1)	There are 3 small, first order streams within the study area. These streams are quite small. Extensive man made drainage features drain into these

Habitat (code)	Evaluation
	habitats to dry out the surrounding low lying landscape.
Hedgerow (WL1)	There is a network of hedgerows along the improved grassland field boundary throughout the site.
Drainage Ditches (FW4)	Man-made features extending around the boundaries of lower lying agricultural fields and conifer plantation within the study area. Many are large with some vegetation.
Spoil and Bare Ground (ED2)	The forestry and farm roads within the site fall into this habitat category and are dominated by compact gravel which is naturally occurring to the area
Buildings and Artificial Surfaces (BL3)	Habitat of very low ecological value.
Treelines (WL2)	There are some small sections of treelines within the study area which mostly occur along tree-lined roads.
Neutral Grassland (GS1)	One section of this habitat near turbine T22.

2.2.4.2 Aquatic Ecology

A water quality assessment was undertaken of the waterways draining the proposed windfarm site to provide baseline water quality, fisheries and riparian habitat data. Watercourses in the vicinity were surveyed by an ecologist on the 11th of June and the 22nd August 2012.The survey results will provide a baseline for future monitoring to ensure that the existing water and habitat quality of watercourses within and adjacent to the site are maintained during the construction and operational phase of the proposed windfarm development.

The study area is situated on hills or drumlins with a number of streams that support the upper reaches of the Owenbeg, Clodiagh and Turraheen River catchments which drain to the Suir. Tributaries of the Clodiagh River drain the northern and central locations of the site while the southern and eastern portion of the site are drained by tributaries of the Owenbeg and Turraheen Rivers. The westerly cluster comprised of turbines T17 and T18 is drained by an unnamed tributary of the Aughvana River and is the only part of the overall site that forms part of the Shannon River Basin District.

A total of six sampling points were strategically identified at locations within the catchment area of the proposed Upperchurch Windfarm site in order to assess and give an indication on the water quality in the immediate area surrounding the proposed site.Table 5 below details the Grid References and Q value of each sampling station on which the survey was undertaken.

TABLE 5 LIST OF SAMPLING STATIONS WITH Q VALUES

Sampling Station	Grid Reference	Location	Q Value
1	97973 61082	Unnamed stream (east of site) which flows to the Owenbeg River	Q3
2	97336 59293	Owenbeg river (east of site)	Q4
3	94363 59329	Unnamed stream (southern section of the site) which flows to the Turraheen River	Q4
4	95056 62330	Unnamed stream (central area of site) which flows to the Clodiagh River	Q4
5	94623 63001	Unnamed stream (northern section of the site) which flows to the Clodiagh River	Q4-5
6	93464 59759	Unnamed stream (southern section of the site) which flows to the Aughvana River	Q3

2.2.4.3 Physiochemical water quality

TABLE 6-6: PHYSIOCHEMICAL WATER QUALITY RECORDED AT THE UPPERCHURCH SITE, CO. TIPPERARY.

Parameter	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Salmonid Regulations S.I. No. 293 of 1988	Surface Water Regulations S.I. No. 272 of 2009
pH	7.5	7.6	7.2	7.7	7.6	7.7	>6 & <9	
Alkalinity, mg/L as CaCO3	72.5	62.9	91.1	81.0	56.6	119		
Temperature	11.28	11.98	10.03	12.29	12.46	12.10		
Suspended solids mg/L	3	2	6	<2	<2	18	<25	
BOD (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	1.4	<5	<2.2
Nitrate(mg/L)N O3-N	1.08	0.73	2.07	1.23	0.65	1.95		
Nitrite	<0.005	<0.005	<.005	<.005	<.005	0.01	<0.05	

Parameter	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Salmonid Regulations S.I. No. 293 of 1988	Surface Water Regulations S.I. No. 272 of 2009
(mg/L)NO2-N								
Sulphate (mg/L)	5.14	4.85	5.70	4.78	4.56	4.36		
MRP, mg/L P	0.01	0.01	0.01	0.02	0.01	0.06		≤0.035
Total phosphorous P (mg/L)	0.09	<0.04	0.16	0.06	0.04	<0.04		
Total dissolved phosphorous P (mg/L)	0.09	<0.04	0.12	0.06	0.04	<0.04		
Particulate phosphorous (mg/L)	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04		
Ammonia	0.03	0.02	<0.02	0.03	0.02	<0.02	≤ 1	
Ammonia (unionised)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	≤ 0.02	
Metals								
Iron (mg/L)	0.251	0.146	0.025	0.089	0.110	0.16		
Aluminium (mg/L)	0.019	0.042	0.023	0.037	0.024	0.05		

Physiochemical water quality testing was undertaken on the 11th of June and 22nd of August 2012 at the same location as the Q value sampling to establish the baseline water quality of watercourses immediately downstream of the proposed windfarm.

Dissolved oxygen levels were >11mg/L in all the watercourses that were surveyed, indicating that all of the surface waters in the catchment areas had levels of oxygen capable of supporting healthy salmonid populations as per the Salmonid Water Regulations (SI No. 293 of 1988) .The pH levels at all sampling stations ranged between 7.5 and 7.7. These fall within the range >6 and <9 required under the Salmonid Water Regulations (S.I. No. 293 of 1988), required for balanced and healthy fish populations in the Salmonid Regulations.

Levels of unionised ammonia and nitrite recorded were within the thresholds specified in the Salmonid Regulations (S.I. No. 293 of 1988).Similarly the BOD levels were low with sites 1 through 5 inclusive, recording <1.0mg/L BOD and site 6 recording the highest levels; 1.4mg/L BOD. All sites were in compliance with the Salmonid Water Regulations.

Ortho-phosphate (MRP) levels were similar across sampling sites with 0.01mg/L levels recorded at sites 1, 2, 3 and 5 with site 4 recording 0.2mg/L and site 6 recording the highest levels of 0.06mg/L. Sites 1 through 5 levels are below the levels recommended in the Surface Water Regulations (S.I. No. 272 of 2009) meeting the requirements of the regulation, however site 6 exceeds the ≤0.035 recommended levels.

The suspended solid levels were low for streams 1 through 5, with levels recorded ranging from 2mg/L to 6mg/L. The value at sampling station 6 was the highest at 18 mg/L. All streams were in compliance with the threshold of <25mg/l required under the Salmonid Water Regulations (S.I. No. 293 of 1988).

2.2.5 Characteristics of the Project (Construction Phase)

2.2.5.1 Size, scale, area, land-take

The proposed windfarm site does not require land take from a Natura 2000 or Ramsar site. The proposed windfarm site is made up of four sections distributed in separate clusters over an overall area of approximately 12km^2. The total proposed site footprint is 110,210 m^2

2.2.5.2 Resource requirement

It is estimated that a total of 17,020m^3 of material will be required for the widening of existing tracks and the construction of new access tracks for the proposed development. It is estimated that construction of the hardstand areas will involve a total volume of 31,100m^3 of imported stone material. It is proposed to source the materials from at local registered quarries.

An average of 345m^3 of imported concrete will be required for each base.

2.2.5.3 Transportation requirements

New and upgrading of existing access tracks will be required to facilitate construction and turbine traffic during the construction, operational and decommissioning phases.

It is proposed that the turbine components will be delivered either from Dublin port or Foynes port. If the components are delivered from Dublin Port they will be transported west along the M7 to the Nenagh by-pass and turn onto the R498 at Knockalton Upper. If the turbine components are delivered from Foynes Port they will be transported east on the M7 to the Nenagh by-pass and turn right on the R498 at Knockalton Upper. The traffic will then travel the R498 into Thurles and turnaround at the Tipperary Institute roundabout and travel back up the R498 for 2.5km in order to effect the turn left onto the R503 after the Racecourse. The vehicles will travel west along the R503 for 17.1km and turn left onto the proposed Upperchurch Windfarm site entrance at an existing field gate at Graniera. The turbine deliveries and construction traffic will also use entrances from the local roads at Knockmaroe, Knockcurraghbola Commons, Shevry, Grousehall and Knocknamena Commons. It is expected that construction materials will be transported along a similar route.

2.2.5.4 Equipment requirement

In association with the above materials the following is a non-exhaustive typical list of plant and equipment that may be required for construction:

- 30-50T Excavators;
- Low ground pressure excavators (Bogmaster);
- Mobile cranes for construction;
- Rebar/shuttering/precast units/conc pipes/box culverts;
- Cranes (1 main, 1 assist) Erection 120t to 800t;
- Dump trucks;
- Tractors and trailers;
- Double contained fuel bowsers;
- 12t Rollers;
- Crushers;
- Screener;
- Diesel powered generators; and
- Water bowsers.

2.2.5.5 Excavation requirements

Implementation of the development will result in the removal of soil, subsoil and rock in parts of the site in order to facilitate the construction of access roads, the upgrade of existing farm roads, the substation compound, crane hard standings and turbine bases. This soil will be reused within the construction site for backfilling around turbine bases and for landscaping post construction.

The volumes of material to be excavated are summarised in Table 7.

TABLE 7 VOLUMES OF MATERIAL TO BE EXCAVATED

ELEMENT	TOPSOIL (M^3)	PEAT (M^3)	SUBSOIL (M^3)
TURBINE T01	**540**	**-**	**4,281**
TURBINE T02	**527**	**-**	**3,832**
TURBINE T03	**481**	**-**	**2,160**
TURBINE T04	**540**	**-**	**4,281**
TURBINE T05	**-**	**570**	**5,318**
TURBINE T06	**540**	**-**	**4,281**
TURBINE T07	**545**	**-**	**4,433**
TURBINE T08	**518**		**3,255**
TURBINE T09	**545**	**-**	**4,433**
TURBINE T10	**507**	**-**	**3,160**
TURBINE T11	**498**	**-**	**2,725**
TURBINE T12	**550**	**-**	**4,798**
TURBINE T13	**540**	**-**	**4,281**
TURBINE T14	**-**	**520**	**3,603**
TURBINE T15	**520**	**-**	**3,603**

ELEMENT	TOPSOIL (M^3)	PEAT (M^3)	SUBSOIL (M^3)
TURBINE T16	**518**	**-**	**3,255**
TURBINE T17	**505**	**-**	**2,928**
TURBINE T18	**505**	**-**	**2,928**
TURBINE T19	**498**	**-**	**2,725**
TURBINE T20	**518**	**-**	**3,255**
TURBINE T21	**505**	**-**	**2,928**
TURBINE T22	**-**	**505**	**2,928**
TURBINE T23	**507**	**-**	**3,160**
NEW ROADS	**13,050**	**900**	**0**
WIDENED ROADS	**2,070**	**360**	**0**
SUB-TOTALS (M^3)	25,527	2,855	79,623
TOTAL (M^3)	107,500		

2.2.5.6 Emissions during the lifetime of the project

Air pollutants from construction vehicles, plant, machinery or generators may include emissions of SO_2, NO_x, CO_2, and PM_{10} (particulates). Any traffic generated by the construction phase will be temporary and of short duration and may cause a temporary, slight, negative impact within the site.

There are no air pollutants or emissions associated with the operational phase of the windfarm. As a result there will be a neutral impact on the local area during the operational phase. The operation of the windfarm will have a positive impact on the national air and climate environment however, through the provision of pollution-free electricity.

2.2.5.7 Waste Management

From a waste management perspective the project can be divided into three phases

- Construction;
- Operation/Maintenance; and
- Decommissioning.

Construction phase waste may consist of hardcore, stone, concrete, steel reinforcement, shuttering timber and unused oil and diesel. This waste will be collected at the end of the construction phase and taken off site to be reused, recycled and disposed of in accordance with best practice procedures at an approved facility. Waste from toilets will be taken from site on a regular basis by approved contractors and disposed of in an authorised facility in accordance with best practice. Plastic waste will be taken for recycling by approved contractor and disposed or recycled at an approved facility.

Wastes arising during the operating phase of the project include but are not limited to lubricating oils, cooling oils and packaging from spare parts. The containment and disposal of such oils will be carried out in a safe manner by an approved contractor. Such operations will be carried out in accordance with the Waste Management (Hazardous Waste) Regulations, 1998. The remaining wastes will all be removed from site and reused, recycled or disposed of in an authorised facility in accordance with best practice.

Wastes generated during the decommissioning phase will be taken off site and disposed of appropriately.

2.2.5.8 Timescales

Once construction commences, it is estimated that the windfarm could be constructed within 8 months.

2.2.6 Description of construction

The first priority of the construction phase will be to construct the access road network, and associated drainage network, and upgrade the existing roads and the spine roads in particular so that they are capped with limestone or similar quality stone to reduce the potential for road degradation. Vehicular movements will be restricted to the footprint of the proposed development, particularly with respect to the newly constructed access roads.

The development is characterised by the following civil engineering works which will be undertaken to provide the necessary infrastructure to complete the windfarm:

- Construction of a temporary site compound;
- Construction of the access tracks and associated drainage;
- Construction of stream crossing;
- Construction of the turbine foundations;
- Construction of the hard stand areas for the turbine assembly and erection;
- Turbine and ancillary equipment transport to the site;
- Turbine erection;
- Construction of the electrical control building; and
- Laying of electrical cables.

2.2.6.1 Temporary site compound

A temporary site compound will be used at the site during the construction period for the safe storage of supplies and equipment, and the provision of toilet facilities (with temporary holding tank) and canteen facilities for construction staff. The holding tank will be emptied on a regular basis and taken to a wastewater treatment facility by a contractor with the appropriate waste collection permit. The compound and associated facilities will be removed on completion of construction and the area will be appropriately reinstated.

2.2.6.2 Access Roads

The construction phase of this project will require deliveries of material and turbines to the site. The access roads to the turbines and the site substation will consist of both existing tracks and newly constructed roads.

- Importation of stone from local quarries for the construction of access roads and hard standings.
- Construction of 8.0 km of 5.00m wide new roads; and
- Widening and upgrading of 3.6 km of existing farm roads (average 2m widening).

All new roads will be excavated, built up with suitable material and capped with suitable material.

2.2.6.3 Drainage

Site drainage has been considered in the Sediment and Erosion Plan detailed in **Appendix 15-I** of the EIS. This plan has been prepared to prevent sediment runoff and control erosion during the construction phase of the project. The plan has also been designed to minimise disturbance to the current hydrological regime and to minimise suspended sediment loading to watercourses during construction. Access tracks will be provided with drainage ditches to collect surface water runoff from the tracks and to ensure that road foundations are protected from standing water. Surface water drains will also be provided around hardstandings, foundations and the compound. Upslope drains will be constructed so as to keep clean water separate from runoff that may be contaminated by sediment. This is standard practice in the control of sediments in windfarm construction. Sediment traps will be used to ensure that all water discharged is clean.

2.2.6.4 Clearfelling

Prior to construction, clear-felling of approximately 4.35ha area of conifer plantation will be required to facilitate the construction the proposed windfarm and associated infrastructure.

2.2.6.5 Wind Turbine foundations and hardstands

Excavation for the construction of 22 turbine bases with a minimum depth of 2.00m and 225m^2 plan area and hardstands with and excavation depth of 0.60m and 1,040m^2 plan area;

Each wind turbine will have a reinforced concrete base pad foundation with a central upstand above the base, which will support the tower. The foundation pad will bear onto rock or other such suitable bearing stratum.

The turbine foundations be backfilled with the materials removed during excavation. The surface vegetation and topsoil layer will be removed and stored adjacent to the foundation site, whilst excavation of the foundation progresses. This stored material will be used during reinstatement of the foundation area following the construction of each wind turbine foundation.

Erection of 22 turbines with hub heights of up to 80m and maximum tip height of up to 126.60m. Once erected the wind turbines will operate automatically, requiring visits on a periodic basis only. These visits, primarily for turbine servicing, will typically be made using four-wheel drive vehicles which will keep to access roads.

2.2.6.6 Sub-station and grid connection

Construction of an electrical substation compound and installation of associated equipment and laying of electrical cable between turbines and the substation compound will be required. The substation compound will measure 64m x 41m. The cabling from the proposed turbines of the Upperchurch Windfarm will link to the proposed sub-station on site. The cables linking the turbine transformers will be located underground to reduce visual impact. A trench of at least 1m deep and 0.5m wide will accommodate these cables.

2.2.7 Operation, decommissioning and restoration

The windfarm will have a projected commercial lifespan of 20-25 years during which time it will produce pollution free electricity with the capacity to provide power, generating 150 million kWh, for up to 23,070 homes. There will be maintenance during the operating period with operating and maintenance personnel typically using four-wheel drive vehicles to visit the site. The system may be readily upgraded at the end of its commercial life, or alternatively decommissioned.

If it is decided to decommission the windfarm at the end of its lifespan, the turbines, transformers, meteorological monitoring mast and substation will be dismantled and removed from the site following consultation with North Tipperary County Council. All associated hardstand areas will be remediated to match the surrounding landcover at the time. An environmental assessment will be undertaken at that time to ascertain whether or not it would be more or less environmentally damaging to remove or keep in place the underground cables and access tracks. All materials removed from the site will be treated in accordance with best practice waste management procedures and will be in consultation with North Tipperary County Council.

2.2.8 Identification of other projects or plans

There are a number of existing windfarms to the west and south of the site. These are listed at Table 8, below.

TABLE 8: NEIGHBOURING WINDFARMS IN THE VICINITY EXISTING AND PERMITTED.

Wind farm	Number of Turbines	Distance and direction from proposed site	Status
Knockastanna, Co Limerick	4	8.1km S	Operating
Mienvee	1	9km SW	Operating
Garracummer	15	3.5km SW	In Construction
Falleennafinoga	2	5.5km S	In Construction
Hollyford	3	5.5km S	Permitted
Glencarbry	9	6.3kn S	Permitted
Glenough	14	3.2kn S	Operating
Cappagh White	18	8.5km S	Permitted
Curraghgraigue	6	9.5km N	Operating
Knockmeale	2	8.2km NW	Permitted
Knockastanna, Co Limerick	4	8.1km S	Operating

Other relevant projects and plans include:

- **Agriculture** is one of the main land uses within the area. Land reclamation, drainage, reseeding, fertilisation, and intensive grazing has transformed the landscape of this area.

- Forestry occurs within sections of the site**,** consisting of either mature or young conifer plantations. Felling has been carried out in sections and has been replanted with the youngest observed at the location of Turbine 22 standing at 1.5 meters high.

2.3 IDENTIFICATION OF NATURA 2000 SITES

2.3.1 Zone of impact influence

The screening stage of AA involves compiling a 'long list' of European sites within a zone of potential impact influence for later analysis which may or may ultimately not be impacted upon by the proposal. All Natura 2000 sites within 15km of the proposal location will be characterised in the context of the rationale for designation and qualifying features, in accordance with NPWS guidance. Following this, the potential impacts associated with the proposal will be identified before an assessment is made of the likely significance of these impacts. Finally, in the conclusion of the screening stage, the Natura 2000 sites within 15km whose integrity will not be adversely impacted will be ruled out. If screening indicates sites will be affected it will be necessary to proceed to Stage 2, Appropriate Assessment for a more detailed assessment.

2.3.2 Identification of Natura 2000 and Ramsar sites

Adopting the precautionary principle in identifying potentially affected European sites, it has been decided to include all cSACs and SPAs/Ramsar sites, within a 15km radius of the proposed windfarm site. The Convention on Wetlands of International Importance especially as Waterfowl Habitat, more commonly known as the Ramsar Convention, was ratified by Ireland in 1984. Ramsar sites are also subject to AA screening. Although not specifically required, it would be considered best practice to include Ramsar sites (classified under the Ramsar Convention 1971) in the appropriate assessment process[2].

Table 9 below lists all designated cSACs and classified SPA sites (referred to as designated sites from hereon in) within 15km of the proposal site including their proximity.

TABLE 9: DESIGNATED CONSERVATION SITES WITHIN A 15KM RADIUS OF PROPOSAL SITE

No.	Designated Site	Site Code	Proximity of site to nearest point of designated site
1	Slievefelim to Silvermines Mountains SPA	004165	Adjacent to the western boundary of turbines T17 to T21.
2	Anglesey Road cSAC	002125	2.55km south west of the proposed windfarm site.
3	Lower River Shannon cSAC	002165	2.7km west of the site boundary (T17 to T21).
4	Lower River Suir cSAC	002137	2.8km east of the proposed windfarm site and approximately 4.1km downstream.
5	Bolingbrook hill SAC	002124	6.9km north west of the site boundary (T17 to T21).
6	Keeper Hill SAC	001197	10.7km north west of the site

[2] EPA, A Note on Waste Water Discharging Licence Appropriate Assessments

No.	Designated Site	Site Code	Proximity of site to nearest point of designated site
			boundary (T17 to T21).
7	Silvermines mountains West SAC	002258	11.25km north west of the site boundary (T17 to T21).
8	Kilduff, Devilsbit Mountain SAC	000934	13.35km north east of the site boundary (T9 to T16)
9	Philipston Marsh SAC	001847	13.6km south west of the site boundary (T1 to T8).

2.3.3 Characteristics of Natura 2000 and Ramsar sites

Table 10, below, characterises the cSACs, SPA and Ramsar sites that lie within 15km of the proposal site by listing the qualifying features and other conservation interests (information pertaining to designated sites is from site synopses, conservation objectives and other information available on www.npws.ie and on the Ramsar website). The qualifying Features of Interest are the primary reasons for the European sites designation, for instance the endangered species that occupy the SAC; rare habitats that occur there; or threatened birds that breed or over-winter in the SPA.

TABLE 10: DESIGNATED CONSERVATION SITES WITH QUALIFYING FEATURES OF CONSERVATION INTEREST

Designated Site	**Site Code**	**Features of Interest**
Slievefelim to Silvermines Mountains SPA	004165	Hen Harrier (*Circus cyaneus*) [A082]
Anglesey Road cSAC	002125	Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230]
Lower River Shannon cSAC	002165	Freshwater pearl mussel (*Margaritifera margaritifera*) [1029] Sea lamprey (*Petromyzon marinus*) [1095] Brook lamprey (*Lampetra planeri*) [1096] River lamprey (*Lampetra fluviatilis*) [1099] Salmon (*Salmo salar*) [1106] Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonizing mud and sand [1310] *Spartina* swards (*Spartinion maritimae*) [1320] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Bottle-nosed dolphin (*Tursiops truncatus*) [1349] Otter (*Lutra lutra*) [1355] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Molinia meadows on calcareous, peaty or clavey-silt-laden soils (*Molinion caeruleae*) [6410] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0]
Lower River Suir cSAC	002137	Freshwater pearl mussel (*Margaritifera margaritifera*) [1029] White-clawed crayfish (*Austropotamobius pallipes*) [1092] Sea lamprey (*Petromyzon marinus)* [1095] Brook lamprey (*Lampetra planeri*) [1096] River lamprey (*Lampetra fluviatilis*) [1099] Allis shad (*Alosa alosa*) [1102] Twaite shad (*Alosa fallax fallax*) [1103] Salmon (*Salmo salar*) [1106] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

Designated Site	Site Code	Features of Interest
		[1330] Otter (*Lutra lutra*) [1355] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Old sessile oak woods with *Ilex* and Blechnum in British Isles [91A0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0] *Taxus baccata* woods of the British Isles [91J0]
Bolingbrook hill SAC	002124	Northern Atlantic wet heaths with *Erica tetralix* [4010] European dry heaths [4030] Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230]
Keeper Hill SAC	001197	Northern Atlantic wet heaths with *Erica tetralix* [4010] Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230] Blanket bog (*active only) [7130]
Silvermines Mountains West SAC	002258	Northern Atlantic wet heaths with *Erica tetralix* [4010] European dry heaths [4030] Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230] Blanket bog (*active only) [7130]
Kilduff, Devilsbit Mountain SAC	000934	European dry heaths [4030] Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230]
Philipston Marsh SAC	001847	Transition mires and quaking bogs [7140] Alkaline fens [7230]

Conservation Objectives of the sites outlined in Table 10 above are included in **Appendix 13-II B**.

2.3.4 Conservation Objectives

According to the Habitat's Directive, the *conservation status of a natural habitat* will be taken as 'favourable' when:

- its natural range and areas it covers within that range are stable or increasing, and

- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable as defined below.

According to the Habitat's Directive, the *conservation status of a species* means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations. The *conservation status* will be taken as 'favourable' when:

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

These conservation objectives are of a wide-ranging nature and most of the conservation objectives developed by NPWS for Natura 2000 sites area are adapted from these and are published on line by the NWPS as 'Generic Conservation Objectives' documents. The available documents are included in **Appendix 13-II B**. Site specific Conservation Management Plans have been developed for some sites listed at Table 10, above, namely Bolingbrook Hill, Keeper Hill and Kilduff, Devilsbit Mountain SACs and these documents are published on line at www.npws.ie.

Figures 13-II-1 and **Figure 13-II-2** at the end of Chapter 13 show the Natura 2000 Sites located within 15 km of the proposed development site. No Ramsar Sites were recorded within 15 km of the proposed development. Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs) have been omitted from the list as they outside the scope of the Appropriate Assessment. The potential impact to these sites is discussed in Ecology chapter of the main EIS document Chapter 13.

2.3.5 Identification of Potential Impacts

Potential impacts are identified in this section. Only those features of the development that have the potential to impact on qualifying features, conservation interests and conservation objectives of the identified Natura 2000 sites are considered.

Description of elements of the project likely to give rise to impacts on Natura 2000 sites.	• Use of plant machinery and associated fuels and oils. • Increased levels of disturbance due to human activities during the construction phase. • Waste generation during construction phase. • Excavations for turbine bases, roads etc. • Extension of the existing road network footprint and associated drainage. • Near and in stream works required for road network stream crossings. • Felling of 4.35 ha. of pre-thicket and post thicket conifer plantation
Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on Natura 2000 sites by virtue of: • *Size and scale;* • *Land-take;* • *Distance from Natura 2000 Site or key features of the Site;* • *Resource requirements;* • *Emissions;* • *Excavation requirements;* • *Transportation requirements;* • *Duration of construction, operation etc.; and* • *Other.*	• Construction phase excavations to be conducted within the catchment of a headwater of an SAC designated for the protection of riparian habitats and species have the potential to initiate point source pollution events. • Soil exposed during construction phase could potentially be transferred via surface water runoff to water courses. • Construction of road network, and its associated drainage network, introduces a potential pollution pathway enabling the transfer of pollutants to ground and surface water during construction and operational phases. • Fugitive noise from construction phase activity and human presence could create disturbance impacts on animal species present within the zone of impact influence. • **Movement of plant and machinery**: Most of the traffic movement within the site will be over existing excavated tracks. • **Ground stability**: The approach to and method of excavation of rock and earth materials is very important for ground stability. Interference with the existing ground stability conditions by inappropriate excavation methods such as continuous vehicular movement over excavated soil must be mitigated by appropriate construction methods. • **Storage, Stockpiles and Waste Generation**: Of significance during the construction phase of the project is the handling of excavated materials, their

	storage and re-use. There is potential for negative direct and indirect short-term minor impact on ground stability and negative direct and indirect short-term moderate to significant impact on water quality, for example slope failure due to excessive loading (surcharge) > 1m in height and the resultant release of peat washings and suspended solids to the surface water system. • **Use of Fuels and Oils:** The plant equipment that will be used during the construction stage is run on hydrocarbons. This implies that mobile equipment will require regular refuelling from a fuelling station, which is likely to be stored on site or will be supplied by a truck / tanker that will be scheduled to re-fuel the plant directly. This poses the potential for spillage and leakage of hydrocarbons from plant equipment and associated transfer stations during the construction phase of this project.
Describe any likely changes to the site arising as a result of: • *Reduction of habitat area;* • *Disturbance of key species;* • *Habitat or species fragmentation;* • *Reduction in species density;* • *Changes in key indicators of conservation value; and* • *Climate change.*	• Due to the alteration of the environment rainwater falling on the development footprint will follow a new drainage regime. • Detrimental water quality impacts could cause significant changes in the water quality influencing the conservation status of the aquatic habitats and designated species creating disturbance or displacement impacts.
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; and* • *Interference with key relationships that define the function of the site.*	Detrimental water quality impacts could cause significant interference with the key relationships that define the structure and function of the site.
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale of	The combined elements of the construction phase could potentially create significant impacts in aquatic habitats in streams adjacent to the site and in the Natura 2000 site to which they drain.

magnitude of impacts is not known.	

2.4 ASSESSMENT OF SIGNIFICANCE OF POTENTIAL IMPACTS

This section considers the list of sites identified in section 2.3 above. The magnitude/extent, probability and duration of significant impacts affecting these sites are examined in the following sections.

It is considered that the proposed windfarm development does not include any element that has the potential to significantly alter the favourable conservation status of species and habitats for which certain Natura 2000 sites, and considered in this document, are designated. It is considered that these sites are outside the zone of impact influence of the proposed windfarm and that the conditions required to initiate a potential 'source-pathway-target' vector connecting the proposed windfarm to these designated sites will not be created. It is further considered that no potential impact pathway connects these designated sites to the location of the proposed works and, therefore, it is objectively concluded that no impact on these sites is reasonably foreseeable as a result of the proposed windfarm. These sites are listed below and will not be considered further in this document.

- **Anglesey Road cSAC (002125)**
- **Bolingbrook hill SAC (002124)**
- **Kilduff, Devilsbit Mountain SAC (000934)**
- **Silvermines mountains West SAC (002258)**
- **Keeper Hill SAC (001197)**
- **Philipston Marsh SAC (001847)**

Therefore, the assessment of significance of potential impacts that follows focuses on the remaining designated sites. These sites are:

- **Lower River Shannon cSAC (002165)**
- **Lower River Suir cSAC (002137)**
- **Slievefelim to Silvermines Mountains SPA (004165)**

The potential for significant impacts on the remaining three Natura 2000 Sites arising from the proposal was determined based on a number of indicators including:

- Habitat loss;
- Habitat alteration;
- Habitat or species fragmentation;
- Disturbance and/or displacement of species;
- Water quality and resource.

2.4.1 Habitat Loss and Alteration

The proposal considered in this document does not require any land take from any Natura 2000 or Ramsar site. It is considered that no significant habitat loss or alteration impacts, within any of the designated sites considered in this document, are reasonably foreseeable as a result of the proposal considered in this document. Indirect impacts on aquatic habitats are assessed in section 2.4.3 below.

2.4.2 Habitat or Species Fragmentation

Bearing in mind the size, scale and duration of the proposed windfarm and its location relative to the relevant designated sites, it is considered that no significant habitat or species fragmentation impacts are reasonably foreseeable within any of the designated sites considered in this document,as a result of the proposal considered in this document.

2.4.3 Disturbance and/or displacement of species

The species, for which the Natura 2000 sites are designated, can be separated into Aquatic, Terrestrial/Riparian and Avian categories as follows:

2.4.3.1 Aquatic

- Sea lamprey (*P. marinus*) [***Lower River Suir cSAC and Lower River Shannon cSAC***]
- Brook lamprey (*L. planeri*) [***Lower River Suir cSAC and Lower River Shannon cSAC***]
- River lamprey (*L. fluviatilis*) [***Lower River Suir cSAC and Lower River Shannon cSAC***]
- Salmon (*S.salar*) [***Lower River Suir cSAC and Lower River Shannon cSAC***]
- Freshwater pearl mussel (*M. margaritifera*) [***Lower River Suir cSAC and Lower River Shannon cSAC***]
- White-clawed crayfish (*A. pallipes*) [***Lower River Suir cSAC***]
- Allis shad (*Alosa alosa*) [***Lower River Suir cSAC***]
- Twaite shad (*A. fallax fallax*) [***Lower River Suir cSAC***]
- White-clawed crayfish (*A. pallipes*) [***Lower River Suir cSAC***]
- Bottle-nosed dolphin (*T. truncatus*) [1349] [***Lower River Shannon* cSAC**]

Aquatic species are considered further in section 2.5.4 Water Quality.

2.4.3.2 Terrestrial/Riparian

- Otter (L. lutra) [Lower River Suir cSAC and Lower River Shannon cSAC]

2.4.3.3 Avian

- Hen harrier (Circus cyaneus) [Slievefelim to Silvermines Mountains SPA]

There is the potential that some of the species maybe impacted by the proposed development and this will be considered further in the Natura Impact Statement.

2.4.4 Water Quality

The proposed site drains into streams that form the upper reaches of the Turraheen, Owenbeg, Clodiagh and Aughvana Rivers. The first three of these rivers form part of the South Eastern River Basin District and ultimately join the River Suir [The Lower River Suir cSAC (Site Code:002137)]to the southeast. The Aughvana River, which forms part of the Shannon River Basin District, joins the Mulkear River and ultimately flows into the River Shannon [Lower River Shannon cSAC (Site Code:002165)]. The watercourses both within and adjacent to the site boundary are tributaries of both the Lower River Suir and the Lower River Shannon cSAC.

No work will take place within 50m buffer zones of watercourses, except at clear span bridges or culverts and associated road construction. A total of three first order streams occur within the site boundary. One stream/river crossing will be required, approximately 254 m to the north of Turbine 4. All construction method statements will be prepared in consultation with Inland Fisheries Ireland.

Roadside drainage will be an integral part of the proposed Upperchurch Windfarm considered in this document. The construction of new roads and the upgrading and widening of existing farm roads will comprise of an integrated set of drainage and sediment control measures which will allow pollution control attenuation prior to discharge across ground rather than to surface water, thereby preventing water runoff from entering watercourses directly.

While the water quality in the Lower River Suir cSAC and the Lower River Shannon cSAC is not in itself a feature of qualifying interest of the SACs it is the case that adverse impacts to their water chemistry could have indirect impacts on the conservation interests of the site; for example by affecting the distribution and density of white-clawed crayfish and the Fresh water pearl mussel or the distribution and density of salmonids which in turn could, potentially, affect the availability of prey for otter.

2.4.4.1 Lower River Suir cSAC (Site Code: 002137)

Most of the Upperchurch site is within the South Eastern River Basin District and drains to the Owenbeg River and ultimately to the River Suir. The River Suir Catchment covers a large area of 3,546km^2, which represents approximately 4% of the land area of the island of Ireland. The catchment includes extensive lowland areas, particularly along the major river valleys such as those of the Suir, the Aherlow, the Multeen and the Anner; and upland areas including parts the Comeragh Mountains, the Knockmealdown Mountains and the Galtee Mountains, rising to an altitude of 919m at Galtymore.

A number of fish species listed under Annex II of the EU Habitats Directive occur within the Suir catchment. These include Atlantic salmon (*S.salar*). All three lamprey species: sea lamprey (*Petromyzon marinus*), river lamprey (*Lampreta fluviatilis*) and brook lamprey (*Lampetra planeri*), which are likely to occur throughout much of the catchment. Allis shad (*Aloso aloso*) and twaite shad (*Alosa fallax fallax*) which occur in Waterford Harbour and tidal sections of the lower River Suir at least as far upstream as Carrick-on-Suir.

A number of protected invertebrates also occur within the Suir catchment which include the freshwater pearl mussel (*Margaritifera margaritifera*) and the White clawed crayfish (*A. pallipes*).

A fishery survey of the River Suir Catchment and Management Recommendations was prepared by the Regional Fisheries Board on behalf of the SE Region Fisheries Board in 2006. The major objective of the assessment was to establish the status of fish stocks in relation to the ecology of the Suir and its tributaries, and to use this data to generate focused management programmes. The Suir is recognised as a premier brown trout angling fishery and also a major salmon fishery. In 2005 the Suir was ranked as the 4th best salmonid river in Ireland, based on angling returns (CFB, 2006).

2.4.4.2 Lower River Shannon cSAC (Site Code: 002165)

The south western boundary of the proposed Upperchurch is within the Shannon River Basin District and drains to the Aughvana River and ultimately to the Mulkear River which is part of the Lower River Shannon cSAC.

The Lower River Shannon cSAC is a very large site stretching along the Shannon valley from Killaloe to Loop Head/ Kerry Head, a distance of some 120 km. 4 species of fish listed on Annex II of the EU Habitats Directive are found within the site. These are Sea Lamprey (*Petromyzon marinus*), Brook Lamprey (*Lampetra planeri*), River Lamprey (*Lampetra fluviatilis*), and Salmon (*Salmo salar*). The three lampreys and Atlantic salmon have all been observed spawning in the lower Shannon or its tributaries. Freshwater Pearl-mussel (*Margaritifera margaritifera*), a species listed on Annex II of the EU Habitats Directive, occurs abundantly in parts of the Cloon River.

2.4.4.3 Conclusion

With regard to the conservation interests of the Lower River Shannon cSAC and the Lower River Suir cSAC it is noted that there is the potential for an unmitigated impact as a result of the proposed development. This impact and proposed mitigations are discussed further in the Natura Impact Statement.

2.5 CONCLUSION OF SCREENING STAGE

In conclusion, to determine the potential impacts, if any, of the proposed windfarm on nearby Natura 2000/Ramsar sites, a screening process for AA was undertaken. The proposed development is within 15km of 9 Natura 2000 Sites. There are no Ramsar sites within 15km of the proposed development.

In concluding the above assessments of significance, it has been shown that there will be no potential impact to the following sites as a result of the proposed development:

- **Anglesey Road cSAC (002125)**
- **Bolingbrook hill SAC (002124)**
- **Kilduff, Devilsbit Mountain SAC (000934)**
- **Silvermines mountains West SAC (002258)**
- **Keeper Hill SAC (001197)**
- **Philipston Marsh SAC (001847)**

However, the proposed project could have potential negative ecological affects on three Natura Sites namely the *Lower River Shannon cSAC, Lower River Suir cSAC* and *Slievefelim to Silvermines Mountains SPA.*

Hence, the recommendation of the screening process is to proceed to Stage 2; Statement for Appropriate Assessment for three Natura 2000 Sites:

1. **Lower River Shannon cSAC (Site code: 002165);**
2. **Lower River Suir cSAC (002137); and**
3. **Slievefelim to Silvermines Mountains SPA (004165)**

3 Natura Impact Statement

3.1 INTRODUCTION

The main objective of Stage 2 of the Appropriate Assessment process is to consider the impact of the project or plan on the integrity of the Natura 2000 and Ramsar Sites, either alone or in combination with other projects, with respect to the conservation objectives of the sites and to identify and assess mitigation measures against any adverse effects the plan or project is likely to cause. Following the screening stage of the Appropriate Assessment, three Natura 2000 Sites were identified that may potentially be impacted by the proposed development are described below followed by further descriptions and details of the characteristics of the proposal. The potential impacts resulting from the unmitigated construction phase of the proposal, and from its operational phase, are then discussed in relation to the conservation objectives of the sites. Mitigation measures where appropriate are presented in below in Section 3.7.

3.1.1 Information sources

Information from the following sources was used to compile the Natura Impact Assessment:

- Winter Bird Survey – November 2010 to March 2011 (Chapter 13 of this EIS);
- Summer Bird Survey – April 2011 to August 2011 (Chapter 13 of this EIS);
- Habitat survey of the site – conducted by ecologists during the month of June 2012 (Chapter 13 of this EIS);
- Mammal survey conducted in conjunction with the habitat survey (Chapter 13 of this EIS);
- The geotechnical stability assessment (Chapter 14 of this EIS);
- National Biodiversity Centre Mapping System[3]
- National Parks and Wildlife Services (NPWS); and
- BirdWatch Ireland;

Publications that are used here and not referenced specifically include:

- Lynas, P., Newton, S.F., and Robinson, J.A. (2007). The status of birds in Ireland: an analysis of conservation concern 2008-2013. Irish Birds, 8: 149-167.
- Crowe, O., 2005. Ireland's Wetlands and their Waterbirds: status and distribution. BirdWatch Ireland.
- Gibbons, D.W., Reid, J.B. and R.A. Chapman, 1993. The New Atlas of Breeding Birds in Britain and Ireland: 1988-1991. British Trust for Ornithology, 1993.

[3] Available at : http://maps.biodiversityireland.ie/#/Home [accessed on various dates July, August 2012]

- Dempsey, E and O' Clery, M. (2010). The Complete Field Guide to Ireland's Birds.
- Commission of the European Communities (2003). Interpretation manual of European Union Habitats-EUR 25. DG Environment-Nature and Biodiversity. Brussels.

3.2 DESCRIPTION OF THE PROJECT

A detailed description of the characteristics is outlined at section 2.4 above and further detail is presented in Chapter 7 – Construction Impacts and Employment of the EIS.

3.3 CHARACTERISTICS OF NATURA 2000 SITES

The NPWS site synopses of the Natura 2000 Sites are provided below to describe the site in more detail. The dates on which the site synopses were written are included at the end of each synopsis.

3.3.1 The Lower River Shannon candidate Special Area of Conservation (cSAC) (Site code: 002165) site synopsis (NPWS)

This very large cSAC stretches along the Shannon valley from Killaloe to Loop Head/ Kerry Head, a distance of some 120 km. The site thus encompasses the Shannon, Feale, Mulkear and Fergus Estuaries, the freshwater lower reaches of the River Shannon (between Killaloe and Limerick), the freshwater stretches of much of the Feale and Mulkear catchments and the marine area between Loop Head and Kerry Head. The Shannon and Fergus flow through Carboniferous limestone as far as Foynes, but west of Foynes Namurian shales and flagstones predominate (except at Kerry Head, which is formed from Old Red Sandstone). The eastern sections of the Feale catchment flow through Namurian Rocks and the western stretches through Carboniferous Limestone. The Mulkear flows through Lower Palaeozoic Rocks in the upper reaches before passing through Namurian Rocks, followed by Lower Carboniferous Shales and Carboniferous Limestone. The Mulkear River itself, immediately north of Pallas Green, passes through an area of Rhyolites, Tuffs and Agglomerates. Rivers within the subcatchment of the Feale include the Galey, Smearlagh, Oolagh, Allaughaun, Owveg, Clydagh, Caher, Breanagh and Glenacarney. Rivers within the sub-catchment of the Mulkear include the Killeenagarriff, Annagh, Newport, the Dead River, the Bilboa, Glashacloonaraveela, Gortnageragh and Cahernahallia.

The Shannon and Fergus Estuaries form the largest estuarine complex in Ireland. They form a unit stretching from the upper tidal limits of the Shannon and Fergus Rivers to the mouth of the Shannon estuary (considered to be a line across the narrow strait between Kilcredaun Point and Kilconly Point). Within this main unit there are several tributaries with their own 'sub-estuaries' e.g. the Deel River, Mulkear River, and Maigue River. To the west of Foynes, a number of small estuaries form indentations in the predominantly hard coastline, namely

Poulnasherry Bay, Ballylongford Bay, Clonderalaw Bay and the Feale or Cashen River Estuary. Both the Fergus and inner Shannon estuaries feature vast expanses of intertidal mudflats, often fringed with saltmarsh vegetation. The smaller estuaries also feature mudflats, but have their own unique characteristics, e.g. Poulnasherry Bay is stony and unusually rich in species and biotopes. Plant species are typically scarce on the mudflats, although there are some Eel-grass beds (Zostera spp.) and patches of green algae (e.g. Ulva sp. and Enteromorpha sp.). The main macro-invertebrate community, which has been noted from the inner Shannon and Fergus estuaries, is a Macoma- Scrobicularia-Nereis community. In the transition zone between mudflats and saltmarsh, specialised colonisers of mud predominate: swards of Common Cord-grass (Spartina anglica) frequently occur in the upper parts of the estuaries. Less common are swards of Glasswort (Salicornia europaea agg.). In the innermost parts of the estuaries, the tidal channels or creeks are fringed with species such as Common Reed (Phragmites australis) and Club-rushes (Scirpus maritimus, S. tabernaemontani and S. triquetrus). In addition to the nationally rare Triangular Club-rush (Scirpus triquetrus), two scarce species are found in some of these creeks (e.g. Ballinacurra Creek): Lesser Bulrush (Typha angustifolia) and Summer Snowflake (Leucojum aestivum).

Saltmarsh vegetation frequently fringes the mudflats. Over twenty areas of estuarine saltmarsh have been identified within the site, the most important of which are around the Fergus Estuary and at Ringmoylan Quay. The dominant type of saltmarsh present is Atlantic salt meadow occurring over mud. Characteristic species occurring include Common Saltmarsh Grass (Puccinellia maritima), Sea Aster (Aster tripolium), Thrift (Armeria maritima), Sea-milkwort (Glaux maritima), Sea Plantain (Plantago maritima), Red Fescue (Festuca rubra), Creeping Bent (Agrostis stolonifera), Saltmarsh Rush (Juncus gerardi), Long-bracted Sedge (Carex extensa), Lesser Seaspurrey (Spergularia marina) and Sea Arrowgrass (Triglochin maritima). Areas of Mediterranean salt meadows, characterised by clumps of Sea Rush (Juncus maritimus) occur occasionally. Two scarce species are found on saltmarshes in the vicinity of the Fergus Estuary: a type of robust Saltmarsh-grass (Puccinellia foucaudii), sometimes placed within the compass of Common Saltmarsh-grass (Puccinellia maritima) and Hard-grass (Parapholis strigosa). Saltmarsh vegetation also occurs around a number of lagoons within the site. The two which have been surveyed as part of a National Inventory of Lagoons are Shannon Airport Lagoon and Cloonconeen Pool. Cloonconeen Pool (4-5 ha) is a natural sedimentary lagoon impounded by a low cobble barrier. Seawater enters by percolation through the barrier and by overwash. This lagoon represents a type which may be unique to Ireland since the substrate is composed almost entirely of peat. The adjacent shore features one of the best examples of a drowned forest in Ireland.

Aquatic vegetation in the lagoon includes typical species such as Beaked Tasselweed (Ruppia maritima) and green algae (Cladophora sp.). The fauna is not diverse, but is typical of a high salinity lagoon and includes six lagoon specialists (Hydrobia ventrosa, Cerastoderma glaucum, Lekanesphaera hookeri, Palaemonetes varians, Sigara stagnalis and Enochrus bicolor). In contrast, Shannon Airport Lagoon (2 ha) is an artificial saline lake with an *artificial barrier and sluiced outlet. However, it supports two Red Data Book species of Stonewort (Chara canescens and Chara cf. connivens).*

Most of the site west of Kilcredaun Point/Kilconly Point is bounded by high rocky sea cliffs. The cliffs in the outer part of the site are sparsely vegetated with lichens, Red Fescue, Sea Beet (Beta vulgaris), Sea Campion (Silene maritima), Thrift and Plantains (Plantago spp.). A rare endemic Sea Lavender (Limonium recurvum subsp. pseudotranswallinum) occurs on cliffs near Loop Head. Cliff-top vegetation usually consists of either grassland or maritime heath. The boulder clay cliffs further up the estuary tend to be more densely vegetated, with swards of Red Fescue and species such as Kidney Vetch (Anthyllis vulneraria) and Bird's-foot Trefoil (Lotus corniculatus).

The site supports an excellent example of a large shallow inlet and bay. Littoral sediment communities in the mouth of the Shannon Estuary occur in areas that are exposed to wave action and also in areas extremely sheltered from wave action. Characteristically, exposed sediment communities are composed of coarse sand and have a sparse fauna. Species richness increases as conditions become more sheltered. All shores in the site have a zone of sand hoppers at the top and below this each of the shores has different characteristic species giving a range of different shore types in the cSAC. The intertidal reefs in the Shannon Estuary are exposed or moderately exposed to wave action and subject to moderate tidal streams. Known sites are steeply sloping and show a good zonation down the shore. Well developed lichen zones and littoral reef communities offering a high species richness in the sublittoral fringe and strong populations of Paracentrotus lividus are found. The communities found are tolerant to sand scour and tidal streams. The infralittoral reefs range from sloping platforms with some vertical steps to ridged bedrock with gullies of sand between the ridges to ridged bedrock with boulders or a mixture of cobbles, gravel and sand. Kelp is very common to about 18m. Below this it becomes rare and the community is characterised by coralline crusts and red foliose algae.

Other coastal habitats that occur within the site include the following:

- *Stony beaches and bedrock shores - these shores support a typical zonation of seaweeds (Fucus spp., Ascophyllum nodosum and kelps).*
- *Shingle beaches - the more stable areas of shingle support characteristic species such as Sea Beet, Sea Mayweed (Matricaria maritima), Sea Campion and Curled Dock (Rumex crispus).*
- *Sandbanks which are slightly covered by sea water at all times – there is a known occurrence of sand/gravel beds in the area from Kerry Head to Beal Head.*
- *Sand dunes - a small area of sand dunes occurs at Beal Point. The dominant species is Marram Grass (Ammophila arenaria).*

Flowing into the estuaries are a number of tidal rivers. Freshwater rivers have been included in the site, most notably the Feale and Mulkear catchments, the Shannon from Killaloe to Limerick (along with some of its tributaries, including a short stretch of the Kilmastulla River), the Fergus up as far as Ennis, and the Cloon River. These systems are very different in character: the Shannon being broad, generally slow-flowing and naturally eutrophic; the Fergus being smaller and alkaline; while the narrow, fast-flowing Cloon is acid in nature. The Feale and Mulkear catchments exhibit all the aspects of a river from source to mouth. Seminatural habitats, such as wet grassland, wet woodland and marsh occur by the rivers, however, improved grassland is most common. One grassland type of particular conservation significance, Molinia meadows, occurs in several parts of the site and the examples at Worldsend on the River Shannon are especially noteworthy. Here are found areas of wet meadow dominated by rushes and sedges and supporting a diverse and species-rich vegetation, including such uncommon species as Blue-eyed Grass (Sisyrinchium bermudiana) and Pale Sedge (Carex pallescens). Floating river vegetation characterised by species of Water-crowfoot (Ranunculus spp.), Pondweeds (Potamogeton spp.) and the moss Fontinalius antipyretica are present throughout the major river systems within the site. The rivers contain an interesting bryoflora with Schistidium alpicola var. alpicola recorded from in-stream boulders on the Bilboa, new to county Limerick. Alluvial woodland occurs on the banks of the Shannon and on islands in the vicinity of the University of Limerick. The woodland is up to 50m wide on the banks and somewhat wider on the largest island. The most prominent woodland type is gallery woodland where White Willow (Salix alba) dominates the tree layer with occasional Alder (Alnus glutinosa). The shrub layer consists of various willow species with sally (Salix cinerea ssp. oleifolia) and what appear to be hybrids of S. alba x S. viminalis. The herbaceous layer consists of tall perennial herbs. A fringe of Bulrush (Typha sp.) occurs on the riverside of the woodland. On slightly higher ground above the wet woodland and on the raised embankment remnants of mixed oak-ash-alder woodland occur. These are poorly developed and contain numerous exotic species but locally there are signs that it is invading open grassland. Alder is the principal tree species with occasional Oak (Quercus robur), Elm (Ulmus glabra, U. procera), Hazel (Corylus avellana), Hawthorn (Crataegus monogyna) and the shrubs Guelder-rose (Viburnum opulus) and willows. The ground flora is species-rich. Woodland is infrequent within the site, however Cahiracon Wood contains a strip of old Oak woodland. Sessile Oak (Quercus petraea) forms the canopy, with an understorey of Hazel and Holly (Ilex aquifolium). Great Wood-rush (Luzula sylvatica) dominates the ground flora. Less common species present include Great Horsetail (Equisetum telmeteia) and Pendulous Sedge (Carex pendula). In the low hills to the south of the Slievefelim mountains, the Cahernahallia River cuts a valley through the Upper Silurian rocks. For approximately 2 km south of Cappagh Bridge at Knockanavar, the valley sides are wooded. The woodland consists of Birch (Betula spp.), Hazel, Oak, Rowan (Sorbus aucuparia), some Ash (Fraxinus excelsior) and Willow (Salix spp.). Most of the valley is not grazed by stock, and as a result the trees are regenerating well. The ground flora feature prominent Greater wood-rush and Bilberry (Vaccinium myrtillus) with a typical range of woodland herbs. Where there is more light available, Bracken (Pteridium aquilinum) features. The valley sides of the Bilboa and Gortnageragh Rivers, on higher ground north *east of Cappamore, support patches of semi-natural broadleaf woodland dominated by Ash, Hazel, Oak and Birch. There is a good scrub layer with Hawthorn, Willow, Holly and Blackthorn (Prunus spinosa) common. The herb layer in these woodlands is often open with a typically rich mixture of woodland herbs and ferns. Moss species diversity is high. The woodlands are ungrazed. The hazel is actively coppiced in places.*

There is a small area of actively regenerating cut away raised bog at Ballyrorheen. It is situated approx. 5 km north west of Cappamore Co. Limerick. The bog contains some wet areas with good moss (Sphagnum) cover. Species of particular interest include the Cranberry (Vaccinium oxycoccos) and the White Sedge (Carex curta) along with two other regionally rare mosses including S. fimbriatum. The site is being invaded by Birch (Betula pubescens) scrub woodland. Both commercial forestry and the spread of rhododendron has greatly reduced the overall value of the site. A number of plant species that are Irish Red Data Book species occur within the site - several are protected under the Flora (Protection) Order, 1999:

- *Triangular Club-rush (Scirpus triquetrus) - in Ireland this protected species is only found in the Shannon Estuary, where it borders creeks in the inner estuary.*
- *Opposite-leaved Pondweed (Groenlandia densa) - this protected pondweed is found in the Shannon where it passes through Limerick City.*
- *Meadow Barley (Hordeum secalinum) - this protected species is abundant in saltmarshes at Ringmoylan and Mantlehill.*
- *Hairy Violet (Viola hirta) - this protected violet occurs in the Askeaton/Foynes area.*
- *Golden Dock (Rumex maritimus) - noted as occurring in the River Fergus Estuary.*
- *Bearded Stonewort (Chara canescens) - a brackish water specialist found in Shannon Airport lagoon.*
- *Convergent Stonewort (Chara connivens) - presence in Shannon Airport Lagoon to be confirmed.*

Overall, the Shannon and Fergus Estuaries support the largest numbers of wintering waterfowl in Ireland. The highest count in 1995-96 was 51,423 while in 1994-95 it was 62,701. Species listed on Annex I of the E.U. Birds Directive which contributed to these totals include: Great Northern Diver (3; 1994/95), Whooper Swan (201; 1995/96), Pale-bellied Brent Goose (246; 1995/96), Golden Plover (11,067; 1994/95) and Bar-tailed Godwit (476; 1995/96). In the past, three separate flocks of Greenland White-fronted Goose were regularly found but none were seen in 1993/94. Other wintering waders and wildfowl present include Greylag Goose (216; 1995/96), Shelduck (1,060; 1995/96), Wigeon (5,976; 1995/96); Teal (2,319; 1995-96); Mallard (528; 1995/96), Pintail (45; 1995/96), Shoveler (84; 1995/96), Tufted Duck (272; 1995/96), Scaup (121; 1995/96), Ringed Plover (240; 1995/96), Grey Plover (750; 1995/96), Lapwing (24,581; 1995/96), Knot (800; 1995/96), Dunlin (20,100;

1995/96), Snipe (719, 1995/96), Black-tailed Godwit (1062; 1995/96), Curlew (1504; 1995/96), Redshank (3228; 1995/96), Greenshank (36; 1995/96) and Turnstone (107; 1995/96). A number of wintering gulls are also present, including Black-headed Gull (2,216; 1995/96), Common Gull (366; 1995/96) and Lesser Black-backed Gull (100; 1994/95). This is the most important coastal site in Ireland for a number of the waders including Lapwing, Dunlin, Snipe and Redshank. It also provides an important staging ground for species such as Black-tailed Godwit and Greenshank. A number of species listed on Annex I of the E.U. Birds Directive breed within the cSAC site. These include Peregine Falcon (2-3 pairs), Sandwich Tern (34 pairs on Rat Island, 1995), Common Tern (15 pairs: 2 on Sturamus Island and 13 on Rat Island, 1995), Chough (14-41 pairs, 1992) and Kingfisher. Other breeding birds of note include Kittiwake (690 pairs at Loop Head, 1987) and Guillemot (4010 individuals at Loop Head, 1987).

There is a resident population of Bottle-nosed Dolphin in the Shannon Estuary consisting of at least 56-68 animals (1996). This is the only known resident population of this E.U. Habitats Directive Annex II species in Ireland. Otter, a species also listed on Annex II of this directive, is commonly found on the site. Five species of fish listed on Annex II of the E.U. Habitats Directive are found within the site. These are Sea Lamprey (Petromyzon marinus), Brook Lamprey (Lampetra planeri), River Lamprey (Lampetra fluviatilis), Twaite Shad (Allosa fallax fallax) and Salmon (Salmo salar). The three lampreys and Salmon have all been observed spawning in the lower Shannon or its tributaries. The Fergus is important in its lower reaches for spring salmon while the Mulkear catchment excels as a grilse fishery though spring fish are caught on the actual Mulkear River. The Feale is important for both types. Twaite Shad is not thought to spawn within the site. There are few other river systems in Ireland which contain all three species of Lamprey. Two additional fish of note, listed in the Irish Red Data Book, also occur, namely Smelt (Osmerus eperlanus) and Pollan (Coregonus autumnalis pollan). Only the former has been observed spawning in the Shannon. Freshwater Pearl-mussel (Margaritifera margaritifera), a species listed on Annex II of the E.U. Habitats Directive, occurs abundantly in parts of the Cloon River. There is a wide range of landuses within the site. The most common use of the terrestrial parts is grazing by cattle and some areas have been damaged through overgrazing and poaching. Much of the land adjacent to the rivers and estuaries has been improved or reclaimed and is protected by embankments (especially along the Fergus Estuary). Further, reclamation continues to pose a threat as do flood relief works (e.g. dredging of rivers). Gravel extraction poses a major threat on the Feale. In the past, Cord-grass (Spartina sp.) was planted to assist in land reclamation. This has spread widely, and may oust less vigorous colonisers of mud and may also reduce the area of mudflat available to feeding birds.

Domestic and industrial wastes are discharged into the Shannon, but water quality is generally satisfactory - except in the upper estuary, reflecting the sewage load from Limerick City. Analyses for trace metals suggest a relatively clean estuary with no influences by industrial discharges apparent. Further industrial development along the Shannon and water polluting operations are potential threats.

Fishing is a main tourist attraction on the Shannon and there are a large number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. The River Feale is a designated Salmonid Water under the E.U. Freshwater Fish Directive. Other uses of the site include commercial angling, oyster farming, boating (including dolphin-watching trips) and shooting. Some of these may pose threats to the birds and dolphins through disturbance. Specific threats to the dolphins include underwater acoustic disturbance, entanglement in fishing gear and collisions with fast moving craft.

This site is of great ecological interest as it contains a high number of habitats and species listed on Annexes I and II of the E.U. Habitats Directive, including the priority habitat lagoon, the only known resident population of Bottle-nosed Dolphin in Ireland and all three Irish lamprey species. A good number of Red Data Book species are also present, perhaps most notably the thriving populations of Triangular Club-rush. A number of species listed on Annex I of the E.U. Birds Directive are also present, either wintering or breeding. Indeed, the Shannon and Fergus Estuaries form the largest estuarine complex in Ireland and support more wintering wildfowl and waders than any other site in the country. Most of the estuarine part of the site has been designated a Special Protection Area (SPA), under the E.U. Birds Directive, primarily to protect the large numbers of migratory birds present in winter.

17.05.2005

3.3.2 Lower River Suir SAC (Site Code: 002137) site synopsis (NPWS)

This site consists of the freshwater stretches of the River Suir immediately south of Thurles, the tidal stretches as far as the confluence with the Barrow/Nore immediately east of Cheekpoint in Co. Waterford and many tributaries including the Clodiagh in Co. Waterford, the Lingaun, Anner, Nier, Tar, Aherlow, Multeen and Clodiagh in Co. Tipperary. The Suir and its tributaries flows through the counties of Tipperary, Kilkenny and Waterford. Upstream of Waterford city, the swinging meanders of the Suir crisscross the Devonian sandstone rim of hard rocks no less than three times as they leave the limestone-floored downfold below Carrick In the vicinity of Carrick-on-Suir the river follows the limestone floor of the Carrick Syncline. Upstream of Clonmel the river and its tributaries traverse Upper Palaeozoic Rocks, mainly the Lower Carboniferous Visean and Tournaisian. The freshwater stretches of the Clodiagh River in Co. Waterford traverse Silurian rocks, through narrow bands of Old Red Sandstone and Lower Avonian Shales before reaching the carboniferous limestone close to its confluence with the Suir. The Aherlow River flows through a Carboniferous limestone valley, with outcrops of Old Red Sandstone forming the Galtee Mountains to the south and the Slievenamuck range to the north. Glacial deposits of sands and gravels are common along the valley bottom, flanking the present-day river course.

The site is a candidate SAC selected for the presence of the priority habitats on Annex I of the E.U. Habitats Directive - alluvial wet woodlands and Yew Wood. The site is also selected as *a candidate SAC for floating river vegetation, Atlantic salt meadows, Mediterranean salt meadows, old oak woodlands and eutrophic tall herbs, all habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected for the following species listed on Annex II of the same directive - Sea Lamprey, River Lamprey, Brook Lamprey, Freshwater Pearl Mussel, Crayfish, Twaite Shad, Atlantic Salmon and Otter.*

Alluvial wet woodland is declining habitat in Europe as a result of drainage and reclamation. The best examples of this type of woodland in the site are found on the islands just below Carrick-on-Suir and at Fiddown Island. Species occurring here include Almond Willow (Salix triandra), White Willow (S. alba), Grey Willow (S. cinerea), Osier (S. viminalis), with Iris (Iris pseudacorus), Hemlock Water-dropwort (Oenanthe crocata), Angelica (Angelica sylvestris), Pendulus Sedge (Carex pendula), Meadowsweet (Filipendula ulmaria) and Valerian (Valeriana officinalis). The terrain is littered with dead trunks and branches and intersected with small channels which carry small streams to the river. The bryophyte and lichen floras appear to be rich and require further investigation. A small plot is currently being coppiced and managed by National Parks and Wildlife. In the drier areas the wet woodland species merge with other tree and shrub species including Ash (Fraxinus excelsior), Hazel (Corylus avellana), Hawthorn (Crataegus monogyna) and Blackthorn (Prunus spinosa). This adds further to the ecological interest of this site.

Eutrophic tall herb vegetation occurs in association with the various areas of alluvial forest and elsewhere where the flood-plain of the river is intact. Characteristic species of the habitat include Meadowsweet (Filipendula ulmaria), Purple Loosestrife (Lythrum salicaria), Marsh Ragwort (Senecio aquaticus), Ground Ivy (Glechoma hederacea) and Hedge Bindweed (Calystegia sepium).

Old oak woodlands are also of importance at the site. The best examples are seen in Portlaw Wood which lies on both sides of the Clodiagh River. On the south-facing side the stand is more open and the Oaks (mainly Quercus robur) are well grown and spreading. Ivy (Hedera helix) and Bramble (Rubus fruticosus) are common on the ground, indicating relatively high light conditions. Oak regeneration is dense, varying in age from 0-40 years and Holly (Ilex aquifolium) is fairly common but mostly quite young. Across the valley, by contrast, the trees are much more closely spaced and though taller are poorly grown on average. There are no clearings; large Oaks extend to the boundary wall. In the darker conditions, Ivy is much rarer and Holly much more frequent, forming a closed canopy in places. Oak regeneration is uncommon since there are as yet few natural clearings. The shallowness of the soil on the northfacing slope probably contributes to the poor tree growth there. The acid nature of the substrate has induced a “mountain” type Oakwood community to develop. There is an extensive species list present throughout including an abundance of mosses, liverworts and lichens. The rare lichen Lobaria pulmonaria, an indicator of ancient woodlands, is found.

Inchinsquillib Wood consists of three small separate sloping blocks of woodland in a valley cut by the young Multeen River and its tributaries through acidic Old Red Sandstone, and Silurian rocks. Two blocks, both with an eastern aspect, located to the north of the road, are *predominantly of Sessile oak (Quercus petraea) and Hazel, with Downy Birch (Betula pubescens), Ash and Holly. The ground flora is quite mixed with for example Wood sedge (Carex sylvatica), Bluebell (Hyacinthoides non-scriptus), Primrose (Primula vulgaris), Wood-sorrel (Oxalis acetosella), Pignut (Conopodium majus) and Hard fern (Blechnum spicant). The base poor nature of the underlying rock is, to some extent masked by the overlying drift. The third block, to the south of the road, and with a northern aspect, is a similar although less mature mixture of Sessile Oak, Birch and Holly, the influence of the drift is more marked, with the occurrence of Wood anemone (Anemone nemorosa) amongst the ground flora.*

Floating river vegetation is evident in the freshwater stretches of the River Suir and along many of its tributaries. Typical species found include Canadian Pondweed (Elodea canadensis), Milfoil (Myriophyllum spp.), Fennel Pondweed (Potamogeton pectinatus), Curled Pondweed (P. crispus), Perfoliate Pondweed (P. perfoliatus), Pond Water-crowfoot (Ranunculus peltatus), other Crowfoots (Ranunculus spp.) and the moss Fontinalis antipyretica. At a couple of locations along the river, Oppositeleaved Pondweed (Groenlandia densa) occurs. This species is protected under the Flora (Protection) Order, 1999.

The Aherlow River is fast-flowing and mostly follows a natural unmodified river channel. Submerged vegetation includes the aquatic moss Fontinalis antipyretica and Stream Water-crowfoot (Ranunculus pencillatus), while shallow areas support species such as Reed Canary-grass (Phalaris arundinacea), Brooklime (Veronica beccabunga) and Water Mint (Mentha aquatica). The river bank is fringed in places with Alder (Alnus glutinosa) and Willows (Salix spp.).

The Multeen River is fast flowing, mostly gravel-bottomed and appears to follow a natural unmodified river channel. Water Crowfoots occur in abundance and the aquatic moss Fontinalis antipyretica is also common. In sheltered shallows, species such as Water-cress (Rorippa nasturtium-aquaticum) and Water-starworts (Callitriche spp.) occur. The river channel is fringed for most of its length with Alder, Willow and a narrow strip of marshy vegetation.

Salt meadows occur below Waterford City in old meadows where the embankment is absent, or has been breached, and along the tidal stretches of some of the in-flowing rivers below Little Island. There are very narrow, non-continuous bands of this habitat along both banks. More extensive areas are also seen along the south bank at Ballynakill, the east side of Little Island, and in three large salt meadows between Ballynakill and Cheekpoint. The Atlantic and Mediterranean sub types are generally intermixed. The species list is extensive and includes Red Fescue (Festuca rubra), Oraches (Atriplex spp.), Sea Aster (Aster tripolium), Sea Couch Grass (Elymus pycnanthus), frequent Sea Milkwort (Glaux maritima), occasional Wild Celery (Apium graveolens), Parsley Water-dropwort (Oenanthe lachenalii), English Scurvygrass (Cochlearia anglica) and Sea Arrowgrass (Triglochin maritima). These species are more representative of the Atlantic sub-type of the habitat. Common Cord-grass

(Spartina anglica), is rather frequent along the main channel edge and up the internal channels. The legally protected (Flora (Protection) Order, 1999) Meadow Barley (Hordeum secalinum) grows at the landward transition of the saltmarsh. Sea Rush (Juncus maritimus), an indicator of the Mediterranean salt meadows, also occurs.

Other habitats at the site include wet and dry grassland, marsh, reed swamp, improved grassland, coniferous plantations, deciduous woodland, scrub, tidal river, stony shore and mudflats. The most dominant habitat adjoining the river is improved grassland, although there are wet fields with species such as Yellow Flag (Iris pseudacorus), Meadow Sweet (Filipendula ulmaria), Rushes (Juncus spp.), Meadow Buttercup (Ranunculus acris) and Cuckoo Flower (Cardamine pratensis).

Cabragh marshes, just below Thurles, lie in a low-lying tributary valley into which the main river floods in winter. Here there is an extensive area of Common Reed (Phragmites australis) with associated marshland and peaty fen. The transition between vegetation types is often well displayed. A number of wetland plants of interest occur, in particular the Narrow-leaved Bulrush (Typha angustifolia), Bottle Sedge (Carex rostrata) and Blunt-flowered Rush (Juncus subnodulosus). The marsh is naturally eutrophic but it has also the nutritional legacy of the former sugar factory which discharged into it through a number of holding lagoons, now removed. Production is high which is seen in the size of such species as Celery-leaved Buttercup (Ranunculus sceleratus) as well as in the reeds themselves.

Throughout the Lower River Suir site are small areas of woodland other than those described above. These tend to be a mixture of native and non-native species, although there are some areas of semi-natural wet woodland with species such as Ash and Willow. Cahir Park Woodlands is a narrow tract of mixed deciduous woodland lying on the flatlying floodplain of the River Suir. This estate woodland was planted over one hundred years ago and it contains a large component of exotic tree species. However, due to original planting and natural regeneration there is now a good mix of native and exotic species. About 5km north west of Cashel, Ardmayle pond is a long, possibly artificial water body running parallel to the River Suir. It is partly shaded by planted Lime (Tilia hybrids), Sycamore (Acer pseudoplatanus) and the native Alder. Growing beneath the trees are shade tolerant species such as Remote sedge (Carex remota).

The site is of particular conservation interest for the presence of a number of Annex II animal species, including Freshwater Pearl Mussel (Margaritifera margaritifera and M. m. durrovensis), Freshwater Crayfish (Austropotamobius pallipes), Salmon (Salmo salar), Twaite Shad (Alosa fallax fallax), three species of Lampreys - Sea Lamprey (Petromyzon marinus), Brook Lamprey (Lampetra planeri) and River Lamprey (Lampetra fluviatilis) and Otter (Lutra lutra). This is one of only three known spawning grounds in the country for Twaite Shad.

The site also supports populations of several other animal species. Those which are listed in the Irish Red Data Book include Daubenton's Bat (Myotis daubentoni), Nattererer's Bat (M.

nattereri), Pipistrelle (Pipistrellus pipistrellus), Pine Marten (Martes martes), Badger (Meles meles), the Irish Hare (Lepus timidus hibernicus), Smelt (Osmerus eperlanus) and the Frog (Rana temporaria). Breeding stocks of Carp are found in Kilsheelan Lake. This is one of only two lakes in the country which is known to have supported breeding Carp. Carp require unusually high summer water temperatures to breed in Ireland and the site may therefore support interesting invertebrate populations.

Parts of the cSAC site have also been identified as of ornithological importance for a number of Annex I (EU Birds Directive) bird species, including Greenland White-fronted Goose (10), Golden Plover (1490), Whooper Swan (7) and Kingfisher. Figures given in brackets are the average maximum counts from 4 count areas within the site for the three winters between 1994 and 1997. Wintering populations of migratory birds use the site. Flocks are seen in Coolfinn Marsh and also along the reedbeds and saltmarsh areas of the Suir. Coolfinn supports nationally important numbers of Greylag Geese on a regular basis. Numbers between 600 and 700 are recorded. Other species occurring include Mallard (21), Teal (159), Wigeon (26), Tufted Duck (60), Pintail (4), Pochard (2), Little Grebe (2), Black-tailed Godwit (20), Oystercatcher (16), Lapwing (993), Dunlin (101), Curlew (195), Redshank (28), Greenshank (4) and Green Sandpiper (1). Nationally important numbers of Lapwing (2750) were recorded at Faithlegg in the winter of 1996/97. In Cabragh marshes there is abundant food for surface feeding wildfowl which total at 1,000 or so in winter. Widgeon, Teal and Mallard are numerous and the latter has a large breeding population - with up to 400 in summer. In addition, less frequent species like Shoveler and Pintail occur and there are records for both Whooper and Bewick's swans. Kingfisher, a species that is listed on Annex I of the EU Birds Directive, occurs along some of the many tributaries throughout the site.

Landuse at the site consists mainly of agricultural activities including grazing, silage production, fertilising and land reclamation. The grassland is intensively managed and the rivers are therefore vulnerable to pollution from run-off of fertilisers and slurry. Arable crops are also grown. Fishing is a main tourist attraction on stretches of the Suir and some of its tributaries and there are a number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. Both commercial and leisure fishing takes place on the rivers. The Aherlow River is a designated Salmonid Water under the EU Freshwater Fish Directive. Other recreational activities such as boating, golfing and walking are also popular. Several industrial developments, which discharge into the river, border the site including three dairy related operations and a tannery.

The Lower River Suir contains excellent examples of a number of Annex I habitats, including the priority habitat Alluvial Forest. The site also supports populations of several Annex II animal species and a number of Red Data Book animal species. The presence of two legally protected plants (Flora (Protection) Order, 1999) and the ornithological importance of the river adds further to the ecological interest of this site.

6.10.2006

3.3.3 Slievefelim to Silvermines Mountains SPA (004165)

The Slievefelim to Silvermines Mountains SPA is an extensive upland site located in Counties Tipperary and Limerick. Much of the site is over 200 m in altitude and rises to 694 m at Keeper Hill. Other peaks included in the site are Slieve Felim, Knockstanna, Knockappul, Mother Mountain, Knockteige, Cooneen Hill and Silvermine Mountain. The site is underlain mainly by sandstones of Silurian age. Several important rivers rise within the site, including the Mulkear, Bilboa and Clare. The site consists of a variety of upland habitats, though approximately half is afforested. The coniferous forests include first and second rotation plantations, with both pre-thicket and post-thicket stands present. Substantial areas of clear-fell are also present at any one time. The principal tree species present are Sitka Spruce (Picea sitchensis) and Lodgepole Pine (Pinus contorta). Roughly one-quarter of the site is unplanted blanket bog and heath, with both wet and dry heath present. The bog and heath vegetation includes such typical species as Ling Heather (Calluna vulgaris), Bilberry (Vaccinium myrtillus), Bell Heather (Erica cinerea), Common Cottongrass (Eriophorum angustifolium), Hare's-tail Cottongrass (Eriophorum vaginatum), Deergrass (Scirpus cespitosus) and Purple Moorgrass (Molinia caerulea). The remainder of the site is mostly rough grassland that is used for hill farming. This varies in composition and includes some wet areas with rushes (Juncus spp.) and some areas subject to scrub encroachment. Some stands of deciduous woodland also occur, especially within the river valleys.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for Hen Harrier. This SPA is one of the strongholds for Hen Harrier in the country. A survey in 2005 resulted in four confirmed and one possible breeding pairs, whereas nine pairs had been recorded in the 1998-2000 period. These numbers represent 3% of the national total. The mix of forestry and open areas provides optimum habitat conditions for this rare bird, which is listed on Annex I of the Birds Directive. The early stages of new and second-rotation conifer plantations are the most frequently used nesting sites, though some pairs may still nest in tall heather of unplanted bogs and heath. Hen Harriers will forage up to c. 5 km from the nest site, utilising open bog and moorland, young conifer plantations and hill farmland that is not too rank. Birds will often forage in openings and gaps within forests. In Ireland, small birds and small mammals appear to be the most frequently taken prey. The site is also a traditional breeding site for a pair of Peregrine. Merlin has been recorded within the site but further survey is required to determine its status. Both of these species are also listed on Annex I of the E.U. Birds Directive. Red Grouse is found on some of the unplanted areas of bog and heath – this is a species that has declined in Ireland and is now Red-listed.

The main threat to the long-term survival of Hen Harriers within the site is further afforestation, which would reduce and fragment the area of foraging habitat, resulting in possible reductions in breeding density and productivity. Overall, the site provides excellent nesting and foraging habitat for breeding Hen Harrier and is among the top five sites in the country for the species

16.7.2007

3.3.4 Features of Interest of the Lower River Shannon cSAC

Table 11 below lists the Annex I habitats and Annex II species for which the Lower River Shannon cSAC has been selected.

TABLE 11: LIST OF QUALIFYING FEATURES OF INTEREST OF THE LOWER RIVER SHANNON CSAC.

Qualifying Interests of the Lower River Shannon cSAC (Site Code: 002165)
Habitats
Sandbanks which are slightly covered by sea water all the time [1110]
Estuaries [1130]
Mudflats and sandflats not covered by seawater at low tide [1140]
Coastal lagoons [1150]
Large shallow inlets and bays [1160]
Reefs [1170]
Perennial vegetation of stony banks [1220]
Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]
Salicornia and other annuals colonizing mud and sand [1310]
Spartina swards (*Spartinion maritimae*) [1320]
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]
Mediterranean salt meadows (*Juncetalia maritimi*) [1410]
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]
Molinia meadows on calcareous, peaty or clavey-silt-laden soils (*Molinion caeruleae*) [6410]
Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0]
Species
Freshwater pearl mussel (*Margaritifera margaritifera*) [1029]
Sea lamprey (*Petromyzon marinus*) [1095]
Brook lamprey (*Lampetra planeri*) [1096]
River lamprey (*Lampetra fluviatilis*) [1099]
Salmon (*Salmo salar*) [1106]
Bottle-nosed dolphin (*Tursiops truncatus*) [1349]
Otter (*Lutra lutra*) [1355]

3.3.5 Features of Interest of the Lower River Suir SAC.

Table 12, below, lists the Annex I habitats and Annex II species for which the Lower River Suir cSAC has been selected.

TABLE 12: LIST OF QUALIFYING FEATURES OF INTEREST FOR THE LOWER RIVER SUIR CSAC.

Qualifying Interests of the Lower River Suir cSAC (Site Code: 002165) Habitats
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]
Mediterranean salt meadows (*Juncetalia maritimi*) [1410]
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]
Old sessile oak woods with *Ilex* and Blechnum in British Isles [91A0]
Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0]
Taxus baccata woods of the British Isles [91J0]
Species
Freshwater pearl mussel (*Margaritifera margaritifera*) [1029]
White-clawed crayfish (*Austropotamobius pallipes*) [1092]
Sea lamprey (*Petromyzon* marinus) [1095]
Brook lamprey (*Lampetra planeri*) [1096]
River lamprey (*Lampetra fluviatilis*) [1099]
Allis shad (*Alosa alosa*) [1102]
Twaite shad (*Alosa fallax fallax*) [1103]
Salmon (*Salmo salar*) [1106]
Otter (*Lutra lutra*) [1355]

3.3.1 *Feature of Interest of the Slievefelim to Silvermines Mountains SPA (004165).*

Table 13, below, lists the bird species for which the Slievefelim to Silvermines Mountains SPA (004165) has been selected.

TABLE 13: LIST OF QUALIFYING FEATURES OF INTEREST OF THE SLIEVEFELIM TO SILVERMINES MOUNTAINS SPA.

Qualifying Interests of the Slievefelim to Silvermines Mountains SPA Site Code:(004165)
Hen Harrier (*C. cyaneus*) [A082]

3.4 CONSERVATION STATUS

According to the Habitat's Directive, the conservation status of a natural habitat will be taken as 'favourable' when:

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

According to the Habitat's Directive, the conservation status of a species means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations. The conservation status will be taken as 'favourable' when:

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

3.4.1 Conservation Objectives and Management Plans

There are no management plans completed to date for the Lower River Shannon cSAC, Lower River Suir cSAC or the Silvermines Mountains SPA. The conservation objectives for the Natura 2000 Sites are as follows:

3.4.1.1 Lower River Shannon cSAC (site code: 002165):

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

- [1029] *Margaritifera margaritifera*
- [1095] *Petromyzon marinus*
- [1096] *Lampetra planeri*
- [1099] *Lampetra fluviatilis*
- [1106] *Salmo salar* (only in fresh water)
- [1110] Sandbanks which are slightly covered by sea water all the time
- [1130] Estuaries
- [1140] Mudflats and sandflats not covered by seawater at low tide
- [1150] Coastal lagoons

- [1160] Large shallow inlets and bays
- [1170] Reefs
- [1220] Perennial vegetation of stony banks
- [1230] Vegetated sea cliffs of the Atlantic and Baltic coasts
- [1310] *Salicornia* and other annuals colonizing mud and sand
- [1330] Atlantic salt meadows (*Glauco□Puccinellietalia* maritimae)
- [1349] *Tursiops truncatus*
- [1355] *Lutra lutra*
- [1410] Mediterranean salt meadows (*Juncetalia* maritimi)
- [3260]Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho□Batrachion* vegetation [3260]
- [6410] *Molinia* meadows on calcareous, peaty or clayey□silt□laden soils (*Molinion caeruleae*)
- [91E0] Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno□Padion*, *Alnion incanae*, *Salicion albae*)

3.4.1.2 Lower River Suir cSAC (site code: 002137)

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

- [1029] *Margaritifera margaritifera*
- [1092] *Austropotamobius pallipes*
- [1095] *Petromyzon marinus*
- [1096] *Lampetra planeri*
- [1099] *Lampetra fluviatilis*
- [1103] *Alosa fallax*
- [1106] *Salmo salar* (only in fresh water)
- [1330] Atlantic salt meadows (*Glauco□Puccinellietalia* maritimae)
- [1355] *Lutra lutra*
- [1410] Mediterranean salt meadows (*Juncetalia maritimi*)
- [3260]Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho□Batrachion* vegetation
- [6430] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
- [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*)
- [91J0] *Taxus baccata* woods of the British Isles

3.4.1.3 Slievefelim to Silvermines Mountains SPA (site code: 004165):

Objective: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:

- *Circus cyaneus* [breeding]

3.4.2 Conclusion

Any impact which is likely to cause or contribute to any of the qualifying species and habitats not reaching or maintaining favourable conservation status within these Natura 2000 Sites would be regarded as being in conflict with the management of the sites. In addition, any impact which would hinder the maintenance of the extent, species richness and biodiversity of the sites would also be in conflict with the conservation objectives.

3.5 ECOLOGICAL FEATURES SELECTED FOR NATURA IMPACT ASSESSMENT

Tables 11, 12 and 13 above, list the habitats and species for which the Natura 2000 sites, considered in this section of the document, have been designated. It is considered that some of these features will not be impacted by the proposed development and these are listed below in Table 13 with the Natura 2000 sites designated for their protection, in section 3.5.1 below. The significance of the impacts affecting the remaining habitats and species, listed in section 3.5.2, below, will then be assessed in terms of magnitude/extent, probability and duration in sections following.

3.5.1 Ecological features not selected for Natura Impact Assessment

The species and habitats of qualifying interest that will not be impacted by the proposed development are listed in Table 14. These habitats,which are either coastal in their distribution or are grassland and forest habitats not connected to the proposal site either directly within the footprint of the development or via waterways draining the site. Dolphin is a marine species and therefore not present within the zone of impact influence of the proposed windfarm site.

