Appendix 9

Bat Survey Report

ENVIRONMENTAL BALANCE IN DESIGN AND CONSTRUCTION

ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED MAIGHNE WIND FARM, COUNTIES KILDARE AND MEATH

BAT FAUNA ASSESSMENT

March 2015

elementpower

FEHILY TIMONEY & COMPANY

ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED MAIGHNE WIND FARM, COUNTIES KILDARE AND MEATH

VOLUME 2 – MAIN EIS

BAT FAUNA ASSESSMENT

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ABSTRACT

This report details site surveys and assessments undertaken seasonally in 2013 and 2014 of the existing bat fauna at proposed wind development sites in Cos. Kildare and Meath, collectively known as Maighne, where 47 turbines are planned to be erected and survey of structures along the proposed routes of the High Voltage and Medium Voltage cables.

In recent years, as wind turbine developments increased around the world, their impacts on birds and bats became known. Multiple studies on the interaction of bats with turbines have shown that these animals, including species found in Ireland, suffer high mortality as a result of the presence of these structures.

The surveys determined that at least five bat species actively forage on or over the study areas and other species are known from the local area and may occur onsite occasionally.

All but one of the bat species confirmed or expected onsite are low fliers and, as a result, are considered to be at a low risk from the proposed development. Only Leisler's bat is of concern as it is a high flier and hence may come into conflict with turbines. However, there is currently no evidence of Leisler's bat mortality due to wind turbines in Ireland. The average foraging height of the species is approximately 40m above the ground and, although it can hunt at heights in excess of 70m, most activity is below 50m.

To date, there are no published results of bat/turbine interaction at Irish wind turbine sites and those undertaken abroad are mainly of wind farms, with multiple turbines, sited along known bat migration routes which are currently unknown in Ireland.

Mitigation measures are given to reduce the potential risks to bats posed by wind turbines. These include clearing vegetation around 36 turbines for the life of the development. The adjudged worst case scenario is that, during operation, the turbine development may possibly cause injury or death to a few individual specimens of Leisler's bat but the resulting impact of the proposed development on local bat populations, with mitigation measures, is considered to be minor negative with the favourable conservation status (FCS) of bat species being unaffected and all species confirmed or expected on or near the study areas are anticipated to persist.

As little research is undertaken on bats and wind turbines in Ireland, the planned development could provide an opportunity to gain baseline data on bat/turbine interaction.

STATEMENT OF COMPETENCE

Mr. Conor Kelleher: The author of this report has specialised in the study of bats since the mid-1980s and is licensed to catch these animals for educational and scientific purposes. He is a past Bat Warden for *English Nature* (now *Natural England*), the Statutory Nature Conservation Organisation in England, from 1989 to 1999. He has published many articles and papers on these animals and presented papers on bat ecology at international conferences and symposia. He is a part-time lecturer on bat ecology at University College Cork.

The author has also undertaken research on bats including radio-telemetry and detector studies and distribution surveys and tutors courses on field study techniques.

Since 2001, he has been self-employed as an Ecological Consultant undertaking terrestrial mammal surveys, specialising in bats, for Environmental Impact Assessments, pre-construction surveys etc. To date, he has been involved in over 400 ecological surveys for developments such as roads, quarries, landfills, wind turbine and residential and commercial projects.

Mr. Kelleher was Secretary and Trustee of the UK *Bat Conservation Trust* from 1998-2003 and has recently stepped down as Chairman of *Bat Conservation Ireland*. He also recently retired as Chairman of the *Irish Wildlife Trust*. He continues chairing the *Cork County Bat Group*. He has attended oral hearings as an Expert Witness on bat issues and has undertaken research-based projects on bats for the *National Parks and Wildlife Service* and the *Vincent Wildlife Trust*.

In 2006, Mr. Kelleher co-authored the National Roads Authority's *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes* and *Guidelines for the Treatment of Bats during the Construction of National Road Schemes*; in 2007, he co-authored the National Parks and Wildlife Service's *Bat Mitigation Guidelines for Ireland* and, in 2012, he co-authored Bat Conservation Ireland's *Wind Turbine/Wind Farm Development Bat Survey Guidelines*. He also recently co-published the interactive DVD: *Knowing, Studying and Conserving the Bats of Ireland – an Interactive Guide on How to Identify, Study, Appreciate and Care for Irish Bats.*

TABLE OF CONTENTS

Page

LIST OF TABLES

Page

1 BAT FAUNA ASSESSMENT

1.1 Introduction

A wind energy development consisting of 47 turbines is proposed to be constructed in the townlands of Ballynakill, Windmill, Drehid, Hortland, Derrybrennan and Cloncumber in County Kildare with the footprint of the Ballynakill site extending into County Meath. The turbines are numbered 1 to 47 as follows:

Ballynakill:	T1 to T10	(10 turbines)
Windmill:	T24 to T26	(3 turbines)
Drehid:	T11 to T23 and T47	(13 turbines)
Hortland:	T40 to T46	(7 turbines)
Derrybrennan:	T27 and T28	(2 turbines)
Cloncumber:	T29 to T39	(11 turbines)

In recent years, as wind turbine developments increased around the world, their impacts on birds and bats became known. Multiple studies on the interaction of bats with turbines have shown that these animals suffer high mortality as a result of the presence of these structures. In Hayes 2013, the published bat fatality information at wind energy facilities in the contiguous United States in 2012 was reviewed to derive estimates of the number of bats killed and concluded that over 600,000 bats may have died as a result of interactions with wind turbines in that year alone. The All-Ireland Species Action Plan: Bats (Anon 2008) states:

> *Wind turbines may have a negative impact on bat populations. Johnson et al., (2000) while studying bird strike, recorded that the number of dead bats found under wind turbines was sometimes greater than the number of dead birds.*

In Europe, twenty bat species have been confirmed as suffering fatal collisions with wind turbines. These include four species that occur in Ireland that may be affected by turbines in different ways. For instance, turbines sited in open landscapes can impact high flying species such as Leisler's bat *Nyctalus leisleri* and migratory species such as Nathusius' pipistrelle *Pipistrellus nathusii* whereas turbines sited close to hedgerows, treelines and woodlands can impact lower flying species such as common *P. pipistrellus* and soprano pipistrelle *P. pygmaeus*.

Although all bat species are given a 'Favourable' conservation status in the Republic of Ireland (*National Parks and Wildlife Service* 2013), all are protected under current European and National legislation (see Appendix 3) and an assessment of impacts, if any, to local bat populations as a result of the planned turbine development was undertaken over two years in 2013 and 2014.

This report presents the results of a desk study into previous records of bat species (from *Bat Conservation Ireland's* National Bat Distribution Database and the *National Parks and Wildlife Service's* National Lesser Horseshoe Bat Roost Database) in the area of the proposed development and that of site visits in spring, summer and autumn 2013 during which the onsite structures and habitats were assessed during daylight hours for their favourability for bats and, from dusk to dawn, bat activity surveys were undertaken using heterodyne, frequency division and time expansion detectors. Also included are the findings of surveys of structures along the proposed routes of the High and Medium Voltage cables. The onsite assessments were undertaken by Mr. Conor Kelleher.

1.2 Methodology

Bats utilise treeline and hedgerow boundaries of agricultural grasslands, sheltered minor roads and lanes, scrub and woodland edge habitats as foraging areas and commuting routes and large-scale development in such areas may adversely affect bats in a number of ways such as vegetation removal for haulage roads or new tracks which may impact bats through the creation of open space barriers that bats may be unwilling to cross. Bat roosts in trees or buildings may be lost if they have to be removed. The removal of hedgerows and treelines and the loss of mature trees, draining of wet areas and provision of artificial lighting all affect the availability of invertebrate prey and feeding areas.

It is essential therefore that a comprehensive study of bat activity at sites of such development be undertaken to identify any conflict zones and hence to avoid or reduce impacts through mitigation to safeguard these animals.

To comprehensively research and so understand the existing behaviour of bats within the study areas the approach detailed in the following guidelines were followed:

- Hundt, L. 2012 in *Bat Surveys: Best Practice Guidelines* (2nd edition). Bat Conservation Trust
- Bat Conservation Ireland 2012 *Wind Turbine/Wind Farm Development Bat Survey Guidelines*, Version 2.8, December 2012 and the
- National Roads Authority 2006 *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes*

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

- post hibernation spring re-emergence
- peak summer activity
- autumnal mating behaviour and, where necessary,
- winter hibernation

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

Spring – May 2013
- Detector surveys to observe bat feeding, commuting and roosting behaviour

Summer – June 2013
- Detector and bat habitat surveys undertaken to observe bat feeding, commuting and roosting behaviour to establish priority bat habitats
- Onsite structure survey carried out where possible to inspect buildings to ascertain bat use
- Assessment of previously identified roosts within or adjacent to study sites and maternity roosts identified through dawn swarming roost surveys

Autumn – September 2013
- To identify Leisler's bat *Nyctalus leisleri* lekking areas and other bat mating sites

Winter – December 2013
- Assessment of known and identification of hibernation sites and, if required, access potential hibernacula in order to check for bat presence

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

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

Habitats on each site were assessed for their favourability for bats and where possible, structures were surveyed for bat presence either externally via bat detector, internally by visual inspection or by a combination of both. All accessible areas of such structures were inspected for bats and/or their signs using powerful torches.

The presence of bats is often shown by grease staining, droppings, urine marks, corpses, feeding signs such as invertebrate prey remains and/or the presence of bat fly *Nycteribiidae* pupae, although direct observations are also occasionally made. Bat droppings are often identifiable to species-level based on their size, shape and content and those of certain species, for example brown long-eared *Plecotus auritus* and lesser horseshoe *Rhinolophus hipposideros* bats, are very distinctive and unmistakable.

