

## 6 ECOLOGY

### 6.1 INTRODUCTION

This chapter describes the findings of the ecological assessment of the proposed Spicer Hill Wind Farm ('the Development'). Potential ecological effects are considered, including habitats, flora, protected mammals, reptiles and amphibians. Potential effects on bird ecology are considered in Chapter 7: Ornithology. Information pertaining to badgers is contained within a Confidential Annex.

Arcus Renewable Energy Consulting Ltd (Arcus) was commissioned to carry out baseline field surveys and the assessment of potential effects of the proposed development on ecological interests.

This chapter includes the following sections:

- Consultation – Summary of consultation undertaken;
- Assessment Methodology – a description of the methods used in the baseline surveys and assessment of the significance of effects;
- Baseline Description – a description of the ecology of the site based on the results of desk study, consultations and surveys;
- Information Gaps – a summary of uncertainties encountered in the assessment;
- Assessment of Potential Effects – a consideration of the ways in which the proposed development may affect the ecology of the site;
- Mitigation – a discussion of appropriate mitigation recommended to off-set identified potential effects, this section also identifies any monitoring requirements;
- Residual Effects – an assessment of the significance of the effects of the proposed development after mitigation has been implemented; and
- Statement of Significance – a summary of the findings of the assessment with reference to the obligation to identify any significant effects set out in regulations.

### 6.2 CONSULTATION

A scoping exercise was undertaken in August 2007. Consultees were provided with specific details of the proposed assessment methodology and data from a variety of sources was collated through a desk study ecological record search. A list of consultees and relevant responses are given in Table 6.1.

**Table 6.1: Summary of Ecology Consultee Responses**

Consultee	Summary
Natural England	The application should make reference to the latest policy guidance <i>i.e.</i> PPS 9. Recommends that the EIA should consider opportunities for increasing biodiversity both within the site and the surrounding countryside, with particular reference to contributing to repairing the fragmentation of heathland in the area.
Environment Agency (EA)	Consider that the scoping document addresses the issues appropriately
Barnsley Metropolitan Borough Council (BMBC)	Records of locally designated sites requested
West Yorkshire Ecology	A data search was conducted covering the southern part of the site boundary and surrounding area, results of which consisted of: Protected mammals; Known bat roosts; Full details can be found in the Technical Appendix.
South Yorkshire Bat Group	All records from within 5km of the site.

Consultee	Summary
South Yorkshire Badger Group	All records from site boundary and surrounding 500m.
County Bird Recorder	Records of statutorily protected and designated breeding and wintering/passage birds.
Local Herpetofauna Recorder	Limited records from surrounding area, noted the only local records are of toads in the local reservoir.

### 6.3 LEGISLATION AND GUIDANCE

The ecological baseline surveys and assessment have been carried out with reference to the following legislation and guidance documents

- Council Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Flora and Fauna;
- The Conservation (Natural Habitats &c) Regulations 1994;
- The Wildlife and Countryside Act 1981;
- The Protection of Badgers Act 1992;
- Planning Policy Statement 9: Biodiversity and Geological Conservation;
- Bat Conservation Trust Bat Surveys Good Practice Guidelines 2007<sup>1</sup>;
- Wind Turbines and Bats: guidelines for the planning process and impact assessments 2006;<sup>2</sup>
- Guidelines for Ecological Impact Assessment in the United Kingdom 2006; and<sup>3</sup>
- Handbook of Biodiversity Methods 2005<sup>4</sup>.

One of the key best practice measures to emerge from the guidance documents referred to is the need for wide consultation. Such consultation is summarised above.

### 6.4 METHODOLOGY

#### 6.4.1 Field Survey Methods

Baseline surveys were carried out by Arcus between May 2007 and March 2008 to collect quantitative data and allow the effects of the Development to be assessed.

Full details of the dates, timing and methodology of each survey are provided in ES Volume 3: *Ecology* Technical Appendix.