TABLE 14: LIST OF ECOLOGICAL FEATURES NOT SELECTED FOR NATURA IMPACT ASSESSMENT WITH NATURA 2000 SITE DESIGNATED FOR THEIR PROTECTION

Feature	**Designated Site**
Coastal and Halophytic Habitats	
Sandbanks which are slightly covered by sea water all the time [1110]	Lower River Shannon cSAC
Estuaries [1130]	Lower River Shannon cSAC
Mudflats and sandflats not covered by seawater at low tide [1140]	Lower River Shannon cSAC
Coastal lagoons [1150]	Lower River Shannon cSAC

Large shallow inlets and bays [1160]	Lower River Shannon cSAC
Reefs [1170]	Lower River Shannon cSAC
Perennial vegetation of stony banks [1220]	Lower River Shannon cSAC
Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	Lower River Shannon cSAC
Salicornia and other annuals colonizing mud and sand [1310]	Lower River Shannon cSAC
Spartina swards (*Spartinion maritimae*) [1320]	Lower River Shannon cSAC
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]	Lower River Shannon cSAC, Lower River Suir cSAC
Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	Lower River Shannon cSAC, Lower River Suir cSAC
Natural and Semi-natural grassland Habitats	
Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410]	Lower River Shannon cSAC
Forest Habitats	
Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]	Lower River Shannon cSAC, Lower River Suir cSAC
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]	Lower River Suir cSAC
Old sessile oak woods with Ilex and Blechnum in British Isles [91A0]	Lower River Suir cSAC
Taxus baccata woods of the British Isles [91J0]	Lower River Suir cSAC
Species (Marine)	
Bottlenose dolphin (*T. truncatus*) [1349]	Lower River Shannon cSAC

3.5.2 *Ecological features selected for Appropriate Assessment*

All of the features of qualifying interest that were deemed relevant to the proposed development were selected for further analysis in respect to likely impacts. These features are listed in Table 15, below. Characteristics of the ecological features selected for Appropriate Assessment are then discussed in the sections following.

TABLE 15: ECOLOGICAL FEATURES SELECTED FOR NATURA IMPACT ASSESSMENT WITHIN NATURA 2000 SITES DESIGNATED FOR THEIR PROTECTION

Feature	Designated Site
Freshwater Habitats (Aquatic)	
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]	Lower River Shannon cSAC, Lower River Suir cSAC
Birds	

Hen Harrier (*C. cyaneus*) [A082]	Slievefelim to Silvermines Mountains SPA
Invertebrates	
Freshwater pearl mussel (*M. margaritifera*) [1029]	Lower River Shannon cSAC, Lower River Suir cSAC
White-clawed crayfish (*A. pallipes*) [1092]	Lower River Suir cSAC
Fishes	
Salmon (*S. salar*) [1106]	Lower River Shannon cSAC, Lower River Suir cSAC
Sea lamprey (*P. marinus*) [1095]	Lower River Shannon cSAC, Lower River Suir cSAC
Brook lamprey (*L. planeri*) [1096]	Lower River Shannon cSAC, Lower River Suir cSAC
River lamprey (*L. fluviatilis*) [1099]	Lower River Shannon cSAC, Lower River Suir cSAC
Allis shad (*A. alosa*) [1102]	Lower River Suir cSAC
Twaite shad (*A. fallax fallax*) [1103]	Lower River Suir cSAC
Mammals	
Otter (*L. lutra*) [1355]	Lower River Shannon cSAC, Lower River Suir cSAC

3.5.2.1 Habitat

Both the Lower River Shannon cSAC and the Lower River Suir cSAC are designated for the protection of the habitat type 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]'. This is a freshwater habitat found in sections of water courses with natural or semi-natural dynamics (minor, average and major beds) where the water quality shows no significant deterioration (EDG, 2007). This habitat is described as being present 'in the major river systems within' the Lower River Shannon cSAC (see Section 3.3.1, Site synopsis 002165), and is 'present in the freshwater stretches of the River Suir and along many of its tributaries' (See Section 3.3.2, site synopsis 002137) Because floating river vegetation communities are found along some the freshwater stretches within both Natura 2000 sites there is the potential that this habitat is within the zone of impact influence of the proposal. The primary pressures on this habitat are considered to be eutrophication, overgrazing, excessive fertilisation, afforestation and the introduction of invasive alien species;the current conservation status of this habitat type is bad (NPWS, 2008). Any impact on this habitat would occur as a result of unmitigated adverse water quality impacts caused by the proposal described in this report. These impacts are discussed in section 3.6.3 below.

3.5.2.2 Birds

Hen Harrier (*C. cyaneus*) [A082]

The hen harrier is listed as an Annex I species under the Birds Directive and classified as an 'Amber Listed' species of medium conservation concern (see Lynas *et al*. 2007). Breeding birds are confined to moorland and young forestry plantations, where they nest on the ground. Hen harriers are found mainly in Counties Laois, Tipperary, Cork, Clare, Limerick and Kerry. In summer hen harrier are found on mountains and moorlands, nesting on the ground. It also nests in young conifer plantations. In winter birds can roost communally and are found in most parts of Ireland including coastal areas.

There is a clear association between habitat composition and hen harrier activity (Wilson *et al.* 2006) and both the quality and quantity of foraging habitats are known to influence hen harrier distribution (Watson, 1977, Pain et al., 1997, Redpath & Thirgood, 1999, Redpath et al., 2002, Madders 2003 cited in Ruddock *et al*. 2012). In their analysis of the distribution of hen harriers in Ireland Wilson *et al.* (2006) determined that areas with less than 30% cover of bog, rough pasture or young forest were avoided by hen harriers. Therefore, the habitat composition of the area is a determining factor influencing the potential level of hen harrier activity. An additional, and primary, governing factor is the proximity of hen harrier nests, as this has a major influence on habitat use (Madders, 2000), both by breeding birds and fledging juveniles, within the areas adjacent to any location.

Therefore, an extensive area of habitats, which are of high ecological value to hen harrier, is available in the extended geographical area surrounding the proposed Upperchurch Windfarm site. It is considered that hen harriers species will preferentially select these areas of high ecological value above the, lower value, post thicket canopy conifer and agricultural grassland habitats or the remnant upland blanket bog/wet heath mosaic areas that are available within the windfarm site.

Post thicket conifer plantation is of only limited value to hen harrier (O'Flynn 1983, Sim et al. 2001 cited in Wilson *et al*., 2009) and is not strongly associated with either foraging or breeding (Madders 2003, Barton *et al*. 2006 cited in Wilson *et al.* 2009) possibly because of the lack of structural diversity within the uniform conifer blocks (O'Donoghue et al. 2011).

It is noted that hen harriers in Ireland strongly avoid this habitat type for nesting due to the lack of cover and the levels of human activity (Wilson *et al*., 2009).

There is a strong association in Ireland between, pre thicket, second rotation conifer plantation and hen harrier nest site selection (Norriss *et al*. 2002, O'Donoghue 2004 cited in Wilson *et al*. 2009; Irwin *et al*. 2012) albeit that other factors, such as the remaining area of heath/bog and rough grassland that is available for foraging (Norris *et al*. 2007, cited in Lewis *et al*. 2009) also influence site selection.. Young second rotation conifer are of value to nesting and foraging hen harrier after 4 years and were replanting to take place in 2035 then the habitat could be conceivable of value for 1-6 years during the later years of windfarm operation.

3.5.2.3 Aquatic species

Freshwater pearl mussel (*M. margaritifera*) [1029]

The freshwater pearl mussel is listed under Annex II of the EU Habitats Directive and is one of the species for which the Lower River Shannon cSAC and the Lower River Suir cSAC have been designated. Ireland is said to support up to 46% of the known populations of the freshwater pearl mussel (*M. margaritifera*) within the European Union (Anon, 2010). The freshwater pearl mussel is listed under Annex II of the EU Habitats Directive and is one of the species for which both the Lower River Shannon cSAC, Lower River Suir cSAC have been designated. Freshwater pearl mussels have a complex life cycle. They mature between seven and 15 years of age and can have a prolonged fertile period lasting into old age. The larvae (glochidia) initially attach to the gills of salmonid fish hosts which provide nourishment, before they become large enough for independent development in the river bed. After excysting from host fish juvenile mussels survive in the interstices of the substrate, comprised of a stable combination of sand, gravels and cobbles, where good oxygen exchange occurs. A covering of fine silt may prevent this and cause heavy mortalities. In summary, the freshwater pearl mussel requires very high quality rivers with clean river beds and waters with very low levels of nutrients without artificially elevated levels of siltation. The survival of the freshwater pearl mussel is under threat and many of the populations are not reproducing and will ultimately disappear if rehabilitative action is not taken.

Of the remaining populations in Ireland it is estimated that at least 90% will “probably never breed successfully again” (Moorkens, 2006, cited in Byrne et al., 2009).

The principal threat to this species is poor substrate quality due to increased growth of algal and macrophyte vegetation as a result of severe nutrient enrichment, as well as physical siltation.. Freshwater pearl mussel is listed as critically endangered in the Republic of Ireland in the most recent review of local IUCN threat status of Irish molluscs. Its overall conservation status in Ireland is ‘Unfavourable’ (NPWS, 2008)

The published current distribution for this species[4] does not include either of the 10km squares which incorporate the location of the proposal considered in this document namely R95 and R96.

White-clawed crayfish (*A. pallipes*) [1092]

[4] Species distribution mapping referred to in this section of the document is published in NPWS, 2008

The Lower River Suir cSAC is designated for the protection of this species. In Ireland, the white-clawed crayfish most commonly occurs in small and medium-sized lakes, large rivers, streams and drains, wherever there is sufficient lime (Reynolds, 2007). The species prefers relatively cool temperatures and adequate dissolved oxygen and lime, although it is capable of tolerating significant fluctuations. Juveniles live among submerged tree-roots, gravel or aquatic plants, while larger crayfish need stones to hide under, or earthen banks in which to burrow. Crayfish show little activity during the winter period (December to March), spending most of their time torpid in refuges. They become more active when the water temperature increases. Females carry their eggs over winter attached in a dense cluster under their tails (Peay, 2003) and they require undisturbed shelter over a prolonged winter-spring period.

White-clawed crayfish eat a wide range of food including fallen leaves, aquatic vegetation, dead fish, aquatic invertebrates such as snails and caddis-fly larvae, and other dead or live crayfish. They have a wide range of predators; juveniles are eaten by fish, birds and invertebrate predators, adults are taken by large predators; heron, otter and mink. The crayfish try to avoid predation by hiding in refuges by day and coming out at night, when most birds and fish are resting.

The overall conservation status of the white-clawed crayfish in Ireland is poor, due to the reduction in its range and the continuing pressures that it faces (NPWS, 2008). The most recently published Current Range and Current Distribution mapping for this species includes both 10km grid squares which incorporate the proposal considered in this document.

<u>Salmon (*S. salar*) [1106]</u>

Atlantic salmon is a species of qualifying interest for both the Lower River Shannon cSAC, Lower River Suir cSAC .It is an anadromous species, living in freshwater for at least the first 2 or 3 years of life before migrating to sea. Relatively large cool rivers with extensive gravelly bottom headwaters are essential during their early life. Smolts migrate to sea where they may live for 1 or 2 years before returning to freshwater. A decline in Salmon stocks is well recognised in Ireland and throughout the range of the North Atlantic Salmon and is attributed to several factors including the salmon disease Ulcerative Dermal Necrosis (UDN), poor marine survival and some overfishing. The NPWS suggest that agricultural enrichment, forestry related pressures and poor water quality resulting from inadequate sewage treatment are the major pressures affecting Irish salmon rivers (NPWS 2007).

The most recently published Current Range and Current Distribution mapping for this species includes the 10km grid squares that encompass the location of the proposal considered in this document, and indicates that the species has a wide distribution within the River Suir system ranging from the headwaters to the lower reaches of the system and and also within the extended Mulkear River system, which is a tributary of the Shannon, to which first order streams adjacent to the site drain.

<u>Sea lamprey (*P. marinus*) [1095]</u>

Both the Lower River Shannon cSAC and the Lower River Suir cSAC are designated for the protection of this species. Sea lampreys spend their adult life in marine and estuarine waters, living as external parasites on other fish species. They migrate up rivers to spawn in areas of clean gravels and after they have spawned, they die. After hatching, the young larvae settle in areas of fine sediment in still water, where they burrow. They live as filter feeders and may remain in fine sediments for several years before transforming into adult fish. Sea lampreys, which can grow up to 1m in length, are widely distributed around the coast. However they tend to occur in low densities. Overall, the conservation status of the sea lamprey in Ireland is considered to be poor (NPWS, 2008). The Current Range and Current Distribution mapping does not include the 10km squares which encompass the proposal considered in this document

Brook lamprey (*L. planeri*) [1096] River lamprey (*L. fluviatilis*) [1099]

The river lamprey grows to 30cm and has a similar life history to the sea lamprey. The brook lamprey is the smallest of the three lampreys native to Ireland at 15 to 20cm. It is also the only one of the three which is non-parasitic and spends all its life in freshwater. Despite the difference in ecology, brook and river lamprey are very similar genetically and extremely difficult to distinguish from each other. Juvenile river and brook lampreys cannot be discriminated and metamorphosed individuals can only be distinguished on the basis of dentition (King *et al.*, 2004). As a result, for the purposes of this assessment, the brook and river lampreys have been treated together. Both are species of qualifying interest for both the Lower River Shannon cSAC and the Lower River Suir cSAC. The current conservation status of these species in Ireland is considered to be good (NPWS, 2008).

Allis shad (*A. alosa*) [1102]

Allis shad spend their adult life at sea or in the lower reaches of estuaries, ascending to freshwater to spawn in early summer. The spawning females shed their eggs into the water where they either drop into the gravel bed or begin to drift downstream. Those eggs that fall into gravels hatch after several days and then drift downstream. The young fish may remain in estuarine waters during their second year before finally going to sea where they mature. While European populations have a recorded capacity for significant migration upstream, this capacity seems more constrained in Irish populations (King *et al.*, 2004). Weirs and dams are known to be obstacles to the migration of Allis shad upstream. The current conservation status of the species is 'Unknown' (NPWS, 2008).

Twaite shad (*A. fallax* fallax) [1103]

The twaite shad is a member of the herring family and is found in coastal areas from Norway and Iceland to the north-eastern Mediterranean. Shad normally live in estuarine and coastal waters but come into the lower reaches of rivers to spawn. Very little is known about the distribution, abundance and biology of the twaite shad although it has been studied in the

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River Barrow in County Waterford, and in the Solway rivers (Scotland)[5]. Twaite shad normally spawn,in May and June , near the tidal limits (NPWS, 2008). Weirs and dams are known to be obstacles to the migration of Twaite shad upstream. The current conservation status of the species is bad (NPWS, 2008).). Irish Red Data Book classified as vulnerable.

3.5.2.4 Mammals

Otter (*L. lutra*) [1355]

The otter is a species of qualifying interest for both the Lower River Shannon cSAC and Lower River Suir cSAC. The otter is widespread throughout the country, in freshwater and coastal habitats, and Ireland has long been considered to hold one of the most important otter populations in Western Europe (Whilde, 1993). Due to a decline in the population in Europe, including Ireland, the otter has been listed in Annex II of the EU Habitats Directive and Appendix II of the Berne Convention. It is also protected under the Wildlife Acts 1976 and 2000. It is listed in the Red Data Book (Whilde, 1993) as vulnerable.

Otters can, potentially, exploit all stretches of a river system where they are present. The two major threats facing otters in Europe are habitat destruction and water pollution (from NPWS, 2008) and the current conservation status for the species is considered ‘Unfavourable-Inadequate’ (NPWS, 2008). In an Irish context the main four threats have been assessed to be direct and indirect habitat destruction, pollution (particularly organic pollution resulting in fish kills), disturbance from increasing recreational activities and accidental death and persecution (Foster-Turley, *et al.*, 1990).

[5] http://www.habitas.org.uk/priority/species.asp?item=42767

3.6 ASSESSMENT OF POTENTIAL IMPACTS

3.6.1 Habitat loss or alteration

3.6.1.1 habitats

The proposal considered in this document does not require any land take from any Natura 2000 or Ramsar site. It is considered that no significant habitat loss or alteration impacts, within any of the designated sites considered in this section of the document, are reasonably foreseeable as a result of the proposal considered in this document.

3.6.1.2 Aquatic habitats

The potential for the alteration of aquatic habitats due to an impairment of water quality is assessed section 3.6.3 below.

3.6.2 Disturbance and/or displacement of species

3.6.2.1 Birds

In relation to the Natura 2000 sites and their conservation objectives, the main bird species of concern is the hen harrier as this is the species for which the Slievefelim to Silvermines Mountains SPA is designated. The bird surveys of the Upperchurch area show that the proposed development site is not greatly or regularly utilised by hen harriers. Hen harriers which use the wider district for foraging could be affected by:

- construction activities;
- disturbance/displacement by the actual presence of the turbines; and
- risk of collision.

It is possible that the construction activities (construction vehicles, erection of turbines, construction of access roads, turbine foundations and hardstandings *etc.*) could cause disturbance to foraging and/or potential nesting hen harriers in the area. However, the bird surveys show that no breeding took place within the study area in 2011. Hence, the construction activities at the proposed development site are unlikely to impact breeding hen harriers.

<u>Disturbance/displacement by the presence of the turbines</u>

Recent research shows that operational turbines cause low levels of displacement of foraging hen harriers. A monitoring study on hen harriers at an existing windfarm in Derrybrien, Co. Galway indicates that the displacement of hen harriers due to wind turbines is also relatively low, with foraging hen harriers regularly observed within 50m of turbines (Madden and Porter, 2007).

Displacement in terms of nesting/breeding appears to be greater. Whitfield and Madders (2006) refer to Natural Research unpublished data from Argyll in Scotland and Northern Ireland, which indicate that nesting attempts may occur in the order of 200-300m around turbines. More recent research indicates that there is a lower density of breeding hen harriers within 500m of turbines (Pearce-Higgins *et al.*, 2009).

Hen harrier was observed on two occasions at Upperchurch during the course of the winter and summer raptor vantage point surveys. The randomness and low number of hen harrier observations during the vantage point surveys in 2010 and 2011 suggests that the proposed windfarm site 2km west of Upperchurch is used infrequently by hen harriers. The very low number of observations would suggest that the significance of the risk of Disturbance/displacement as a result of the construction of the wind farm is considered *very low*.

Collision risk

Collision risk for hen harriers is considered to be low (see Madden and Porter, 2007; Whitfield and Madders, 2006). They are known to be manoeuvrable in flight and have been observed to fly to within 10m of turbine bases (Madden and Porter, 2007) and to fly through the gaps in an electricity pylon. The minimum distance between the proposed turbine hubs within the proposed development site is 379m. The randomness and low number of hen harrier observations during the vantage point surveys in 2010 and 2011 suggests that the proposed windfarm site 2km west of Upperchurch is used infrequently by hen harriers and the resultant risk of collision is *very low*.

3.6.2.2 Aquatic species

Freshwater pearl mussel (Margaritifera margaritifera)

Distribution in the Lower River Shannon cSAC

As was noted previously the current published distribution for this species within the Shannon river system does not include any 10km square which incorporates any stretch of river downstream of the location of the proposal considered in this document. Mapping of the distribution in this cSAC indicates that the species is restricted to the Feale system a separate tributary which drains to the Shannon Estuary via the Cashen River in North County Kerry. No records for the river system downstream of the proposal site are retained at the NBDC on line data resource. On the basis of the evidence outlined in this paragraph it is concluded that no impacts on this species, within the Lower River Shannon cSAC downstream of the proposal site, are reasonably foreseeable as a result of the proposal considered in this document.

Distribution in the Lower River Suir cSAC

The published current distribution for this species includes 10km grid squares R94 and S05 which incorporate the Clodiagh River into which first order stream adjacent to the proposal site drain. The distribution mapping also includes 10km grid squares S04, S02 and S01 which contain a significant stretch of the main channel of the Suir further downstream of the proposal site. In addition records from 2006, retained at the National Biodiversity Data Centre on line data resource, indicate that the species was then recorded in several locations on the Multeen River. An unnamed stream adjacent to the proposal site drains to the Turaheen River which in turn drains to the Multeen. The nearest record retained is for 1km grid square R9844 situated approximately 21km downstream[6] of the proposal site. It is presumed in light of the aforementioned direct evidence and on the basis of the precautionary principle, that this species is potentially present within the zone of impact influence of the proposal.

There is a risk that the water quality of the local watercourses, that drain the site, could be impaired during the construction stage of the proposed windfarm. It is possible that this could impact negatively on the Freshwater pearl mussel within the Lower River Suir cSAC downstream of the proposal site.

There is also a risk of negative impact to this species because of its complex life cycle which includes a larval stage when they are dependent on salmonid fish hosts. It is possible that these salmonids could be in the impact zone of the development when they migrate further upstream. The main potential risk to the mussel posed by the proposed development is the threat of sedimentation and pollution of waterways during the construction phase of the proposal. Therefore, it cannot be objectively concluded that significant indirect impacts on the freshwater pearl mussel will not ensue from an unmitigated construction phase.

White-clawed crayfish (Austropotamobius pallipes)

As was noted previously the most recently published Current Range and Current Distribution mapping for this species includes both 10km grid squares which incorporate the proposal considered in this document. In addition, records retained at the NBDC include one location within the Turraheen system and several locations on the Owenbeg system all of which are downstream of the proposal site considered in this document. The record on the Turraheen is located approximately 8km[7] downstream of the site. The nearest location on the Owenbeg is approximately 4km downstream of the site. O Connor (2007) noted that crayfish were

[6] Distance measured on 'Draw and Measure' tool on the IFI Water Framework Directive Fish Survey Map Viewer (Available at http://www.ifigis.ie/WFDFishMap/ [accessed 14/08/2012])

[7] Distances measured on 'Analysis' tool on the NBDC Biodiversity Maps Map Viewer. (Available at http://maps.biodiversityireland.ie/#/Map [accessed 15/08/2012])

abundant at Munroe Bridge which is situated on the Cromoge River which drains to Clodiagh at a point upstream of the point of confluence of the Clodiagh and Owenbeg. Taken together these various records indicate the strong likelihood of the presence of a significant population(s) within the upper Clodiagh/Owenbeg system. It is presumed in light of the aforementioned direct evidence and on the basis of the precautionary principle, that this species is potentially present within the zone of impact influence of the proposal.

There is a risk that the water quality of the local watercourses, that drain the site, could be impaired during the construction stage of the proposed windfarm. It is possible that this could impact negatively on the white-clawed crayfish.

Therefore, it cannot be objectively concluded that significant indirect impacts on the white-clawed crayfish will not ensue from an unmitigated construction phase.

<u>Salmon (*S. salar*) [1106]</u>

As was mentioned previously, current available evidence indicates that this species has a wide distribution within both cSAC river systems. It is presumed in light of the aforementioned evidence and on the basis of the precautionary principle, that this species is potentially present within the zone of impact influence of the proposal.

There is a risk that the water quality of the local watercourses, that drain the site, could be impaired during the construction stage of the proposed windfarm. It is possible that this could impact negatively on the Atlantic salmon. The main potential risk posed by the proposed development is the threat of sedimentation and pollution of waterways and consequent potential loss of spawning habitat during the construction phase. Therefore, it cannot be objectively concluded that significant indirect impacts on the salmon will not ensue from an unmitigated construction phase.

Potential nursery habitat was recorded along the stream to the south of turbines T9 and T10. No suitable salmon nursery habitat was recorded within the other streams within the site boundary.

<u>Sea lamprey (Petromyzon marinus)</u>

Distribution in the Lower River Shannon cSAC

The Current Range and Current Distribution mapping indicates that this species is not present within the tributary system which connects the proposal considered in this document, via the Mulkear River, to the main channel of the River Shannon. The mapping indicates that the nearest record is for 10km Grid square R55 at a location downstream of the point of confluence of the Mulkear and Shannon rivers, near Castletroy in Limerick city. This location is a linear distance in excess of 29km west of the proposal site and separated from it by a watercourse of significantly greater length. It is noted that the weir at Annacotty is a migration barrier that prevents lamprey from accessing the Mulkear of the river[8]. On the basis of the evidence outlined in this paragraph it is concluded that within the Lower River Shannon cSAC downstream of the proposal site, no significant impacts on this species are reasonably foreseeable as a result of the proposal considered in this document.

Distribution in the Lower River Suir cSAC

The Current Range and Current Distribution mapping indicates that that the distribution of the species extends to a location which is in excess of 12km downstream of the point of confluence of the Turaheen/ Multeen system and the Owenbeg/ Suir system (near Golden, County Tipperary). This location, which is in excess of a linear distance of 34km south east of the proposal, is adjacent to Cahir in County Tipperary. O Connor, (2007 p.4) states that sea lamprey were recorded downstream of Cahir, County Tipperary a finding confirmed by the Current range and Distribution mapping which indicates that the species has a wide distribution within the River Suir system spanning the Suir from downstream of Cahir to the lower reaches of the system (NPWS, 2008). It is presumed in light of the aforementioned direct evidence and on the basis of the precautionary principle, that this species is potentially present within the zone of impact influence of the proposal.

There is a risk that the water quality of the local watercourses, that drain the site, could be impaired during the construction stage of the proposed windfarm. It is possible that this could impact negatively on the sea lamprey within the Lower River Suir cSAC downstream of the proposal site.

The main potential risk posed by the proposed development is the threat of sedimentation and pollution of waterways during the construction phase of the proposal. Therefore, it cannot be objectively concluded that significant indirect impacts on the sea lamprey will not ensue from an unmitigated construction phase.

<u>Brook lamprey (Lampetra planeri) [1096] and River lamprey (Lampetra fluviatilis]</u>

Currently no records are retained online at the National Biodiversity Data Centre for these species within the extended river systems of either cSAC. The current known distribution for these species includes the 10km squares within which the proposal considered in this document occurs and the grid squares which incorporate the extended river systems which drain to both cSACs. O Connor (2007) confirmed the presence of these species within the Multeen, upstream of its point of confluence with the Aughnaglanny River, at a site approximately 18km downstream of the proposal site. The same survey recorded these species on the Owenbeg and Clodiagh rivers at sites located up stream of their point of confluence which is situated approximately 9km downstream on the Owenbeg and 19km downstream on the Clodiagh.

[8] http://www.mulkearlife.com/sea-lamprey.php

It is presumed in light of the aforementioned evidence and on the basis of the precautionary principle, that these species are potentially present within the zone of impact influence of the proposal. within both cSACs.

There is a risk that the water quality of the local watercourses, that drain the site, could be impaired during the construction stage of the proposed windfarm. It is possible that this could impact negatively on the lamprey within the Lower River Suir cSAC downstream of the proposal site.

There is a potential risk of a negative impact on these species from the construction. The main potential risk posed by the proposed development is the threat of sedimentation and pollution of waterways during the construction phase of the proposal. Therefore, it cannot be objectively concluded that significant indirect impacts on lamprey will not ensue from an unmitigated construction phase.

Allis shad (*A. alosa*) [1102]

The Lower River Suir cSAC is designated for the protection of this species because Current Range mapping for this species is only available in 50km grid cells the resolution is less fine than that which is available for other species. However, mapping of the Current Distribution of this species, which is available at 10km grid resolution, indicates that the species is confined to the lower reaches of the Suir system (NPWS, 2008) which is a linear distance of in excess of 60km south east of the proposal site and separated from it by a watercourse of considerably greater length[9]. Therefore, on the basis of the distribution mapping, and bearing in mind the constrained capacity for upstream migration referred to previously, it is considered unlikely that this species occurs within 15km of the proposed development. On the basis of the evidence outlined in this paragraph it is concluded that on this species, within the cSAC, no significant impacts are reasonably foreseeable as a result of the proposal considered in this document.

Twaite shad (*A. fallax* fallax) [1103]

The Lower River Suir cSAC is designated for the protection of this species Because Favourable Reference Range Mapping for this species is only available in 50km grid cells the resolution is less fine than that which is available for other species. However, mapping of the Current Distribution of this species, which is available at 10km grid resolution, indicates that the species s is confined to the lower reaches of the Suir system at a linear distance of in excess of 60km[10] south east of the proposal site and separated from it by a watercourse of considerably greater length. Therefore on the basis of the distribution mapping, and the

[9] Distance measured using 'Measure Distance' Analysis Tool available at http://maps.biodiversityireland.ie/#/Map [accessed 14/08/2012]

[10] Distance measured using 'Measure Distance' Analysis Tool available at http://maps.biodiversityireland.ie/#/Map [accessed 14/08/2012]

evidence sited in the site synopsis, it is considered unlikely that this species occurs within 15km of the proposed development. On the basis of the evidence outlined in this paragraph it is concluded that on this species, within either cSAC, no significant impacts are reasonably foreseeable as a result of the proposal considered in this document.

3.6.2.3 Mammals

Otter (L. lutra)

A search of the NBDC online resource indicates that the most recent, adjacent, records retained for this species are 1980 records included in the 1982 Otter Survey of Ireland[11]. At that time otter were recorded in 100m grid square R947628 approximately 1.3km north east of T21 on the Clodiagh river and in 100m grid square R974594 on the Owenbeg, approximately 1.2km south east of T2.These records, albeit historic, indicate that otters are potentially present within the vicinity of the proposal.

It is presumed in light of the aforementioned evidence and on the basis of the precautionary principle, that these species are potentially present within the zone of impact influence of the proposal.

There is a risk that disturbance due to noise and human presence could cause disturbance or displacement impacts on this species during the construction phase of the proposed windfarm. There is also a risk that the water quality of the local watercourses, that drain the site, could be impaired during the construction stage of the proposed windfarm. It is possible that this could impact negatively on the otter within both the Lower River Shannon cSAC and the Lower River Suir cSAC downstream of the proposal site.

It is considered that the proposal considered in this document could potentially pose a risk of habitat degradation through sedimentation and/or pollution. This could impact the otter directly or indirectly through the reduced availability of prey. Therefore, it cannot be objectively concluded that significant indirect impacts on the otter will not ensue from an unmitigated construction phase.

3.6.3 Water Quality

The potential significant impacts of the proposed development on aquatic ecology (without mitigation) are summarised as follows:

1. *Pollution of watercourses with suspended solids due to runoff of soil from construction areas.*

[11] Available at: http://maps.biodiversityireland.ie/#/Map [accessed 7/06/2012]

In the absence of adequate mitigation measures, contamination of water courses with suspended solids may have the potential to impact on potential salmonid spawning and nursery areas and this is one of the most significant potential impacts of the proposed development. The impact would be classified as a significant negative impact on all affected streams (namely the Clydagh and Breanagh Rivers and their tributaries). Pollution of the local watercourses would result in a direct impact on the SPA and particularly the cSAC.

2. *Pollution of watercourses with nutrients due to ground disturbance during construction and during clear felling of forestry.*

The main potential sources of nutrient inputs to freshwater due to ground disturbance are:

i. Nutrients adsorbed or chemically bound to eroded suspended solids
ii. Leaching of fertilisers used during the forestry operation

3. *Pollution of watercourses with nutrients due to decomposition of brash after forestry clear felling.*

4. *Pollution of watercourses, during construction phase, with other substances such as fuels, lubricants, waste concrete, waste water from wash facilities, etc.*

5. *Pollution of watercourses with surface drainage water from paved areas and road surfaces.*

   There is a risk of pollution of surface waters with hydrocarbons from paved areas after the construction is complete.

6. *Permanent loss of habitat due to stream crossings.*

   Construction of stream crossings at site entrance and installation of box culvert at may result in potential for in-stream deterioration of water quality.

In the absence of adequate mitigation measures, pollution of water courses from any of the above possible sources has the potential to impact on qualifying interests, aquatic species, otter and freshwater habitat within the *Lower River Shannon and Lower River Suir c SACs*. This is the most significant potential impact of the proposed development. The impact, if it resulted in a severe pollution event, would be classified as a significant negative impact on the adjacent stream and on both cSACs. A number of species of qualifying interest could be affected, particularly if spawning success of these species was negatively impacted. Additional impacts would occur, particularly to otter, should availability of prey be reduced.

TABLE 16 SUMMARY OF UNMITIGATED IMPACTS

Ecological Feature	**Potential impacts**	**Potential significance of the unmitigated impact Lower River Shannon cSAC**	**Potential significance of the unmitigated impact Lower River Suir cSAC**
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]	• Possible decrease in water quality as a result of run-off of pollution.	**Significant**	**Significant**
Freshwater pearl mussel (*Margaritifera margaritifera*) [1029]	• Possible decrease in habitat quality from sedimentation or pollution. Possible death of glochidia larvae. • Possible decrease in abundance of parasitic salmonid hosts due to sedimentation or pollution of habitat.	*None expected*	**Significant**
White-clawed crayfish (*Austropotamobius pallipes*)[1092]	• Possible decrease in habitat quality from sedimentation or pollution.	<u>Species not a Qualifying Feature of Interest</u>	**Significant**
Atlantic salmon (*Salmo salar*) [1106]	• Possible decrease in habitat quality from sedimentation or pollution and reduction in spawning area.	**Significant**	**Significant**
Sea lamprey (*Petromyzon marinus*)[1095]	• Possible decrease in habitat quality from sedimentation or pollution.	*None expected*	**Significant**

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Ecological Feature	**Potential impacts**	**Potential significance of the unmitigated impact Lower River Shannon cSAC**	**Potential significance of the unmitigated impact Lower River Suir cSAC**
Brook lamprey (*L. Planeri*) [1096] and River lamprey (*Lampetra fluviatilis*) [1099]	• Possible decrease in habitat quality from sedimentation or pollution and reduction in spawning area.	**Significant**	**Significant**
Allis shad (*A. alosa*) [1102]		Species not a Qualifying Feature of Interest	*None expected*
Twaite shad (*A. fallax fallax*) [1103]		Species not a Qualifying Feature of Interest	*None expected*
Otter (*L. lutra*) [1355]	Possible disturbance or displacement impacts from noise and human presence during construction phase. Possible decrease in habitat quality and/or prey availability from sedimentation or pollution.	**Significant**	**Significant**
Ecological Feature	**Potential impacts**	**Potential significance of the unmitigated impact Slieve Felim to Silvermines SPA**	
Hen harrier (*C.cyaneus*) [A082]	Disturbance/displacement from habitat Potential risk of collision	**Not Significant**	

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3.7 MITIGATION

Construction of the windfarm has the potential to cause negative short-term and/or permanent impacts to terrestrial habitats within the proposed windfarm site and to aquatic habitats and species in the rivers and streams associated with the site. A number of planned mitigation measures detailed below will reduce these impacts significantly. Many of the mitigation measures below have been based on CIRIA (Construction Industry Research and Information Association, UK) technical guidance on water pollution control and on current accepted best practice.

3.7.1.1 Storage, Stockpiling and Waste Generation Management

All excavated earth materials must be either re-used in an environmentally appropriate and safe manner, e.g. used for landscaping, or removed from the development site at the end of the construction phase.

In addition, a construction phase Environmental Management Plan will be incorporated to include regular checking of equipment, materials storage and transfer areas, drainage structures and their attenuation ability during the construction phase of the project. The purpose of this management control is to ensure that the measures that are put in place continue to operate effectively, to prevent accidental leakages, and to identify potential breaches in the protective retention and attenuation network during earthworks operations

3.7.1.2 Soil, Subsoil and Bedrock Removal

The removal of topsoil, mineral subsoil and bedrock is an unavoidable impact of the development but every effort will be made to ensure that the amount of earth materials excavated is kept to a minimum in order to limit the impact on the geological and hydrological aspects of the site.

A number of mitigation measures have been incorporated into the project design in order to reduce the likely significance of the impacts on the Natura 2000 sites as outlined above. The main concern is the potential impacts on the water quality of watercourses within the Lower River Suir and the Lower River Shannon cSACs during the construction phase, and the subsequent impacts on the aquatic species of qualifying The main risk to the water quality of the streams draining the site, which drain into the nearby Lower River Suir cSAC and the Lower River Shannon cSAC, results from the potential sedimentation of streams, run-off of pollutants from construction discharging into watercourses and accidental fuel spillages. These risks arise from both felling and construction activities. Management measures will be put in place to avoid any pollution risks to the Lower River Suir cSAC and the Lower River Shannon cSAC.

3.7.2 Water Quality Measures during the Construction Phase

It is noted that no in-stream works are proposed. A number of mitigation measures will be implemented in order to reduce the significance of the potential adverse impacts associated with the construction phase.

3.7.2.1 Runoff and sediment control

Erosion control where runoff is prevented from flowing across exposed ground and sediment control where runoff is slowed to allow suspended sediment to settle are important elements in runoff and sediment control. An erosion and sediment control management plan has been designed to prevent sediment and pollutant runoff into the river during the construction phase and is included as **Appendix 15-I**. This plan will be implemented during construction to control increased runoff and associated suspended solid loads in discharging waters from the development areas. The main elements of this plan include:

- Implement erosion control to prevent runoff flowing across exposed ground and becoming polluted by sediments;
- Intercept and divert clean water runoff away from construction site runoff to avoid cross-contamination of clean water with soiled water;
- Implement sediment control to slow down runoff allowing suspended sediments to settle in situ particularly on roads;
- When working at each stage and section (e.g. access road, substation compound, turbine bases, etc) of the development the associated erosion and sediment controls at each section will be put in place prior to construction of each section. Access roads will need to be constructed to access the proposed site for turbine locations. The associated erosion and sediment controls, drains, sediment traps and settling ponds, will be constructed along side these roads and in a conscious manner to ensure that the potential risk to water quality is minimised;
- Minimise area of exposed ground by maintaining existing vegetation that would otherwise be subject to erosion in the vicinity of the windfarm infrastructure and keeping excavated areas to a minimum;
- The clearing of soil and peat associated with the proposed development will take place immediately before construction begins;
- Avoid working near watercourses during or after prolonged rainfall or an intense rainfall event and cease work entirely near drains when it is evident that pollution is occurring;
- Install a series of silt fences or other appropriate silt retention measure where there is a risk of erosion runoff to watercourses from construction related activity particularly if working during prolonged wet weather period or if working during intense rainfall event;

- Implement sediment control measures that includes for the prevention of runoff from adjacent intact ground that is for the separation of clean and 'dirty' water;
- Install appropriate silt control measures such as silt-traps, check dams and sedimentation ponds;
- Provide recommendations for public road cleaning where needed particularly in the vicinity of drains; and
- Controls need to be regularly inspected and maintained otherwise a failure may result, such as a build up of silt or tear in a fence, which will lead to water pollution so controls must work well until the vegetation has re-established; inspection and maintenance is critical after prolonged or intense rainfall.
- Run-off from wind turbine foundation concrete pours shall not be permitted to enter the drainage system and shall be contained within the foundation excavations and designated areas that are suitably sited and designed;
- No work will take place within 50m buffer zones of live watercourses except for the stream crossings.
- All construction method statements will be prepared in consultation with Inland Fisheries Ireland;
- All associated tree felling will be undertaken using good working practices as outlined by the Forest Service in their 'Forestry Harvesting and Environment Guidelines' (Forest Service, 2000a) and the 'Forestry and Water Quality Guidelines '(Forest Service, 2000b). The latter guidelines deal with sensitive areas, erosion, buffer zone guidelines for aquatic zones, ground preparation and drainage, chemicals, fuel and machine oils;
- Drainage ditches or other suitable measures will be adopted alongside access roads, turbines and other disturbed areas to prevent silt or contamination from construction water runoff entering watercourses;
- Check dams will be placed at regular intervals based on slope gradient along all drains to slow down runoff to encourage settlement and to reduce scour and ditch erosion;
- Drains, carrying construction site runoff, will be diverted into silt traps;
- Wheel washes will be provided for exiting heavy vehicles to ensure roads outside of the site boundary are clean;
- Pumped or tremied concrete will be monitored carefully to ensure no accidental discharge into the watercourse;
- A programme of inspection and maintenance of drainage and sediment control measures during construction will be designed and dedicated construction personnel assigned to manage this programme;
- Water quality monitoring will be carried out for two years post-construction to determine whether water quality is impacted.

3.7.2.2 Protection of Watercourses (General Measures)

It is recommended that the following measures should be incorporated into the development so as to ensure no significant negative impact on water course and the features of conservation interest:

- Raw or uncured waste concrete / cementitious material will be disposed of by removal from the site.
- The amount of *in-situ* concreting required will be minimised and ready-mix suppliers will be used in preference to on-site batching.
- Fuelling and lubrication of equipment will be carried out in bunded areas.
- Any spillage of fuels, lubricants or hydraulic oils will be immediately contained and the contaminated soil removed from the site and properly disposed of.
- Oil booms and oil soakage pads will be kept on site to deal with any accidental spillage.
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling.
- Prior to any work it will be ensured that all construction equipment is mechanically sound to avoid leaks of oil, fuel, hydraulic fluids and grease.
- Overnight parking of vehicles away from watercourses

3.7.2.3 Run-off and Sediment Control Plan and Measures

A Sediment and Erosion Control Plan will be designed to safeguard the water environment and incorporated into the Construction Environmental Management Plan (CEMP) and other surface water management measures employed during the construction phase of the proposed windfarm (see Chapter 13). The main aspects of the plan are outlined hereunder:

- Reduce changes in run-off regimes
- Control surface water run-off within and its effects outside the site
- Protect aquatic environments
- Separate clean water from construction activity effected water
- Appropriately design and specify the provision of sediment series ponds and silt traps
- Prevent all sediment associated pollution entering watercourses and groundwater

Erosion control where run-off is prevented from flowing across exposed ground and sediment control where run-off is slowed to allow suspended sediment to settle are important elements in run-off and sediment control. This plan will be implemented during construction to control increased run-off and associated suspended solid loads in discharging waters from the construction area. All site compound drainage will be passed through a settlement facility with the capacity to retain any accidental spillage or leakage of polluting substances. The main elements of this plan include:

- Prior to excavation, drains will be established to effectively drain grounds prior to earthworks. Such drains will be positioned at an oblique angle to slope contours to ensure ground stability.
- All site excavations and construction will be supervised by a suitably qualified engineer. The contractor's methodology statement will be reviewed and approved by a suitably qualified engineer prior to site operations.
- Run-off from foundation concrete / cementitious material pours shall not be permitted to enter the watercourse and shall be contained within the foundation excavations and designated areas that are suitably sited and designed.
- The area of exposed ground will be kept to a minimum by maintaining, where possible, existing vegetation.
- Temporary deposition areas will be designated and designed to hold temporary stockpiles of spoil. These will be located away from the stream and stockpiles that are at risk of erosion will be protection by silt trapping apparatus such as a geotextile silt fence to prevent contaminated run-off.
- Silt fences or other appropriate silt retention measure will be installed where there is a risk of erosion run-off to the stream from construction related activity, particularly during prolonged wet weather periods or an intense rainfall event.
- Check dams will be placed at regular intervals based on slope gradient along all drains to slow down run-off to encourage settlement and to reduce scour and ditch erosion.
- Drains carrying construction site run-off will be diverted into silt traps.
- It is recommended that wheel washes will be provided in a bunded area at a remove from the stream.
- Pumped or tremied concrete / cementitious material will be monitored carefully to ensure no accidental discharge into the stream.
- A programme of inspection and maintenance of drainage and sediment control measures during construction will be designed and dedicated construction personnel assigned to manage this programme.
- Silt traps will be regularly inspected, any blockages cleared and they will be maintained and cleaned during dry weather.

A continuous silt fence will be installed down slope from the works area where construction shall take place within 100m of a stream. This will act as a physical impediment to any material or run-off reaching the stream and will be installed prior to the commencement of site excavations for each section. Effective and adequate temporary silt fences will be erected on the river side to trap sediment particles when work is taking place during a prolonged wet weather period or intense rainfall event. The silt fences will be inspected regularly to ensure that the integrity of the structure remains intact and fit for purpose throughout the construction phase of the proposal.

3.7.2.4 Fuel and Oil Management Plan

Fuel management measures will be implemented which will incorporate the following elements:

- Machinery will be confirmed as being mechanically sound and without fuel or oil leaks and fit for purpose prior to project start;
- Use of biodegradable products where possible, e.g. hydraulic fluid;
- Mobile bowsers, tanks and drums will be stored in secure, impermeable storage area, a minimum of 50m from drains and open water;
- Fuel containers must be stored within a secondary containment system e.g. bund for static tanks or a drip tray for mobile stores;
- Ancillary equipment such as hoses, pipes must be contained within the bund;
- Taps, nozzles or valves must be fitted with a lock system;
- Fuel and oil stores including tanks and drums will be regularly inspected for leaks and signs of damage;
- Only designated trained operators will be authorised to refuel plant on site and emergency spill kits will be present at equipment for all refuelling events;
- Procedures and contingency plans will be set up to deal with an emergency accidents or spills; and
- An emergency spill kit with oil boom, absorbers etc. will be kept on site in the event of an accidental spill.
-

3.7.2.5 Replanting and Reinstatement of Site

Exposed areas of the site that are slow to re-vegetate may need to be replanted with suitable vegetation. This will be decided by the developer in consultation with the project ecologist near the end of the construction phase.

As a result of permanent felling, works areas surrounding T3, T9, T12, T14 and T22 will be bare and it is proposed to incorporate these areas into an Ecological Management Plan for the site.

3.7.2.6 Truck Wash and Concrete / Cementitious Material Residue

It is important to prevent concrete and other cementitious material from entering the streams situated in close proximity to the site.

It is recommended that a designated bunded and impermeable truck wash area be provided. Resultant waste water is to be diverted to siltation pond for settling out of solids, prior to release. It is important that a pumping / dewatering system is well planned. Pumped water will need to be treated in the adequate settlement pond and silt trap before it can enter the stream. Among other things, concrete and other cementitious material will be used for the construction and the following measures will be implemented:

- Designate a concrete / cementitious material washout area away from drains and watercourses at a designated, contained impermeable area or washout trucks off-site.
- A designated trained operator experienced in working with concrete and other cementitious material will be employed during the pouring phase.
- Large volumes of concrete and other cementitious material water to be pumped into a skip to settle out.

3.7.2.7 Waste Control

The main contractor should engage a waste company to deal with all its wastes during construction, so all waste streams should be identified at the outset and a selection of skips and bins are delivered to the contractor's compound at the outset and the waste is then managed throughout the construction phase. The contractor should prepare a Waste Management Plan.

Any introduced semi-natural (road building materials) or artificial (PVC piping, cement materials, electrical wiring etc.) must be taken off site at the end of the construction phase. Any accidental spillage of solid state introduced materials must be removed from the site.

3.7.2.8 Storage

The storage of materials, containers, stockpiles and waste, however temporary, should follow best practice at all times and be stored at designated areas. Storage will be located as follows:

- Away from drains and any watercourses or drains
- Fuel oils etc. will be stored in a sheltered area well removed from aquatic zones
- Under cover to prevent damage from the elements
- In secure areas
- Well away from moving plant, machinery and vehicles

All containers will be stored upright and clearly labelled.

3.7.3 Summary of Residual Mitigated Impacts

Table 16 below includes an assessment of the likely residual impacts of the proposed Upperchurch Windfarm provided that all management mitigation measures outlined above are adequately implemented.

TABLE 17: POTENTIAL SIGNIFICANCE OF THE MITIGATED IMPACT

Ecological Feature(s) / Impact	**Potential significance of the unmitigated impact**	**Summary of Mitigation Measures**	**Potential significance of the mitigated**
Freshwater pearl mussel (*Margaritifera margaritifera*) / Impairment of water quality	Significant	• Protection of water quality (general) • Run-off and Sediment Control Plan and Measures • Fuel and Oil Management Plan • Truck Wash and Concrete / Cementitious Material Residue • Waste Control • Storage	Not significant
White-clawed crayfish (*Austropotamobius pallipes*) / Impairment of water quality	Significant		Not significant
Sea lamprey (*Petromyzon marinus*) / Impairment of water quality	Significant		Not significant
River lamprey (*Lampetra fluviatilis*) and brook lamprey (*L. Planeri*) / Impairment of water quality	Significant		Not significant
Atlantic salmon (*Salmo salar)* Impairment of water quality	Significant		Not significant
Otter (*Lutra lutra*) / Impairment of water quality	Significant		Not significant
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation / Impairment of water quality	Significant		Not significant

4 Conclusion

- The proposed windfarm lies within 15 km of Lower River Shannon cSAC (site code 002165), Bolingbrook Hill cSAC (site code 002124), Lower River Suir cSAC (site code 002137), Anglesey Road cSAC (site code 002125), Slievefelim to Silvermines Mountains SPA (site code 004165), Silvermines mountains West SAC (site code 002258), Keeper Hill SAC (site code 001197), Kilduff, Devilsbit Mountain SAC (site code 000934) and Philipston Marsh SAC (site code 001847). An Appropriate Assessment has been undertaken to determine the significance of the impact on Natura 2000 sites. No adverse impact is expected to arise to Natura 2000 Sites as a result of the proposed development.
- The main potential negative impacts identified relate to habitat loss, disturbance to fauna during construction phase of the development, risk of collision for the hen harrier and the pollution of waterways downstream of the drains/streams within the proposed site.
- A comprehensive erosion and sediment plan has been developed and this will reduce the likelihood of any potential pollution event occurring which could impact on protected sites downstream of the development. Other mitigation measures include the implementation of a fuel management plan, control of wheel wash, dewatering and concrete, and the recommendation for the composition of an ecological management plan prior to construction.
- Pre-construction monitoring will be undertaken for birds and post construction monitoring will be undertaken for the first two year of operation.
- No significant ecological residual impacts are expected as a result of the construction and operational phase of the proposed Upperchurch Windfarm.

5 References

Anon, (2010). *Freshwater Pearl Mussel Second Draft Munster Blackwater Sub-Basin Management Plan*. (Produced by NS 2; Funded by Department of the Environment, Heritage and Local Government (DoEHLG)

Blamey, M., Fitter, R. & Fitter, A. (2003). *Wild Flowers of Britain and Ireland*. London: A & C BlackPublishers Ltd

Byrne, A., Moorkens, E.A., Anderson, R., Killeen, I.J. & Regan, E.C. (2009) *Ireland Red List No. 2 – Non- Marine Molluscs*. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

Dempsey, E and O' Clery, M. (2010). The Complete Field Guide to Ireland's Birds. Published by Gill and Macmillan Ltd.

Department of the Environment, Heritage and Local Government (DoEHLG) (2009). *Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities.* Department of Environment, Heritage and Local Government.

EC (2000). *Managing Natura 2000 Sites: The provision of Article 6 of the Habitats Directive 92/43/EEC*. Luxembourg: Office for Official Publications of the European Communities, 2000.

EC (2001). *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*. Luxembourg: Office for Official Publications of the European Communities.

Environment Directorate General (EDG) (2007). *Interpretation Manual of European Union Habitats*, European Commission, Brussels.

EPA, 2002. *Guidelines on information to be contained in Environmental Impact Statements*. Published by the Environmental Protection Agency, Ireland.

Fossitt, J. A. (2000) *A Guide to Habitats in Ireland*. Kilkenny: The Heritage Council.

Foster-Turley, P., Macdonald, S.M. & Mason, C.F. (1990). Otters*: an action plan for their conservation.* Gland, Switzerland: International Union for the Conservation of Nature and Nature Resources/Species Survival Commission/Otter Specialist Group.

IEEM (2006). *Guidelines for Ecological Impact Assessment in the United Kingdom*. Institute for Ecology and Environmental Management.

Irwin, S., Wilson, M., O'Donoghue, B., O'Mahony, B., Kelly, T. & O'Halloran J. (2012). *Optimum Scenarios for Hen Harrier conservation in Ireland: HENHARRIER FINAL REPORT*. A Report prepared for the Department of Agriculture, Food & the Marine, Dublin.

King J. J. and Linnane S. M. (2004) The status and distribution of lamprey and shad in the Slaney and Munster Blackwater SACs. *Irish Wildlife Manuals*, No. 14. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

Lewis, C., Jackson, A. and Lowes, T. (2009). *Ireland's designation of Special Protection Areas (SPAs) for Hen harriers (Circus cyaneus) under Council Directive 79/409/EEC on the conservation of wild bird.* (Available at: http://www.friendsoftheirishenvironment.net/cmsfiles/files/library/hen_harrier_circualtion_copy__26_02_09.pdf [accessed 26/07/2012]).

Lynas, P., Newton, S.F., and Robinson, J.A. (2007). *The status of birds in Ireland: an analysis of conservation concern 2008-2013.* Irish Birds, 8: 149-167.

Madden, B. and Porter, B. (2007). Do wind turbines displace hen harriers *Circus cyaneus* from foraging habitat? Preliminary results from a case study at the Derrybrien wind farm, County Galway. *Irish Birds,* 8: 231-236.

Madders, M. (2000). Habitat selection and foraging success of Hen Harriers Circus cyaneus in west Scotland. *Bird Study*. **47**, 32-40.

National Parks and Wildlife Service (NPWS) (2007) Atlantic salmon (Salmo salar L.) (1106) Conservation Status Assessment Report. National Parks & Wildlife Service. http://www.npws.ie/en/media/Media,6273,en.pdf

National Parks and Wildlife Service (NPWS), (2008). *The Status of EU Protected Habitats and Species in Ireland. Conservation Status in Ireland of Habitats and Species listed in the European Council Directive on the Conservation of Habitats, Flora and Fauna 92/43/EEC*, Department of the Environment, Heritage and Local Government.

NRA (2009). *Guidelines for Assessment of Ecological Impacts of National Road Schemes*. National Roads Authority.

O'Connor, W. (2007) A Survey of Juvenile Lamprey Populations in the Corrib and Suir Catchments. *Irish Wildlife Manuals* No. 26. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

O'Donoghue, B., O'Donoghue, T.A., and Frank King, F. (2011), The Hen Harrier in Ireland: Conservation Issues for the 21st Century. *Biology and Environment: Proceedings of the Royal Irish Academy*, Vol. 111B.

Parnell, J. and Curtis, T. (2012). *Webb's An Irish Flora.* 8th edn. Cork: Cork University Press.

Peay, S. (2003). *Guidance on habitats for white-clawed crayfish*. R&D Technical report WI-067/TR, Bristol: Environment Agency. In: Reynolds, J. D. (2007). *Conservation Assessment* *of the White-Clawed Crayfish* Austropotamobius Pallipes (*Lereboullet, 1858) in Ireland.* Report to National Parks and Wildlife Service.

Reynolds, J. D. (2007). *Conservation Assessment of the White-Clawed Crayfish,* Austropotamobius Pallipes, (*Lereboullet, 1858) in Ireland.* Report to National Parks and Wildlife Service.

Ruddock, M. & Dunlop, B.J., O'Toole, L., Mee, A., Nagle, T. (2012) Republic of Ireland National Hen Harrier Survey 2010. *Irish Wildlife Manual*, No. 59. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Smith, G., O'Donoghue, P., O'Hora, K., & Delaney, E. (2011). *Best Practice Guidance for Habitat Survey and Mapping*. The Heritage Council.

Whilde, A., (1993) Threatened *Mammals, Birds, Amphibians and Fish in Ireland – Irish Red Data Book 2: Vertebrates*. HMSO, Belfast.

Wilson, M., Gittings, T., O'Halloran, J., Kelly, T. and Pithon, J (2006). The distribution of Hen Harriers in Ireland in relation to land use cover, particularly forest cover. *CoFord Connects, Forestry & Environment: No.6*, September 2006 (Available at: http://www.coford.ie/media/coford/content/publications/projectreports/cofordconnects [accessed 17/07/2012])

Wilson, M. W., Irwin, S., Norriss, D.W., Newton, S.F., Collins, K., Kelly, T.C. & O'Halloran, J. (2009). The importance of pre-thicket conifer plantations for nesting Hen Harriers Circus cyaneus in Ireland. *Ibis* (2009) 151. 332-343.

FIGURE 13-II-1: SPECIAL AREAS OF CONSERVATION (SAC) WITHIN 15KM OF THE STUDY AREA

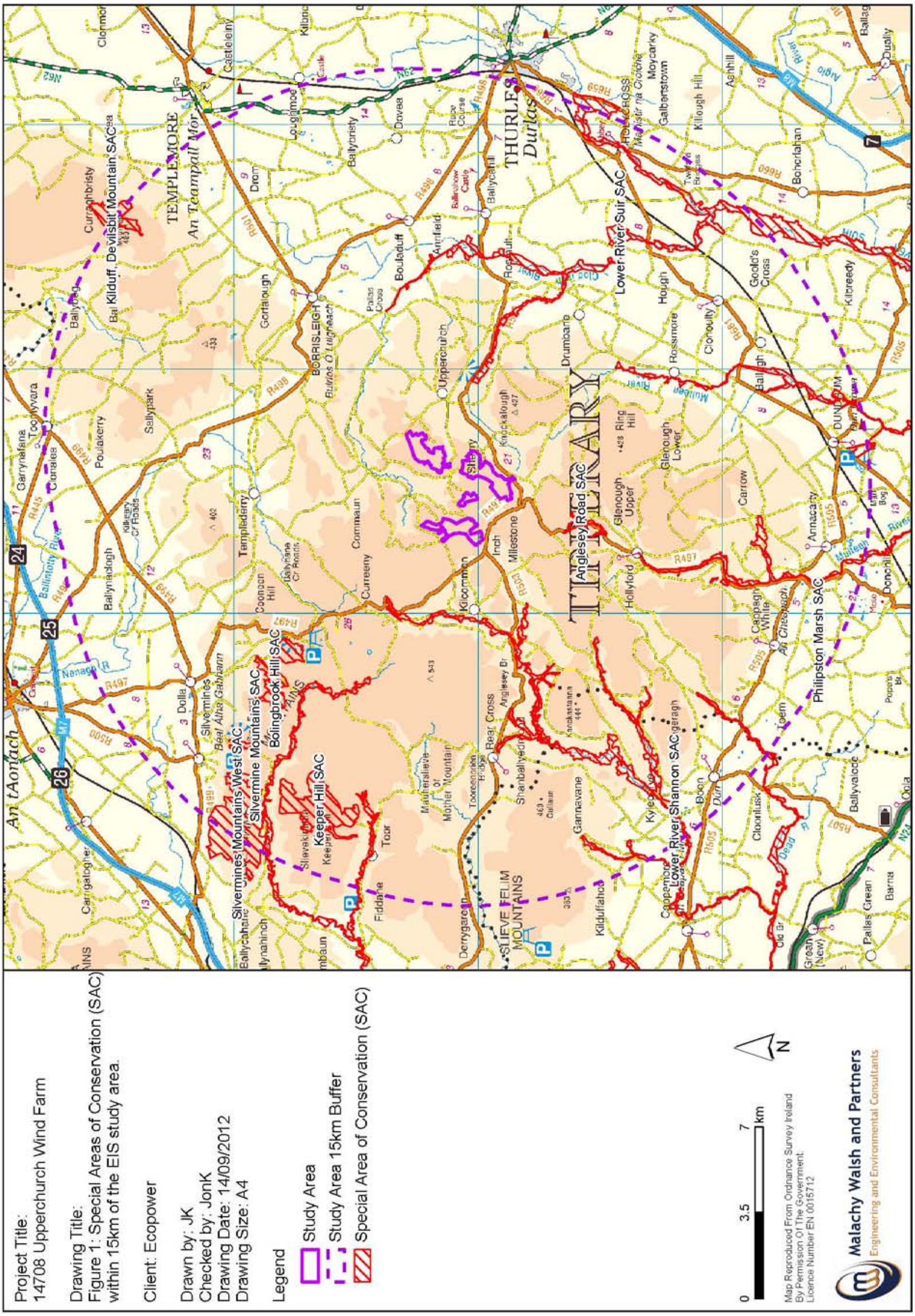
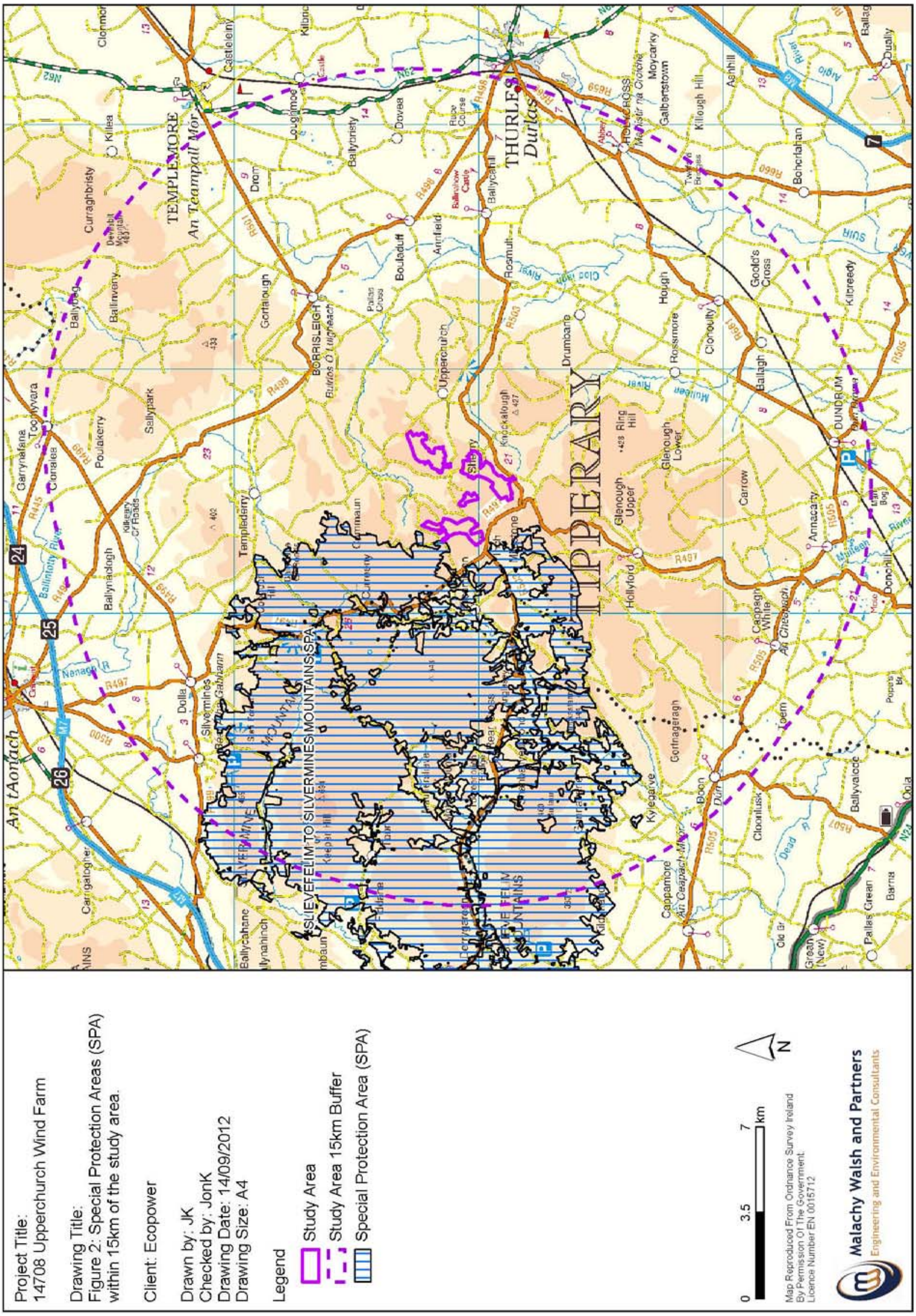


FIGURE 13-II-2: SPECIAL PROTECTION AREAS (SPA) WITHIN 15KM OF THE STUDY AREA



Upperchurch Windfarm Environmental Impact Statement

Malachy Walsh and Partners
Engineering and Environmental Consultants

APPENDIX 13- B CONSERVATION OBJECTIVES

Conservation Objectives for Anglesey Road SAC [002125]

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

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:
- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

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

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

- [6230] * Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)

Citation:

NPWS (2011) Conservation objectives for Anglesey Road SAC [002125]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning

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Conservation Objectives for Kilduff, Devilsbit Mountain SAC [000934]

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

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:
- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

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

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

- [4030] European dry heaths
- [6230] * Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)

Citation:

NPWS (2011) Conservation objectives for Kilduff, Devilsbit Mountain SAC [000934]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning

Conservation Objectives for Keeper Hill SAC [001197]

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

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:
- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

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

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

- [4010] Northern Atlantic wet heaths with *Erica tetralix*
- [6230] * Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)
- [7130] Blanket bogs (* if active only)

Citation:

NPWS (2011) Conservation objectives for Keeper Hill SAC [001197]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning

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Department of
Arts, Heritage and the Gaeltacht
18 July 2011

Conservation Objectives for Philipston Marsh SAC [001847]

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

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:
- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

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

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

- [7140] Transition mires and quaking bogs

Citation:

NPWS (2011) Conservation objectives for Philipston Marsh SAC [001847]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning

Conservation Objectives for Bolingbrook Hill SAC [002124]

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

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:
- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

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

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

- [4010] Northern Atlantic wet heaths with *Erica tetralix*
- [4030] European dry heaths
- [6230] * Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)

Citation:

NPWS (2011) Conservation objectives for Bolingbrook Hill SAC [002124]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning

Conservation Objectives for Lower River Suir SAC [002137]

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

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:
- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

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

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

- [1029] *Margaritifera margaritifera*
- [1092] *Austropotamobius pallipes*
- [1095] *Petromyzon marinus*
- [1096] *Lampetra planeri*
- [1099] *Lampetra fluviatilis*
- [1103] *Alosa fallax*
- [1106] *Salmo salar* (only in fresh water)
- [1330] Atlantic salt meadows (*Glauco-Puccinellietalia* maritimae)
- [1355] *Lutra lutra*
- [1410] Mediterranean salt meadows (*Juncetalia maritimi*)
- [3260] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
- [6430] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
- [91A0] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

Citation:

NPWS (2011) Conservation objectives for Lower River Suir SAC [002137]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning

- [91E0] * Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)
- [91J0] * *Taxus baccata* woods of the British Isles

Citation:

NPWS (2011) Conservation objectives for Lower River Suir SAC [002137]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht
18 July 2011
Generic Conservation Objective

Conservation Objectives for Lower River Shannon SAC [002165]

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

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:
- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

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

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

- [1029] *Margaritifera margaritifera*
- [1095] *Petromyzon marinus*
- [1096] *Lampetra planeri*
- [1099] *Lampetra fluviatilis*
- [1106] *Salmo salar* (only in fresh water)
- [1110] Sandbanks which are slightly covered by sea water all the time
- [1130] Estuaries
- [1140] Mudflats and sandflats not covered by seawater at low tide
- [1150] * Coastal lagoons
- [1160] Large shallow inlets and bays
- [1170] Reefs
- [1220] Perennial vegetation of stony banks
- [1230] Vegetated sea cliffs of the Atlantic and Baltic coasts
- [1310] *Salicornia* and other annuals colonizing mud and sand
- [1330] Atlantic salt meadows (*Glauco-Puccinellietalia* maritimae)

Citation:

NPWS (2011) Conservation objectives for Lower River Shannon SAC [002165]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning

- [1349] *Tursiops truncatus*
- [1355] *Lutra lutra*
- [1410] Mediterranean salt meadows (*Juncetalia maritimi*)
- [3260] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
- [6410] *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)
- [91E0] * Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)

Citation:

NPWS (2011) Conservation objectives for Lower River Shannon SAC [002165]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning

Conservation Objectives for Silvermines Mountains West SAC [002258]

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

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

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

The favourable conservation status of a species is achieved when:

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

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

- [4010] Northern Atlantic wet heaths with *Erica tetralix*
- [4030] European dry heaths

Citation:

NPWS (2011) Conservation objectives for Silvermines Mountains West SAC [002258]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning

Conservation Objectives for Slievefelim to Silvermines Mountains SPA [004165]

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

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:
- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

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

Objective: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:

- *Circus cyaneus* [breeding]

Citation:

NPWS (2011) Conservation objectives for Slievefelim to Silvermines Mountains SPA [004165]. Generic Version 4.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning

Upperchurch Windfarm Environmental Impact Statement

Malachy Walsh and Partners

Consulting Engineers

Cork | Tralee | Limerick | London

WINDFARM DEVELOPMENT
UPPERCHURCH, THURLES, COUNTY TIPPERARY

GEOTECHNICAL ASSESSMENT REPORT

ECOPOWER DEVELOPMENTS LIMITED

Project	Document	Revision	Prepared	Checked	Status	Date
14708	6003	A	Sean Doyle	Jack O'Leary	Draft	18 June 2012

14 Geotechnical

14.1 INTRODUCTION

It is proposed to construct a 22 turbine wind farm in the area immediately to the west of Upperchurch and 18km to the west of Thurles, County Tipperary. The turbines, which are numbered T01 to T22 are arranged in four clusters within an overall area of 12km^2. This study assesses the potential impact of the wind farm development proposals on the soils and geology of the area.

A desk study was undertaken to collate and review all available information from existing datasets and documentation sources relating to the site's natural environment and included the following:

- Examination of maps and aerial photography;
- Examination of the Geological Survey of Ireland (GSI) datasets pertaining to geological and extractive industry data;
- Examination of EPA soil and subsoil maps;
- Examination of National Parks and Wildlife Service (NPWS) nature conservation designations.

Site visits were undertaken on 28th October 2011, 11th & 12th April and 10th May 2012 during which field surveys were carried out. These surveys identified geological and soil features, peat extent and depth, geomorphological features, relict failures, rock exposures, wet ground, general soil and rock types and drainage patterns. Trial pits were excavated at 20 of the proposed turbine sites and peat depth and classification was measured at the remaining two sites (T05 & T14) which are in forested areas. Ground surface slope was measured at all turbine sites. The trial pit logs and photographs are included in **Appendix 14-I**.

14.2 EXISTING ENVIRONMENT

14.2.1 General

The Upperchurch wind farm site is located within a series of small hills or drumlins to the west of Upperchurch village. The hills are at elevations of between 363mOD and 411mOD and the peaks are generally at heights of 100m above the intervening lower terrain. The highest peak is that of Knockmaroe at an elevation of 411mOD.

The Slievefelim to Silvermines Mountains SPA lies to the west of the site. Most of the site is within the South Eastern River Basin District and drains to the Owenbeg Turraheen and Clodiagh Rivers and ultimately to the River Suir. The remaining part of the site at the south western extremity is within the Shannon River Basin District and drains to the Aughvana River and ultimately to the Mulkear River.

The area is underlain by Silurian Metasediments and Volcanics with subsoils consisting of Devonian / Carboniferous sandstone and shale till. Some rock outcropping occurs, most notably at the northeast part of the site. The area originally had shallow peat land cover but most of it has been reclaimed by deep ploughing and converted to pasture. The remaining peat areas are used mainly for commercial forestry.

Overall it is a landscape much altered by human activity.

14.2.2 Geological heritage

The Irish Geological Heritage Programme identifies and selects a complete range of sites that represent Ireland's geological heritage under sixteen themes ranging from Karst features to Hydrogeology. Consultation with GSI Geological Heritage Database and the GSI indicates that there is a feature approximately 3.50km to the south of the site at Irish National Grid coordinate E:193850, N:155900. This feature (IGH2-34) is designated as a Precambrian to Devonian Palaeontology fossil from the Silurian era.

14.2.3 Regional geology

The geology of the Tipperary region (GSI Sheet 18) is dominated by the sedimentary rocks of the Carboniferous Period. Within this greater area is the Slievefelim-Devilsbit Inlier which is the largest of the Irish Lower Palaeozoic Inliers. The rocks in the inlier are from the mid-Silurian Period dating back c400 million years. The inlier is represented by the Hollyford Formation which consists of greywacke, siltstone and grit and the surrounding Cappagh White Formation from the Devonian Period which consists of red and white sandstone and conglomerates. The formations pre-date the surrounding Carboniferous rocks and were exposed by erosion of anticlinal folds which were formed during the late Carboniferous or Permian Period earth movements.

The Upperchurch site, which lies to the west of Mauher Slieve on the Slievefelim-Devilsbit mountain range, is wholly within the Hollyford Formation (Refer to **Figure 14-1: Bedrock Geology** map at the end of this Chapter). The siltstone bedrock encountered in the site investigations and visible as outcrops in the general area is consistent with the rock type of this formation.

14.2.4 Extractive industry and historic borrow pits

The geological survey of Ireland database for mines and extractions showed up a number of quarries and stone extraction areas located within 20km of the proposed site as outlined below.

- Gortdrum Stone Company sandstone quarry, Gortdrum, County Tipperary is located 20km south southwest of the site and 30km southwest of Thurles at E:187556, N:140592;
- Roadstone Killough limestone Quarry, Thurles is located 18km southeast of the site and 8km south of Thurles at E:211100, N:150700;
- Fantane grit and siltstone quarry, Borrisoleigh is located 6km north northeast of the site at E:198600, N:168456;
- Grawn sand and gravel quarry, Latteragh, County Tipperary is located 8km to the north of the site at E:197530, N:170980;
- Harney Quarries, Cloncannon, Moneygall, Roscrea, County Tipperary is located 16km to the northeast of the site at E:203400, N:177900;
- Latteragh quarry, Lackenavorna, Nenagh, County Tipperary is located 10km to the north of the site at E:196100, N:172700;
- Toor pit, Doonane, Newport is located 16km to the west of the site at E:177700, N:164870;
- There is a mine located 20km west southwest of the site at E:187500, N:140700. Copper, silver and mercury are extracted from this mine;
- There is also a mine 20km southwest of the site at E:183000, N:142500 from which sphalerite and galena are extracted;
- There are also borrow pits on neighbouring wind farms to the south, that have subsequently been filled in.

The locations of the quarries are shown in **Figure 14-5: Quarry Locations**, at the end of this Chapter.

14.3 GEOTECHNICAL

14.3.1 Subsoils

The GSI subsoil geology maps indicate rock at the surface for most of the site with some areas being represented by sandstone and shale till from the Lower Palaeozoic Period. The site investigation trial pits at the turbine locations exposed subsoils consistent with the geology maps with siltstone bedrock close to the surface, overlain by weathered siltstone or shale till derived chiefly from Lower Palaeozoic rocks (Refer to **Figure 14-2: Subsoil Geology** map and Trial Pit logs in **Appendix 14-I**, at the end of this Chapter).

14.3.2 Soils

The soil type varies considerably throughout the site but consists mainly of the following types:

- Lithosols / Rogosols derived mainly from acidic parent materials which are shallow well drained minerals;
- Surface water Gleys / Ground water Gleys derived mainly from acidic parent materials which consist of deep and poorly drained minerals (AminPD);
- Acid Brown Earths / Brown Podzolics derived mainly from acidic parent materials which are deep well drained minerals (AminDW).

The hilltop areas include Peaty Podzolic and Peaty Gley soils.

The primary land use is pasture with some areas of higher ground used for commercial forestry. Refer to Soil Geology map in **Figure 14-3** at the end of this Chapter.

14.3.3 Peat

Much of the hilltop areas were originally covered in shallow peat but most of this has been reclaimed for agricultural use. The remaining peat areas are now almost exclusively used for forestry. Peat depths are typically less than a metre in depth with many areas showing less than 0.30m depth. Shear vane testing and Von Post classification of the peat layer was not carried out because of the shallow depth and low ground slopes which individually or in combination are indicative of low risk of instability.

14.3.4 Composition and character of mineral soils

The composition of the mineral soils was determined by mechanical excavation of trial pits at each of the turbine locations, with the exception of T05 and T14 where only peat depths were recorded. The trial pits indicate a predominance of siltstone till with some occurrences of shale and clay layers. The trial pit logs are included in **Appendix 14-I**.

14.3.5 Ground stability

All parts of the site were examined during the course of the site investigation works. This did not reveal any stress indicators in the form of erosion and there is no evidence of historical peat slides in the area.

Recorded peat slides or landslides in the wider area are:

- A bog burst in Cappamurra Bog, County Tipperary in 1788 which is situated 14km south southwest of the wind farm site;
- An unspecified landslide that occurred at Cummer More, County Tipperary in 1995, 4.20km southwest of the wind farm site.

14.3.6 Slope measurements

Ground slope measurements were taken at each turbine location. The slopes ranged from a minimum of 0.06 at T03 to a maximum of 0.20 at T05. The values for each location are as follows:

Turbine	Gradient	Angle (degrees)
T01	0.16	8.87
T02	0.14	7.97
T03	0.06	3.21
T04	0.16	9.15
T05	0.20	11.31
T06	0.16	9.20
T07	0.17	9.70
T08	0.12	6.73
T09	0.17	9.82
T10	0.11	6.11
T11	0.09	5.14
T12	0.18	10.43
T13	0.16	9.15
T14	0.13	7.52
T15	0.13	7.24
T16	0.12	6.67
T17	0.10	5.94
T18	0.10	5.77
T19	0.09	5.03
T20	0.12	6.73
T21	0.10	5.54
T22	0.11	6.39

TABLE 14.1 – GROUND SLOPES AT TURBINE SITES

These values will be taken into account in the detailed design of the turbine bases but the information from the trial pits indicates that the ground is inherently stable and there is no particular risk of failure.

14.3.7 Site drainage

All of the proposed wind turbine locations and site access roads are on elevated sloping ground with good natural drainage to the streams in the surrounding valleys which form the upper reaches of a number of rivers in the area. Most of the site lies within the South Eastern River Basin District and drains to the Turaheen, Owenbeg and Clodiagh Rivers, all of which ultimately drain to the River Suir. The remaining part of the site at its south western extremity is within the Shannon River Basin District and drains to the Aughvana River which joins the Mulkear River east of Cappamore and ultimately into the Shannon immediately upstream of Limerick City.

14.3.8 Summary of geotechnical and soil stability

There is a very low risk of slippage or landslides in the Upperchurch wind farm site because of the stable sub-surface ground conditions as determined in the site investigations and the absence of any significant peat coverage. Mitigation measures, based on precautionary principles, as outlined in Section 14.4 will ensure that the level of risk will not increase as a result of construction activities.

14.4 LIKELY SIGNIFICANT IMPACTS

14.4.1 Construction Phase Impacts

14.4.1.1 Primary Construction Activities

The development is characterised by the following civil engineering works which will be undertaken to provide the necessary infrastructure to complete the wind farm:

- Excavation for the construction of 22 turbine bases with a minimum depth of 2.00m and 250m^2 plan area and hardstands with and excavation depth of 0.60m and 1,040m^2 plan area;
- Erection of 22 turbines with hub heights of up to 85m and maximum tip heights of up to 126.60m;
- Construction of 8km of 5.00m wide new roads;
- Widening and upgrading of 3.6km of existing farm roads (average 2m widening);
- Construction of an electrical sub-station compound with excavation depth of 0.60m and 2,624m^2 plan area;
- Construction of an electrical sub-station and installation of associated equipment;
- Laying electrical cable between turbines and sub-station compound;
- Construction of a surface water drainage system along the road edges; and
- Importation of stone, as required, from borrow pits or from local quarries for construction of access roads and hard standings.

The volumes of material to be excavated are summarised in Table 14.2.

Element	Topsoil (m^3)	Peat (m^3)	Subsoil (m^3)
Turbine T01	540		4,281
Turbine T02	527		3,832
Turbine T03	481		2,160
Turbine T04	540		4,281
Turbine T05		570	5,318
Turbine T06	540		4,281
Turbine T07	545		4,433
Turbine T08	518		3,255
Turbine T09	545		4,433
Turbine T10	507		3,160
Turbine T11	498		2,725
Turbine T12	550		4,798
Turbine T13	540		4,281
Turbine T14		520	3,603
Turbine T15	520		3,603
Turbine T16	518		3,255
Turbine T17	505		2,928
Turbine T18	505		2,928
Turbine T19	498		2,725
Turbine T20	518		3,255
Turbine T21	505		2,928
Turbine T22	507		3,160
New roads	13,050	900	0
Widened roads	2,070	360	0
Sub-totals	25,527	2,350	79,623
Total	107,500		

Table 14.2 – Volumes of materials to be excavated

14.4.1.2 Soil, Subsoil and Bedrock removal

Implementation of the development will result in the removal of soil, subsoil and rock in parts of the site in order to facilitate the construction of access roads, crane hard standings, sub-station compound and turbine bases. This soil will be reused within the construction site for backfilling around turbine bases and for landscaping post construction. Removal of the soil and subsoil is a direct permanent impact on the environment but is considered to be a minor impact given the scale of the project.

In 18 out of the 20 trial pits that were excavated, bedrock was encountered at an average depth of 1.90m below the surface, the minimum and maximum depths being 1.20m and 2.90m respectively. Bedrock consisted of siltstone or hard shale. The two remaining trial pits were excavated in stiff clay to depths of 1.50m and 2.70m. Some bedrock will be excavated for the turbine bases where it is shallow although the volumes will be minimal. The removal of this bedrock will be a direct minor impact of the construction phase.

14.4.1.3 Borrow Pits

A number of suitable locations have been identified for borrow pits for the extraction of material for road construction within the site. The locations of the borrow pits in Irish National Grid coordinates are shown in Table 14.3 below and shown in **Figure 14.6** at the end of this chapter.

ID	Easting	Northing	Location
1	195,190	158,858	300m east of T01
2	195,852	159,751	100m north of T04
3	196,267	160,330	140m west of T06
4	196,359	162,215	150m southeast of T12
5	193,663	160,497	300m southeast of T18
6	193,504	161,777	40m southwest of T20

TABLE 14.3 – LOCATION OF BORROW PITS

The removal of material from the borrow pits will be a permanent minor impact of the construction phase.

14.4.1.4 Vehicular Movement

Most of the traffic movement within the site during the construction phase will be over new roads. Vehicles will traverse the ground surface or excavate into the soil and subsoil in the course of construction of new access roads and widening of existing roads and construction of turbine bases, crane hardstandings, sub-station and temporary construction compounds. This will be a minor negative short to medium term direct impact on the in-situ surface and subsurface materials.