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

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

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

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

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

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

The areas under study and the number and location of turbines changed throughout the study as the planned development evolved. Some areas surveyed in 2013 are now no longer within the scheme.

1.2.1 Survey Constraints

There were no climatic or seasonal constraints to the onsite assessments as each was undertaken during optimal conditions however the prolonged winter of 2012/2013 and very cold spring of 2013 resulted in decreased numbers or indeed an absence of flying insects up to the end of May which affected bat activity. In 2013, the Irish bat fauna experienced a second consecutive winter and spring of exceptionally low temperatures. In 2012, bat activity throughout the country was noticeably affected by the severely cold temperatures with bats remaining in hibernation far longer than usual. Some species remained underground until mid-May (pers. obs.); unlike, in 'normal' years, when bats are usually active from mid-March onwards.

The prolonged and record rainfall in the summer of 2012 which followed the long winter of 2011/2012 noticeably affected a range of animal species including bees, butterflies and moths and resulted in far fewer

numbers of these invertebrates being on the wing than in other years. The reduction in prey items affected bat activity and would certainly have lead to malnourised animals entering hibernation.

Any young born late in the summer of 2012 would likely have perished during the following winter having had less time for feeding and, consequently, low fat reserves. The negative impacts of the spring and summer weather were then exacerbated by a second prolonged winter which lasted until the end of May 2013 with night temperatures throughout the month of only 2°C to 6°C which is certain to have resulted in greater mortality of juveniles.

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

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

1.2.2 Relevant Guidance

- Bat Conservation Ireland 2012 *Wind Turbine/Wind Farm Development Bat Survey Guidelines*, Version 2.8. Bat Conservation Ireland, Virginia, Co. Cavan
- Bat Conservation Trust 2012 *Bat Surveys: Best Practice Guidelines* (2nd edition). Bat Conservation Trust, London
- Carlin, C. and Mitchell-Jones, T. 2012 *Bats and Onshore Wind Turbines – Interim Guidance (2nd Edition),* Technical Information Note TIN051. *Natural England*, Peterborough, UK
- National Roads Authority 2006a *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes,* NRA, Dublin
- National Roads Authority 2006b *Guidelines for the Treatment of Bats during the Construction of National Road Schemes*, NRA, Dublin
- Northern Ireland Environment Agency 2011 *Bat survey – specific requirements for wind farm proposals*. Northern Ireland Environment Agency, Department of the Environment, Belfast
- Rodrigues, L., Bach, L., Dubourg-Savage, M-J., Goodwin, J. and Harbusch, C. 2008 *Guidelines for Consideration of Bats in Wind Farm Projects:* EUROBATS Publication Series No. 3. UNEP/EUROBATS Secretariat, Bonn, Germany

1.3 Existing Environment

The study areas are within a lowland landscape, 50m to 90m asl, which largely consists of improved agricultural (GA1) and wet grasslands (GS4) with associated hedgerows (WL1) and treelines (WL2), arable crops (BC1), blanket bog (PB3) and cutaway blanket bog (PB4), coniferous plantations (WD4), deciduous woodland (WD1) and scrub (WS1). Rivers (FW2), small streams and minor drainage channels (FW4) are common. Several classes of public roads (BL3) traverse the area (habitat classifications based on Fossit 2000).

1.3.1 General Description of Area and Habitats

The landscape is characterised by relative tranquillity with the principal agricultural land use in the area being permanent grassland pasture, grazed principally by cattle and horses. Most pastures are of high quality improved grassland but poorer quality wet grasslands are also used for agricultural purposes. Some fields are also in use for tillage. A number of coniferous plantations are present as is some scrub. Deciduous

woodlands occur but are uncommon. Areas of blanket bog are widespread. There are three large rivers (Boyne, Blackwater and Slate), two canals (the Royal and the Grand) and many small tributaries and drains in the area. Habitats are described individually over.

1.3.2 Designated Sites of Conservation Interest in the Locality

The development area is within the catchment of the River Boyne and River Blackwater Special Area of Conservation Site Code 002299.

1.3.3 Grassland: Improved (GA1), Wet (GS4); Arable Crops (BC1)

The grasslands are mostly improved pastures of variable quality, predominantly used for grazing and silage but wet grasslands also occur. Field size varies in the area and most field boundaries are of hedgerows of varying quality and treelines but some have been removed and replaced by light fencing or temporary electric fences.

1.3.4 Hedgerows (WL1), Treelines (WL2), Stone Walls (BL1), Earthen Banks (BL2)

The structure of hedgerow boundaries varies in the study areas but is principally of hawthorn *Crataegus monogyna* and with taller emergent trees. Hedgerows also occur with stone walls or earthen banks as boundaries in some areas.

1.3.5 Woodland: Coniferous (WD4), Deciduous (WD1)

Dense stands of semi-mature conifer plantations occur in some areas. These woodlands have limited ground flora. Some stands are edged with deciduous tree species and these are more favourable to bats. Deciduous woodlands exist but they are not extensive or common but, where present, are very favourable bat habitats.

1.3.6 Scrub (WS1)

Scrub is present in some wetter areas and in clear-felled areas of commercial forestry.

1.3.7 Blanket Bog (PB3), Cutaway Blanket Bog (PB4)

Large areas of blanket bog occur but these have been largely cutaway historically. Industrial peat cutting continues in some areas.

1.3.8 Rivers, Canals, Streams (FW2), Drains (FW4)

The proposed development areas are within the catchments of the Boyne, Slate and Blackwater rivers as well as numerous small tributaries including streams and drains.

1.3.9 Built Land, Roads (BL3)

Apart from major and minor roads and lanes, there are also many tracks that serve as access to farms and houses within the survey areas. Bridges and culverts occur throughout and dwellings, farm buildings, disused and derelict structures are also present.

1.4 Desk Study Findings

A review of existing bat records within 30km and 10km of the study areas (sourced from BCIreland's National Bat Records Database) reveals that, currently, eight of the ten known Irish species have been

observed within a 30km radius. These include common, soprano and Nathusius' pipistrelles, Leisler's, brown long-eared, Daubenton's *Myotis daubentonii,* whiskered *M. mystacinus* and Natterer's *M. nattereri* bats as shown in Tables 1 to 12 below. Roosts of several of these species, as shown in the tables, have also been identified within these radii but none are within or immediately adjacent to any of the study areas.

The two remaining Irish species; lesser horseshoe and Brandt's *M. brandtii* bats have not been recorded in the local area to date. Of these, the lesser horseshoe bat is not known to occur in either county as the species' distribution range is confined to the west of Ireland and only a single confirmed specimen of Brandt's bat has been found in Ireland (Mullen 2007). Further information on the Irish bat species is given in Appendix 1 and 2.

Tables 1 to 12 below outline the adjudged status of each bat species within a 30km and a 10km radius of each of the respective study areas.

Table 1: Adjudged status of Irish bat species within a 30km radius of the Ballynakill study area

Common name	Scientific name	30km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus*	Present	12 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	22 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Present	0 known	BCIreland
Unknown pipistrelle	*Pipistrellus* spp.		12 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	10 known	BCIreland/Pers. Obs.
Brown long-eared bat	*Plecotus auritus*	Present	23 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	3 known	BCIreland/Pers. Obs.
Natterer's bat	*Myotis nattereri*	Present	1 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Present	1 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland
Unknown species			18 known	BCIreland

Table 2: Adjudged status of Irish bat species within a 10km radius of the Ballynakill study area

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

Table 3: Adjudged status of Irish bat species within a 30km radius of the Windmill study area

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

Table 4: Adjudged status of Irish bat species within a 10km radius of the Windmill study area

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

Table 5: Adjudged status of Irish bat species within a 30km radius of the Drehid study area

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

Table 6: Adjudged status of Irish bat species within a 10km radius of the Drehid study area

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

Table 7: Adjudged status of Irish bat species within a 30km radius of the Hortland study area

Common name	Scientific name	30km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus*	Present	18 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	18 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Present	0 known	BCIreland
Unknown pipistrelle	*Pipistrelle* spp.		18 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	27 known	BCIreland/Pers. Obs.

Common name	Scientific name	30km radius	Known roosts	Source
Brown long-eared bat	*Plecotus auritus*	Present	35 known	BCIreland/Pers. Obs.
Daubenton's bat	*Myotis daubentonii*	Present	4 known	BCIreland/Pers. Obs.
Natterer's bat	*Myotis nattereri*	Present	4 known	BCIreland/Pers. Obs.
Whiskered bat	*Myotis mystacinus*	Present	2 known	BCIreland
Lesser horseshoe bat	*Rhinolophus hipposideros*	Absent	0 known	BCIreland/NPWS
Brandt's bat	*Myotis brandtii*	Potential – rare	0 known	BCIreland
Unknown species			21 known	BCIreland

Table 8: Adjudged status of Irish bat species within a 10km radius of the Hortland study area

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

Table 9: Adjudged status of Irish bat species within a 30km radius of the Derrybrennan study area

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

Table 10: Adjudged status of Irish bat species within a 10km radius of the Derrybrennan study area

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

Table 11: Adjudged status of Irish bat species within a 30km radius of the Cloncumber study area

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

Table 12: Adjudged status of Irish bat species within a 10km radius of the Cloncumber study area

Common name	Scientific name	10km radius	Known roosts	Source
Common pipistrelle	*Pipistrellus*	Present	0 known	BCIreland/Pers. Obs.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Present	0 known	BCIreland/Pers. Obs.
Nathusius' pipistrelle	*Pipistrellus nathusii*	Potential	0 known	BCIreland
Leisler's bat	*Nyctalus leisleri*	Present	0 known	BCIreland/Pers. Obs.

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

1.5 Field Study Findings

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

1.5.1 Bat Activity Survey Findings

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

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

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

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

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

The bat observations recorded at the proposed locations of each turbine are shown in Table 3 below.