#### 6.4.2 Phase 1 Habitat Survey

A Phase 1 Habitat Survey was conducted, using the standard methods outlined in the *Handbook for Phase 1 Habitat Survey* published by the Nature Conservancy Council (1990)<sup>5</sup>, to identify habitat areas of ecological importance. Four visits were made, between August and October 2007 and any significant observations during other ecological surveys undertaken between November 2007 and March 2008 were also included.

<sup>1</sup> Parsons, K., Crompton, R., Graves, R., Markham, S., Matthews, S., Oxford, M., Shepherd, P., Sowler, S. 2007. Bat Surveys: Good Practice Guidelines. BCT, London.

<sup>2</sup> Rodrigues, L., Bach, L., Biraschi, L., Dubourg-Savage, M., Goodwin J., Harsbuch, C., Hutson, A., Ivanova T., Lutsar, L., Parsons, K. 2006 "Wind Turbines and Bats: guidelines for the planning process and impact assessments" Version 1.0 Doc.EUROBATS.MoP5.12.Rev.3.Annex1 available from [www.bats.org.uk](http://www.bats.org.uk)

<sup>3</sup> IEEM. 2006. Guidelines for Ecological Impact Assessment in the United Kingdom. IEEM, available from [www.ieem.org.uk](http://www.ieem.org.uk)

<sup>4</sup> Hill, D., Fasham, M., Tucker, G., Shewry, M., Shaw, P. 2005. Handbook of Biodiversity Methods. Cambridge University Press, Cambridge.

<sup>5</sup> Joint Nature Conservancy Council. 1990. Handbook for Phase 1 habitat survey: a technique for environmental audit. Joint Nature Conservancy Council

### **6.4.3 Mammals**

#### **6.4.3.1 Badger**

A survey to determine the presence of badgers was conducted within a 500 m buffer of the turbine envelope. Two visits were made on 15<sup>th</sup> October and 6<sup>th</sup> November 2007, and the area was examined for any signs of badger activity following standard methodology. The survey also involved checking records of setts received during the desk study. Any evidence of badgers recorded during other ecological survey visits for other features was also included.

#### **6.4.3.2 Water Vole**

A survey to determine the presence of water voles was conducted within the turbine envelope. All watercourses were searched for field signs.

#### **6.4.3.3 Otter**

A survey to determine the presence of otters was conducted within the turbine envelope. All watercourses were searched for field signs.

#### **6.4.3.4 Bats**

A single preliminary visit was made on 12<sup>th</sup> to 13<sup>th</sup> September 2007 to determine the scope of survey that would be necessary at this site, based upon the level of bat activity observed. This consisted of consecutive dusk and dawn activity transect surveys, following a predetermined route incorporating 12 listening stops, and was designed with reference to Bat Conservation Trust (BCT) good practice guidelines. Bat echolocation calls were recorded using a frequency division bat detector (Batbox Duet) and digital recorder (EDIROL R-09). Structures and trees were also assessed as to their suitability as bat roosts during daylight.

### **6.4.4 Reptiles**

Habitat within the site boundary was assessed as to its suitability to support reptile populations.

### **6.4.5 Amphibians**

#### **6.4.5.1 Great Crested Newt**

Habitat within 500 m of the turbine envelope was assessed as to its suitability to support great crested newt populations.

### **6.4.6 Assessment of Significance**

The approach taken to the assessment of ecological impacts follows the guidance produced by the Institute of Ecology and Environmental Management (IEEM 2006)<sup>6</sup>. These guidelines set out the process for assessment through the following stages:

- Identification of Valued Ecological Receptors (VER's) (the baseline ecological conditions);
- Predicting and characterising ecological impacts on these resources according to the criteria identified in the guidance (these include for example the magnitude of the effect, duration, nature, and confidence in predictions);
- Assessment of whether impacts are ecologically significant; and
- Identification of any monitoring requirements.

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<sup>6</sup> Institute of Ecology and Environmental Management 2006 "Guidelines for Ecological Impact Assessment in the United Kingdom" IEEM, Winchester

In attributing a value to a receptor, a simple scale of international-national-regional-local is used, as described in Table 6.2. For designated sites this is usually straightforward as most designations imply a level of value, for example SSSIs are designated on a national basis, whereas RAMSAR wetlands are designated at an international level and so imply international value. Guidance for valuing non-designated features and populations is available in publications such as [JNCC 1989 et seq<sup>7</sup>], and these are referenced where appropriate.