14.4.1.5 Ground Stability

Because of the shallow depths of peat, which was encountered at 2 of the 22 turbine loaction, and the inherent stability of the sub-soils there will be no particular risk to ground stability on any part of the wind farm site. Notwithstanding this, inappropriate excavation methods could lead to instability, albeit of a very local nature.

14.4.1.6 Storage, Stockpiles and Waste Generation

The handling, storage and re-use of excavated materials during the construction phase of the development can be significant in terms of impact. There is potential for negative direct and indirect short-term minor impact on ground stability and negative direct and indirect short-term moderate to significant impact on water quality. A possible example of this would be slope failure due to excessive loading (surcharge) from stockpiled material and the resultant release of sediment and suspended solids to the surface water system.

Approximately 28,000m^3 of topsoil and peat will have to be excavated as part of the construction of Upperchurch wind farm. It is envisaged that topsoil will be formed into bunds along the access roads and around the crane hardstand areas. These bunds will be constructed to a maximum height of 1.0m with a width at base of 3.0m and side slopes of 2:1. The drainage regime will be considered when constructing the bunds in order to reduce the risk of sediment runoff to clean water drains.

14.4.1.7 Risk of Pollution from Hydrocarbon Leakage

The plant and equipment that will be used during the construction phase will be run on hydrocarbons. This means that mobile plant will require regular re-fuelling from an on-site fuelling station or by direct re-fuelling from scheduled truck deliveries. This creates the potential for spillage and leakage of hydrocarbons from plant or from on-site storage stations during construction.

Hydrocarbons are a pollution risk due to their toxicity to all flora and fauna organisms. A hydrocarbon adsorbs (sticks) onto the majority of natural solid objects it encounters such as vegetation, animals or earth materials. It burns most living organic tissue such as vegetation because of its volatile chemistry. Contaminated earth materials may then act as a pathway for pollution of receptors such as water and groundwater. Refer also to Chapter 15 – Hydrological Impacts.

An accidental hydrocarbon spillage would have a negative short to medium term moderate impact on the vegetation and earth materials at and downhill from the development site.

14.4.2 Operational Phase Impacts

No new impacts will arise during the operational phase of the project on the geological environment. However, due to the alteration of the environment, rainwater falling on the development footprint will follow an altered drainage regime which is expected to be an indirect minor impact. Refer to Chapter 15 – Hydrological Impacts for details.

14.5 MITIGATION MEASURES

14.5.1 Construction phase

Construction of the wind farm has the potential to cause negative short-term to permanent minor to significant impacts to the soils and geology of the permitted development site. A number of planned mitigation measures detailed below will reduce these impacts significantly. Many of the mitigation measures below have been based on CIRIA (Construction Industry Research and Information Association, UK) technical guidance on water pollution control and on current accepted best practice.

14.5.1.1 Soil, Subsoil and Bedrock Removal

The removal of topsoil, mineral subsoil and bedrock is an unavoidable impact of the development but every effort will be made to ensure that the amount of earth materials excavated is kept to a minimum in order to limit the impact on the geological and hydrological aspects of the site.

14.5.1.2 Construction Activities

The first priority of the construction phase will be to construct the access road network and upgrade the existing roads and the spine roads in particular so that they are capped with limestone or similar quality stone to reduce the potential for road degradation. Vehicular movements will be restricted to the footprint of the proposed development, particularly with respect to the newly constructed access roads. This implies that machinery must be kept on roads and aside from advancing excavations do not move onto areas that are not permitted for the development.

14.5.1.3 Ground Stability

The geotechnical investigations at the proposed Upperchurch Wind Farm indicate that the site has a very low risk of slope failures or landslides due to the virtual absence of peat on the site. Slopes are moderate over most of the development footprint. It is noted that geotechnical investigations indicate stable conditions throughout the extent of the areas investigated and therefore constraint mapping was not required for this site. As a precautionary principle, however, the following procedures are recommended as best-practise mitigation measures to avoid slope instability, even of a very local nature, at wind farm sites. These are:

- Drains will be established to effectively drain grounds prior to excavation or earthworks of each section of road. Such drains will be positioned at an oblique angle to slope contours to ensure ground stability;
- All site excavations should be planned and overseen in conjunction a suitably qualified engineer. The contractor's method statement will be reviewed and approved by a suitably qualified geotechnical engineer prior to site operations.

14.5.1.4 Storage, Stockpiling and Waste Generation Management

All excavated earth materials must be either re-used in an environmentally appropriate and safe manner, e.g. used for landscaping, or removed from the development site at the end of the construction phase. Permanent stockpiles above existing ground level are not recommended at the site.

Any introduced semi-natural (road building materials) or artificial (PVC piping, cement materials, electrical wiring etc.) materials that are left over must be taken off site at the end of the construction phase. Any accidental spillage of solid state introduced materials must be removed from the site.

In addition, a construction phase Environmental Management Plan will be incorporated to include regular checking of equipment, materials storage and transfer areas, drainage structures and their attenuation ability during the construction phase of the project. The purpose of this management control is to ensure that the measures that are put in place continue to operate effectively, to prevent accidental leakages, and to identify potential breaches in the protective retention and attenuation network during earthworks operations.

It is also recommended that a fuel management plan is implemented. The plan should incorporate the following elements:

- Mobile bowsers, tanks and drums will be stored in secure, impermeable storage areas away from drains and open water;
- Fuel containers must be stored within a secondary containment system, e.g. bunds for static tanks or a drip tray for mobile stores;
- Ancillary equipment such as hoses and pipes must be contained within the bund;
- Taps, nozzles or valves must be fitted with a lock system;
- Fuel and oil stores including tanks and drums will be regularly inspected for leaks and signs of damage;
- Only designated trained operators will be authorised to refuel plant on site;
- Procedures and contingency plans will be set up to deal with emergency accidents or spills; and

- An emergency spill kit with oil boom, absorbers etc. is to be kept on site for use in the event of an accidental spill.

14.5.2 Drainage

The permanent road works will require a drainage network to be in place for the construction and operational phases of the wind farm. This will necessitate the construction of adequately sized settlement ponds and silt traps to deal with water that has become contaminated with silt. The site drainage will be regularly monitored, and maintained to ensure the constructed drainage performs through to the operational phase of the project and is fit for purpose thereafter. Refer to the Sediment and Erosion plan included in **Appendix 15-I** at the end of Chapter 15.

14.6 RESIDUAL IMPACTS

Following on from the detailed site surveys carried out in conjunction with a review of existing data, mapping, geology and drainage features on site it is clear that there are some limited potential negative impacts during the construction phase of the works. However, given the low risk nature of the site and in light of the mitigation measures outlined above it is considered that there will be no significant residual impact to soils and geology following the development of this project.

14.7 CONCLUSION

The development of this wind farm at Upperchurch will not have a significant impact on Soils and Geology given the inherent low risk nature of the site and provided that the mitigation measures outlined above are implemented.

14.8 REFERENCES

1. Geological Survey of Ireland online Geology Mapping.
2. Geological Survey of Ireland (2001) "Directory of Active Quarries, Pits and Mines in Ireland"
3. Geological Survey of Ireland (July 2009) "Consultation with National Landslides Database".

FIGURE 14-1: BEDROCK GEOLOGY

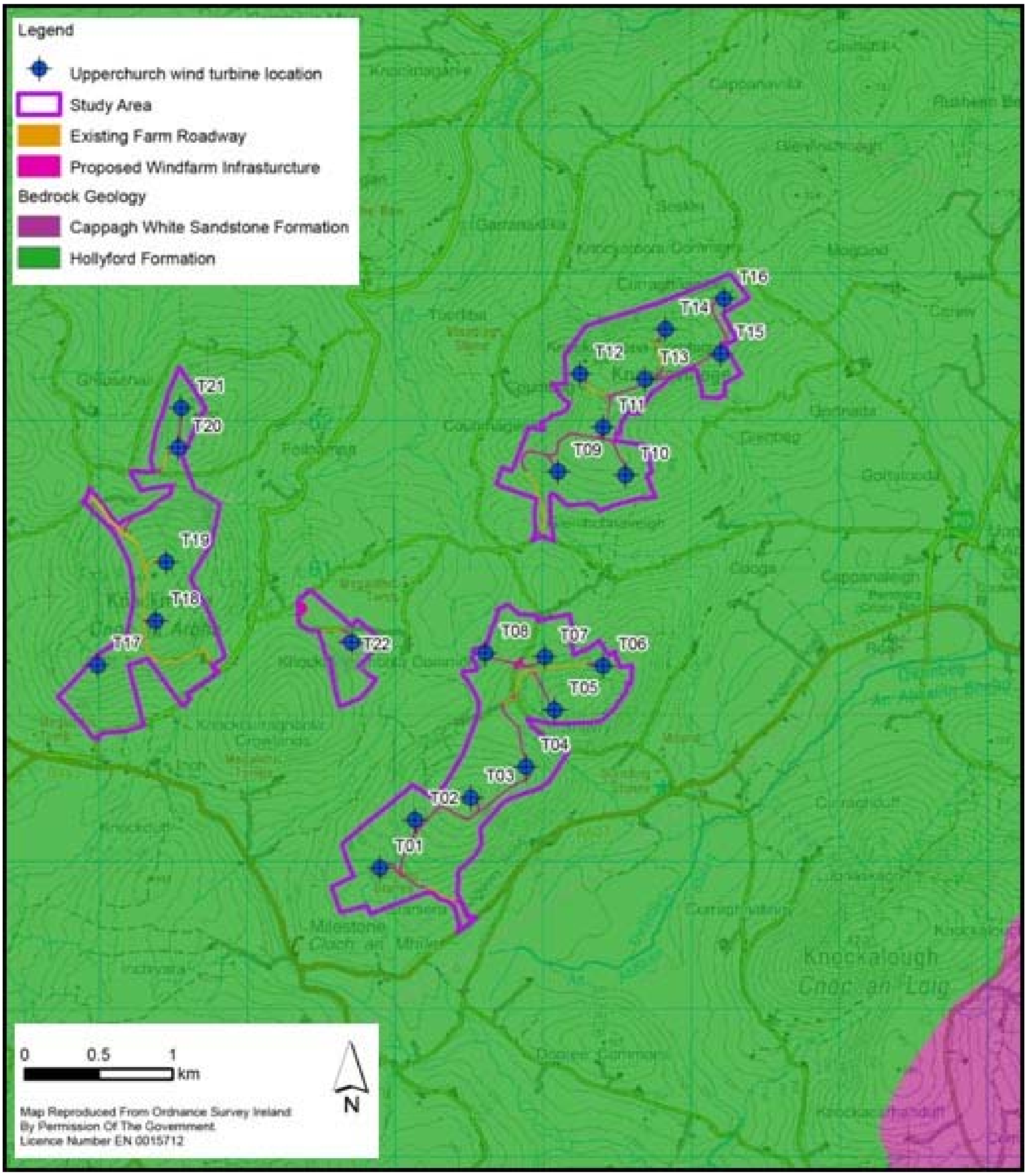

FIGURE 14-2: SUBSOIL GEOLOGY

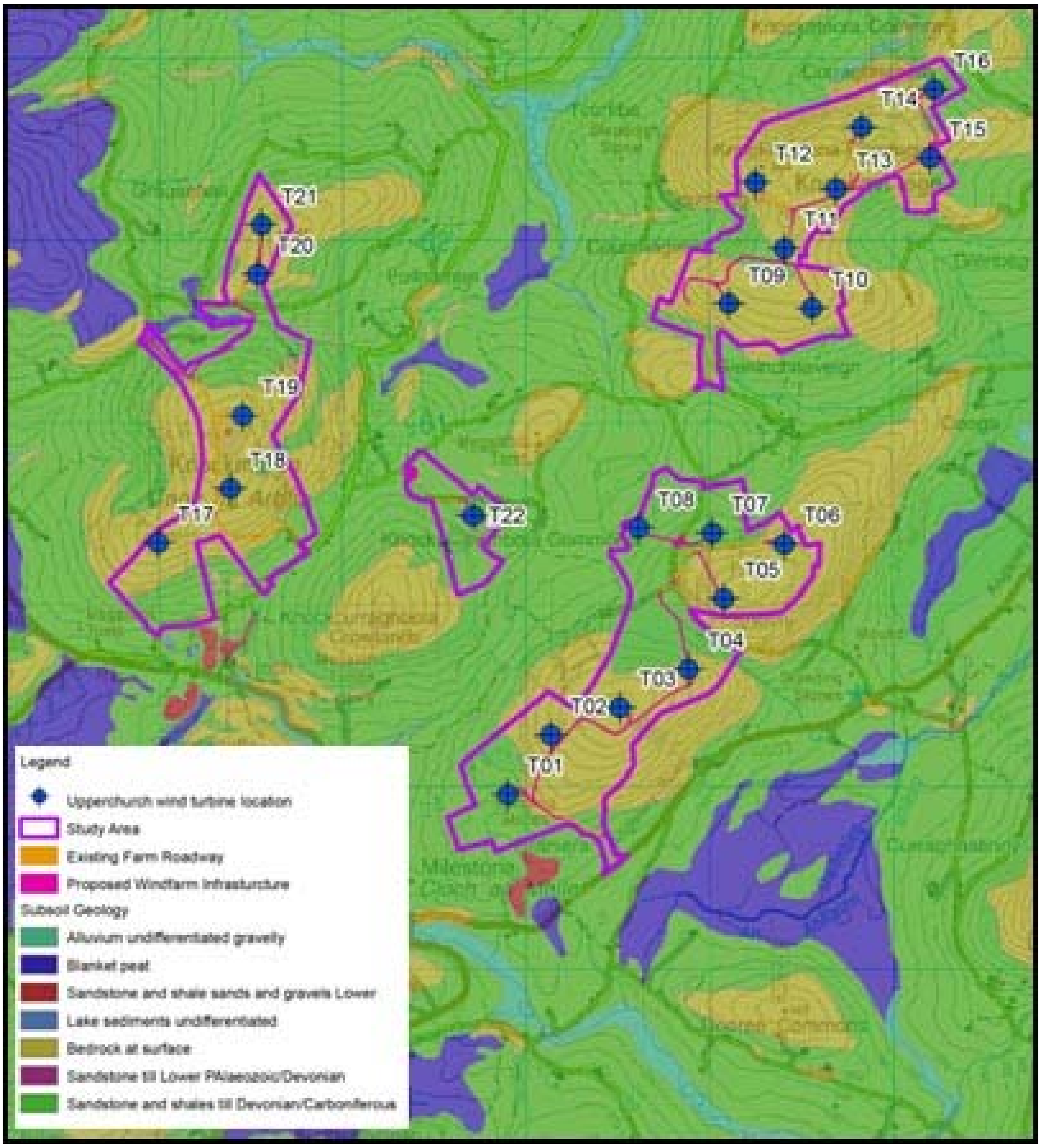

FIGURE 14-3: SOIL GEOLOGY

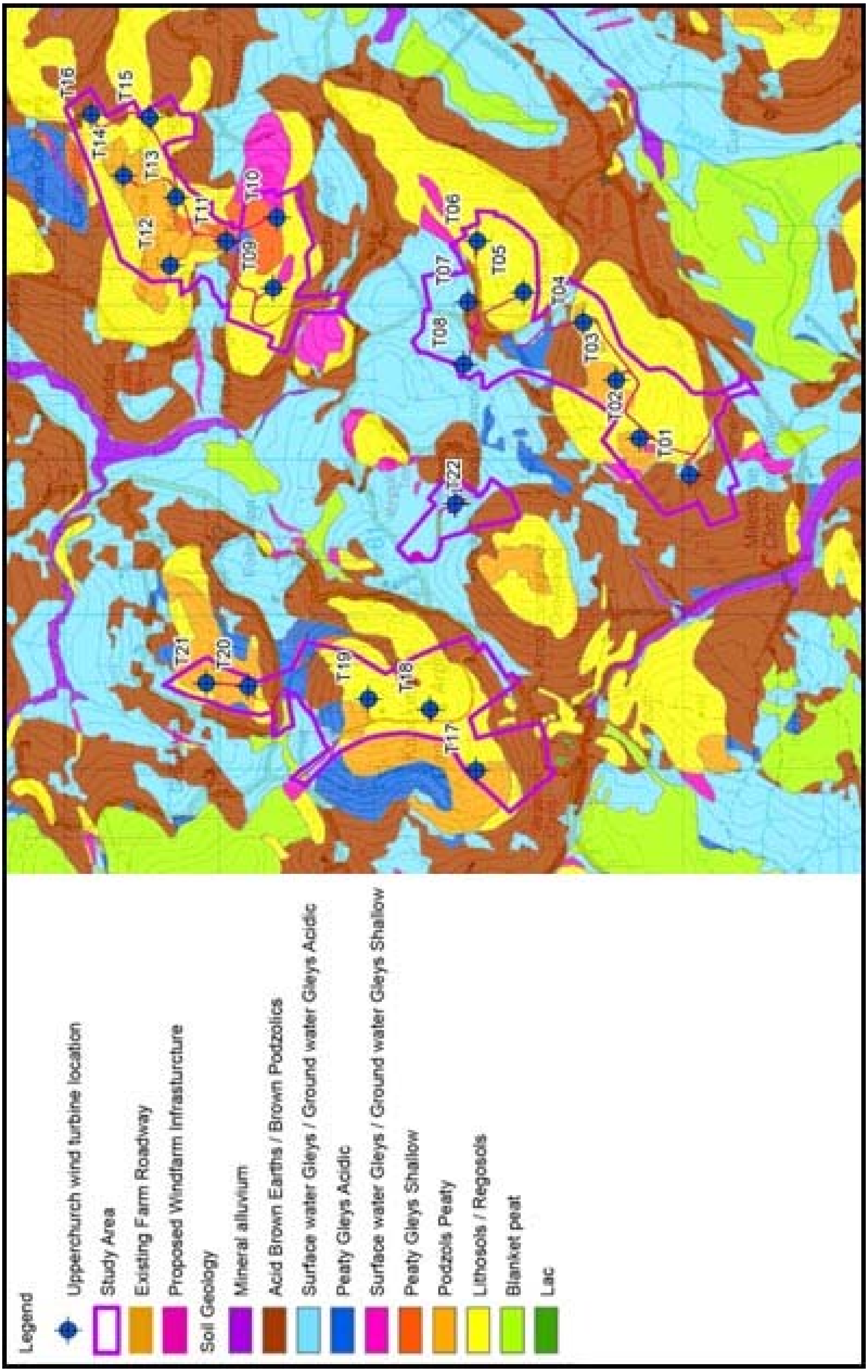

FIGURE 14-4: CORINE LAND COVER

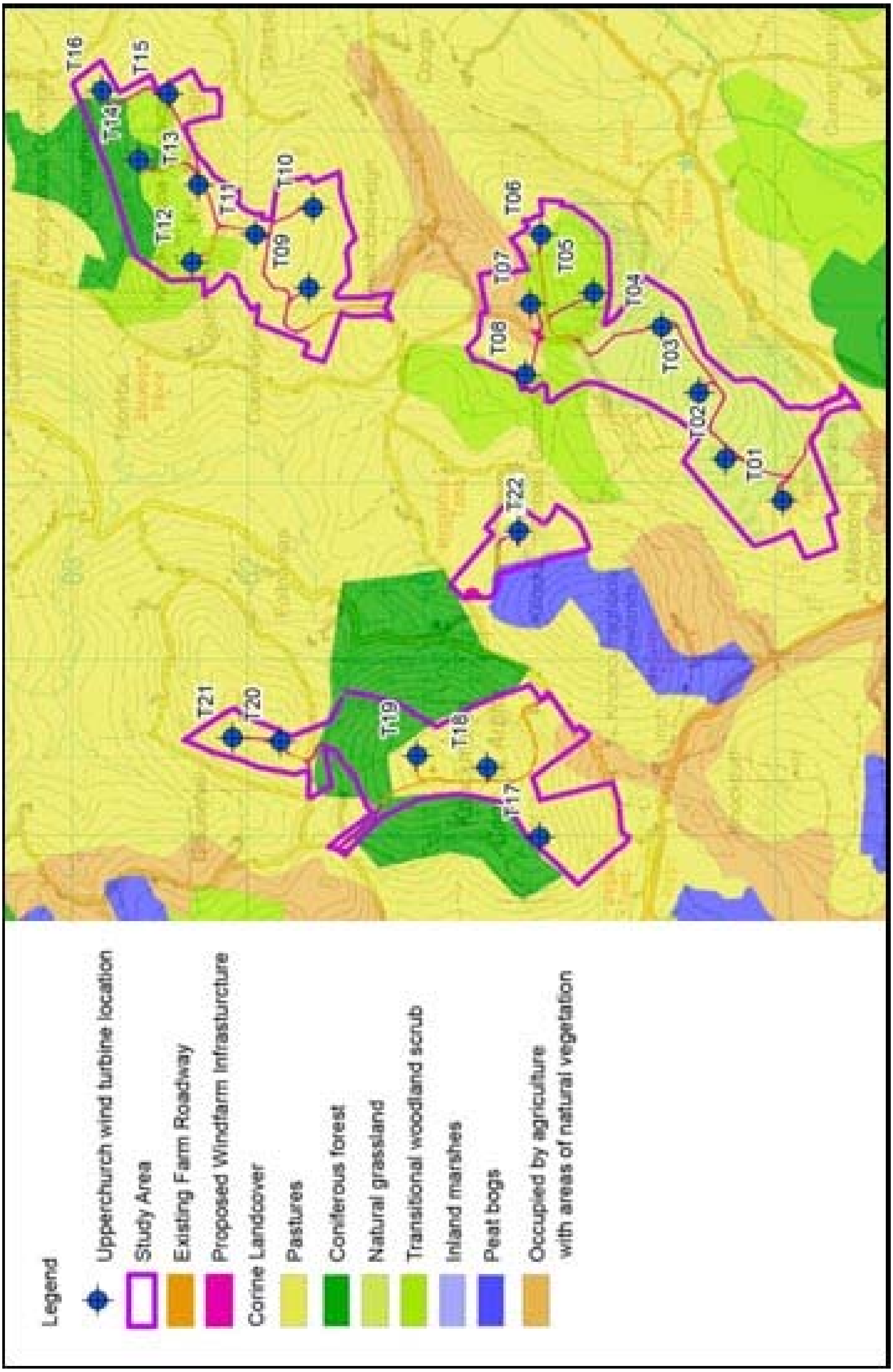

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FIGURE 14-5: QUARRY LOCATIONS

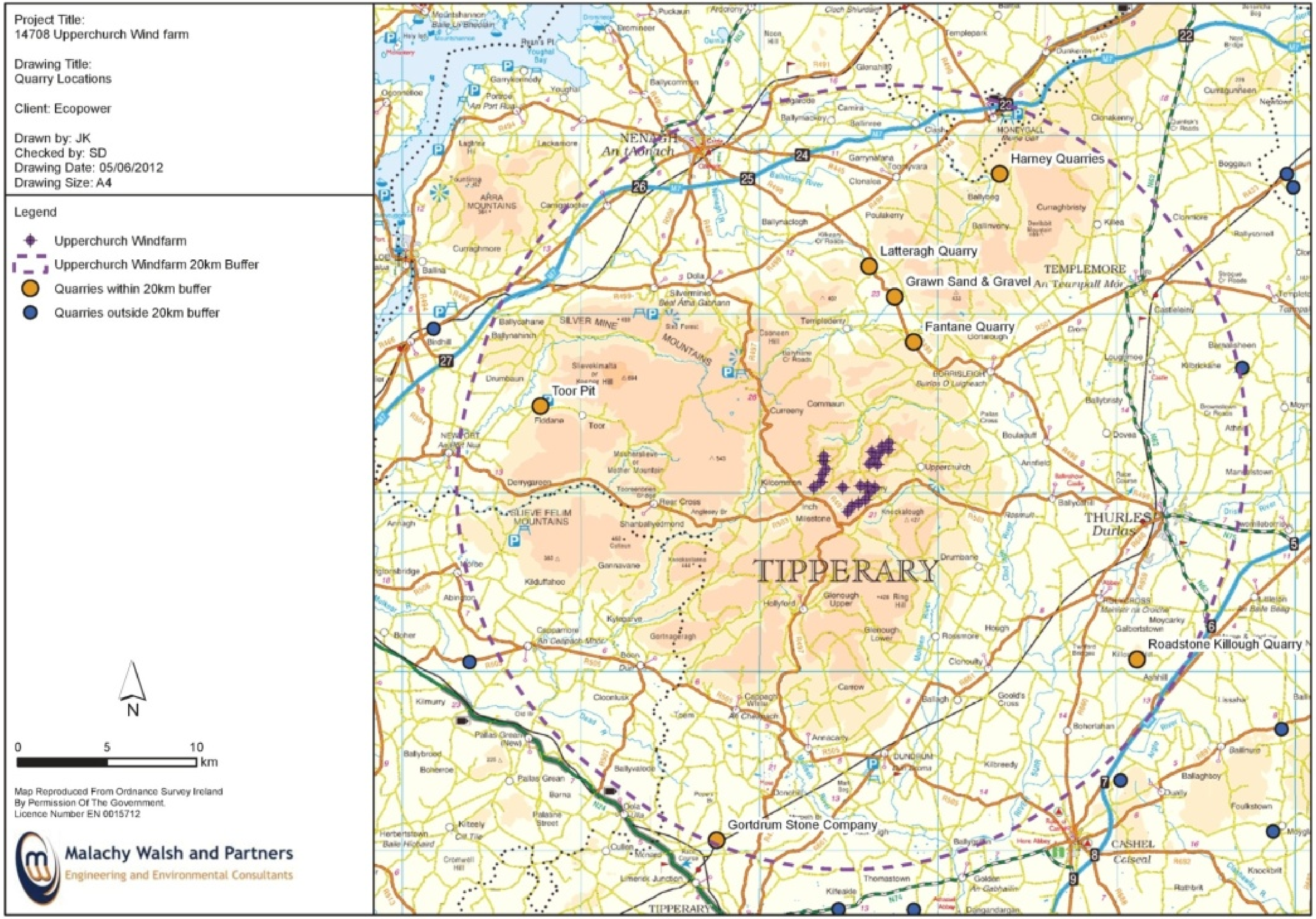

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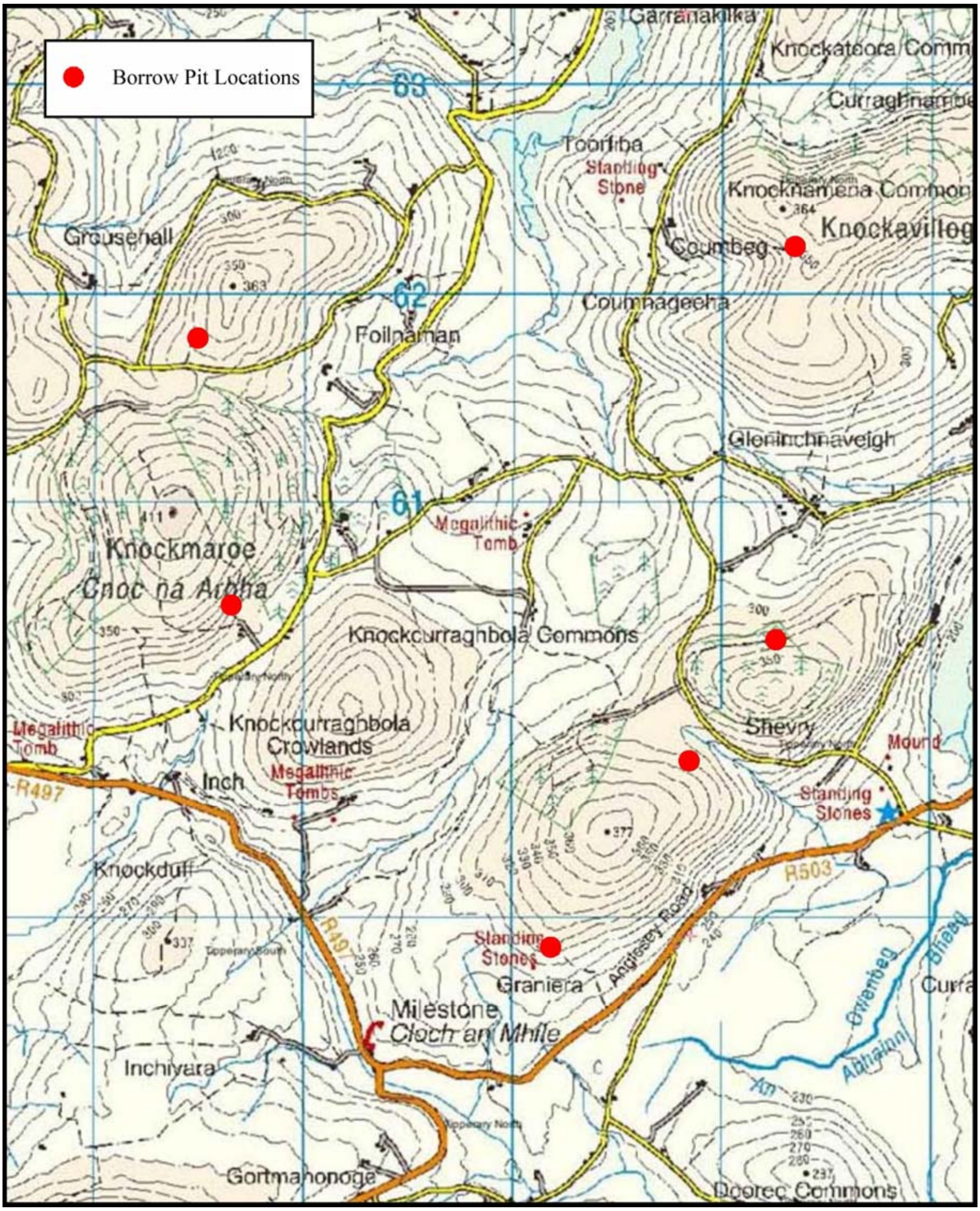
FIGURE 14-6: BORROW PIT LOCATIONS



APPENDIX 14-I TRIAL PIT LOGS AND PHOTOGRAPHS

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**	T01
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**	E: 194902 N: 158932
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**	unknown
Date:	28 October 2011	**Logged by:**	S. Doyle

Strata Description	**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests** Type	Depth	Result
Organic soil	0.30					
Soft brown stony CLAY, stone size typically less than100mm	0.80					
Weathered SILTSTONE becoming more solid with depth	2.00					
End of trial pit at siltstone bedrock						

Remarks:
No groundwater encountered at 2m depth

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**	T02
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**	E: 195261 N: 159221
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**	unknown
Date:	28 October 2011	**Logged by:**	S. Doyle

Strata Description	**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests**		
				Type	**Depth**	**Result**
Organic soil	0.30					
Soft brown stony CLAY, stone size typically less than100mm	1.20					
Heavily weathered SILTSTONE	2.60					
End of trial pit at siltstone bedrock						

Remarks:
No groundwater encountered at 2.60m depth

T02 - Photograph 1

T02 - Photograph 2

T02 - Photograph 3

T02 - Photograph 4

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**	T03				
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**	E: 195574 N: 159410				
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**	unknown				
Date:	28 October 2011	**Logged by:**	S. Doyle				

Strata Description	**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests: Type**	**Depth**	**Result**
Organic soil	0.20					
Soft stony CLAY, progressively more stony with depth	1.80					
End of trial pit at SILTSTONE bedrock						

Remarks:
No groundwater encountered at 1.80m depth

T03 - Photograph 1

T03 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**	T04
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**	E: 195988 N: 159620
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**	unknown
Date:	28 October 2011	**Logged by:**	S. Doyle

Strata Description	**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests** Type	Depth	Result
Organic soil	0.20					
Soft light brown/orange CLAY	0.50					
Soft brown/grey stony CLAY	1.50					
Very loose weathered SILTSTONE (trial pit sides unstable)	2.90					
End of trial pit at solid siltstone						

Remarks:
No groundwater encountered at 2.90m depth
Clay sample taken

T04 - Photograph 1

T04 - Photograph 2

T04 - Photograph 3

T04 - Photograph 4

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**	T06
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**	E: 196450 N: 160319
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**	unknown
Date:	28 October 2011	**Logged by:**	S. Doyle

Strata Description	**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests** Type	Depth	Result
Organic soil	0.20					
Loose brown stony CLAY	1.00					
Hard weathered SILTSTONE (progressively harder with depth)	2.30					
End of trial pit at siltstone bedrock						

Remarks:
No groundwater encountered at 2.30m depth

T06 - Photograph 1

T06 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**	T07
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**	E: 195989 N: 160428
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**	unknown
Date:	11 April 2012	**Logged by:**	S. Doyle

Strata Description	**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests** Type	Depth	Result
Organic soil	0.15					
Soft grey CLAY with some organic content	0.45					
Stiff stony grey CLAY	1.00					
Stiff stony yellow CLAY	2.70					
End of trial pit within clay stratum						

Remarks:
Clay is very dry.
No water in excavation.

T07 - Photograph 1

T07 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**	T08
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**	E: 195598 N: 160397
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**	unknown
Date:	11 April 2012	**Logged by:**	S. Doyle

Strata Description	**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests** Type	Depth	Result
Organic soil	0.15					
Soft grey CLAY with some organic content	0.45					
Soft stony grey CLAY	2.00					
End of trial pit at SILTSTONE bedrock						

Remarks:
Siltstone bedrock is very hard.
No water in excavation.

T08 - Photograph 1

T08 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**			T09		
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**			E: 196117 N: 161662		
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**			unknown		
Date:	11 April 2012	**Logged by:**			S. Doyle		
					Samples /Tests		
Strata Description		**Depth (m)**	**OD level**	**Water depth**	**Type**	**Depth**	**Result**
Organic soil		0.15					
Soft stony yellow CLAY		1.70					
Weathered SHALE		2.00					
SHALE		2.80					
End of trial pit within shale stratum							

Remarks:
Shale rock is competent at 2.00m depth below the surface.
No water in excavation.

T09 - Photograph 1

T09 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**	T10
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**	E: 196539 N: 161601
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**	unknown
Date:	11 April 2012	**Logged by:**	S. Doyle

Strata Description	**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests** Type	Depth	Result
Organic soil	0.20					
Soft stony yellow CLAY	1.00					
Weathered SILTSTONE	1.80					
End of trial pit at siltstone bedrock						

Remarks:
Siltstone bedrock is very hard.
No water in excavation.

T10 - Photograph 1

T10 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**	T11
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**	E: 196417 N: 161965
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**	Unknown
Date:	11 April 2012	**Logged by:**	S. Doyle

Strata Description	**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests** Type	Depth	Result
Organic soil	0.30					
	0.80					
Weathered SILTSTONE	1.70					
End of trial pit at siltstone bedrock						

Remarks:
No water in excavation.

T11 - Photograph 1

T11 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**			T12		
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**			E: 196253 N: 162314		
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**			unknown		
Date:	11 April 2012	**Logged by:**			S. Doyle		
Strata Description		**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests** Type	Depth	Result
Organic soil		0.20					
Soft brown CLAY		1.20					
Weathered SHALE		3.00					

Remarks:
Shale rock is competent at 2.00m below the surface.
No water in excavation.

T12 - Photograph 1

T12 - Photograph 2

T12 - Photograph 3

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**	T13
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**	E: 196716 N: 162269
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**	unknown
Date:	11 April 2012	**Logged by:**	S. Doyle

Strata Description	**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests** Type	Depth	Result
Organic soil	0.15					
Soft stony yellow CLAY	0.70					
Weathered SILTSTONE	1.60					
End of trial pit at siltstone bedrock						

Remarks:
No water in excavation

T13 - Photograph 1

T13 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**	T15
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**	E: 197132 N: 162393
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**	unknown
Date:	11 April 2012	**Logged by:**	S. Doyle

Strata Description	**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests** Type	Depth	Result
Organic soil	0.15					
Soft brown/yellow CLAY	1.10					
Weathered SILTSTONE	2.10					
End of trial pit at siltstone bedrock						

Remarks:
Siltstone bedrock is very hard.
No water in excavation.

T15 - Photograph 1

T15 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development			**Trial Pit ID**		T16	
Location:	Upperchurch, Thurles, County Tipperary			**ING Coordinates**		E: 197224 N: 162824	
Client:	Ecopower Ltd., Sion Road, Kilkenny			**Elevation:**		unknown	
Date:	10 May 2012			**Logged by:**		S. Doyle	

Strata Description	**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests** Type	Depth	Result
Organic soil	0.15					
Soft grey CLAY	0.60					
Soft yellow CLAY	1.60					
Weathered SHALE	2.60					
End of excavation at SILTSTONE bedrock						

Remarks:
No groundwater encountered.

T16 - Photograph 1

T16 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**	T17
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**	E: 193559 N: 162081
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**	unknown
Date:	12 April 2012	**Logged by:**	S. Doyle

Strata Description	**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests** Type	Depth	Result
Organic PEAT	0.10					
Soft yellow stony CLAY	0.40					
Weathered SILTSTONE with some clay content	1.20					
End of trial pit at siltstone bedrock						

Remarks:
No groundwater encountered.

T17 - Photograph 1

T17 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**	T18
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**	E: 193534 N: 161809
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**	unknown
Date:	12 April 2012	**Logged by:**	S. Doyle

Strata Description	**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests** Type	Depth	Result
Organic soil	0.15					
Soft orange/yellow CLAY	0.45					
Soft stony yellow CLAY with angular cobbles	1.40					
Weathered SILTSTONE with some clay content	2.20					
End of trial pit at siltstone bedrock						

Remarks:
Minor ingress of groundwater into the excavation after 20 minutes.

T18 - Photograph 1

T18 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**	T19
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**	E: 193430 N: 161039
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**	unknown
Date:	12 April 2012	**Logged by:**	S. Doyle

Strata Description	**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests** Type	Depth	Result
Organic soil	0.15					
Soft yellow stony CLAY	1.10					
Weathered SILTSTONE	1.70					
End of trial pit at siltstone bedrock						

Remarks:
Siltstone is hard at 1.70m below the surface.
No groundwater infiltration.

T19 - Photograph 1

T19 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**			T20			
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**			E: 193367 N: 160612			
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**			unknown			
Date:	12 April 2012	**Logged by:**			S. Doyle			
					Samples /Tests			
Strata Description		**Depth (m)**	**OD level**	**Water depth**	**Type**	**Depth**	**Result**	
Organic soil		0.15						
Soft yellow stony CLAY		1.10						
Weathered SILTSTONE		1.70						
End of trial pit at siltstone bedrock								

Remarks:
Siltstone is hard at 1.70m below the surface.
No groundwater infiltration.

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T20 - Photograph 1

T20 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**	T21
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**	E: 192992 N: 160336
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**	unknown
Date:	10 May 2012	**Logged by:**	S. Doyle

Strata Description	**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests** Type	Depth	Result
Organic soil	0.15					
Soft brown CLAY	0.45					
Heavily weathered SILTSTONE	1.50					
End of trial pit at siltstone bedrock						

Remarks:
Siltstone is hard at 1.50m below the surface.
No groundwater infiltration.

T21 - Photograph 1

T21 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**			T22		
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**			E: 194754 N: 160387		
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**			unknown		
Date:	12 April 2012	**Logged by:**			S. Doyle		
					Samples /Tests		
Strata Description		**Depth (m)**	**OD level**	**Water depth**	**Type**	**Depth**	**Result**
Peaty organic soil		0.30					
Stiff stony grey CLAY		1.50					
Stiff stony yellow CLAY		2.20					
End of trial pit within clay stratum							

Remarks:
No groundwater infiltration.

T22 - Photograph 1

T22 - Photograph 2

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WINDFARM DEVELOPMENT

UPPERCHURCH, THURLES, COUNTY TIPPERARY

HYDROLOGICAL IMPACT ASSESSMENT

ECOPOWER DEVELOPMENTS LIMITED

Project	Document	Revision	Prepared	Checked	Status	Date
14708	6004	B	Sean Doyle	Jack O'Leary	Final	17 September 2012

15 Hydrological Impact Assessment

15.1 INTRODUCTION

It is proposed to construct a 22 turbine wind farm in the area immediately to the west of Upperchurch and 18km to the west of Thurles, County Tipperary. The turbines, which are numbered T01 to T22 are arranged in four clusters within an overall area of 12km^2.

The four clusters are as follows

- T01 to T08 are arranged around two hills at Shevry;
- T09 to T16 are arranged around the hill at Knocknameana Commons;
- T17 to T21 are arranged around two hills at Knockmaroe and Foilnaman;
- T22 is a single turbine on the northeast side of the hill at Knockcurraghbola Crowlands.

This study describes the existing hydrological characteristics at the proposed wind farm site. The surface water features and characteristics are described, as well as the site drainage and groundwater. An impact assessment was carried out to determine whether the project poses a significant impact to the hydrology and hydrogeological aspects of the environment and to propose mitigation measures to reduce any potential negative impact of the proposed wind farm.

15.1.1 Scope of assessment

The following sets out the scope of the assessment undertaken:

- Establish the baseline conditions on site;
- Identify the impacts of the proposed development during construction and operation of the project;
- Develop mitigation measures to reduce or eliminate the impacts;
- Identify any residual impacts after mitigation measures are implemented.

15.1.2 Consultation

The GSI and EPA databases were consulted in terms of classifying the aquifers underlying the region and to establish sensitive or important aquifers. The aquifer location, importance and position relative to the proposed site are discussed in the report.

15.1.3 Desk study

The desk study involved a review of all available information, datasets and documentation sources pertaining to the site's natural environment and involved the following:

- Examination of maps and aerial photography;
- Review of legislation including the Water Framework Directive and all previous water quality legislation;

- Review of the South Eastern River Basin Management Plan (2009 – 2015);
- Review of the Suir Main Water Management Unit Action Plan. This is the primary river in the catchment and ultimately receives the water from the greater proportion of the proposed site;
- Review of the Shannon International River Basin Management Plan (2009 – 2015). The Shannon is the primary river in the catchment for part of the southwest section of the proposed site;
- Review of existing water quality data, chemical and biological, available from EPA etc.;
- Review of Water Framework Directive datasets, reports and maps;
- Examination of maps and aerial photography to identify any hydrological features and site topography and slope;
- Determination of the catchments and drainage regime on and downstream from the site;
- Examination of the Geological Survey of Ireland (GSI) online datasets pertaining to hydro-geology features such as aquifers, wells, groundwater bodies and groundwater protection schemes;
- Examination of National Parks and Wildlife Service (NPWS) nature conservation designations;
- Preparation of catchment and other site maps and sampling field sheets for the site survey.

15.1.4 Site Walkover and Investigations

Field work included initial site walkovers and surveys followed by detailed site investigations and included the following:

- Site investigations in the form of peat probing and trial pits were undertaken at various times in October 2011 and in April and May 2012. Trial pits were excavated at 20 of the proposed turbine sites and peat depth and classification was measured at the remaining three sites (T05 & T14) which are in forested areas;
- Ground surface slope was measured at all turbine sites;
- A walkover survey of the site to identify hydrological features on site, wet ground, drainage patterns and distribution, exposures, drains etc.;
- Confirmation of the site catchments and drainage regime, and any hydrological buffers to be implemented;
- Field hydrochemistry measurements in-situ, using the YSI multi-parameter probe, to determine pH, Total Dissolved Solids, Electrical Conductivity, Dissolved Oxygen, Temperature;
- The collection of water samples for laboratory analysis for select quality parameters (Suspended Solids, Nitrate, mg/L NO3-N, Nitrite, mg/L NO2-N, MRP, mg/L, Alumimium mg/l, Phosphorous);
- Other parameters: MRP, PH, Econd, TDS, Nitrate, Nitrite, Suplhur; and
- Aquatic Ecology Assessment to determine biological Q-rating at chosen locations downstream of the site.

Following field surveys, the results were input to a standard GIS database. This allowed for accurate graphical representation of results.

This Hydrology and Hydrogeology Chapter integrates with the Sediment and Erosion Control Plan for the proposed site. This is included in **Appendix 15-I**.

15.1.5 Assessment Criteria

The results of the water sampling and analysis both in the field and in the laboratory are compared to Environmental Water Quality Standards as set out in the in the European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations 1989. It must be noted that these standards are used for comparative purposes only as the surface water is not for human consumption.

The results have also been assessed against the surface water limits as outlined in S.I No. 293/1988- European Communities (Quality of Salmonid Waters) Regulations, 1988.

All water quality analysis must be considered in the wider context of the Water Framework Directive.

15.1.6 Legislation Context

15.1.6.1 The Water Framework Directive

The Water Framework Directive (WFD) (2000/60/EC) establishes an integrated and coordinated framework for the sustainable management of water. The Water Framework Directive, transposed into national legislation in 2003, aims to:

- Prevent deterioration of status for surface and groundwaters and the protection, enhancement and restoration of all water bodies;
- Achieve [1]good ecological status by 2015 and good chemical status for surface waters and good chemical and good quantitative status for groundwaters;
- Progresse reduction of pollution of priority substances and phase-out of priority hazardous substances in surface waters and prevention and limitation of input of pollutants in groundwaters;
- Reverse any significant upward trend of pollutants in groundwaters; and
- Achieve standards and objectives set for protected areas in Community legislation.

---

[1] Assessment of quality is based on the extent of deviation from these reference conditions, following the definitions in the Directive. ‘Good status’ means ‘slight’ deviation, ‘moderate status’ means ‘moderate’ deviation, and so on. The definition of ecological status takes into account specific aspects of the biological quality elements, for example “composition and abundance of aquatic flora” or “composition, abundance and age structure of fish fauna” (see WFD Annex V Section 1.1 for expanded definitions and a complete list).

The objective for each surface water body is to prevent deterioration, maintain high and good status waters, restore waters to at least good status by 2015 where necessary, and ensure that the requirements of associated protected areas are met. The WFD has at its core a series of River Basin Management Plans (RBMPs). The RBMPs were completed in 2009 and were adopted by the various local authorities in 2010. The proposed development is located primarily within the South Eastern River Basin District with a small part of the south western portion of the site being located in the Shannon River Basin District.

15.1.6.2 Environmental Quality Standards (EQS)

Environmental quality standards (EQS) for water quality were assessed against surface water limits set out in the European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations 1989. The results have also been assessed against the surface water limits as outlined in S.I No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations, 1988.

15.1.7 Evaluation and impact assessment categorisation

The assessment was prepared with regard to the NRA Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydro-geology for National Road Schemes. The method of impact assessment and prediction follows the EPA (2002) Guidelines on the information to be contained in Environmental Impact Statements.

15.1.8 Constraint study and mitigation by avoidance

A key element of EIA is the avoidance and reduction of negative impacts at the design stage. Maximum use of existing infrastructure will be made, particularly access tracks. The final design has been informed by a constraints study which identified and included 50m buffer zones on all streams and rivers within and adjacent to the site where no infrastructure is proposed. See **Figure 15-6** at the end of this chapter.

For more detailed information on constraints refer to **Chapter 13 – Ecological Impact Assessment**.

15.2 EXISTING ENVIRONMENT

The hydrological environment includes all surface waters and hydrogeology and therefore includes all surface water catchments at the proposedUpperchurch wind farm site as well as the groundwater resource in the area.

15.2.1 Topography and land use

The proposal is to construct 22 wind turbines and a control building together with new and upgraded service roadways. Construction and operational access will be gained from the existing public Local road network via Regional roads R497 and R503 to the east and west of Milestone Cross. Electricity generated will be cabled underground to the wind farm control building, which will be located 305m southeast of turbine T18.

The site is divided into four separate clusters located around a number of hilltops to the west of Upperchurch village. The hills are at elevations of between 363mOD and 411mOD and the peaks are generally at heights of 100m above the intervening lower terrain. The principal land uses are agriculture with some commercial forestry.

The Slievefelim to Silvermines Mountains SPA lies to the west of the site.

The soil type varies considerably throughout the site but consists mainly of Lithosols / Rogosols, Surface water Gleys / Ground water Gleys, and Acid Brown Earths / Brown Podzolics. The hilltop areas include Peaty Podzolic soils and Peaty Gley soils.

There is a number of existing wind farms in the area surrounding the proposed Upperchurch wind farm. Table 15-1 below lists the wind farms within 15km of the site that have received planning permission or extensions of planning permission within the last 5 years or are under construction or in operation.

Wind farm	Number of Turbines	Distance and direction from proposed site	Status
Knockastanna, Co Limerick	4	8.1km south	Operating
Mienvee	1	9.0km southwest	Operating
Garracummer	15	3.5km southwest	In Construction
Falleennafinoga	2	5.5km south	In Construction
Hollyford	3	5.5km south	Permitted
Glencarbry	9	6.3km south	Permitted
Glenough	14	3.2km south	Operating
Cappagh White	18	8.5km south	Permitted
Curraghgraigue	6	9.5km north	Operating
Knockmeale	2	8.2km northwest	Permitted

TABLE 15-1 EXISTING AND PERMITTED WIND FARMS IN THE AREA

15.2.2 Hydrology

15.2.2.1 Surface Water and Drainage

The proposed site drains into streams that form the upper reaches of the Turraheen, Owenbeg, Clodiagh and Aughvana Rivers. The first three of these rivers form part of the South Eastern River Basin District and ultimately join the River Suir to the southeast. The Aughvana River, which forms part of the Shannon River Basin District, joins the Mulkear River and ultimately flows into the River Shannon to the east of Limerick City.

There are some EPA sampling stations in the vicinity of the proposed site as follows:

- The nearest sampling station on the Clodiagh River is at a bridge to the north of Castlehill (ING coordinates E: 198173, N: 165027), 5km downstream of the site and 2.4km to the north of turbine T16.
- The nearest sampling station on the Turraheen River (ING coordinates E: 197600, N: 155900) is 4km downstream of the site and 4km to the southeast of turbine T01.
- The nearest sampling station on the Owenbeg River is at a bridge on the local road immediately to the south of the R503 at Upperchurch (ING coordinates E: 198577, N: 160362) and 2.2km to the east of turbine T06.

The site drains to the different rivers as follows:

- The area around turbines T01 and T02 drains towards the west to an unnamed tributary of the Turraheen River.
- The area around turbines T03, T04, T05 and T06 drains to the southeast to the Owenbeg River and its tributaries.
- The area around turbines T07, T08 and T09 drains to the north to the streams that form the upper reaches of the Clodiagh River.
- The area around turbines T10, T11, T13 and T15 drains to the south and southeast to tributaries of the Owenbeg River.
- The area around turbines T12, T14 and T16 drain to the west and north to the Clodiagh River.
- The area around turbines T17 and T18 drains south to an unnamed tributary of the Aughvana River. This is the only part of the overall site that forms part of the Shannon River Basin District.
- The remaining areas around turbines T19, T20, T21 and T22 drain in different directions to unnamed tributaries of the Clodiagh River to the north.

The locations of the sampling points are shown in Table 15-2 below and **Figure 15-2** at the end of this chapter.

Sampling Station	Grid Reference (ING)	Location
1	97973, 61082	Unnamed stream (east of site), flows to the Owenbeg River
2	97336, 59293	Owenbeg River (east of site)
3	94363, 59329	Unnamed stream (southern section of site), flows to Turraheen River

4	95056, 62330	Unnamed stream (central area of site), flows to the Clodiagh River
5	91623, 63001	Unnamed stream (north section of the site), flows to the Clodiagh River
6	93464 59759	Unnamed stream (southern section of site), flows to the Aughvana River

TABLE 15-2 WATER QUALITY SAMPLING POINT LOCATIONS

15.2.2.2 Water quality in the existing environment

Chemical and Biological analyses of water each have inherent advantages and disadvantages. Biological analysis can detect ecological change which will be indicative of water quality or pollution, but the chemical analysis is required to ascertain the root cause. However, hydrochemical sampling is a spot check analysis on water quality which can vary greatly due to site conditions and environmental factors at a particular time (e.g. time of day relating to temperature, presence of farm animals at stream prior to or at time of sampling). Surveys of the biological habitat (such as Q-rating surveys) provide a better depiction of the health of the baseline water environment.

WATER QUALITY

Water quality of the streams and water bodies within the study area was assessed in three ways, namely by means of field sampling (using a YSI handheld unit), physio-chemical analysis of water samples in a laboratory and also by means of Q sampling to assess biological standards. The use of combined assessment methods gives good indications of the standard of water quality as it exists today prior to any development.

Water chemistry and quality are a reflection of geology and land use and the main effects of pollution on quality are a reduction in oxygen and nutrient enrichment. The water quality assessments of surface waters within, adjacent to and downstream of the proposed development site are based on data collated from both physio-chemical and biological surveys.

The location of the field testing with the YSI unit and location of water sampling for laboratory analysis are shown in **Error! Reference source not found.** below. A discussion of the results is outlined in the following sections relative to each method of assessment.

Q SAMPLING METHODOLOGY

Biological water quality monitoring refers to Q Value system of ranges where the relationship between water quality and the in-stream macroinvertebrate community is described in numerical terms. A Q value of 5 indicates very high water quality while a Q value of 1 indicates poor water quality.

Biotic Index	EPA Water Quality	Water Framework Directive Ecological Status	Quality Status
Q5	Good	High	Unpolluted Waters
Q4-5	Fair - Good	High	
Q4	Fair	Good	
Q3-4	Doubtful - Fair	Moderate	Slightly Polluted Waters
Q3	Doubtful	Poor	Moderately Polluted

Q2-3	Poor - Doubtful	Poor	Waters
Q2	Poor	Bad	Seriously Polluted Waters
Q1-2	Bad - Poor	Bad	
Q1	Bad	Bad	

TABLE 15-3 RELATIONSHIP BETWEEN BIOTIC INDEX (Q-VALUE) AND WATER QUALITY.

Kick sampling, where the river bed is disturbed using the foot immediately upstream of a kick net, which collects the sample, was conducted at six sampling stations within the study area. Macroinvertebrate samples were returned to the laboratory where species within each kick sample were identified to genus level. Differing macroinvertebrate species are assigned to a group according to its tolerance of or sensitivity to water pollution. A river is then assigned a Q value based on these groupings.

The results of the Q sampling survey are shown in Tables 15-4 to 15-9 below.

Station number 1					
Date	11th June 2012	**DO%**	103.4	**Conductivity (µS)**	173
GPS Location (ING)	197973, 161082	**DO mg/L**	11.31	**pH**	7.5
GPS Accuracy	4m	**Temp (°C)**	11.28	**TDS (g/L)**	0.043

Bank Width	1.8m
Wet Width	1.5m
River Depth:	16.5cm
Velocity:	V. slow
Clarity :	Slightly turbid
Colour:	Slight
Dominant substrate:	Gravel & Mud
Filamentous Green Algae:	None
Macrophytes:	Normal growth
Sewage Fungus:	None
Siltation:	Heavy
Surrounding land type:	Pasture
Outflow pipes:	None
Shading:	Medium
Cattle Access:	Yes
Stream flow type:	Slow flow
Q value	Q3
Further comments	Depth of mud in areas up to 10cm. During time of sampling field to east closed for silage. Field to west wet grassland/no fencing Evidence of cattle encroachment. Geology- Silurian metasediments & volcanic with shallow peat top soil.

TABLE 15-4 RESULTS OF Q SAMPLING SURVEY, STATION NUMBER 1

Station number 2					
Date	11th June 2012	**DO%**	108.0	**Conductivity (µS)**	157
GPS Location (ING)	197336,1 59239	**DO mg/L**	11.64	**pH**	7.6
GPS Accuracy	4m	**Temp (°C)**	11.98	**TDS (g/L)**	0.33

Bank Width	1.9m- 2.0m	
Wet Width	1.80m	
River Depth:	Avg - 16.5c Max - 30cm	
Velocity:	Fast	
Clarity :	Clear	
Colour:	Peat Stained/slight	
Dominant substrate:	(Cobbles 65%) (Boulder 15%) sand/gravel	
Filamentous Green Algae:	None	
Macrophytes:	Normal growth	
Sewage Fungus:	None	
Surrounding land type:	To south Riparian Woodland/ to north improved grassland	
Outflow pipes:	None	
Shading:	Moderate	
Cattle Access:	None	
Stream flow type:	Riffle and glide	
Q value	Q4	
Bank Width	1.9m- 2.0m	
Further comments	Slightly Peat stained water Field to north cattle grazing Species note: Brown trout, freshwater limpet. To immediate south WN5 with alder and salix	

TABLE 15-5 RESULTS OF Q SAMPLING SURVEY, STATION NUMBER 2

Station number 3					
Date	11th June 2012	**DO%**	102.8	**Conductivity (µS)**	261
GPS Location (ING)	194363, 159329	**DO mg/L**	11.58	**pH**	7.2
GPS Accuracy	4m	**Temp (°C)**	10.03	**TDS (g/L)**	0.49

Bank Width	1.9m- 2.0m
Wet Width	1m
River Depth:	Avg - 12.5cm Max - 20cm
Velocity:	Fast
Clarity :	Clear
Colour:	Peat Stained/slight
Dominant substrate:	(Cobbles 40%) (Boulder 15%) sand/gravel
Filamentous Green Algae:	Trace
Macrophytes:	Normal growth
Sewage Fungus:	None
Surrounding land type:	To northwest improved wet grassland. Steep bank to south west then conifer plantation
Outflow pipes:	None
Shading:	Medium
Cattle Access:	Yes
Stream flow type:	Riffle and glide
Q value	Q4
Bank Width	1.9m- 2.0m
Further comments	Slightly Peat stained water. Field to northwest cattle grazing. To south east steep bank (5m) with narrow stretch of conifer plantation (Sitka spruce) 4 trees deep. Species note: Water starwort in pool areas (light cover)

TABLE 15-6 RESULTS OF Q SAMPLING SURVEY, STATION NUMBER 3

Station number 4					
Date	11th June 2012	**DO%**	104.3	**Conductivity (µS)**	188
GPS Location (ING)	195056, 162330	**DO mg/L**	11.15	**pH**	7.7
GPS Accuracy	4m	**Temp (°C)**	12.29	**TDS (g/L)**	0.29

Bank Width	2.0 - 2.30m
Wet Width	2.10m avg
River Depth:	Avg - 16.5cm Max - 30cm
Velocity:	Fast
Clarity :	Clear
Colour:	Peat Stained/slight
Dominant substrate:	(Cobbles 60%) (Boulder 10%) sand/gravel
Filamentous Green Algae:	Trace
Macrophytes:	Normal growth
Sewage Fungus:	None
Surrounding land type:	Pasture
Outflow pipes:	None
Shading:	medium
Cattle Access:	None
Stream flow type:	Riffle and glide
Q value	Q4
Bank Width	2.0 - 2.30m
Further comments	Fields to west saved for silage harvesting. Field to east recent cattle grazing wet grassland with areas of scrub. Geology- Silurian metasediments & volcanic. Soils mineral alluvium. Immediate bank areas very wet.

TABLE 15-7 RESULTS OF Q SAMPLING SURVEY, STATION NUMBER 4

Station number 5					
Date	11th June 2012	**DO%**	105.0	**Conductivity (µS)**	146
GPS Location (ING)	194623, 163001	**DO mg/L**	11.20	**pH**	7.6
GPS Accuracy	4m	**Temp (°C)**	12.45	**TDS (g/L)**	0.26

Bank Width	4- 4.4m
Wet Width	4.1m
River Depth:	Avg - 14.5cm Max - 25cm i
Velocity:	Fast
Clarity :	Clear
Colour:	Peat Stained/slight
Dominant substrate:	(Cobbles 55%) (Boulder 20%) sand/gravel
Filamentous Green Algae:	Trace
Macrophytes:	Normal growth
Sewage Fungus:	None
Surrounding land type:	Pasture to west/woodland N/NE
Outflow pipes:	None
Shading:	medium
Cattle Access:	yes
Stream flow type:	Riffle and glide
Sampled in minutes	Q4-5
Bank Width	4- 4.4m
Further comments	Slightly Peat stained Water. Animals were observed crossing river downstream of survey site. Species note: Very species diverse.

TABLE 15-8 RESULTS OF Q SAMPLING SURVEY, STATION NUMBER 5

Station number 6					
Date	22/08/2012	**DO%**	101.1	**Conductivity (µS)**	169
GPS Location	193464, 159759	**DO mg/L**	11.35	**pH**	7.6
GPS Accuracy	2m	**Temp (°C)**	12.10	**TDS (g/L)**	0.041
Bank Width	2.2m				
Wet Width	1.3m				
River Depth:	Avg 12cm; Max 20cm				
Velocity:	Fast				
Clarity :	Slightly turbid				
Colour:	Slight				
Dominant substrate:	Cobble50%; Gravel 20%; Boulder5% & fine gravel				
Filamentous Green Algae:	Trace				
Macrophytes:	Normal growth				
Sewage Fungus:	None				
Siltation:	Slight				
Surrounding land type:	Pasture				
Outflow pipes:	None				
Shading:	Medium				
Cattle Access:	Yes				
Stream flow type:	Riffle/Glide				
Sampled in minutes	*Stone wash*	1 minute	*Kick sampling*	2 minutes	
Further comments	During time of sampling field to east had recent cattle grazing. Field to west improved grassland/steep bank. No fencing on either bank. Evidence of cattle encroachment. Shading during time of survey was 25%. Further downstream on the west of R497 the stream in used as roadway. Geology- Silurian metasediments & volcanic with shallow peat top soil.				

TABLE 15-9 RESULTS OF Q SAMPLING SURVEY, STATION NUMBER 6

PHYSIOCHEMICAL WATER QUALITY

Physiochemical water quality testing was undertaken on the 11th of June and the 22 nd of August 2012 in order to establish the baseline water quality of watercourses just downstream of the proposed wind farm infrastructure catchment area. Testing was done at sampling stations on five streams outside the immediate site. Grab samples were collected at each location and sent to a laboratory for testing. The parameters tested included temperature, pH, electrical conductivity, total dissolved solids and dissolved oxygen and the results of the laboratory tests are contained in Table 15-9.

Parameter	**Site 1**	**Site 2**	**Site 3**	**Site 4**	**Site 5**	**Site 6**	**Salmonid Regulations S.I. No. 293 of 1988**	**Surface Water Regulations S.I. No. 272 of 2009**
pH	7.5	7.6	7.2	7.7	7.6	7.7	>6 & <9	
Alkalinity, mg/L as $CaCO_3$	72.5	62.9	91.1	81.0	56.6	119		
Temperature	11.28	11.98	10.03	12.29	12.46	12.10		
Suspended solids mg/L	3	2	6	<2	<2	18	<25	
BOD (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	1.4	<5	<2.2
Nitrate(mg/L)NO_3-N	1.08	0.73	2.07	1.23	0.65	1.95		
Nitrite (mg/L)NO_2-N	<0.005	<0.005	<.005	<.005	<.005	0.01	<0.05	
Sulphate (mg/L)	5.14	4.85	5.70	4.78	4.56	4.36		
MRP, mg/L P	0.01	0.01	0.01	0.02	0.01	0.06		≤0.035
Total phosphorous P (mg/L)	0.09	<0.04	0.16	0.06	0.04	<0.04		
Total dissolved phosphorous P (mg/L)	0.09	<0.04	0.12	0.06	0.04	<0.04		
Particulate phosphorous (mg/L)	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04		
Ammonia	0.03	0.02	<0.02	0.03	0.02	<0.02	≤ 1	
Ammonia (unionised)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	≤ 0.02	
Metals								
Iron (mg/L)	0.251	0.146	0.025	0.089	0.110	0.16		
Aluminium (mg/L)	0.019	0.042	0.023	0.037	0.024	0.05		

TABLE 15-9 PHYSIOCHEMICAL WATER QUALITY RECORDED AT THE UPPERCHURCH SITE

Dissolved oxygen levels were good in all the watercourses that were surveyed (>11mg/L), indicating that all of the surface waters in the catchment areas had levels of oxygen present capable of supporting healthy salmonid populations as per the Salmonid Water Regulations (SI No. 293 of 1988) implementing the Freshwater Fish Directive (78/659/EEC).

Levels of unionised ammonia and nitrite that are known to be particularly toxic to fish were within the thresholds specified in the Salmonid Regulations (S.I. No. 293 of 1988) at <0.02 and <0.005 respectively (see Table 13-12). Similarly the BOD levels were low with sites 1 through 5 inclusive, recording <1.0mg/L BOD and site 6 recording the highest levels; 1.4mg/L BOD. All sites were in compliance with the Salmonid Water Regulations (see Table 13-12).

Ortho-phosphate (MRP) levels were similar across sampling sites with 0.01mg/L levels recorded at sites 1,2,3 and 5 with site 4 recording 0.2mg/L and site 6 recording the highest levels of 0.06mg/L. Sites 1 through 5 levels are below the levels recommended in the Surface Water Regulations (S.I. No. 272 of 2009) meeting the requirements of the regulation, however site 6 exceeds the ≤0.035 recommended levels.

The suspended solid levels were also very low for streams 1 through 5, with levels recorded at <2mg/l at sampling stations 4 and 5. Sampling station 2 recorded 2mg/L. Sampling stations 1 and 3 were slightly higher with levels of 3mg/L and 6mg/L respectively. Sampling station six recorded the highest levels of 18 mg/L. Sampling station 1 has a Q value of 3 with the other stations having values of 4 or 4/5. All streams were in compliance with the threshold of <25mg/l required under the Salmonid Water Regulations (S.I. No. 293 of 1988).

As the catchment is dominated by siliceous rocks the buffering capacity of water can change rapidly over the season especially when water levels are higher, resulting in the dilution of background mineral salts. As a result H+ ions are not easily neutralized, meaning a reduction in the pH. In addition, rain water that is naturally low in pH (circa 5.5) can scavenge acidic ions from pine needles and peat and wash them into receiving water bodies causing local reductions in pH. The pH levels at all sampling stations range between 7.2 and 7.7. These fall within the threshold (>6 & <9) required under the Salmonid Water Regulations (S.I. No. 293 of 1988), required for balanced and healthy fish populations in the Salmonid Regulations.

15.2.3 Hydrogeology

Groundwater is an important water source as it provides base-flow to rivers and surface water bodies and is a natural resource for human activities. It also has inherent value as a natural resource and warrants protection for the prevention of pollution and contamination. The Geological Survey of Ireland administers the Groundwater Protection Schemes within Ireland.

15.2.3.1 Aquifer classification at the site

Information on the underlying acquifer was acquired from consultation with the GSI databases.

The wind farm site lies entirely within the Templemore A groundwater body (GWB). This aquifer is classified as PI, Poor Aquifer – bedrock which is generally unproductive except for local zones.

The groundwater body extends from north of Templemore south towards Annacarthy in County Tipperary. The GWB contains the Silvermine Mountains, which lies within the South Eastern River Basin District. At the very north there is Kilduff Mountain, Devilsbit Mountain, Knockanora and Knocknascreggan. Elevations reach up to 450mOD at Hollyford. The land elevation drops off to the east of these mountains towards the Suir valley. Drainage is to the east towards the Suir valley.

The majority of groundwater flow in this aquifer is considered to take place in the upper weathered zone (3m), below this the amount of groundwater flow decreases gradually with depth and large flows are not expected below 10m except in isolated open fractures.

Groundwater will discharge locally to streams and rivers crossing the aquifer and also to small springs and seeps. Owing to the poor productivity of the aquifers in this body it is unlikely that any major groundwater-surface water interactions occur. Baseflow to rivers and streams is likely to be relatively low.

Diffuse recharge to this groundwater body occurs, mostly where subsoil is thinnest or most permeable. The proportion of available recharge that enters the groundwater body varies depending on the subsoil thickness and permeability. The steep slopes in this area will reduce the actual discharge by causing more interflow and overland flow.

Groundwater was not encountered in any of the trial pits that were excavated on the wind farm site.

The GSI Databases contains information on wells and boreholes in the area. Table 15-10 below shows the location, depth and use of boreholes within 2km of the site.

GSI Code	Coordinates (ING)	Location	Accuracy	Depth of Bore	Depth to Bedrock	Use
1715SEW036	E: 196380 N: 157650	Doree Commons, Upperchurch	50m	94.5m	Unknown	Agriculture & domestic
1715SEW042	E: 194310 N: 158390	Milestone, Upperchurch	50m	Unknown	Unknown	Agriculture and domestic
1715SEW044	E: 194930 N: 158390	Graneria Upperchurch	10-50m	Unknown	Unknown	Agriculture and domestic
1715SEW032	E: 193750 N: 159480	Knockcurrabola Crowlands, Upperchurch	10m	4m	Not met	Not recorded
1715SEW043	E: 196550 N: 159840	Shevry, Upperchurch	50m	76.2m	Unknown	Agriculture and domestic
1715SEW070	E: 191880 N: 160610	Reisk, Upperchurch	10m	4m	Not met	Not recorded
1715SEW064	E: 194330 N: 160660	Knockcurrabola Commons, Upperchurch	10m	4m	Not met	Not recorded
1715SEW108	E: 195690 N: 161220	Knockeravoola, Upperchurch	50m	91.4m	Unknown	Agriculture and domestic
1715SEW063	E: 195990 N: 161180	Knockamena Commons, Upperchurch	10m	2.5m	2.5m (presumed)	Not recorded
1715SEW062	E: 197210 N: 161120	Cooga, Upperchurch	10m	2.5m	2.5m	Not recorded
1715SEW069	E: 191440 N: 161420	Reisk, Upperchurch	10m	4m	2.5m (presumed)	Not recorded
1715SEW065	E: 194110 N: 161610	Foilnaman, Upperchurch	10m	3m	3m (presumed)	Not recorded
1715SEW109	E: 197100 N: 161680	Glenbeg, Upperchurch	50m	54.9m	Unknown	Not recorded
1715SEW061	E: 197560 N: 162080	Glenbeg, Upperchurch	10m	1.5m	1.5m	Not recorded
1715SEW060	E: 197810 N: 162310	Gortnada, Upperchurch	10m	2.5m	2.5m (presumed)	Not recorded
1715SEW101	E: 195780 N: 162320	Coumber, Upperchurch	50m	Unknown	Unknown	Agriculture and domestic
1715SEW103	E: 196000 N: 162500	Coumbeg, Upperchurch	50m	82.3m	Unknown	Agriculture and domestic
1715SEW119	E: 196020 N: 162800	Garrankilka, Upperchurch	20m	39.6m	6.1m	Agriculture and domestic
1715SEW066	E: 195120 N: 162990	Glastrigan Upperchurch	10m	3.3m	3.3m	Not recorded
1715SEW058	E: 197270 N: 163430	Seskin, Upperchurch	10m	4m	Not met	Not recorded
1715SEW057	E: 196380 N: 164040	Seskin, Upperchurch	10m	4m		Not recorded
1715SEW067	E: 193990 N: 164050	Cumme, Upperchurch	10m	3m	3m (presumed)	Not recorded

TABLE 15-10 RECORDED WELLS IN PROXIMITY TO THE SITE (GSI)

15.2.3.2 Groundwater protection

The GSI administers Groundwater Protection Schemes within Ireland and the scheme has been developed in conjunction with the Environmental Protection Agency and the Department of Environment, Heritage and Local Government. The Protection Schemes are based on a combination of factors, namely the details on the existing groundwater sources and resources and the vulnerability of the groundwater to pollution together with data regarding responses to groundwater protection.

15.2.3.3 Groundwater vulnerability

According to the GSI, groundwater vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. The GSI uses a matrix comprising four groundwater vulnerability categories to classify aquifer vulnerability. These categories are extreme, high, moderate and low. The ratings are used in the GSI vulnerability Mapping Guidelines as outlined in Table 15-11 below.

Vulnerability Rating	Hydrogeological Conditions				
	Subsoil Permeability (Type) and Thickness			Unsaturated Zone	Karst Features
	High permeability (sand/gravel)	Moderate permeability (e.g. Sandy subsoil)	Low permeability (e.g. Clayey subsoil, clay, peat)	(Sand/gravel aquifers only)	(<30 m radius)
Extreme (E)	0 - 3.0m	0 - 3.0m	0 - 3.0m	0 - 3.0m	-
High (H)	>3.0m	3.0 - 10.0m	3.0 - 5.0m	>3.0m	N/A
Moderate (M)	N/A	>10.0m	5.0 - 10.0m	N/A	N/A
Low (L)	N/A	N/A	>10.0m	N/A	N/A

Notes: (1) N/A = not applicable.
(2) Precise permeability values cannot be given at present.
(3) Release point of contaminants is assumed to be 1-2 m below ground surface.

TABLE 15-11 VULNERABILITY MAPPING GUIDELINES

The Geological Survey of Ireland (GSI) Interim Vulnerability Classification maps indicate that the majority of the site is classified as *Extreme Vulnerability* (E) or *Extreme Vulnerability with rock near Surface or Karst* (X). This is in agreement with the site investigation results where rock was encountered at less than three metres depth in 18 out of 20 trial pits. The bedrock at the site is siltstone. **Figure 15-3**, at the end of this chapter, shows the GSI Interim Vulnerability Classification Map for the area.

Turbine T08 is in an area of High to Low Vulnerability (H/L). Turbines T01, T07 and T22 are in areas with vulnerability rating E and all the remaining turbines are in areas with vulnerability rating X. Almost all of the new roads and roads that are to be widened are in areas rated E or X.

15.2.3.4 Water balance

Water balance describes the flow of water into and out of the site. The low soil and subsoil permeability and significant ground surface slopes mean that there is limited capacity for rainwater to infiltrate the ground during periods of high rainfall. The land use at the site is mainly agricultural with some commercial forestry in the upland areas.

A water balance analysis has been undertaken to assess the likely run off volumes and flow for the site based on the ground type, permeability, contours and existing drainage network. This assessment has been used to identify how the proposed wind farm infrastructure will impact on the drainage patterns on site. This is then dealt with in the Sediment and Erosion Control Plan, which is included in **Appendix 15-I**, and informs the design of the drainage system on site.

15.2.3.5 Flood hazard

The OPW manages CFRAM programme, a catchment flood risk assessment and management programme, initiated in 2011 in response to the EU Floods Directive. The CFRAM Programme is central to the medium to long term strategy for the reduction and management of flood risk in Ireland. Implementation of the EU Floods Directive is coordinated with the Water Framework Directive and the River Basin Management Plans.

The OPW has completed a Preliminary Flood Risk Assessment (PFRA) for the country, the results of which are available online, via interactive mapping. The assessment considers all types of flooding that can occur, from rivers, sea, estuaries, heavy rain, groundwater and the failure of infrastructure. The PFRA identifies areas where the risk of flooding might be significant. The intent is to carry out more detailed study in these at risk areas to more accurately assess the degree and extent of flood risk.

The PFRA maps have been interrogated for the Upperchurch site and the results are indicated on the map in **Figure 15-4**: Preliminary Flood Risk Assessment Map (2019/MAP/150/A) at the end of this chapter.

Figure 15-4 indicates that none of the proposed infrastructure for the 22 turbines lies within any of the flood risk zones. Furthermore, the site drainage plan intends to attenuate any incidental rainfall on the new hard surfaces by means of silt fences, settling ponds and outfalls over land as opposed to direct discharge to watercourses. This will reduce the impact of the wind farm’s infrastructure on the downstream watercourses.

15.3 LIKELY SIGNIFICANT IMPACTS

The following sections provide an assessment of the unmitigated impacts of the proposed Upperchurch wind farm on the hydrological environment.

15.3.1 Characteristics of the proposal

The development is characterised by the following civil engineering works which will be undertaken to provide the necessary infrastructure to complete the wind farm:

- Excavation for the construction of 22 turbine bases with a minimum depth of 2.00m and 225m^2 plan area and hardstands with and excavation depth of 0.60m and 1,040m^2 plan area;
- Erection of 22 turbines with hub heights of up to 85m and maximum tip height of up to 126.60m;
- Construction of an electrical sub-station compound with excavation depth of 0.60m and 2,624m^2 plan area;
- Construction of 8.0km of 5.00m wide new roads;
- Widening and upgrading of 3.9km of existing farm roads (average 2m widening);
- Construction of a surface water drainage system along the road edges; and
- Importation of stone from local quarries for construction of access roads and hard standings.

The site layout is shown in **Figure 15-**1 at the end of this chapter.

15.3.2 Surface water flow

15.3.2.1 Interruption of existing drainage patterns

The existing drainage network on site, associated with wind farm tracks and natural streams has some potential to be impacted upon by the construction phase of the wind farm. Excavation of new drainage channels, and modifications to the existing surface water drainage network to link new infrastructure has the potential to impact on surface water flow. There is a potential for moderate negative impacts to occur to surface water flows.

15.3.2.2 Surface water quality

RELEASE OF SUSPENDED SOLIDS

The mains risks to water quality arise from the following;

- Release of suspended solids, particularly from peat soils;
- Nutrient release from transported or suspended sediments;
- Nutrient release from brash from tree felling to facilitate the works.

Suspended solids and nutrient release will have a negative impact on the water quality of streams/rivers and an impact on aquatic ecology (see **Chapter 13 Ecological Impact**

Assessment). Given the permeable nature of the existing soil and the small number of streams draining the site, the potential for a significant impact to surface water quality within the receiving catchments is low.

RISK OF POLLUTION FROM HYDROCARBON RELEASE

The construction of the wind farm infrastructure requires the use of mechanical plant and equipment. The use of plant on site introduces a risk of potential spillage of oils or hydrocarbons from vehicle and plant either working on site or delivering materials or equipment to site.

RISK OF POLLUTION FROM CEMENT

There is a risk of spillage and run off from cement trucks delivering concrete to site during the placing of concrete, but also in the washing out of chutes. The spillage of cementitous material into a watercourse would significantly impact on the pH of the water and thus impact on water quality.

RISK OF POLLUTION FROM WATER SANITATION

A risk of ground water pollution can occur where adequate toilet facilities are not provided on site.

RISK OF POLLUTION FROM TREE FELLING

In order to construct the proposed wind farm, felling of existing maturing conifer trees and clearing of young plantation will be required around turbines T05 and T14. The risk to water quality from felling comes from the brash and needles that remain from the felling process. Brash, if left on site, will eventually lose it needles and break down to effectively form a localised store of phosphorous. This has the potential to be released due to excavation and poor drainage controls.

In summary, there is a potential for minor-moderate negative impacts to occur to surface water quality due to tree felling.

15.3.2.3 Groundwater flow

EXCAVATION SEEPAGE

In terms of impact, limited and discontinuous seepage is expected from the sides of excavations for turbine pads in sloping ground. The excavations are likely to be up to 4m below ground level depending on the ground surface slope and formation depth. The time of year and level of rainfall for excavation will be a significant control in how much seepage occurs in foundations.

In the context of the site geology, its high elevation within the catchment combined with existing drainage, any seepage that does occur will be low in volume. Lowering of water table

The site investigations carried out on the site indicate that the water table levels are generally low. Excavation for turbine bases is therefore not likely to cause any lowering of the water table other than in the immediate vicinity of the bases.

DEWATERING OF WELLS

There are a number of wells in the area as listed in **Table 15-10 Recorded wells in proximity to the site (GSI)** above. Each of these wells is at a lower elevation than the proposed wind turbine locations or is separated from them by intervening valleys. There will therefore be no potential for dewatering or hydraulic impact on groundwater supplies.

15.3.2.4 Groundwater quality

GROUNDWATER CONTAMINATION

As outlined in Section 15.2.3.1 above, the wind farm site lies entirely within the Templemore A groundwater body. This aquifer is classified as PI, Poor Aquifer – bedrock which is generally unproductive except for local zones. Nonetheless, there are a number of wells in the area although the yields from them are not indicated in the GSI data for the area.

Due to the requirements of the Water Framework Directive with respect to the protection of all groundwater quality, the groundwater beneath the site requires preventative mitigation measures for potentially polluting activities, of which hydrocarbons release is the main threat to groundwater quality.

The potential threats to groundwater contamination are essentially the same for surface water and include the same potential sources. These are:

- Hydrocarbons from introduced plant equipment / fuel stations.
- Waste water and chemical treatment compounds from sanitation facilities.
- Inorganic nutrients such as nitrogen and phosphorus compounds from tree felling (if present in excavated sediment).

No wells have been identified within a distance of 100m of any of the proposed infrastructural works. The proposed development does not have the potential to pollute any known ground water supply.

15.3.3 Operational Phase

The potential impacts on the hydrological and hydrogeological environments during the operational phase are discussed hereunder.

15.3.3.1 Surface water flow

The construction of new roads, turbine bases and hardstands creates additional surface area from which increased surface water runoff can occur. On the proposed site there is a total of 8.0km of new wind farm roads, widening of 3.9km of existing roads, construction of 22 turbine bases and hard standing areas together with the associated new drainage works. The increase in impermeable area can increase the runoff rate to the downstream system.

15.3.3.2 Surface water quality

While the main threat to water quality, in particular surface water quality, arises during the construction phase of the project due to earthworks activity, there is also a risk of pollution during the early operation phase of the project that is associated with drainage runoff and release of suspended solids. The impact to surface water quality may be significant.

15.3.3.3 Groundwater quality

There is a potential risk of groundwater contamination during the operation phase of the project from maintenance vehicles. However, given the low level of maintenance required this risk is not considered significant.

15.4 MITIGATION MEASURES

15.4.1 Construction Phase

15.4.1.1 Mitigation by avoidance

A process of *'mitigation by avoidance'* was undertaken by the EIA team during the design of the turbine and associated infrastructure layout. Mitigation by avoidance was particularly relevant to avoiding, except at crossings, the local streams. Arising from the results of this study, a constraints map was produced which identifies areas where hydrological constraints make parts of the site unsuitable for development. A 50m constraints buffer was applied to all streams within the site during the project design phase. There will be no roads or turbine foundations within 50m of a watercourse, except at the necessary stream crossing. The internal road crosses streams at one location: 250m to the north of T04. See **Figure 15-6** at the end of this chapter.

15.4.1.2 Surface water flow

Potential impacts on site hydrology including surface water flow during construction phase of wind farm development are mitigated by the constructed drainage design. This will cause minimal disturbance to the current hydrological regime and will minimise suspended sediment loading. The details of this constructed drainage and associated drawings are outlined in the Sediment and Erosion Control Plan in **Appendix 15-I** at the end of this Chapter.

There will be no diversion, infilling or dewatering of existing surface water drainage as part of the proposed development; therefore no mitigation is required.