Table 13: Bat observations at proposed turbine locations

Turbine number	Habitat Code	Bat species	Comments
1	GA1, WL1	Common pipistrelle	Low activity
2	GA1, WL1	Common pipistrelle	Low activity
3	GA1, WL1	Common pipistrelle Soprano pipistrelle Brown long-eared	Low activity

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

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

Turbine number	Habitat Code	Bat species	Comments
44	WD4	Common pipistrelle Soprano pipistrelle	Low activity
45	WD4	Common pipistrelle	Low activity
46	GA1	Common pipistrelle	Low activity
47	GA1, WL1	Common pipistrelle Soprano pipistrelle	Low activity

1.5.2 Roost Survey Findings

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

1.5.3 High and Medium Voltage Cable Routes Structure Survey Findings

Several structures along the proposed High (HV) and Medium Voltage (MV) cable routes were inspected for their potential to harbour bat roosts. These included 23 culverts and 9 bridges as shown in Table 14 below with their adjudged potential to be used by bats.

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

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

Table 14: Bat roost potential within impacted structures along the HV and MV cable routes

Structure	Bat potential	Location	Comments
Bridge	Nil	N705 215	Low, prone to predation and flooding
Bridge	Nil	N703 216	Sealed – no available crevices for bat-use
Culvert	Nil	N711 233	Low, prone to predation and flooding
Culvert	Nil	N708 242	Low, prone to predation and flooding
Culvert	Nil	N704 255	Low, prone to predation and flooding
Culvert	Nil	N706 266	Low, prone to predation and flooding
Bridge	**Potential**	**N710 287**	**Some crevices present**
Bridge	**Potential**	**N716 293**	**Some crevices present**
Bridge	**Low**	**N719 293**	**Low, prone to predation and flooding**
Culvert	**Low**	**N715 305**	**Low, prone to predation and flooding**
Culvert	**Low**	**N715 313**	**Low, prone to predation and flooding**
Culvert	Nil	N736 336	Low, prone to predation and flooding
Culvert	Nil	N770 322	Low, prone to predation and flooding
Culvert	Nil	N778 333	Low, prone to predation and flooding
Culvert	Nil	N717 348	Low, vegetated, prone to predation and flooding
Culvert	Nil	N710 362	Low, prone to predation and flooding
Bridge	**Potential**	**N921 342**	**Some crevices present**

Structure	Bat potential	Location	Comments
Culvert	Nil	N895 342	Low, prone to predation and flooding
Culvert	Nil	N885 340	Low, prone to predation and flooding
Culvert	Nil	N877 337	Low, prone to predation and flooding
Culvert	Nil	N851 332	Low, prone to predation and flooding
Culvert	**Limited**	**N827 342**	**Low, prone to predation and flooding**
Culvert	Nil	N824 348	Low, prone to predation and flooding
Culvert	Nil	N816 357	Low, prone to predation and flooding
Bridge	**Potential**	**N807 374**	**Some crevices present**
Culvert	Nil	N795 379	Low, prone to predation and flooding
Culvert	Nil	N839 384	Low, prone to predation and flooding
Bridge	**Potential**	**N876 404**	**Some crevices present**
Bridge	**Potential**	**N881 405**	**Some crevices present**
Culvert	Nil	N939 452	Low, prone to predation and flooding
Culvert	Nil	N946 463	Low, prone to predation and flooding
Culvert	Nil	N949 467	Low, prone to predation and flooding

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

1.6 Overall Assessment of Scientific Interest of Area for Bats

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

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

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

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

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

1.6.1 Agricultural Areas and Associated Hedgerows and Treelines

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

1.6.2 Woodland and Scrub

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

1.6.3 Blanket Bog

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

1.6.4 Rivers, Canals, Streams and Drains

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

1.7 Assessment of Proposed Development

The field study findings indicate that a diverse range of bat species use the landscape in the study areas and the key potential impacts on these animals arise through potential roost loss, loss of feeding areas and disruption of commuting routes.

A variety of habitats occur in the area which vary in their importance for bats. The loss of areas of improved agricultural grassland will have negligible or minor impact on bats. Watercourses should not be significantly impacted by the proposed development and thus bats are likely to continue using them. The main impact on bats arises through the potential loss of woodland, mature deciduous trees and hedgerows which are widely used by these animals.

As the study areas include open fields amid tall vegetation that provide sheltered areas in which insects can swarm, it is favourable for foraging bats and the field surveys have confirmed the presence of five bat species and others may be expected to occur on occasion. Apart from one, each of the bat species confirmed or expected onsite are normally low fliers e.g. <10m above ground level and thus are considered to be at a low risk from turbine impacts. The exception is Leisler's bat which is a high-flying species and as such is of most concern.

Leisler's bat is classified as a *high risk* species in relation to wind turbines as it is a high flier (Carlin and Mitchell-Jones 2012) which travels considerable distances (up to 13.4km has been recorded in Ireland, Shiel *et al.* 1999) between roosts and foraging areas. The species has evolved for fast flight in excess of 40km/h (Dietz *et al.* 2007) and is less manoeuvrable as a consequence. It therefore avoids cluttered environments by keeping above the tree canopy normally flying between 10m and 70m above the ground (Russ 1999) but which has been known to reach heights of 500m (Bruderer and Popa-Lisseanu 2005). Flying at such heights brings it into direct conflict with wind turbines.

Wind turbines are a known risk to bats (Arnett *et al.* 2008, Baerwald *et al.* 2008, Cryan and Brown 2007, Johnson *et al.* 2003, Johnson and Strickland 2004, Zagmajster *et al.* 2007) and the *EUROBATS Secretariat* has published guidelines on bats and wind farm projects (Rodrigues *et al.* 2008) to ensure bats are considered as part of development proposals. The Irish Government has yet to produce national guidelines as has been done in the UK and Northern Ireland but, following discussions with the *Irish Wind Energy Association, Bord Gáis Energy, Forestry Service, BirdWatch Ireland* and other interested parties, *Bat Conservation Ireland* published wind turbine/wind farm development bat survey guidelines in December 2012 (Version 2.8).

Although further worldwide research on bat/turbine interactions needs to be undertaken, studies to date in Europe and the U.S.A. (Kunz *et al.* 2007, Arnett *et al.* 2008, Horn *et al.* 2008, Rydell *et al.* 2010), have shown that bat mortality due to wind turbines is a serious issue.

To add to the dangers to bats of collision with a rotating turbine, a study in 2008 by Baerwald *et al.* showed that bats do not have to make contact with the turbine to be killed as the change in atmospheric pressure resulting from the rotating rotor causes bats' lungs to haemorrhage leading to the animal's death however the findings of this study have since been questioned (Rollins *et al.* 2012). While such foreign findings cannot be ignored, to date, there is no published research or survey evidence that the same scenarios apply in Ireland and there is no evidence of Leisler's bat mortality due to wind turbines in this country as, to date, no studies have been undertaken.

1.8 Potential Impacts

Bat species within the study areas will be affected by both the construction phase and subsequent existence of the wind development in the landscape. Apart from Leisler's bat which is a high flying species so will not be impacted unduly by the removal of vegetation along cable or haul routes, loss of foraging sites and commuting habitat may displace other bat species.

1.8.1 Potential Impacts during Construction

The construction of the planned wind development will involve offsite widening of existing road carriageways to allow unimpeded haulage of the large turbine sections. This road widening will involve tree and hedgerow removal which may affect bats. Existing bridges and culverts which may be in use by bats may also require strengthening to cope with increased loads during turbine delivery or works to facilitate cable placement. New onsite haul roads will also need to be constructed resulting in the loss of vegetation which may be in use as flight path features by bats. Onsite human construction activity may also cause disturbance to these animals. The foreseen potential impacts are as follows.

1.8.1.1 Potential Direct Impacts

- Loss of commuting and foraging habitats
- Loss of roosts in trees
- Loss of roosts in bridges/culverts

1.8.1.2 Potential Indirect Impacts

- Disturbance due to increased human activity

1.8.1.3 Potential Cumulative Impacts

- Displacement of populations
- Abandonment of young
- Mortality

1.8.2 Potential Impacts during Operation

Bat mortality due to collisions with wind turbines is well known and studies have further shown that bats may be killed without physically contacting turbine blades. The death of bats due to the presence of the operating turbines may reduce local bat populations especially if a turbine is sited near a roost. The planned turbine development is also to be sited within an area which is over-flown by Leisler's bat and whose hedgerow, treeline and forest edge habitats are currently in use by at least four other bat species. Although, as yet, there are no published results of a study of bat mortality from Irish wind turbines, considering recent research from mainland Europe and North America, there is an increasing amount of detailed published evidence that wind turbines cause bat fatalities. However, many of these overseas turbine/bat mortality studies are at wind farms, with significantly large numbers of turbines, sited along known bat migration routes where many hundreds or even thousands of bats commute seasonally resulting

in numerous deaths and injuries. There is currently no evidence that mortality of bats on the same scale occurs here.

Also, although it is known that Nathusius' pipistrelle migrates from Scandinavia to Scotland and to the north of Ireland and back again (Russ *et al.* 2001), apart from this species, there is currently no evidence that internal or external bat migration routes of other bat species exist elsewhere in Ireland as no research has been undertaken. Nevertheless, risks to bats from wind turbines have to be acknowledged and it is possible that some bat mortality may occur due to the operation of the planned development therefore mitigation measures are recommended to reduce the likelihood of such fatalities. The foreseen potential impacts during operation are as follows.