**TABLE 6.2: Approach to Valuing Ecological Receptors**

Value Level	Examples
International	An internationally designated site, candidate site, or an area meeting the criteria for an international designation. Large areas of priority habitat listed under Annex I of the Habitats Directive, and smaller areas of such a habitat that are essential to maintain the viability of that ecological resource. A regularly occurring, nationally significant population of any internationally important species.
National	A nationally designated site or area, meeting criteria for national level designations. Significant extents of a priority habitat identified in the UK BAP, or smaller areas which are essential to maintain the viability of that ecological resource.
Regional	Viable areas of key semi-natural habitat identified in the Local BAP (LBAP). A regularly occurring, locally significant population of a species listed as being nationally scarce or in the LBAP. Sites which exceed the local authority-level designations but fall short of SSSI selection guidelines, including areas of semi-natural woodland exceeding 0.25ha.
Local	Areas of semi-natural ancient woodland smaller than 0.25ha. Sites of Importance for Nature Conservation or equivalent sites selected on local authority criteria. Local Nature Reserves. Areas of habitat or species considered to appreciably enrich the ecological resource within the local context <i>e.g.</i> species-rich flushes or hedgerows.

Assessment of the magnitude of effects is quantitative where possible. Effects may be negative, neutral or positive in nature, regarding their effect on VER's and local ecological interests as a whole.

The 2006 IEEM guidelines use only two categories: "significant" or "not significant". In assessing whether an impact is significant, the concept of "ecological integrity" is a guiding principle. This concept can be applied both to designated sites (for example a SSSI) and to defined populations (for example a local red squirrel population). This concept underpins much of the European legislation in relation to nature conservation.

## 6.5 Baseline Description

This section describes the flora and fauna at the Development site. Full details can be found in the Ecology Technical Appendix.

### 6.5.1 Desk Study and Consultations

A summary of consultation responses is provided in Table 6.1 above.

### 6.5.2 Designated Sites

Consultation and a search of available digital datasets indicate that there are no statutory designations of European importance (*e.g.* Special Areas of Conservation (SAC)), national importance (*e.g.* Sites of Special Scientific Interest (SSSI)) or non-statutory local importance

<sup>7</sup> [JNCC 1989 et seq] Joint Nature Conservation Committee 1989 "Guidelines for the selection of Biological SSSIs" Joint Nature Conservation Committee, Peterborough

(*e.g.* Site of Importance for Nature Conservation (SINC) within the turbine envelope). Details of the closest designated sites are provided in Table 6.3, and locations of SSSIs and SINC are shown in Figure 6.1.

**Table 6.3: Designated Sites**

Designation	Distance	Name	Comments
Special Area of Conservation (SAC)	4.2 km SW	South Pennine Moors	Designated for a variety of habitats. Site includes small semi-improved patches of dry heath type habitat but is distantly separated from the SAC by a considerable distance of numerous low value habitats. <i>i.e.</i> improved grassland, arable, conifer plantation etc. No other habitats are shared between the SAC and the site.
Special Protection Area (SPA)	4.2 km SW (same boundary as SAC above)	Peak District Moors (South Pennine Moors Phase 1)	Designated for populations of: golden plover, peregrine, merlin, short-eared owl and dunlin. None of these species were recorded during any surveys and the site provides no significant breeding habitat for any of these species.
Site of Special Scientific Interest (SSSI)	3.9 km SE	Spring Meadow, Alderman's Head and Cow Croft Meadows	Designated for its species-rich, unimproved, neutral grassland. This habitat does not occur within the survey area.
Natural Heritage Site	c. 700 m W	Whitley Edge	Designated primarily for its western gorse heathland and other habitats forming a mosaic with the gorse. Parts of the survey area share these habitats but not within the development footprint.
Natural Heritage Site	c. 500 m NW	Broadstone Reservoir	This site is designated for its aquatic habitats, its mosaic of grassland/heathland and its passage and breeding bird populations. Parts of the survey area shares the constituent habitats within the mosaic but not within the development footprint. The survey area has been assessed for its breeding and passage bird populations.
Natural Heritage Site	c. 700 m E	Ingbirchworth Reservoir	This site is designated for a range of wetland and dry habitats and scarce wetland plants. The site also holds important wintering and passage bird populations. Parts of the survey area share some of the constituent habitats within this NHS but not within the development footprint. The survey area has been assessed for its breeding and passage bird populations.
Natural Heritage Site	c. 650 m E	Royd Moor Reservoir	The site is designated primarily for its standing water and inundation habitats. Great