Where construction activities associated with the one watercourse crossings intercept the 50m hydrological buffer zone, the following mitigation will used to prevent any potential impacts:

- Construction activities in the hydrological buffer zones will be avoided during or after prolonged rainfall or an exceptional rainfall event. Work will cease entirely near watercourses when it is evident that pollution is likely to occur.
- Culverts will be installed at locations where land drains are intercepted and will be diverted into the clean water drains. The culverts will be designed to facilitate the large flows that may occur following intense or prolonged rainfall events.

All river and stream crossing method statements will be designed in consultation with Inland Fisheries Ireland – South Eastern River Basin District and Shannon River Basin District prior to initiation of construction works.

15.4.1.3 Surface water quality

<u>SEDIMENT AND EROSION CONTROL</u>

Erosion control where runoff is prevented from flowing across exposed ground and sediment control where runoff is slowed to allow suspended sediment to settle are important elements in runoff and sediment control. A Sediment and Erosion Control Plan has been prepared (See **Appendix 15-I** of this Chapter) and will be implemented to prevent sediment and pollutant runoff into the local watercourses during the construction phase. The plan includes the following elements:

- The plan will effectively consist of restoring and maintaining the existing drainage network and upgrading it as per new drainage details as required on site along the existing access track and roads where it exists and integrating it with newly constructed drainage required for upgraded and new roads.
- No work will take place within 50m buffer zones of watercourses, except at crossings.
- All construction method statements will be prepared in consultation with Inland Fisheries Ireland – South Eastern River Basin District and Shannon River Basin District.
- The area of exposed ground will be kept to a minimum by maintaining, where possible, existing vegetation.
- Temporary deposition areas will be designated and designed to hold temporary stockpiles and will be located away from drains and watercourses.
- Stockpiles that are at risk of erosion will be protected by silt trapping apparatus such as a geo-textile silt fence to prevent contaminated runoff.
- Silt fences or other appropriate silt retention measures will be installed where there is a risk of erosion runoff to watercourses from construction related activity, particularly during prolonged wet weather periods or following an intense rainfall event.
- The silt retention measures where they are installed will be inspected and maintained on a regular basis throughout the construction and operation phases of the wind farm.
- All associated tree felling will be undertaken using good working practices as outlined by the Forest Service in their 'Forestry Harvesting and Environment Guidelines' (Forest Service, 2000a) and the 'Forestry and Water Quality Guidelines '(Forest Service, 2000b). The latter guidelines deal with sensitive areas, erosion, buffer zone guidelines for aquatic zones, ground preparation and drainage, chemicals, fuel and machine oils.
- Drainage ditches or other suitable measures will be adopted alongside access roads, turbines and other disturbed areas to prevent silt or contamination from construction water runoff entering watercourses.
- Check dams will be placed at regular intervals based on slope gradient along all drains to slow down runoff so as to encourage settlement and to reduce scour and ditch erosion.
- Drains carrying construction site runoff will be diverted into silt traps.
- Wheel washes will be provided for exiting heavy vehicles to ensure roads outside of the site boundary are clean.
- Pumped or tremmied concrete will be monitored carefully to ensure no accidental discharge into local watercourses.
- A programme of inspection and maintenance of drainage and sediment control measures during construction will be designed and dedicated construction personnel assigned to manage this programme.
- Water quality monitoring will be carried out in years 1 and 2 of operation to determine whether water quality has been impacted. Monitoring of water quality parameters will

be conducted monthly in Year 1. If thresholds are not exceeded in Year 1, then the effort may be reduced in Year 2.

FUEL CONTROL

A fuel and oil management plan will be agreed with the civil contractor prior to commencement of construction. This will outline measures to prevent fuel and oil from entering local watercourses and emergency procedures to deal with any accidental spillages. See also Section 15.4.1.5 Groundwater quality below.

CEMENT CONTROL

During the pouring of concrete at the turbine bases effective containment measures will be implemented to avoid spilling concrete outside the construction area and prevent concrete entering the drainage system. In the case of cement washout entering water courses, the following measures will be put in place to mitigate and reduce its potential negative impact on water quality, particularly on baseline pH range:

- Trucks that deliver concrete to site will be washed out at the supplier's facilities and not on site.
- If the above is undertaken, this means that the only cement washing that will need to occur on site is the hand washing of the chutes at the rear of the cement lorries after the cement has been deposited.
- Run-off from wind turbine foundation concrete pours shall not be permitted to enter the watercourses and shall be contained within the foundation excavations and designated areas that are suitably sited and designed.
- In the case of emergencies there will be a dedicated concrete washout area onsite.

WASTE WATER SANITATION

During the construction phase, a self contained portable toilet with an integrated waste holding tank will be used on site for toilet facilities. This will be maintained by the service contractor on a regular basis and will be removed from the site on completion of the construction phase.

TREE FELLING

The impacts posed by the release of suspended solids and sedimentation after tree felling can be mitigated by following the requirements and mitigation measures outlined under *'Release of suspended solids'* in Section 15.3.2.2 - Surface water quality above. These measures include the protection of the riparian zones, installing buffered drainage outfalls, installation of drains and silt traps as soon as possible once felling has been completed, and a regime of continued monitoring of silt traps and drainage outfalls will be implemented.

Some tree felling (4.35 hA) will be required at turbines T05 and T14 for parts of the turbine foundation, hardstanding, under the swept area of the blades and for turbulence prevention. See **Figure 15-5: Clear Fell Areas Map** at the end of this chapter. All associated tree felling will be undertaken using good working practices as outlined by the Forest Service in their '*Forestry Harvesting and Environment Guidelines' (2000)* and the *'Forestry and Water Quality Guidelines ' (2000)*. The latter guidelines deal with sensitive areas, erosion, buffer zone guidelines for aquatic zones, ground preparation and drainage, chemicals, fuel and machine oils. All felled brash will be removed off site to avoid release and runoff of phosphorous into sensitive watercourses.

During the construction phase of the proposed project, water quality in the streams and outflow from end points of the drainage system will be monitored by sampling and testing on a regular basis during different weather conditions. This monitoring along with the visual monitoring outlined below will help to ensure that the mitigation measures that are in place to protect water quality are working.

15.4.1.4 Groundwater flow

<u>EXCAVATION SEEPAGE / INFLOWS</u>

Any water ingress that may be encountered in the weathered bedrock / mineral subsoils during the construction phase will be intercepted by an interceptor drain and diverted to the constructed drainage system for pollution control attenuation prior to discharge. All pumped water must be captured and directed to constructed drainage. No freshly pumped water must enter the existing drainage network directly or be pumped out onto adjacent habitat.

15.4.1.5 Groundwater quality

<u>GROUNDWATER CONTAMINATION</u>

The main threat to groundwater quality is the introduction of hydrocarbons to the site. In order to mitigate groundwater contamination by hydrocarbons in particular, it is proposed to implement a fuel management plan which should incorporate the following elements:

- Mobile bowsers, tanks and drums will be stored in secure, impermeable storage area, away from drains and open water;
- Fuel containers must be stored within a secondary containment system e.g. bund for static tanks or a drip tray for mobile stores;
- Ancillary equipment such as hoses, pipes must be contained within the bund;
- Taps, nozzles or valves must be fitted with a lock system;
- Fuel and oil stores including tanks and drums will be regularly inspected for leaks and signs of damage;
- Only designated trained operators will be authorised to refuel plant on site;
- Procedures and contingency plans will be set up to deal with emergency accidents or spills; and

- An emergency spill kit with oil boom, absorbers etc. is to be kept on site in the event of an accidental spill.

In relation to non-hydrocarbon potential contamination, waste water from temporary sanitation facilities will be mitigated by use of temporary and portable sanitary facilities that are self-contained. These facilities will not interact with the existing hydrological environment in any way and they will be maintained, serviced and removed from site at the end of the construction phase.

15.4.1.6 Environmental audits

Regular environmental water quality audits should take place during the construction phase to ensure compliance with legislative water quality standards and effective implementation of proposed mitigation measures.

15.4.2 Operational Phase

15.4.2.1 Surface water quality

The Sediment and Erosion Control Plan will be maintained for the early operational phase and replanting of vegetation should take place as necessary to minimise sediment loading. Regular environmental water quality audits should take place during the first two years of operation. Monitoring of water quality parameters will be conducted monthly in Year 1. If thresholds are not exceeded in Year 1, then the effort may be reduced in Year 2. Ongoing inspection and maintenance of the sediment and erosion measures will be carried out periodically throughout the life of the project.

15.5 CUMULATIVE IMPACTS

There is unlikely to be a significant cumulative impact on the hydrology and hydrogeology of the region if recommended mitigation measures are implemented.

15.6 RESIDUAL IMPACTS

The residual impact on the water environment during the construction and operational phase of the development is unlikely to be significant.

15.7 CONCLUSION

The development of the Upperchurch wind farm will not have a significant impact on Hydrology and Hydrogeology provided mitigation measures are implemented.

FIGURE 15 - 1: UPPERCHURCH WIND FARM LAYOUT

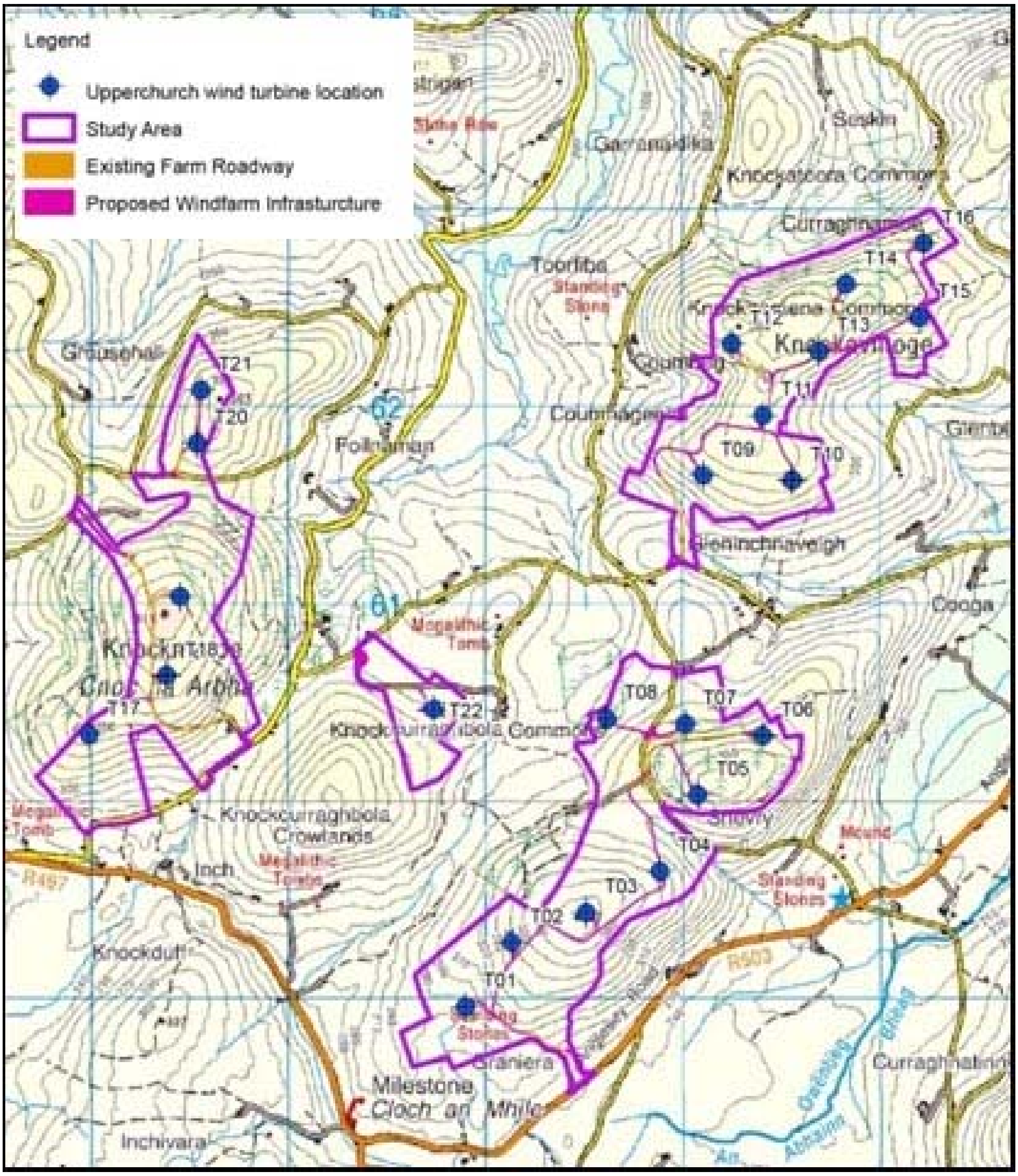
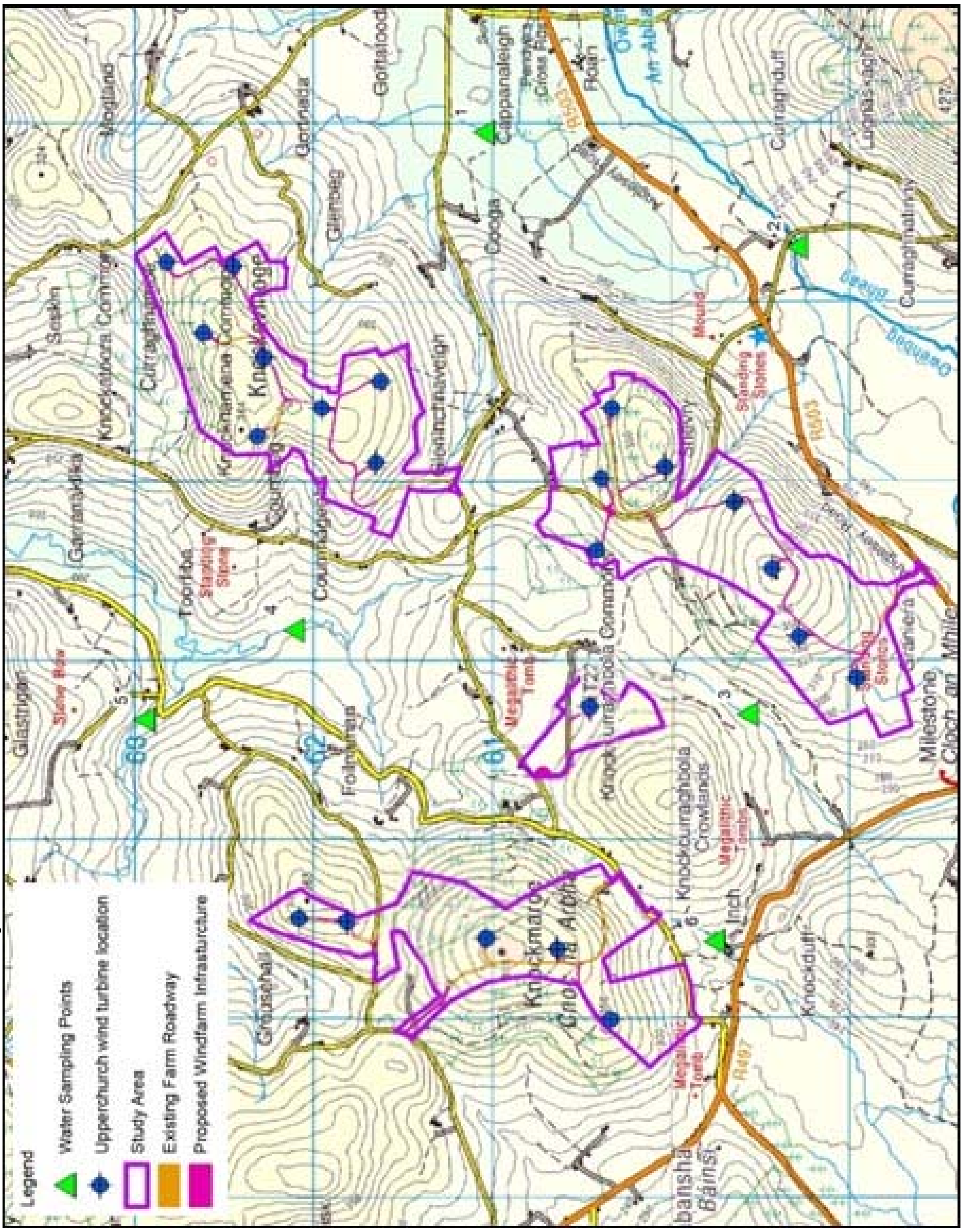


FIGURE 15 - 2: WATER QUALITY SAMPLING POINT LOCATION



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Consulting Engineers

FIGURE 15 - 3: GSI INTERIM VULNERABILITY CLASSIFICATION MAP

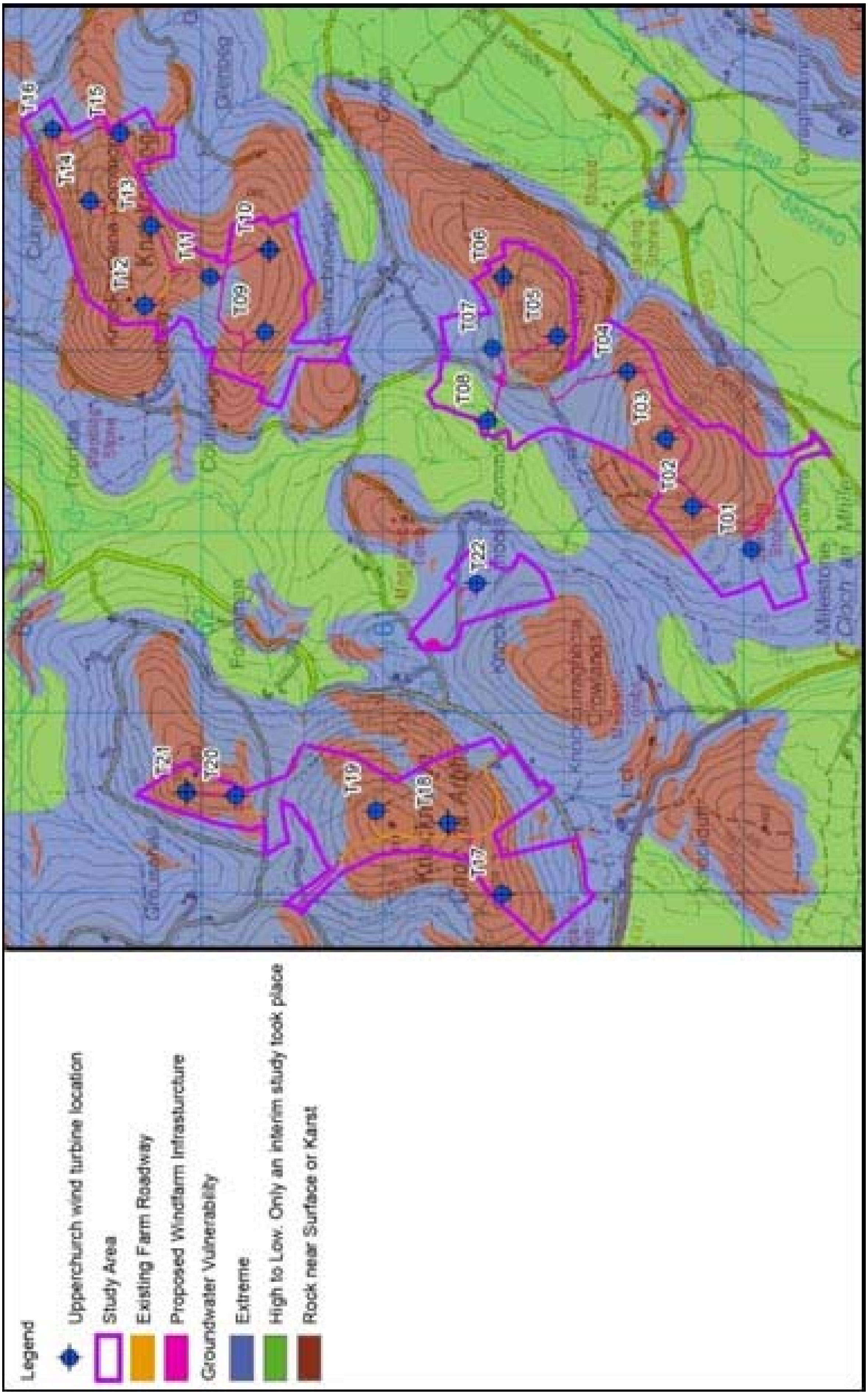


FIGURE 15 - 4 : PRELIMINARY FLOOD RISK ASSESSMENT MAP (2019/MAP/150/A)

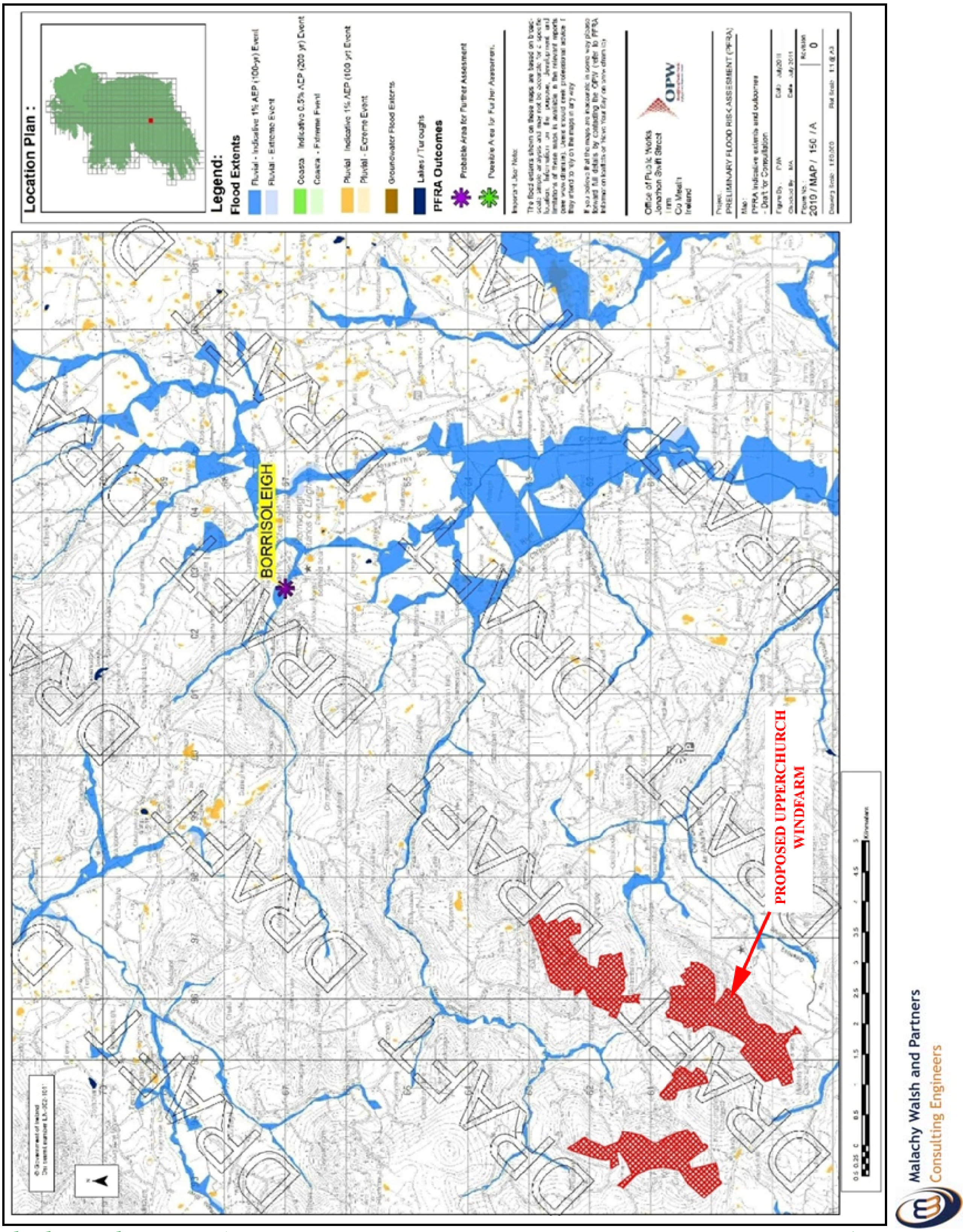


FIGURE 15-5: TREE CLEAR FELLING AREAS

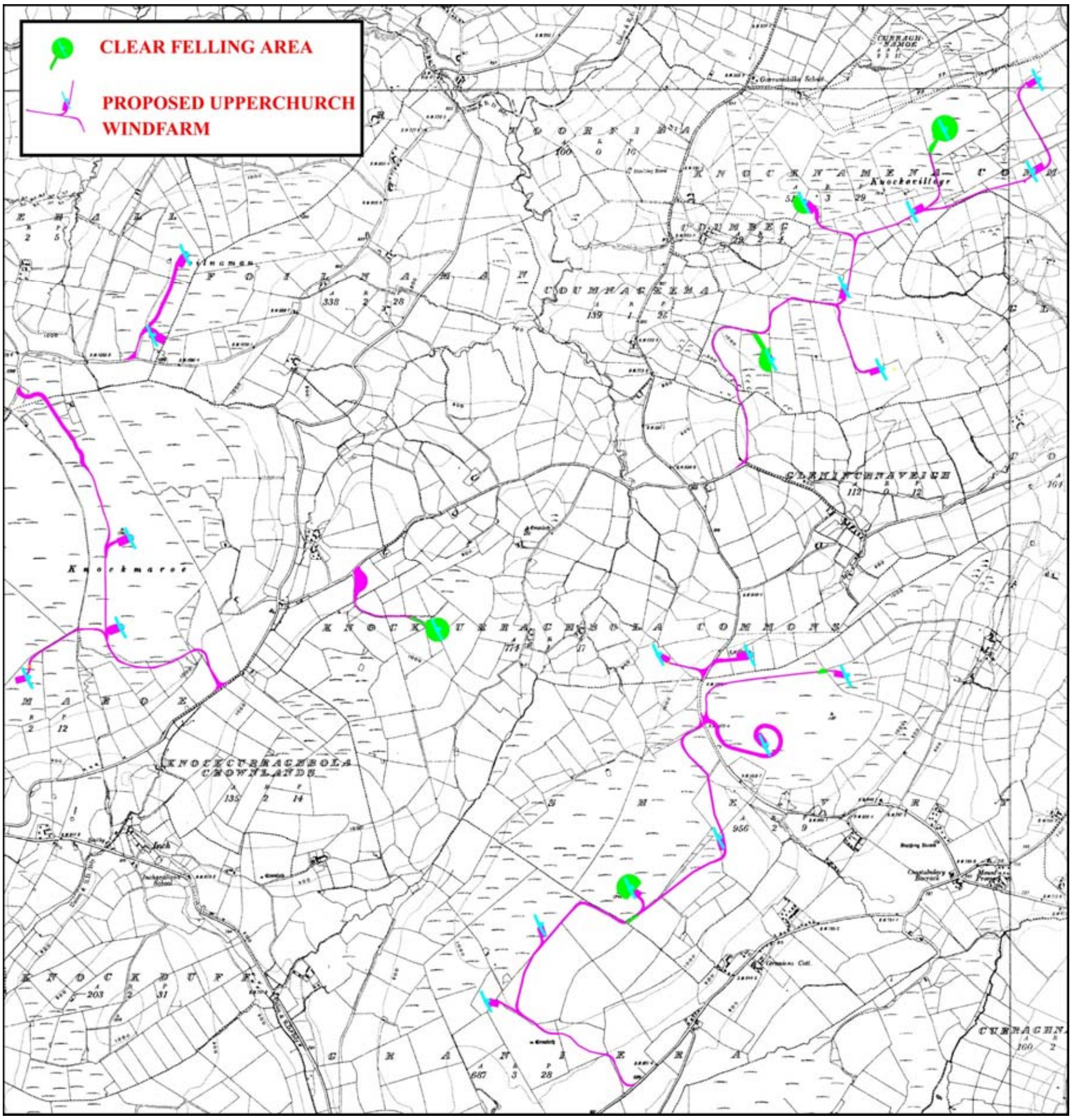
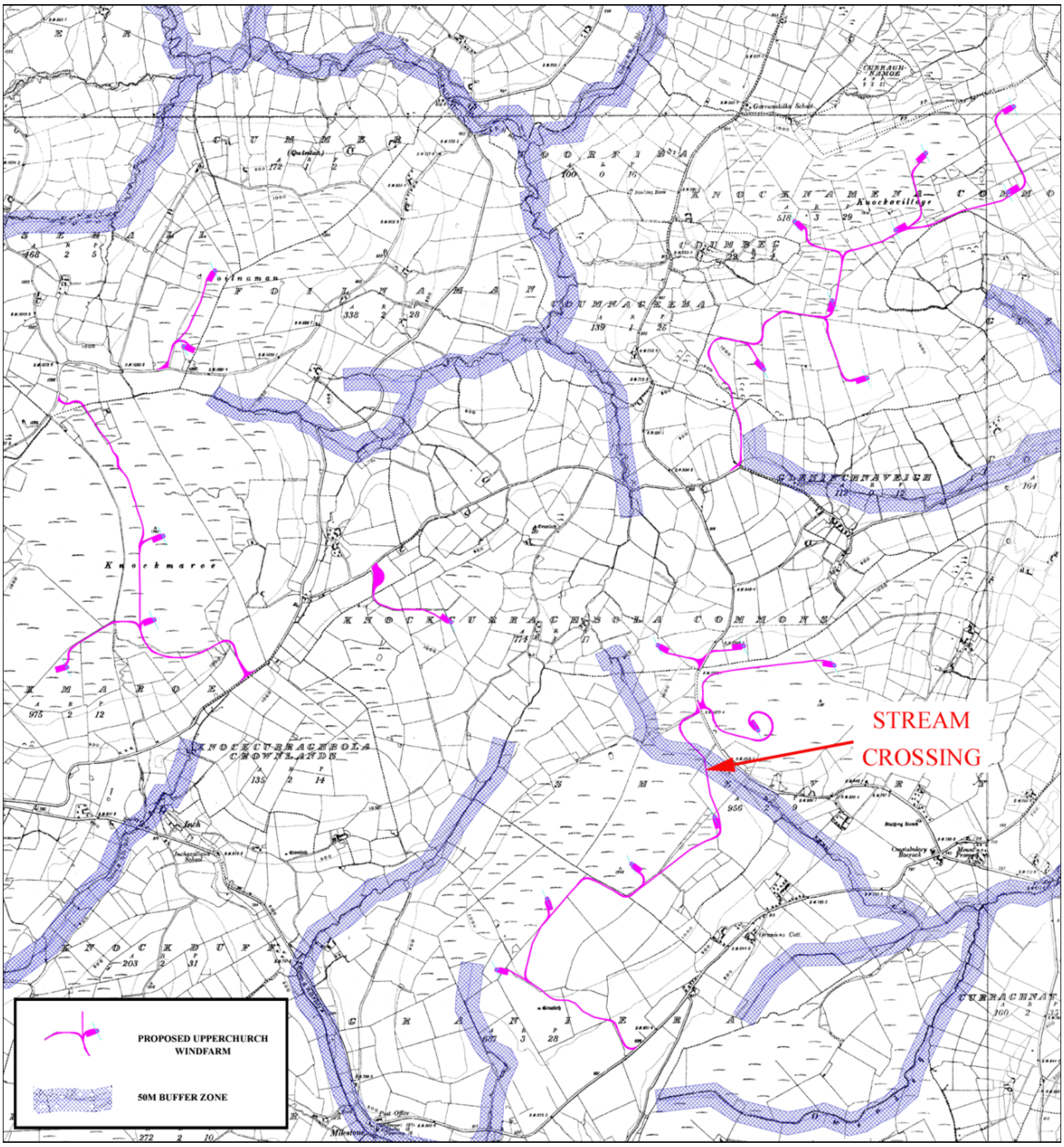


FIGURE 15-6: STREAM CROSSING AND 50M BUFFER ZONE



REFERENCE DOCUMENTS

Upperchurch Windfarm Environmental Impact Statement

Malachy Walsh and Partners

Consulting Engineers

Cork | Tralee | Limerick | London

WINDFARM DEVELOPMENT

UPPERCHURCH, THURLES, COUNTY TIPPERARY

SEDIMENT AND EROSION CONTROL PLAN

ECOPOWER DEVELOPMENTS LIMITED

Project	Document	Revision	Prepared	Checked	Status	Date
14708	6002	B	Sean Doyle	Jack O'Leary	Final	24 September 2012

1 Introduction

Sediment such as peat, clay and silt can cause significant pollution during the construction phase of civil engineering projects due to erosion of exposed soil by surface water runoff. This plan has been prepared to control runoff and prevent erosion during the construction phase of the Upperchurch Wind Farm. The implementation of sediment and erosion control measures is essential in preventing sediment pollution. Erosion control is intended to prevent runoff flowing across exposed ground and becoming polluted with sediments while sediment control is designed to slow runoff (Murnane et al., 2006).

The sediment and erosion plan is compiled with regard to:

- Knowledge of the site's environmental conditions;
- Previous construction experience with wind farm developments in similar upland environments;
- Previous experience of environmental constraints and issues from construction in other wind farms in similar environmental conditions;
- Mitigation measures outlined in other EIS Chapters most notably **Chapter 9, Hydrology and Hydrogeology**; and
- A number of technical guidance and best management practice manuals.

The following site specific information was used to compile the sediment and erosion plan:

- High resolution aerial photography;
- OSi 10m Contour data;
- Wind farm infrastructure layout (turbines, sub-station, roads and ancillary development);
- Hydrology maps (watercourses and buffer zones);
- Soil and land use maps; and
- Modified Bilham Tables of rainfall intensity, duration and frequency.

2 Site description

The site is located within a series of small hills or drumlins to the west of Upperchurch village and 18 kilometres to the west of Thurles. The hills are at elevations of between 363mOD and 411mOD and the peaks are generally at heights of 100m above the intervening lower terrain.

The Slievefelim to Silvermines Mountains SPA lies to the west of the site. Most of the site is within the South Eastern River Basin District and drains to the Owenbeg, Turraheen and Clodiagh Rivers and ultimately to the River Suir. The remaining part of the site at the south western extremity is within the Shannon River Basin District and drains to the Aughvana River and ultimately to the Mulkear River.

The area is underlain by Silurian Metasediments and Volcanics with subsoils consisting of Devonian / Carboniferous sandstone and shale till. Some rock outcropping occurs, most notably at the northeast part of the site. The area originally had shallow peat land cover but most of it has been reclaimed by deep ploughing and converted to pasture. The remaining peat areas are used for commercial forestry.

Overall it is a landscape much altered by human activity.

3 Control of Sediment and Erosion

This plan has been designed to cause minimal disturbance to the current hydrological regime and minimise suspended sediment loading. Reduction of sediment loading is important as the site drains to a number of streams and rivers immediately to the north, east and south that ultimately drain to the River Suir and to the Mulkear River (a tributary of the River Shannon). Therefore, mitigation measures are required to protect against suspended solid loading of headwater drainage during the construction stage of the project.

The plan will be implemented early in the construction phase, prior to the main site clearance works and preferably during dry weather conditions to control increased runoff and associated suspended solids loads in discharging waters from the development areas. The plan can be implemented in phases as work progresses through the site. The events and locations with the highest potential for sediment runoff include:

- During and after heavy rainfall events or prolonged rainfall;
- Areas where construction activities (earthworks) are taking place;
- Steep slopes;
- Temporary stockpiles;
- Borrow pits;
- Areas of exposed ground;
- During bridge or drain works (e.g. during implementation of the drainage network) and
- Clear felling.

The proposed drainage layout and sediment control details are shown on the following figures which are at the end of this report:

- **FIGURE 15-I-1 to 15-I-4** – Proposed Drainage Layout;
- **FIGURE 15-I-5** – Internal Road Details;
- **FIGURE 15-I-6** – Site Drainage Details.

And are shown on the following drawings which accompany this Environmental Impact Statement:

- **Drawings 14708-5001 to 14708-5004** – Proposed Drainage Layout;
- **Drawing 14708-5005** – Internal Road Details;
- **Drawing 14708-5006** – Site Drainage Details.

It is proposed to combine sediment and erosion control measures to reduce the pollution runoff from the site during the construction phase of Upperchurch wind farm. It is important to reduce erosion of soil and peat where possible to prevent sediment suspension in runoff.

No work will take place within 50m buffer zones of watercourses except for clear span bridges or culverts and associated road construction. All construction method statements will be developed in consultation with Inland Fisheries Ireland – Shannon River Basin District and South Eastern River Basin District.

Generally, the footprint of the works area of a wind farm development represents only a small proportion of the overall catchment area intercepted by the site. Unless appropriate measures are put in place the works area can potentially contaminate all the runoff from the upstream catchment, creating an excessive volume of contaminated water which is then difficult to manage. The aim of this sediment and erosion plan is t**o intercept the clean water runoff from the upstream catchment and to isolate it from the contaminated water flowing from the works areas**. This minimises the volume of contaminated water that has to be cleaned before it is released to the downstream receiving waters.

3.1 PROTECTION OF CLEAN WATER FROM THE UPSTREAM CATCHMENT

A fundamental principle of the design of the sediment and erosion plan is that clean water flowing in the upstream catchment, including overland flow and flow in existing streams, is not contaminated by silt from the works area. Existing stream crossings, the works area will be piped. New drains will be constructed to collect overland flow that is intercepted by the works areas or by new access roads. These will be constructed on the uphill side of the works and piped to the downhill side, bypassing the works areas, thereby preventing contamination with construction related runoff water. However, this will cause the normally dispersed flow to be concentrated at specific discharge points downstream of the works. In order to disperse the flow each clean water drain will be terminated in a discharge channel running parallel to the ground contours that will function as a weir to disperse the flow over a wider area of vegetation. This will prevent erosion of the ground surface and will attenuate the flow rate to the downstream receiving waters. The resultant diversion of clean water runoff will ensure that the sediment and erosion control measures will only need to deal with construction related runoff.

3.2 TREATMENT OF WATER FROM THE WORKS AREAS

Runoff from the works areas will be isolated from the clean catchment runoff by means of a series of open drains that will be constructed on the down-hill side of the works. These drains will be directed to settlement ponds that will be constructed throughout the site, downhill from the works areas. The ponds have been designed to a modular size to cater for a single turbine hard standing area or a 1,000m^2 area of internal access road. Each drain will incorporate a series of check dams that will attenuate the flow and provide storage for the increased runoff from exceptional rainfall events. Where larger areas of runoff have to be catered for at a single discharge point the size of the settlement lagoon will be increased pro rata. At locations where fine silt particles, less than 20 microns in size, are present in the runoff, larger settlement ponds will be required. Proprietary clarifiers may be used as an alternative, with the addition of flocculants where necessary.

Excavation of drains will cause an initial drawdown of the water table in the immediate vicinity at locations where it is above the drain invert. The clay layers will have low permeability and the underlying till will have moderate permeability. Some seepage can occur from these layers but, based on site investigation information, is expected to be minimal. The volume and rate of flow from this source are unlikely to be significant or to exceed the capacity of the settlement ponds which are designed for extreme storm events.

Dewatering of turbine base excavations can result in significant flow rates to the drainage and settlement system if high capacity pumps are used. In order to avoid the need for pumping it is proposed to provide drainage channels from the excavations so as to prevent a build up of water. Where this is not feasible, dewatering should only be carried out at a flow rate that is within the capacity of the sediment ponds

The design of the settlement ponds in outlined below.

3.3 SETTLEMENT PONDS

Drains carrying construction site runoff will be diverted into settlement ponds that reduce flow velocities, allowing silt to settle and reducing the sediment loading. Settlement ponds have been designed as a three-stage tiered system and this has been proven to work effectively on wind farm construction sites. The three-stage system also facilitates effective cleaning with minimal contamination of water exiting the pond. The settlement ponds have been designed with regard to the following:

- Size of construction area and associated runoff flow rate (clean water from the surrounding catchment will be diverted away from construction area);
- Modified Bilham Tables for rainfall intensity and duration;
- Expected sedimentation rates; and
- Character of the impermeable areas (runoff coefficients).

Settlement ponds will require inspection and cleaning when necessary. This will be carried out under low or zero flow conditions so as not to contaminate the clean effluent from the pond. The water level would first be lowered to a minimum level by pumping without disturbing the settled sediment. The sediment would then be removed by mechanical excavator and disposed of in areas designated for deposition of spoil. Ponds will also require perimeter fencing and signage to ensure that there are no health and safety risks.

Contaminated runoff can be generated on the site access roads, construction compounds, sub-station sites and turbine hard standing areas and is mainly due to excavation for the infrastructure or movement of delivery vehicles and on-site traffic. A modular approach has been adopted for the design of the settlement ponds which have been sized to cater for a catchment area of 1,000m^2 works area. This is equivalent to a road length of 200m or the area of a typical turbine hard standing.

Generally, high intensity rainfall events have a short duration and lower intensity rainfall events tend to have a longer duration. The Bilham Table for statistical rainfall events demonstrates that exceedance probability decreases as intensity or duration increases. The runoff control measures for the wind farm site have been designed in the context of storm events of varying duration and intensity. The settlement ponds have been designed to cater for a maximum continuous flow rate associated with a medium-intensity rainfall event.

Higher intensity runoff will be attenuated by the open drain collection system which provides temporary storage and limits the rate at which it enters the settlement ponds. This is achieved by the use of check dams within the open drains as described elsewhere in this document. Longer duration storms of 24 hours or more generally have very low intensity and are not critical in terms of the runoff rates that they generate. Since the design is for the construction phase only, no additional allowance has been made for possible increase in rainfall intensity due to climate change in the future.

3.3.1 Design flow rate

The modular settlement ponds are designed to operate effectively for the runoff rate associated with a continuous high rainfall event of 20mm/hour. This is equivalent to a 60 minute duration storm event with a 5-year return period (M5-60) or a 25 minute duration storm event with a 1-year return (M1-25).

The design runoff rate is calculated using the formula:

$Q = c\,i\,A$

where c is the runoff coefficient

i is the rainfall intensity in m/sec and

A is the catchment surface area in m^2

A runoff coefficient of 0.70 is assumed for the hardcore surface. For a rainfall intensity of 20mm/hour and an area of 1,000m^2 the runoff rate is:

$Q = 0.70 \times (0.02/3600) \times 1{,}000\ m^3/sec$

$= 0.0039\ m^3/sec$ (3.90 litres/sec)

3.3.2 Pond surface area

The main design parameter for the settlement pond is the water surface area. The required surface area is the design flow rate in m^3/sec divided by the particle settlement velocity (V_s) in m/sec (Area = $Q/V_s\ m^2$). The particle settlement velocity is determined using the formula derived by Stokes in 1851 as follows:

$V_s = 2\,r^2\,(D_p - D_f) / (9\,n)$

where V_s is the particle settling velocity (m/sec)

r is the radius of the particle (metres),

D_p is the density of the particles (kg/m^3);

D_f is the density of the fluid (kg/m^3),

n is the viscosity of the fluid (0.000133 kg sec/m^2 @ 10°C).

For a particle density of 2,700kg/m^3 and diameter of 20 microns the settlement velocity V_s is 0.000284m/sec.

The required settlement pond surface area is

$A = Q/V_s$

= 0.0039/0.000284

= $13.70m^2$

Theoretically the pond depth is not relevant but in practice a minimum depth is required to ensure laminar flow and to allow temporary storage of settled silt. The modular settlement pond has been designed conservatively with a surface area of $24m^2$ (12m x 2m) and a depth of 1m. This is divided into three chambers of equal length and in practice it has been found that most of the settlement occurs in the first chamber with very low turbidity levels being achieved in the final effluent. The design is conservative and therefore has sufficient redundancy to cater for occasional higher runoff rates or sediment loads.

For practical reasons it may be necessary to increase the area directed to a settlement pond in which case the pond surface area will be increased pro rata.

3.3.3 Extreme flow rates

For rainfall intensities above the design value of 20mm/hour the excess runoff needs to be temporarily stored. The storage can be provided in the drainage channels by installing check dams at intervals along the channel as described below.

The storage volumes required for 10-year storm events of various durations are shown in the Table 1 below. The volumes are based on a catchment area of $1,000m^2$ and a runoff coefficient of 0.70. The maximum storage volume required is $6.98m^3$ for 20 minutes storm duration. This is equivalent to 30 minutes of flow through the settlement pond at the design through flow rate of 3.90 litres/second. The stored water will drain off gradually as runoff from the works area subsides. The storage volume represents an average depth of 0.06m in a 200m long, 0.60m wide open drain and can therefore be easily accommodated in the drainage system.

Storm Event	**Duration (minutes)**	**Rainfall rate (mm/hour)**	**Excess (mm/hour)**	**Runoff Coefficient**	**Storage Volume (m^3)**
M10-60min	60	24.50	4.50	0.70	3.15
M10-40min	40	32.40	12.40	0.70	5.79
M10-30min	30	39.10	19.10	0.70	6.69
M10-20min	20	49.90	29.90	0.70	**6.98**
M10-10min	10	71.40	51.40	0.70	6.00
M10-5min	5	94.90	74.90	0.70	4.37

TABLE 1 - CALCULATED STORAGE VOLUMES

The ability to limit flow rates is fundamental to the control of sediment during extreme storm events. It is not proposed to use any proprietary mechanical devices for this purpose but instead to rely on the check dams to effectively limit flow rates to the required levels. The check dams are constructed with gravel or other suitable material and will be of sufficient length and height to provide the required attenuation rates. This will vary depending on the gradient of the drainage channel with higher gradients requiring a greater number of dams with larger dimensions. Their ability to retain water and release it slowly can be confirmed visually.

3.3.4 Outflow Weirs

The effluent from each settlement pond will discharge to an open channel, 8 to 10 metres in length, running parallel to the ground contours. This will form a weir that will overflow on its downhill side and disperse the flow across the existing vegetation. A minimum buffer width of 20m is specified between the overflow weir and downstream watercourses. Buffer widths are designed in line with Scottish Forestry Commission Guidelines (2004) on protection of water courses during forestry operations and management. This method buffers the larger volumes of run-off discharging from the drainage system during periods of high precipitation, reducing the hydraulic loading and further reducing suspended sediment load to surface watercourses. In general, the outflow weirs should not be located on slopes steeper than 3:1 or in areas of high peat stability risk. However, since there are no areas of deep peat in the Upperchurch site, peat stability is not a particular risk in this case.

3.3.5 Check dams

Check dams will be placed at regular intervals based on bed gradient along all drains to slow down runoff, facilitate settlement and reduce scour and ditch erosion. Check dams are relatively small and composed of gravels or other suitable material. Depending on the longitudinal gradient they will be placed at distances and heights that allow small pools to develop behind them. This is required in order to attenuate flow to the settlement ponds during storm events where the runoff rate would otherwise exceed the settlement pond capacity.

FIGURE 1 EXAMPLES OF CHECK DAMS AND EXAMPLE OF SILT FENCE USED IN CONJUNCTION WITH CHECK DAMS ALONG ROADSIDE DRAINAGE CHANNELS

3.4 SEDIMENT CONTROL MANAGEMENT

The settlement ponds and check dams described in the previous section provide the essential mechanism for the removal of silt from construction related runoff and the controlled return of the treated runoff to the downstream watercourses. Additional infrastructure and control methodologies are also required in order to minimise the sediment load from the runoff and to prevent contamination by other potential pollutants.

3.4.1 Working near watercourses

No work will take place within 50m buffer zones of watercourses except for clear span bridges or culverts and associated road construction. Working near watercourses during or after intense or prolonged rainfall events will be avoided and work will cease entirely near watercourses when it is evident that there is a risk that pollution could occur. All construction method statements will be developed in consultation with Inland Fisheries Ireland – Shannon and South Western River Basin Districts.

3.4.2 Minimise exposed area

The area of exposed ground will be kept to a minimum by maintaining where possible existing vegetation that would otherwise be subject to erosion in the vicinity of the wind farm infrastructure and keeping excavated areas to a minimum. The clearing of peat, where it occurs, will be delayed until before construction begins rather than stripping the entire site months in advance particularly during road construction.

3.4.3 Silt fences

Silt fences or other appropriate silt retention measures will be installed where there is a risk of erosion runoff to watercourses from construction related activity particularly if working during prolonged wet weather periods or if working during intense rainfall events. Silt fences can be used in conjunction with check dams in drains. Preliminary site works, and particularly the construction of the drainage system, will require the use of silt fences to prevent siltation due to ground disturbance caused by excavation works.

3.4.4 Engineered deposition areas

Temporary engineered deposition areas will be designated and designed to hold temporary stockpiles and located away from drains and watercourses. Stockpiles that are at risk of erosion will be protected by silt trapping apparatus such as a geo-textile silt fences to prevent contamination of runoff.

3.4.5 Felling

Permanent tree felling will take place to facilitate access to the wind farm infrastructure. All associated tree felling will be undertaken using good working practices as outlined in *Forestry Harvesting and the Environment Guidelines* and *Forestry and Water Quality Guidelines*, both published by the Forest Service, Department of Marine and Natural Resources, July 2000. The latter guidelines deal with sensitive areas, erosion, buffer zone guidelines for aquatic zones, ground preparation and drainage, chemicals, fuel and machine oils.

3.4.6 Establish vegetation

As part of the works, some areas of organic soil and peat will be permanently removed. These areas include the locations of new roads, turbine bases, hard standings and electrical sub-station compound. The soil can be re-used to remediate exposed areas and prevent erosion in the future when the civil works have been completed.

In addition, some exposed areas of the site that are slow to re-vegetate may need to be replanted with suitable vegetation. This can be by natural regeneration or by reseeding. Natural regeneration relies on colonisation of bare ground by native species from adjacent habitats. A roughened surface will be provided, which can trap seeds and soil to provide initial regeneration areas. The need for replanting or reseeding will be decided by the developer in consultation with the project ecologist near the end of the construction phase.

3.4.7 Road runoff

All access roads are to be stabilised and maintained after grading followed by a final capping with crushed limestone or similar quality stone. Limestone or similar quality stone can significantly reduce road related runoff resulting from construction traffic and the road stone. The road surface can become contaminated with clay or other silty material during construction. Road cleaning will, therefore, need to be undertaken regularly during wet weather to reduce the risk of sediment runoff to watercourses. This is normally achieved by scraping the road surface with the front bucket of an excavator and disposing of the material at designated locations within the site.

3.4.8 Wheel washes

Wheel washes will be provided for exiting heavy vehicles to ensure roads outside of the site boundary are clean. It is recommended that a designated bunded and impermeable wheel wash area is provided and resultant waste water is diverted to a settlement pond for settling out of solids. If a pumped dewatering system is required it will be well planned and pumped water will be adequately treated in the settlement pond.

3.5 OPERATIONAL PHASE

The measures for control of runoff and sediment relate to the construction phase of the project when there is continuous movement of site vehicles and delivery vehicles. Following construction the amount of on-site traffic will be negligible and there will be no particular risk of sediment runoff. It is therefore proposed to partly fill the sediment ponds with stone so that they will not present a long-term safety risk. Runoff from the roads, hard-standings, and other works areas will continue to be directed to these ponds and from there to the outfall weirs. Check dams within the drainage channels will also remain in place. The retention of this drainage infrastructure will ensure that runoff continues to be attenuated and dispersed across existing vegetation before reaching the downstream receiving waters.

3.6 FLOOD ATTENUATION

The creation of impermeable areas within a development site has the effect of increasing rates of runoff into the downstream drainage system and this may increase flood risk and flood severity downstream. This applies particularly to urban areas that drain to closed pipe systems which do not have the capacity to cater for increased hydraulic loads. The Upperchurch wind farm development is located within a large rural catchment with an open drainage system. The footprint of the impermeable areas and the associated increase in runoff rate is very small in the context of the catchment size and therefore presents a negligible increase in downstream flood risk. Notwithstanding the low increase in flood risk due to the development, the drainage system has been designed to prevent any increase in discharge rates above that which already exist in the undeveloped site.

The following flood attenuation measures have been incorporated into the design:

- Existing drains will bypass the works and no additional runoff will be routed directly into them;
- Overland flow of clean water that is intercepted by the works will be collected in open drains, piped to the downhill side of the works, and dispersed over existing vegetation by means of overflow weirs as described elsewhere in this document. These will be provided at intervals of approximately 200m, the exact locations being determined on site at construction stage.
- Runoff from roads, hard-standings and other new surfaces will be also be dispersed across existing vegetation downstream of the works following removal of sediment in the settlement ponds. This flow regime will remain in place permanently after completion of the works.
- Some attenuation will be provided by the use of a series of gravel dams placed at intervals within the open drains carrying silt contaminated runoff. These are intended to limit the flow rate to the settlement ponds during construction but they will also provide attenuation of flow to the downstream receiving waters in the longer term during the operational phase of the wind farm. The overflow weirs downstream of the

settlement ponds will remain in place permanently so that the flow continues to be dispersed across existing vegetation and not directly to open drains or streams.

3.7 INSPECTION AND MAINTENANCE

Controls need to be regularly inspected and maintained to ensure that any failures, such as a build up of silt or a tear in a silt fence, are quickly identified and repaired so as to prevent to water pollution. Inspection and maintenance is critical after prolonged or intense rainfall while maintenance will ensure continued effectiveness of the sediment and erosion plan. A programme of inspection and maintenance will be designed and dedicated construction personnel assigned to manage this programme. A checklist of the inspection and maintenance control measures will be developed and records kept of inspections and maintenance works. Controls must work well during the operational phase of the wind farm until the vegetation has re-established.

3.8 WATER QUALITY MONITORING

Baseline water quality of all of the streams leaving the development site will be undertaken prior to construction. This baseline data will include the main components of a full hydrograph for the streams including both high spate flow and base flow where possible.

A weir or flume water level auto-logger and infra-red suspended solids sonde will be installed at select locations. This equipment will allow for continuous monitoring of water flow and associated suspended solids load during storm events. This equipment will be installed in time to monitor baseline conditions for at least 6 months prior to construction, and will be maintained during construction and post construction for at least 12 months.

During the construction phase of the project, water quality in the streams and outflow from the drainage and attenuation system will be monitored, field-tested and laboratory tested on a regular basis during different weather conditions. This monitoring along with the visual monitoring will help to ensure that the mitigation measures that are in place to protect water quality are working.

During the construction phase of the project, the development areas will be monitored regularly for evidence of groundwater seepage, water ponding and wetting of previously dry spots, and visual monitoring of the effectiveness of the constructed drainage and attenuation system to ensure it does not become blocked, eroded or damaged during the construction process.

3.9 CONCLUSION

Construction practices impact on the natural drainage patterns in a landscape. The intent is to keep clean water clean and to manage construction related runoff through a designed, managed and maintained sediment and erosion plan. Attenuation measures are incorporated into the design of the drainage and sediment control system.

The measures outlined above, in conjunction with the site drainage layout and details, will prevent sediment and erosion problems and will ensure that the development of the

Upperchurch wind farm will not have a significant impact on the River Suir and River Shannon or their tributaries.

3.10 REFERENCES

Forestry Commission (2004). "*Forests and Water Guidelines*". 4th Edition. Forestry Commission, Edinburgh, Scotland.

Forest Service, Department of Marine and Natural Resources, July 2000. Forest Harvesting and the Environment Guidelines.

Forest Service, Department of Marine and Natural Resources, July 2000. Forestry and Water Quality Guidelines.

Murnane, E., Heap, A. and A. Swain, 2006. Control of water pollution from linear construction projects. A Technical Guidance. A CIRIA publication, UK.

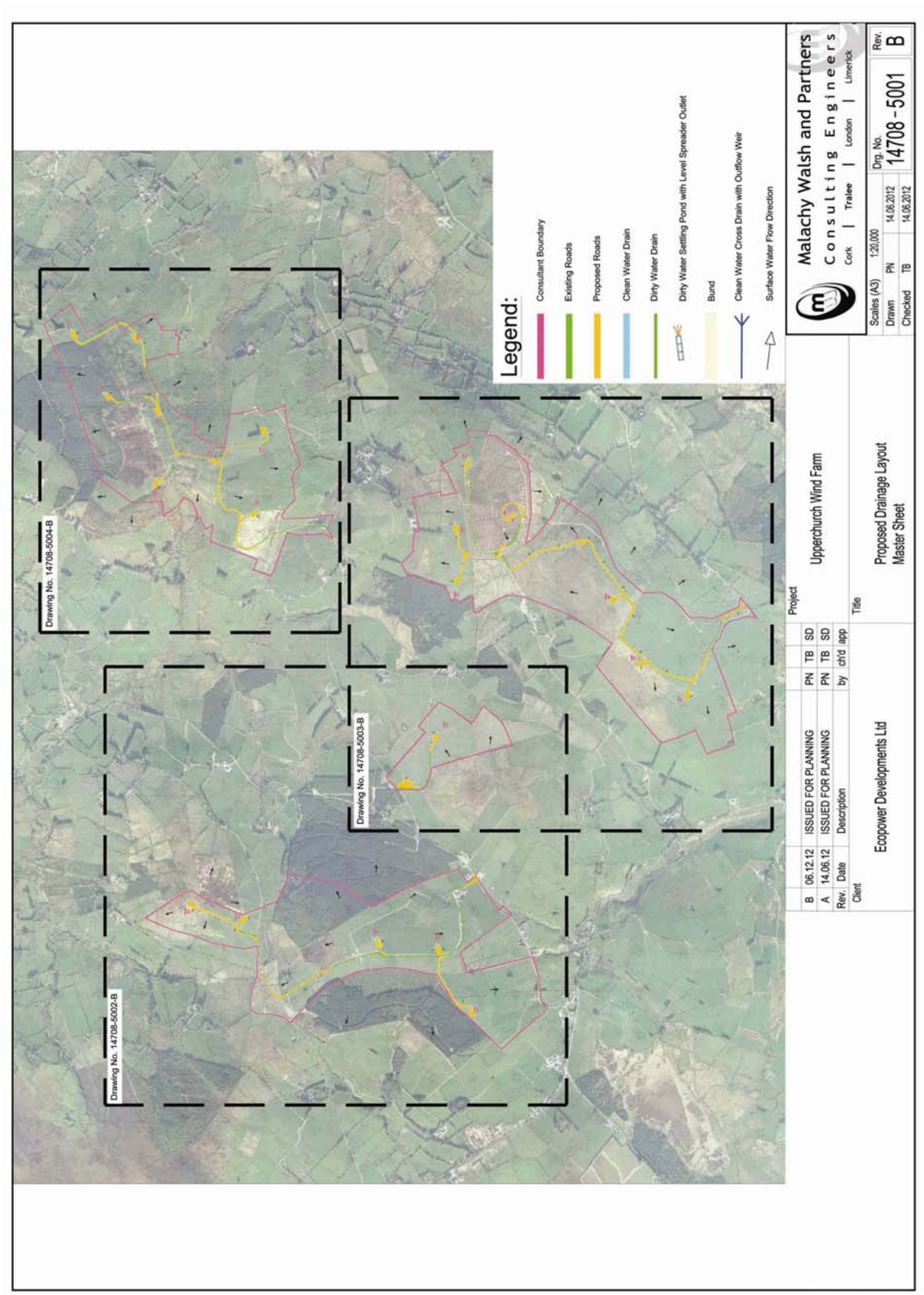


FIGURE 15-I-1: PROPOSED DRAINAGE LAYOUT MASTER SHEET

FIGURE 15-I-2: PROPOSED DRAINAGE LAYOUT SHEET 1 OF 3

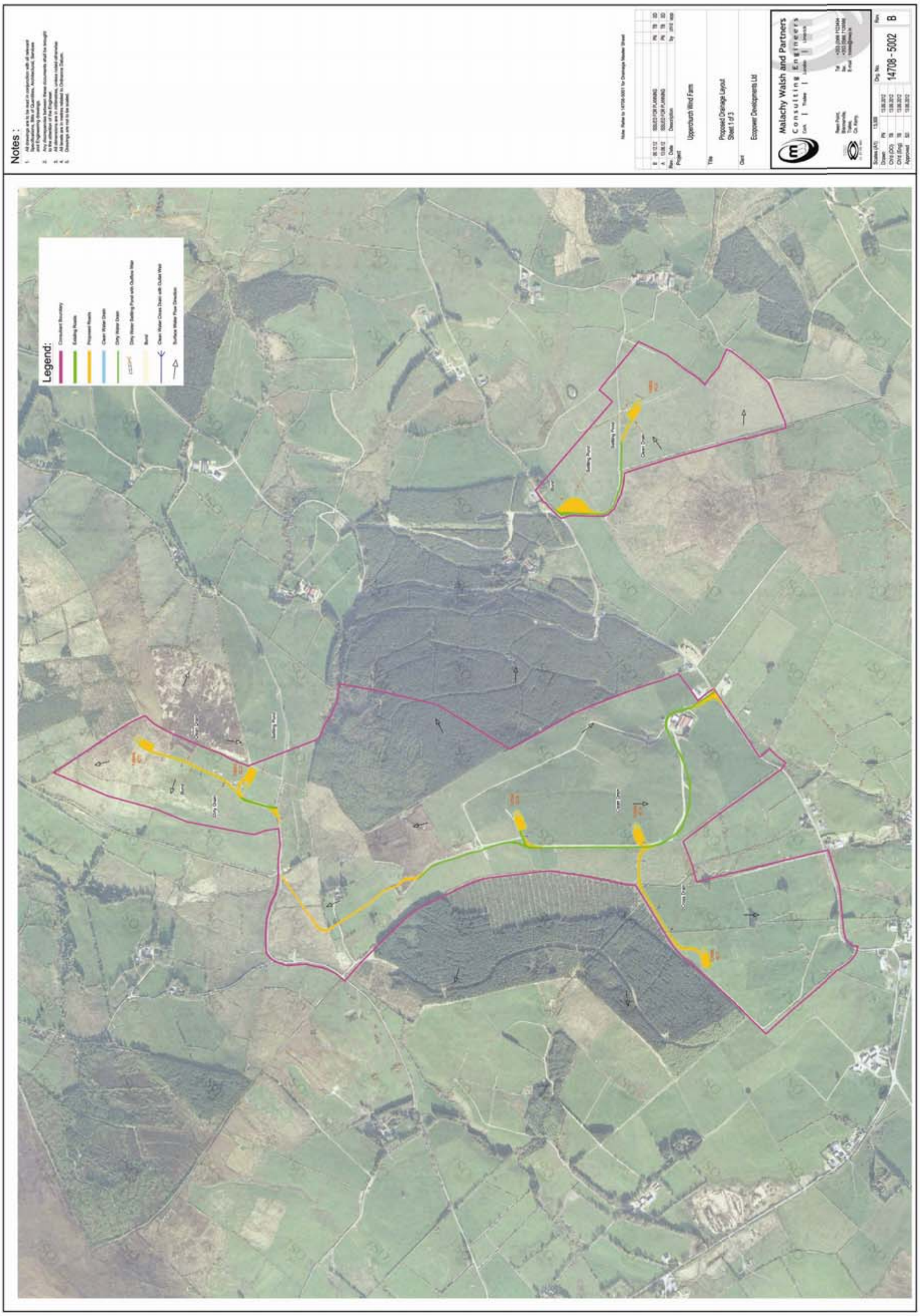
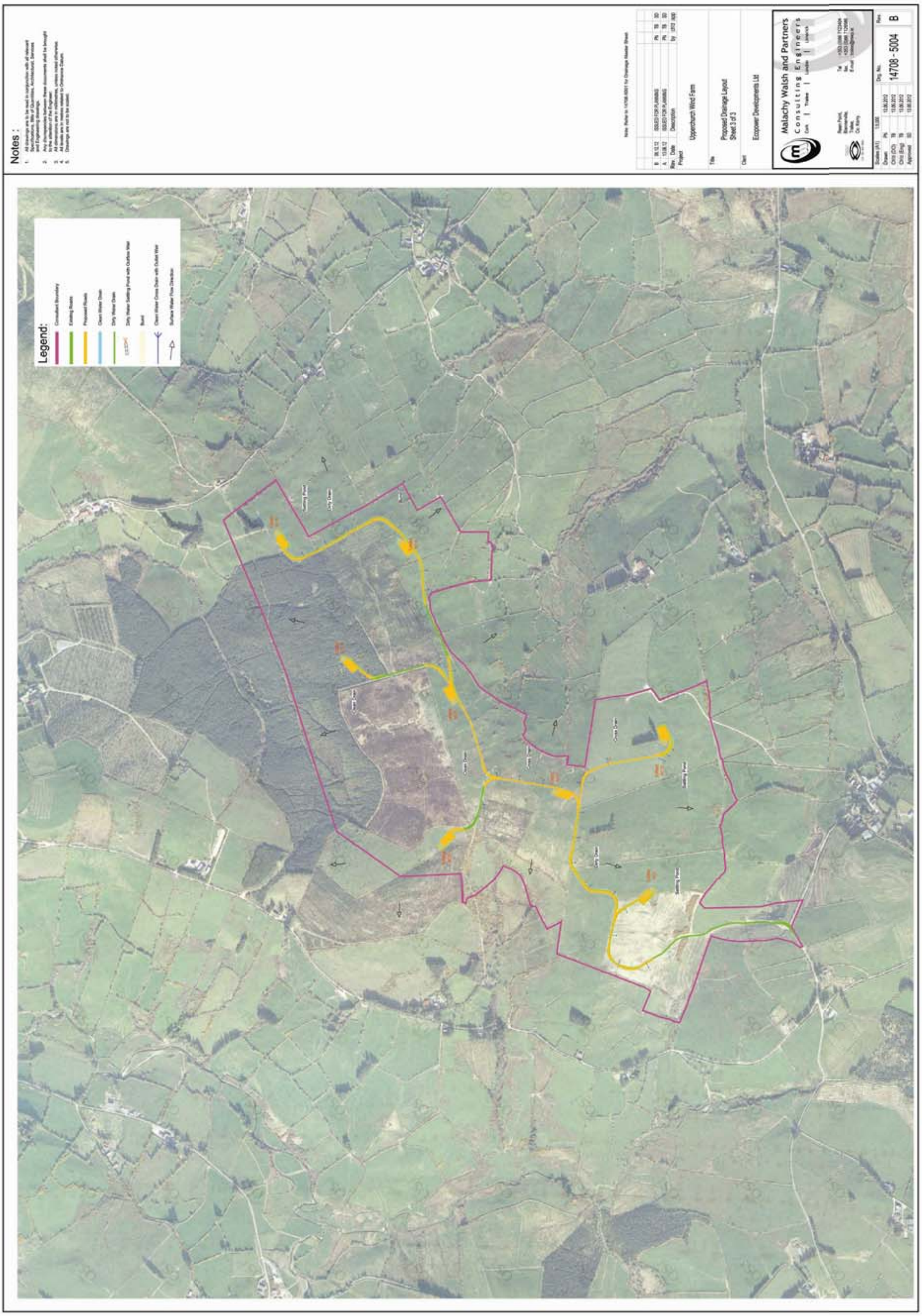


FIGURE 15-I-3: PROPOSED DRAINAGE LAYOUT SHEET 2 OF 3

FIGURE 15-I-4: PROPOSED DRAINAGE LAYOUT SHEET 3 OF 3



Malachy Walsh and Partners
Consulting Engineers

FIGURE 15-I-5: PROPOSED INTERNAL ROAD DETAILS

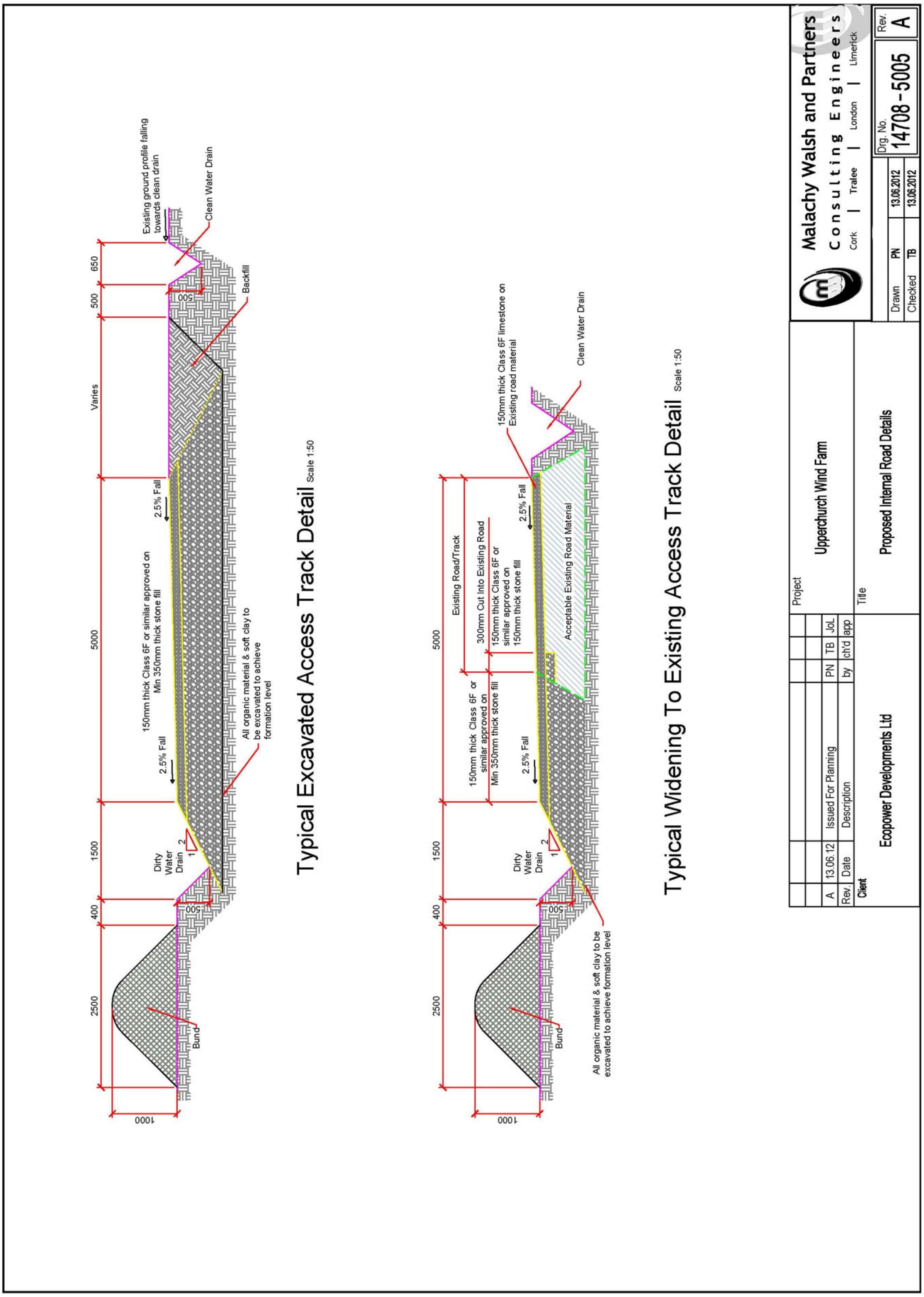
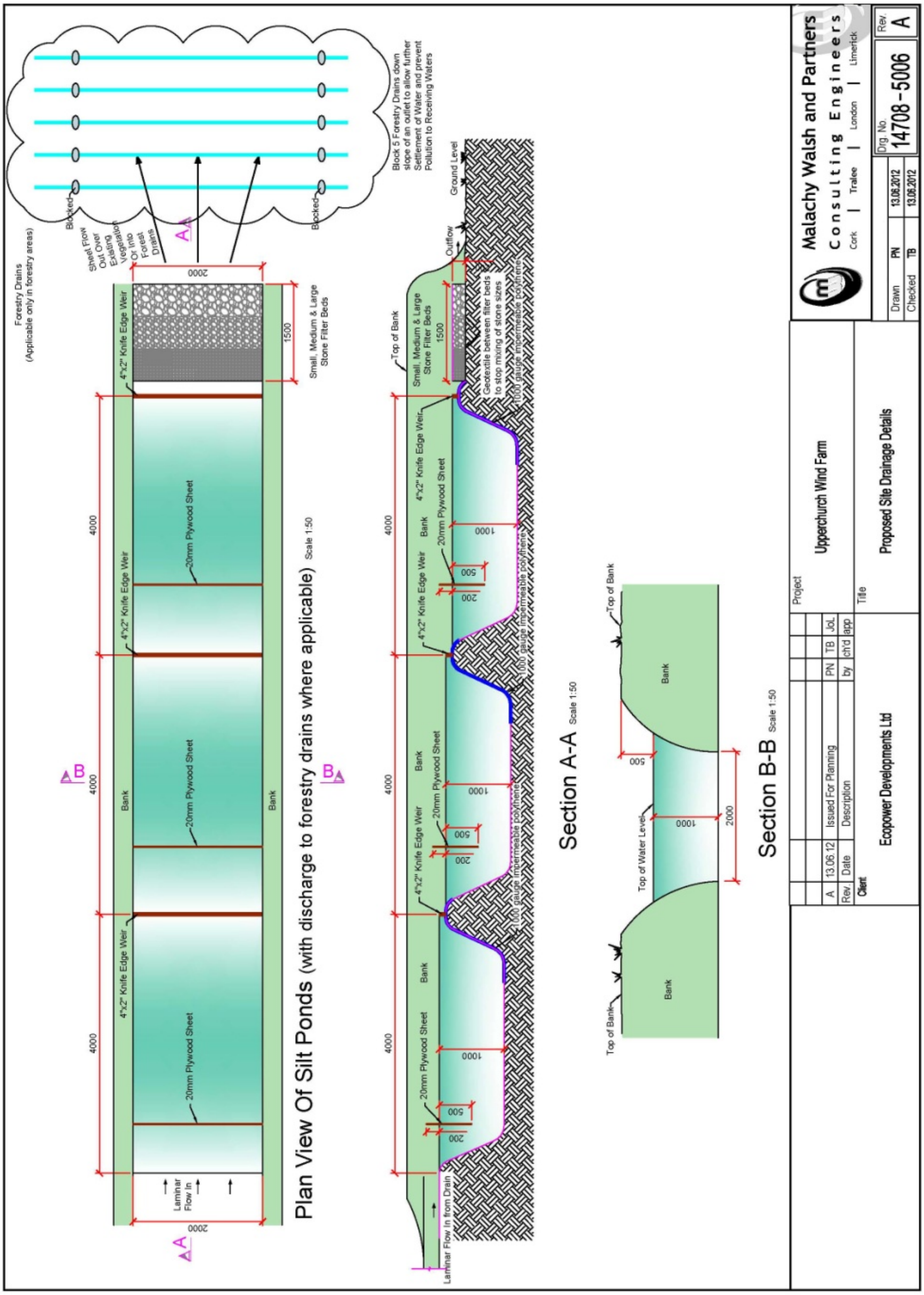


FIGURE 15-I-6: PROPOSED SITE DRAINAGE DETAILS



16. Conclusion

Wind energy is a clean, renewable and sustainable means of electricity generation. It can make a substantial contribution to reducing global environmental damage associated with the energy demands of modern lifestyles and development. Wind power is an indigenous source of fuel, which is everlasting and which Ireland has in abundance. If this resource is properly developed it will provide a significant amount of our energy requirement in the coming years,

The Environmental Impact Assessment on the proposal was carried out by;

- Ecopower Developments Ltd, Wind Energy Developer
- Malachy Walsh & Partners, Consulting Engineers
- Mozart, Landscape Architects
- Ai Bridges Ltd, communications solutions engineers
- Kilkenny Archaeology, chartered archaeologists

There is a clear environmental imperative and an increasing economic and security of supply imperative, to the development of renewable energy sources. Over one-fifth of new electricity generation capacity installed in Europe in 2011 was wind energy electricity generation. A binding target of 20% of all energy coming from renewable sources has been set for the EU to achieve by 2020, which would mean approximately 35% of electricity coming from renewables by then. Ireland is committed to this target in the Energy White Paper 2007.

The proposal is to construct 22 turbines in the townlands of Graniera, Shevry, Knockcurraghbola Commons, Gleninchnaveigh, Coumnageeha, Knocknamena Commons, Knockmaroe and Grousehall west of Upperchurch village, Co. Tipperary. For clarity of nomenclature this proposal is described throughout as the Upperchurch Windfarm. The Upperchurch windfarm is proposed for an area within a series of small hills 2km west of Upperchurch village and 18km to the west of Thurles, County Tipperary. It lies just north of the main road between Limerick and Thurles, which dissects the mountains from west to east and almost borders Milestone on its south-western extent.

The site is in an area zoned for wind farm development in the Wind Capacity Strategy which was adopted by the Council in 2009. The wind farm is proposed for the area Upperchurch – Kilcommon Hills as detailed in the Strategy. The Strategy states that this area has extensive capacity to absorb wind farm development and that windfarms of a bigger scale are acceptable.

There are grid connection options for the project at Upperchurch. The electricity can be transported to the National Grid by a combination of cable and overhead line to a connection point on the Killoan to Nenagh 110kV line. The project has secured access to the National Grid in the Gate 3 Grid Connection process operated by ESB Networks.

The proposed turbine sites enjoy a favourable wind regime and are not within a Natura 2000 or a p.NHA designated ecology site.

Potential noise impacts on local residences were assessed by Malachy Walsh & Partners. Modern turbines can be operated in different modes where the sound output is kept within a defined level. The results of this assessment have been based on a typical turbine suitable for the site, operating in a mode that ensures compliance with the Wind Energy Guidelines noise limits. The results show that the predicted wind farm noise levels adhere to the Guidelines at all locations.

The results of the shadow flicker model show that shadow flicker effect is unlikely to be a problem at the nearest residents due to the unlikely probability of all the conditions for the phenomenon occurring simultaneously, tall trees between potential spots and the turbines and the distance of the proposed turbines from local residences.

Impact on telecommunications was carried out by Ai Bridges, communications consultants. Following extensive study of the signal paths of telecommunications, a final layout was designed so that the turbines will not interfere with the signals in the area. In any case remedial measures are readily available to solve any problems that might arise.

Impacts on the Landscape were assessed by Mozart, Landscape Architects. They conclude that the surrounding undulating topography provides screening for the development and high banks and hedgerows allow only intermittent views within a 5km radius. The landscape context is one of a working landscape with many anthropogenic elements, including wind turbines, communications mast, electricity and telephone lines, once off rural housing and farmsteads, farms buildings and roads. This setting provides a relatively high visual absorption capacity. The visual impact of the proposal is identified in Zone of Visual Impact Figures and 22 Photomontages within the study area.

Habitats, flora, and fauna of the proposed site were assessed by Malachy Walsh and Partners (MWP), Environmental and Engineering Consultants. This assessment describes the ecology of the site, with emphasis on habitats, flora, fauna and water quality, and assesses the potential effects of the proposed windfarm development on these ecological receptors. The assessment included identification of the habitats on site, assessment of the effect of the proposal on designated sites, an Appropriate Assessment to determine the significance of the impact on Natura 2000 sites and an assessment of NHAs not covered by Natura 2000 sites. A winter and summer hen harrier study was conducted along with a bat survey and mammal survey. The field surveys were conducted by ecologists during the month of June 2012. A Sediment and Erosion Plan was developed to protect water quality on site down-stream of the development. Following their assessment, MWP concluded that no significant ecological residual impacts are expected as a result of the construction and operational phase of the proposed Upperchurch Windfarm.

MWP also assessed the potential impacts to the soils and geology of the environment from the proposed turbines. Detailed site surveys were carried out in conjunction with a review of existing data, mapping, geology and drainage features on site. They assess that there is a very low risk of slippage or landslides in the site because of the stable sub-surface ground conditions as determined in the site investigations and the absence of any significant peat coverage. They recommend that the site drainage be regularly monitored, and maintained to ensure the constructed drainage performs through to the operational phase of the project and is fit for purpose thereafter.

MWP also assessed the potential impact on Hydrology and Hydrogeology. This study describes the existing hydrological characteristics at the proposed wind farm site. The surface water features and characteristics are described, as well as the site drainage and groundwater. An impact assessment was carried out to determine whether the project poses a significant impact to the hydrology and hydrogeological aspects of the environment and to propose mitigation measures to reduce any potential negative impact of the proposed wind farm. The study included initial site walkovers and surveys followed by detailed site investigations which included peat probing and trial pits. Trial pits were excavated at 20 of the proposed turbine sites and peat depth and classification was measured at the remaining three sites which are in forested areas. Field hydrochemistry measurements were taken in-situ and water samples were collected for laboratory analysis. Following this detailed assessment MWP conclude that the development of the Upperchurch wind farm will not have a significant impact on Hydrology and Hydrogeology provided mitigation measures are implemented. These mitigation measures are set out in the Sediment and Erosion Plan.

In conclusion MWP assess that this wind farm will not have a significant impact on Soils and Geology or Hydrology and Hydrogeology provided mitigation measures are implemented and given the inherent low risk nature of the site.

The archaeological impacts of the proposal were assessed by Kilkenny Archaeology, consultant archaeologist, and they conclude that there will be no direct impacts on any recorded archaeological sites, features or items due to the construction of the turbines. Kilkenny Archaeology state that the possibility exists that previously unknown archaeological material could be impacted upon by the proposed development given the high number of Recorded Monuments in close proximity to development and recommend that all groundworks associated with the proposed development be archaeologically monitored under licence to the National Monuments Service. It is also recommended that a buffer-zone where development is precluded, be instituted around the single Recorded Monument in the proposed development area. They also state that archaeological sites within the study area will have intervisibilty with the turbines and therefore the operational phase the development will lead to a visual impact upon the archaeological landscape.

The jobs and opportunities that will be created both during the construction and the operation phase of the proposed windfarm in Upperchurch are;-

- Annual rental payments to 37 landowners, 35 of whom live locally.
- Annual community benefit payment to local community development groups.
- Commercial Rates will be paid annually to the Local Authority.
- General activity on the site will increase business in the local service industry i.e. accommodation and restaurants for a period of 8 months.
- There will be increased orders at local concrete plants and quarries.
- 277 temporary jobs in civil and electrical construction companies, legal and accountancy firms, financial services sector, insurance sector, quarry and stone suppliers and project management.
- 28 permanent jobs operation and maintenance, legal, electricity sales, asset management
- €20 million will be spent in Ireland on the civil and electrical contracts

The windfarm will produce substantial amounts of green electricity, enough for the domestic requirements of North Tipperary and thereby contribute to the reduction of environmentally harmful emissions associated with the generation of electricity by conventional means. The generation of the amount of electricity from the wind will improve our country's balance of payments (€10m) because it avoids the importing of oil, coal and gas.