1.8.2.1 Potential Direct Impacts

- Death through collision with turbine blades
- Death through barotrauma

1.8.2.2 Potential Indirect Impacts

- No indirect impacts envisaged

1.8.2.3 Potential Cumulative Impacts

- Mortality
- Reduction of local populations

1.8.3 Potential Impacts during Decommissioning

The possible impacts on bats during the decommissioning phase of the wind development are the same as those given for the construction phase of the project as similar activities which may affect bats will again be undertaken both on and offsite resulting in the potential

- loss of commuting and foraging habitats
- loss of roosts in trees
- loss of roosts in bridges/culverts and
- disturbance due to increased human activity.

1.9 Mitigation Measures

Standard mitigation measures, as would apply to any large-scale development, shall be adopted in the site clearance and construction of the turbines. These shall include limiting season of disturbance to trees and other vegetation so as to reduce impacts on breeding bird species and to implement measures to avoid and/or control pollution and sedimentation into watercourses. The following specific measures will be required to protect bats onsite.

The following mitigation measures are in line with the NRA guidelines on provisions for the conservation of bats during the planning and construction of roads (2006). Reference is made to the NRA Guidelines (*Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes* and the *Guidelines for the Treatment of Bats during the Construction of National Road Schemes*).

Each of the proposed locations of the 47 turbines was surveyed and the bat activity findings recorded have identified specific areas of conflict that are listed in Table 15 over along with recommended mitigation measures to prevent or reduce the potential negative impacts in these areas.

Table 15: Assessment of potential turbine / bat conflict zones

Turbine number	Nearest vegetation	Bat activity	Recommended mitigation measures and general comments
1	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft Survey veteran ash tree with bat roost potential
2	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
3	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
4	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft Survey mature beech and horse chestnut trees with bat roost potential
5	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
6	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft Survey mature beech trees with bat roost potential
7	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
8	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
9	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
10	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft Survey mature beech trees with bat roost potential
11	In forestry	High	Remove all tree plantings within a 60m radius of the turbine shaft
12	In forestry	High	Remove all tree plantings within a 60m radius of the turbine shaft
13	Scrub	Low	Remove vegetation within 60m of the turbine shaft
14	Scrub	Low	Remove vegetation within 60m of the turbine shaft
15	Scrub	Low	Remove vegetation within 60m of the turbine shaft
16	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
17	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
18	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
19	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
20	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
21	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
22	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
23	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
24	N/A	Low	No mitigation required
25	N/A	Low	No mitigation required
26	N/A	Low	No mitigation required
27	N/A	Low	No mitigation required
28	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
29	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
30	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
31	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
32	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
33	N/A	Low	No mitigation required
34	Hedgerow	High	Remove hedgerow vegetation within 60m of the turbine shaft

Turbine number	Nearest vegetation	Bat activity	Recommended mitigation measures and general comments
35	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft
36	N/A	Low	No mitigation required
37	N/A	Low	No mitigation required
38	N/A	Low	No mitigation required
39	N/A	Low	No mitigation required
40	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
41	N/A	Low	No mitigation required
42	In forestry	High	Remove all tree plantings within a 60m radius of the turbine shaft
43	In forestry	High	Remove all tree plantings within a 60m radius of the turbine shaft
44	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
45	In forestry	Low	Remove all tree plantings within a 60m radius of the turbine shaft
46	N/A	Low	No mitigation required
47	Hedgerow	Low	Remove hedgerow vegetation within 60m of the turbine shaft

As shown in the previous table, apart from four sites needing pre-construction tree surveys, mitigation measures to protect bats are required at 22 of the 47 proposed turbine locations. In all cases it is recommended that existing vegetation is cleared to provide a vegetation-free buffer zone around the turbine. This includes turbines T31 and T32 at Cloncumber which are within a *Coillte*-owned, set-aside biodiversity area. This area mainly consists of non-native coniferous woodland and removing such within a 60m radius of both turbines will not impact on the biodiversity value of the site as tree clearance should encourage the growth of ground-cover native bog flora.

1.9.1 Mitigation Measures during Construction

1.9.1.1 Buffer zones

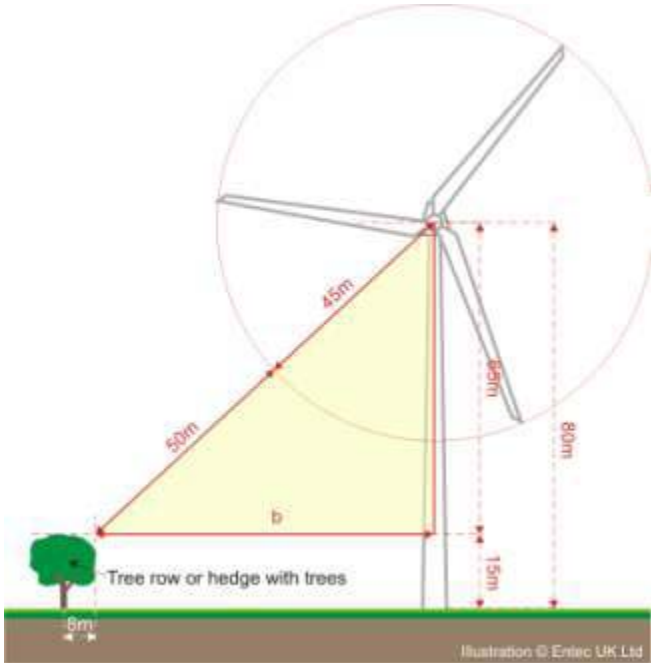
Bats commuting and foraging along onsite forest edge, treelines and hedgerows should be safeguarded by providing a 50m minimum distance buffer zone between the rotors of the planned turbines and the nearest vegetation to reduce the risk of collision and/or barotrauma. This is in line with present best practice guidelines (Carlin and Mitchell-Jones 2012) and should prevent impacts to bats that mainly fly low along such linear features e.g. the pipistrelles. Such a buffer zone can be provided by either siting the turbines so that rotors are a minimum of 50m away from existing vegetation or by felling any trees within 50m of rotors. Such cleared vegetation should be managed and maintained during the operational life of the development

From Carlin and Mitchell-Jones 2012: *It is incorrect to measure 50m 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 (b) using the formula:*

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

where, (in metres):

bl = blade length
hh = hub height
fh = feature height



For the example above, b = 69.3m

1.9.1.2 Removal of deciduous trees

Any mature broadleaved trees that are to be removed, should first be surveyed for bat presence by a suitably experienced specialist. If bats are found, an application for a derogation licence should be made to the *National Parks and Wildlife Service* to allow its legal removal. Such trees should ideally be felled in the period late August to late October, or early November, in order to avoid disturbance of any roosting bats as per *National Roads Authority* guidelines (NRA 2006a and 2006b) and also to avoid the bird breeding seasons. Tree felling should be completed by Mid-November at the latest as bats roosting in trees are very vulnerable to disturbance during their hibernation period (November – April). Trees with ivy *Hedera helix* cover, once felled, should be left intact onsite for 24 hours prior to disposal to allow any bats beneath foliage to escape overnight.

Landowners should be advised that the timber from felled trees will remain for their use. This should prevent trees being felled prematurely.

1.9.1.3 Retention of trees

Several species of bats roost in trees. Where possible, treelines and mature trees that are located immediately adjacent to the line of proposed haul roads or are not directly impacted should be avoided and retained intact. Overall impacts on these sites should be reduced through modified design and sensitivity during construction. Any trees and treelines along approach roads and planned site access tracks should be retained where possible. Retained trees should be protected from root damage by machinery by an exclusion zone of at least 7 metres or equivalent to canopy height. Such protected trees should be fenced off by adequate temporary fencing prior to other works commencing.

1.9.1.4 HV and MV cable routes – other structures

Should any further structures be impacted by changes to the current proposed HV and MV cable routes then these should be assessed for their potential to harbour bats prior to works and the findings reported. If bat use is confirmed, appropriate mitigation measures should be taken to ensure no animals are harmed.

1.9.1.5 Compensation for loss of commuting routes

Linear features such as hedgerows and treelines serve as commuting corridors for bats (and other wildlife). Mitigation measures are recommended to compensate for the loss of these features that are used by bats as commuting routes. These measures will also compensate for habitat loss and provide continuity in the landscape.

Severed linear features such as hedgerows and treelines should, where possible, be reconnected using semi-mature trees under-planted with hedgerow species to compensate for the loss of treelines and hedgerows that are currently used by bats. The exact locations of such planting will be designed at detailed landscaping stage. Native species should be used as they support more insect life than non-native varieties.

All planting shall preferably, be completed during the pre-construction phase to provide hedgerow/tree growth prior to completion of the development. This would ensure that bats commuting in the area have prior knowledge of newly planted landscape features as well as ensuring the newly planted hedgerows/treelines are well established prior to completion of the wind farm.

1.9.1.6 Habitat retention, replacement and landscaping

Habitat replacement and landscaping could compensate for or add to the wildlife value of the area and also provide areas of aesthetic as well as wildlife interest. Further pro-active habitat restoration measures are considered below.

In general, best practice design should aim to retain the quality of the landscape where possible and ensure its protection within the landscaping programme. Existing hedgerows and treelines, semi-natural scrub or semi-natural grasslands should be retained where possible and incorporated into the landscaping programme.

The overall design of the project should also include habitat replacement or enhancement of existing onsite woodland, hedgerow, treeline and scrub habitats and it is recommended that the planting of native broadleaved trees is also considered. Native species should be chosen in all landscaping schemes. Planting schemes should attempt to link in with existing wildlife corridors (hedgerows and treelines) to provide continuity of wildlife corridors.

1.9.1.7 Bridges and culverts on HV and MV cables/turbine delivery routes

If any of the structures listed in Table 5 that showed potential for use by bats or any other local bridge or culvert is to be strengthened prior to use for haulage of construction materials for this development, it should first be surveyed/re-surveyed for bat presence prior to any upgrading or maintenance works. Bats, especially Daubenton's, regularly use bridges for roosting and are vulnerable within such structures due to infilling of crevices during which they may be entombed. If bats are found then some crevices beneath the bridge should be retained for their continued use according to best practice bat mitigation measures for bridge works (see *Billington and Norman 1997, Highways Agency 2001, Joint Nature Conservation Committee 2004, National Roads Authority 2006a/2006b* and *Shiel 1999*). Any re-pointing or pressure grouting of bridges should only proceed after an inspection of the structure for bats and, should bats be found, an application for a derogation licence to legally allow works on or near a bat roost, which is a notifiable action under current legislation (see Appendix 4), should be made to the *National Parks and Wildlife Service*.

1.9.1.8 Lighting restrictions

In general, artificial light creates a barrier to bats so lighting should be avoided where possible. Where lighting is required, directional lighting (i.e. lighting which only shines on work areas and not nearby countryside) should be used to prevent overspill. This can be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvers and shields to direct the light to the intended area only.

1.9.2 Mitigation Measures during Operation

1.9.2.1 Buffer zones

The vegetation-free buffer zones around the identified 38 turbines should be managed and maintained during the operational life of the development.

1.9.2.2 Changes to cut-in speeds

Due to mitigation by design, as each turbine is to be sited a suitable separation distance to hedgerows and/or trees or such vegetation is to be removed to ensure a vegetation-free buffer zone, no operational curtailment of any turbine as a mitigation measure is required however, should any turbine be relocated so that its blade tip is less than 50m from any hedgerow or treeline, the recommended mitigation measure is to increase the turbine's cut-in speed during the active bat period from April to September, inclusive. Increasing the cut-in speed to 5.5m/s from 30 minutes prior to dusk to 30 minutes after dawn has been shown to protect bats (Arnett *et al.* 2010). This measure should be actioned during optimal bat hunting conditions when wind speeds are less than 5.5m/s and air temperature is greater than 7^{o}C as measured onsite.

1.9.2.3 Bat fatality monitoring

As no research currently exists on bats and wind farms in Ireland, the planned development could provide an opportunity to gain baseline data on bat/turbine interaction and it is recommended that the scheme be monitored for bat fatalities for the first three years of operation. A comprehensive onsite avian fatality monitoring programme is to be undertaken following published best practice. This fatality monitoring programme should be extended and duplicated for bat fauna. The primary components of the bird mortality programme are outlined below and an assessment of bat mortality would essentially follow the same methodology.

a. Carcass removal trials to establish levels of predator removal of possible fatalities. This should be done following best recommended practice and with due cognisance of published effects such as predator swamping, whereby excessive placement of carcasses increases predator presence and consequently skews results. No turbines which are used for carcass removal trials should be used for subsequent fatality monitoring.

b. Turbine searches for fatalities should be undertaken following best practice in terms of search area (minimum radius hub height) and at intervals selected to effectively sample fatality rates as determined by carcass removal trials in (a) above.

c. The large scale and clustered nature of the proposed wind farm provides an opportunity for a standardised approach with a possible control group of one cluster and/or variation in search techniques such as straight line transects/randomly selected spiral transects/dog searches as a means of robustly estimating the post construction impact in terms of fatality.

d. Recorded fatalities should be calibrated against known predator removal rates to provide an estimate of overall fatality rates.

1.9.2.4 Monitoring of mitigation measures

The success of the implemented mitigation measures for bats on the project should be monitored for a period of three years after construction and appropriate measures taken to enhance these if and where required. A recommended schedule for such monitoring is given in Table 16 over.

Table 16: Monitoring schedule recommended for bat mitigation measures

Mitigation measure	Monitoring required	Description	Duration
Newly planted hedgerows and treelines	Ensure viable growth of planting	Planted material shall be checked periodically over the growing season to remove dead material. Any dead material shall be replaced within the same season with viable stock according to age/height restrictions already specified in mitigation.	From time of planting to 1 year post construction
Bat boxes and tubes	Monitor bat use	Bat boxes and tubes shall be examined by a licensed bat specialist following or pursuant to NPWS guidance. Records should be submitted to *Bat Conservation Ireland* for inclusion in their bat distribution database. Re-site if necessary. Annual cleaning required if well used by bats or if used by birds. Replacement if damaged/lost.	From mounting to 3 years post construction.
Mortality study	Fatality monitoring	Corpse searches beneath turbines to assess the impact of operation on bats.	From initial operation to three years post commissioning.

1.9.3 Mitigation Measures during Decommissioning

Mitigation measures implemented during decommissioning should be the same as those recommended for implementation during construction.

1.10 Residual Impacts

Some of the planned turbines are to be located within or close to existing vegetation but providing a vegetation-free buffer zone around these turbines or increasing cut-in speeds should reduce the risk of collision and/or barotrauma to foraging and/or commuting species such as pipistrelles.

The adjudged worst case scenario is that, during operation, the turbines may possibly cause injury or death to a few individual specimens of Leisler's bat as it is a high flying species (10m to 70m+). However, the amount of time spent hunting at the upper height limit cannot be assessed accurately due to the maximum distance (60m to 80m) of detection of this species by ultrasound detectors (Rodrigues *et al.* 2008) but most activity and time can be expected to occur in the mid-region of the species hunting altitude i.e. 40m. The resulting impact of the proposed development on local bat populations, with implemented mitigation measures, is considered to be minor negative with the favourable conservation status (FCS) of bat species being unaffected and all species confirmed or expected on or near the study areas are anticipated to persist.

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2 APPENDICES

2.1 Appendix 1: Bat Ecology

Introduction

The bat is the only mammal that is capable of true flight using modified hands and arms which are covered by a supple membrane of skin. This ability has allowed bats to exploit aerial insect prey and avoid predation. As the largest mammalian group after the rodents (to which they are not related), bats are very successful and have diversified into over 1,200 species worldwide, representing almost a quarter of all mammal species. Within such diversification, they have evolved a range of hunting strategies, means of reproduction, roosting behaviours and social interactions (Kunz 1982). They are found throughout the world and in every continent apart from Antarctica.

Bats are classified within the Order Chiroptera (meaning 'Hand-wing') and this is further divided into two Superfamilies: the Megachiroptera and Microchiroptera. The former are mainly fruit-eaters while the latter are predominantly insectivorous. Of these, 52 bat species are currently known in Europe.

Irish bat species

In Ireland, nine species of bat are currently known to be resident while others may yet be confirmed. These are classified into two Families: the Rhinolophidae (Horseshoe bats) and the Vespertilionidae (Common bats). The lesser horseshoe bat *Rhinolophus hipposideros* is the only representative of the former Family in Ireland. All the other Irish bat species are of the latter Family and these include three pipistrelle species: common *Pipistrellus*, soprano *P. pygmaeus* and Nathusius' *P. nathusii*, four *Myotids*: Natterer's *Myotis nattereri*, Daubenton's *M. daubentonii*, whiskered *M. mystacinus*, Brandt's *M. brandtii*, the brown long-eared *Plecotus auritus* and Leisler's *Nyctalus leisleri* bats.

Individual species accounts with distribution maps of bats recorded or expected to occur onsite are given in Appendix 2 below.

Hunting with sound

The microbats are unique as they use a type of sonar, called echolocation, by which they hunt their prey. This is a stream of sound produced at high frequencies which allows the animal to build-up a complete 'sound picture' of their surroundings. These sounds are produced well beyond the range of human hearing. Using these sounds, the bats are able to detect the clutter of nearby leaves, hear an insect, know how fast it is travelling, how fast its wings are beating, whether it is hard or soft bodied etc. before closing in for the catch. Although bats use this method to find their way around, they also use their eyes to see in low light levels.

All the European bat species feed exclusively on insects and/or spiders and a pipistrelle, weighing only 4 to 8 grams, will eat up to 3,500 insects every night. This allows the bat to increase its body weight by 50% each night but this is immediately burned off through calorie consumption while flying. Such feeding ensures a build-up of fat in the form of brown adipose tissue between the shoulder blades of the bat which acts as a winter fuel store to keep the animal alive while in hibernation.

Roosting behaviour

Bats naturally roost in caves and trees but some species have recently adapted to using man-made structures for roosting. Being social animals, these roosts can reach substantial numbers in the peak period of bat activity in mid-summer and especially if the roost has been selected as a maternity site. These nursery roosts are mainly composed of breeding females but often they include some non-breeding females and males that may be the previous season's young still with their mother. Males are more solitary and form smaller roosts apart from the females.

For summer roosts, bats seek warm temperatures but, for hibernation in winter, they require constant temperatures of only 5° or 6°C and humid surroundings to keep from dehydrating. In mild winters, bats will emerge from such sites to hunt should insects be on the wing.

Breeding and longevity
In autumn, male bats attract females by song flights and form harems with up to 20 females being defended by a male. After mating, the males take no further part in the rearing of the young.