The valuable wind resource in this area can be harnessed without significant adverse impacts to the locality and the environment. The proposal to develop the windfarm will bring benefits to local farmers and the local community, benefits to the county with increased commercial rates and to the region with increased employment and activity in the growing wind energy sector.

UPPERCHURCH WINDFARM

CONSENTED WINDFARM REFERENCE DOCUMENTS

Tipperary County Council Planning Application 13/510003

Response to Request for Further Information

ECOPOWER

REFERENCE DOCUMENTS

Ecopower Developments Limited, Sion Road Kilkenny Ireland
Tel: (056) 7750140 Email office@ecopower.ie

Planning Section
North Tipperary County Council
Civic Offices, Limerick Road
Nenagh
Co. Tipperary

27th November, 2013

Re: 13 /51/0003 - 22 No. wind turbines, overall height of up to 126.6 meters, 2 No. meteorological masts up to 80 meters in height with wind measuring equipment attached, access roads, electrical substation compound and control buildings and ancillary site works at Graniera / Shevry / Knockcurraghbola Commons / Knockmaroe / Grousehall / Cummer / Foilnaman / Gleninchnaveigh / Coumnageeha / Coumbeg / Knocknamena Commons / Glenbeg / Seskin, Upperchurch, Co.Tipperary.

A Chara,

Arising from your Request for Further Information, dated 28th February, 2013, I wish to submit the attached response. 6 hard copies and 10 soft copies(on CD) are submitted as arranged with Mary Devine, Planning Department, on Tuesday 26th.

Please note that an extension of time for submission of a response to Further Information was granted on 11th July, 2013. The RFI and Extension of Time to submit a response are attached in Appendix A.

Significant information is being submitted and therefore a further Planning Notice was placed in The Tipperary Star, dated 21/11/2013 and is also attached in Appendix A.

Pat Brett
for and on behalf of Ecopower Developments Limited

REFERENCE DOCUMENTS

APPENDIX A
Further Information 13/51/0003

'ag obair leis an bpobal'
'working with the community'

Comhairle Contae Thiobraid Árann Thuaidh
North Tipperary County Council

Fón/Phone: 067-44652
Facs/Fax: 067-44654
Gréasán/Web: www.tipperarynorth.ie
r-phost/email:
planning@northtippcoco.ie

An Rannóg Pleanála, Oifigí Cathartha, Bóthar Luimnigh,
An t-Aonach, Contae Thiobraid Árann
Planning Section, Civic Offices, Limerick Road, Nenagh, Co. Tipperary

Our Reference	Your Reference	Date
13/51/0003		11th July, 2013

Re: PERMISSION for erect 22 no. wind turbines, overall height up to 126.6meters, 2 no. meteorological masts up to 80m in height with wind measuring equip attached, access roads, electrical substation compound & control buildings & ancillary site works. This application is for a 10 year permission. Application is accompanied by an EIS, which includes an Appropriate Assessment (Natura Impact Statement) at Graniera, Shevry, Knockcurraghbola Upperchurch Co. Tipperary

Dear Sir/Madam,

I refer to your letter dated 5th July, 2013 regarding an extension of the time allowed to submit further information on the above mentioned file. I wish to inform you that the Planning Authority is agreeable to an extension of time under Article 33 (3) of the Planning and Development Regulations 2006 for this application.

Please be aware that the latest date for submission of the further information in now closing time on **27th November, 2013 at 4.00pm**. If all further information is not received by this date the application will be deemed withdrawn.

Please do not hesitate to contact Brian Clancy at 067-44656 should you have any queries.

Yours Faithfully,

For Director of Services

Ecopower Development Limited
Sion Road
Kilkenny
Co Kilkenny

'ag obair leis an bpobal'
'working with the community'

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An t-Aonach, Contae Thiobraid Árann
Planning Section, Civic Offices, Limerick Road, Nenagh, Co. Tipperary

Our Reference	Your Reference	Date
13/51/0003		28th February, 2013

Please submit the following further information under Article 33 of Planning & Development Regulations 2001 to 2006:-

1. In regard to the submitted Natura Impact Statement and EIS the Planning Authority is not satisfied that the impacts upon the adjacent Slieve Felim to Silvermines Mountains SPA (Site Code: 004165) have been fully assessed and appropriate mitigation measures proposed.

   You are advised of the following detailed concerns which will require to be fully addressed:

   (a) As Hen Harriers from the adjacent Special Protection Area (SPA) use this site the development would result in the loss of potential foraging habitat for pairs breeding within the SPA (3 within 5KM) according to best scientific advice (Pierce et 2009). Therefore, it should be treated as if within the SPA and significant negative effects cannot be ruled out beyond a reasonable scientific doubt. Such ex situ affects on the SPA have to be considered under Article 6 of the Habitats Directive. Nesting pairs are often now having to travel some distance to forage successfully (O'Donoghue pers communicae). Males have been found over 15km and females over 7km from the nest during the breeding season foraging (UCC/Coford). This has not been taken account of in the submissions. A full assessment of the suitable habitat lost from within a 250m radius of the turbines will be required as this is the zone of displacement found by Pierce et al (which is the best scientific advice available. This should include any conifer plantation that would be suitable for Harrier foraging within the life time of the development; in order to do this the planting date/felling dates will have to be ascertained for the plantations within a 250m radius of proposed turbines and a figure arrived at of what would be available/suitable to Harriers during the operating lifetime of the windfarm. Any other suitable foraging habitat within 250m of turbines will also have to be included (eg scrub, wet grassland, acid grassland, wet heath blanket bog etc). The creation of an equivalent area of new and equivalent alternative habitat suitable for foraging should then be considered as mitigation for that lost through potential displacement. Direct loss of habitat outside the 250m radius should be included in the calculations and side casting, peat/mineral soil deposition areas, bunds etc).

   (b) A full Cumulative Impact Assessment upon the SPA has not been carried out. Some of the nearby wind farm projects have been listed (but only within 10km and the one proposed – ref. 12/51/0385 - adjacent to the site is left out) but no qualitative or quantitative assessment has been carried out on the potential effects on the SPA (eg on harrier foraging areas, disturbance etc). Other factors have to be included also (eg. afforestation in the SPA post designation). The 250m displacement effect means overlap with the SPA. This is required. The items requiring consideration at (a) above shall also be taken into account in the cumulative assessment that is required.

2. The Bat survey work and report is incomplete. The Eurobats "*Guidelines for consideration of bats in wind farm projects*" shall be followed especially with regard to survey and mitigation and the necessary additional information submitted.

3. A full survey for badger sett/setts shall be conducted and report submitted. A Badger Derogation Licence would be required from the National Parks and Wildlife Service for works within 50m (breeding season) or 30m (non breeding season).

4. Section 4.1 of the Environmental Impact Assessment notes that noise levels at houses H2, H5, H7 and H9 may be exceeded having regard to the guidance contained in the DECLG Wind Energy Planning Guidelines (published 2006). It should be noted that wind turbines in proximity to these dwellings should have an appropriate noise reduced mode to mitigate such impacts.
Taking the above into account you are advised to submit a revised Noise & Vibration Impact Assessment (Operational Phase & Construction Phase), which shall also address the following issues;
(i) Results of a site-specific study identifying and quantifying potential vibration impacts as relates to proposed construction works e.g. borrow-pit blasting, etc.
(ii) Implementation of best practice procedures e.g. early warning system/NSL's, etc.
(iii) NSL shall not be differentiated on owners/occupiers 'financial interests' with 'dwellings' only differentiated on the basis of habitation potential e.g. *dwelling in dilapidated state (roof falling in) would clearly not qualify*.
(iv) Potential cumulative effects from proposed adjacent developments e.g. Plan Ref: 12510385.
(v) Proposals in relation to intended, defined, operating mode of each specific turbine (submit list).
(vi) In-depth, identification and consideration of potential noise/vibration and associated effects (dust) with outline of specific mitigation measures as per BS5228.

5. You are advised that a preliminary Ecological Management Plan (EcMP) in relation to the construction and operational phases of all relevant aspects of the proposed development shall be submitted. The plan shall deal with the management and implementation methodology associated with all relevant ecological issues, constraints and proposed mitigation measures/propositions as identified in the EIS and documents submitted as part of this application. In addition, the Plan shall include for specific proposals in relation to the intended removal of ~360m of hedgerow and its replacement taking into account optimisation on species connectivity (bats, birds, mammals etc), hedgerow species type, variation and quantity etc.

6. Please submit a preliminary Environmental Management Plan (EnvMP) in relation to the proposed construction and operational phases of all relevant aspects of the proposed development. Such plan shall deal with the management and implementation methodology associated with all relevant environmental: issues, constraints and proposed mitigation measures/propositions as identified in the EIS and documents submitted as part of this application. In addition please submit a Surface Water Management Plan (inclusive of annotated drawings) in relation to all relevant aspects (e.g. bridge crossings, borrow pit etc) of the proposed development including potential impacts that may arise upon the downstream Lower River Suir SAC.

7. Please submit a Reinstatement/Restoration & Aftercare programme for the wind farm, providing for example: removal of turbines, substation, foundations, roads and ancillary works etc (itemise and describe precisely) and also detailed proposals for landscaping & screening [scheme] of the site. The scheme shall also provide for the replacement and renewal of any hedgerows damaged and / or removed in the course of the construction phase and transportation of materials to/from the site and shall include a timescale for implementation. The programme shall include proposals for:-
(i) The satisfactory recycling or reuse of waste materials;
(ii) The replacement of topsoil so as to render the land suitable for agricultural use or other use consistent in appearance/utilisation of the surrounding land; and
(iii) The grading of any surface levels and the restoration of natural surface and subsoil drainage and the seeding and planting of the site.
Note: The above shall be accompanied with fully annotated drawings, colour coded, indicating extent and type of intended restoration works.
*Note: 'Reinstatement' shall include Landscaping Works and Earthworks Restoration, as required.
(b) Based on the above programme, please submit a detailed estimate of the restoration/aftercare/landscaping costs of the proposed development including costs in relation to the removal of turbines, foundations, etc. Such estimate shall indicate proposed works description, associated quantities with applied labour/plant costs and all shall be certified by an indemnified, independent, Charted Quantity Surveyor. The developer should note that such estimate may be utilised by the Planning Authority in order to determine a fair and satisfactory amount of Restoration Bond required.

(c) Taking the above into account you are advised to submit revised proposals in relation to the proposed borrow-pits, post-excavation, taking into account:-
- Provision of appropriate side-slopes/base-slope conducive to restoration afteruse e.g. agriculture, forestry, ecological etc.
- Surface water ponding.

8. In relation to the proposed site compound please submit the following information::
(a) design proposals in relation to the proposed site compound i.e. layout drawing: parking area, refuelling area/facilities, offices, sanitary facilities, drinking water supply etc.
(b) proposals (design details) in relation to the provision of sanitary facilities etc facilitating maintenance personnel over the long term life of the development.
Note: If it is intended not to provide long term facilities then a statement outlining reasons for same is required.

9. The visual impact assessment contained in the submitted EIS does not take account of the potential impacts that may arise from the adjoining wind farm proposed under application reference 12/51/0385. You are therefore advised to submit a revised visual impact assessment including revised photomontages.

10. As set out in Section 10.13 of the County Development Plan 2010 in Table 10.9 Exclusion and Separation Zones the boundary setback distance for wind turbines is stated to be 1.5times the turbine height. In this regard you are advised that turbine T22 is less than the necessary distance from the boundary of the landholding and therefore the proposal should be revised to take account of this.

11. With regard to wind farm development in general, it has been noted that an increasing number of [international] turbine installations have proved problematic in that under certain conditions, the structure can become unstable. Such 'conditions' have, in general, been attributed to high winds, human (design) error, un-designed-for dynamic loads and those resulting from basically, taller and larger turbines. Taking such issues into consideration and their applicability to the current turbine proposals i.e. high turbines and large mass ($345m^3$) of concrete foundations and notwithstanding the isolated locale of the development, suggests that the H&S aspect of the turbine installations, need to be considered. Accordingly, you are requested to submit an Turbine Design Assessment which shall address the structural design issues as outlined above and possible issues relating adverse conditions (eg. ice formation on the blades), in particular, you are requested to refer to quality control methodology utilised in order to ensure effective and consistent concrete strength in such [large] concrete placements.

12. In the event of significant information being submitted you are requested to submit a further notice in the stated newspaper and in the format set out on the attached and display new site notice (see attached).

Prior to the submission of further information you are advised to contact the Planning Authority so as to allow of discussion of the implications of the above.

Your application will not be further processed until confirmation of the above is received.
<u>Note:-</u> (1) Where Maps, Drawings, Plans or Documents are required, *<u>ten copies</u>* have to be submitted.
(2) Where new newspaper notice is required, full page of newspaper should be submitted within 14 days of date of publication of same.

REFERENCE DOCUMENTS

tribute to Sean.
Many thanks to Dr. James Moloney and Elizabeth and the doctors, nurses and staff of Clonmel Hospital who took such good care of Sean during his short illness and to Fr. Pat Hayes, Chaplin for his comforting words.
We would like to thank Fr. Breen, Fr. Tierney, Fr. Purcell, Fr. Woods and Fr. Cunningham who officiated at the funeral mass and provided the family with much needed support. Thanks also to our Sacristan, Noreen. Thanks to Margaret Heaphy and Cecilia Maher for the lovely singing and music and thanks to the staff and pupils of Ballycahill N.S..
Thanks to O'Dwyer Undertakers for their kindness and professional handling of the funeral arrangements. Also thanks to all who looked after the grave.
Thanks to Brian O Farrell and staff for the beautiful meal and to Sean Treacy's G.A.A. Club for the kind use of their facilities.
As it would be impossible to thank everyone individually, we trust that this acknowledgement will be accepted by all as a token of our sincere gratitude and appreciation.
The Holy Sacrifice of the Mass will be offered for your intentions.
Sean's Months Mind Mass will be celebrated in Ballycahill Church on Saturday, 23rd November at 6.00p.m.

We hope this acknowledgement will be accepted by all with our gratitude and appreciation.
Masses will be offered for your intentions
Month Mind Mass for daddy Joseph Neary will be celebrated in the Church of the Assumption, Urlingford on Sunday 24th November at 11.30am

Tipperary Star

For more information or to make an appointment please Contact: Beatrice, Josephine or Michelle Phone: (0504) 29100

the above roads should be made in writing and should reach:
Marcus O'Connor, Director of Roads & Water Services, North Tipperary County Council, Civic Offices, Limerick Road, Nenagh
or
Michael Ryan, Town Clerk, Thurles Town Council, Slievenamon Road, Thurles not later than 12.00 p.m. on Thursday 28th November 2013

TEMPORARY CLOSING OF ROAD ROADS ACT 1993 - 2007 (SECTION 75 OF THE ROADS ACT 1993) ROADS REGULATIONS 1994.

NOTICE IS HEREBY GIVEN that North Tipperary County Council and Thurles Town Council propose to make an order closing the following roads in Thurles Town to the public: -

ROAD TO BE CLOSED	(1)Mathew Avenue/Castle Avenue from its junction with the R498 Parnell Street to its junction with R660 Friar Street/The Colmyard road - (Holycross Road).
ALTERNATIVE ROUTES:	(1)Northern Traffic (heading towards R660 Holycross road) via turning right off the R498 Castlemeadows road onto the Bohernanave road and on towards R660 The Colmyard road (Holycross Road). (2) Western Traffic (from Holycross heading towards the R498 Nenagh Road & N62 Templemore road) via turning left off the R660 The Colmyard road (Holycross Road) onto the Bohernanave road and on towards the R498 Castlemeadows road. (3)Southern Traffic (from Butlers Avenue & Iona Avenue heading towards the R498 Nenagh Road & N62 Templemore road) via turning left off Butlers Avenue onto the R660 The Colmyard road (Holycross Road) and turn right onto the Bohernanave road and on towards the R498 Castlemeadows road.
PERIOD OF CLOSURE:	The above road closure will be in place from 6am on Monday 6th January 2014 to 6pm on Friday 14th February 2014. Local and business access will be maintained and it is anticipated that this road will be re-opened at weekends.

The purpose of the road closure is to facilitate works associated with the Watermain Rehabilitation Works (Contract No.2) in Thurles Town

Any objection which a person may have to the proposal to close the above road should be made in writing and should reach:
Marcus O'Connor, Director of Roads & Water Services, North Tipperary County Council, Civic Offices, Limerick Road, Nenagh
or
Michael Ryan, Town Clerk, Thurles Town Council, Slievenamon Road, Thurles not later than 12.00 p.m. on Thursday 28th November 2013
Website: www.tipperarynorth.ie
"Ag obair leis an bpobal - Working with the Community"

PLANNING NOTICES

NORTH TIPPERARY COUNTY COUNCIL

Graniera / Shevry / Knockcurraghbola Commons / Knockmaroe / Grousehall / Cummer / Foilnaman / Gleninchnaveigh / Coumnageeha / Coumbeg / Knocknamena Commons / Glenbeg / Seskin, Upperchurch, Co.Tipperary.

Ecopower Developments Ltd. Sion Road, Kilkenny intends to submit Further Information/Revised Plans to North Tipperary County Council in relation to Further Information Planning Reference Number 13/51/0003. The development applied for consisted of the erection of 22 No. wind turbines, overall height of up to 126.6 meters, 2 No. meteorological masts up to 80 meters in height with wind measuring equipment attached, access roads, electrical substation compound and control buildings and ancillary site works at Graniera / Shevry / Knockcurraghbola Commons / Knockmaroe / Grousehall / Cummer / Foilnaman / Gleninchnaveigh / Coumnageeha / Coumbeg / Knocknamena Commons / Glenbeg / Seskin, Upperchurch, Co.Tipperary. The application is for a 10 year permission under Section 41 of the Planning and Development Act 2000.
The Further Information/Revised Plans in relation to the application have been furnished to the Planning Authority, and are available for inspection or purchase at a fee not exceeding the reasonable cost of making a copy at the offices of the Authority during public opening hours.
A submission or observation in relation to the Further Information/Revised Plans may be made in writing to the Planning Authority within a period of FIVE weeks, beginning on the date of receipt by the Authority of the Further Information on payment of the prescribed fee of 20 Euro.
Signed: Pat Brett, Ecopower Developments Ltd.

NORTH TIPPERARY COUNTY COUNCIL

We, John and Margaret Butler wish to apply to the above County Council for full Planning Permission for a two storey dwelling house, domestic garage, septic tank, percolation area and entrance at Ballyroan, Borrisoleigh, Thurles. Previous planning permission 10510340.
This planning application may be inspected or purchased at a fee not exceeding the reasonable cost of making a copy, at the offices of the Planning Authority during its public opening hours and that a submission or observation in relation to the application may be made in writing to the planning authority on payment of the prescribed fee within the period of five weeks beginning on the date of receipt by the authority of the planning application.

REFERENCE DOCUMENTS

13 /51/0003 – response to RFI dated 28th February, 2013

Q1.*In regard to the submitted Natura Impact Statement and EIS the Planning Authority is not satisfied that the impacts upon the adjacent Slieve Felim to Silvermines Mountains SPA (Site Code: 004165) have been fully assessed and appropriate mitigation measures proposed,*
You are advised of the following detailed concerns which will require to be fully addressed:

(a) As Hen Harriers from the adjacent Special Protection Area (SPA) use this site the development would result in the loss of potential foraging habitat for pairs breeding within the SPA (3 within. 5KM) according to best scientific advice(Pierce et 2009). Therefore, it should be treated as if within the SPA and significant negative effects cannot be ruled out beyond a reasonable scientific doubt. Such ex situ affects on the SPA have to be considered under Article 6 of the Habitats Directive. Nesting pairs often now having to travel some distance to forage successfully (O'Donoghue pers communicae). Males have been found over 15km and females over 7km from the nest during the breeding season foraging (UCC/Coford). This has not been taken account of in the submissions. A full assessment of the suitable habitat lost from within a 250m radius of the turbines will be required as this is the zone of displacement foundby Pierce et al (which.is thebest scientific advice available). This should include anyconifer plantation that would be suitable for Harrier foraging within the life time of the development; in order to do this the planting date/felling dates will have to be ascertained forthe plantations within a 250m radius' of proposedturbines and a figure arrived at of whatwould be available/suitable to Harriers during the operating lifetime of thy windfarm. Anyother suitable foraging habitat within 250m ofturbines will also have included (eg scrub, wet grassland, acid grassland, wet heath blanketbog etc.). The creation of an equivalent area ofnew and equivalent alternativehabitat suitable for foraging should thenbe considered asmitigation for that lost through potential displacement. Direct loss of habitat outside the 250mradius should be included in the calculations and side casting, peat/mineral soil-deposition areas, bunds etc).

(b) A full Cumulative Impact Assessment upon the SPA has not been carried out. Some of thenearby wind farm projects have been listed (butonly within 10kmand the one proposed -ref.12/51/0385 - adjacent to the site is left out) but no qualitative or quantitative assessment hasbeen carried out on the potential effects on the SPA (eg on harrier foraging areas, disturbance etc.). Other factors have to be included also (eg. afforestation in the SPA post designation). The 250m displacementeffect means overlap with theSPA. This is required. The items requiringconsideration at (a) above shall alsobe taken into account in the cumulative assessment that isrequired.

The **Answer** to **Q.1 (a)** is contained in the Ecological Management Plan - **Answer to Q5** which includes;

- Ecological Management Plan - Hen Harrier Habitat Area, Individual Field photographs, management measures and restrictions - National Parks and Wildlife Service Farm Plan Scheme - Landowner consent letters - Hen Harrier Habitat Area Matrix - Consent Letters for Habitat compensation areas (Tab 5)

Answer to **Q1. (b)** follows (over);

- Response to RFI 1(b): Upperchurch Wind Farm **Cumulative Impact Assessment** which includes **Revised Natura Impact Assessment**

13 /51/0003 – response to RFI dated 28th February, 2013

Further Information 13/51/0003 (22 No. wind Turbines at Upperchurch)

Malachy Walsh and Partners
Engineering and Environmental Consultants

Response to RFI 1(b): Upperchurch Wind Farm Cumulative Impact Assessment

15388

November 2013

Job number	Revision	Prepared by	Checked by	Status	Date
15388-6008	C	JA, MK	JK	Final	26th November 2013

MWP ENVIRONMENT AND PLANNING

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Appendices:

Appendix A: Figures

Appendix B: Revised Natura Impact Statement

1 Introduction

1.1 Request for Further Information

In response to the submission of the planning application for Upperchurch Wind Farm (Planning Ref.: 13/51) a Request for Further Information (RFI) was issued from North Tipperary County Council (NTCC). This report addresses Item 1(b), which has been reproduced hereunder:

"*A full Cumulative Impact Assessment upon the SPA has not been carried out. Some of the nearby wind farm projects have been listed (but only within 10km and the one proposed – ref. 12/51/0385 – adjacent to the site is left out) but no qualitative or quantitative assessment has been carried out on the potential effects on the SPA (e.g. on harrier foraging areas, disturbance etc). Other factors have to be included also (e.g. afforestation in the SPA post designation). The 250m displacement effect means overlap with the SPA. This is required. The items requiring consideration at (a) above shall also be taken into account in the cumulative assessment that is required*."

1.2 Site Description

The proposed Upperchurch Wind farm site is located in north Co. Tipperary, approximately 1.9 km west of the village of Upperchurch and a further 18 km west of Thurles town. The study area is made up of four sections with an overall area of 12 km².

The surrounding local landscape is dominated by 'Pasture' with 'Forestry, 'Bog', 'Other Agricultural Land' and 'Other' land located to the south of the proposed wind farm site (Corine Landcover database).

The four sections of the site are located on a series of small hills or drumlins that reach elevations of between 363mOD and 411mOD, where the peaks are generally at heights of 100m above the intervening lower terrain. The highest peak is that of Knockmaroe, at an elevation of 411mOD.

The area originally would have had a shallow peat land cover but most of it has been reclaimed by deep ploughing and converted to pasture. The remaining peat areas are used mainly for commercial forestry. Some rock outcropping occurs, most notably at the northeast part of the site.

1.3 Designated Areas

Upperchurch Wind Farm lies close to the *Slievefelim to Silvermines Mountains SPA* (Site Code 004165). This SPA held four confirmed pairs and one possible pair of hen harrier in 2005 (NPWS, site synopsis[1], 2007). Hen harrier is listed on Annex I of the EU Birds Directive and is a Red Data Book species (Whilde, 1993). Hen harrier was formerly listed as being of High Conservation Concern by BirdWatch Ireland (Newton et al., 1999), but is currently listed as of Medium Conservation Concern (Lynas et al. 2007).

1.4 Project Description

It is proposed to construct the windfarm, which comprises of 22 turbines, at a location situated approximately 1.9 km west of the village of Upperchurch. The turbines are numbered T01 to T22 and are arranged in four clusters as follows:

[1] NPWS (National Parks & Wildlife Service) 2007. Slievefelim to Silvermines SP Site Synopsis. http://www.npws.ie/media/npwsie/content/images/protectedsites/sitesynopsis/SY004165.pdf

- T01 to T08 are arranged around two hills at Shevry;
- T09 to T16 are arranged around the hill at Knocknamena;
- T17 to T21 are arranged around two hills at Knockmaroe and Foilnaman; and
- T22 is a single turbine on the northeast side of the hill at Knockcurraghbola.

Turbines will have hub heights of up to 85m and a maximum tip height of up to 126.60m. Construction of an electrical substation compound and installation of associated equipment and laying of electrical cable between turbines and the substation compound will be required. The wind farm will require the construction of 8km of new roads (5m width) and the widening and upgrading of 3.9km of existing farm roads. Prior to construction, clear-felling of approximately 4.35ha of conifer plantation will be required to facilitate the construction of the proposed windfarm and associated infrastructure.

The proposed Upperchurch Wind Farm is not located within the *Slievefelim to Silvermines Mountains SPA*, nor does it lie within, or overlap with, the the 250m buffer zone along the edge of the SPA. <u>The nearest turbine to the SPA, T21, lies 490m from its eastern edge.</u>

1.5 Summary of Hen Harrier Activity at Upperchurch Wind Farm

Both winter and breeding bird hen harrier surveys were conducted at Upperchurch Wind Farm (for further details see Chapter 6, Ecology, of the EIS). Hen harrier surveys included a total of ninety (90) hours observation from 3 vantage points for the winter survey and seventy two (72) hours observation from the same vantage points for the summer bird survey. Following the receipt of the RFI and in addition to those survey hours, further breeding surveys were undertaken in July and August 2013 providing an additional 24 observational hours. The main findings of the surveys in relation to hen harrier are summarised here:

- There was a sighting of an adult male in January 2011, during a transect survey, hunting low (<10m) in a westerly direction over improved agricultural grassland at the northeast of the site, in the townland of Glenbeg.

- In July 2011, there was a sighting of an adult female hunting low (<10m) in the second rotation forestry at Shevry, just east of VP-1 in the townland of Shevry.

- There was no evidence of hen harriers breeding at the study site in the summer of 2011.

- The randomness and low number of hen harrier observations during the vantage point surveys in 2010 and 2011 suggests that the proposed windfarm site at Upperchurch is used infrequently by hen harriers.

- In July 2013, there was one adult female hen harrier sighting from VP-1.

- There was no evidence of hen harriers breeding at the study site in the summer of 2013.

1.6 Ecological Management Plan

In response to Item 5 of the RFI an Ecological Management Plan (EcMP) for Upperchurch Wind Farm has been developed that provides a framework for ecological management and enhancement. Management objectives include:

- Requirement for a suitably qualified ecologist to oversee the implementation of the plan over lifetime of the wind farm.
- Creation of an area of new and alternative habitat suitable for foraging hen harrier to be considered as mitigation for that lost through potential displacement.
- Measures to protect breeding birds.
- Measures to protect bats.
- Measures to protect habitats and water quality during stream crossing works.
- Enhancement of site for aquatic invertebrates.
- Replacement of all removed hedgerow and replanting with native species.
- Enhancement of keyhole fell areas to restore wet habitat types as appropriate.

1.6.1 <u>Creation of Area of New and Alternative Habitat Suitable for Foraging Hen Harrier</u>

Item 1(a) of the RFI requested, "*The creation of an equivalent area of new and equivalent alternative habitat suitable for foraging should then be considered as mitigation for that lost through potential displacement*." In response the project has developed a plan that provides suitable mitigatory habitat for foraging hen harrier to offset any loss of potential foraging habitat within a 250m displacement zone of the Upperchurch turbines.

The creation of new and alternative habitat has been achieved through a plan of measures that are based on those set down in the NPWS Hen Harrier Scheme for farmers. This scheme has now finished, however, it is now proposed to develop a very similar scheme in the Upperchurch area, which is set out in detail in the Ecological Management Plan (EcMP) accompanying this RFI. Participating landowners will be compensated for implementing a set of habitat improvement measures for foraging hen harrier. The objective of the plan is create, improve and maintain suitable agricultural land as hen harrier foraging habitat to offset any potential loss associated with the proposed windfarm. These measures include:

- 123ha of habitat will be managed to increase the area of hen harrier foraging habitat. Measures set down to achieve this include:
    - Rush management to control coverage and increase suitability for foraging habitat
    - 2,085m increase in hedgerow
    - 3ha enclosures of native scrub and trees
    - Lines of electric fence with plastic fliers so that they are more visible to the hen harrier
    - Enhance riparian corridor:
        - 1220m of woody scrub species
        - Erect fencing to make stockproof and exclude access to river by livestock.

The following restrictions will apply to landowners within the Upperchurch hen harrier habitat scheme:

- Limited spreading of fertiliser (every 4-5 years).
- Limited spreading of lime (every 4-5 years).
- No burning.
- No excavation of drains or reclaiming heath or bog.

- No removal of hedgerows.
- No recreational off-roading with vehicles.
- No use of poisons or stupefying baits
- No new forestry plantation.

In addition to this hen harrier workshops will be delivered by the project ecologist at the initiation of the scheme. It is proposed that all landowners participating in the plan as well as those involved in the windfarm development will attend a series of hen harrier workshops, as required, which will be developed and delivered by the project ecologist. A suitably qualified representative from NPWS will be invited to deliver part of the workshop. The aim of the workshop will be to advise landowners on the importance of the conservation of the hen harrier and the proper and full implementation of the plan, and to fully explain the measures and the restrictions set down in the plan. Further detail is provided in the EcMP accompanying the Upperchurch Wind Farm RFI.

1.7 Cumulative Impact upon SPA, with Other Wind Farms and Forestry

In its request for a cumulative impact assessment, North Tipperary County Council (NTCC) sought an assessment of the potential impact upon the SPA at the outset. It was requested that all windfarm projects be considered and that the impact of other factors such as afforestation in the SPA post-designation be assessed. This has been addressed in the following section while other potential cumulative effects have been assessed in a subsequent section (see 1.8).

1.7.1 Cumulative Impact upon SPA

NTCC have requested that a cumulative impact assessment upon the SPA be carried out. In response a cumulative impact assessment on the SPA has been undertaken and is presented in this section.

The Upperchurch Wind Farm including a buffer zone of 250m radius around the turbines does not overlap with the SPA; the nearest turbine is 490m to the boundary of the *Slieve Felim to Silvermines Mountains SPA* (see Map 3, Appendix A). Four of the turbines are located within 1km of the SPA, three turbines lies between 1km and 2km while the remaining turbines are located a distance of over 2km from the SPA.

In the RFI it states, "*The 250m displacement effect means overlap with the SPA. This* [cumulative impact assessment] *is required*." It is clear from Map 3 (Appendix A) that the closest turbine lies 490m, or just under 0.5km, from the SPA, therefore, it can be argued that a cumulative impact assessment on the SPA is not required because the nearest turbine lies outside of the 250m buffer zone. However, in order to satisfy the request a cumulative impact assessment has been completed.

The study area for the assessment includes the *Slieve Felim to Silvermines Mountains SPA* as well as a distance of 250m outside of the SPA.

Again, it is important to emphasise that the proposed Upperchurch Wind Farm will not affect the number of turbines within the SPA or within the 250m buffer zone surrounding the SPA boundary.

Table 1 below details the wind farm projects within the *Slievefelim to Silvermines Mountains SPA* and within the 250m buffer zone from its boundary. Of the 45 turbines within the SPA, 16 are proposed, 16 are permitted and 13 are operational. The Upperchurch Wind Farm is outside the SPA with the nearest turbine being 490m and the majority of turbines are located between 1-2km from the edge of the SPA (see Map 3, Appendix A).

Table 1. Details of the wind farm projects within the SPA

Wind Farm	Owner	Status	No. turbines	No. turbines within SPA & 250m buffer zone	No. turbines outside SPA
Garracummer	Bord Gais	Operating	17	7*	10
Knockstanna	Airtricity	Operating	5	5	0
Bunkimalta	ESB/Coillte	Proposed	16	16	0
Knockmeale	Templederry Windfarm Ltd	Operating	2	1	1
Castlewaller	Castlewaller Woodland Partnership	Permitted	16	16	0
			56	**45**	**11**

* Two of the seven turbines lie outside the SPA but within the 250m buffer zone

Conifer plantation is considered to provide suitable foraging habitat during the open canopy stage, between years 2-10 of planting. Therefore, conifer plantation is only suitable for 20% or 8 years of its estimated 40 year rotational cycle and is thus considered to provide suitable habitat on a short-term basis. The provision of suitable conifer plantation habitat thus only coincides with a portion, and not all, of the lifetime of a windfarm. Marginal or semi-natural habitats, which are permanently open (i.e. not subject to the rotational cycles of conifer plantations), are considered suitable hen harrier foraging habitats over the lifetime of the windfarm.

Table 2. Details of the Upperchurch Wind Farm

Wind Farm	No. turbines within SPA & 250m buffer zone	Habitat types within 250m displacement zones of use to hen harrier	Short-term suitable foraging areas, conifer plantation (ha)	Area of suitable conifer plantation over project lifetime (ha)	Permanently suitable foraging areas, semi-open & marginal habitats (ha)
Upperchurch	0	Conifer plantation, acid grassland, wet grassland, upland blanket bog, wet heath	108ha	11ha	84ha

Table 2 above details the habitat types and areas within Upperchurch Wind Farm that are suitable on a short-term and permanent basis. At Upperchurch there is a mix of permanently open habitats (acid grassland, wet grassland, bog, heath) and conifer plantation (suitable on a short-term basis). **Error! Not a valid bookmark self-reference.** below details the habitat types and areas of the wind farms within the *Slievefelim to Silvermines Mountains* SPA and the 250m buffer zone that are suitable on short-term and permanent basis (see Map 1, Appendix A). At Garracummer, Bunkimalta and Castlewaller the displacement zones are dominated by conifer plantation. The 5 turbines at

Knockastanna support bog and wet grassland that can be considered as suitable foraging habitat through the lifetime of the wind farm (i.e. permanently suitable). Knockmeale supports less than 1ha of suitable foraging habitat.

Table 3. Details of the wind farm projects within the SPA and buffer zone (information sourced from relevant wind farm planning application documentation, note Planning Ref. (PR) quoted)

Wind Farm	No. turbines within SPA & 250m buffer zone	Habitat types within 250m displacement zones of use to hen harrier	Conifer plantation (ha)	Area of suitable conifer plantation available over project lifetime (ha)	Permanently suitable foraging areas, semi-open & marginal habitats (ha)
Garracummer	7	Conifer plantation	106	44	20
Knockstanna	5	Upland blanket bog, wet grassland	6		46
Bunkimalta (P.R. 13510035)	16	Conifer plantation, upland blanket bog, wet grassland	274	163	27
Knockmeale	1	Agricultural grassland, wet grassland	0	0	1
Castlewaller (P.R. 11510251)	16	Conifer plantation	288	48	0
	45		**674**	**255**	**84**

It is estimated that of the 674ha within the displacement zones of the turbines within the SPA and 250m SPA buffer zone, 255ha of this is likely to be suitable as hen harrier foraging habitat over the lifetime of the wind farms. When combined with the 84ha of permanently open habitat this increases to a total area of 339ha of suitable hen harrier foraging habitat within the displacement zones. Should hen harrier avoid the 250m displacement zones around turbines and foraging habitat is lost as a result, there is potential for cumulative impacts to arise within the SPA. Upperchurch Wind Farm will not contribute to any habitat loss within the SPA or associated 250m buffer zone, however, hen harrier are known to use the site though infrequently and the loss of approximately 95ha of potentially suitable hen harrier habitat may result in a cumulative effect. The potential losses of foraging habitat for the hen harrier associated with the Upperchurch Wind Farm will be fully mitigated by the creation of areas of suitable foraging habitat (see EcMP for further detail). Therefore, it is considered that impact of Upperchurch Wind Farm will be neutral and it will not contribute to a significant cumulative impact upon the *Slieve Felim to Silvermines Mountains SPA*.

The two largest wind farms within the SPA, the proposed Bunkimalta (Planning Ref. 13510035) and the permitted Castlewaller (Planning Ref. 11510251), which make up 74% of wind farms within the SPA, have acknowledged the potential for potential cumulative effects for foraging hen harrier. To remedy this, both have provided for the creation of equivalent areas of suitable foraging habitat.

Mitigation habitat that is the creation of equivalent areas of suitable foraging habitat has been proposed by the applicants for the Bunkimalta and Castlewaller Wind Farm projects. The Bunkimalta project proposes to create an equivalent area of open canopy forest over the lifetime of the wind farm. Bunkimalta and Castlewaller are the largest of the wind farm projects within the SPA and they have the greatest coverage of forestry. Therefore, as a full mitigation programme involving the provision of equivalent areas of suitable foraging habitat is proposed for the Bunkimalta and Castlewaller projects it can be concluded that the net impact of these projects on the SPA is neutral and therefore the SPA should not be adversely affected.

In summary, the provision of mitigatory habitat for most of the turbines within the SPA and at Upperchurch Wind Farm coupled with the fact that Upperchurch wind farm lies outside the SPA and the associated 250m buffer zone, a cumulative impact effect with the SPA is not expected to arise.

1.7.2 Cumulative Impact of Other Wind Farms

The cumulative impact assessment area for the assessment of in-combination effects with other wind farms is made up of an area of 15km from the outer turbines of the Upperchurch Windfarm as well as the *SlieveFelims to Silvermines Mountains SPA* in addition to a buffer of 3km on the western edge of the SPA. The total area of this assessment area is 106,915ha. This differs from the SPA assessment area which was confined to the SPA and the surrounding 250m buffer zone.

There are a number of permitted and existing wind farms in the assessment area, as detailed in Table 4 below and Map 2 (Appendix A). Of the 45 turbines within the SPA, 16 are proposed, 16 are permitted and 13 are existing and operating. The Upperchurch Wind Farm is outside the SPA with the nearest turbine being a distance of 490mm; most turbines are located at distances greater than 1km and 2km from the edge of the SPA (see Map 3, Appendix A). The remaining 101 turbines within the study area are outside the SPA and within 15km of the Upperchurch Wind Farm. Most of these are located to the southeast of Upperchurch Wind Farm.

Table 4. Wind Farms within 15km of the proposed wind farm (wind farms with turbines with the SPA have been bolded for clarity)

	Wind Farm	Owner	Status	No. turbines	Distance from nearest UWF turbine - KM	No. turbines within SPA	No. turbines outside SPA	Distance of nearest turbine from SPA - KM
1	Upperchurch	Ecopower Developments	Proposed	22	0	0	22	0.5
2	**Garracummer**	**Bord Gais**	**Operating**	**17**	**2.8**	**5**	**12**	**0**
3	**Knockstanna**	**Airtricity**	**Operating**	**5**	**8**	**5**	**0**	**0**
4	Cappawhite	ESB	Permitted	18	8.5	0	18	3.7
5	Glencarbry	Ecopower Developments	Permitted	11	4.5	0	11	3.4
6	Glenough	ABO Wind	Operating	14	3.2	0	14	2.7
7	Hollyford	Viridian	Under construction	3	3.7	0	3	3.1
8	Turraheen	Ecopower Developments	Proposed	3	5.6	0	3	5.5
9	Milestone	ABO Wind	Proposed	5	0.4	0	5	1.3
10	**Bunkimalta**	**ESB/Coillte**	**Proposed**	**16**	**9.5**	**16**	**0**	**0**
11	**Knockmeale**	**Templederry Windfarm Ltd**	**Operating**	**2**	**7.8**	**1**	**1**	**0.03**
12	**Castlewaller**	**Castlewaller Woodland Partnership**	**Permitted**	**16**	**14**	**16**	**0**	**0**
13	Ballinlough	Jaroma Windfarm Ltd	Operating	3	12.7	0	3	9.2
14	Curraghgraigue	Aeolus Energy Ltd	Operating	6	9.4	0	6	2.4
15	Ballinveny	North Tipperary Windpower Ltd	Operating	3	12.8	0	3	11.9
				144		**43**	**101**	

A GIS and autocad software have been used to map and estimate abundances for potentially useful hen harrier foraging habitat such as conifer plantation (suitable on a short-term basis during its open canopy stage) and marginal and semi-natural habitats, which are useful over the 25 year lifetime of the wind farm. The results of this analysis are presented in the following tables and have been used to undertake the assessment (see Map 2, Appendix A).

Table 5. Temporarily and permanently suitable foraging habitat within the assessment area

	Wind Farm	No. turbines within SPA & 250m buffer zone	Habitat types within 250m displacement zones of use to hen harrier	Area of conifer plantation within 250m displacement zones (ha)	Area available conifer plantation within 250m displacement zones (ha) over lifetime of windfarm	Permanently suitable foraging areas, semi-open & marginal habitats (ha)
1	Upperchurch	0	Conifer plantation, acid grassland, wet grassland, upland blanket bog, wet heath	11	11	84
2	Garracummer	7	Conifer plantation	106	44	77
3	Knockstanna	5	Upland blanket bog, wet grassland	6	4	46
4	Cappawhite	0	Conifer plantation, wet grassland, bog/heath	234	92	93
5	Glencarbry	0	Conifer plantation, wet grassland, acid grassland, wet heath mosaic	135	44	17
6	Glenough	0	Conifer plantation, wet grassland, wet heath, acid grassland	90	18	29
7	Hollyford	0	Conifer plantation, wet grassland, wet heath, acid grassland, heath/bog cutover	5	0	19
8	Turraheen	0	Conifer plantation, wet grassland, bog/grassland mosaic, bog, wet heath	16	14	12
9	Milestone	0	Conifer plantation, wet grassland, wet heath	15	15	10

10	Bunkimalta	16	Conifer plantation, upland blanket bog, wet grassland	163	163	27
11	Knockmeale	1	Agricultural grassland, wet grassland	0	-	1
12	Castlewaller	16	Conifer plantation	48	48	0
13	Ballinlough	0	-	-	-	-
14	Curraghgraigue	0	Conifer plantation	1	0	0
15	Ballinveny	0	Conifer plantation	7	7	0
		45		**788**	**451**	**415**

Table 5 above presents all of the wind farms within the assessment areas. The total area of conifer plantation within the 205m displacement zones is 788ha, however, this does not reflect the fact that the plantation canopy will be closed for 80% of 4/5 of its rotational cycle. Therefore, this figure is a considerable overestimation. Following an analysis of the amount of area of available conifer plantation for foraging hen harrier over the lifetime of the Upperchurch Wind Farm this has been reduced to 451ha within the 250m displacement zones.

Table 6 below presents the corine landcover analysis, which was used in the assessment. Based on an analysis of the definitions of the landcover classifications habitats that are considered to provide potentially suitable forging habitat include transitional woodland-scrub, coniferous forestry, peat bog, moor and heath and natural grassland. It has been estimated that a total of approximately 22,000ha of potentially suitable hen harrier habitat occurs within the assessment area.

Table 6. Corine landcover estimates within the assessment area

Landcover type	Area (ha)	Potentially suitable hen harrier foraging area (ha)	Class as a % of the Zone
Pasture	73,169	-	68%
Transitional Woodland-Scrub	**9,092**	**9,092**	**9%**
Coniferous Forestry	**7,536**	**7,536**	**7%**
Agricultural	7,271	-	7%
Peat Bog	**4,562**	**4,562**	4%
Un-Irrigated Land	2,427	-	2%
Complex Cultivation	984	-	1%
Natural Grassland	**521**	**521**	0%
Broadleaf Forestry	409	-	0%
Discontinuous Urban	398	-	0%
Moor and Heath	**304**	**304**	0%
Inland Marsh	240	-	0%
		22,015	100.0%

When taken into context of the total area of potentially suitable available landcover of ~ 22,000ha for foraging hen harrier, the Upperchurch project will potentially affect 95ha (see Table 2), which is less than 0.5%. The other wind farm projects within the assessment area will potentially affect 451ha of useful conifer plantation and 415ha of open habitat giving a total of 866ha (see Table 5). When taken in context of the 22,015ha of available land this constitutes less than 4% of the total suitable landcover. The presence of the other windfarms may result in a cumulative effect; however, it is unlikely to be significant.

Mitigatory habitat has been proposed for Upperchurch Wind Farm through the provision of areas of suitable foraging habitat (nearest turbine is 490m from edge of SPA, therefore outside 250m buffer zone around SPA) the net impact is considered neutral. It is not anticipated that Upperchurch Wind Farm will contribute in a significant way to a cumulative effect.

Furthermore, mitigatory habitat has been proposed to offset loss of potential foraging habitat for the two largest wind farms, Bunkimalta and Castlewaller. Mitigatory habitat has also been proposed for Milestone Wind Farm (P.R. 12510385), which lies within the vicinity of Upperchurch Wind Farm but like Upperchurch is located outside of the SPA.

1.7.3 Cumulative Impact of Forestry

The *Slievefelim to Silvermines Mountains SPA* is an extensive upland site and approximately half of the site is afforested, including both first and second rotation plantations and clear fell areas. Roughly one-quarter of the site is unplanted blanket bog and heath, with both wet and dry heath present. The remainder of the site is largely rough grassland that is used for hill farming while some stands of deciduous woodland also occur, especially in the river valleys.

A considerable portion of the forestry within the SPA was planted pre-2000 and much of the current crop is in its second 40 year rotation. Of the total area of land within the assessment area (that is the 15km around the windfarm + SPA + 3km area surrounding SPA) 14,862ha or 13.9% of the forestry within the greater assessment area was planted prior to the year 2000. The significance of this is that that area may be of value to hen harrier for a portion of the lifetime of Upperchurch Wind Farm, which is planned for construction in 2017. It is only pre-thicket or open canopy conifer plantation during the years 2-10, or often years 3-9, that are considered to be of use to the hen harrier. Most of the forestry planted post-2000 will already be past the pre-thicket stage and the canopy will have closed.

From examination of a number of evidence sources in particular aerial photography and analysis presented in the planning documentation submitted in support of other wind farms in the region, it is expected that the area of available suitable forestry for hen harrier foraging will decrease over the lifetime of the Upperchurch Wind Farm. The expected reduction is mainly due to the impending closure of open canopy young second rotation forestry, which occurs 10 years after planting. This will likely result in a reduction in potential foraging habitat for the hen harrier within the SPA and influence future population trends.

According to the National Hen Harrier Survey (Ruddock, 2012) a significant decrease in population has been recorded since the previous national survey in 2005. It is considered that forest maturation is considered partly responsible for this due to a shift in the age structure to more mature closed canopy. It is worth noting that one of the principal threats to nesting hen harrier is predators such as crows and foxes (pers. comm. Barry O'Donoghue).

With the creation of an area of hen harrier foraging habitat as part of the Upperchurch project, it is expected that the hen harrier will use this area while forestry lands within the SPA come under pressure. With the EcMP in place the potential impact of the Upperchurch Wind Farm will be neutral, and may even be considered positive. It is not anticipated that the project when considered with forestry will result in a significant cumulative impact.

1.8 Other Cumulative Effects

1.8.1 Cumulative disturbance effects

Cumulative disturbance effects can occur during the construction phase in particular, due to noise, visual intrusion or disturbance effectively amounting to habitat loss arising from the effect of displacement from more than one wind farm development. Disturbance is short term and may occur during construction. Disturbance effects may be non-linear where birds may tolerate a certain level of disturbance up to a threshold (SNH, 2012).

Observations of a female hen harrier during a breeding season survey at Glencarbry Windfarm Extension in summer 2011, while the western-most turbine turbine at Glenough wind farm was undergoing construction, indicated no disturbance effect. The bird was first observed over mature conifer plantation and circled north over improved agricultural grassland, to within 300m of the construction area (pers. obs.). Glencarbry wind farm and Glenough wind farm are 4.5km and 3.2 km to the south of the proposed Upperchurch wind farm, respectively (pers. obs. 2011).

It is not expected that cumulative disturbance effects, which are temporary in nature, will be significant.

1.8.2 Cumulative Collision Effects

Cumulative collision effects can arise as a result of a number of wind farm developments in an area as well as changes in behaviour of bird species in response, making them more / less likely to collide (King et al., 2009). In practice, most birds take avoidance action to avoid a wind farm or wind turbine structure and alter their flight lines (SNH, 2012). Information on collision is limited, because as mentioned it can rarely be assumed that all collisions are detected, due to scavenging, as well as surveyor bias.

The evidence to date indicates that the effects are extremely species and site specific. Not all species are equally sensitive to collision. Large birds such as raptors and wildfowl are considered to be at greater risk of collision due to their flight behaviour and mobility (Percival, 2003). Percival notes that in Ireland, wind farms are most likely to have a serious negative impact on birds in areas of high concentrations of seabirds, wintering wildfowl or breeding raptors. There is no evidence of breeding raptors at Upperchurch Wind Farm with the nearest known nest recorded roughly 4km to the southeast of the Upperchurch site bordering the Glenough windfarm to the southeast of the site.

There is no known hen harrier flight paths between foraging and roosting areas associated with the Upperchurch project.

Observations at the Glenough wind farm in 2012 and 2013 indicated that potential hen harriers collision was unlikely as the majority of flying adults and juveniles were recorded below 35m i.e. below turbine blade height (Cork Ecology 2012, 2013).

All observations of hen harrier during breeding and winter surveys at Upperchurch in 2011 and 2013 were recorded below 35m.

The main collision risk to hen harrier occurs where nests are located within 500m of a turbine. A risk to fledglings that are not as aerially skilled as adults may result in a collision risk.

At Glenough wind farm, there is an historic hen harrier nest site, c. 300m from the nearest turbine and another c. 2.5km from the nearest turbine. In 2012, during a post-construction survey, two fledged young were observed at the nest site, 2.4km from the nearest turbine. In 2013, two fledged young were observed at the nest site, 300m from the nearest turbine (Cork Ecology 2012, 2013). As already stated, Glenough wind farm is 3.2km from the nearest turbine at the proposed Upperchurch wind farm.

Post-construction monitoring at a wind farm site in Co. Galway indicated that most observations were of hen harrier foraging at less than 10m above ground, although birds were also recorded at rotor height. Between 10 and 11 pairs of hen harriers bred within 5km of the win farm site boundary, during each year of monitoring (Madden and Porter 2007).

It is not expected that collision of hen harrier with turbines at Upperchurch will occur due to the low flying height of foraging hen harriers together with the absence of recorded nests within the vicinity of the project.

1.8.3 <u>Cumulative Barrier Effects</u>

Cumulative barrier effects occurs where birds alter their migration flyways or local flight paths, to avoid wind farm developments, resulting in increased energy expenditure as birds have to fly longer distances and could result in disruption. Barrier effects depend on species, type of bird movement, flight height, turbine layout, wind force and direction (King at al., 2009).

There is a strong relationship between cumulative barrier effects and cumulative displacement effects, particularly after construction has taken place. It will depend on the number of wind farms and the number of turbines in these wind farms, within the vicinity of the proposed wind farm at Upperchurch. It will also depend on the quality of hen harrier habitats available within these wind farms and in the surrounding area.

At a 71 turbine wind farm site in Co. Galway, within the Slieve Aughty SPA, there were numerous sightings of hen harrier. Monitoring commenced in 2004, prior to the erection of turbines and continued in 2006 and 2007, when the wind farm was in full operation. Most observations were of hen harrier foraging at less than 10m over the bog. Birds regularly passed within 50m of turbines, with one bird foraging within 10m of a turbine base. The behavioural observations indicated that birds passed between turbines or along lines of turbines, and no sudden movements were seen that suggested alarm or hesitation (Madden and Porter 2007).

At the 14 turbine wind farm at Glenough, the levels of hunting recorded during the post-construction monitoring, indicated that there was suitable hunting habitat both within the wind farm and in the immediate surrounding area, and that the presence of turbines did not act as a barrier to foraging hen harrier (Cork Ecology 2013).

The turbines at Upperchurch are well spread and the site is not considered a bird migration route. Other wind farms in the region are well spread and spaced from one another and most turbines are at a minimum of 300-400m apart.

In summary it is not expected that the Upperchuch Wind Farm proposal will contribute a significant cumulative barrier effect with other windfarms.

1.8.4 *Cumulative Impact of Agriculture*

The area within and surrounding the proposed wind farm at Upperchurch is currently intensively farmed and is primarily improved agricultural grassland. This habitat is deemed unsuitable for foraging hen harrier. It is one of the main habitats associated with the 250m buffer displacement zone around the turbines. If the wind farm was granted permission, it is likely that farming would continue within these buffer zones.

It is expected that the quota for milk will be removed in 2015 and under Harvest 2020[2] milk production is expected to increase by 50% by 2020. Existing marginal land such as that surrounding the SPA and within 15km of the wind farm may be subject to improvement in an effort to increase the amount of available high quality agricultural grassland and meet the 2020 target for milk production. If this occurs on a significant level it is likely to result in the reduction of future hen harrier foraging habitat and may have a knock-on effect on future population trends.

The proposed Ecological Management Plan prepared as part of this RFI proposes the management of approximately 124ha of land outside the SPA. This will have the effect of securing this land for hen harrier foraging habitat over the lifetime of the wind farm whose construction is likely to coincide with the early years of the removal of the milk quota. With the Ecological Management Plan in place the potential impact of the Upperchurch Wind Farm will be neutral, and may even be considered positive. A significant cumulative effect with agriculture is not antipated.

1.9 Hen Harrier Habituation to Wind Farm Development

Certain bird species are known to habituate to the presence of wind farms (Spaans et al., 1998 a & b). In Pierce-Higgins et al., (2012) following temporary disturbance during construction, upland bird populations became habituated to operational wind farms. This conclusion was based on a 3 year period of wind farm operation. The main finding of this study for breeding bird populations suggests that the main effects of wind farms may be through disturbance displacement during construction. The turbines at Upperchurch are carefully sited and well spread; it is likely that hen harriers will habituate to the wind farm to a degree over its lifetime.

At Garracummer wind farm, there were no observations of hen harrier nesting behaviour during the construction phase in 2011/2012, although there was hen harrier breeding activity observed in the 5km hinterland, during the construction phase. However, there was a significant increase in raptor activity during post-construction monitoring at the site in 2013 (pers. comm. BGE, 29/11/2013). Garracummer wind farm is 2.8km from the nearest turbine at Upperchurch wind farm and is within 5km of the wind farm at Glenough.

As already mentioned with regard to the 14 turbine wind farm at Glenough, the levels of hunting recorded during the post-construction monitoring, indicated that there was suitable hunting habitat both within the wind farm and in the immediate surrounding area, and that the presence of turbines did not act as a barrier to foraging hen harrier (Cork Ecology 2013).

[2] http://www.agriculture.gov.ie/agri-foodindustry/foodharvest2020/

1.10 Conclusion

This cumulative impact assessment was prepared in response to a Request for Further Information (RFI) issued from South Tipperary County Council (NTCC).

At the outset it is important to point out that the nearest turbine to edge of the SPA is a distance of 490m. In the RFI it states, "*The 250m displacement effect means overlap with the SPA. This* [cumulative impact assessment] *is required*." It is clear from Map 3 (Appendix A) that the closest turbine lies 490m, or just under 0.5km, from the SPA, therefore, it can be argued that a cumulative impact assessment on the SPA is not required because the nearest turbine lies outside of the 250m buffer zone. However, in order to satisfy the request a cumulative impact assessment has been completed.

There are 43 proposed, permitted or operational turbines within the SPA and 2 more turbines within the 250m buffer zone around the SPA. Within the SPA and the 250m buffer zone, there will be a loss of conifer plantation and open habitats, which could reduce the amount of available suitable foraging habitat for hen harrier within the SPA and may result in potential cumulative effects. However, the provision of mitigatory habitat for most of the turbines within the SPA and at Upperchurch Wind Farm coupled with the fact that Upperchurch wind farm lies outside the SPA and associated 250m buffer zone, a cumulative impact effect with the SPA is not expected to arise.

It is expected that the area of available suitable forestry for hen harrier foraging will decrease over the lifetime of the Upperchurch Wind Farm. The expected reduction is mainly due to the impending closure of open canopy young second rotation forestry within the SPA, which occurs 10 years after planting. This will likely result in a reduction in potential foraging habitat for the hen harrier within the SPA. With the creation of an area of hen harrier foraging habitat as part of the Upperchurch project, it is expected that the hen harrier will use this area while forestry lands within the SPA comes under pressure. With the EcMP in place the potential impact of the Upperchurch Wind Farm will be neutral, and may even be considered positive. It is not anticipated that the project when considered with forestry will result in a significant cumulative impact.

Following the preparation of the plan to create hen harrier foraging habitat and the cumulative impact assessment report, the original Natura Impact Statement has been revised and updated (see Appendix B, attached).

2 References

Cork Ecology (2012). Final Report on Hen Harrier activity and breeding bird survey at Glenough Windfarm in 2012. A Report for Abo Wind Ltd.

Cork Ecology (2013). Final Report on Hen Harrier activity and breeding bird survey at Glenough Windfarm in 2013. A Report for Abo Wind Ltd.

King et al. (2009). Development guidance on Ornithological Cumulative Impact Assessment for Onshore Wind Farm Developers. Commissioned by COWRIE Ltd.

Lynas et al. (2007). The status of birds in Ireland: an analysis of conservation concern. Irish Birds 8: 149-166.

Newton S., Donaghy A., Allen D. & Gibbons D. (1999). Birds of Conservation Concern in Ireland. Irish Birds, **6**: 333-342.

Madden, B. and B. Porter (2007). Do wind turbines displace Hen Harriers (*Circus cyaneus*) from foraging habitat? Preliminary Results of a Case Study at the Derrybrien Wind Farm in Co. Galway. Irish Birds Vol. 8, No.2.

Percival S.M. (2003). Birds and Windfarms in Ireland: A Review of Potential Issues and Impact Assessment. Sustainable Energy Ireland.

Ruddock, M. & Dunlop, B.J., O'Toole, L., Mee, A., Nagle, T. (2012) Republic of Ireland National Hen Harrier Survey 2010. Irish Wildlife Manual, No. 59. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Scottish Natural Heritage (2012). *Cumulative effect of windfarms: guidance document*. Scottish Natural Heritage.

Spaans, A., van den Bergh, L., Dirksen, S. & van der Winden, J. (1998a) Windturbines en vogles: hoe hiermee om te gaan? Levende Natuur 99: 115 – 121. Cited in Birdlife International (2003) Windfarms and Birds: An analysis of the effects of windfarms on birds, and guidance on environmental assessement criteria and site selection issues.

Spaans, A., van der Winden, J., Lensink, R., van den Bergh, L.M.J. & Dirksen, S. & (1998b) Vogelhinder door windturbines: Landelijk onderzoekprogramma, deel 4: nachtelijke vliegbewegingen en vlieghoogtes van vogels langs de Afsluitdijk. Bureau Waardenburg/IBN-DLO/NOVEM. www.alterra.nl. Cited in Birdlife International (2003) Windfarms and Birds: An analysis of the effects of windfarms on birds, and guidance on environmental assessement criteria and site selection issues.

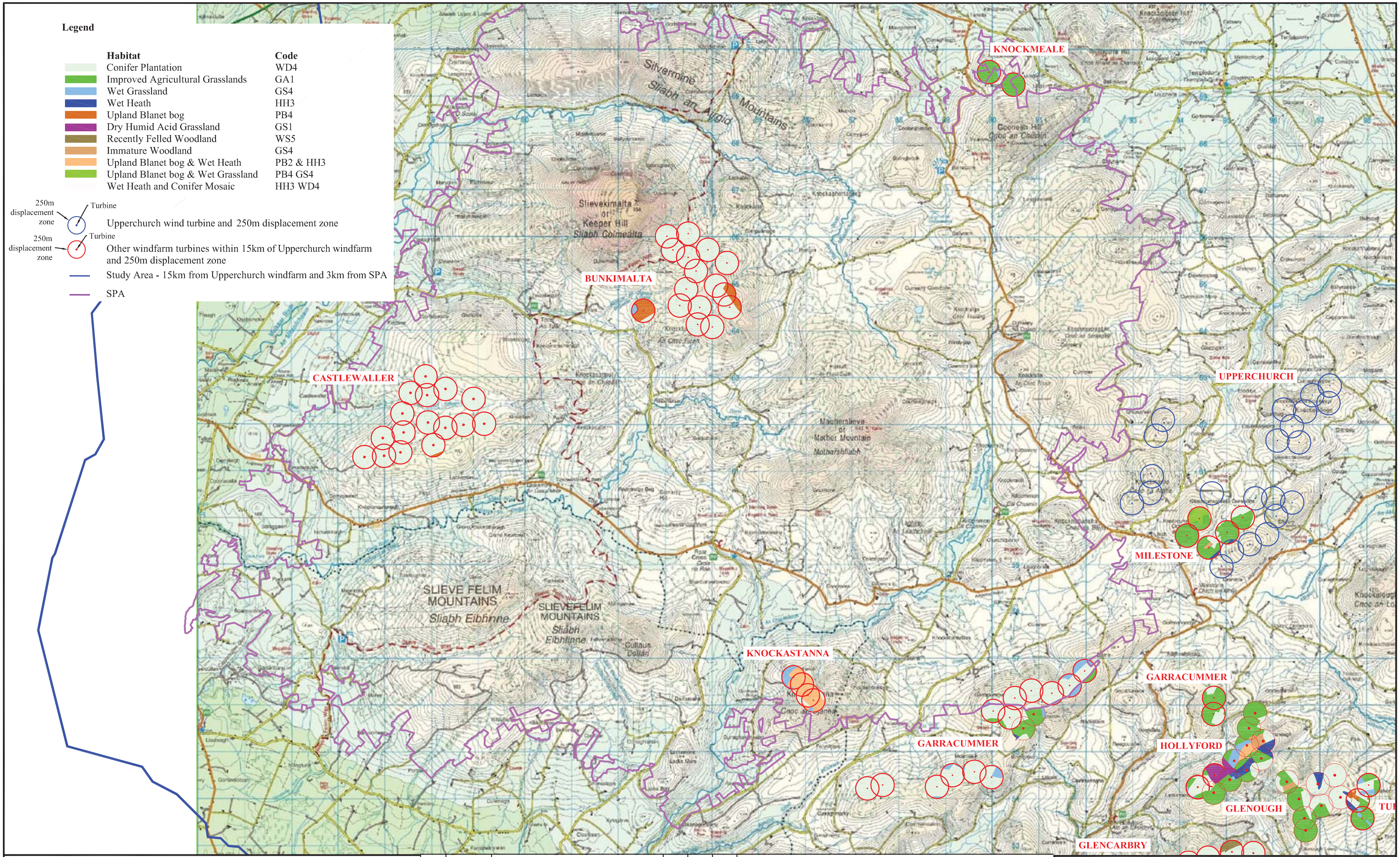
Whilde A. (1993) Threatened Mammals, Birds, Amphibians and Fish in Ireland. Irish Red Data Book: Vertebrates. HMSO, Belfast

REFERENCE DOCUMENTS

Appendix A

Figures

REFERENCE DOCUMENTS



Rev.	Date	Description	by	ch'd	app
B	27.11.13	Issued For RFI	JK	MK	MK
A	26.11.13	Issued For RFI	JK	MK	MK

Client: Ecopower Developments Ltd

Project: Upperchurch Wind Farm

Title: Map 1

Malachy Walsh and Partners
Consulting Engineers
Cork | Tralee | London | Limerick

Scales (A3)	NTS	
Drawn	JK	26.11.2013
Checked	MK	26.11.2013

Drg. No. 15388 - SK02

Rev. B

REFERENCE DOCUMENTS

Habitat within 250m of turbines within 15km of Upperchurch Windfarm

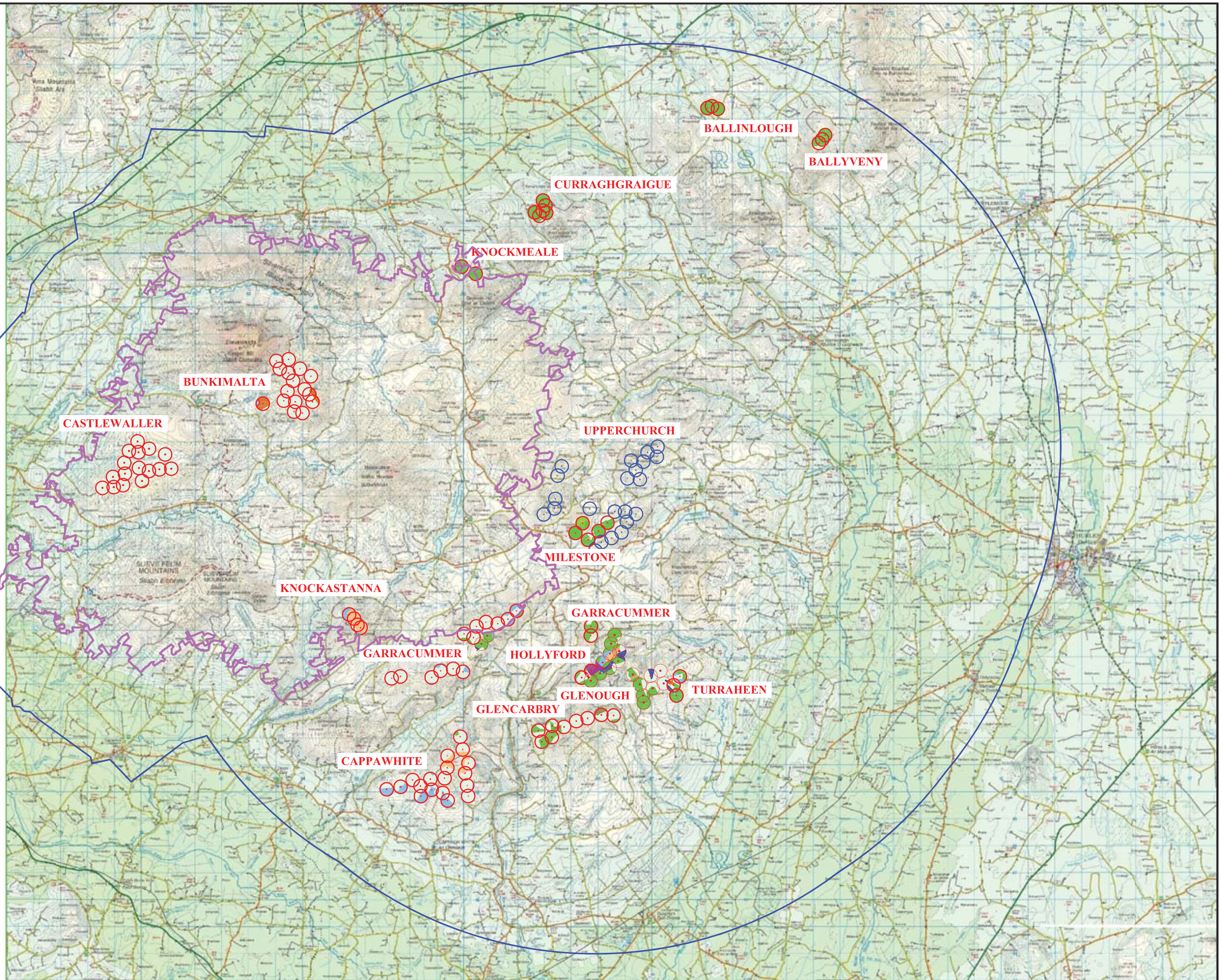
Habitat	Code
Conifer Plantation	WD4
Improved Agricultural Grasslands	GA1
Wet Grassland	GS4
Wet Heath	HH3
Upland Blanet bog	PB4
Dry Humid Acid Grassland	GS1
Recently Felled Woodland	WS5
Immature Woodland	GS4
Upland Blanet bog & Wet Heath	PB2 & HH3
Upland Blanet bog & Wet Grassland	PB4 GS4
Wet Heath and Conifer Mosaic	HH3 WD4

Upperchurch wind turbine

Other windfarm turbines within 15km of Upperchurch windfarm

Study Area - 15km from Upperchurch windfarm and 3km from SPA

SPA



Rev.	Date	Description	by	ch'd	app
A	26.11.13	Issued For RFI	JK	MK	MK

Project: Upperchurch Wind Farm

Client: Ecopower Developments Ltd

Title: Map 2

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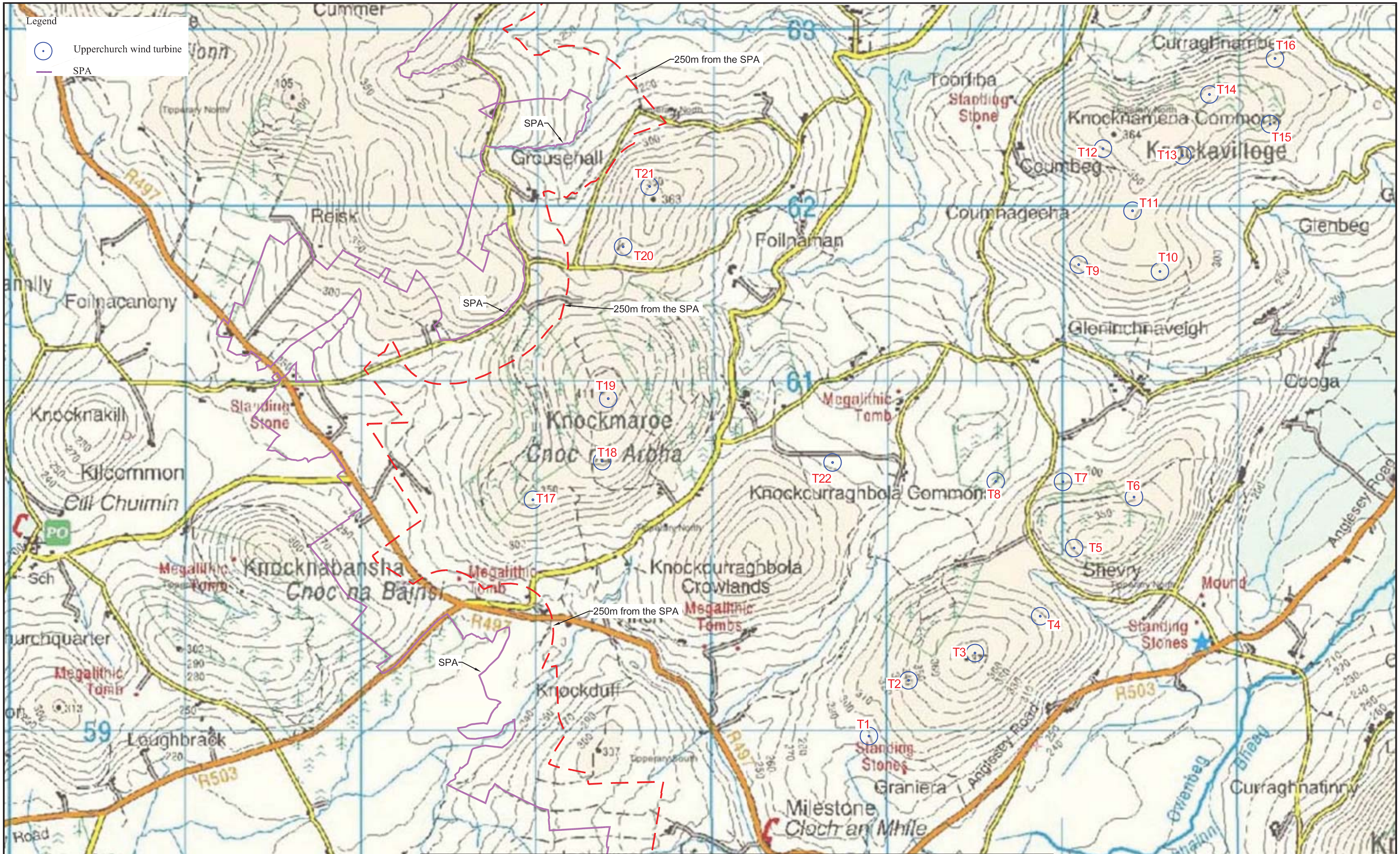
Cork | Tralee | London | Limerick

Scales (A3)	NTS	
Drawn	JK	26.11.2013
Checked	MK	26.11.2013

Drg. No. 15388 - SK03

Rev. A



Rev.	Date	Description	by	ch'd	app
B	27.11.13	Issued For RFI	JK	MK	MK
A	26.11.13	Issued For RFI	JK	MK	MK

Client: Ecopower Developments Ltd

Project: Upperchurch Wind Farm

Title: Map 3

Malachy Walsh and Partners
Consulting Engineers
Cork | Tralee | London | Limerick

Scales (A3)	NTS	
Drawn	JK	26.11.2013
Checked	MK	26.11.2013

Drg. No. 15388 - SK04

Rev. B

REFERENCE DOCUMENTS

Appendix B

Revised Natura Impact Statement

REFERENCE DOCUMENTS

Malachy Walsh and Partners
Engineering and Environmental Consultants

Revised Natura Impact Statement

Upperchurch Windfarm

14708

December 2012

Job number	Revision	Prepared by	Checked by	Status	Date
14708 - 6005	Rev C	CON	JK	Final	26th November 2013

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1 Introduction

1.1 Background

Member States are required to designate Special Areas of Conservation (SACs) and Special Protected Areas (SPAs) under the EU Habitats and Birds Directives, respectively. SACs and SPAs are collectively known as Natura 2000 sites. An 'Appropriate Assessment' (AA) is a required assessment to determine the likelihood of significant impacts, based on best scientific knowledge, of any plans or projects on Natura 2000 sites. A screening for AA determines whether a plan or project, either alone or in combination with other plans and projects, is likely to have significant effects on a Natura 2000 site in view of its conservation objectives.

This AA screening has been undertaken to determine the potential for significant impacts of a proposal to construct a 22 turbine windfarm, 1.9 km west of Upperchurch and a further 18 km west of Thurles in county Tipperary, on nearby Sites with European conservation designations (i.e. Natura 2000 Sites). The purpose of this assessment is to determine, the appropriateness, or otherwise, of the proposed project in the context of the conservation objectives of such sites. For clarity of nomenclature this proposal will be described, hereinafter, as the Upperchurch Windfarm.

This Screening for Appropriate Assessment has been undertaken by Malachy Walsh and Partners ecologists.

Assessment of potential impacts on other species of national and community interest does not fall within the scope of this report.

An Environmental Impact Statement has also been carried out in association with the proposed windfarm.

1.2 Legislative Context

The Habitats Directive (92/43/EEC) seeks to conserve natural habitats and of wild fauna and flora by the designation of SACs and the Birds Directive (79/409/EEC) seeks to protect birds of special importance by the designation of SPAs. It is the responsibility of each member state to designate SPAs and cSACs, both of which will form part of Natura 2000, a network of protected sites throughout the European Community.

An Appropriate Assessment is required under Article 6 of the Habitats Directive where a project or plan may give rise to significant effects upon a Natura 2000 Site, and paragraphs 3 and 4 state that:

6(3) Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.

6(4) If, in spite of a negative assessment of the implications for the site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, the Member State shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted. Where the site concerned hosts a priority natural habitat type and/or a priority species, the only considerations which may be raised are those relating to human health or public safety, to beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest.

The current assessment was conducted within this legislative framework and also the recent DoEHLG (2009) guidelines. As outlined in these, it is the responsibility of the proponent of the project developer to provide a comprehensive and objective Screening for Appropriate Assessment, which can then be used by the competent authority in order to conduct the Appropriate Assessment (DoEHLG, 2009).

1.3 Stages of AA

A Screening for Appropriate Assessment (AA) has been prepared by Malachy Walsh and Partners, to determine the likelihood of significant impacts, if any, of the proposal to construct a 22 turbine windfarm and all associated works located 1.9km west of Upperchurch village and a further 18km west of Thurles in County Tipperary, on nearby sites with European conservation designations (i.e. Natura 2000 sites). A Natura Impact Statement (NIS) has also been undertaken and is presented in this report after the screening stage.

The AA process is a four-stage process to complete the AA, with issues and tests at each stage. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required. This proposal has proceeded as far as Stage 2 only.

The first stage of the AA process and that undertaken to determine the likelihood of significant impacts of this proposal is:

Stage 1: Screening.

The second stage of the AA process assesses the impact of the proposal (either alone or in combination with other projects or plans) on the integrity of the Natura 2000 site with respect to the conservation objectives of the site and its ecological structure and function. A Natura Impact Statement was prepared for this proposed development. A Natura Impact Statement

containing a professional scientific examination of the proposal is required and includes any mitigation measure to avoid, reduce or offset negative impacts:
Stage 2: Natura Impact Statement (NIS).

If the outcome of Stage 2 is negative i.e. adverse impacts to the sites cannot be scientifically ruled out, despite mitigation, the plan or project should proceed to Stage 3 or be abandoned. This stage examines alternative solutions to the proposal:
Stage 3: Assessment of alternative solutions.

The final stage is the main derogation process examining whether there are imperative reasons of overriding public interest (IROPI) for allowing a plan or project to adversely affect a Natura 2000 site where no less damaging solution exists:
Stage 4: Assessment where no alternative solutions exist and where adverse impacts remain.

In summary, the purpose of the Screening stage is to determine the necessity or otherwise for a NIS. Screening for AA examines the likely effects of a project or plan, alone and in combination with other projects or plans, upon a Natura 2000 site and considers whether it can be objectively concluded that these effects will not be significant. If it is determined during screening that the proposal may have a significant effect on a Natura 2000 site then a NIS will need to be prepared. A Screening exercise has been undertaken and concluded that a NIS was required. The Screening is outlined in section 2 below as it now forms part of the overall NIS. The NIS is presented in Section 3 below.

1.4 Screening Steps

This Screening for AA, or Stage 1 of AA, has been undertaken in accordance with the European Commission Methodological Guidance on the provision of Article 6(3) and 6(4) of the 'Habitats' Directive 92/43/EEC (EC, 2001) and the European Commission Guidance 'Managing Natura 2000 sites' (EC, 2000).
Screening for AA involves the following:
Establish whether the plan is necessary for the management of a Natura 2000 site;
Description of the Plan;
Identification of Natura 2000 sites potentially affected;
Identification and description of individual and cumulative impacts likely to result from the plan;
Assessment of the significance of the impacts identified above on site integrity; and
Exclusion of sites where it can be objectively concluded that there will be no significant effects.

Stage 1, Screening, examines whether or not likely effects upon a Natura 2000 site will be significant and determines whether the AA process for the proposed windfarm needs to proceed to Stage 2.

1.5 Assessment Methodologies

1.5.1 In house Consultation with Design Engineers

Consultation with the client, Ecopower Developments, and with Malachy Walsh and Partners' in-house engineering team was conducted on an ongoing basis in order to formulate a project design which would avoid, by design and at source, any construction activities that could initiate potential water quality impacts. As a consequence, all aspects of the construction of the proposed windfarm and its layout adopted an avoidance by design approach. An example of this aspect of the avoidance by design approach is the fact that the windfarm roads and the turbine sites for the most part were located on the least ecologically sensitive areas found during the site investigation in order to minimise potential impacts. In addition, it was decided to remove if possible, from the projects design, all elements that could impinge on the conservation interests of the nearby Lower River Suir cSAC and the Lower River Shannon cSAC located downstream thereby avoiding impacts at source.

1.5.2 Desk Study

A desk study was carried out to collate available information on the proposal site's natural environment. This comprised a review of the following publications and datasets:
OSI Aerial photography and 1:50000 mapping;
National Parks and Wildlife Service (NPWS);
BirdWatch Ireland;
Teagasc soil area maps (NBDC website);
Geological Survey Ireland (GSI) area maps;
Environmental Protection Agency (EPA) water quality data;
Shannon River Basin District (ShRBD) datasets (Water Framework Directive);
South Eastern River Basin District (SERBD) datasets (Water Framework Directive); and
National Biodiversity Centre (NBDC) (on-line map-viewer).

1.5.3 Ecological Site Surveys

1.5.3.1 *Habitat surveying, mapping and evaluation*

Field surveys were conducted by ecologists during the month of June 2012. Habitats were categorised according to the Heritage Council's '*A Guide to Habitats in Ireland'* (Fossitt, 2000) to level 3.

The habitat mapping exercise had regard to the 'Best Practice Guidance for Habitat Survey and Mapping' (Smith *et al.* 2011) published by the Heritage Council. Laminated A3 aerial photography was used together with a GPS to accurately enable field navigation. Habitat categories, characteristic plant species and other ecological features and resources were recorded on waterproof field sheets.

Scientific and common names for plants follow Parnell *et al.* (2012) and Blamey *et al.* (1996), respectively. Habitat boundaries and associated attribute data were mapped using desk-based GIS software, namely ArcView 9.2.

1.5.3.2 *Water quality and aquatic habitat assessment*

In order to to collect baseline water quality data and in order to conduct fisheries and riparian habitat evaluations, a programme of biological and physico-chemical water quality assessments were undertaken in the waterways draining the area of the proposed windfarm. Streams in the vicinity of the proposed development were surveyed by an ecologist on the 11th of June and 22nd of August, 2012. A total of six sampling points were strategically identified at locations within the catchment areas of the proposed Upperchurch Windfarm site in order to assess and give an indication on the water quality in the immediate area surrounding the proposed windfarm site.