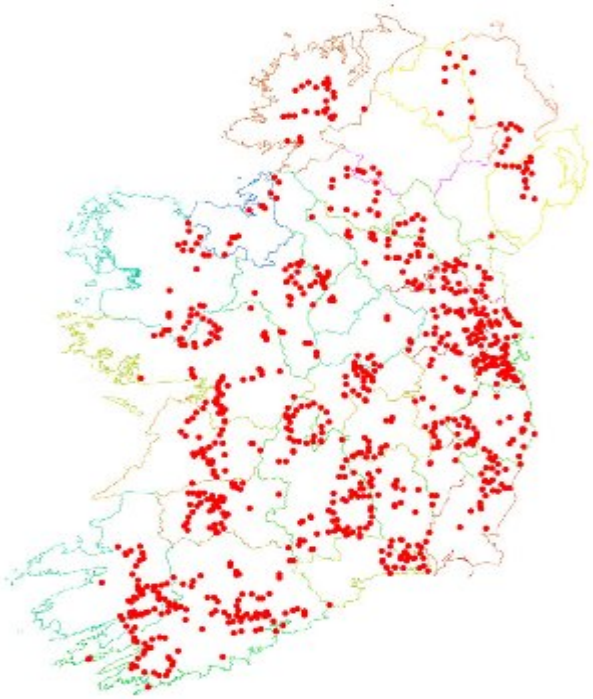
Irish bats can produce one young per year but, more usually, only one young is born in spring every two years (Boyd and Stebbings 1989). There is no fixed pregnancy period and gestation is governed by ambient temperature. The slow rate of reproduction by bats inhibits repopulation in areas of rapid decline. Although bats have been known to live for twenty or more years, this is rare as most die in their first and the average lifespan, in the wild, is four years. The survival of the young is closely linked to climate and poor weather in spring and summer can result in high infant mortality.

Threats
All bat species are in decline as they face many threats to their highly developed and specialised lifestyles. Many bats succumb to poisons used as woodworm treatments within their roosting sites (Racey and Swift 1986). Agricultural intensification, with the loss of hedgerows, treelines, woodlands and species-rich grasslands have impacted bat species also. Habitual roosting or hibernation sites in caves, mines, trees and disused buildings are also often lost to development. Summer roosts are prone to disturbance from vandals. Agricultural pesticides accumulate in their prey, reaching lethal doses (Jefferies 1972). Chemical treatments in cattle production sterilise dung thus ensuring that no insects can breed within it to be fed upon by bats. Likewise, river pollution, from agricultural runoff, reduces the abundance of aquatic insects. Road building, with the resultant loss of foraging and roosting sites is a significant cause in the reduction of bat populations across Europe.

Extinction
As recently as 1992, the greater mouse-eared bat *Myotis* became the first mammal to become extinct in Britain since the wolf in the 18th century.

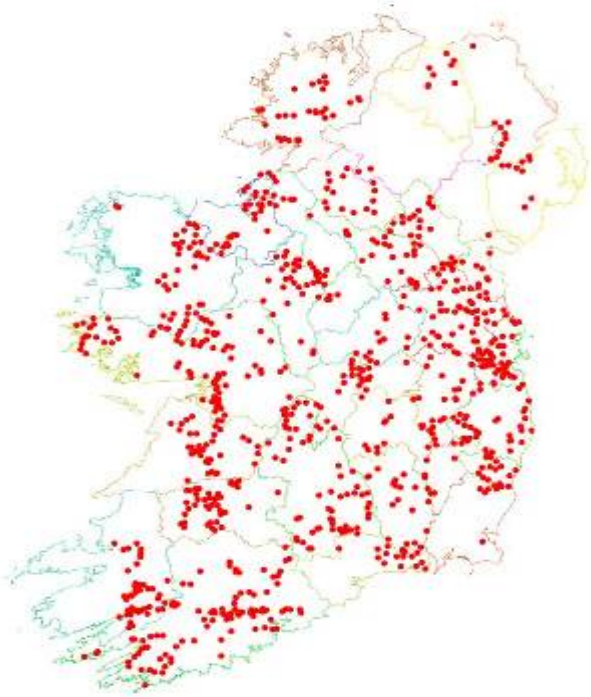
2.2 Appendix 2: Description of the Irish bat species

Brief species accounts and current known distribution (maps from *Bat Conservation Ireland*)



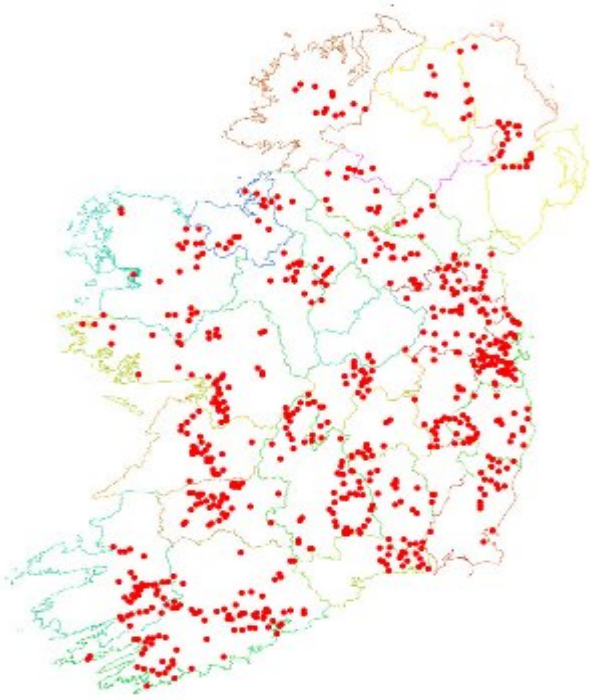
Common pipistrelle *Pipistrellus*

This species was only recently separated from its sibling, the soprano or brown pipistrelle *Pipistrellus pygmaeus*, which is detailed below (Barratt *et al.* 1997). The common pipistrelle's echolocation calls peak at 45 kHz. The species forages along linear landscape features such as hedgerows and treelines as well as within woodland.



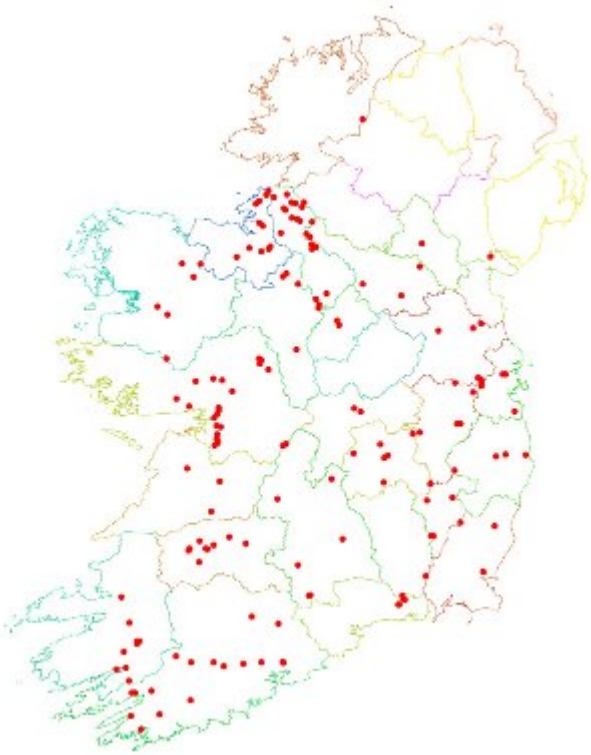
Soprano pipistrelle *Pipistrellus pygmaeus*

The soprano pipistrelle's echolocation calls peak at 55 kHz, which distinguishes it readily from the common pipistrelle. The pipistrelles are the smallest and most often seen of our bats, flying at head height and taking small prey such as midges and small moths. Summer roost sites are usually in buildings but tree holes and heavy ivy are also used. Roost numbers can exceed 1500 animals in mid-summer.



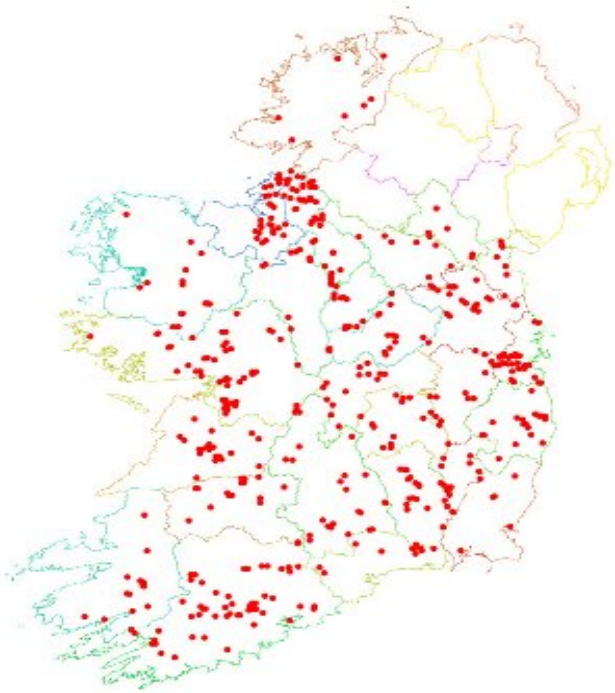
Leisler's bat *Nyctalus leisleri*

This species is Ireland's largest bat, with a wingspan of up to 320mm; it is also the third most common bat, preferring to roost in buildings, although it is sometimes found in trees and bat boxes. It is the earliest bat to emerge in the evening, flying fast and high with occasional steep dives to ground level, feeding on moths, caddis-flies, and beetles. The echolocation calls are sometimes audible to the human ear being around 15 kHz at their lowest. The audible chatter from their roost on hot summer days is sometimes an aid to location. This species is uncommon in Europe and Ireland holds the largest national population. The species is considered as *Internationally Important*.