Biological water quality monitoring refers to Q Value system of ranges where the relationship between water quality and the in-stream macroinvertebrate community is described in numerical terms. A Q value of 5 indicates very high water quality while a Q value of 1 indicates poor water quality. Kick sampling, where the river bed is disturbed using the foot immediately upstream of a kick net, which collects the sample, was conducted at five sampling stations just downstream of the study area. Macroinvertebrate samples were returned to the laboratory where species within each kick sample were identified to genus level. Differing macroinvertebrate species are assigned to a group according to its tolerance of or sensitivity to water pollution. A river is then assigned a Q value based on these groupings. Table 1, below indicates the relationship between Q values and water quality.

Table 1: Relationship between biotic index (Q-value) and water quality.

Biotic Index	EPA Water Quality	Water Framework Directive Ecological Status	Quality Status
Q5	Good	High	Unpolluted Waters
Q4-5	Fair - Good	High	
Q4	Fair	Good	
Q3-4	Doubtful - Fair	Moderate	Slightly Polluted Waters
Q3	Doubtful	Poor	Moderately Polluted Waters
Q2-3	Poor - Doubtful	Poor	
Q2	Poor	Bad	Seriously Polluted Waters
Q1-2	Bad - Poor	Bad	
Q1	Bad	Bad	

1.5.3.3 *Ornithological surveys*

Winter Hen Harrier Survey 2010/2011

Field surveys were undertaken at the proposed site in order to examine the usage and activity of hen harriers at the site during the winter of 2010/2011.

Vantage Point Observations

Vantage point observations were carried out in order to assess the level of raptor activity and purpose at the development site. These observations were carried out in accordance with NPWS hen harrier survey guidelines. Three (3) vantage point locations were selected in order to obtain maximum visibility of the site and habitats outside the site boundary.

Vantage point watches were of six (6) hours duration and the three vantage points were watched for a total of eighteen (18) hours per site visit. During the course of the survey from November 2010 to March 2011 the site was watched for a total of ninety (90) hours. The locations of the vantage points are illustrated in Figure 6-7 at the end of this report.

Summer Hen Harrier Survey 2011

Vantage Point Observations

Vantage point observations were carried out in order to assess the level of raptor activity and purpose at the development site during the summer of 2011. These observations were carried out in accordance with NPWS hen harrier survey guidelines. The vantage point locations chosen for the summer hen harrier survey remained the same as those chosen for the winter hen harrier survey.

Vantage point watches were of six (6) hours duration and the three vantage points were watched for a total of eighteen (18) hours per site visit. During the course of the summer survey from April to July 2011 the site was watched for a total of seventy two (72) hours. The locations of the vantage points are illustrated in Figure 6-7 at the end of this report.

Transect surveys

Winter Transect counts were undertaken on 19th January and 16th March 2011 at five locations across the site and their locations are illustrated in Figure 6-8 at the end of this report. Transect counts were undertaken on 19th May and 12th July 2011 at the same five locations as the winter bird survey.

1.5.3.4 *Otter survey*

A survey for signs of otters, including scat and evidence of otter holts, was carried out in conjunction with the programme of water quality assessments described above and during the ecological site visits.

1.5.4 Assessment of Potential Impact Significance

Once the potential impacts that may arise from the proposal are identified the significance of these is assessed through the use of key indicators:

Habitat loss;

Habitat alteration;
Habitat or species fragmentation;
Disturbance and/or displacement of species; and
Water quality and resource.

In line with the EPA Guidelines (EPA, 2002), the following terms are defined when quantifying duration:
Temporary: up to 1 year;
Short-term: from 1-7 years;
Medium-term: 7-15 years;
Long-term: 15-60 years; and
Permanent: over 60 years.

The criterion for confidence levels of the predicted likely impacts are given here in Table 1 as recommended by IEEM, (2006) and NRA, (2009).

Table 2: Confidence levels of predictions of likely impacts as outlined in NRA (2009) and IEEM (2006).

Confidence level category	
Near certain	>95% chance of occurring as predicted
Probably	50-95% chance of occurring as predicted
Unlikely	5-50% chance of occurring as predicted
Extremely unlikely	<5% chance of occurring as predicted

The impact significance criteria follow EPA guidance (EPA, 2002).

Table 3: Significance of impact (EPA, 2002).

Significance of Impacts	**Definition**
Imperceptible Impact	An impact capable of measurement but without noticeable consequences.
Slight Impact	An impact which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate Impact	An impact that alters the character of the environment in a manner that is consistent with existing and emerging trends.
Significant Impact	An impact which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Profound Impact	An impact which obliterates sensitive characteristics.

2 Stage 1 Screening

2.1 Management of Natura 2000 Site

The proposal is not connected with or necessary to the conservation management of a Natura 2000 site.

2.2 Description of Project

2.2.1 Brief Project Description

In this revision of the NIS for the RFI it is important to note that T22 has been moved 110m to the south. It is in the same habitat type, however, and it is now a distance of 419m (previously 458m) from the nearest watercourse and 2.1km (previously 2.0km) to the Slievefelim to Silvermines SPA.

It is proposed to construct the 22 turbine windfarm at a location situated approximately 1.9 km west of the village of Upperchurch and a further 18 km west of Thurles in County Tipperary. The turbines are numbered T01 to T22 and are arranged in four clusters as follows:
T01 to T08 are arranged around two hills at Shevry;
T09 to T16 are arranged around the hill at Knocknamena;
T17 to T21 are arranged around two hills at Knockmaroe and Foilnaman; and
T22 is a single turbine on the northeast side of the hill at Knockcurraghbola.

The individual clusters occur within a series of small hills or drumlins and are distributed over an area of 12km^2. The hills are at elevations of between 363mOD and 411mOD and the peaks are generally at heights of 100m above the intervening lower terrain. The highest peak is that of Knockmaroe at an elevation of 411mOD (Grid Ref: R193372 160945). All of the proposed wind turbine locations are on elevated sloping ground with good natural drainage to the streams in the surrounding valley.

2.2.2 Purpose of the Project Proposal

The purpose of the project is to generate electricity from wind energy and to export to the national grid. It will produce pollution free electricity with the capacity to provide power, generating 150 million kWh, for up to 23,070 homes.

2.2.3 Description of the Site

The principal land uses within the greater area are pasture (dairy farming and dry cattle) and some blocks of conifer plantation occur within the site. The surrounding local landscape is a mixture of predominantly improved agricultural grassland, acidic grassland, upland blanket bog with some of this habitat forming mosaics with wet heath.

An ecological survey, conducted as part of the EIS associated with the proposed windfarm, determined that the habitats listed at Table 4, below, comprise the habitats in the area of the proposed windfarm.

It was clear from the ecological survey that the extent of upland blanket bog habitat within the site boundary and the greater geographical area was larger historically. Both the quality and extent of this habitat has been significantly reduced by peat-cutting and agricultural land management practises including drainage, grazing, fertilisation and reseeding. There is evidence of peat harvesting in the past with small areas of this habitat occurring within limited sections of the site where peat banks of up to 1.3 m can be seen.

The soil composition within the turbine cluster areas is, variously comprised of mosaics of 'Surface water Gleys / Ground water Gleys acidic' ,'Lithosols / Regosols', 'Podzols Peaty', 'Shallow Peaty Gleys' and 'Acid Brown Earths/ Brown Podzolics'. Bedrock at the location is 'Silurian Metasediments and Volcanics' with some rock outcropping, most notably at the northeast part of the site.. The Corine Landcover classes 'Pasture', 'Bog', 'Other' and 'Forestry' are the dominant types in the area around the windfarm and in the greater geographical area extending away from the proposal site[1].

Three first order streams situated adjacent to the proposed windfarm site drain into streams that form the upper reaches of the Turraheen, Owenbeg, Clodiagh and Aughvana Rivers. The first three of these rivers form part of the South Eastern River Basin District and ultimately join the River Suir to the southeast. The Aughvana River, which forms part of the Shannon River Basin District, joins the Mulkear River and ultimately flows into the River Shannon to the east of Limerick City.

The site drains to the different rivers as follows:

Suir Catchment

The area around turbines T01 and T02 drains towards the west to an unnamed tributary of the Turraheen River.

The area around turbines T03, T04, T05 and T06 drains to the southeast to the Owenbeg River and its tributaries.

The area around turbines T07, T08 and T09 drains to the north to the streams that form the upper reaches of the Clodiagh River.

The area around turbines T10, T11, T13 and T15 drains to the south and southeast to tributaries of the Owenbeg River.

The area around turbines T12, T14 and T16 drain to the west and north to the Clodiagh River.

The areas around turbines T19, T20, T21 and T22 drain in different directions to unnamed tributaries of the Clodiagh River to the north.

[1] Data in this paragraph from http://maps.biodiversityireland.ie/#/Map [accessed 06/09/2012]

Shannon Catchment

The area around turbines T17 and T18 drains south to an unnamed tributary of the Aughvana River. This is the only part of the overall site that forms part of the Shannon River Basin District.

2.2.4 Ecological description of the proposed Upperchurch Windfarm Site

2.2.4.1 *Terrestrial Ecology*

Habitat surveys were conducted by ecologists during the month of June 2012. Habitats were categorised according to the Heritage Council's 'A Guide to Habitats in Ireland' (Fossitt, 2000) to level 3. A total of 13 habitats types were identified within the proposed Upperchurch Windfarm EIS study area. The predominant habitats within the site are improved agricultural grassland and conifer plantation.

See Volume 2 Chapter 6 Figure 6-4 A, B and C for a habitat map of the proposed Upperchurch Windfarm site. Site photographs of habitats are presented in Appendix 6-1, Volume 3. Table 4, below, lists the habitats recorded during the habitat survey with a qualitative description.

Table 4 Summary list of habitats recorded with spatial description

Habitat (code)	Evaluation
Improved Agricultural Grassland (GA1)	There is an extensive cover of Improved Agricultural Grassland throughout the site. The habitat is not species rich (as per agricultural grassland) but is of value to species which forage within it.
Coniferous Plantation (WD4)	There are 5 stands of conifer plantation within the study area planted on heath/upland blanket bog habitat. The dense growth within this habitat means there is very little light penetration reducing the diversity of plant species at ground level. Some areas have been felled and replanted. The younger stands have much more diverse vegetation undergrowth.
Wet Grassland (GS4)	This habitat is common in the lower lying areas and along margins of streams of the site. The wet grassland habitat has been modified by the building of drains around the field boundaries, reseeding and the application of fertiliser. While generally species poor the habitat is considered to be of some ecological value.
Wet Heath (HH3)	An area to the west of T2 in the south eastern section is classified as wet heath. This area was dominated by bell heather and purple moor-grass. This area would be subject to cattle grazing. Peat depth is low, approximately 0.3m. Formed due to peat extraction.
Acid Grassland (GS3)	This habitat occurs mainly outside of the enclosed grassland farm areas in areas where no reclamation has taken place but is extensively grazed by cattle. This habitat occurs to the south east of turbines T3 and T4 and on steep slopes to the northwest of turbine T21.
Upland Blanket Bog (PB2)	Upland blanket bog is one of the least dominant habitats within the study area. The habitat has been degraded by previous peat extraction, land reclamation, conifer plantation, grazing and drainage.
Eroding/Upland River (FW1)	There are 3 small, first order streams within the study area. These streams are quite small. Extensive man made drainage features drain into these habitats to dry out the surrounding low lying landscape.
Hedgerow (WL1)	There is a network of hedgerows along the improved grassland field boundary throughout the site.
Drainage Ditches	Man-made features extending around the boundaries of lower lying

Habitat (code)	Evaluation
(FW4)	agricultural fields and conifer plantation within the study area. Many are large with some vegetation.
Spoil and Bare Ground (ED2)	The forestry and farm roads within the site fall into this habitat category and are dominated by compact gravel which is naturally occurring to the area
Buildings and Artificial Surfaces (BL3)	Habitat of very low ecological value.
Treelines (WL2)	There are some small sections of treelines within the study area which mostly occur along tree-lined roads.
Neutral Grassland (GS1)	One section of this habitat near turbine T22.

2.2.4.2 *Aquatic Ecology*

A water quality assessment was undertaken of the waterways draining the proposed windfarm site to provide baseline water quality, fisheries and riparian habitat data. Watercourses in the vicinity were surveyed by an ecologist on the 11th of June and the 22nd August 2012.The survey results will provide a baseline for future monitoring to ensure that the existing water and habitat quality of watercourses within and adjacent to the site are maintained during the construction and operational phase of the proposed windfarm development.

The study area is situated on hills or drumlins with a number of streams that support the upper reaches of the Owenbeg, Clodiagh and Turraheen River catchments which drain to the Suir. Tributaries of the Clodiagh River drain the northern and central locations of the site while the southern and eastern portion of the site are drained by tributaries of the Owenbeg and Turraheen Rivers. The westerly cluster comprised of turbines T17 and T18 is drained by an unnamed tributary of the Aughvana River and is the only part of the overall site that forms part of the Shannon River Basin District.

A total of six sampling points were strategically identified at locations within the catchment area of the proposed Upperchurch Windfarm site in order to assess and give an indication on the water quality in the immediate area surrounding the proposed site.Table 5 below details the Grid References and Q value of each sampling station on which the survey was undertaken.

Table 5 List of Sampling Stations with Q values

Sampling Station	Grid Reference	Location	Q Value
1	97973 61082	Unnamed stream (east of site) which flows to the Owenbeg River	Q3
2	97336 59293	Owenbeg river (east of site)	Q4
3	94363 59329	Unnamed stream (southern section of the site) which flows to the Turraheen River	Q4
4	95056 62330	Unnamed stream (central area of site) which flows to the Clodiagh River	Q4
5	94623 63001	Unnamed stream (northern section of the site) which flows to the Clodiagh River	Q4-5
6	93464 59759	Unnamed stream (southern section of the site) which flows to the Aughvana River	Q3

2.2.4.3 *Physiochemical water quality*

Table 2-6: Physiochemical water quality recorded at the Upperchurch site, Co. Tipperary.

Parameter	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Salmonid Regulations S.I. No. 293 of 1988	Surface Water Regulations S.I. No. 272 of 2009
pH	7.5	7.6	7.2	7.7	7.6	7.7	>6 & <9	
Alkalinity, mg/L as CaCO3	72.5	62.9	91.1	81.0	56.6	119		
Temperature	11.28	11.98	10.03	12.29	12.46	12.10		

Parameter	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Salmonid Regulations S.I. No. 293 of 1988	Surface Water Regulations S.I. No. 272 of 2009
Suspended solids mg/L	3	2	6	<2	<2	18	<25	
BOD (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0	1.4	<5	<2.2
Nitrate(mg/L) NO3-N	1.08	0.73	2.07	1.23	0.65	1.95		
Nitrite (mg/L)NO2-N	<0.005	<0.005	<.005	<.005	<.005	0.01	<0.05	
Sulphate (mg/L)	5.14	4.85	5.70	4.78	4.56	4.36		
MRP, mg/L P	0.01	0.01	0.01	0.02	0.01	0.06		≤0.035
Total phosphorous P (mg/L)	0.09	<0.04	0.16	0.06	0.04	<0.04		
Total dissolved phosphorous P (mg/L)	0.09	<0.04	0.12	0.06	0.04	<0.04		
Particulate phosphorous (mg/L)	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04		
Ammonia	0.03	0.02	<0.02	0.03	0.02	<0.02	≤ 1	
Ammonia (unionised)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	≤ 0.02	
Metals								
Iron (mg/L)	0.251	0.146	0.025	0.089	0.110	0.16		
Aluminium (mg/L)	0.019	0.042	0.023	0.037	0.024	0.05		

Physiochemical water quality testing was undertaken on the 11th of June and 22nd of August 2012 at the same location as the Q value sampling to establish the baseline water quality of watercourses immediately downstream of the proposed windfarm.

Dissolved oxygen levels were >11mg/L in all the watercourses that were surveyed, indicating that all of the surface waters in the catchment areas had levels of oxygen capable of supporting healthy salmonid populations as per the Salmonid Water Regulations (SI No. 293 of 1988) .The pH levels at all sampling stations ranged between 7.5 and 7.7. These fall within the range >6 and <9 required under the Salmonid Water Regulations (S.I. No. 293 of 1988), required for balanced and healthy fish populations in the Salmonid Regulations.

Levels of unionised ammonia and nitrite recorded were within the thresholds specified in the Salmonid Regulations (S.I. No. 293 of 1988).Similarly the BOD levels were low with sites 1 through 5 inclusive, recording <1.0mg/L BOD and site 6 recording the highest levels; 1.4mg/L BOD. All sites were in compliance with the Salmonid Water Regulations.

Ortho-phosphate (MRP) levels were similar across sampling sites with 0.01mg/L levels recorded at sites 1, 2, 3 and 5 with site 4 recording 0.2mg/L and site 6 recording the highest levels of 0.06mg/L. Sites 1 through 5 levels are below the levels recommended in the Surface Water Regulations (S.I. No. 272 of 2009) meeting the requirements of the regulation, however site 6 exceeds the ≤0.035 recommended levels.

The suspended solid levels were low for streams 1 through 5, with levels recorded ranging from 2mg/L to 6mg/L. The value at sampling station 6 was the highest at 18 mg/L. All streams were in compliance with the threshold of <25mg/l required under the Salmonid Water Regulations (S.I. No. 293 of 1988).

2.2.5 Characteristics of the Project (Construction Phase)

2.2.5.1 *Size, scale, area, land-take*

The proposed windfarm site does not require land take from a Natura 2000 or Ramsar site. The proposed windfarm site is made up of four sections distributed in separate clusters over an overall area of approximately 12km^2. The total proposed site footprint is 110,210 m^2

2.2.5.2 *Resource requirement*

It is estimated that a total of 17,020m^3 of material will be required for the widening of existing tracks and the construction of new access tracks for the proposed development. It is estimated that construction of the hardstand areas will involve a total volume of 31,100m^3 of imported stone material. It is proposed to source the materials from at local registered quarries.

An average of 345m^3 of imported concrete will be required for each base.

2.2.5.3 *Transportation requirements*

New and upgrading of existing access tracks will be required to facilitate construction and turbine traffic during the construction, operational and decommissioning phases.

It is proposed that the turbine components will be delivered either from Dublin port or Foynes port. If the components are delivered from Dublin Port they will be transported west along the M7 to the Nenagh by-pass and turn onto the R498 at Knockalton Upper. If the turbine components are delivered from Foynes Port they will be transported east on the M7 to the Nenagh by-pass and turn right on the R498 at Knockalton Upper. The traffic will then travel the R498 into Thurles and turnaround at the Tipperary Institute roundabout and travel back up the R498 for 2.5km in order to effect the turn left onto the R503 after the Racecourse. The vehicles will travel west along the R503 for 17.1km and turn left onto the proposed Upperchurch Windfarm site entrance at an existing field gate at Graniera. The turbine deliveries and construction traffic will also use entrances from the local roads at Knockmaroe, Knockcurraghbola Commons, Shevry, Grousehall and Knocknamena Commons. It is expected that construction materials will be transported along a similar route.

2.2.5.4 *Equipment requirement*

In association with the above materials the following is a non-exhaustive typical list of plant and equipment that may be required for construction:

30-50T Excavators;

Low ground pressure excavators (Bogmaster);

Mobile cranes for construction;

Rebar/shuttering/precast units/conc pipes/box culverts;

Cranes (1 main, 1 assist) Erection 120t to 800t;
Dump trucks;
Tractors and trailers;
Double contained fuel bowsers;
12t Rollers;
Crushers;
Screener;
Diesel powered generators; and
Water bowsers.

2.2.5.5 *Excavation requirements*

Implementation of the development will result in the removal of soil, subsoil and rock in parts of the site in order to facilitate the construction of access roads, the upgrade of existing farm roads, the substation compound, crane hard standings and turbine bases. This soil will be reused within the construction site for backfilling around turbine bases and for landscaping post construction.

The volumes of material to be excavated are summarised in Table 7**Error! Reference source not found.**.

Table 7 Volumes of material to be excavated

Element	Topsoil (m^3)	Peat (m^3)	Subsoil (m^3)
Turbine T01	540	-	4,281
Turbine T02	527	-	3,832
Turbine T03	481	-	2,160
Turbine T04	540	-	4,281
Turbine T05	-	570	5,318
Turbine T06	540	-	4,281
Turbine T07	545	-	4,433
Turbine T08	518		3,255
Turbine T09	545	-	4,433
Turbine T10	507	-	3,160
Turbine T11	498	-	2,725
Turbine T12	550	-	4,798
Turbine T13	540	-	4,281
Turbine T14	-	520	3,603
Turbine T15	520	-	3,603
Turbine T16	518	-	3,255
Turbine T17	505	-	2,928
Turbine T18	505	-	2,928
Turbine T19	498	-	2,725
Turbine T20	518	-	3,255
Turbine T21	505	-	2,928
Turbine T22	507	-	3,160
New roads	13,050	900	0
Widened roads	2,070	360	0
Sub-totals (m^3)	25,527	2,855	79,623
Total (m^3)	107,500		

2.2.5.6 *Emissions during the lifetime of the project*

Air pollutants from construction vehicles, plant, machinery or generators may include emissions of SO_2, NO_x, CO_2, and PM_{10} (particulates). Any traffic generated by the construction phase will be temporary and of short duration and may cause a temporary, slight, negative impact within the site.

There are no air pollutants or emissions associated with the operational phase of the windfarm. As a result there will be a neutral impact on the local area during the operational phase. The operation of the windfarm will have a positive impact on the national air and climate environment however, through the provision of pollution-free electricity.

2.2.5.7 *Waste Management*

From a waste management perspective the project can be divided into three phases
Construction;
Operation/Maintenance; and
Decommissioning.

Construction phase waste may consist of hardcore, stone, concrete, steel reinforcement, shuttering timber and unused oil and diesel. This waste will be collected at the end of the construction phase and taken off site to be reused, recycled and disposed of in accordance with best practice procedures at an approved facility. Waste from toilets will be taken from site on a regular basis by approved contractors and disposed of in an authorised facility in accordance with best practice. Plastic waste will be taken for recycling by approved contractor and disposed or recycled at an approved facility.

Wastes arising during the operating phase of the project include but are not limited to lubricating oils, cooling oils and packaging from spare parts. The containment and disposal of such oils will be carried out in a safe manner by an approved contractor. Such operations will be carried out in accordance with the Waste Management (Hazardous Waste) Regulations, 1998. The remaining wastes will all be removed from site and reused, recycled or disposed of in an authorised facility in accordance with best practice.

Wastes generated during the decommissioning phase will be taken off site and disposed of appropriately.

2.2.5.8 *Timescales*

Once construction commences, it is estimated that the windfarm could be constructed within 8 months.

2.2.6 Description of construction

The first priority of the construction phase will be to construct the access road network, and associated drainage network, and upgrade the existing roads and the spine roads in particular so that they are capped with limestone or similar quality stone to reduce the potential for road degradation. Vehicular movements will be restricted to the footprint of the proposed development, particularly with respect to the newly constructed access roads.

The development is characterised by the following civil engineering works which will be undertaken to provide the necessary infrastructure to complete the windfarm:

Construction of a temporary site compound;

Construction of the access tracks and associated drainage;

Construction of stream crossing;

Construction of the turbine foundations;

Construction of the hard stand areas for the turbine assembly and erection;

Turbine and ancillary equipment transport to the site;

Turbine erection;

Construction of the electrical control building; and

Laying of electrical cables.

2.2.6.1 *Temporary site compound*

A temporary site compound will be used at the site during the construction period for the safe storage of supplies and equipment, and the provision of toilet facilities (with temporary holding tank) and canteen facilities for construction staff. The holding tank will be emptied on a regular basis and taken to a wastewater treatment facility by a contractor with the appropriate waste collection permit. The compound and associated facilities will be removed on completion of construction and the area will be appropriately reinstated.

2.2.6.2 *Access Roads*

The construction phase of this project will require deliveries of material and turbines to the site. The access roads to the turbines and the site substation will consist of both existing tracks and newly constructed roads.

Importation of stone from local quarries for the construction of access roads and hard standings.

Construction of 8.0 km of 5.00m wide new roads; and

Widening and upgrading of 3.9 km of existing farm roads (average 2m widening).

All new roads will be excavated, built up with suitable material and capped with suitable material.

2.2.6.3 *Drainage*

Site drainage has been considered in the Sediment and Erosion Plan detailed in Appendix 15.2 Volume 3. of the EIS. This plan has been prepared to prevent sediment runoff and control erosion during the construction phase of the project. The plan has also been designed to minimise disturbance to the current hydrological regime and to minimise suspended sediment loading to watercourses during construction. Access tracks will be provided with drainage ditches to collect surface water runoff from the tracks and to ensure that road foundations are protected from standing water. Surface water drains will also be provided around hardstandings, foundations and the compound. Upslope drains will be constructed so as to keep clean water separate from runoff that may be contaminated by sediment. This is standard practice in the control of sediments in windfarm construction. Sediment traps will be used to ensure that all water discharged is clean.

2.2.6.4 *Clearfelling*

Prior to construction, clear-felling of approximately 4.35 ha area of conifer plantation will be required to facilitate the construction the proposed windfarm and associated infrastructure.

2.2.6.5 *Wind Turbine foundations and hardstands*

Excavation for the construction of 22 turbine bases with a minimum depth of 2.00m and 225m^2 plan area and hardstands with and excavation depth of 0.60m and 1,040m^2 plan area;

Each wind turbine will have a reinforced concrete base pad foundation with a central upstand above the base, which will support the tower. The foundation pad will bear onto rock or other such suitable bearing stratum.

The turbine foundations be backfilled with the materials removed during excavation. The surface vegetation and topsoil layer will be removed and stored adjacent to the foundation site, whilst excavation of the foundation progresses. This stored material will be used during reinstatement of the foundation area following the construction of each wind turbine foundation.

Erection of 23 turbines with hub heights of up to 85m and maximum tip height of up to 126.60m. Once erected the wind turbines will operate automatically, requiring visits on a periodic basis only. These visits, primarily for turbine servicing, will typically be made using four-wheel drive vehicles which will keep to access roads.

2.2.6.6 *Sub-station and grid connection*

Construction of an electrical substation compound and installation of associated equipment and laying of electrical cable between turbines and the substation compound will be required. The substation compound will measure 64m x 41m. The cabling from the proposed turbines of the Upperchurch Windfarm will link to the proposed sub-station on site. The cables linking the turbine transformers will be located underground to reduce visual impact. A trench of at least 1m deep and 0.5m wide will accommodate these cables.

2.2.7 Operation, decommissioning and restoration

The windfarm will have a projected commercial lifespan of 20-25 years during which time it will produce pollution free electricity with the capacity to provide power, generating 150 million kWh, for up to 23,070 homes. There will be maintenance during the operating period with operating and maintenance personnel typically using four-wheel drive vehicles to visit the site. The system may be readily upgraded at the end of its commercial life, or alternatively decommissioned.

If it is decided to decommission the windfarm at the end of its lifespan, the turbines, transformers, meteorological monitoring mast and substation will be dismantled and removed from the site following consultation with North Tipperary County Council. All associated hardstand areas will be remediated to match the surrounding landcover at the time. An environmental assessment will be undertaken at that time to ascertain whether or not it would be more or less environmentally damaging to remove or keep in place the underground cables and access tracks. All materials removed from the site will be treated in accordance with best practice waste management procedures and will be in consultation with North Tipperary County Council.

2.2.8 Identification of other projects or plans

There are a number of existing windfarms to the west and south of the site. These are listed at Table 8, below.

Table 8: Neighbouring Windfarms in the vicinity existing and permitted.

Wind farm	Number of Turbines	Distance and direction from proposed site	Status
Knockastanna, Co Limerick	4	8.1km S	Operating
Mienvee	1	9km SW	Operating
Garracummer	15	3.5km SW	In Construction
Falleennafinoga	2	5.5km S	In Construction
Hollyford	3	5.5km S	Permitted
Glencarbry	9	6.3kn S	Permitted
Glenough	14	3.2kn S	Operating
Cappagh White	18	8.5km S	Permitted
Curraghgraigue	6	9.5km N	Operating
Knockmeale	2	8.2km NW	Permitted
Knockastanna, Co Limerick	4	8.1km S	Operating

Other relevant projects and plans include:

Agriculture is one of the main land uses within the area. Land reclamation, drainage, reseeding, fertilisation, and intensive grazing has transformed the landscape of this area.

Forestry occurs within sections of the site**,** consisting of either mature or young conifer plantations. Felling has been carried out in sections and has been replanted with the youngest observed at the location of Turbine 22 standing at 1.5 meters high.

2.3 Identification of Natura 2000 sites

2.3.1 Zone of impact influence

The screening stage of AA involves compiling a 'long list' of European sites within a zone of potential impact influence for later analysis which may or may ultimately not be impacted upon by the proposal. All Natura 2000 sites within 15km of the proposal location will be characterised in the context of the rationale for designation and qualifying features, in accordance with NPWS guidance. Following this, the potential impacts associated with the proposal will be identified before an assessment is made of the likely significance of these impacts. Finally, in the conclusion of the screening stage, the Natura 2000 sites within 15km whose integrity will not be adversely impacted will be ruled out. If screening indicates sites will be affected it will be necessary to proceed to Stage 2, Appropriate Assessment for a more detailed assessment.

2.3.2 Identification of Natura 2000 and Ramsar sites

Adopting the precautionary principle in identifying potentially affected European sites, it has been decided to include all cSACs and SPAs/Ramsar sites, within a 15km radius of the proposed windfarm site. The Convention on Wetlands of International Importance especially as Waterfowl Habitat, more commonly known as the Ramsar Convention, was ratified by Ireland in 1984. Ramsar sites are also subject to AA screening. Although not specifically required, it would be considered best practice to include Ramsar sites (classified under the Ramsar Convention 1971) in the appropriate assessment process[2].

Table 9 below lists all designated cSACs and classified SPA sites (referred to as designated sites from hereon in) within 15km of the proposal site including their proximity.

Table 9: Designated conservation sites within a 15km radius of proposal site

No.	Designated Site	Site Code	Proximity of site to nearest point of designated site
1	Slievefelim to Silvermines Mountains SPA	004165	Adjacent to the western boundary of turbines T17 to T21.
2	Anglesey Road cSAC	002125	2.55km south west of the proposed windfarm site.
3	Lower River Shannon cSAC	002165	2.7km west of the site boundary (T17 to T21).
4	Lower River Suir cSAC	002137	2.8km east of the proposed windfarm site and approximately 4.1km downstream.
5	Bolingbrook hill SAC	002124	6.9km north west of the site

[2] EPA, A Note on Waste Water Discharging Licence Appropriate Assessments

No.	Designated Site	Site Code	Proximity of site to nearest point of designated site
			boundary (T17 to T21).
6	Keeper Hill SAC	001197	10.7km north west of the site boundary (T17 to T21).
7	Silvermines mountains West SAC	002258	11.25km north west of the site boundary (T17 to T21).
8	Kilduff, Devilsbit Mountain SAC	000934	13.35km north east of the site boundary (T9 to T16)
9	Philipston Marsh SAC	001847	13.6km south west of the site boundary (T1 to T8).

2.3.3 Characteristics of Natura 2000 and Ramsar sites

Table 10, below, characterises the cSACs, SPA and Ramsar sites that lie within 15km of the proposal site by listing the qualifying features and other conservation interests (information pertaining to designated sites is from site synopses, conservation objectives and other information available on www.npws.ie and on the Ramsar website). The qualifying Features of Interest are the primary reasons for the European sites designation, for instance the endangered species that occupy the SAC; rare habitats that occur there; or threatened birds that breed or over-winter in the SPA.

Table 10: Designated conservation sites with qualifying Features of conservation Interest

Designated Site	Site Code	Features of Interest
Slievefelim to Silvermines Mountains SPA	004165	Hen Harrier (*Circus cyaneus*) [A082]
Anglesey Road cSAC	002125	Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230]

Lower River Shannon cSAC	002165	Freshwater pearl mussel (*Margaritifera margaritifera*) [1029] Sea lamprey (*Petromyzon marinus*) [1095] Brook lamprey (*Lampetra planeri*) [1096] River lamprey (*Lampetra fluviatilis*) [1099] Salmon (*Salmo salar*) [1106] Sandbanks which are slightly covered by sea water all the time [1110] Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140] Coastal lagoons [1150] Large shallow inlets and bays [1160] Reefs [1170] Perennial vegetation of stony banks [1220] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230] Salicornia and other annuals colonizing mud and sand [1310] Spartina swards (Spartinion maritimae) [1320] Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] Bottle-nosed dolphin (*Tursiops truncatus*) [1349] Otter (*Lutra lutra*) [1355] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Molinia meadows on calcareous, peaty or clavey-silt-laden soils (*Molinion caeruleae*) [6410] Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0]
Lower River Suir cSAC	002137	Freshwater pearl mussel (*Margaritifera margaritifera*) [1029] White-clawed crayfish (*Austropotamobius pallipes*) [1092] Sea lamprey (*Petromyzon marinus)* [1095] Brook lamprey (*Lampetra planeri*) [1096] River lamprey (*Lampetra fluviatilis*) [1099] Allis shad (*Alosa alosa*) [1102] Twaite shad (*Alosa fallax fallax*) [1103] Salmon (*Salmo salar*) [1106] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Otter (*Lutra lutra*) [1355]

Designated Site	Site Code	Features of Interest
		Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] Old sessile oak woods with *Ilex* and Blechnum in British Isles [91A0] Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0] *Taxus baccata* woods of the British Isles [91J0]
Bolingbrook hill SAC	002124	Northern Atlantic wet heaths with *Erica tetralix* [4010] European dry heaths [4030] Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230]
Keeper Hill SAC	001197	Northern Atlantic wet heaths with *Erica tetralix* [4010] Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230] Blanket bog (*active only) [7130]
Silvermines Mountains West SAC	002258	Northern Atlantic wet heaths with *Erica tetralix* [4010] European dry heaths [4030] Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230] Blanket bog (*active only) [7130]
Kilduff, Devilsbit Mountain SAC	000934	European dry heaths [4030] Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230]
Philipston Marsh SAC	001847	Transition mires and quaking bogs [7140] Alkaline fens [7230]

Conservation Objectives of the sites outlined in Table 10 above are included in Appendix 1.

2.3.4 Conservation Objectives

According to the Habitat's Directive, the *conservation status of a natural habitat* will be taken as 'favourable' when:

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

According to the Habitat's Directive, the *conservation status of a species* means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations. The *conservation status* will be taken as 'favourable' when:

population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, *and*
the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, *and*
there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.
These conservation objectives are of a wide-ranging nature and most of the conservation objectives developed by NPWS for Natura 2000 sites area are adapted from these and are published on line by the NWPS as 'Generic Conservation Objectives' documents. The available documents are included in Appendix 2. Site specific Conservation Management Plans have been developed for some sites listed at Table 10, above, namely Bolingbrook Hill, Keeper Hill and Kilduff, Devilsbit Mountain SACs and these documents are published on line at www.npws.ie.
Figures 2 and 3 at the end of this chapter show the Natura 2000 Sites located within 15 km of the proposed development site. No Ramsar Sites were recorded within 15 km of the proposed development. Natural Heritage Areas (NHAs) and proposed Natural Heritage Areas (pNHAs) have been omitted from the list as they outside the scope of the Appropriate Assessment. The potential impact to these sites is discussed in Ecology chapter of the main EIS document Chapter 6, Volume 2.

2.3.5 Identification of Potential Impacts

Potential impacts are identified in this section. Only those features of the development that have the potential to impact on qualifying features, conservation interests and conservation objectives of the identified Natura 2000 sites are considered.

Description of elements of the project likely to give rise to impacts on Natura 2000 sites.	• Use of plant machinery and associated fuels and oils. • Increased levels of disturbance due to human activities during the construction phase. • Waste generation during construction phase. • Excavations for turbine bases, roads etc. • Extension of the existing road network footprint and associated drainage. • Near and in stream works required for road network stream crossings. • Felling of 4.35 ha. of pre-thicket and post thicket conifer plantation
Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on Natura 2000 sites by virtue of: • *Size and scale;* • *Land-take;* • *Distance from Natura 2000 Site or key features of the Site;* • *Resource requirements;* • *Emissions;* • *Excavation requirements;* • *Transportation requirements;* • *Duration of construction, operation etc.; and* • *Other.*	• Construction phase excavations to be conducted within the catchment of a headwater of an SAC designated for the protection of riparian habitats and species have the potential to initiate point source pollution events. • Soil exposed during construction phase could potentially be transferred via surface water runoff to water courses. • Construction of road network, and its associated drainage network, introduces a potential pollution pathway enabling the transfer of pollutants to ground and surface water during construction and operational phases. • Fugitive noise from construction phase activity and human presence could create disturbance impacts on animal species present within the zone of impact influence. • **Movement of plant and machinery**: Most of the traffic movement within the site will be over existing excavated tracks. • **Ground stability**: The approach to and method of excavation of rock and earth materials is very important for ground stability. Interference with the existing ground stability conditions by inappropriate excavation methods such as continuous vehicular movement over excavated soil must be mitigated by appropriate construction methods. • **Storage, Stockpiles and Waste Generation**: Of significance during the construction phase of the

	project is the handling of excavated materials, their storage and re-use. There is potential for negative direct and indirect short-term minor impact on ground stability and negative direct and indirect short-term moderate to significant impact on water quality, for example slope failure due to excessive loading (surcharge) > 1m in height and the resultant release of peat washings and suspended solids to the surface water system. • **Use of Fuels and Oils:** The plant equipment that will be used during the construction stage is run on hydrocarbons. This implies that mobile equipment will require regular refuelling from a fuelling station, which is likely to be stored on site or will be supplied by a truck / tanker that will be scheduled to re-fuel the plant directly. This poses the potential for spillage and leakage of hydrocarbons from plant equipment and associated transfer stations during the construction phase of this project.
Describe any likely changes to the site arising as a result of: • *Reduction of habitat area;* • *Disturbance of key species;* • *Habitat or species fragmentation;* • *Reduction in species density;* • *Changes in key indicators of conservation value; and* • *Climate change.*	• Due to the alteration of the environment rainwater falling on the development footprint will follow a new drainage regime. • Detrimental water quality impacts could cause significant changes in the water quality influencing the conservation status of the aquatic habitats and designated species creating disturbance or displacement impacts.
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; and* • *Interference with key relationships that define the function of the site.*	Detrimental water quality impacts could cause significant interference with the key relationships that define the structure and function of the site.
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be	The combined elements of the construction phase could potentially create significant impacts in aquatic habitats in streams adjacent to the site and in the Natura 2000 site to which they drain.

significant or where the scale of magnitude of impacts is not known.	

2.4 Assessment of Significance of Potential Impacts

This section considers the list of sites identified in section 2.3 above. The magnitude/extent, probability and duration of significant impacts affecting these sites are examined in the following sections.

It is considered that the proposed windfarm development does not include any element that has the potential to significantly alter the favourable conservation status of species and habitats for which certain Natura 2000 sites, and considered in this document, are designated. It is considered that these sites are outside the zone of impact influence of the proposed windfarm and that the conditions required to initiate a potential 'source-pathway-target' vector connecting the proposed windfarm to these designated sites will not be created. It is further considered that no potential impact pathway connects these designated sites to the location of the proposed works and, therefore, it is objectively concluded that no impact on these sites is reasonably foreseeable as a result of the proposed windfarm. These sites are listed below and will not be considered further in this document.

Anglesey Road cSAC (002125)
Bolingbrook hill SAC (002124)
Kilduff, Devilsbit Mountain SAC (000934)
Silvermines mountains West SAC (002258)
Keeper Hill SAC (001197)
Philipston Marsh SAC (001847)

Therefore, the assessment of significance of potential impacts that follows focuses on the remaining designated sites. These sites are:

Lower River Shannon cSAC (002165)
Lower River Suir cSAC (002137)
Slievefelim to Silvermines Mountains SPA (004165)

The potential for significant impacts on the remaining three Natura 2000 Sites arising from the proposal was determined based on a number of indicators including:

Habitat loss;
Habitat alteration;
Habitat or species fragmentation;
Disturbance and/or displacement of species;
Water quality and resource.

2.4.1 Habitat Loss and Alteration

The proposal considered in this document does not require any land take from any Natura 2000 or Ramsar site. It is considered that no significant habitat loss or alteration impacts, within any of the designated sites considered in this document, are reasonably foreseeable as a result of the proposal considered in this document. Indirect impacts on aquatic habitats are assessed in section 2.4.3 below.

2.4.2 Habitat or Species Fragmentation

Bearing in mind the size, scale and duration of the proposed windfarm and its location relative to the relevant designated sites, it is considered that no significant habitat or species fragmentation impacts are reasonably foreseeable within any of the designated sites considered in this document,as a result of the proposal considered in this document.

2.4.3 Disturbance and/or displacement of species

The species, for which the Natura 2000 sites are designated, can be separated into Aquatic, Terrestrial/Riparian and Avian categories as follows:

2.4.3.1 *Aquatic*

Sea lamprey (P. marinus) [Lower River Suir cSAC and Lower River Shannon cSAC]
Brook lamprey (L. planeri) [Lower River Suir cSAC and Lower River Shannon cSAC]
River lamprey (L. fluviatilis) [Lower River Suir cSAC and Lower River Shannon cSAC]
Salmon (S.salar) [Lower River Suir cSAC and Lower River Shannon cSAC]
Freshwater pearl mussel (M. margaritifera) [Lower River Suir cSAC and Lower River Shannon cSAC]
White-clawed crayfish (A. pallipes) [**Lower River Suir cSAC**]
Allis shad (Alosa alosa) [**Lower River Suir cSAC**]
Twaite shad (A. fallax fallax) [**Lower River Suir cSAC**]
White-clawed crayfish (*A. pallipes*) [***Lower River Suir cSAC***]
Bottle-nosed dolphin (*T. truncatus*) [1349] [***Lower River Shannon* cSAC**]
Aquatic species are considered further in section 2.5.4 Water Quality.

2.4.3.2 *Terrestrial/Riparian*

Otter (L. lutra) [Lower River Suir cSAC and Lower River Shannon cSAC]

2.4.3.3 *Avian*

Hen harrier (Circus cyaneus) [Slievefelim to Silvermines Mountains SPA]

There is the potential that some of the species maybe impacted by the proposed development and this will be considered further in the Natura Impact Statement.

2.4.4 Water Quality

The proposed site drains into streams that form the upper reaches of the Turraheen, Owenbeg, Clodiagh and Aughvana Rivers. The first three of these rivers form part of the South Eastern River Basin District and ultimately join the River Suir [The Lower River Suir cSAC (Site Code:002137)]to the southeast. The Aughvana River, which forms part of the Shannon River Basin District, joins the Mulkear River and ultimately flows into the River Shannon [Lower River Shannon cSAC (Site Code:002165)]. The watercourses both within and adjacent to the site boundary are tributaries of both the Lower River Suir and the Lower River Shannon cSAC.

No work will take place within 50m buffer zones of watercourses, except at clear span bridges or culverts and associated road construction. A total of three first order streams occur within the site boundary. One stream/river crossing will be required approximately 254 m to the north of Turbine 4. All construction method statements will be prepared in consultation with Inland Fisheries Ireland.

Roadside drainage will be an integral part of the proposed Upperchurch Windfarm considered in this document. The construction of new roads and the upgrading and widening of existing farm roads will comprise of an integrated set of drainage and sediment control measures which will allow pollution control attenuation prior to discharge across ground rather than to surface water, thereby preventing water runoff from entering watercourses directly.

While the water quality in the Lower River Suir cSAC and the Lower River Shannon cSAC is not in itself a feature of qualifying interest of the SACs it is the case that adverse impacts to their water chemistry could have indirect impacts on the conservation interests of the site; for example by affecting the distribution and density of white-clawed crayfish and the Fresh water pearl mussel or the distribution and density of salmonids which in turn could, potentially, affect the availability of prey for otter.

2.4.4.1 *Lower River Suir cSAC (Site Code: 002137)*

Most of the Upperchurch site is within the South Eastern River Basin District and drains to the Owenbeg River and ultimately to the River Suir. The River Suir Catchment covers a large area of 3,546km^2, which represents approximately 4% of the land area of the island of Ireland. The catchment includes extensive lowland areas, particularly along the major river valleys such as those of the Suir, the Aherlow, the Multeen and the Anner; and upland areas including parts the Comeragh Mountains, the Knockmealdown Mountains and the Galtee Mountains, rising to an altitude of 919m at Galtymore.

A number of fish species listed under Annex II of the EU Habitats Directive occur within the Suir catchment. These include Atlantic salmon (*S.salar*). All three lamprey species: sea lamprey (*Petromyzon marinus*), river lamprey (*Lampreta fluviatilis*) and brook lamprey (*Lampetra planeri*), which are likely to occur throughout much of the catchment. Allis shad

(*Aloso aloso*) and twaite shad (*Alosa fallax fallax*) which occur in Waterford Harbour and tidal sections of the lower River Suir at least as far upstream as Carrick-on-Suir.

A number of protected invertebrates also occur within the Suir catchment which include the freshwater pearl mussel (*Margaritifera margaritifera*) and the White clawed crayfish (*A. pallipes*).

A fishery survey of the River Suir Catchment and Management Recommendations was prepared by the Regional Fisheries Board on behalf of the SE Region Fisheries Board in 2006. The major objective of the assessment was to establish the status of fish stocks in relation to the ecology of the Suir and its tributaries, and to use this data to generate focused management programmes. The Suir is recognised as a premier brown trout angling fishery and also a major salmon fishery. In 2005 the Suir was ranked as the 4th best salmonid river in Ireland, based on angling returns (CFB, 2006).

2.4.4.2 *Lower River Shannon cSAC (Site Code: 002165)*

The south western boundary of the proposed Upperchurch is within the Shannon River Basin District and drains to the Aughvana River and ultimately to the Mulkear River which is part of the Lower River Shannon cSAC.

The Lower River Shannon cSAC is a very large site stretching along the Shannon valley from Killaloe to Loop Head/ Kerry Head, a distance of some 120 km. 4 species of fish listed on Annex II of the EU Habitats Directive are found within the site. These are Sea Lamprey (*Petromyzon marinus*), Brook Lamprey (*Lampetra planeri*), River Lamprey (*Lampetra fluviatilis*), and Salmon (*Salmo salar*). The three lampreys and Atlantic salmon have all been observed spawning in the lower Shannon or its tributaries. Freshwater Pearl-mussel (*Margaritifera margaritifera*), a species listed on Annex II of the EU Habitats Directive, occurs abundantly in parts of the Cloon River.

2.4.4.3 *Conclusion*

With regard to the conservation interests of the Lower River Shannon cSAC and the Lower River Suir cSAC it is noted that there is the potential for an unmitigated impact as a result of the proposed development. This impact and proposed mitigations are discussed further in the Natura Impact Statement.

2.5 Conclusion of screening stage

In conclusion, to determine the potential impacts, if any, of the proposed windfarm on nearby Natura 2000/Ramsar sites, a screening process for AA was undertaken. The proposed development is within 15km of 9 Natura 2000 Sites. There are no Ramsar sites within 15km of the proposed development.

In concluding the above assessments of significance, it has been shown that there will be no potential impact to the following sites as a result of the proposed development:

Anglesey Road cSAC (002125)
Bolingbrook hill SAC (002124)
Kilduff, Devilsbit Mountain SAC (000934)
Silvermines mountains West SAC (002258)
Keeper Hill SAC (001197)
Philipston Marsh SAC (001847)

However, the proposed project could have potential negative ecological affects on three Natura Sites namely the *Lower River Shannon cSAC, Lower River Suir cSAC* and *Slievefelim to Silvermines Mountains SPA.*

Hence, the recommendation of the screening process is to proceed to Stage 2; Statement for Appropriate Assessment for three Natura 2000 Sites:

Lower River Shannon cSAC (Site code: 002165);
Lower River Suir cSAC (002137); and
Slievefelim to Silvermines Mountains SPA (004165)

3 Natura Impact Statement

3.1 Introduction

The main objective of Stage 2 of the Appropriate Assessment process is to consider the impact of the project or plan on the integrity of the Natura 2000 and Ramsar Sites, either alone or in combination with other projects, with respect to the conservation objectives of the sites and to identify and assess mitigation measures against any adverse effects the plan or project is likely to cause. Following the screening stage of the Appropriate Assessment, three Natura 2000 Sites were identified that may potentially be impacted by the proposed development are described below followed by further descriptions and details of the characteristics of the proposal. The potential impacts resulting from the unmitigated construction phase of the proposal, and from its operational phase, are then discussed in relation to the conservation objectives of the sites. Mitigation measures where appropriate are presented in below in Section 3.7.

3.1.1 Information sources

Information from the following sources was used to compile the Natura Impact Assessment:
Winter Bird Survey – November 2010 to March 2011 (Volume 2, Chapter 6);
Summer Bird Survey – April 2011 to August 2011 (Volume 2, Chapter 6);
Habitat survey of the site – conducted by ecologists during the month of June 2012 (Volume 2, Chapter 6);
Mammal survey conducted in conjunction with the habitat survey (Volume 2, Chapter 6);
The geotechnical stability assessment (Volume 3, Appendix 3-A);
National Biodiversity Centre Mapping System[3]
National Parks and Wildlife Services (NPWS); and
BirdWatch Ireland;
Publications that are used here and not referenced specifically include:
Lynas, P., Newton, S.F., and Robinson, J.A. (2007). The status of birds in Ireland: an analysis of conservation concern 2008-2013. Irish Birds, 8: 149-167.
Crowe, O., 2005. Ireland's Wetlands and their Waterbirds: status and distribution. BirdWatch Ireland.
Gibbons, D.W., Reid, J.B. and R.A. Chapman, 1993. The New Atlas of Breeding Birds in Britain and Ireland: 1988-1991. British Trust for Ornithology, 1993.
Dempsey, E and O' Clery, M. (2010). The Complete Field Guide to Ireland's Birds.
Commission of the European Communities (2003). Interpretation manual of European Union Habitats-EUR 25. DG Environment-Nature and Biodiversity. Brussels.

[3] Available at : http://maps.biodiversityireland.ie/#/Home [accessed on various dates July, August 2012]

3.2 Description of the Project

A detailed description of the characteristics is outlined at section 2.2.5 above and further detail is presented in Chapter 2 of the EIS.

3.3 Characteristics of Natura 2000 Sites

The NPWS site synopses of the Natura 2000 Sites are provided below to describe the site in more detail. The dates on which the site synopses were written are included at the end of each synopsis.

3.3.1 The Lower River Shannon candidate Special Area of Conservation (cSAC) (Site code: 002165) site synopsis (NPWS)

This very large cSAC stretches along the Shannon valley from Killaloe to Loop Head/ Kerry Head, a distance of some 120 km. The site thus encompasses the Shannon, Feale, Mulkear and Fergus Estuaries, the freshwater lower reaches of the River Shannon (between Killaloe and Limerick), the freshwater stretches of much of the Feale and Mulkear catchments and the marine area between Loop Head and Kerry Head. The Shannon and Fergus flow through Carboniferous limestone as far as Foynes, but west of Foynes Namurian shales and flagstones predominate (except at Kerry Head, which is formed from Old Red Sandstone). The eastern sections of the Feale catchment flow through Namurian Rocks and the western stretches through Carboniferous Limestone. The Mulkear flows through Lower Palaeozoic Rocks in the upper reaches before passing through Namurian Rocks, followed by Lower Carboniferous Shales and Carboniferous Limestone. The Mulkear River itself, immediately north of Pallas Green, passes through an area of Rhyolites, Tuffs and Agglomerates. Rivers within the subcatchment of the Feale include the Galey, Smearlagh, Oolagh, Allaughaun, Owveg, Clydagh, Caher, Breanagh and Glenacarney. Rivers within the sub-catchment of the Mulkear include the Killeenagarriff, Annagh, Newport, the Dead River, the Bilboa, Glashacloonaraveela, Gortnageragh and Cahernahallia.

The Shannon and Fergus Estuaries form the largest estuarine complex in Ireland. They form a unit stretching from the upper tidal limits of the Shannon and Fergus Rivers to the mouth of the Shannon estuary (considered to be a line across the narrow strait between Kilcredaun Point and Kilconly Point). Within this main unit there are several tributaries with their own 'sub-estuaries' e.g. the Deel River, Mulkear River, and Maigue River. To the west of Foynes, a number of small estuaries form indentations in the predominantly hard coastline, namely Poulnasherry Bay, Ballylongford Bay, Clonderalaw Bay and the Feale or Cashen River Estuary. Both the Fergus and inner Shannon estuaries feature vast expanses of intertidal mudflats, often fringed with saltmarsh vegetation. The smaller estuaries also feature mudflats, but have their own unique characteristics, e.g. Poulnasherry Bay is stony and unusually rich in species and biotopes. Plant species are typically scarce on the mudflats, although there are some Eel-grass beds (Zostera spp.) and patches of green algae (e.g. Ulva sp. and Enteromorpha sp.). The main macro-invertebrate community, which has been noted from the inner Shannon and Fergus estuaries, is a Macoma- Scrobicularia-Nereis community. In the transition zone between mudflats and saltmarsh, specialised colonisers of mud predominate: swards of Common Cord-grass (Spartina anglica) frequently occur in the upper parts of the estuaries. Less common are swards of Glasswort (Salicornia europaea agg.). In the innermost parts of the estuaries, the tidal channels or creeks are fringed with species such as Common Reed (Phragmites australis) and Club-rushes (Scirpus maritimus, S. tabernaemontani and S. triquetrus). In addition to the nationally rare Triangular Club-rush (Scirpus triquetrus), two scarce species are found in some of these creeks (e.g. Ballinacurra Creek): Lesser Bulrush (Typha angustifolia) and Summer Snowflake (Leucojum aestivum).

Saltmarsh vegetation frequently fringes the mudflats. Over twenty areas of estuarine saltmarsh have been identified within the site, the most important of which are around the Fergus Estuary and at Ringmoylan Quay. The dominant type of saltmarsh present is Atlantic salt meadow occurring over mud. Characteristic species occurring include Common Saltmarsh Grass (Puccinellia maritima), Sea Aster (Aster tripolium), Thrift (Armeria maritima), Sea-milkwort (Glaux maritima), Sea Plantain (Plantago maritima), Red Fescue (Festuca rubra), Creeping Bent (Agrostis stolonifera), Saltmarsh Rush (Juncus gerardi), Long-bracted Sedge (Carex extensa), Lesser Seaspurrey (Spergularia marina) and Sea Arrowgrass (Triglochin maritima). Areas of Mediterranean salt meadows, characterised by clumps of Sea Rush (Juncus maritimus) occur occasionally. Two scarce species are found on saltmarshes in the vicinity of the Fergus Estuary: a type of robust Saltmarsh-grass (Puccinellia foucaudii), sometimes placed within the compass of Common Saltmarsh-grass (Puccinellia maritima) and Hard-grass (Parapholis strigosa). Saltmarsh vegetation also occurs around a number of lagoons within the site. The two which have been surveyed as part of a National Inventory of Lagoons are Shannon Airport Lagoon and Clonconeen Pool. Cloonconeen Pool (4-5 ha) is a natural sedimentary lagoon impounded by a low cobble barrier. Seawater enters by percolation through the barrier and by overwash. This lagoon represents a type which may be unique to Ireland since the substrate is composed almost entirely of peat. The adjacent shore features one of the best examples of a drowned forest in Ireland.

Aquatic vegetation in the lagoon includes typical species such as Beaked Tasselweed (Ruppia maritima) and green algae (Cladophora sp.). The fauna is not diverse, but is typical of a high salinity lagoon and includes six lagoon specialists (Hydrobia ventrosa, Cerastoderma glaucum, Lekanesphaera hookeri, Palaemonetes varians, Sigara stagnalis and Enochrus bicolor). In contrast, Shannon Airport Lagoon (2 ha) is an artificial saline lake with an artificial barrier and sluiced outlet. However, it supports two Red Data Book species of Stonewort (Chara canescens and Chara cf. connivens).

Most of the site west of Kilcredaun Point/Kilconly Point is bounded by high rocky sea cliffs. The cliffs in the outer part of the site are sparsely vegetated with lichens, Red Fescue, Sea Beet (Beta vulgaris), Sea Campion (Silene maritima), Thrift and Plantains (Plantago spp.). A rare endemic Sea Lavender (Limonium recurvum subsp. pseudotranswallinum) occurs on cliffs near Loop Head. Cliff-top vegetation usually consists of either grassland or maritime heath. The boulder clay cliffs further up the estuary tend to be more densely vegetated, with swards of Red Fescue and species such as Kidney Vetch (Anthyllis vulneraria) and Bird's-foot Trefoil (Lotus corniculatus).

The site supports an excellent example of a large shallow inlet and bay. Littoral sediment communities in the mouth of the Shannon Estuary occur in areas that are exposed to wave action and also in areas extremely sheltered from wave action. Characteristically, exposed sediment communities are composed of coarse sand and have a sparse fauna. Species richness increases as conditions become more sheltered. All shores in the site have a zone of sand hoppers at the top and below this each of the shores has different characteristic species giving a range of different shore types in the cSAC. The intertidal reefs in the Shannon Estuary are exposed or moderately exposed to wave action and subject to moderate tidal streams. Known sites are steeply sloping and show a good zonation down the shore. Well developed lichen zones and littoral reef communities offering a high species richness in the sublittoral fringe and strong populations of Paracentrotus lividus are found. The communities found are tolerant to sand scour and tidal streams. The infralittoral reefs range from sloping platforms with some vertical steps to ridged bedrock with gullies of sand between the ridges to ridged bedrock with boulders or a mixture of cobbles, gravel and sand. Kelp is very common to about 18m. Below this it becomes rare and the community is characterised by coralline crusts and red foliose algae.

Other coastal habitats that occur within the site include the following:

Stony beaches and bedrock shores - these shores support a typical zonation of seaweeds (Fucus spp., Ascophyllum nodosum and kelps).

Shingle beaches - the more stable areas of shingle support characteristic species such as Sea Beet, Sea Mayweed (Matricaria maritima), Sea Campion and Curled Dock (Rumex crispus).

Sandbanks which are slightly covered by sea water at all times – there is a known occurrence of sand/gravel beds in the area from Kerry Head to Beal Head.

Sand dunes - a small area of sand dunes occurs at Beal Point. The dominant species is Marram Grass (Ammophila arenaria).

Flowing into the estuaries are a number of tidal rivers. Freshwater rivers have been included in the site, most notably the Feale and Mulkear catchments, the Shannon from Killaloe to Limerick (along with some of its tributaries, including a short stretch of the Kilmastulla River), the Fergus up as far as Ennis, and the Cloon River. These systems are very different in character: the Shannon being broad, generally slow-flowing and naturally eutrophic; the Fergus being smaller and alkaline; while the narrow, fast-flowing Cloon is acid in nature. The Feale and Mulkear catchments exhibit all the aspects of a river from source to mouth. Seminatural habitats, such as wet grassland, wet woodland and marsh occur by the rivers, however, improved grassland is most common. One grassland type of particular conservation significance, Molinia meadows, occurs in several parts of the site and the examples at Worldsend on the River Shannon are especially noteworthy. Here are found areas of wet meadow dominated by rushes and sedges and supporting a diverse and species-rich vegetation, including such uncommon species as Blue-eyed Grass (Sisyrinchium bermudiana) and Pale Sedge (Carex pallescens). Floating river vegetation characterised by species of Water-crowfoot (Ranunculus spp.), Pondweeds (Potamogeton spp.) and the moss Fontinalius antipyretica are present throughout the major river systems within the site. The rivers contain an interesting bryoflora with Schistidium alpicola var. alpicola recorded from in-stream boulders on the Bilboa, new to county Limerick. Alluvial woodland occurs on the banks of the Shannon and on islands in the vicinity of the University of Limerick. The woodland is up to 50m wide on the banks and somewhat wider on the largest island. The most prominent woodland type is gallery woodland where White Willow (Salix alba) dominates the tree layer with occasional Alder (Alnus glutinosa). The shrub layer consists of various willow species with sally (Salix cinerea ssp. oleifolia) and what appear to be hybrids of S. alba x S. viminalis. The herbaceous layer consists of tall perennial herbs. A fringe of Bulrush (Typha sp.) occurs on the riverside of the woodland. On slightly higher ground above the wet woodland and on the raised embankment remnants of mixed oak-ash-alder woodland occur. These are poorly developed and contain numerous exotic species but locally there are signs that it is invading open grassland. Alder is the principal tree species with occasional Oak (Quercus robur), Elm (Ulmus glabra, U. procera), Hazel (Corylus avellana), Hawthorn (Crataegus monogyna) and the shrubs Guelder-rose (Viburnum opulus) and willows. The ground flora is species-rich. Woodland is infrequent within the site, however Cahiracon Wood contains a strip of old Oak woodland. Sessile Oak (Quercus petraea) forms the canopy, with an understorey of Hazel and Holly (Ilex aquifolium). Great Wood-rush (Luzula sylvatica) dominates the ground flora. Less common species present include Great Horsetail (Equisetum telmeteia) and Pendulous Sedge (Carex pendula). In the low hills to the south of the Slievefelim mountains, the Cahernahallia River cuts a valley through the Upper Silurian rocks. For approximately 2 km south of Cappagh Bridge at Knockanavar, the valley sides are wooded. The woodland consists of Birch (Betula spp.), Hazel, Oak, Rowan (Sorbus aucuparia), some Ash (Fraxinus excelsior) and Willow (Salix spp.). Most of the valley is not grazed by stock, and as a result the trees are regenerating well. The ground flora feature prominent Greater wood-rush and Bilberry (Vaccinium myrtillus) with a typical range of woodland herbs. Where there is more light available, Bracken (Pteridium aquilinum) features. The valley sides of the Bilboa and Gortnageragh Rivers, on higher ground north east of Cappamore, support patches of semi-natural broadleaf woodland dominated by Ash, Hazel, Oak and Birch. There is a good scrub layer with Hawthorn, Willow, Holly and Blackthorn (Prunus spinosa) common. The herb layer in these woodlands is often open with a typically rich mixture of woodland herbs and ferns. Moss species diversity is high. The woodlands are ungrazed. The hazel is actively coppiced in places.

There is a small area of actively regenerating cut away raised bog at Ballyrorheen. It is situated approx. 5 km north west of Cappamore Co. Limerick. The bog contains some wet areas with good moss (Sphagnum) cover. Species of particular interest include the Cranberry (Vaccinium oxycoccos) and the White Sedge (Carex curta) along with two other regionally rare mosses including S. fimbriatum. The site is being invaded by Birch (Betula pubescens) scrub woodland. Both commercial forestry and the spread of rhododendron has greatly reduced the overall value of the site. A number of plant species that are Irish Red Data Book species occur within the site - several are protected under the Flora (Protection) Order, 1999:

Triangular Club-rush (Scirpus triquetrus) - in Ireland this protected species is only found in the Shannon Estuary, where it borders creeks in the inner estuary.

Opposite-leaved Pondweed (Groenlandia densa) - this protected pondweed is found in the Shannon where it passes through Limerick City.

Meadow Barley (Hordeum secalinum) - this protected species is abundant in saltmarshes at Ringmoylan and Mantlehill.

Hairy Violet (Viola hirta) - this protected violet occurs in the Askeaton/Foynes area.

Golden Dock (Rumex maritimus) - noted as occurring in the River Fergus Estuary.

Bearded Stonewort (Chara canescens) - a brackish water specialist found in Shannon Airport lagoon.

Convergent Stonewort (Chara connivens) - presence in Shannon Airport Lagoon to be confirmed.

Overall, the Shannon and Fergus Estuaries support the largest numbers of wintering waterfowl in Ireland. The highest count in 1995-96 was 51,423 while in 1994-95 it was 62,701. Species listed on Annex I of the E.U. Birds Directive which contributed to these totals include: Great Northern Diver (3; 1994/95), Whooper Swan (201; 1995/96), Pale-bellied Brent Goose (246; 1995/96), Golden Plover (11,067; 1994/95) and Bar-tailed Godwit (476; 1995/96). In the past, three separate flocks of Greenland White-fronted Goose were regularly found but none were seen in 1993/94. Other wintering waders and wildfowl present include Greylag Goose (216; 1995/96), Shelduck (1,060; 1995/96), Wigeon (5,976; 1995/96); Teal (2,319; 1995-96); Mallard (528; 1995/96), Pintail (45; 1995/96), Shoveler (84; 1995/96), Tufted Duck (272; 1995/96), Scaup (121; 1995/96), Ringed Plover (240; 1995/96), Grey Plover (750; 1995/96), Lapwing (24,581; 1995/96), Knot (800; 1995/96), Dunlin (20,100; 1995/96), Snipe (719, 1995/96), Black-tailed Godwit (1062; 1995/96), Curlew (1504; 1995/96), Redshank (3228; 1995/96), Greenshank (36; 1995/96) and Turnstone (107; 1995/96). A number of wintering gulls are also present, including Black-headed Gull (2,216; 1995/96), Common Gull (366; 1995/96) and Lesser Black-backed Gull (100; 1994/95). This is the most important coastal site in Ireland for a number of the waders including Lapwing, Dunlin, Snipe and Redshank. It also provides an important staging ground for species such as Black-tailed Godwit and Greenshank. A number of species listed on Annex I of the E.U. Birds Directive breed within the cSAC site. These include Peregine Falcon (2-3 pairs), Sandwich Tern (34 pairs on Rat Island, 1995), Common Tern (15 pairs: 2 on Sturamus Island and 13 on Rat Island, 1995), Chough (14-41 pairs, 1992) and Kingfisher. Other breeding birds of note include Kittiwake (690 pairs at Loop Head, 1987) and Guillemot (4010 individuals at Loop Head, 1987).

There is a resident population of Bottle-nosed Dolphin in the Shannon Estuary consisting of at least 56-68 animals (1996). This is the only known resident population of this E.U. Habitats Directive Annex II species in Ireland. Otter, a species also listed on Annex II of this directive, is commonly found on the site. Five species of fish listed on Annex II of the E.U. Habitats Directive are found within the site. These are Sea Lamprey (Petromyzon marinus), Brook Lamprey (Lampetra planeri), River Lamprey (Lampetra fluviatilis), Twaite Shad (Allosa fallax fallax) and Salmon (Salmo salar). The three lampreys and Salmon have all been observed spawning in the lower Shannon or its tributaries. The Fergus is important in its lower reaches for spring salmon while the Mulkear catchment excels as a grilse fishery though spring fish are caught on the actual Mulkear River. The Feale is important for both types. Twaite Shad is not thought to spawn within the site. There are few other river systems in Ireland which contain all three species of Lamprey. Two additional fish of note, listed in the Irish Red Data Book, also occur, namely Smelt (Osmerus eperlanus) and Pollan (Coregonus autumnalis pollan). Only the former has been observed spawning in the Shannon. Freshwater Pearl-mussel (Margaritifera margaritifera), a species listed on Annex II of the E.U. Habitats Directive, occurs abundantly in parts of the Cloon River. There is a wide range of landuses within the site. The most common use of the terrestrial parts is grazing by cattle and some areas have been damaged through overgrazing and poaching. Much of the land adjacent to the rivers and estuaries has been improved or reclaimed and is protected by embankments (especially along the Fergus Estuary). Further, reclamation continues to pose a threat as do flood relief works (e.g. dredging of rivers). Gravel extraction poses a major threat on the Feale. In the past, Cord-grass (Spartina sp.) was planted to assist in land reclamation. This has spread widely, and may oust less vigorous colonisers of mud and may also reduce the area of mudflat available to feeding birds.

Domestic and industrial wastes are discharged into the Shannon, but water quality is generally satisfactory - except in the upper estuary, reflecting the sewage load from Limerick City. Analyses for trace metals suggest a relatively clean estuary with no influences by industrial discharges apparent. Further industrial development along the Shannon and water polluting operations are potential threats.

Fishing is a main tourist attraction on the Shannon and there are a large number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. The River Feale is a designated Salmonid Water under the E.U. Freshwater Fish Directive. Other uses of the site include commercial angling, oyster farming, boating (including dolphin-watching trips) and shooting. Some of these may pose threats to the birds and dolphins through disturbance. Specific threats to the dolphins include underwater acoustic disturbance, entanglement in fishing gear and collisions with fast moving craft.

This site is of great ecological interest as it contains a high number of habitats and species listed on Annexes I and II of the E.U. Habitats Directive, including the priority habitat lagoon, the only known resident population of Bottle-nosed Dolphin in Ireland and all three Irish lamprey species. A good number of Red Data Book species are also present, perhaps most notably the thriving populations of Triangular Club-rush. A number of species listed on Annex I of the E.U. Birds Directive are also present, either wintering or breeding. Indeed, the Shannon and Fergus Estuaries form the largest estuarine complex in Ireland and support more wintering wildfowl and waders than any other site in the country. Most of the estuarine part of the site has been designated a Special Protection Area (SPA), under the E.U. Birds Directive, primarily to protect the large numbers of migratory birds present in winter.

17.05.2005

3.3.2 Lower River Suir SAC (Site Code: 002137) site synopsis (NPWS)

This site consists of the freshwater stretches of the River Suir immediately south of Thurles, the tidal stretches as far as the confluence with the Barrow/Nore immediately east of Cheekpoint in Co. Waterford and many tributaries including the Clodiagh in Co. Waterford, the Lingaun, Anner, Nier, Tar, Aherlow, Multeen and Clodiagh in Co. Tipperary. The Suir and its tributaries flows through the counties of Tipperary, Kilkenny and Waterford. Upstream of Waterford city, the swinging meanders of the Suir crisscross the Devonian sandstone rim of hard rocks no less than three times as they leave the limestone-floored downfold below Carrick In the vicinity of Carrick-on-Suir the river follows the limestone floor of the Carrick Syncline. Upstream of Clonmel the river and its tributaries traverse Upper Palaeozoic Rocks, mainly the Lower Carboniferous Visean and Tournaisian. The freshwater stretches of the Clodiagh River in Co. Waterford traverse Silurian rocks, through narrow bands of Old Red Sandstone and Lower Avonian Shales before reaching the carboniferous limestone close to its confluence with the Suir. The Aherlow River flows through a Carboniferous limestone valley, with outcrops of Old Red Sandstone forming the Galtee Mountains to the south and the Slievenamuck range to the north. Glacial deposits of sands and gravels are common along the valley bottom, flanking the present-day river course.

The site is a candidate SAC selected for the presence of the priority habitats on Annex I of the E.U. Habitats Directive - alluvial wet woodlands and Yew Wood. The site is also selected as a candidate SAC for floating river vegetation, Atlantic salt meadows, Mediterranean salt meadows, old oak woodlands and eutrophic tall herbs, all habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected for the following species listed on Annex II of the same directive - Sea Lamprey, River Lamprey, Brook Lamprey, Freshwater Pearl Mussel, Crayfish, Twaite Shad, Atlantic Salmon and Otter.

Alluvial wet woodland is declining habitat in Europe as a result of drainage and reclamation. The best examples of this type of woodland in the site are found on the islands just below

Carrick-on-Suir and at Fiddown Island. Species occurring here include Almond Willow (Salix triandra), White Willow (S. alba), Grey Willow (S. cinerea), Osier (S. viminalis), with Iris (Iris pseudacorus), Hemlock Water-dropwort (Oenanthe crocata), Angelica (Angelica sylvestris), Pendulus Sedge (Carex pendula), Meadowsweet (Filipendula ulmaria) and Valerian (Valeriana officinalis). The terrain is littered with dead trunks and branches and intersected with small channels which carry small streams to the river. The bryophyte and lichen floras appear to be rich and require further investigation. A small plot is currently being coppiced and managed by National Parks and Wildlife. In the drier areas the wet woodland species merge with other tree and shrub species including Ash (Fraxinus excelsior), Hazel (Corylus avellana), Hawthorn (Crataegus monogyna) and Blackthorn (Prunus spinosa). This adds further to the ecological interest of this site.

Eutrophic tall herb vegetation occurs in association with the various areas of alluvial forest and elsewhere where the flood-plain of the river is intact. Characteristic species of the habitat include Meadowsweet (Filipendula ulmaria), Purple Loosestrife (Lythrum salicaria), Marsh Ragwort (Senecio aquaticus), Ground Ivy (Glechoma hederacea) and Hedge Bindweed (Calystegia sepium).

Old oak woodlands are also of importance at the site. The best examples are seen in Portlaw Wood which lies on both sides of the Clodiagh River. On the south-facing side the stand is more open and the Oaks (mainly Quercus robur) are well grown and spreading. Ivy (Hedera helix) and Bramble (Rubus fruticosus) are common on the ground, indicating relatively high light conditions. Oak regeneration is dense, varying in age from 0-40 years and Holly (Ilex aquifolium) is fairly common but mostly quite young. Across the valley, by contrast, the trees are much more closely spaced and though taller are poorly grown on average. There are no clearings; large Oaks extend to the boundary wall. In the darker conditions, Ivy is much rarer and Holly much more frequent, forming a closed canopy in places. Oak regeneration is uncommon since there are as yet few natural clearings. The shallowness of the soil on the northfacing slope probably contributes to the poor tree growth there. The acid nature of the substrate has induced a "mountain" type Oakwood community to develop. There is an extensive species list present throughout including an abundance of mosses, liverworts and lichens. The rare lichen Lobaria pulmonaria, an indicator of ancient woodlands, is found.

Inchinsquillib Wood consists of three small separate sloping blocks of woodland in a valley cut by the young Multeen River and its tributaries through acidic Old Red Sandstone, and Silurian rocks. Two blocks, both with an eastern aspect, located to the north of the road, are predominantly of Sessile oak (Quercus petraea) and Hazel, with Downy Birch (Betula pubescens), Ash and Holly. The ground flora is quite mixed with for example Wood sedge (Carex sylvatica), Bluebell (Hyacinthoides non-scriptus), Primrose (Primula vulgaris), Wood-sorrel (Oxalis acetosella), Pignut (Conopodium majus) and Hard fern (Blechnum spicant). The base poor nature of the underlying rock is, to some extent masked by the overlying drift. The third block, to the south of the road, and with a northern aspect, is a similar although less mature mixture of Sessile Oak, Birch and Holly, the influence of the drift is more marked, with the occurrence of Wood anemone (Anemone nemorosa) amongst the ground flora.

Floating river vegetation is evident in the freshwater stretches of the River Suir and along many of its tributaries. Typical species found include Canadian Pondweed (Elodea canadensis), Milfoil (Myriophyllum spp.), Fennel Pondweed (Potamogeton pectinatus), Curled Pondweed (P. crispus), Perfoliate Pondweed (P. perfoliatus), Pond Water-crowfoot (Ranunculus peltatus), other Crowfoots (Ranunculus spp.) and the moss Fontinalis antipyretica. At a couple of locations along the river, Oppositeleaved Pondweed (Groenlandia densa) occurs. This species is protected under the Flora (Protection) Order, 1999.

The Aherlow River is fast-flowing and mostly follows a natural unmodified river channel. Submerged vegetation includes the aquatic moss Fontinalis antipyretica and Stream Water-crowfoot (Ranunculus pencillatus), while shallow areas support species such as Reed Canary-grass (Phalaris arundinacea), Brooklime (Veronica beccabunga) and Water Mint (Mentha aquatica). The river bank is fringed in places with Alder (Alnus glutinosa) and Willows (Salix spp.).

The Multeen River is fast flowing, mostly gravel-bottomed and appears to follow a natural unmodified river channel. Water Crowfoots occur in abundance and the aquatic moss Fontinalis antipyretica is also common. In sheltered shallows, species such as Water-cress (Rorippa nasturtium-aquaticum) and Water-starworts (Callitriche spp.) occur. The river channel is fringed for most of its length with Alder, Willow and a narrow strip of marshy vegetation.

Salt meadows occur below Waterford City in old meadows where the embankment is absent, or has been breached, and along the tidal stretches of some of the in-flowing rivers below Little Island. There are very narrow, non-continuous bands of this habitat along both banks. More extensive areas are also seen along the south bank at Ballynakill, the east side of Little Island, and in three large salt meadows between Ballynakill and Cheekpoint. The Atlantic and Mediterranean sub types are generally intermixed. The species list is extensive and includes Red Fescue (Festuca rubra), Oraches (Atriplex spp.), Sea Aster (Aster tripolium), Sea Couch Grass (Elymus pycnanthus), frequent Sea Milkwort (Glaux maritima), occasional Wild Celery (Apium graveolens), Parsley Water-dropwort (Oenanthe lachenalii), English Scurvygrass (Cochlearia anglica) and Sea Arrowgrass (Triglochin maritima). These species are more representative of the Atlantic sub-type of the habitat. Common Cord-grass (Spartina anglica), is rather frequent along the main channel edge and up the internal channels. The legally protected (Flora (Protection) Order, 1999) Meadow Barley (Hordeum secalinum) grows at the landward transition of the saltmarsh. Sea Rush (Juncus maritimus), an indicator of the Mediterranean salt meadows, also occurs.

Other habitats at the site include wet and dry grassland, marsh, reed swamp, improved grassland, coniferous plantations, deciduous woodland, scrub, tidal river, stony shore and mudflats. The most dominant habitat adjoining the river is improved grassland, although there are wet fields with species such as Yellow Flag (Iris pseudacorus), Meadow Sweet (Filipendula ulmaria), Rushes (Juncus spp.), Meadow Buttercup (Ranunculus acris) and Cuckoo Flower (Cardamine pratensis).

Cabragh marshes, just below Thurles, lie in a low-lying tributary valley into which the main river floods in winter. Here there is an extensive area of Common Reed (Phragmites australis) with associated marshland and peaty fen. The transition between vegetation types is often well displayed. A number of wetland plants of interest occur, in particular the Narrow-leaved Bulrush (Typha angustifolia), Bottle Sedge (Carex rostrata) and Blunt-flowered Rush (Juncus subnodulosus). The marsh is naturally eutrophic but it has also the nutritional legacy of the former sugar factory which discharged into it through a number of holding lagoons, now removed. Production is high which is seen in the size of such species as Celery-leaved Buttercup (Ranunculus sceleratus) as well as in the reeds themselves.

Throughout the Lower River Suir site are small areas of woodland other than those described above. These tend to be a mixture of native and non-native species, although there are some areas of semi-natural wet woodland with species such as Ash and Willow. Cahir Park Woodlands is a narrow tract of mixed deciduous woodland lying on the flatlying floodplain of the River Suir. This estate woodland was planted over one hundred years ago and it contains a large component of exotic tree species. However, due to original planting and natural regeneration there is now a good mix of native and exotic species. About 5km north west of Cashel, Ardmayle pond is a long, possibly artificial water body running parallel to the River Suir. It is partly shaded by planted Lime (Tilia hybrids), Sycamore (Acer pseudoplatanus) and the native Alder. Growing beneath the trees are shade tolerant species such as Remote sedge (Carex remota).

The site is of particular conservation interest for the presence of a number of Annex II animal species, including Freshwater Pearl Mussel (Margaritifera margaritifera and M. m. durrovensis), Freshwater Crayfish (Austropotamobius pallipes), Salmon (Salmo salar), Twaite Shad (Alosa fallax fallax), three species of Lampreys - Sea Lamprey (Petromyzon marinus), Brook Lamprey (Lampetra planeri) and River Lamprey (Lampetra fluviatilis) and Otter (Lutra lutra). This is one of only three known spawning grounds in the country for Twaite Shad.

The site also supports populations of several other animal species. Those which are listed in the Irish Red Data Book include Daubenton's Bat (Myotis daubentoni), Nattererer's Bat (M. nattereri), Pipistrelle (Pipistrellus pipistrellus), Pine Marten (Martes martes), Badger (Meles meles), the Irish Hare (Lepus timidus hibernicus), Smelt (Osmerus eperlanus) and the Frog (Rana temporaria). Breeding stocks of Carp are found in Kilsheelan Lake. This is one of only two lakes in the country which is known to have supported breeding Carp. Carp require unusually high summer water temperatures to breed in Ireland and the site may therefore support interesting invertebrate populations.

Parts of the cSAC site have also been identified as of ornithological importance for a number of Annex I (EU Birds Directive) bird species, including Greenland White-fronted Goose (10), Golden Plover (1490), Whooper Swan (7) and Kingfisher. Figures given in brackets are the average maximum counts from 4 count areas within the site for the three winters between 1994 and 1997. Wintering populations of migratory birds use the site. Flocks are seen in Coolfinn Marsh and also along the reedbeds and saltmarsh areas of the Suir. Coolfinn supports nationally important numbers of Greylag Geese on a regular basis. Numbers between 600 and 700 are recorded. Other species occurring include Mallard (21), Teal (159), Wigeon (26), Tufted Duck (60), Pintail (4), Pochard (2), Little Grebe (2), Black-tailed Godwit (20), Oystercatcher (16), Lapwing (993), Dunlin (101), Curlew (195), Redshank (28), Greenshank (4) and Green Sandpiper (1). Nationally important numbers of Lapwing (2750) were recorded at Faithlegg in the winter of 1996/97. In Cabragh marshes there is abundant food for surface feeding wildfowl which total at 1,000 or so in winter. Widgeon, Teal and Mallard are numerous and the latter has a large breeding population - with up to 400 in summer. In addition, less frequent species like Shoveler and Pintail occur and there are records for both Whooper and Bewick's swans. Kingfisher, a species that is listed on Annex I of the EU Birds Directive, occurs along some of the many tributaries throughout the site.

Landuse at the site consists mainly of agricultural activities including grazing, silage production, fertilising and land reclamation. The grassland is intensively managed and the rivers are therefore vulnerable to pollution from run-off of fertilisers and slurry. Arable crops are also grown. Fishing is a main tourist attraction on stretches of the Suir and some of its tributaries and there are a number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. Both commercial and leisure fishing takes place on the rivers. The Aherlow River is a designated Salmonid Water under the EU Freshwater Fish Directive. Other recreational activities such as boating, golfing and walking are also popular. Several industrial developments, which discharge into the river, border the site including three dairy related operations and a tannery.

The Lower River Suir contains excellent examples of a number of Annex I habitats, including the priority habitat Alluvial Forest. The site also supports populations of several Annex II animal species and a number of Red Data Book animal species. The presence of two legally protected plants (Flora (Protection) Order, 1999) and the ornithological importance of the river adds further to the ecological interest of this site.

6.10.2006

3.3.3 Slievefelim to Silvermines Mountains SPA (004165)

The Slievefelim to Silvermines Mountains SPA is an extensive upland site located in Counties Tipperary and Limerick. Much of the site is over 200 m in altitude and rises to 694 m at Keeper Hill. Other peaks included in the site are Slieve Felim, Knockstanna, Knockappul, Mother Mountain, Knockteige, Cooneen Hill and Silvermine Mountain. The site is underlain mainly by sandstones of Silurian age. Several important rivers rise within the site, including the Mulkear, Bilboa and Clare. The site consists of a variety of upland habitats, though approximately half is afforested. The coniferous forests include first and second rotation plantations, with both pre-thicket and post-thicket stands present. Substantial areas of clear-fell are also present at any one time. The principal tree species present are Sitka Spruce (Picea sitchensis) and Lodgepole Pine (Pinus contorta). Roughly one-quarter of the site is unplanted blanket bog and heath, with both wet and dry heath present. The bog and heath vegetation includes such typical species as Ling Heather (Calluna vulgaris), Bilberry (Vaccinium myrtillus), Bell Heather (Erica cinerea), Common Cottongrass (Eriophorum angustifolium), Hare's-tail Cottongrass (Eriophorum vaginatum), Deergrass (Scirpus cespitosus) and Purple Moorgrass (Molinia caerulea). The remainder of the site is mostly rough grassland that is used for hill farming. This varies in composition and includes some wet areas with rushes (Juncus spp.) and some areas subject to scrub encroachment. Some stands of deciduous woodland also occur, especially within the river valleys.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for Hen Harrier. This SPA is one of the strongholds for Hen Harrier in the country. A survey in 2005 resulted in four confirmed and one possible breeding pairs, whereas nine pairs had been recorded in the 1998-2000 period. These numbers represent 3% of the national total. The mix of forestry and open areas provides optimum habitat conditions for this rare bird, which is listed on Annex I of the Birds Directive. The early stages of new and second-rotation conifer plantations are the most frequently used nesting sites, though some pairs may still nest in tall heather of unplanted bogs and heath. Hen Harriers will forage up to c. 5 km from the nest site, utilising open bog and moorland, young conifer plantations and hill farmland that is not too rank. Birds will often forage in openings and gaps within forests. In Ireland, small birds and small mammals appear to be the most frequently taken prey. The site is also a traditional breeding site for a pair of Peregrine. Merlin has been recorded within the site but further survey is required to determine its status. Both of these species are also listed on Annex I of the E.U. Birds Directive. Red Grouse is found on some of the unplanted areas of bog and heath – this is a species that has declined in Ireland and is now Red-listed.

The main threat to the long-term survival of Hen Harriers within the site is further afforestation, which would reduce and fragment the area of foraging habitat, resulting in possible reductions in breeding density and productivity. Overall, the site provides excellent nesting and foraging habitat for breeding Hen Harrier and is among the top five sites in the country for the species

16.7.2007

3.3.4 Features of Interest of the Lower River Shannon cSAC

Table 11 below lists the Annex I habitats and Annex II species for which the Lower River Shannon cSAC has been selected.

Table 11: List of qualifying Features of Interest of the Lower River Shannon cSAC.

Qualifying Interests of the Lower River Shannon cSAC (Site Code: 002165)
Habitats
Sandbanks which are slightly covered by sea water all the time [1110]
Estuaries [1130]
Mudflats and sandflats not covered by seawater at low tide [1140]
Coastal lagoons [1150]
Large shallow inlets and bays [1160]
Reefs [1170]
Perennial vegetation of stony banks [1220]
Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]
Salicornia and other annuals colonizing mud and sand [1310]
Spartina swards (Spartinion maritimae) [1320]
Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]
Mediterranean salt meadows (*Juncetalia maritimi*) [1410]
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]
Molinia meadows on calcareous, peaty or clavey-silt-laden soils (*Molinion caeruleae*) [6410]
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0]
Species
Freshwater pearl mussel (*Margaritifera margaritifera*) [1029]
Sea lamprey (*Petromyzon marinus*) [1095]
Brook lamprey (*Lampetra planeri*) [1096]
River lamprey (*Lampetra fluviatilis*) [1099]
Salmon (*Salmo salar*) [1106]
Bottle-nosed dolphin (*Tursiops truncatus*) [1349]
Otter (*Lutra lutra*) [1355]

3.3.5 Features of Interest of the Lower River Suir SAC.

Table 12, below, lists the Annex I habitats and Annex II species for which the Lower River Suir cSAC has been selected.

Table 12: List of qualifying Features of Interest for the Lower River Suir cSAC.

Qualifying Interests of the Lower River Suir cSAC (Site Code: 002165) **Habitats**
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]
Mediterranean salt meadows (*Juncetalia maritimi*) [1410]
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]
Old sessile oak woods with *Ilex* and Blechnum in British Isles [91A0]
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0]
Taxus baccata woods of the British Isles [91J0]
Species
Freshwater pearl mussel (*Margaritifera margaritifera*) [1029]
White-clawed crayfish (*Austropotamobius pallipes*) [1092]
Sea lamprey (*Petromyzon* marinus) [1095]
Brook lamprey (*Lampetra planeri*) [1096]
River lamprey (*Lampetra fluviatilis*) [1099]
Allis shad (*Alosa alosa*) [1102]
Twaite shad (*Alosa fallax fallax*) [1103]
Salmon (*Salmo salar*) [1106]
Otter (*Lutra lutra*) [1355]

3.3.6 Feature of Interest of the Slievefelim to Silvermines Mountains SPA (004165).

Table 13, below, lists the bird species for which the Slievefelim to Silvermines Mountains SPA (004165) has been selected.

Table 13: List of qualifying Features of Interest of the Slievefelim to Silvermines Mountains SPA.

Qualifying Interests of the Slievefelim to Silvermines Mountains SPA **Site Code:(004165)**
Hen Harrier (*C. cyaneus*) [A082]

3.4 Conservation Status

According to the Habitat's Directive, the conservation status of a natural habitat will be taken as 'favourable' when:

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

According to the Habitat's Directive, the conservation status of a species means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations. The conservation status will be taken as 'favourable' when:

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

3.4.1 Conservation Objectives and Management Plans

There are no management plans completed to date for the Lower River Shannon cSAC, Lower River Suir cSAC or the Silvermines Mountains SPA. The conservation objectives for the Natura 2000 Sites are as follows:

3.4.1.1 *Lower River Shannon cSAC (site code: 002165):*

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

[1029] Margaritifera margaritifera
[1095] Petromyzon marinus
[1096] Lampetra planeri
[1099] Lampetra fluviatilis
[1106] *Salmo salar* (only in fresh water)
[1110] Sandbanks which are slightly covered by sea water all the time
[1130] Estuaries
[1140] Mudflats and sandflats not covered by seawater at low tide
[1150] Coastal lagoons
[1160] Large shallow inlets and bays
[1170] Reefs
[1220] Perennial vegetation of stony banks
[1230] Vegetated sea cliffs of the Atlantic and Baltic coasts
[1310] *Salicornia* and other annuals colonizing mud and sand
[1330] Atlantic salt meadows (*Glauco-Puccinellietalia* maritimae)
[1349] Tursiops truncatus
[1355] Lutra lutra
[1410] Mediterranean salt meadows (*Juncetalia* maritimi)
[3260]Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]
[6410] *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)

[91E0] Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)

3.4.1.2 *Lower River Suir cSAC (site code: 002137)*

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:
[1029] Margaritifera margaritifera
[1092] Austropotamobius pallipes
[1095] Petromyzon marinus
[1096] Lampetra planeri
[1099] Lampetra fluviatilis
[1103] Alosa fallax
[1106] *Salmo salar* (only in fresh water)
[1330] Atlantic salt meadows (*Glauco-Puccinellietalia* maritimae)
[1355] Lutra lutra
[1410] Mediterranean salt meadows (*Juncetalia maritimi*)
[3260]Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
[6430] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
[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)
[91J0] *Taxus baccata* woods of the British Isles

3.4.1.3 *Slievefelim to Silvermines Mountains SPA (site code: 004165):*

Objective: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:
Circus cyaneus [breeding]

3.4.2 Conclusion

Any impact which is likely to cause or contribute to any of the qualifying species and habitats not reaching or maintaining favourable conservation status within these Natura 2000 Sites would be regarded as being in conflict with the management of the sites. In addition, any impact which would hinder the maintenance of the extent, species richness and biodiversity of the sites would also be in conflict with the conservation objectives.

3.5 Ecological Features Selected for Natura Impact Assessment

Tables 11, 12 and 13 above, list the habitats and species for which the Natura 2000 sites, considered in this section of the document, have been designated. It is considered that some of these features will not be impacted by the proposed development and these are listed below in Table 14 with the Natura 2000 sites designated for their protection, in section 3.5.1 below. The significance of the impacts affecting the remaining habitats and species, listed in section 3.5.2, below, will then be assessed in terms of magnitude/extent, probability and duration in sections following.

3.5.1 Ecological features not selected for Natura Impact Assessment

The species and habitats of qualifying interest that will not be impacted by the proposed development are listed in Table 14. These habitats,which are either coastal in their distribution or are grassland and forest habitats not connected to the proposal site either directly within the footprint of the development or via waterways draining the site. Dolphin is a marine species and therefore not present within the zone of impact influence of the proposed windfarm site.

Table 14: List of Ecological features not selected for Natura Impact Assessment with Natura 2000 site designated for their protection

Feature	Designated Site
Coastal and Halophytic Habitats	
Sandbanks which are slightly covered by sea water all the time [1110]	Lower River Shannon cSAC
Estuaries [1130]	Lower River Shannon cSAC
Mudflats and sandflats not covered by seawater at low tide [1140]	Lower River Shannon cSAC
Coastal lagoons [1150]	Lower River Shannon cSAC
Large shallow inlets and bays [1160]	Lower River Shannon cSAC
Reefs [1170]	Lower River Shannon cSAC
Perennial vegetation of stony banks [1220]	Lower River Shannon cSAC
Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	Lower River Shannon cSAC
Salicornia and other annuals colonizing mud and sand [1310]	Lower River Shannon cSAC
Spartina swards (Spartinion maritimae) [1320]	Lower River Shannon cSAC
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]	Lower River Shannon cSAC, Lower River Suir cSAC
Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	Lower River Shannon cSAC, Lower River Suir cSAC
Natural and Semi-natural grassland Habitats	

Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410]	Lower River Shannon cSAC
Forest Habitats	
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0]	Lower River Shannon cSAC, Lower River Suir cSAC
Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]	Lower River Suir cSAC
Old sessile oak woods with Ilex and Blechnum in British Isles [91A0]	Lower River Suir cSAC
Taxus baccata woods of the British Isles [91J0]	Lower River Suir cSAC
Species (Marine)	
Bottlenose dolphin (*T. truncatus*) [1349]	Lower River Shannon cSAC

3.5.2 Ecological features selected for Appropriate Assessment

All of the features of qualifying interest that were deemed relevant to the proposed development were selected for further analysis in respect to likely impacts. These features are listed in Table 15, below. Characteristics of the ecological features selected for Appropriate Assessment are then discussed in the sections following.

Table 15: Ecological features selected for Natura Impact Assessment within Natura 2000 Sites designated for their protection

Feature	Designated Site
Freshwater Habitats (Aquatic)	
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]	Lower River Shannon cSAC, Lower River Suir cSAC
Birds	
Hen Harrier (*C. cyaneus*) [A082]	Slievefelim to Silvermines Mountains SPA
Invertebrates	
Freshwater pearl mussel (*M. margaritifera*) [1029]	Lower River Shannon cSAC, Lower River Suir cSAC
White-clawed crayfish (*A. pallipes*) [1092]	Lower River Suir cSAC
Fishes	
Salmon (*S. salar*) [1106]	Lower River Shannon cSAC, Lower River Suir cSAC

Sea lamprey (*P. marinus*) [1095]	Lower River Shannon cSAC, Lower River Suir cSAC
Brook lamprey (*L. planeri*) [1096]	Lower River Shannon cSAC, Lower River Suir cSAC
River lamprey (*L. fluviatilis*) [1099]	Lower River Shannon cSAC, Lower River Suir cSAC
Allis shad (*A. alosa*) [1102]	Lower River Suir cSAC
Twaite shad (*A. fallax fallax*) [1103]	Lower River Suir cSAC
Mammals	
Otter (*L. lutra*) [1355]	Lower River Shannon cSAC, Lower River Suir cSAC

3.5.2.1 *Habitat*

Both the Lower River Shannon cSAC and the Lower River Suir cSAC are designated for the protection of the habitat type 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]'. This is a freshwater habitat found in sections of water courses with natural or semi-natural dynamics (minor, average and major beds) where the water quality shows no significant deterioration (EDG, 2007). This habitat is described as being present 'in the major river systems within' the Lower River Shannon cSAC (see Section 3.3.1, Site synopsis 002165), and is 'present in the freshwater stretches of the River Suir and along many of its tributaries' (See Section 3.3.2, site synopsis 002137) Because floating river vegetation communities are found along some the freshwater stretches within both Natura 2000 sites there is the potential that this habitat is within the zone of impact influence of the proposal. The primary pressures on this habitat are considered to be eutrophication, overgrazing, excessive fertilisation, afforestation and the introduction of invasive alien species;the current conservation status of this habitat type is bad (NPWS, 2008). Any impact on this habitat would occur as a result of unmitigated adverse water quality impacts caused by the proposal described in this report. These impacts are discussed in section 3.6.3 below.

3.5.2.2 *Birds*

Hen Harrier (*C. cyaneus*) [A082]
The hen harrier is listed as an Annex I species under the Birds Directive and classified as an 'Amber Listed' species of medium conservation concern (see Lynas *et al*. 2007). Breeding birds are confined to moorland and young forestry plantations, where they nest on the ground. Hen harriers are found mainly in Counties Laois, Tipperary, Cork, Clare, Limerick and Kerry. In summer hen harrier are found on mountains and moorlands, nesting on the ground.

It also nests in young conifer plantations. In winter birds can roost communally and are found in most parts of Ireland including coastal areas.

There is a clear association between habitat composition and hen harrier activity (Wilson *et al.* 2006) and both the quality and quantity of foraging habitats are known to influence hen harrier distribution (Watson, 1977, Pain et al., 1997, Redpath & Thirgood, 1999, Redpath et al., 2002, Madders 2003 cited in Ruddock *et al*. 2012). In their analysis of the distribution of hen harriers in Ireland Wilson *et al.* (2006) determined that areas with less than 30% cover of bog, rough pasture or young forest were avoided by hen harriers. Therefore, the habitat composition of the area is a determining factor influencing the potential level of hen harrier activity. An additional, and primary, governing factor is the proximity of hen harrier nests, as this has a major influence on habitat use (Madders, 2000), both by breeding birds and fledging juveniles, within the areas adjacent to any location.

Therefore, an extensive area of habitats, which are of high ecological value to hen harrier, is available in the extended geographical area surrounding the proposed Upperchurch Windfarm site. It is considered that hen harriers species will preferentially select these areas of high ecological value above the, lower value, post thicket canopy conifer and agricultural grassland habitats or the remnant upland blanket bog/wet heath mosaic areas that are available within the windfarm site.

Post thicket conifer plantation is of only limited value to hen harrier (O'Flynn 1983, Sim et al. 2001 cited in Wilson *et al*., 2009) and is not strongly associated with either foraging or breeding (Madders 2003, Barton *et al*. 2006 cited in Wilson *et al.* 2009) possibly because of the lack of structural diversity within the uniform conifer blocks (O'Donoghue et al. 2011).

It is noted that hen harriers in Ireland strongly avoid this habitat type for nesting due to the lack of cover and the levels of human activity (Wilson *et al*., 2009).

There is a strong association in Ireland between, pre thicket, second rotation conifer plantation and hen harrier nest site selection (Norriss *et al*. 2002, O'Donoghue 2004 cited in Wilson *et al*. 2009; Irwin *et al*. 2012) albeit that other factors, such as the remaining area of heath/bog and rough grassland that is available for foraging (Norris *et al*. 2007, cited in Lewis *et al*. 2009) also influence site selection.. Young second rotation conifer are of value to nesting and foraging hen harrier after 4 years and were replanting to take place in 2035 then the habitat could be conceivable of value for 1-6 years during the later years of windfarm operation.

3.5.2.3 *Aquatic species*

Freshwater pearl mussel (*M. margaritifera*) [1029]

The freshwater pearl mussel is listed under Annex II of the EU Habitats Directive and is one of the species for which the Lower River Shannon cSAC and the Lower River Suir cSAC have been designated. Ireland is said to support up to 46% of the known populations of the freshwater pearl mussel (*M. margaritifera*) within the European Union (Anon, 2010). The freshwater pearl mussel is listed under Annex II of the EU Habitats Directive and is one of the species for which both the Lower River Shannon cSAC, Lower River Suir cSAC have been designated. Freshwater pearl mussels have a complex life cycle. They mature between seven and 15 years of age and can have a prolonged fertile period lasting into old age. The larvae (glochidia) initially attach to the gills of salmonid fish hosts which provide nourishment, before they become large enough for independent development in the river bed. After excysting from host fish juvenile mussels survive in the interstices of the substrate, comprised of a stable combination of sand, gravels and cobbles, where good oxygen exchange occurs. A covering of fine silt may prevent this and cause heavy mortalities. In summary, the freshwater pearl mussel requires very high quality rivers with clean river beds and waters with very low levels of nutrients without artificially elevated levels of siltation. The survival of the freshwater pearl mussel is under threat and many of the populations are not reproducing and will ultimately disappear if rehabilitative action is not taken.

Of the remaining populations in Ireland it is estimated that at least 90% will "probably never breed successfully again" (Moorkens, 2006, cited in Byrne et al., 2009).

The principal threat to this species is poor substrate quality due to increased growth of algal and macrophyte vegetation as a result of severe nutrient enrichment, as well as physical siltation. Freshwater pearl mussel is listed as critically endangered in the Republic of Ireland in the most recent review of local IUCN threat status of Irish molluscs. Its overall conservation status in Ireland is 'Unfavourable' (NPWS, 2008)

The published current distribution for this species[4] does not include either of the 10km squares which incorporate the location of the proposal considered in this document namely R95 and R96.

White-clawed crayfish (*A. pallipes*) [1092]

The Lower River Suir cSAC is designated for the protection of this species. In Ireland, the white-clawed crayfish most commonly occurs in small and medium-sized lakes, large rivers, streams and drains, wherever there is sufficient lime (Reynolds, 2007). The species prefers relatively cool temperatures and adequate dissolved oxygen and lime, although it is capable of tolerating significant fluctuations. Juveniles live among submerged tree-roots, gravel or aquatic plants, while larger crayfish need stones to hide under, or earthen banks in which to burrow. Crayfish show little activity during the winter period (December to March), spending most of their time torpid in refuges. They become more active when the water temperature increases. Females carry their eggs over winter attached in a dense cluster under their tails (Peay, 2003) and they require undisturbed shelter over a prolonged winter-spring period.

White-clawed crayfish eat a wide range of food including fallen leaves, aquatic vegetation, dead fish, aquatic invertebrates such as snails and caddis-fly larvae, and other dead or live crayfish. They have a wide range of predators; juveniles are eaten by fish, birds and

[4] Species distribution mapping referred to in this section of the document is published in NPWS, 2008

invertebrate predators, adults are taken by large predators; heron, otter and mink. The crayfish try to avoid predation by hiding in refuges by day and coming out at night, when most birds and fish are resting.

The overall conservation status of the white-clawed crayfish in Ireland is poor, due to the reduction in its range and the continuing pressures that it faces (NPWS, 2008). The most recently published Current Range and Current Distribution mapping for this species includes both 10km grid squares which incorporate the proposal considered in this document.

Salmon (*S. salar*) [1106]

Atlantic salmon is a species of qualifying interest for both the Lower River Shannon cSAC, Lower River Suir cSAC .It is an anadromous species, living in freshwater for at least the first 2 or 3 years of life before migrating to sea. Relatively large cool rivers with extensive gravelly bottom headwaters are essential during their early life. Smolts migrate to sea where they may live for 1 or 2 years before returning to freshwater. A decline in Salmon stocks is well recognised in Ireland and throughout the range of the North Atlantic Salmon and is attributed to several factors including the salmon disease Ulcerative Dermal Necrosis (UDN), poor marine survival and some overfishing. The NPWS suggest that agricultural enrichment, forestry related pressures and poor water quality resulting from inadequate sewage treatment are the major pressures affecting Irish salmon rivers (NPWS 2007).

The most recently published Current Range and Current Distribution mapping for this species includes the 10km grid squares that encompass the location of the proposal considered in this document, and indicates that the species has a wide distribution within the River Suir system ranging from the headwaters to the lower reaches of the system and and also within the extended Mulkear River system, which is a tributary of the Shannon, to which first order streams adjacent to the site drain.

Sea lamprey (*P. marinus*) [1095]

Both the Lower River Shannon cSAC and the Lower River Suir cSAC are designated for the protection of this species. Sea lampreys spend their adult life in marine and estuarine waters, living as external parasites on other fish species. They migrate up rivers to spawn in areas of clean gravels and after they have spawned, they die. After hatching, the young larvae settle in areas of fine sediment in still water, where they burrow. They live as filter feeders and may remain in fine sediments for several years before transforming into adult fish. Sea lampreys, which can grow up to 1m in length, are widely distributed around the coast. However they tend to occur in low densities. Overall, the conservation status of the sea lamprey in Ireland is considered to be poor (NPWS, 2008). The Current Range and Current Distribution mapping does not include the 10km squares which encompass the proposal considered in this document

Brook lamprey (*L. planeri*) [1096] River lamprey (*L. fluviatilis*) [1099]

The river lamprey grows to 30cm and has a similar life history to the sea lamprey. The brook lamprey is the smallest of the three lampreys native to Ireland at 15 to 20cm. It is also the only one of the three which is non-parasitic and spends all its life in freshwater. Despite the difference in ecology, brook and river lamprey are very similar genetically and extremely difficult to distinguish from each other. Juvenile river and brook lampreys cannot be discriminated and metamorphosed individuals can only be distinguished on the basis of dentition (King *et al.*, 2004). As a result, for the purposes of this assessment, the brook and river lampreys have been treated together. Both are species of qualifying interest for both the Lower River Shannon cSAC and the Lower River Suir cSAC. The current conservation status of these species in Ireland is considered to be good (NPWS, 2008).

Allis shad (*A. alosa*) [1102]

Allis shad spend their adult life at sea or in the lower reaches of estuaries, ascending to freshwater to spawn in early summer. The spawning females shed their eggs into the water where they either drop into the gravel bed or begin to drift downstream. Those eggs that fall into gravels hatch after several days and then drift downstream. The young fish may remain in estuarine waters during their second year before finally going to sea where they mature. While European populations have a recorded capacity for significant migration upstream, this capacity seems more constrained in Irish populations (King *et al.*, 2004). Weirs and dams are known to be obstacles to the migration of Allis shad upstream. The current conservation status of the species is 'Unknown' (NPWS, 2008).

Twaite shad (*A. fallax* fallax) [1103]

The twaite shad is a member of the herring family and is found in coastal areas from Norway and Iceland to the north-eastern Mediterranean. Shad normally live in estuarine and coastal waters but come into the lower reaches of rivers to spawn. Very little is known about the distribution, abundance and biology of the twaite shad although it has been studied in the River Barrow in County Waterford, and in the Solway rivers (Scotland)[5]. Twaite shad normally spawn, in May and June, near the tidal limits (NPWS, 2008). Weirs and dams are known to be obstacles to the migration of Twaite shad upstream. The current conservation status of the species is bad (NPWS, 2008).). Irish Red Data Book classified as vulnerable.

3.5.2.4 *Mammals*

Otter (*L. lutra*) [1355]

The otter is a species of qualifying interest for both the Lower River Shannon cSAC and Lower River Suir cSAC. The otter is widespread throughout the country, in freshwater and coastal habitats, and Ireland has long been considered to hold one of the most important otter populations in Western Europe (Whilde, 1993). Due to a decline in the population in Europe, including Ireland, the otter has been listed in Annex II of the EU Habitats Directive and Appendix II of the Berne Convention. It is also protected under the Wildlife Acts 1976 and 2000. It is listed in the Red Data Book (Whilde, 1993) as vulnerable.

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[5] http://www.habitas.org.uk/priority/species.asp?item=42767

Otters can, potentially, exploit all stretches of a river system where they are present. The two major threats facing otters in Europe are habitat destruction and water pollution (from NPWS, 2008) and the current conservation status for the species is considered 'Unfavourable-Inadequate' (NPWS, 2008). In an Irish context the main four threats have been assessed to be direct and indirect habitat destruction, pollution (particularly organic pollution resulting in fish kills), disturbance from increasing recreational activities and accidental death and persecution (Foster-Turley, *et al.*, 1990).

3.6 Assessment of Potential Impacts

3.6.1 Habitat loss or alteration

3.6.1.1 *Habitats*

The proposal considered in this document does not require any land take from any Natura 2000 or Ramsar site. It is considered that no significant habitat loss or alteration impacts, within any of the designated sites considered in this section of the document, are reasonably foreseeable as a result of the proposal considered in this document.

3.6.1.2 *Aquatic habitats*

The potential for the alteration of aquatic habitats due to an impairment of water quality is assessed section 3.6.3 below.

3.6.2 Disturbance and/or displacement of species

3.6.2.1 *Birds*

In relation to the Natura 2000 sites and their conservation objectives, the main bird species of concern is the hen harrier as this is the species for which the Slievefelim to Silvermines Mountains SPA is designated. The bird surveys of the Upperchurch area show that the proposed development site is not greatly or regularly utilised by hen harriers. Hen harriers which use the wider district for foraging could be affected by:
construction activities;
disturbance/displacement by the actual presence of the turbines; and
risk of collision.
It is possible that the construction activities (construction vehicles, erection of turbines, construction of access roads, turbine foundations and hardstandings *etc.*) could cause disturbance to foraging and/or potential nesting hen harriers in the area. However, the bird surveys show that no breeding took place within the study area in 2011. Hence, the construction activities at the proposed development site are unlikely to impact breeding hen harriers.
Disturbance/displacement by the presence of the turbines
Recent research shows that operational turbines cause low levels of displacement of foraging hen harriers. A monitoring study on hen harriers at an existing windfarm in Derrybrien, Co. Galway indicates that the displacement of hen harriers due to wind turbines is also relatively low, with foraging hen harriers regularly observed within 50m of turbines (Madden and Porter, 2007).
Displacement in terms of nesting/breeding appears to be greater. Whitfield and Madders (2006) refer to Natural Research unpublished data from Argyll in Scotland and Northern

Ireland, which indicate that nesting attempts may occur in the order of 200-300m around turbines. More recent research indicates that there is a lower density of breeding hen harriers within 500m of turbines (Pearce-Higgins *et al.*, 2009).

Hen harrier was observed on two occasions at Upperchurch during the course of the winter and summer raptor vantage point surveys. The randomness and low number of hen harrier observations during the vantage point surveys in 2010 and 2011 suggests that the proposed windfarm site 2km west of Upperchurch is used infrequently by hen harriers. The very low number of observations would suggest that the significance of the risk of Disturbance/displacement as a result of the construction of the wind farm is considered *very low*.

Collision risk

Collision risk for hen harriers is considered to be low (see Madden and Porter, 2007; Whitfield and Madders, 2006). They are known to be manoeuvrable in flight and have been observed to fly to within 10m of turbine bases (Madden and Porter, 2007) and to fly through the gaps in an electricity pylon. The minimum distance between the proposed turbine hubs within the proposed development site is 280m. The randomness and low number of hen harrier observations during the vantage point surveys in 2010 and 2011 suggests that the proposed windfarm site 2km west of Upperchurch is used infrequently by hen harriers and the resultant risk of collision is *very low*.

3.6.2.2 *Aquatic species*

Freshwater pearl mussel (Margaritifera margaritifera)

Distribution in the Lower River Shannon cSAC

As was noted previously the current published distribution for this species within the Shannon river system does not include any 10km square which incorporates any stretch of river downstream of the location of the proposal considered in this document. Mapping of the distribution in this cSAC indicates that the species is restricted to the Feale system a separate tributary which drains to the Shannon Estuary via the Cashen River in North County Kerry. No records for the river system downstream of the proposal site are retained at the NBDC on line data resource. On the basis of the evidence outlined in this paragraph it is concluded that no impacts on this species, within the Lower River Shannon cSAC downstream of the proposal site, are reasonably foreseeable as a result of the proposal considered in this document.

Distribution in the Lower River Suir cSAC

The published current distribution for this species includes 10km grid squares R94 and S05 which incorporate the Clodiagh River into which first order stream adjacent to the proposal site drain. The distribution mapping also includes 10km grid squares S04, S02 and S01 which contain a significant stretch of the main channel of the Suir further downstream of the proposal site. In addition records from 2006, retained at the National Biodiversity Data

Centre on line data resource, indicate that the species was then recorded in several locations on the Multeen River. An unnamed stream adjacent to the proposal site drains to the Turaheen River which in turn drains to the Multeen. The nearest record retained is for 1km grid square R9844 situated approximately 21km downstream[6] of the proposal site. It is presumed in light of the aforementioned direct evidence and on the basis of the precautionary principle, that this species is potentially present within the zone of impact influence of the proposal.

There is a risk that the water quality of the local watercourses, that drain the site, could be impaired during the construction stage of the proposed windfarm. It is possible that this could impact negatively on the Freshwater pearl mussel within the Lower River Suir cSAC downstream of the proposal site.

There is also a risk of negative impact to this species because of its complex life cycle which includes a larval stage when they are dependent on salmonid fish hosts. It is possible that these salmonids could be in the impact zone of the development when they migrate further upstream. The main potential risk to the mussel posed by the proposed development is the threat of sedimentation and pollution of waterways during the construction phase of the proposal. Therefore, it cannot be objectively concluded that significant indirect impacts on the freshwater pearl mussel will not ensue from an unmitigated construction phase.

White-clawed crayfish (Austropotamobius pallipes)

As was noted previously the most recently published Current Range and Current Distribution mapping for this species includes both 10km grid squares which incorporate the proposal considered in this document. In addition, records retained at the NBDC include one location within the Turraheen system and several locations on the Owenbeg system all of which are downstream of the proposal site considered in this document. The record on the Turraheen is located approximately 8km[7] downstream of the site. The nearest location on the Owenbeg is approximately 4km downstream of the site. O Connor (2007) noted that crayfish were abundant at Munroe Bridge which is situated on the Cromoge River which drains to Clodiagh at a point upstream of the point of confluence of the Clodiagh and Owenbeg. Taken together these various records indicate the strong likelihood of the presence of a significant population(s) within the upper Clodiagh/Owenbeg system. It is presumed in light of the aforementioned direct evidence and on the basis of the precautionary principle, that this species is potentially present within the zone of impact influence of the proposal.

There is a risk that the water quality of the local watercourses, that drain the site, could be impaired during the construction stage of the proposed windfarm. It is possible that this could impact negatively on the white-clawed crayfish.

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[6] Distance measured on 'Draw and Measure' tool on the IFI Water Framework Directive Fish Survey Map Viewer (Available at http://www.ifigis.ie/WFDFishMap/ [accessed 14/08/2012])

[7] Distances measured on 'Analysis' tool on the NBDC Biodiversity Maps Map Viewer. (Available at http://maps.biodiversityireland.ie/#/Map [accessed 15/08/2012])

Therefore, it cannot be objectively concluded that significant indirect impacts on the white-clawed crayfish will not ensue from an unmitigated construction phase.

Salmon (S. salar) [1106]

As was mentioned previously, current available evidence indicates that this species has a wide distribution within both cSAC river systems. It is presumed in light of the aforementioned evidence and on the basis of the precautionary principle, that this species is potentially present within the zone of impact influence of the proposal.

There is a risk that the water quality of the local watercourses, that drain the site, could be impaired during the construction stage of the proposed windfarm. It is possible that this could impact negatively on the Atlantic salmon. The main potential risk posed by the proposed development is the threat of sedimentation and pollution of waterways and consequent potential loss of spawning habitat during the construction phase. Therefore, it cannot be objectively concluded that significant indirect impacts on the salmon will not ensue from an unmitigated construction phase.

Potential nursery habitat was recorded along the stream to the south of turbines T9 and T10. No suitable salmon nursery habitat was recorded within the other streams within the site boundary.

Sea lamprey (Petromyzon marinus)

Distribution in the Lower River Shannon cSAC

The Current Range and Current Distribution mapping indicates that this species is not present within the tributary system which connects the proposal considered in this document, via the Mulkear River, to the main channel of the River Shannon. The mapping indicates that the nearest record is for 10km Grid square R55 at a location downstream of the point of confluence of the Mulkear and Shannon rivers, near Castletroy in Limerick city. This location is a linear distance in excess of 29km west of the proposal site and separated from it by a watercourse of significantly greater length. It is noted that the weir at Annacotty is a migration barrier that prevents lamprey from accessing the Mulkear of the river[8]. On the basis of the evidence outlined in this paragraph it is concluded that within the Lower River Shannon cSAC downstream of the proposal site, no significant impacts on this species are reasonably foreseeable as a result of the proposal considered in this document.

Distribution in the Lower River Suir cSAC

The Current Range and Current Distribution mapping indicates that that the distribution of the species extends to a location which is in excess of 12km downstream of the point of confluence of the Turaheen/ Multeen system and the Owenbeg/ Suir system (near Golden, County Tipperary). This location, which is in excess of a linear distance of 34km south east of the proposal, is adjacent to Cahir in County Tipperary. O Connor, (2007 p.4) states that sea lamprey were recorded downstream of Cahir, County Tipperary a finding confirmed by the

[8] http://www.mulkearlife.com/sea-lamprey.php

Current range and Distribution mapping which indicates that the species has a wide distribution within the River Suir system spanning the Suir from downstream of Cahir to the lower reaches of the system (NPWS, 2008). It is presumed in light of the aforementioned direct evidence and on the basis of the precautionary principle, that this species is potentially present within the zone of impact influence of the proposal.

There is a risk that the water quality of the local watercourses, that drain the site, could be impaired during the construction stage of the proposed windfarm. It is possible that this could impact negatively on the sea lamprey within the Lower River Suir cSAC downstream of the proposal site.

The main potential risk posed by the proposed development is the threat of sedimentation and pollution of waterways during the construction phase of the proposal. Therefore, it cannot be objectively concluded that significant indirect impacts on the sea lamprey will not ensue from an unmitigated construction phase.

Brook lamprey (Lampetra planeri) [1096] and River lamprey (Lampetra fluviatilis]

Currently no records are retained online at the National Biodiversity Data Centre for these species within the extended river systems of either cSAC. The current known distribution for these species includes the 10km squares within which the proposal considered in this document occurs and the grid squares which incorporate the extended river systems which drain to both cSACs. O Connor (2007) confirmed the presence of these species within the Multeen, upstream of its point of confluence with the Aughnaglanny River, at a site approximately 18km downstream of the proposal site. The same survey recorded these species on the Owenbeg and Clodiagh rivers at sites located up stream of their point of confluence which is situated approximately 9km downstream on the Owenbeg and 19km downstream on the Clodiagh.

It is presumed in light of the aforementioned evidence and on the basis of the precautionary principle, that these species are potentially present within the zone of impact influence of the proposal. within both cSACs.

There is a risk that the water quality of the local watercourses, that drain the site, could be impaired during the construction stage of the proposed windfarm. It is possible that this could impact negatively on the lamprey within the Lower River Suir cSAC downstream of the proposal site.

There is a potential risk of a negative impact on these species from the construction. The main potential risk posed by the proposed development is the threat of sedimentation and pollution of waterways during the construction phase of the proposal. Therefore, it cannot be objectively concluded that significant indirect impacts on lamprey will not ensue from an unmitigated construction phase.

Allis shad (*A. alosa*) [1102]

The Lower River Suir cSAC is designated for the protection of this species because Current Range mapping for this species is only available in 50km grid cells the resolution is less fine than that which is available for other species. However, mapping of the Current Distribution of this species, which is available at 10km grid resolution, indicates that the species is confined to the lower reaches of the Suir system (NPWS, 2008) which is a linear distance of in excess of 60km south east of the proposal site and separated from it by a watercourse of considerably greater length[9]. Therefore, on the basis of the distribution mapping, and bearing in mind the constrained capacity for upstream migration referred to previously, it is considered unlikely that this species occurs within 15km of the proposed development. On the basis of the evidence outlined in this paragraph it is concluded that on this species, within the cSAC, no significant impacts are reasonably foreseeable as a result of the proposal considered in this document.

Twaite shad (*A. fallax* fallax) [1103]

The Lower River Suir cSAC is designated for the protection of this species Because Favourable Reference Range Mapping for this species is only available in 50km grid cells the resolution is less fine than that which is available for other species. However, mapping of the Current Distribution of this species, which is available at 10km grid resolution, indicates that the species s is confined to the lower reaches of the Suir system at a linear distance of in excess of 60km[10] south east of the proposal site and separated from it by a watercourse of considerably greater length. Therefore on the basis of the distribution mapping, and the evidence sited in the site synopsis, it is considered unlikely that this species occurs within 15km of the proposed development. On the basis of the evidence outlined in this paragraph it is concluded that on this species, within either cSAC, no significant impacts are reasonably foreseeable as a result of the proposal considered in this document.

[9] Distance measured using 'Measure Distance' Analysis Tool available at http://maps.biodiversityireland.ie/#/Map [accessed 14/08/2012]

[10] Distance measured using 'Measure Distance' Analysis Tool available at http://maps.biodiversityireland.ie/#/Map [accessed 14/08/2012]

3.6.2.3 *Mammals*

Otter (L. lutra)

A search of the NBDC online resource indicates that the most recent, adjacent, records retained for this species are 1980 records included in the 1982 Otter Survey of Ireland[11]. At that time otter were recorded in 100m grid square R947628 approximately 1.3km north east of T21 on the Clodiagh river and in 100m grid square R974594 on the Owenbeg, approximately 1.2km south east of T2.These records, albeit historic, indicate that otters are potentially present within the vicinity of the proposal.

It is presumed in light of the aforementioned evidence and on the basis of the precautionary principle, that these species are potentially present within the zone of impact influence of the proposal.

There is a risk that disturbance due to noise and human presence could cause disturbance or displacement impacts on this species during the construction phase of the proposed windfarm. There is also a risk that the water quality of the local watercourses, that drain the site, could be impaired during the construction stage of the proposed windfarm. It is possible that this could impact negatively on the otter within both the Lower River Shannon cSAC and the Lower River Suir cSAC downstream of the proposal site.

It is considered that the proposal considered in this document could potentially pose a risk of habitat degradation through sedimentation and/or pollution. This could impact the otter directly or indirectly through the reduced availability of prey. Therefore, it cannot be objectively concluded that significant indirect impacts on the otter will not ensue from an unmitigated construction phase.

3.6.3 Water Quality

The potential significant impacts of the proposed development on aquatic ecology (without mitigation) are summarised as follows:

Pollution of watercourses with suspended solids due to runoff of soil from construction areas.

In the absence of adequate mitigation measures, contamination of water courses with suspended solids may have the potential to impact on potential salmonid spawning and nursery areas and this is one of the most significant potential impacts of the proposed development. The impact would be classified as a significant negative impact on all affected streams (namely the Clydagh and Breanagh Rivers and their tributaries). Pollution of the local watercourses would result in a direct impact on the SPA and particularly the cSAC.

Pollution of watercourses with nutrients due to ground disturbance during construction and during clear felling of forestry.

The main potential sources of nutrient inputs to freshwater due to ground disturbance are:

Nutrients adsorbed or chemically bound to eroded suspended solids

[11] Available at: http://maps.biodiversityireland.ie/#/Map [accessed 7/06/2012]

Leaching of fertilisers used during the forestry operation

Pollution of watercourses with nutrients due to decomposition of brash after forestry clear felling.

Pollution of watercourses, during construction phase, with other substances such as fuels, lubricants, waste concrete, waste water from wash facilities, etc.

Pollution of watercourses with surface drainage water from paved areas and road surfaces.

There is a risk of pollution of surface waters with hydrocarbons from paved areas after the construction is complete.

Permanent loss of habitat due to stream crossings.

Construction of stream crossings at site entrance and installation of box culvert at may result in potential for in-stream deterioration of water quality.

In the absence of adequate mitigation measures, pollution of water courses from any of the above possible sources has the potential to impact on qualifying interests, aquatic species, otter and freshwater habitat within the *Lower River Shannon and Lower River Suir c SACs*. This is the most significant potential impact of the proposed development. The impact, if it resulted in a severe pollution event, would be classified as a significant negative impact on the adjacent stream and on both cSACs. A number of species of qualifying interest could be affected, particularly if spawning success of these species was negatively impacted. Additional impacts would occur, particularly to otter, should availability of prey be reduced.

Table 16 Summary of unmitigated impacts

Ecological Feature	Potential impacts	**Potential significance of the unmitigated impact Lower River Shannon cSAC**	**Potential significance of the unmitigated impact Lower River Suir cSAC**
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]	Possible decrease in water quality as a result of run-off of pollution.	**Significant**	**Significant**
Freshwater pearl mussel (*Margaritifera margaritifera*) [1029]	Possible decrease in habitat quality from sedimentation or pollution. Possible death of glochidia larvae. Possible decrease in abundance of parasitic salmonid hosts due to sedimentation or pollution of habitat.	*None expected*	**Significant**
White-clawed crayfish (*Austropotamobius pallipes*)[1092]	Possible decrease in habitat quality from sedimentation or pollution.	Species not a Qualifying Feature of Interest	**Significant**
Atlantic salmon (*Salmo salar*) [1106]	Possible decrease in habitat quality from sedimentation or pollution and reduction in spawning area.	**Significant**	**Significant**
Sea lamprey (*Petromyzon marinus*)[1095]	Possible decrease in habitat quality from sedimentation or pollution.	*None expected*	**Significant**

Ecological Feature	Potential impacts	Potential significance of the unmitigated impact Lower River Shannon cSAC	Potential significance of the unmitigated impact Lower River Suir cSAC
Brook lamprey (*L. Planeri*) [1096] and River lamprey (*Lampetra fluviatilis*) [1099]	Possible decrease in habitat quality from sedimentation or pollution and reduction in spawning area.	**Significant**	**Significant**
Allis shad (*A. alosa*) [1102]		Species not a Qualifying Feature of Interest	*None expected*
Twaite shad (*A. fallax fallax*) [1103]		Species not a Qualifying Feature of Interest	*None expected*
Otter (*L. lutra*) [1355]	Possible disturbance or displacement impacts from noise and human presence during construction phase. Possible decrease in habitat quality and/or prey availability from sedimentation or pollution.	**Significant**	**Significant**
Ecological Feature	Potential impacts	**Potential significance of the unmitigated impact Slieve Felim to Silvermines SPA**	
Hen harrier (*C.cyaneus*) [A082]	Disturbance/displacement from habitat Potential risk of collision	**Not Significant**	

3.7 Mitigation

Construction of the windfarm has the potential to cause negative short-term and/or permanent impacts to terrestrial habitats within the proposed windfarm site and to aquatic habitats and species in the rivers and streams associated with the site. A number of planned mitigation measures detailed below will reduce these impacts significantly. Many of the mitigation measures below have been based on CIRIA (Construction Industry Research and Information Association, UK) technical guidance on water pollution control and on current accepted best practice.

3.7.1.1 *Storage, Stockpiling and Waste Generation Management*

All excavated earth materials must be either re-used in an environmentally appropriate and safe manner, e.g. used for landscaping, or removed from the development site at the end of the construction phase.

In addition, a construction phase Environmental Management Plan will be incorporated to include regular checking of equipment, materials storage and transfer areas, drainage structures and their attenuation ability during the construction phase of the project. The purpose of this management control is to ensure that the measures that are put in place continue to operate effectively, to prevent accidental leakages, and to identify potential breaches in the protective retention and attenuation network during earthworks operations

3.7.1.2 *Soil, Subsoil and Bedrock Removal*

The removal of topsoil, mineral subsoil and bedrock is an unavoidable impact of the development but every effort will be made to ensure that the amount of earth materials excavated is kept to a minimum in order to limit the impact on the geological and hydrological aspects of the site.

A number of mitigation measures have been incorporated into the project design in order to reduce the likely significance of the impacts on the Natura 2000 sites as outlined above. The main concern is the potential impacts on the water quality of watercourses within the Lower River Suir and the Lower River Shannon cSACs during the construction phase, and the subsequent impacts on the aquatic species of qualifying The main risk to the water quality of the streams draining the site, which drain into the nearby Lower River Suir cSAC and the Lower River Shannon cSAC, results from the potential sedimentation of streams, run-off of pollutants from construction discharging into watercourses and accidental fuel spillages. These risks arise from both felling and construction activities. Management measures will be put in place to avoid any pollution risks to the Lower River Suir cSAC and the Lower River Shannon cSAC.

3.7.2 Water Quality Measures during the Construction Phase

It is noted that no in-stream works are proposed. A number of mitigation measures will be implemented in order to reduce the significance of the potential adverse impacts associated with the construction phase.

3.7.2.1 *Runoff and sediment control*

Erosion control where runoff is prevented from flowing across exposed ground and sediment control where runoff is slowed to allow suspended sediment to settle are important elements in runoff and sediment control. An erosion and sediment control management plan has been designed to prevent sediment and pollutant runoff into the river during the construction phase and is included as Appendix 15-2 Volume 3. This plan will be implemented during construction to control increased runoff and associated suspended solid loads in discharging waters from the development areas. The main elements of this plan include:

Implement erosion control to prevent runoff flowing across exposed ground and becoming polluted by sediments;

Intercept and divert clean water runoff away from construction site runoff to avoid cross-contamination of clean water with soiled water;

Implement sediment control to slow down runoff allowing suspended sediments to settle in situ particularly on roads;

When working at each stage and section (e.g. access road, substation compound, turbine bases, etc) of the development the associated erosion and sediment controls at each section will be put in place prior to construction of each section. Access roads will need to be constructed to access the proposed site for turbine locations. The associated erosion and sediment controls, drains, sediment traps and settling ponds, will be constructed along side these roads and in a conscious manner to ensure that the potential risk to water quality is minimised;

Minimise area of exposed ground by maintaining existing vegetation that would otherwise be subject to erosion in the vicinity of the windfarm infrastructure and keeping excavated areas to a minimum;

The clearing of soil and peat associated with the proposed development will take place immediately before construction begins;

Avoid working near watercourses during or after prolonged rainfall or an intense rainfall event and cease work entirely near drains when it is evident that pollution is occurring;

Install a series of silt fences or other appropriate silt retention measure where there is a risk of erosion runoff to watercourses from construction related activity particularly if working during prolonged wet weather period or if working during intense rainfall event;

Implement sediment control measures that includes for the prevention of runoff from adjacent intact ground that is for the separation of clean and 'dirty' water;

Install appropriate silt control measures such as silt-traps, check dams and sedimentation ponds;

Provide recommendations for public road cleaning where needed particularly in the vicinity of drains; and

Controls need to be regularly inspected and maintained otherwise a failure may result, such as a build up of silt or tear in a fence, which will lead to water pollution so controls must work well until the vegetation has re-established; inspection and maintenance is critical after prolonged or intense rainfall.

Run-off from wind turbine foundation concrete pours shall not be permitted to enter the drainage system and shall be contained within the foundation excavations and designated areas that are suitably sited and designed;

No work will take place within 50m buffer zones of live watercourses except for the stream crossings.

All construction method statements will be prepared in consultation with Inland Fisheries Ireland;

All associated tree felling will be undertaken using good working practices as outlined by the Forest Service in their 'Forestry Harvesting and Environment Guidelines' (Forest Service, 2000a) and the 'Forestry and Water Quality Guidelines '(Forest Service, 2000b). The latter guidelines deal with sensitive areas, erosion, buffer zone guidelines for aquatic zones, ground preparation and drainage, chemicals, fuel and machine oils;

Drainage ditches or other suitable measures will be adopted alongside access roads, turbines and other disturbed areas to prevent silt or contamination from construction water runoff entering watercourses;

Check dams will be placed at regular intervals based on slope gradient along all drains to slow down runoff to encourage settlement and to reduce scour and ditch erosion;

Drains, carrying construction site runoff, will be diverted into silt traps;

Wheel washes will be provided for exiting heavy vehicles to ensure roads outside of the site boundary are clean;

Pumped or tremied concrete will be monitored carefully to ensure no accidental discharge into the watercourse;

A programme of inspection and maintenance of drainage and sediment control measures during construction will be designed and dedicated construction personnel assigned to manage this programme;

Water quality monitoring will be carried out for two years post-construction to determine whether water quality is impacted.

3.7.2.2 *Protection of Watercourses (General Measures)*

It is recommended that the following measures should be incorporated into the development so as to ensure no significant negative impact on water course and the features of conservation interest:

Raw or uncured waste concrete / cementitious material will be disposed of by removal from the site.
The amount of *in-situ* concreting required will be minimised and ready-mix suppliers will be used in preference to on-site batching.
Fuelling and lubrication of equipment will be carried out in bunded areas.
Any spillage of fuels, lubricants or hydraulic oils will be immediately contained and the contaminated soil removed from the site and properly disposed of.
Oil booms and oil soakage pads will be kept on site to deal with any accidental spillage.
Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling.
Prior to any work it will be ensured that all construction equipment is mechanically sound to avoid leaks of oil, fuel, hydraulic fluids and grease.
Overnight parking of vehicles away from watercourses

3.7.2.3 *Run-off and Sediment Control Plan and Measures*

A Sediment and Erosion Control Plan will be designed to safeguard the water environment and incorporated into the Construction Environmental Management Plan (CEMP) and other surface water management measures employed during the construction phase of the proposed windfarm (see Chapter 6 Volume 2). The main aspects of the plan are outlined hereunder:
Reduce changes in run-off regimes
Control surface water run-off within and its effects outside the site
Protect aquatic environments
Separate clean water from construction activity effected water
Appropriately design and specify the provision of sediment series ponds and silt traps
Prevent all sediment associated pollution entering watercourses and groundwater
Erosion control where run-off is prevented from flowing across exposed ground and sediment control where run-off is slowed to allow suspended sediment to settle are important elements in run-off and sediment control. This plan will be implemented during construction to control increased run-off and associated suspended solid loads in discharging waters from the construction area. All site compound drainage will be passed through a settlement facility with the capacity to retain any accidental spillage or leakage of polluting substances. The main elements of this plan include:
Prior to excavation, drains will be established to effectively drain grounds prior to earthworks. Such drains will be positioned at an oblique angle to slope contours to ensure ground stability.
All site excavations and construction will be supervised by a suitably qualified engineer. The contractor's methodology statement will be reviewed and approved by a suitably qualified engineer prior to site operations.

Run-off from foundation concrete / cementitious material pours shall not be permitted to enter the watercourse and shall be contained within the foundation excavations and designated areas that are suitably sited and designed.
The area of exposed ground will be kept to a minimum by maintaining, where possible, existing vegetation.
Temporary deposition areas will be designated and designed to hold temporary stockpiles of spoil. These will be located away from the stream and stockpiles that are at risk of erosion will be protection by silt trapping apparatus such as a geotextile silt fence to prevent contaminated run-off.
Silt fences or other appropriate silt retention measure will be installed where there is a risk of erosion run-off to the stream from construction related activity, particularly during prolonged wet weather periods or an intense rainfall event.
Check dams will be placed at regular intervals based on slope gradient along all drains to slow down run-off to encourage settlement and to reduce scour and ditch erosion.
Drains carrying construction site run-off will be diverted into silt traps.
It is recommended that wheel washes will be provided in a bunded area at a remove from the stream.
Pumped or tremied concrete / cementitious material will be monitored carefully to ensure no accidental discharge into the stream.
A programme of inspection and maintenance of drainage and sediment control measures during construction will be designed and dedicated construction personnel assigned to manage this programme.
Silt traps will be regularly inspected, any blockages cleared and they will be maintained and cleaned during dry weather.

A continuous silt fence will be installed down slope from the works area where construction shall take place within 100m of a stream. This will act as a physical impediment to any material or run-off reaching the stream and will be installed prior to the commencement of site excavations for each section. Effective and adequate temporary silt fences will be erected on the river side to trap sediment particles when work is taking place during a prolonged wet weather period or intense rainfall event. The silt fences will be inspected regularly to ensure that the integrity of the structure remains intact and fit for purpose throughout the construction phase of the proposal.

3.7.2.4 *Fuel and Oil Management Plan*

Fuel management measures will be implemented which will incorporate the following elements:
Machinery will be confirmed as being mechanically sound and without fuel or oil leaks and fit for purpose prior to project start;
Use of biodegradable products where possible, e.g. hydraulic fluid;

Mobile bowsers, tanks and drums will be stored in secure, impermeable storage area, a minimum of 50m from drains and open water;
Fuel containers must be stored within a secondary containment system e.g. bund for static tanks or a drip tray for mobile stores;
Ancillary equipment such as hoses, pipes must be contained within the bund;
Taps, nozzles or valves must be fitted with a lock system;
Fuel and oil stores including tanks and drums will be regularly inspected for leaks and signs of damage;
Only designated trained operators will be authorised to refuel plant on site and emergency spill kits will be present at equipment for all refuelling events;
Procedures and contingency plans will be set up to deal with an emergency accidents or spills; and
An emergency spill kit with oil boom, absorbers etc. will be kept on site in the event of an accidental spill.

3.7.2.5 *Replanting and Reinstatement of Site*

Exposed areas of the site that are slow to re-vegetate may need to be replanted with suitable vegetation. This will be decided by the developer in consultation with the project ecologist near the end of the construction phase.
As a result of permanent felling, works areas surrounding T3, T9, T12, T14 and T22 will be bare and it is proposed to incorporate these areas into an Ecological Management Plan for the site.

3.7.2.6 *Truck Wash and Concrete / Cementitious Material Residue*

It is important to prevent concrete and other cementitious material from entering the streams situated in close proximity to the site.
It is recommended that a designated bunded and impermeable truck wash area be provided. Resultant waste water is to be diverted to siltation pond for settling out of solids, prior to release. It is important that a pumping / dewatering system is well planned. Pumped water will need to be treated in the adequate settlement pond and silt trap before it can enter the stream. Among other things, concrete and other cementitious material will be used for the construction and the following measures will be implemented:
Designate a concrete / cementitious material washout area away from drains and watercourses at a designated, contained impermeable area or washout trucks off-site.
A designated trained operator experienced in working with concrete and other cementitious material will be employed during the pouring phase.
Large volumes of concrete and other cementitious material water to be pumped into a skip to settle out.

3.7.2.7 *Waste Control*

The main contractor should engage a waste company to deal with all its wastes during construction, so all waste streams should be identified at the outset and a selection of skips and bins are delivered to the contractor's compound at the outset and the waste is then managed throughout the construction phase. The contractor should prepare a Waste Management Plan.
Any introduced semi-natural (road building materials) or artificial (PVC piping, cement materials, electrical wiring etc.) must be taken off site at the end of the construction phase. Any accidental spillage of solid state introduced materials must be removed from the site.

3.7.2.8 *Storage*

The storage of materials, containers, stockpiles and waste, however temporary, should follow best practice at all times and be stored at designated areas. Storage will be located as follows:
Away from drains and any watercourses or drains
Fuel oils etc. will be stored in a sheltered area well removed from aquatic zones
Under cover to prevent damage from the elements
In secure areas
Well away from moving plant, machinery and vehicles

All containers will be stored upright and clearly labelled.

3.7.3 Summary of Residual Mitigated Impacts

Table 16 below includes an assessment of the likely residual impacts of the proposed Upperchurch Windfarm provided that all management mitigation measures outlined above are adequately implemented.

Table 17: Potential Significance of the mitigated impact

<table>
<tr><th>Ecological Feature(s) / Impact</th><th>Potential significance of the unmitigated impact</th><th>Summary of Mitigation Measures</th><th>Potential significance of the mitigated</th></tr>
<tr><td>Freshwater pearl mussel (Margaritifera margaritifera) / Impairment of water quality</td><td>Significant</td><td rowspan="7">Protection of water quality (general)
Run-off and Sediment Control Plan and Measures
Fuel and Oil Management Plan
Truck Wash and Concrete / Cementitious Material Residue
Waste Control
Storage</td><td>Not significant</td></tr>
<tr><td>White-clawed crayfish (Austropotamobius pallipes) / Impairment of water quality</td><td>Significant</td><td>Not significant</td></tr>
<tr><td>Sea lamprey (Petromyzon marinus) / Impairment of water quality</td><td>Significant</td><td>Not significant</td></tr>
<tr><td>River lamprey (Lampetra fluviatilis) and brook lamprey (L. Planeri) / Impairment of water quality</td><td>Significant</td><td>Not significant</td></tr>
<tr><td>Atlantic salmon (Salmo salar) Impairment of water quality</td><td>Significant</td><td>Not significant</td></tr>
<tr><td>Otter (Lutra lutra) / Impairment of water quality</td><td>Significant</td><td>Not significant</td></tr>
<tr><td>Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation / Impairment of water quality</td><td>Significant</td><td>Not significant</td></tr>
</table>

4 Cumulative Impact Assessment

The Natura Impact Assessment has been revised and updated following the a request by NTCC as part of a RFI (13/51/0003) for a cumulative impact assessment and ecological management plan.

4.1 Cumulative Impact upon SPA

The Upperchurch Wind Farm including a buffer zone of 250m radius around the turbines does not overlap with the SPA; the nearest turbine is 490m to the boundary of the *Slieve Felim to Silvermines Mountains SPA* (see Map 3, Appendix 1). Four of the turbines are located within 1km of the SPA, three turbines lies between 1km and 2km while the remaining turbines are located a distance of over 2km from the SPA.

The study area for the assessment includes the *Slieve Felim to Silvermines Mountains SPA* as well as a distance of 250m outside of the SPA.

Again, it is important to emphasise that the proposed Upperchurch Wind Farm will not affect the number of turbines within the SPA or within the 250m buffer zone surrounding the SPA boundary.

Table 18 below details the wind farm projects within the *Slievefelim to Silvermines Mountains SPA* and within the 250m buffer zone from its boundary. Of the 45 turbines within the SPA, 16 are proposed, 16 are permitted and 13 are operational. The Upperchurch Wind Farm is outside the SPA with the nearest turbine being 490m and the majority of turbines are located between 1-2km from the edge of the SPA (see Map 3, Appendix 1).

Table 18. Details of the wind farm projects within the SPA

Wind Farm	Owner	Status	No. turbines	No. turbines within SPA & 250m buffer zone	No. turbines outside SPA
Garracummer	Bord Gais	Operating	17	7*	10
Knockstanna	Airtricity	Operating	5	5	0
Bunkimalta	ESB/Coillte	Proposed	16	16	0
Knockmeale	Templederry Windfarm Ltd	Operating	2	1	1
Castlewaller	Castlewaller Woodland Partnership	Permitted	16	16	0
			56	**45**	**11**

* Two of the seven turbines lie outside the SPA but within the 250m buffer zone

Conifer plantation is considered to provide suitable foraging habitat during the open canopy stage, between years 2-10 of planting. Therefore, conifer plantation is only suitable for 20% or 8 years of its estimated 40 year rotational cycle and is thus considered to provide suitable habitat on a short-term basis. The provision of suitable conifer plantation habitat thus only coincides with a portion, and not all, of the lifetime of a windfarm. Marginal or semi-natural habitats, which are permanently open (i.e. not subject to the rotational cycles of conifer plantations), are considered suitable hen harrier foraging habitats over the lifetime of the windfarm.

Table 19. Details of the Upperchurch Wind Farm

Wind Farm	No. turbines within SPA & 250m buffer zone	Habitat types within 250m displacement zones of use to hen harrier	Short-term suitable foraging areas, conifer plantation (ha)	Area of suitable conifer plantation over project lifetime (ha)	Permanently suitable foraging areas, semi-open & marginal habitats (ha)
Upperchurch	0	Conifer plantation, acid grassland, wet grassland, upland blanket bog, wet heath	108ha	11ha	84ha

Table 2 above details the habitat types and areas within Upperchurch Wind Farm that are suitable on a short-term and permanent basis. At Upperchurch there is a mix of permanently open habitats (acid grassland, wet grassland, bog, heath) and conifer plantation (suitable on a short-term basis).Table 20 below details the habitat types and areas of the wind farms within the *Slievefelim to Silvermines Mountains* SPA and the 250m buffer zone that are suitable on short-term and permanent basis (see Map 1, Appendix 1). At Garracummer, Bunkimalta and Castlewaller the displacement zones are dominated by conifer plantation. The 5 turbines at Knockastanna support bog and wet grassland that can be considered as suitable foraging habitat through the lifetime of the wind farm (i.e. permanently suitable). Knockmeale supports less than 1ha of suitable foraging habitat.

Table 20. Details of the wind farm projects within the SPA and buffer zone (information sourced from relevant wind farm planning application documentation, note Planning Ref. (PR) quoted)

Wind Farm	No. turbines within SPA & 250m buffer zone	Habitat types within 250m displacement zones of use to hen harrier	Conifer plantation (ha)	Area of suitable conifer plantation available over project lifetime (ha)	Permanently suitable foraging areas, semi-open & marginal habitats (ha)
Garracummer	7	Conifer plantation	106	44	20
Knockstanna	5	Upland blanket bog, wet grassland	6		46
Bunkimalta (P.R. 13510035)	16	Conifer plantation, upland blanket bog, wet grassland	274	163	27
Knockmeale	1	Agricultural grassland, wet grassland	0	0	1
Castlewaller (P.R. 11510251)	16	Conifer plantation	288	48	0
	45		**674**	**255**	**84**

It is estimated that of the 674ha within the displacement zones of the turbines within the SPA and 250m SPA buffer zone, 255ha of this is likely to be suitable as hen harrier foraging habitat over the lifetime of the wind farms. When combined with the 84ha of permanently open habitat this increases to a total area of 339ha of suitable hen harrier foraging habitat within the displacement zones. Should hen harrier avoid the 250m displacement zones around turbines and foraging habitat is lost as a result, there is potential for cumulative impacts to arise within the SPA. Upperchurch Wind Farm will not contribute to any habitat loss within the SPA or associated 250m buffer zone, however, hen harrier are known to use the site though infrequently and the loss of approximately 95ha of potentially suitable hen harrier habitat may result in a cumulative effect. The potential losses of foraging habitat for the hen harrier associated with the Upperchurch Wind Farm will be fully mitigated by the creation of areas of suitable foraging habitat (see EcMP for further detail). Therefore, it is considered that impact of Upperchurch Wind Farm will be neutral and it will not contribute to a significant cumulative impact upon the *Slieve Felim to Silvermines Mountains SPA.*

The two largest wind farms within the SPA, the proposed Bunkimalta (Planning Ref. 13510035) and the permitted Castlewaller (Planning Ref. 11510251), which make up 74% of wind farms within the SPA, have acknowledged the potential for potential cumulative effects for foraging hen harrier. To remedy this, both have provided for the creation of equivalent areas of suitable foraging habitat. Mitigation habitat that is the creation of equivalent areas of suitable foraging habitat has been proposed by the applicants for the Bunkimalta and Castlewaller Wind Farm projects. The Bunkimalta project proposes to create an equivalent area of open canopy forest over the lifetime of the wind farm. Bunkimalta and Castlewaller are the largest of the wind farm projects within the SPA and they have the greatest coverage of forestry. Therefore, as a full mitigation programme involving the provision of equivalent areas of suitable foraging habitat is proposed for the Bunkimalta and Castlewaller projects it can be concluded that the net impact of these projects on the SPA is neutral and therefore the SPA should not be adversely affected.

In summary, the provision of mitigatory habitat for most of the turbines within the SPA and at Upperchurch Wind Farm coupled with the fact that Upperchurch wind farm lies outside the SPA and the associated 250m buffer zone, a cumulative impact effect with the SPA is not expected to arise.

4.1.1 Cumulative Impact of Other Wind Farms

The cumulative impact assessment area for the assessment of in-combination effects with other wind farms is made up of an area of 15km from the outer turbines of the Upperchurch Windfarm as well as the *SlieveFelims to Silvermines Mountains SPA* in addition to a buffer of 3km on the western edge of the SPA. The total area of this assessment area is 106,915ha. This differs from the SPA assessment area which was confined to the SPA and the surrounding 250m buffer zone.

There are a number of permitted and existing wind farms in the assessment area, as detailed in Table 21 below and Map 2 (Appendix 1). Of the 45 turbines within the SPA, 16 are proposed, 16 are permitted and 13 are existing and operating. The Upperchurch Wind Farm is outside the SPA with the nearest turbine being a distance of 490mm; most turbines are located at distances greater than 1km and 2km from the edge of the SPA (see Map 3, Appendix 1). The remaining 101 turbines within the study area are outside the SPA and within 15km of the Upperchurch Wind Farm. Most of these are located to the southeast of Upperchurch Wind Farm.

REFERENCE DOCUMENTS

Table 21. Wind Farms within 15km of the proposed wind farm (wind farms with turbines with the SPA have been bolded for clarity)

	Wind Farm	Owner	Status	No. turbines	Distance from nearest UWF turbine - KM	No. turbines within SPA	No. turbines outside SPA	Distance of nearest turbine from SPA - KM
1	Upperchurch	Ecopower Developments	Proposed	22	0	0	22	0.5
2	**Garracummer**	**Bord Gais**	**Operating**	**17**	**2.8**	**5**	**12**	**0**
3	**Knockstanna**	**Airtricity**	**Operating**	**5**	**8**	**5**	**0**	**0**
4	Cappawhite	ESB	Permitted	18	8.5	0	18	3.7
5	Glencarbry	Ecopower Developments	Permitted	11	4.5	0	11	3.4
6	Glenough	ABO Wind	Operating	14	3.2	0	14	2.7
7	Hollyford	Viridian	Under construction	3	3.7	0	3	3.1
8	Turraheen	Ecopower Developments	Proposed	3	5.6	0	3	5.5
9	Milestone	ABO Wind	Proposed	5	0.4	0	5	1.3
10	**Bunkimalta**	**ESB/Coillte**	**Proposed**	**16**	**9.5**	**16**	**0**	**0**
11	**Knockmeale**	**Templederry Windfarm Ltd**	**Operating**	**2**	**7.8**	**1**	**1**	**0.03**
12	**Castlewaller**	**Castlewaller Woodland Partnership**	**Permitted**	**16**	**14**	**16**	**0**	**0**
13	Ballinlough	Jaroma Windfarm Ltd	Operating	3	12.7	0	3	9.2
14	Curraghgraigue	Aeolus Energy Ltd	Operating	6	9.4	0	6	2.4
15	Ballinveny	North Tipperary Windpower Ltd	Operating	3	12.8	0	3	11.9
				144		**43**	**101**	

A GIS and autocad software have been used to map and estimate abundances for potentially useful hen harrier foraging habitat such as conifer plantation (suitable on a short-term basis during its open canopy stage) and marginal and semi-natural habitats, which are useful over the 25 year lifetime of the wind farm. The results of this analysis are presented in the following tables and have been used to undertake the assessment (see Map 2, Appendix 1).

Table 22. Temporarily and permanently suitable foraging habitat within the assessment area

	Wind Farm	No. turbines within SPA & 250m buffer zone	Habitat types within 250m displacement zones of use to hen harrier	Area of conifer plantation within 250m displacement zones (ha)	Area available conifer plantation within 250m displacement zones (ha) over lifetime of windfarm	Permanently suitable foraging areas, semi-open & marginal habitats (ha)
1	Upperchurch	0	Conifer plantation, acid grassland, wet grassland, upland blanket bog, wet heath	11	11	84
2	Garracummer	7	Conifer plantation	106	44	77
3	Knockstanna	5	Upland blanket bog, wet grassland	6	4	46
4	Cappawhite	0	Conifer plantation, wet grassland, bog/heath	234	92	93
5	Glencarbry	0	Conifer plantation, wet grassland, acid grassland, wet heath mosaic	135	44	17
6	Glenough	0	Conifer plantation, wet grassland, wet heath, acid grassland	90	18	29
7	Hollyford	0	Conifer plantation, wet grassland, wet heath, acid grassland, heath/bog cutover	5	0	19
8	Turraheen	0	Conifer plantation, wet grassland, bog/grassland mosaic, bog, wet heath	16	14	12
9	Milestone	0	Conifer plantation, wet grassland, wet heath	15	15	10

10	Bunkimalta	16	Conifer plantation, upland blanket bog, wet grassland	163	163	27
11	Knockmeale	1	Agricultural grassland, wet grassland	0	-	1
12	Castlewaller	16	Conifer plantation	48	48	0
13	Ballinlough	0	-	-	-	-
14	Curraghgraigue	0	Conifer plantation	1	0	0
15	Ballinveny	0	Conifer plantation	7	7	0
		45		**788**	**451**	**415**

Table 5 above presents all of the wind farms within the assessment areas. The total area of conifer plantation within the 205m displacement zones is 788ha, however, this does not reflect the fact that the plantation canopy will be closed for 80% of 4/5 of its rotational cycle. Therefore, this figure is a considerable overestimation. Following an analysis of the amount of area of available conifer plantation for foraging hen harrier over the lifetime of the Upperchurch Wind Farm this has been reduced to 451ha within the 250m displacement zones.

Table 6 below presents the corine landcover analysis, which was used in the assessment. Based on an analysis of the definitions of the landcover classifications habitats that are considered to provide potentially suitable forging habitat include transitional woodland-scrub, coniferous forestry, peat bog, moor and heath and natural grassland. It has been estimated that a total of approximately 22,000ha of potentially suitable hen harrier habitat occurs within the assessment area.

Table 23. Corine landcover estimates within the assessment area

Landcover type	Area (ha)	Potentially suitable hen harrier foraging area (ha)	Class as a % of the Zone
Pasture	73,169	-	68%
Transitional Woodland-Scrub	**9,092**	**9,092**	**9%**
Coniferous Forestry	**7,536**	**7,536**	**7%**
Agricultural	7,271	-	7%
Peat Bog	**4,562**	**4,562**	**4%**
Un-Irrigated Land	2,427	-	2%
Complex Cultivation	984	-	1%
Natural Grassland	**521**	**521**	0%
Broadleaf Forestry	409	-	0%
Discontinuous Urban	398	-	0%
Moor and Heath	**304**	**304**	0%
Inland Marsh	240	-	0%
		22,015	100.0%

When taken into context of the total area of potentially suitable available landcover of ~ 22,000ha for foraging hen harrier, the Upperchurch project will potentially affect 95ha (see Table 19), which is less than 0.5%. The other wind farm projects within the assessment area will potentially affect 451ha of useful conifer plantation and 415ha of open habitat giving a total of 866ha (see Table 22). When taken in context of the 22,015ha of available land this constitutes less than 4% of the total suitable landcover. The presence of the other windfarms may result in a cumulative effect; however, it is unlikely to be significant.

Mitigatory habitat has been proposed for Upperchurch Wind Farm through the provision of areas of suitable foraging habitat (nearest turbine is 490m from edge of SPA, therefore outside 250m buffer zone around SPA) the net impact is considered neutral. It is not anticipated that Upperchurch Wind Farm will contribute in a significant way to a cumulative effect.

Furthermore, mitigatory habitat has been proposed to offset loss of potential foraging habitat for the two largest wind farms, Bunkimalta and Castlewaller. Mitigatory habitat has also been proposed for Milestone Wind Farm (P.R. 12510385), which lies within the vicinity of Upperchurch Wind Farm but like Upperchurch is located outside of the SPA.

4.1.2 Cumulative Impact of Forestry

The *Slievefelim to Silvermines Mountains SPA* is an extensive upland site and approximately half of the site is afforested, including both first and second rotation plantations and clear fell areas. Roughly one-quarter of the site is unplanted blanket bog and heath, with both wet and dry heath present. The remainder of the site is largely rough grassland that is used for hill farming while some stands of deciduous woodland also occur, especially in the river valleys.

A considerable portion of the forestry within the SPA was planted pre-2000 and much of the current crop is in its second 40 year rotation. Of the total area of land within the assessment area (that is the 15km around the windfarm + SPA + 3km area surrounding SPA) 14,862ha or 13.9% of the forestry within the greater assessment area was planted prior to the year 2000. The significance of this is that that area may be of value to hen harrier for a portion of the lifetime of Upperchurch Wind Farm, which is planned for construction in 2017. It is only pre-thicket or open canopy conifer plantation during the years 2-10, or often years 3-9, that are considered to be of use to the hen harrier. Most of the forestry planted post-2000 will already be past the pre-thicket stage and the canopy will have closed.

From examination of a number of evidence sources in particular aerial photography and analysis presented in the planning documentation submitted in support of other wind farms in the region, it is expected that the area of available suitable forestry for hen harrier foraging will decrease over the lifetime of the Upperchurch Wind Farm. The expected reduction is mainly due to the impending closure of open canopy young second rotation forestry, which occurs 10 years after planting. This will likely result in a reduction in potential foraging habitat for the hen harrier within the SPA and influence future population trends.

According to the National Hen Harrier Survey (Ruddock, 2012) a significant decrease in population has been recorded since the previous national survey in 2005. It is considered that forest maturation is considered partly responsible for this due to a shift in the age structure to more mature closed canopy. It is worth noting that one of the principal threats to nesting hen harrier is predators such as crows and foxes (pers. comm. Barry O'Donoghue).

With the creation of an area of hen harrier foraging habitat as part of the Upperchurch project, it is expected that the hen harrier will use this area while forestry lands within the SPA come under pressure. With the EcMP in place the potential impact of the Upperchurch Wind Farm will be neutral, and may even be considered positive. It is not anticipated that the project when considered with forestry will result in a significant cumulative impact.

4.2 Other Cumulative Effects

4.2.1 Cumulative disturbance effects

Cumulative disturbance effects can occur during the construction phase in particular, due to noise, visual intrusion or disturbance effectively amounting to habitat loss arising from the effect of displacement from more than one wind farm development. Disturbance is short term and may occur during construction. Disturbance effects may be non-linear where birds may tolerate a certain level of disturbance up to a threshold (SNH, 2012).

Observations of a female hen harrier during a breeding season survey at Glencarbry Windfarm Extension in summer 2011, while the western-most turbine turbine at Glenough wind farm was undergoing construction, indicated no disturbance effect. The bird was first observed over mature conifer plantation and circled north over improved agricultural grassland, to within 300m of the construction area (pers. obs.). Glencarbry wind farm and Glenough wind farm are 4.5km and 3.2 km to the south of the proposed Upperchurch wind farm, respectively (pers. obs. 2011).

It is not expected that cumulative disturbance effects, which are temporary in nature, will be significant.

4.2.2 Cumulative Collision Effects

Cumulative collision effects can arise as a result of a number of wind farm developments in an area as well as changes in behaviour of bird species in response, making them more / less likely to collide (King et al., 2009). In practice, most birds take avoidance action to avoid a wind farm or wind turbine structure and alter their flight lines (SNH, 2012). Information on collision is limited, because as mentioned it can rarely be assumed that all collisions are detected, due to scavenging, as well as surveyor bias.

The evidence to date indicates that the effects are extremely species and site specific. Not all species are equally sensitive to collision. Large birds such as raptors and wildfowl are considered to be at greater risk of collision due to their flight behaviour and mobility (Percival, 2003). Percival notes that in Ireland, wind farms are most likely to have a serious negative impact on birds in areas of high concentrations of seabirds, wintering wildfowl or breeding raptors. There is no evidence of breeding raptors at Upperchurch Wind Farm with the nearest known nest recorded roughly 4km to the southeast of the Upperchurch site bordering the Glenough windfarm to the southeast of the site.

There is no known hen harrier flight paths between foraging and roosting areas associated with the Upperchurch project.

Observations at the Glenough wind farm in 2012 and 2013 indicated that potential hen harriers collision was unlikely as the majority of flying adults and juveniles were recorded below 35m i.e. below turbine blade height (Cork Ecology 2012, 2013).
All observations of hen harrier during breeding and winter surveys at Upperchurch in 2011 and 2013 were recorded below 35m.

The main collision risk to hen harrier occurs where nests are located within 500m of a turbine. A risk to fledglings that are not as aerially skilled as adults may result in a collision risk.

At Glenough wind farm, there is an historic hen harrier nest site, c. 300m from the nearest turbine and another c. 2.5km from the nearest turbine. In 2012, during a post-construction survey, two fledged young were observed at the nest site, 2.4km from the nearest turbine. In 2013, two fledged young were observed at the nest site, 300m from the nearest turbine (Cork Ecology 2012, 2013). As already stated, Glenough wind farm is 3.2km from the nearest turbine at the proposed Upperchurch wind farm.

Post-construction monitoring at a wind farm site in Co. Galway indicated that most observations were of hen harrier foraging at less than 10m above ground, although birds were also recorded at rotor height. Between 10 and 11 pairs of hen harriers bred within 5km of the win farm site boundary, during each year of monitoring (Madden and Porter 2007).
It is not expected that collision of hen harrier with turbines at Upperchurch will occur due to the low flying height of foraging hen harriers together with the absence of recorded nests within the vicinity of the project.

4.2.3 Cumulative Barrier Effects

Cumulative barrier effects occurs where birds alter their migration flyways or local flight paths, to avoid wind farm developments, resulting in increased energy expenditure as birds have to fly longer distances and could result in disruption. Barrier effects depend on species, type of bird movement, flight height, turbine layout, wind force and direction (King at al., 2009).

There is a strong relationship between cumulative barrier effects and cumulative displacement effects, particularly after construction has taken place. It will depend on the number of wind farms and the number of turbines in these wind farms, within the vicinity of the proposed wind farm at Upperchurch. It will also depend on the quality of hen harrier habitats available within these wind farms and in the surrounding area.

At a 71 turbine wind farm site in Co. Galway, within the Slieve Aughty SPA, there were numerous sightings of hen harrier. Monitoring commenced in 2004, prior to the erection of turbines and continued in 2006 and 2007, when the wind farm was in full operation. Most observations were of hen harrier foraging at less than 10m over the bog. Birds regularly passed within 50m of turbines, with one bird foraging within 10m of a turbine base. The behavioural observations indicated that birds passed between turbines or along lines of turbines, and no sudden movements were seen that suggested alarm or hesitation (Madden and Porter 2007).

At the 14 turbine wind farm at Glenough, the levels of hunting recorded during the post-construction monitoring, indicated that there was suitable hunting habitat both within the wind farm and in the immediate surrounding area, and that the presence of turbines did not act as a barrier to foraging hen harrier (Cork Ecology 2013).

The turbines at Upperchurch are well spread and the site is not considered a bird migration route. Other wind farms in the region are well spread and spaced from one another and most turbines are at a minimum of 300-400m apart.

In summary it is not expected that the Upperchuch Wind Farm proposal will contribute a significant cumulative barrier effect with other windfarms.

4.2.4 Cumulative Impact of Agriculture

The area within and surrounding the proposed wind farm at Upperchurch is currently intensively farmed and is primarily improved agricultural grassland. This habitat is deemed unsuitable for foraging hen harrier. It is one of the main habitats associated with the 250m buffer displacement zone around the turbines. If the wind farm was granted permission, it is likely that farming would continue within these buffer zones.

It is expected that the quota for milk will be removed in 2015 and under Harvest 2020[12] milk production is expected to increase by 50% by 2020. Existing marginal land such as that surrounding the SPA and within 15km of the wind farm may be subject to improvement in an effort to increase the amount of available high quality agricultural grassland and meet the 2020 target for milk production. If this occurs on a significant level it is likely to result in the reduction of future hen harrier foraging habitat and may have a knock-on effect on future population trends.

The proposed Ecological Management Plan prepared as part of the RFI proposes the management of approximately 120ha of land outside the SPA. This will have the effect of securing this land for hen harrier foraging habitat over the lifetime of the wind farm whose construction is likely to coincide with the early years of the removal of the milk quota. With

[12] http://www.agriculture.gov.ie/agri-foodindustry/foodharvest2020/

the Ecological Management Plan in place the potential impact of the Upperchurch Wind Farm will be neutral, and may even be considered positive. A significant cumulative effect with agriculture is not antipated.

4.3 Hen Harrier Habituation to Wind Farm Development

Certain bird species are known to habituate to the presence of wind farms (Spaans et al., 1998 a & b). In Pierce-Higgins et al., (2012) following temporary disturbance during construction, upland bird populations became habituated to operational wind farms. This conclusion was based on a 3 year period of wind farm operation. The main finding of this study for breeding bird populations suggests that the main effects of wind farms may be through disturbance displacement during construction. The turbines at Upperchurch are carefully sited and well spread; it is likely that hen harriers will habituate to the wind farm to a degree over its lifetime.

At Garracummer wind farm, there were no observations of hen harrier nesting behaviour during the construction phase in 2011/2012, although there was hen harrier breeding activity observed in the 5km hinterland, during the construction phase. However, there was a significant increase in raptor activity during post-construction monitoring at the site in 2013 (pers. comm. BGE, 29/11/2013). Garracummer wind farm is 2.8km from the nearest turbine at Upperchurch wind farm and is within 5km of the wind farm at Glenough.

As already mentioned with regard to the 14 turbine wind farm at Glenough, the levels of hunting recorded during the post-construction monitoring, indicated that there was suitable hunting habitat both within the wind farm and in the immediate surrounding area, and that the presence of turbines did not act as a barrier to foraging hen harrier (Cork Ecology 2013).