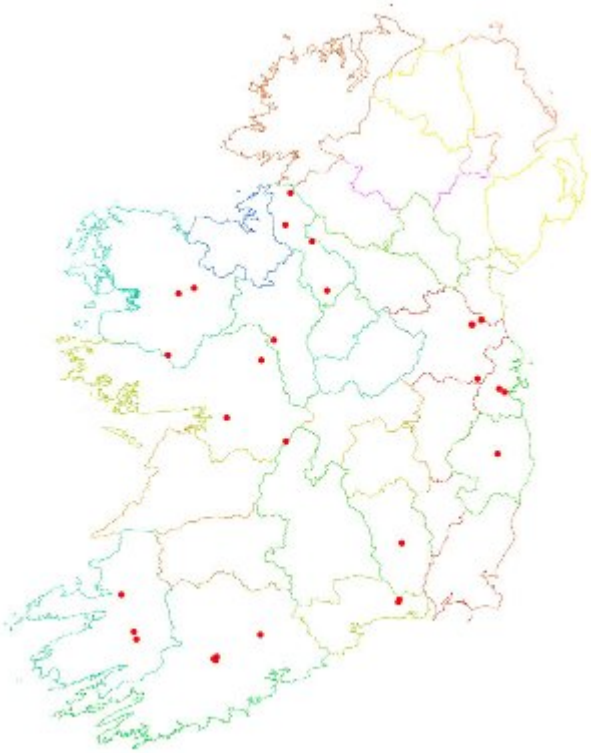
Natterer's bat *Myotis nattereri*

This species has a slow to medium flight, usually over trees but sometimes over water. They follow hedges and treelines to their feeding sites, consuming flies, moths and caddis-flies. Natterer's bats are frequently recorded in hibernation sites in winter but there are few records of summer roosts. Those that are known are usually in old stone buildings but they have been found in trees and bat boxes. The status of the Natterer's bat has not been determined but it is classed as *Threatened* and is listed in the *Irish Red Data Book* (Whilde 1993).



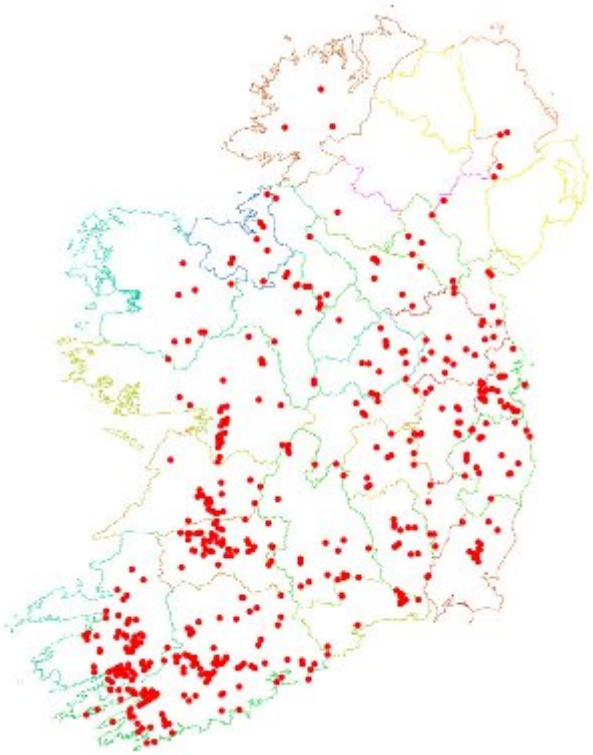
Daubenton's bat *Myotis daubentonii*

This bat species feeds close to the surface of water, either over rivers, canals, ponds, lakes or reservoirs, but can also be found foraging in woodlands. Flying at 15 kilometres per hour, it gaffs insects with its over-sized feet as they emerge from the surface of the water - feeding on caddis flies, moths, mosquitoes, midges etc. It is often found roosting beneath bridges or in tunnels and also makes use of hollows in trees.



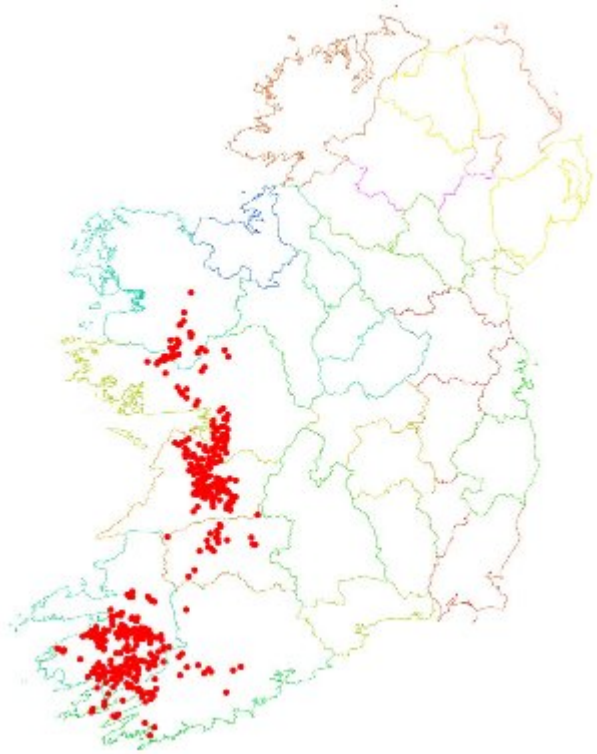
Whiskered bat *Myotis mystacinus*

This species, although widely distributed, has been rarely recorded in Ireland. It is often found in woodland, frequently near water. Flying high, near the canopy, it maintains a steady beat and sometimes glides as it hunts. It also gleans spiders from the foliage of trees. Whiskered bats prefer to roost in buildings, under slates, lead flashing or exposed beneath the ridge beam within attics. However, they also use cracks and holes in trees and sometimes bat boxes. The status of the species has not been determined but it is classed as *Threatened* and is listed in the *Irish Red Data Book* (Whilde 1993).



Brown long-eared bat *Plecotus auritus*

This species of bat is a 'gleaner', hunting amongst the foliage of trees and shrubs, and hovering briefly to pick a moth or spider off a leaf, which it then takes to a sheltered perch to consume. They often land on the ground to capture their prey. Using its nose to emit its echolocation, the long-eared bat 'whispers' its calls so that the insects, upon which it preys, cannot hear its approach (and hence, it needs oversize ears to hear the returning echoes). As this is a whispering species, it is extremely difficult to monitor in the field as it is seldom heard on a bat detector. Furthermore, keeping within the foliage, as it does, it is easily overlooked.

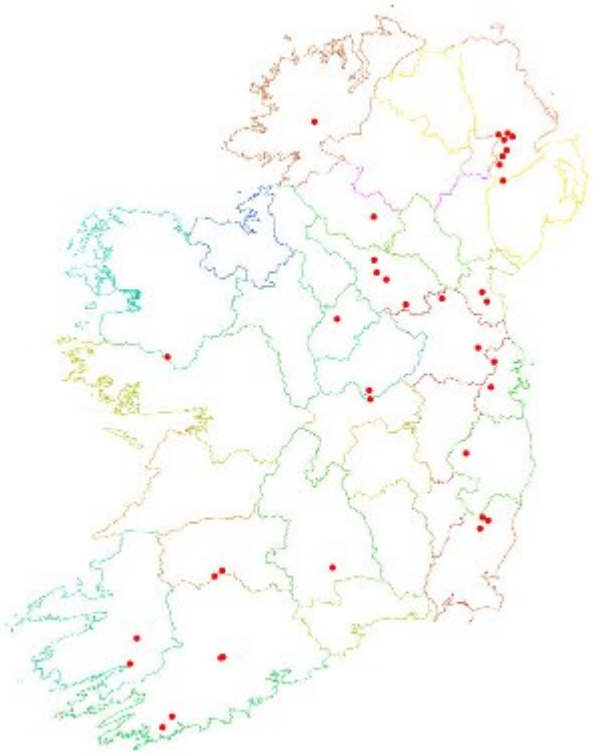


Lesser horseshoe bat *Rhinolophus hipposideros*

This species is the only representative of the Rhinolophidae family in Ireland. It differs from our other species in both habits and looks, having a unique nose leaf with which it projects its echolocation calls. It is also quite small and, at rest, wraps its wings around its body. Lesser horseshoe bats feed close to the ground, gleaning their prey from branches and stones. They often carry their prey to a perch to consume, leaving the remains beneath as an indication of their presence. The echolocation call of this species is of constant frequency and, on a bat detector, sounds like a melodious warble. Its distribution is restricted to the western Atlantic seaboard counties of Mayo, Galway, Clare, Limerick, Kerry and Cork (Kelleher 2004). However, single specimens have recently been discovered in Lough Key, near Boyle, Co. Roscommon in 2004 (B. Keeley, pers. comm.) and in Tubbercurry, Co. Sligo in 2008 (Kelleher, pers. obs.), two counties where their low numbers may have caused their presence to be overlooked in the past. This species is considered as *Internationally Important* and it is an Annex II species under the *EC Habitats Directive 1992*.

Nathusius' pipistrelle *Pipistrellus nathusii*

Nathusius' pipistrelle is a recent addition to the Irish fauna and, so far, has mainly been recorded from the north of the island in Cos. Antrim, Down and Longford (Richardson 2000) but is assumed to be spreading as single specimens have been recorded in Kerry and Cork (Kelleher 2006a) and elsewhere and the known resident population is enhanced in the autumn months by an influx of animals from Scandinavian countries. There is a likelihood, therefore, that this species may occur in the area as a vagrant especially in the autumn months. The status of the species has not been determined.



Brandt's bat *Myotis brandtii* (No map)

This sibling species to the whiskered bat is known from four specimens found to date in Cos. Wicklow (Mullen 2007), Cavan, Clare (B. Keeley, pers. comm.) and Tipperary (Kelleher 2006b). A fifth specimen was identified in Killarney National Park, Co. Kerry in August 2005 (Kelleher 2005 and 2006a). Its status is unknown.

2.3 Appendix 3: Legislation relating to bats

All Irish bat species are protected under the Wildlife Act (1976) and Wildlife Amendment Acts (2000 and 2010). 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. All Irish bats are listed in Annex IV of the Habitats Directive and the lesser horseshoe bat *Rhinolophus hipposideros* is further listed under Annex II. 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.

Also, under existing legislation, the destruction, alteration or evacuation of a known bat roost is a notifiable action and a derogation licence has to be obtained from the *National Parks and Wildlife Service* before works can commence.