5 Conclusion

The proposed windfarm lies within 15 km of Lower River Shannon cSAC (site code 002165), Bolingbrook Hill cSAC (site code 002124), Lower River Suir cSAC (site code 002137), Anglesey Road cSAC (site code 002125), Slievefelim to Silvermines Mountains SPA (site code 004165), Silvermines mountains West SAC (site code 002258), Keeper Hill SAC (site code 001197), Kilduff, Devilsbit Mountain SAC (site code 000934) and Philipston Marsh SAC (site code 001847). An Appropriate Assessment has been undertaken to determine the significance of the impact on Natura 2000 sites. No adverse impact is expected to arise to Natura 2000 Sites as a result of the proposed development.

The main potential negative impacts identified relate to habitat loss, disturbance to fauna during construction phase of the development, risk of collision for the hen harrier and the pollution of waterways downstream of the drains/streams within the proposed site.

A comprehensive erosion and sediment plan has been developed and this will reduce the likelihood of any potential pollution event occurring which could impact on protected sites downstream of the development. Other mitigation measures include the implementation of a fuel management plan, control of wheel wash, dewatering and concrete, and the recommendation for the composition of an ecological management plan prior to construction.

Pre-construction monitoring will be undertaken for birds and post construction monitoring will be undertaken for the first two year of operation.

No significant ecological residual impacts are expected as a result of the construction and operational phase of the proposed Upperchurch Windfarm.

Following the completion of a cumulative impact assessment it is anticipated that the project will not contribute to significant cumulative impacts.

6 References

Anon, (2010). *Freshwater Pearl Mussel Second Draft Munster Blackwater Sub-Basin Management Plan*. (Produced by NS 2; Funded by Department of the Environment, Heritage and Local Government (DoEHLG)

Blamey, M., Fitter, R. & Fitter, A. (2003). *Wild Flowers of Britain and Ireland*. London: A & C BlackPublishers Ltd

Byrne, A., Moorkens, E.A., Anderson, R., Killeen, I.J. & Regan, E.C. (2009) *Ireland Red List No. 2 – Non- Marine Molluscs*. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

Dempsey, E and O' Clery, M. (2010). The Complete Field Guide to Ireland's Birds. Published by Gill and Macmillan Ltd.

Department of the Environment, Heritage and Local Government (DoEHLG) (2009). *Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities.* Department of Environment, Heritage and Local Government.

EC (2000). *Managing Natura 2000 Sites: The provision of Article 6 of the Habitats Directive 92/43/EEC*. Luxembourg: Office for Official Publications of the European Communities, 2000.

EC (2001). 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. Luxembourg: Office for Official Publications of the European Communities.

Environment Directorate General (EDG) (2007). *Interpretation Manual of European Union Habitats*, European Commission, Brussels.

EPA, 2002. Guidelines on information to be contained in Environmental Impact Statements. Published by the Environmental Protection Agency, Ireland.

Fossitt, J. A. (2000) *A Guide to Habitats in Ireland*. Kilkenny: The Heritage Council.

Foster-Turley, P., Macdonald, S.M. & Mason, C.F. (1990). Otters*: an action plan for their conservation.* Gland, Switzerland: International Union for the Conservation of Nature and Nature Resources/Species Survival Commission/Otter Specialist Group.

IEEM (2006). *Guidelines for Ecological Impact Assessment in the United Kingdom*. Institute for Ecology and Environmental Management.

Irwin, S., Wilson, M., O'Donoghue, B., O'Mahony, B., Kelly, T. & O'Halloran J. (2012). *Optimum Scenarios for Hen Harrier conservation in Ireland: HENHARRIER FINAL REPORT*. A Report prepared for the Department of Agriculture, Food & the Marine, Dublin.

King J. J. and Linnane S. M. (2004) The status and distribution of lamprey and shad in the Slaney and Munster Blackwater SACs. *Irish Wildlife Manuals*, No. 14. National Parks and

Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

Lewis, C., Jackson, A. and Lowes, T. (2009). Ireland's designation of Special Protection Areas (SPAs) for Hen harriers (Circus cyaneus) under Council Directive 79/409/EEC on the conservation of wild bird. (Available at: http://www.friendsoftheirishenvironment.net/cmsfiles/files/library/hen_harrier_circualtion_copy__26_02_09.pdf [accessed 26/07/2012]).

Lynas, P., Newton, S.F., and Robinson, J.A. (2007). The status of birds in Ireland: an analysis of conservation concern 2008-2013. Irish Birds, 8: 149-167.

Madden, B. and Porter, B. (2007). Do wind turbines displace hen harriers *Circus cyaneus* from foraging habitat? Preliminary results from a case study at the Derrybrien wind farm, County Galway. *Irish Birds,* 8: 231-236.

Madders, M. (2000). Habitat selection and foraging success of Hen Harriers Circus cyaneus in west Scotland. *Bird Study*. **47**, 32-40.

National Parks and Wildlife Service (NPWS) (2007) Atlantic salmon (Salmo salar L.) (1106) Conservation Status Assessment Report. National Parks & Wildlife Service. http://www.npws.ie/en/media/Media,6273,en.pdf

National Parks and Wildlife Service (NPWS), (2008). The Status of EU Protected Habitats and Species in Ireland. Conservation Status in Ireland of Habitats and Species listed in the European Council Directive on the Conservation of Habitats, Flora and Fauna 92/43/EEC, Department of the Environment, Heritage and Local Government.

NRA (2009). Guidelines for Assessment of Ecological Impacts of National Road Schemes. National Roads Authority.

O'Connor, W. (2007) A Survey of Juvenile Lamprey Populations in the Corrib and Suir Catchments. *Irish Wildlife Manuals* No. 26. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

O'Donoghue, B., O'Donoghue, T.A., and Frank King, F. (2011), The Hen Harrier in Ireland: Conservation Issues for the 21st Century. *Biology and Environment: Proceedings of the Royal Irish Academy*, Vol. 111B.

Parnell, J. and Curtis, T. (2012). *Webb's An Irish Flora.* 8th edn. Cork: Cork University Press.

Peay, S. (2003). *Guidance on habitats for white-clawed crayfish*. R&D Technical report WI-067/TR, Bristol: Environment Agency. In: Reynolds, J. D. (2007). *Conservation Assessment of the White-Clawed Crayfish* Austropotamobius Pallipes (*Lereboullet, 1858) in Ireland.* Report to National Parks and Wildlife Service.

Reynolds, J. D. (2007). *Conservation Assessment of the White-Clawed Crayfish,* Austropotamobius Pallipes, (*Lereboullet, 1858) in Ireland.* Report to National Parks and Wildlife Service.

Ruddock, M. & Dunlop, B.J., O'Toole, L., Mee, A., Nagle, T. (2012) Republic of Ireland National Hen Harrier Survey 2010. *Irish Wildlife Manual*, No. 59. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Smith, G., O'Donoghue, P., O'Hora, K., & Delaney, E. (2011). *Best Practice Guidance for Habitat Survey and Mapping*. The Heritage Council.

Whilde, A., (1993) Threatened Mammals, Birds, Amphibians and Fish in Ireland – Irish Red Data Book 2: Vertebrates. HMSO, Belfast.

Wilson, M., Gittings, T., O'Halloran, J., Kelly, T. and Pithon, J (2006). The distribution of Hen Harriers in Ireland in relation to land use cover, particularly forest cover. *CoFord Connects, Forestry & Environment: No.6*, September 2006 (Available at: http://www.coford.ie/media/coford/content/publications/projectreports/cofordconnects [accessed 17/07/2012])

Wilson, M. W., Irwin, S., Norriss, D.W., Newton, S.F., Collins, K., Kelly, T.C. & O'Halloran, J. (2009). The importance of pre-thicket conifer plantations for nesting Hen Harriers Circus cyaneus in Ireland. *Ibis* (2009) 151. 332-343.

6.1

REFERENCE DOCUMENTS

Appendix 1
Figures

FIGURE 13-II-1: SPECIAL AREAS OF CONSERVATION (SAC) WITHIN 15KM OF THE STUDY AREA

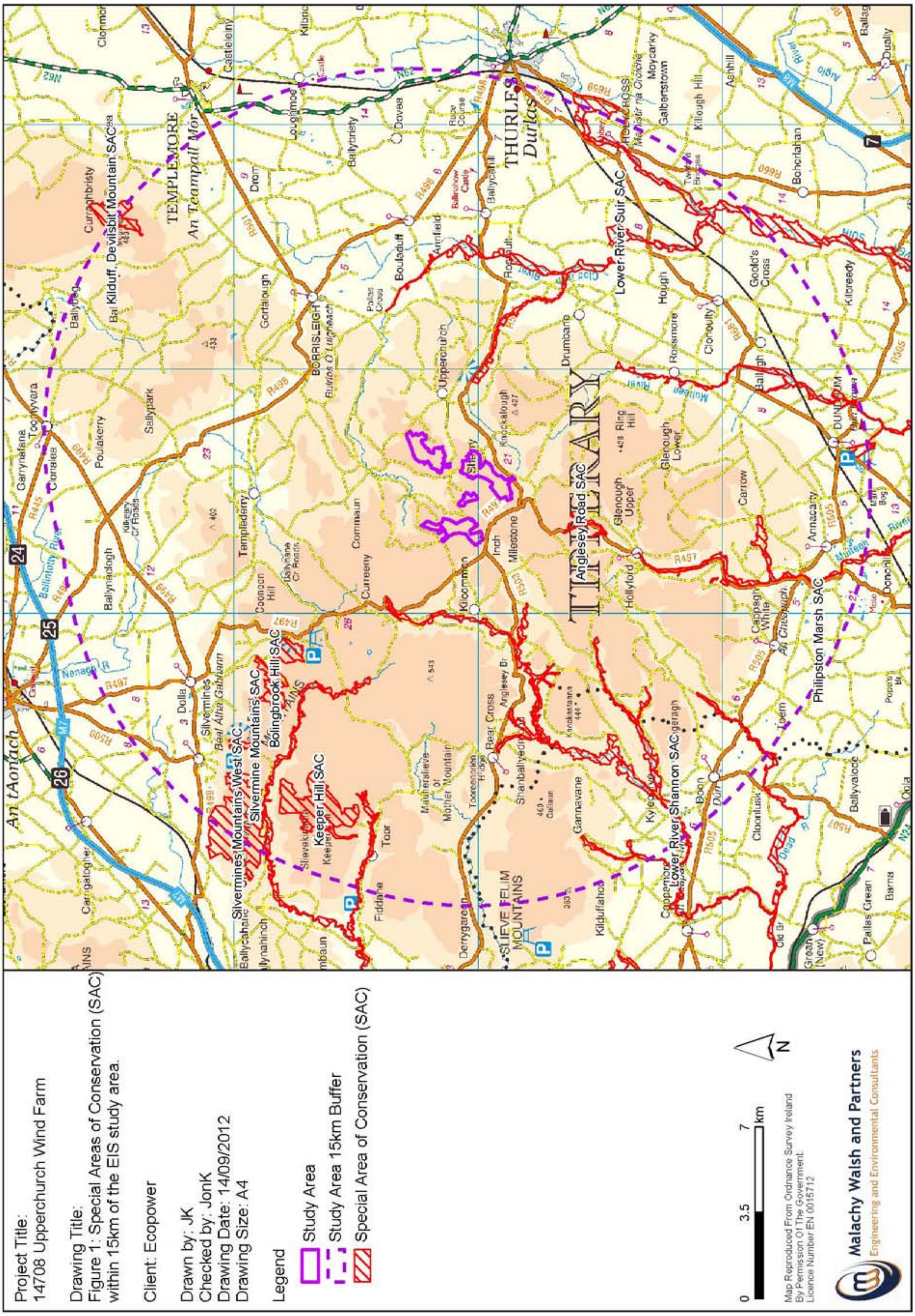
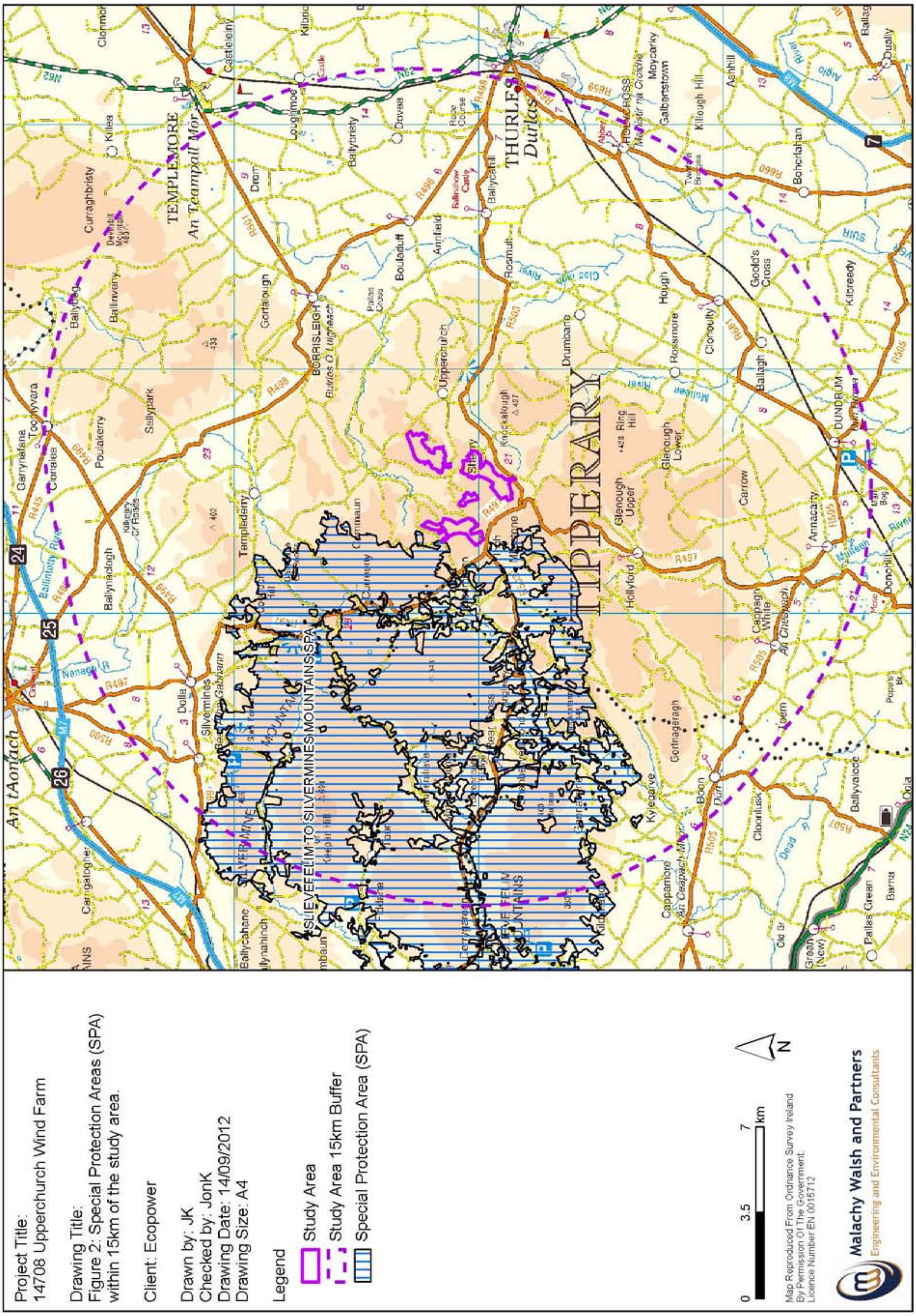


FIGURE 13-II-2: SPECIAL PROTECTION AREAS (SPA) WITHIN 15KM OF THE STUDY AREA



Upperchurch Windfarm Environmental Impact Statement

Appendix 2
Conservation Objectives

Conservation Objectives for Anglesey Road SAC [002125]

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

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

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

The favourable conservation status of a species is achieved when:

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

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

- [6230] * Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)

Citation:

NPWS (2011) Conservation objectives for Anglesey Road SAC [002125]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning

Conservation Objectives for Kilduff, Devilsbit Mountain SAC [000934]

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

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

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

The favourable conservation status of a species is achieved when:

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

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

- [4030] European dry heaths
- [6230] * Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)

Citation:

NPWS (2011) Conservation objectives for Kilduff, Devilsbit Mountain SAC [000934]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning

Conservation Objectives for Keeper Hill SAC [001197]

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

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

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

The favourable conservation status of a species is achieved when:

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

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

- [4010] Northern Atlantic wet heaths with *Erica tetralix*
- [6230] * Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)
- [7130] Blanket bogs (* if active only)

Citation:

NPWS (2011) Conservation objectives for Keeper Hill SAC [001197]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning

Conservation Objectives for Philipston Marsh SAC [001847]

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

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

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

The favourable conservation status of a species is achieved when:

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

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

- [7140] Transition mires and quaking bogs

Citation:

NPWS (2011) Conservation objectives for Philipston Marsh SAC [001847]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning

Conservation Objectives for Bolingbrook Hill SAC [002124]

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

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:
- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

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

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

- [4010] Northern Atlantic wet heaths with *Erica tetralix*
- [4030] European dry heaths
- [6230] * Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)

Citation:

NPWS (2011) Conservation objectives for Bolingbrook Hill SAC [002124]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning

Conservation Objectives for Lower River Suir SAC [002137]

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

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:
- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

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

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

- [1029] *Margaritifera margaritifera*
- [1092] *Austropotamobius pallipes*
- [1095] *Petromyzon marinus*
- [1096] *Lampetra planeri*
- [1099] *Lampetra fluviatilis*
- [1103] *Alosa fallax*
- [1106] *Salmo salar* (only in fresh water)
- [1330] Atlantic salt meadows (*Glauco-Puccinellietalia* maritimae)
- [1355] *Lutra lutra*
- [1410] Mediterranean salt meadows (*Juncetalia maritimi*)
- [3260] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
- [6430] Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
- [91A0] Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

Citation:

NPWS (2011) Conservation objectives for Lower River Suir SAC [002137]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning

- [91E0] * Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)
- [91J0] * *Taxus baccata* woods of the British Isles

Citation:

NPWS (2011) Conservation objectives for Lower River Suir SAC [002137]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning

Conservation Objectives for Lower River Shannon SAC [002165]

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

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:
- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

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

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

- [1029] *Margaritifera margaritifera*
- [1095] *Petromyzon marinus*
- [1096] *Lampetra planeri*
- [1099] *Lampetra fluviatilis*
- [1106] *Salmo salar* (only in fresh water)
- [1110] Sandbanks which are slightly covered by sea water all the time
- [1130] Estuaries
- [1140] Mudflats and sandflats not covered by seawater at low tide
- [1150] * Coastal lagoons
- [1160] Large shallow inlets and bays
- [1170] Reefs
- [1220] Perennial vegetation of stony banks
- [1230] Vegetated sea cliffs of the Atlantic and Baltic coasts
- [1310] *Salicornia* and other annuals colonizing mud and sand
- [1330] Atlantic salt meadows (*Glauco-Puccinellietalia* maritimae)

Citation:

NPWS (2011) Conservation objectives for Lower River Shannon SAC [002165]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning

- [1349] *Tursiops truncatus*
- [1355] *Lutra lutra*
- [1410] Mediterranean salt meadows (*Juncetalia maritimi*)
- [3260] Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
- [6410] *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)
- [91E0] * Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)

Citation:

NPWS (2011) Conservation objectives for Lower River Shannon SAC [002165]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning

Conservation Objectives for Silvermines Mountains West SAC [002258]

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

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:
- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

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

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

- [4010] Northern Atlantic wet heaths with *Erica tetralix*
- [4030] European dry heaths

Citation:

NPWS (2011) Conservation objectives for Silvermines Mountains West SAC [002258]. Generic Version 3.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning

Conservation Objectives for Slievefelim to Silvermines Mountains SPA [004165]

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

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

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

The favourable conservation status of a species is achieved when:

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

Objective: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:

- *Circus cyaneus* [breeding]

Citation:

NPWS (2011) Conservation objectives for Slievefelim to Silvermines Mountains SPA [004165]. Generic Version 4.0. Department of Arts, Heritage & the Gaeltacht.

For more information please go to: www.npws.ie/protectedsites/conservationmanagementplanning

13 /51/0003 – response to RFI dated 28th February, 2013

Q2.*The Bat survey work and report is incomplete. The Eurobats "Guidelines for consideration of bats in windfarm projects" shall be followed, especially with regard to survey and mitigation and the necessary additional information submitted.*

The answer to Q.2follows(over);

UPPERCHURCH WINDFARM BAT SURVEY

REFERENCE DOCUMENTS

13 /51/0003 – response to RFI dated 28th February, 2013

Further Information 13/51/0003 (22 No. wind Turbines at Upperchurch)

Malachy Walsh and Partners

Engineering and Environmental Consultants

Upperchurch Wind Farm Bat Survey

15388

November 2013

Job number	Revision	Prepared by	Checked by	Status	Date
15388-6003	A	JK	MK	Final	21st November 2013

MWP ENVIRONMENT AND PLANNING

Table of Contents

Appendices

1 Introduction

Malachy Walsh and Partners were commissioned to conduct bat surveys as a response to a Request for further Information sent by North Tipperary County Council (13/51/0003). The following report gives a detailed account of the bat surveys conducted, between July and August 2013 at Upperchurch, Co. Tipperary.

2 Site Description

The proposed Upperchurch Wind Farm site is located in north Co. Tipperary, approximately 1.9 km west of the village of Upperchurch and a further 18 km west of Thurles town. The study area is made up of four sections with an overall area of 12 km².

The surrounding local landscape is dominated by 'Pasture' with 'Forestry, 'Bog', 'Other Agricultural Land' and 'Other' land located to the south of the proposed wind farm site (NPWS, online mapping 2012). The area is underlain by Silurian Metasediments and Volcanics with subsoils consisting of "Sandstone and shales till Devonian/Carboniferous"

The four sections of the site are located on a series of small hills or drumlins that reach elevations between 363mOD and 411mOD where the peaks are generally at heights of 100m above the intervening lower terrain. The highest peak is that of Knockmaroe at an elevation of 411mOD.

The area originally would have had a shallow peat land cover but most of it has been reclaimed by deep ploughing and converted to pasture. The remaining peat areas are used mainly for commercial forestry. Some rock outcropping occurs, most notably at the northeast part of the site.

3 Legal and conservation status

All Irish bat species are protected under the Wildlife Act (1976) and Wildlife Amendment Act (2000). Also, the EC Directive on The Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive 1992) seeks to protect rare species, including bats, and their habitats and requires that appropriate monitoring of populations be undertaken. Across Europe they are further protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), which, in relation to bats, exists to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) was instigated to protect migrant species across all European boundaries. The Irish government has ratified both these conventions.

All bats are listed in Annex IV of the Habitats Directive and the lesser horseshoe bat is further listed under Annex II.

4 Survey Methodology

Bats in Ireland feed exclusively on insects and in the summer they generally emerge from their roosts at dusk to feed. The distances covered while foraging varies considerably between species. They are known to use a number of different foraging sites in the same night and move between them to locate areas of high insect density. They are also known to exhibit a level of site loyalty and will frequently return to the same foraging sites night after night (Joint Nature Conservancy Committee JNCC, 2001).

Survey methodology was designed with reference to *Eurobats - Guidelines for consideration of bats in wind farm projects*. Stationary automated bat detectors were utilised throughout the site to supplement data already retrieved during Anabat activity surveys in 2012 (which consisted of walked transects, car-based transects and point counts). As per Eurobats guidelines an initial desktop study was carried out to collated data of the study area. The following resources were utilised during the desktop study.

- Bat Conservation Ireland (BCI);
- National Parks and Wildlife Service (NPWS);
- National Biodiversity Data Centre (NBDC); and
- OSI Aerial photography and 1:50000 mapping.

Building on existing guidance, an assessment was made of the quality of the habitat at the site and in the wider landscape, and the potential for these areas to support bats, taking into account:

- the extent and quality of foraging and commuting habitat within and surrounding the site e.g. woodland, well-connected and structured hedgerows, waterways and water bodies,
- the proximity of the proposed site to areas designated for bats (Natural Heritage Areas or Special Areas of Conservation), and
- the presence of buildings or other features or structures that may support or are known to support bat roosts.

Consultation was also undertaken with Bat Conservation Ireland on the 20th June 2012. National Parks and Wildlife Services were contacted between March and April 2013 (Stefan Jones District Conservation Officer of Limerick/North Tipperary region and Áine Lynch Local Conservation Ranger for Tipperary – North) to arrange a meeting to discuss the Request for Further Information but a meeting failed to materialise.

In line with Eurobats guidelines bat surveys were carried out at five predefined sampling stations over an extended period of time from the 3rd July 2013 to the 1st August, 2013. This survey supplemented a previous Anabat activity survey conducted in June 2012. Locations of stationary bat detectors were selected based on its potential value to bats species including a cluster of old farm buildings, the edges of conifer plantation, hedgerows and a stream. An upland area along the edge of conifer plantation was also selected to assess the potential value of this area for bat species (BSS5). A remote recording device, a SM2+, was left at these locations programmed to record from sunset to sunrise. Two ultrasonic microphones placed on the end of extension cables allowed for unidirectional recording of high frequency sounds. The SM2+ unit records real-time calls which can be converted to sonograms. It is these sonograms (2-d sound pictures) that are digitally stored on the CF card and downloaded for analysis. Each time a bat is detected, an individual time-stamped (date and time to the second) file is recorded. This detector system records bat ultrasonic calls on a continuous basis and stores the information onto an internal flash card for later analysis.

Evidence of bats was searched for and information on all potential roosts was recorded according to roost identification guidelines 'Bat Survey Guidelines: Traditional Farm Buildings Scheme', Aughney, T., Kelleher, C. & Mullen, D. (2008).

Eurobats guidelines have been developed to standardise bat survey methodology and impact assessment for wind farms on a European wide level. There are strong provisions within these guidelines for the assessment of migratory species and bat species know to commute across large open sections of habitat rather than more linear features utilised by many of Irelands bat species. Although it is known that Nathusius' pipistrelle *Pipistrellus nathusii* migrates seasonally from Scandinavia to Scotland and to the north of Ireland and back again (Russ *et al*. 2001), there is currently no evidence at present of bat migration elsewhere in Ireland.

5 Results of bat survey

Table 1: Results of survey at location 1

Bat Sampling Station 1 (BSS 1)		
Habitats and features of interest		
Microphones located on a peat bank at the entrance to a firebreak and along the edge of a conifer plantation. The surrounding habitat was heath, grassland and enclosed conifer plantation.		
Date	**Species present**	**Number of calls recorded**
03/07/2013	Common pipistrelle	29
	Leisler's bat	3
	Whiskered bat	1
	Daubenton's bat	4
04/07/2013	Common pipistrelle	10

Table 2: Results of survey at location 2

Bat Sampling Station 2 (BSS 2)		
Habitats and features of interest		
Bat located along the edge of a young conifer plantation along a farm track with a nearby stream.		
Date	**Species present**	**Number of calls recorded**
05/07/2013	Common pipistrelle	10
	Leisler's bat	13
	Myotis	1
	Soprano pipistrelle	7
	Daubenton's bat	2
06/07/2013	Leisler's bat	6
07/07/2013	No bats	-
08/07/2013	No bats	-
09/07/2013	No bats	-
10/07/2013	No bats	-

Table 3: Results of survey at location 3

Bat Sampling Station 3 (BSS 3)		
Habitats and features of interest		
Bat box located on a field boundary between a blanket bog to the east and a grassland field to the west. There were scattered low lying gorse and willow trees along the hedgerow.		
Date	**Species present**	**Number of calls recorded**
11/07/2013	Common pipistrelle	15
	Leisler's bat	12
	Whiskered bat	1
	Soprano pipistrelle	1
	Nathusius' pipistrelle	4
12/07/2013	Common pipistrelle	39
	Leisler's bat	11
	Whiskered bat	3

Bat Sampling Station 3 (BSS 3)		
13/07/2013	Common pipistrelle	39
	Soprano pipistrelle	20
	Leisler's bat	16
	Myotis	3
	Whiskered bat	3
14/07/2013	Common pipistrelle	3
15/07/2013	Common pipistrelle	2
	Leisler's bat	11
	Myotis	1
16/07/2013	Common pipistrelle	30
	Soprano pipistrelle	2
	Leisler's bat	10
	Myotis (probable Whiskered bat)	7
17/07/2013	Common pipistrelle	7
	Soprano pipistrelle	5
	Leisler's bat	3

Table 4: Results of survey at location 4

Bat Sampling Station 4 (BSS 4)		
Habitats and features of interest		
Located near a series of old farm buildings of varying degree of use with conifer plantation to the west and surrounding grassland fields. The stationary detector was moved locally to two locations in order to collate data of site utilisation.		
Date	**Species present**	**Number of calls recorded**
23/07/2013	No bats	-
24/07/2013	No bats	-
25/07/2013	No bats	-
26/07/2013	Common pipistrelle	67
	Soprano pipistrelle	69

Bat Sampling Station 4 (BSS 4)		
	Leisler's bat	11
	Whiskered bat	5
27/07/2013	Common pipistrelle	125
	Soprano pipistrelle	10
	Leisler's bat	13
	Whiskered bat	3
28/07/2013	Common pipistrelle	29
	Soprano pipistrelle	2
	Leisler's bat	11
29/07/2013	Common pipistrelle	26
	Soprano pipistrelle	164
	Leisler's bat	22
	Whiskered bat	8

Table 5: Results of survey at location 5

Bat Sampling Station 5 (BSS 5)		
Habitats and features of interest		
Located on top of the hill (Circa 350m O.D.) on a boundary ditch along the edge of a conifer plantation and an improved grassland field.		
Date	**Species present**	**Number of calls recorded**
30/07/2013	Common pipistrelle	9
	Leisler's bat	2
	Daubenton's bat	1
31/07/2013	Leisler's bat	1

Table 6: Summary of results of the transect survey

Species	**Total number of calls recorded**	**Number of sampling stations at which the species was recorded**
Common pipistrelle (*Pipistrellus pipistrellus*)	440	5
Leisler's bat (*Nyctalus leisleri*)	145	5
Soprano pipistrelle (*Pipistrellus pygmaeus*)	280	3
Whiskered bat (*Myotis mystacinus*)	34	3
Daubenton's bat (*Myotis daubentonii*)	7	3
Myotis sp.*	5	2
Nathusius' pipistrelle (*Pipistrellus nathusii*)	4	1

* Likely to be Whiskered or Daubenton's bats but not clear from sonogram

6 Results of 2012 bat survey

Four species of bat were recorded in all during the bat survey conducted on the 21st of June 2012 namely common pipistrelle, soprano pipistrelle, brown long eared bat (*Plecotus auritus*) and either a whiskered or Brandt's bat (*Myotis brandtii*). The *Myotis* species, the whiskered/Brandt's bat was recorded along a hedgerow and a mix of broadleaf and conifer treeline located to the north-east of the western section. Two calls were heard during the entire transects routes, with the second pass recorded just to the south of the western section of the site.

Overall 6 passes of brown long eared bat were recorded, commuting and hunting along the foliage of hedgerows and forest edge. Common pipistrelle, were the most recorded species with 73 passes throughout the whole survey. This is one Ireland's most common species and was recorded along all transects, except for transect BT 1.Two passes of soprano pipistrelle was recorded during the survey. Both species were observed hunting midges and moths along hedgerows and treelines, flying rapidly and twisting in flight.

The majority of the activity was recorded along BT 5, recording all species that were encountered during the whole survey. This route runs parallel with the western section of the site and is adjacent to most habitats that occur within the site. The weather conditions at the time of the survey were favourable for bats. Following the survey it can be concluded that the habitats at the Upperchurch site support a healthy population of common pipistrelle and to a lesser extent brown long eared bat, Soprano pipistrelle and whiskered/Brandts bat. Table 7 below shows the species recorded during the bat survey at the Upperchurch site in 2012.

Table 7: Bat Species recorded during survey

Common name	Scientific name
Common pipistrelle	*Pipistrellus pipistrellus*
Soprano pipistrelle	*Pipistrellus pygmaeus*
Brown long eared bat	*Plecotus auritus*
Whiskered/Brandts bat	*Myotis sp.*

7 Discussion of Bat Surveys

Throughout the site common pipistrelles and soprano pipistrelles were recorded on the edge of woodland, along access tracks, hedgerows, treelines, over areas of scrub, semi-natural grassland and improved agricultural grassland. Common pipistrelle was the most common species recorded during surveys in 2012 and 2013. Soprano pipistrelle were the second most common species recorded however the species was recorded in only three of the five sampling locations. The relatively recent discovery that the species formerly known as the pipistrelle (*Pipistrellus pipistrellus*) was in fact two separate but cryptic species, the common pipistrelle and the soprano pipistrelle, has been well documented (Barratt *et al.*, 1997). O'Sullivan (1994) found 584 pipistrelle bat roosts during the National Bat Survey, the highest number for any species, and described it as the most abundant in Ireland and widely distributed. It is worth noting however that both species were considered to be the same at that time. It has been established following their separation that the common and soprano pipistrelles were the most common and second most common species encountered respectively (Roche *et al.*, 2007).

Ireland's two smallest bat species, are the bats most likely to be seen flying around soon after dusk in both urban and rural areas. Both have a rapid, twisting flight as they pursue tiny prey of midges, mosquitoes and small moths. A single pipistrelle (weighing approximately 5-6g) may consume as many as 3,500 of these insects in one night (BCI, 2013). Summer roosts of soprano and common pipistrelles are normally in buildings (NPWS, 2009). Pipistrelles are frequently found roosting in houses, although they also roost in other locations such as tree holes. In houses they prefer to occupy confined spaces such as behind hanging tiles and soffit boards or between roofing felt and roof tiles, rather than the main attic space (BCI, 2013, McGuire, 1998 and Allen *et al.*, 2000).

Four calls of what is considered to be Nathusius' pipistrelle were recorded on the night of the 11th of July 2013 at sampling station 3. The sonograms were not typical of the species but the frequency slope and range exhibited elements consistence with the species. The closest know records of this species are a roosting site north of Clonmel and near Birr in co. Offaly. Maternity roosts for the species have only been recorded in Northern Ireland but currently, the only known Nathusius' roosts in the Republic are of single males.

Leisler's bat were recorded at all five sampling locations and were the third most common species recorded during the 2013 survey. The species was not recorded within the study area during the survey in 2012. Results from the Car-Based Bat Monitoring Scheme for Ireland (Roche *et al.*, 2009) recorded that Leisler's bats had been the third most frequently encountered species during the monitoring scheme in all survey years, except 2006 when the species was the second-most common. This species was encountered in all of the survey squares (Roche *et al.*, 2009).

Whiskered bat was recorded at 3 sampling stations with 33 calls heard over the month of surveys. The unidentifiable Myotis sp. calls recorded at sampling stations 2 and 3 are also considered likely to have been calls from whiskered bat. During surveys in 2012 the species was recorded flying along a hedgerow and a mix of broadleaf and conifer treeline located to the north-east of the western section of the site. Although the whiskered bat is widely distributed throughout Ireland, there are relatively few records (NPWS, 2009). O'Sullivan (1994) recorded that whiskered bats are found in houses during the summer, roosting in small numbers in the roof space, often between the rafters and felt or in narrow slits where timbers meet, where they are difficult to observe.

Daubenton's bat were recorded sporadically over the survey period. Seven calls in total were recorded at 3 sampling station. This species also known as the 'water bat' is strongly associated within watercourses. The two streams within the site boundary although not significant in size offer potential habitat for this species as a corridor of foraging habitat from the larger watercourses downstream of the site.

Brown long eared bat were not recorded during surveys in 2013 but had been recorded during surveys within the study area in 2012. The species is considered likely to be using habitat within the greater area and potentially features within the proposed site boundary.

No bat roosts were recorded within the site boundary. The farm buildings west of turbine T22 were investigated for potential bat roost during surveys in July with no evidence of bats recorded. Large numbers of soprano pipistrelle (29/07/2012) calls and common pipistrelle calls (27/07/2013) were recorded one night each when the SM2 bat box was stationed beside the farm buildings. There is the potential that bat maybe roosting occasionally within these buildings however the buildings are located outside the site boundary and over 350m from the nearest turbine T22. Large mature treelines in the greater area offer potential roosting sites for bats particularly along the roads in Shevry and Gleninchnaveigh. The large stands of conifer plantation with the site offer very poor roosting habitat for bat lacking the hole, crevices and cracks preferable to bats features common in mature deciduous trees.

<u>Collision Risk</u>

Natural England has produced guidance on the impacts of wind farms to bats (Natural England, 2012). Collision risk is an issue in relation to bats, particularly in relation to *Myotis* spp. which exhibit swarming behaviour (JNCC, 2001). Natural England has produced guidance on the impacts of wind farms to bats (Natural England, 2012). In this guidance, they have assessed the risk of collision to different species and placed them into low, medium or high risk categories, based on a number of factors, such as flight patterns and foraging strategies. This risk assessment is summarised below in Table 8, where the information on species that occur in Ireland has been extracted. In contrast to JNCC (2001), Natural England has classified *Myotis* species as being at low risk of collision.

Table 8: Assessment of the likely level of risk to bat species occurring in the UK, from collision with wind turbines (information on species that occur in Ireland extracted). Source: Natural England (2012).

Risk of turbine impact			
Factor	**Low Risk**	**Medium Risk**	**High Risk**
Habitat preference	Bats preferring cluttered habitat	Bats able to exploit background cluttered space	Bats preferring to use open habitat
Echolocation characteristics	Short range High frequency Low intensity Detection distance	Intermediate – more plastic in their echolocation	Long range Low frequency High intensity Detection distance

Risk of turbine impact			
Factor	**Low Risk**	**Medium Risk**	**High Risk**
	~15m		~80m
Weight	Lightest	Medium	Heaviest
Wing shape	Low wing loading Low aspect ratio Broadest wings	Intermediate	High wing loading High aspect ratio Narrow wings
Flight speed	Slow	Intermediate	Fast
Flight behaviour and use of landscape	Manoeuvre well Will travel in cluttered habitat Keeps close to vegetation Gaps may be avoided	Some flexibility	Less able to manoeuvre May avoid cluttered habitat Can get away from unsuitable habitat quickly Commute across open landscape
Hunting techniques	Hunt close to vegetation Exploit richer food sources in cluttered habitat Gleaners	Hunt in edge and gap habitat Aerial hawkers	Less able to exploit insect abundance in cluttered habitat Aerial hawker Feed in open
Migration	Local or regional movements	Regional migrant in some parts of range	Long-range migrant in some parts of range
Conclusion	***Myotis* species** **Long eared-bats** **Horseshoe bats**	**Common pipistrelle** **Soprano pipistrelle**	**Leisler's bat** **Nathusius' pipistrelle**

Given a relative population size for each species and the likely risk posed by turbines, it may be possible to determine the level of threat posed to populations of bats. Most effort should be expended on populations likely to be at high risk of collisions and that may be most threatened. Table 9 below lists the likely level of risk, considering the population size in the UK i.e. the resultant risk to the overall population of a more common species would be less than a rarer species. Species present in Ireland have been extracted from Natural England's list. It should be noted however, that Leisler's bat are more common in Ireland due to the lack of competition from the Noctule bat which is absent from Ireland.

Table 9: Assessment of the likely level of risk to the populations of bat species occurring in the UK, from collision with wind turbines (information on species that occur in Ireland extracted). Source: Natural England (2012).

Low Risk	Medium Risk	High Risk
Myotis species		Leisler's bat
Long-eared bats		Nathusius' pipistrelle
Horseshoe bats		
Common pipistrelle		
Soprano pipistrelle		

Common pipistrelle and soprano pipistrelle were the two most common bat species recorded during the survey described in this report. These two species are considered to be of 'Low Risk' from collision with wind turbines (Natural England, 2012). Brown long eared bat, whiskered bat and Daubenton's bat all fall within this category. Leisler's bat and nathusius' pipistrelle are classified as high risk species.

Turbine blades for the proposed wind farm could reach a maximum of 45 metres in length, with a hub height ranging between 78 - 85 metres. The tip of the turbine blades at the proposed wind farm would be 50m away from hedgerows and trees. Most bat species in the Ireland are unlikely to come into contact with the blades during their normal movements, because bats rarely fly at height levels that intersect with turbine blades. Pipistrelle bats generally fly between 5-25m above ground level (Stebbings *et al,* 2007). Myotis species (Brandt's bat/whiskered bat) are generally low flying species ranging from 2-20m above ground level. Leisler's bat and nathusius' pipistrelle are known to fly high when commuting and low when hunting (Harris and Yalden, 2008). Due to the fact that some bat species fly at higher heights and therefore are at risk.

There is also the possibility that bats may investigate turbine towers either to feed on insects attracted by the heat generated by nacelles, or because they are simply attracted by moving blades. Such behaviours could also put bats at risk of collision. However the use of red lights will reduce the risk of insects being attached to turbines and in turn bats. Natural England (2012) has advised that predicted harm to bats could be minimised by altering locations of turbines within a site. The design of the wind farm has taken into the account the Natural England recommended guidelines. Further mitigation measures for bats outlined in the Ecological Management Plan include planting of new hedgerows to mitigation the loss of hedgerow during the construction phase. The location of these hedgerows will be sited to ensure the connectivity of existing corridors will be maintained and will be designed by the project ecologist during the construction phase of the wind farm. There is also the provision for the improvement of existing hedgerows (filling gaps) both within the site and the alternative habitats put forward for hen harrier outside the site. This measure shall improve existing corridors within the site. The reverting of these alternative habitats back to more semi natural habitat will increase diversity of plant species within these areas which in turn will lead to an increase of prey items to bats (insects).

8 Conclusion

Malachy Walsh and Partners were commissioned to conduct bat surveys for the proposed Upperchurch Wind Farm as a response to a request for further information from North Tipperary County Council.

The results of bats surveys indicate that up to seven species of bat are utilising habitats within the study area or are commuting through the site to more suitable habitat in the greater area. A potential Nathusius pipistrelle was recorded on one night over the month of surveys indicating that the species is commuting through the site boundary. Only single males have been recorded within the Republic of Ireland with no maternity roosts confined to a few sites in Northern Ireland. The level of activity during surveys indicates that the site does not contain a roost. Nathusius pipistrelle along with Leisler's bat would be deemed at high risk from collision from a poorly designed and sited wind farm, however the mitigation measures proposed both within the design and as part of the overall management of the site would reduce the potential risk to these species.

8.1 *Further recommendations*

It is recommended that pre and post construction monitoring of the bats be carried out as part of the management of the site and this has been included in the ecological management plan.

References

Allen, P., Forsyth, I., Hale, P. & Rogers, S. (2000). Bats in Northern Ireland. *Irish Naturalists' Journal*. Special Zoological Supplement.

Aughney, T; Kelleher, C; & Mullen, D; (2008). Bat Survey Guidelines: Traditional Farm Buildings Scheme. The Heritage Council, Áras na hOidhreachta, Church Lane, Kilkenny.

Barratt, E.M., Deaville, R., Burland, T.M., Bruford, M.W., Jones, G., Racey, P.A., & Wayne, R.K. (1997). DNA answers the call of pipistrelle bat species. *Nature*, **387**: 138-139.

BCI, (2013). Bat Conservation Ireland website accessed September 2013. www.batconservationireland.org/

Harris, S. And Yalden, D. W. Editors. (2008). Mammals of the British Isles: Handbook, 4th edition. Mammal Society, Southampton. UK.

JNCC, (2001). Habitat management for bats: A guide for landowners, land managers and their advisors. Peterborough: Joint Nature Conservation Committee.

McGuire, C. (1998). Survey of lesser horseshoe bats *Rhinolophus hipposideros* (Bechstein) and other bat species in north Co. Clare. *Irish Naturalists' Journal*. Vol. **26**: 43-50.

Natural England (2012). Bats and onshore wind turbines: Interim guidance. *Natural England Technical Note TIN051*, Feb. 2012. Peterborough: Natural England. Available at www.naturalengland.org.uk.

NPWS, (2009). Threat Response Plan: Vesper bats (2009-2011). National Parks & Wildlife Service, Department of the Environment, Heritage & Local Government, Dublin.

NPWS, (2013). National Parks and Wildlife Service website http://www.npws.ie/en/ accessed Sept 2013.

O'Sullivan, P. (1994). Bats in Ireland. *Irish Naturalists' Journal*. **24**: Special Zoological Supplement.

Roche, N., Langton, S., & Aughney, T. (2007). The Car-based Bat Monitoring Scheme for Ireland: Report for 2007. Unpublished report to the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government. Dublin, Ireland.

Rodrigues, L., L. Bach, M.-J. Dubourg-Savage, J. Goodwin & C. Harbusch (2008): Guidelines for consideration of bats in wind farm projects. EUROBATS Publication Series No. 3 (English version). UNEP/EUROBATS Secretariat, Bonn, Germany, 51 pp.

Russ, J. M., Hutson, A.M., Montgomery, W.I., Racey, P.A. and Speakman, J.R. (2001). The status of Nathusius' Pipistrelle (Pipistrellus nathusii Keyserling and Blasius, 1839) in the British Isles, Journal of Zoology 254: 91 – 100.

Stebbings, R.E., Yalden, D.W. And Herman, J.S. (2007). Which bat is it? A guide to identification in Great Britain and Ireland, 3rd edition. The Mammal Society, London, UK.

Whilde, T. (1993). Threatened mammals, birds, amphibians and fish in Ireland. *Irish Red Data Book 2: Vertebrates*. HMSO, Belfast.

REFERENCE DOCUMENTS

Appendix A

Figures

REFERENCE DOCUMENTS

Project Title:
14708 Upperchurch Wind farm

Drawing Title:
Figure Stationary bat detector locations

Client: Ecopower

Drawn by: JonK
Checked by: JK
Drawing Date: 11/10/2013
Drawing Size: A4

Legend

- Bat box sampling stations
- Study Area

0 0.45 0.9 km

N

Map Reproduced From Ordnance Survey Ireland
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Malachy Walsh and Partners
Engineering and Environmental Consultants

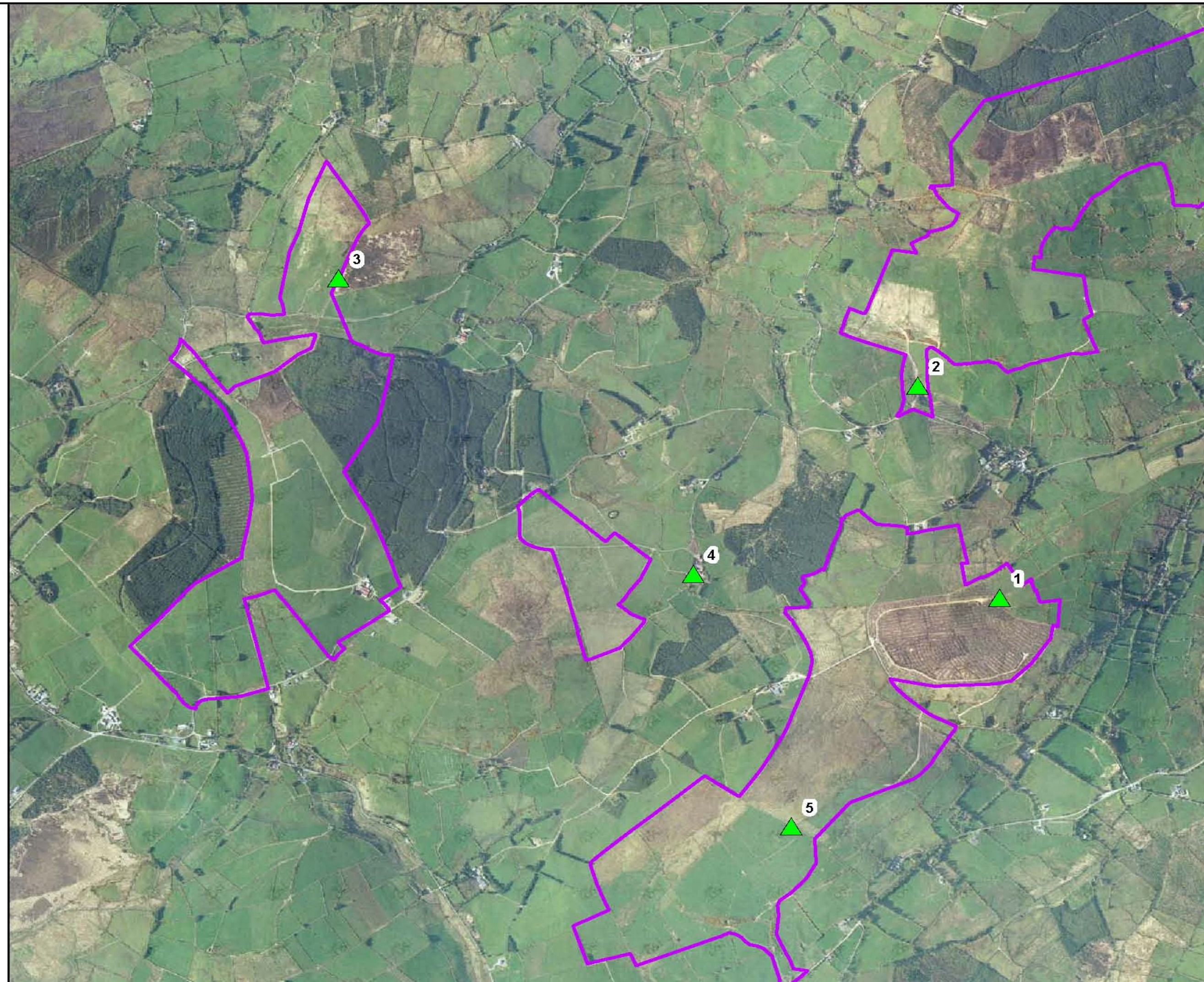

Figure 1: SM2 (stationary bat detector) locations

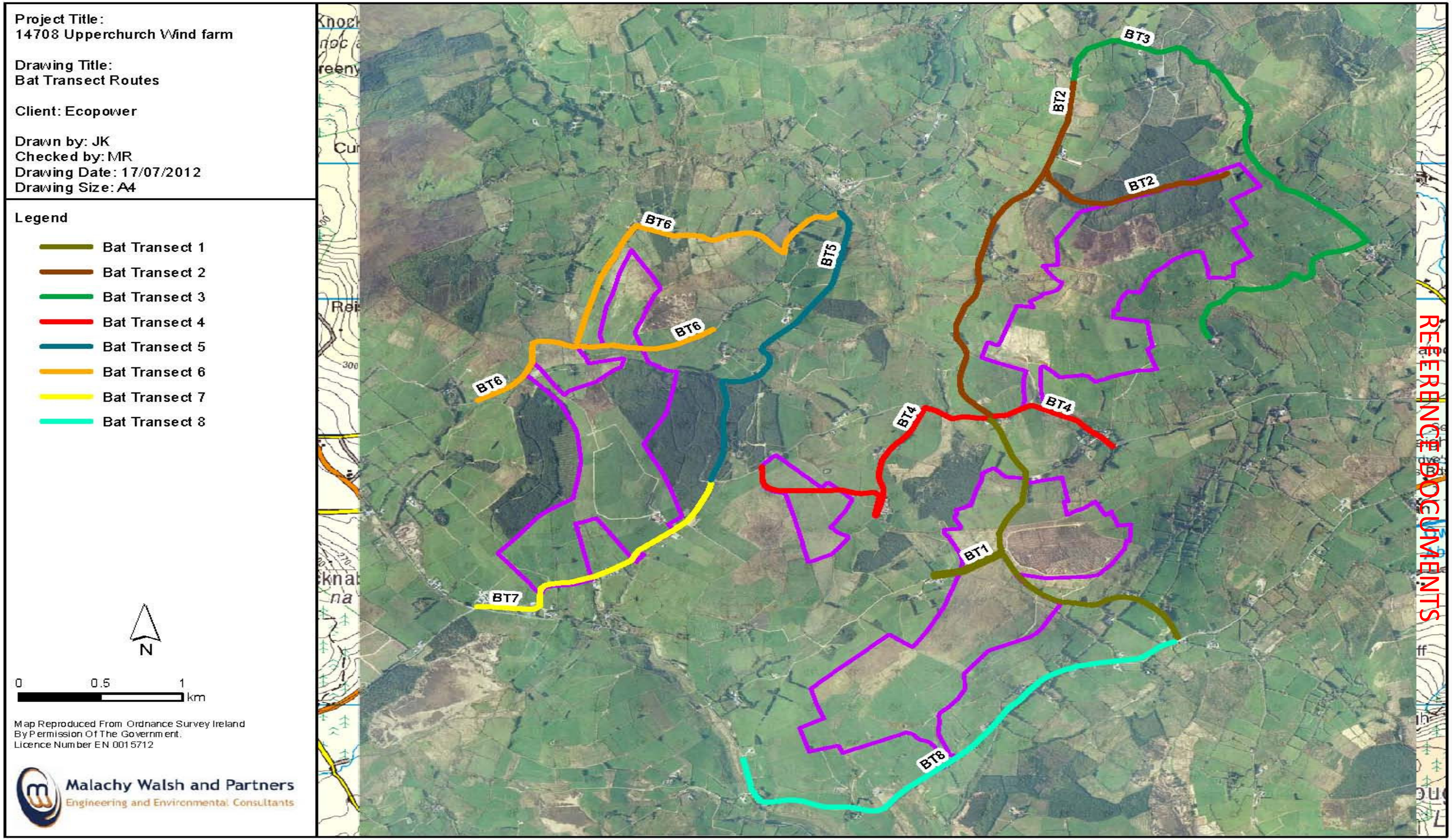

Figure 2: Bat transects June 2012

Appendix B

Bat Sonograms

REFERENCE DOCUMENTS

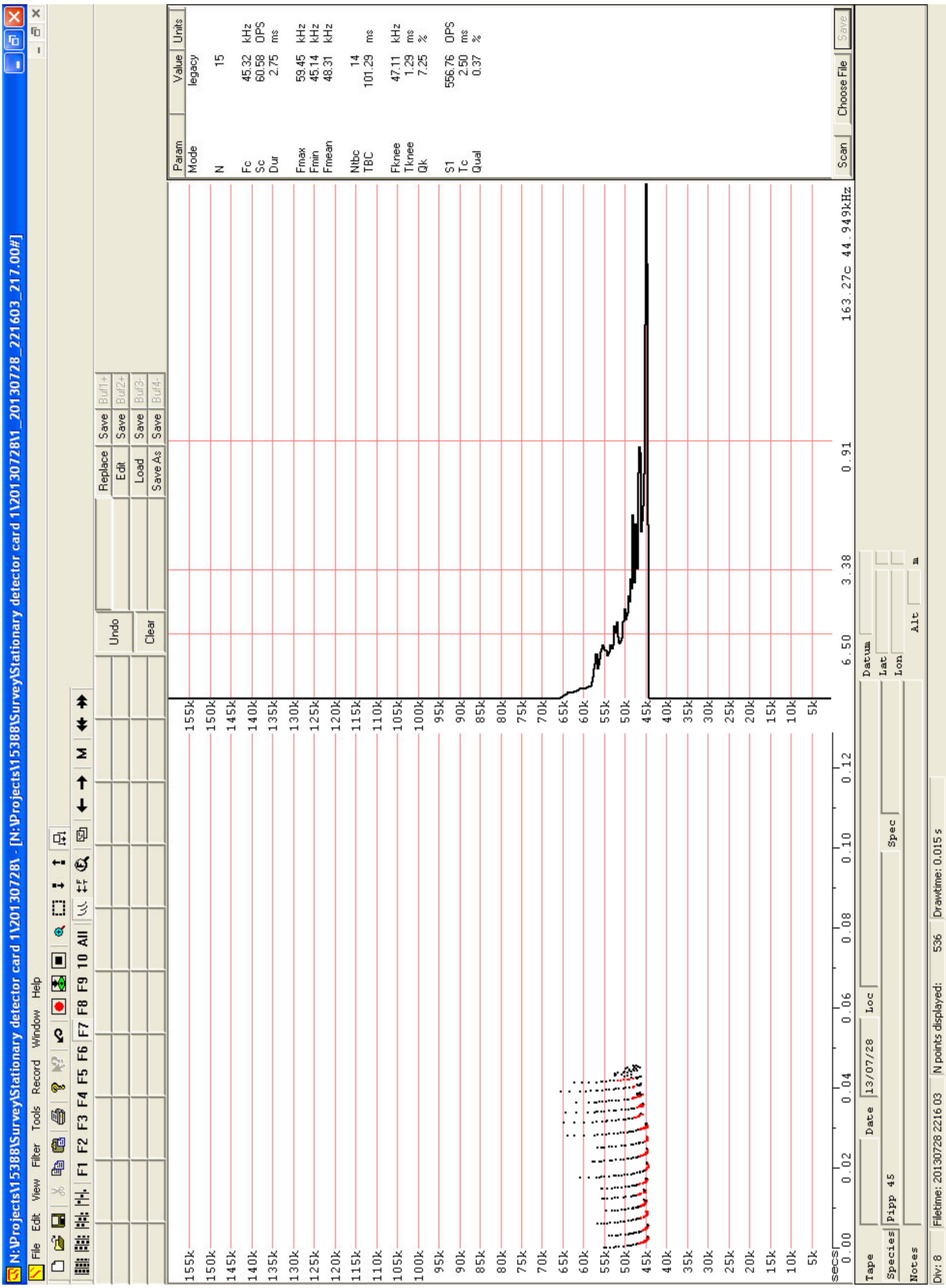

Figure 1B: Common Pipistrelle recorded during surveying.

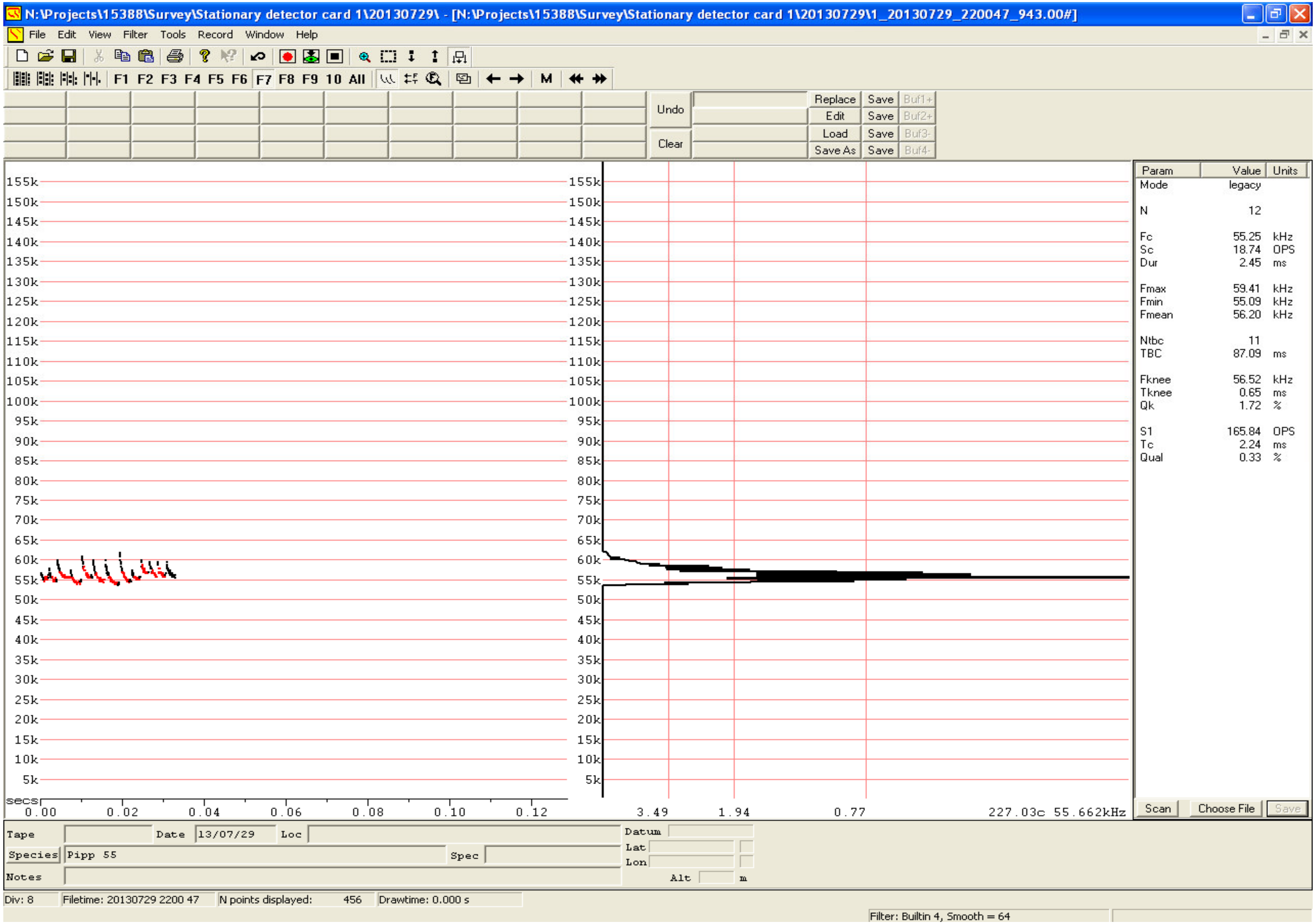

Figure 2B: Soprano Pipistrelle recorded during surveying.

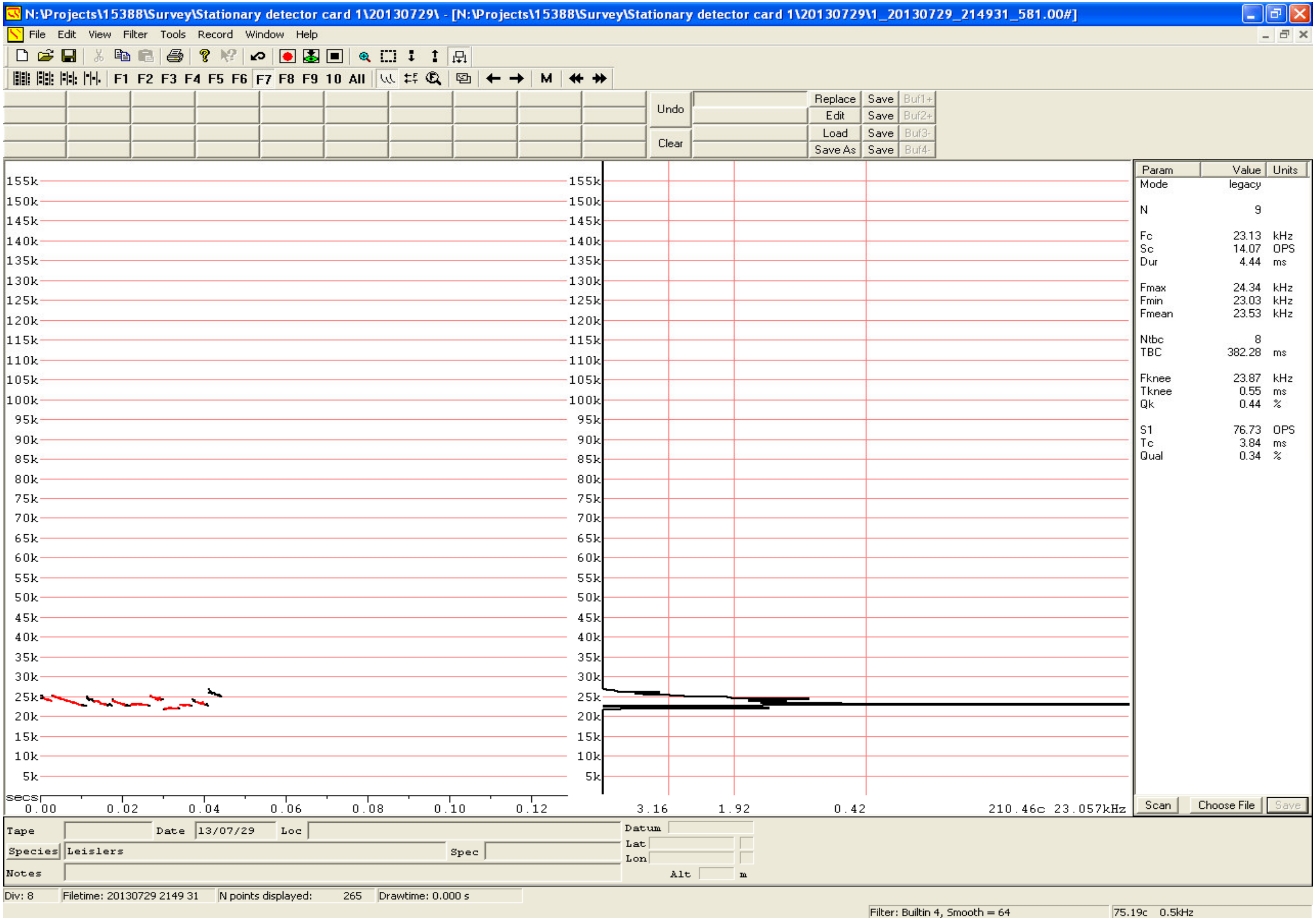

Figure 3B: Leisler's bat recorded during surveying.

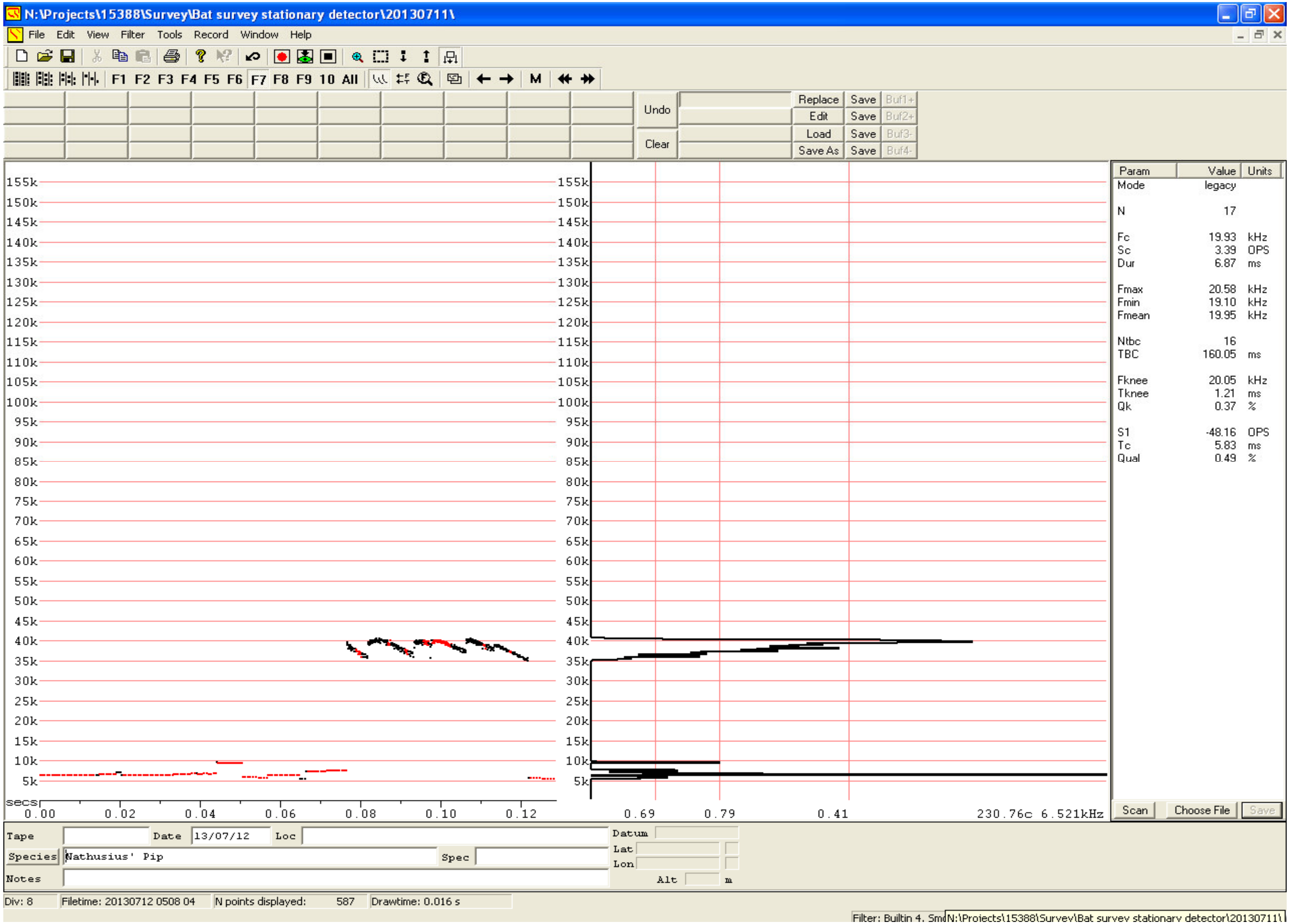

Figure 4B: Nathusius' pipistrelle recorded during surveying.

REFERENCE DOCUMENTS

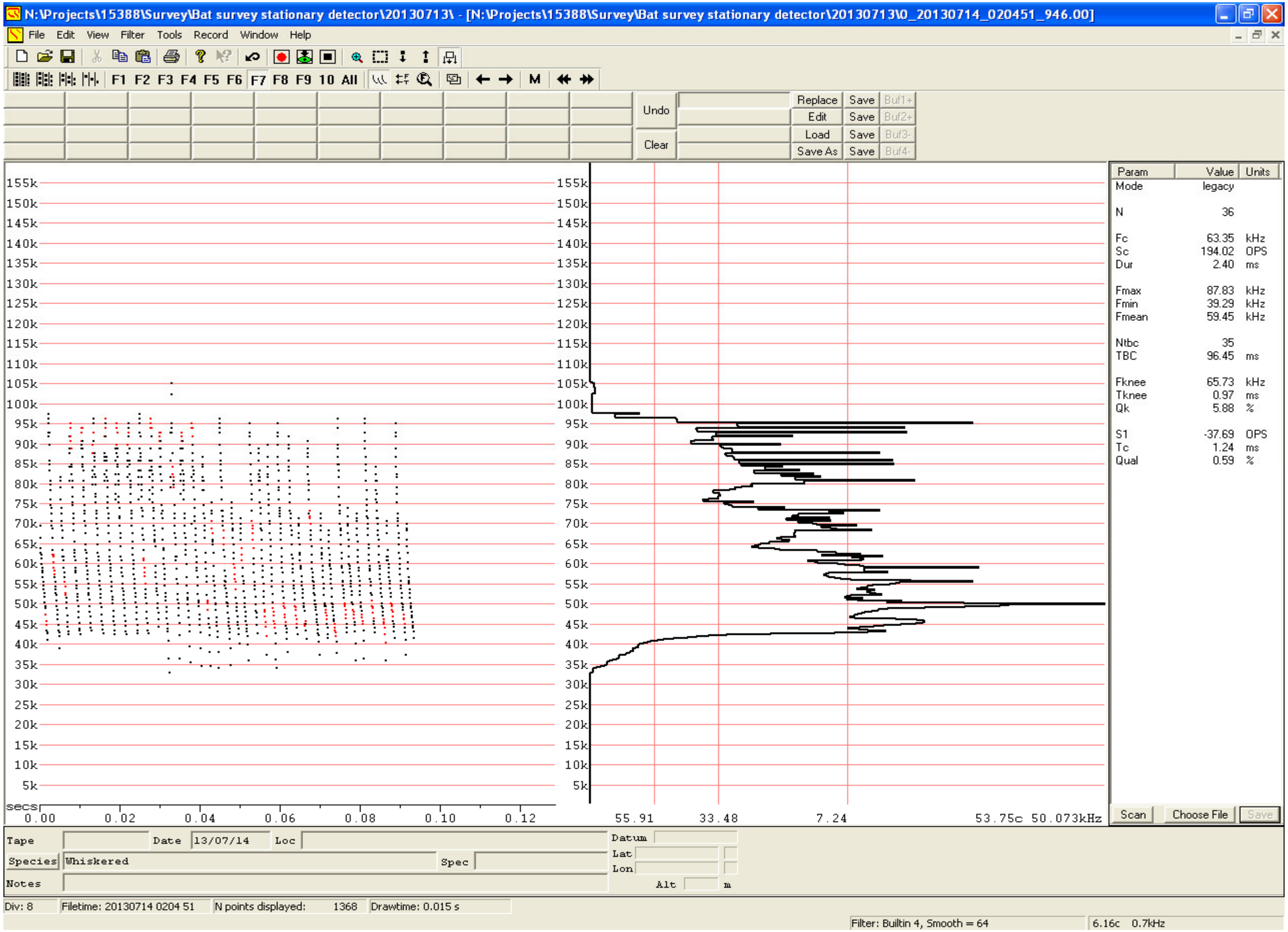

Figure 5B: Whiskered bat recorded during surveying.

REFERENCE DOCUMENTS

13 /51/0003 – response to RFI dated 28th February, 2013

Q3.*A full survey of badger sett/setts shall be conducted and report submitted. A Badger Derogation Licence would be required from the National Parks and Wildlife Service-for works within 50m (breeding season) or 30m (non-breeding season).*

The answer to Q.3 follows(over);

UPPERCHURCH WINDFARM BADGER SETT SURVEY

REFERENCE DOCUMENTS

13 /51/0003 – response to RFI dated 28th February, 2013

Further Information 13/51/0003 (22 No. wind Turbines at Upperchurch)

REFERENCE DOCUMENTS

Malachy Walsh and Partners
Engineering and Environmental Consultants

Upperchurch Windfarm Badger Sett Survey

15388

November 2013

Job number	Revision	Prepared by	Checked by	Status	Date
15388-6002	A	JK	MK	Final	20th November 2013

Table of Contents

Appendices

1 Introduction

Malachy Walsh and Partners were commissioned to conduct a survey for potential badger activity within the site of the proposed Upperchurch Windfarm as a response to a Request for Further Information sent by North Tipperary County Council (13/51/0003). The following report gives a detailed account of the badger survey conducted, in July and August 2013 at Upperchurch, Co. Tipperary.

2 Site Description

The proposed Upperchurch Windfarm site is located in north Co. Tipperary, approximately 1.9 km west of the village of Upperchurch and a further 18 km west of Thurles town. The study area is made up of four sections with an overall area of 12 km².

The surrounding local landscape is dominated by 'Pasture' with 'Forestry, 'Bog', 'Other Agricultural Land' and 'Other' land located to the south of the proposed windfarm site (NPWS, online mapping 2012). The area is underlain by Silurian Metasediments and Volcanics with subsoils consisting of "Sandstone and shales till Devonian/Carboniferous"

The four sections of the site are located on a series of small hills or drumlins that reach elevations between 363mOD and 411mOD where the peaks are generally at heights of 100m above the intervening lower terrain. The highest peak is that of Knockmaroe at an elevation of 411mOD.

The area originally would have had a shallow peat land cover but most of it has been reclaimed by deep ploughing and converted to pasture. The remaining peat areas are used mainly for commercial forestry. Some rock outcropping occurs, most notably at the northeast part of the site.

3 Legal and conservation status

Badgers and their setts are protected under the provisions of the Wildlife Act, 1976, and the Wildlife Amendment Act, 2000. It is an offence to intentionally kill or injure a protected species or to wilfully interfere with or destroy the breeding site or resting place of a protected wild animal. The National Roads Authority (NRA) produced a guidance document for badgers titled '*Guidelines for the treatment of badgers prior to the construction of national roads schemes'* (NRA, 2005). The following guidelines are taken from that document:

"The following provisions should apply to all construction works:

- *Badger sett tunnel systems can extend up to c. 20m from sett entrances. Therefore, no heavy machinery should be used within 30m of badger setts (unless carried out under licence); lighter machinery (generally wheeled vehicles) should not be used within 20m of a sett entrance; light work, such as digging by hand or scrub clearance should not take place within 10m of sett entrances.*

- *During the breeding season (December to June inclusive), none of the above works should be undertaken within 50m of active setts nor blasting or pile driving within 150m of active setts.*
- *Following consultation with the NPWS and badger experts, works closer to active setts may take place during the breeding season provided appropriate mitigation measures are in place, e.g. sett screening, restricted working hours, etc.*

In order to comply with these constraints:

- *All affected badger setts should be clearly marked and the extent of bounds prohibited for vehicles clearly marked by fencing and signage. Bunting is an option on a temporary basis. Hazard tape is inadequate as it is prone to deterioration and damage by wind or cattle etc.*
- *All contractors/operators on site should be made fully aware of the procedures pertaining to each sett on site.*
- *Construction activities within the vicinity of affected setts may commence once these setts have been evacuated and destroyed under licence from the NPWS. Where affected setts do not require destruction, construction works may commence once recommended alternative mitigation measures to address the badger issues have been complied with.*
- *In almost all circumstances, works close to badger setts may only be conducted under the supervision of a qualified expert under licence from the NPWS."*

4 Survey Methodology

A badger survey was conducted within the site boundary for the proposed Upperchurch Windfarm over three days between 3rd and 8th of July 2013. Habitats and features of interest adjacent to the site boundary were also considered during the survey. All field boundaries and potential landscape feature of interest to badgers were walked to record any potential signs of mammal activity. All records of mammal species were noted during the course of surveys. The site was searched for tracks and signs of mammals according to methodology described in *Animal Tracks and Signs* (Bang and Dahlstrom, 2001); and *The Mammal Detective* (Strachan, 1995).

5 Badger activity within the study area

An old disused single entrance badger (*Meles meles*) sett was recorded along a hedgerow approximately 250m south west of turbine T7. The entrance was overgrown and did not appear to have been used for a significant period of time. A potential single entrance badger sett was recorded along a field boundary 150m west of turbine T4. The entrance again exhibited signs that it hadn't been used for a significant period of time. No badger activity was noted during nocturnal surveys for bats although the habitats within the site offer potential habitat for badgers. Many of the sections of conifer plantations are extensive offering potential shelter for setts however no setts were recorded along their margins during surveys. During the field surveys in 2012 badger activity (tracks and droppings) was recorded in the south eastern section of the site. A trail was followed through a field which led to a gap in the hedgerow at the north eastern corner of the field where T7 is located. Fresh droppings were found at this site (GPS R96274 60423).

6 Other terrestrial mammals recorded within the study area

Fallow deer (*Dama dama*) are present within the study area and utilised habitats within the site boundary. The grassland fields and patches of heath/bog as well as hedgerows offer potential foraging habitat for the species. A small herd of 5 individuals including two juveniles were recorded on the 4th of July 2013 during surveys within an improved grassland field in Knockmaroe near the proposed location of turbine T19. The group once spotted retreated into the nearby conifer plantation for cover. Trails, prints, droppings and evidence of feeding were recorded at knockcurraghbola near turbine T8. It is considered likely that the species is utilising habitats throughout the site and the greater area with the stands of conifer plantation offering the protection of cover and shelter.

An Irish hare (*Lepus timidus Hibernicus*) was recorded within an agricultural field Knocknamena Commons. The species is present and potentially numerous within the study area. Rabbits (*Oryctolagus cunniculus*) are also present and common throughout the study area with frequent dropping recorded in Knockmaroe, knockcurraghbola, Shevry and Grouse hall.

Otter (*Lutra lutra*), hedgehog (*Erinaceus europaeus*), stoat (*Mustela erminia*), pine marten (*Martes martes*) and pygmy shrew (*Sorex minutus*) where not noted during the 2013 survey at the site, although all are known to be present in the locality. A pygmy shrew was observed just outside the south eastern section of the site during a bat survey in 2012 near Milestone.

Other mammals known to be present include fox (*Vulpes vulpes*). No den was found however they are likely to have a den near the site. Fox dropping were recorded during surveys at several locations within the site. Brown rat (*Rattus norvegicus*) and house mouse (*Mus musculus*) was not noted but they are widespread and numerous and may be present especially around the farmyards and around private houses in the local area. Wood mouse (*Apodemus sylvaticus*) were not recorded during the survey but are also likely to be present.

7 Conclusion

Malachy Walsh and Partners were commissioned to conduct a badger survey for the proposed Upperchurch Windfarm as a response to a request for further information from North Tipperary County Council.

Badger activity within the site, by the nature of the nocturnal behaviour of this mammal, has the potential to be under recorded during surveys. The clues and physical structures left by this species offers the greatest insight into their utilisation of a study area. A comprehensive assessment of the site has been carried out as part of this survey with a complete site walkover focussing exclusively on mammal tracks, trails, droppings, fur, signs of feeding activity as well as setts, den, burrows, forms, etc. The level of activity is not considered to be significant and the habitats within the site are common within the greater area. The species of terrestrial mammal including badger within the study area are not consider likely to be impacted by the proposed windfarm apart from the increase in noise and activity during construction phase which would be deemed a localised and temporary impact with species expected to return soon after construction.

7.1 Further recommendations

It is recommended that pre and post construction monitoring of badger activity within the site be carried out as part of the management of the site and this has been included in the ecological management plan. Construction shall also be limited to the footprint of the proposed development and the planning boundary thus maintaining the existing buffer between the proposed development and the old setts recorded during the survey.

If a new badger sett is discovered during construction works particularly vegetation clearance. Works shall be suspending within 50m of any newly discovered badger sett during the breeding season (*December to June inclusive*) and 30m outside the breeding season (*July to November inclusive*) pending an activity survey, consultation with the local NPWS Wildlife Ranger and receipt of a badger derogation licence.

8 References

Bang, Preben and Dahlstrom, Preben (2001). Animal Tracks and Signs by Oxford University Press

Harris, S. And Yalden, D. W. Editors. (2008). Mammals of the British Isles: Handbook, 4th edition. Mammal Society, Southampton. UK.

National Roads Authority, (2005). *Guidelines for the treatment of badgers prior to the construction of national roads schemes*. NRA, Dublin.

NPWS, (2013). National Parks and Wildlife Service website http://www.npws.ie/en/ accessed Sept 2013.

Strachan, Rob (1995). The Mammal Detective by Whittet Books

Whilde, T. (1993). Threatened mammals, birds, amphibians and fish in Ireland. *Irish Red Data Book 2: Vertebrates.* HMSO, Belfast.

Appendix A

Photographs

Plate 1: Disused badger sett approximately 250m south west of turbine T7

Plate 2: Disused badger recorded along a field boundary 150m west of turbine T4

REFERENCE DOCUMENTS