The current status and legal protection of the known bat species occurring in Ireland is given in the table below.

Common and scientific name	Wildlife Act 1976 & Wildlife (Amendment) Acts 2000 & 2010	Irish Red List status	Habitats Directive	Bern & Bonn Conventions
Common pipistrelle *Pipistrellus*	Yes	Least Concern	Annex IV	Appendix II
Soprano pipistrelle *P. pygmaeus*	Yes	Least Concern	Annex IV	Appendix II
Nathusius' pipistrelle *P. nathusii*	Yes	Not referenced	Annex IV	Appendix II
Leisler's bat *Nyctalus leisleri*	Yes	Near Threatened	Annex IV	Appendix II
Brown long-eared bat *Plecotus auritus*	Yes	Least Concern	Annex IV	Appendix II
Lesser horseshoe bat *Rhinolophus hipposideros*	Yes	Least Concern	Annex II Annex IV	Appendix II
Daubenton's bat *Myotis daubentonii*	Yes	Least Concern	Annex IV	Appendix II
Natterer's bat *M. nattereri*	Yes	Least Concern	Annex IV	Appendix II
Whiskered bat *M. mystacinus*	Yes	Least Concern	Annex IV	Appendix II
Brandt's bat *M. brandtii*	Yes	Data Deficient	Annex IV	Appendix II

It should also be noted that any works interfering with bats and especially their roosts, including for instance, the installation of lighting in the vicinity of the latter, may only be carried out under a licence to derogate from Regulation 23 of the Habitats Regulations 1997 and Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011 (which transposed the EU Habitats Directive into Irish law), issued by NPWS. The details with regards to appropriate assessments, the strict parameters within which derogation licences may be issued and the procedures by which and the order in relation to the planning and development regulations such licences should be obtained, are set out in Circular Letter NPWS 2/07 "*Guidance on Compliance with Regulation 23 of the Habitats Regulations 1997 - strict protection of certain species/applications for derogation licences*" issued on behalf of the Minister of the Environment, Heritage and Local Government on the 16th of May 2007 – reproduced in Appendix 4.

Furthermore, on 21st September 2011, the Irish Government published the European Communities (Birds and Natural Habitats) Regulations 2011 which include the protection of the Irish bat fauna and further outline derogation licensing requirements re: European Protected Species.

2.4 Appendix 4: NPWS Circular Letter 2/07

AN ROINN COMHSHAOIL, OIDHREACHTA AGUS RIALTAIS ÁITIÚIL
DEPARTMENT OF THE ENVIRONMENT, HERITAGE AND LOCAL GOVERNMENT

AN ROINN COMHSHAOIL,
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Circular Letter NPWS 2/07

16 May, 2007

Guidance on Compliance with Regulation 23 of the Habitats Regulations 1997 – strict protection of certain species/ applications for derogation licences.

A chara,

I am directed by the Minister for the Environment, Heritage and Local Government to refer to the EU Habitats Directive, to the Habitats Regulations 1997-2005 which transpose that directive into Irish law,[1] and to Ireland's obligations under that Directive.

The Directive, and the implementing Regulations, require that certain species listed in Annex IV of the Habitats Directive are strictly protected. A list of these species is appended.

These species are not necessarily associated with areas subject to a specific nature designation: in the case of bat species and otters they may be found anywhere throughout the country.

Under Regulation 23 of the Habitats Regulations 1997, any person who, in regard to the animal species listed in Annex IV of the Habitats Directive-

"(a) deliberately captures or kills any specimen of these species in the wild,
(b) deliberately disturbs these species particularly during the period of breeding, rearing, hibernation and migration,
(c) deliberately takes or destroys the eggs from the wild, or
(d) damages or destroys a breeding site or resting place of such an animal,

shall be guilty of an offence."

[1] Council Directive 92/43/EEC of 21 May 1992, on the conservation of natural habitats and of wild flora and fauna, the European Communities (Natural Habitats) Regulations, 1997 (S.I. No. 94 of 1997), the European Communities (Natural Habitats) (Amendment) Regulations, 1998, (S.I. No. 233 of 1998), and the European Communities (Natural Habitats) (Amendment) Regulations, 2005, (S.I. No. 378 of 2005),

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Regulation 21 provides corresponding protection for Annex IV plant species.

The carrying out of any work that has the potential to disturb these species, and for which a derogation licence has not been granted, may constitute an offence under Regulation 21 or 23 of the Habitats Regulations.

It should be noted that in the case of Regulation 23 (d), it is not necessary that the action should be deliberate for an offence to occur. This places an onus of due diligence on anyone proposing to carry out an action or project that might result in such damage or destruction.

A particular concern arises regarding works carried out by or on behalf of local authorities themselves, including works of maintenance or repair.

Examples of cases that are likely to require assessment are the removal of trees and other habitat during the construction of roads or other infrastructure, the modification of the courses of rivers, drainage and discharge of water, and even the re-pointing or replacement of masonry in bridges, walls and other structures where bats are likely to roost, etc.

Procedure to be followed
Local authorities must ensure that they, their staff and their agents comply fully with the requirements of the Directive and the Regulations as follows:

1. In advance of any works, an appropriate initial assessment should be carried out by a person competent to identify where a risk of damage or disturbance to an Annex IV species may exist (e.g. by an appropriately qualified ecologist). The fact that such an assessment has been carried out should be recorded and kept with the papers associated with the project.

2. Projects where a risk is identified should be subject to an appropriate scientific assessment. It will be necessary to identify alternatives or modifications that will avoid that risk.

3. Where it is not possible to identify a means of avoiding the risk completely, the question of seeking a derogation licence from the Minister under Regulation 23 of the Habitats Regulations should be considered if it is desired, notwithstanding, to proceed with the action or project.

4. The Minister is empowered, within strict parameters, to grant a license for derogation from complying with the requirements of the provisions of section 21 of the Wildlife Act 1976 and Regulations 23 and 24 of the Habitats Regulations. The scope of the Minister's powers to grant derogation licences is set out in Regulation 23, as follows:

Where there is no satisfactory alternative and the derogation is not detrimental to the maintenance of the populations of the species to which the Habitats Directive relates at a favourable conservation status in their natural range, the Minister may, in respect of those species, grant a licence to one or more persons permitting a

derogation from complying with the requirements of the provisions of section 21 of the Principal Act and Regulations 23 and 24 where it is—

(a) in the interests of protecting wild fauna and flora and conserving natural habitats, or

(b) to prevent serious damage, in particular to crops, livestock, forests, fisheries and water and other types of property, or

(c) in the interests of public health and public safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature and beneficial consequences of primary importance for the environment, or

(d) for the purpose of research and education, of repopulating and re-introducing these species and for the breeding operations necessary for these purposes, including the artificial propagation of plants,

(e) to allow, under strictly supervised conditions, on a selective basis and to a limited extent, the taking or keeping of certain specimens of the species to the extent (if any) specified therein, which are set out in the First Schedule.

6. Any application for a derogation licence (to be submitted to Mr Jamie Mulleady of this Department at: Species and Regulations Unit, National Parks and Wildlife Service, 7 Ely Place, Dublin 2 email: Jamie.mulleady@environ.ie) should address the criteria referred to in the above paragraph as well as proposed scientifically-based mitigation measures to address any potential impact on the identified Annex IV species. A decision on an application will be made on the basis of the information and proposals submitted and best scientific knowledge.

7. An application for such a derogation licence should be made in advance of seeking approval under Part 8 or 10 of the Planning and Development Regulations, 2001, as amended, or seeking planning permission for works. This will ensure that full consideration can be given to the impacts of the proposed project on the species and to avoid the possibility of delay to the proposed project or of a refusal of a derogation licence which would prevent the works being carried out as planned.

8. The obligation to obtain a derogation licence is additional to the requirement to notify the Minister of a proposed development which may have an impact on nature conservation to the Minister under article 82(3)(n) and others of the Planning and Development Regulations, 2001 (as amended). Local authorities should notify the Minister (Development Applications Unit) in any case where it appears that a proposed development may pose a risk to Annex IV species.

9. Should a problem be identified regarding Annex IV species in the course of works, this should be reported immediately to the National Parks and Wildlife Service. No further work that might impact on such species should take place unless a derogation licence has been obtained.

Applications for planning permission
Issues concerning damage or disturbance to Annex IV species also arise in the context of applications for planning permission for proposed development, e.g. proposals to renovate older houses. The responsibility of avoiding disturbance or damage to Annex IV species, or of obtaining an appropriate derogation licence, rests with the developer.

However, planning authorities should note that in any case where it appears that a proposal may pose a risk to Annex IV species, the planning application should be referred to the Minister under article 27(1)(n) of the Planning and Development Regulations 2001 (as amended). This referral should be done in the appropriate manner for applications having impacts on nature conservation sites. Planning authorities could also take the opportunity afforded by any pre-application discussions to alert prospective applicants to the requirements in relation to Annex IV species.

Further information
Species Action Plans, which set out specific measures for the monitoring and protection of these species, have been or are being prepared. They are published on www.npsw.ie or can be obtained from Species Unit (Tel: 01 888 3212). Guidelines in regard to bats are available at www.npsw.ie.

General questions in relation to the protection of Annex IV species or require any further information on an application for a derogation licence should be referred to Species Unit (01 8883214). Specific queries regarding a proposed project, location or species should be referred to the appropriate National Parks and Wildlife Service Divisional Ecologist or to the Regional Manager (contact details http://www.npws.ie/media/Media,4976,en.pdf).

If you have any questions in relation to the referral of a planning application, please contact Development Applications Unit (Tel: 01 8883181)

Is mise le meas,

Peter Carvill,
Assistant Principal Officer.

To: all County and City Managers, Directors of Services for Planning, Town Clerks