Designation	Distance	Name	Comments
			Crested Newt has also been recorded at this site although its current status is not clear.
Parish Council Designated Nature Reserve	Immediately NE of Spicer House Lane	Ingbirchworth Nature Reserve	Dry heath dominated, isolated, small (c.1ha) site. No negative impact likely.

### 6.5.3 Habitats

The turbine envelope and surrounding area is greatly dominated by generally poor arable and improved grazing fields. All woodland within the site is plantation and found in restricted pockets. The site includes a number of streams with no high value associated features. The more valuable habitats within the site are dominated by semi-improved grasslands showing characteristics of dry heath shrub and acid grassland. Habitats recorded are shown in Figure 6.2, coded following standard classification. Detailed results of the habitat survey are presented in the Technical Appendix. The main habitats recorded are described below.

#### 6.5.3.1 Improved Grassland

The majority of the Development site consists of improved grassland, dominated by agricultural grasses such as perennial rye-grass, crested dog's tail and meadow grasses with frequent clover in the sward. Locally wetter areas have some soft-rush, and nettles and thistles are also occasionally found. This is a common and widespread habitat of limited ecological value. The most improved areas showed evidence of mechanical seeding and are considered to be equivalent to arable fields.

#### 6.5.3.2 Arable

Several fields adjacent to Spicer House Lane held crops or were ploughed and tilled during the survey. This is a common and widespread habitat of limited ecological value.

#### 6.5.3.3 Semi-improved Grassland

Sections of several fields held species-poor neutral swards dominated by perennial rye-grass and crested dog's tail (*Cynosurus cristatus*) with herbs generally limited to thistles, buttercup, dandelions, docks and other common species. Occasional clumps of rush are found throughout damper areas. In a less improved sward, primarily located in the south-east corner of the site, a more diverse flora has been retained including greater amounts of additional species such as sweet-vernal grass, sorrel and self-heal.

#### 6.5.3.4 Semi-improved Acid Grassland

The remainder of the semi-improved fields holds a slightly more diverse sward including species indicating acidic conditions. In addition to the grasses mentioned previously common bent, red and sheep's fescues and mat-grass are all present along with herbs including heath bedstraw, sheep's sorrel, harebell and tormentil. This habitat is frequently found forming a mosaic alongside the dry dwarf shrub heath habitat described below. This habitat is also found in a more species-poor form (common bent and mat-grass dominate with few herbs) beneath the long plantation bordering the stream which cuts through the proposal site near Spicer House.

#### 6.5.3.5 Dry Dwarf Shrub Heath

This habitat within the survey area is almost entirely dominated by western gorse and is located on the steeper slopes of the fields south of Whitely Road and as part of a habitat mosaic with the acid grasslands in the south-east corner of the site. Very few heather plants

were also located in the south-east corner and occasional bilberry plants were located adjacent to streams running through the site. The Ingbirchworth Nature Reserve immediately north-east of the survey area was dominated by heather with stands of bilberry and bracken.

#### *6.5.3.6 Marshy Grassland*

This habitat occurs in a few small damp areas generally at the bottom of slopes of semi-improved fields where the sward becomes dominated by rush and tufted hair-grass with other species including compact rush, marsh foxtail and forbs including marsh thistle, cuckoo flower and, rarely, sneezewort.

#### *6.5.3.7 Plantation Woodland*

The site includes a few small pockets of broad-leaved plantation dominated by sycamore, oak and beech and a stand of non-native spruce plantation immediately south of Spicer House. These plantations are small, lack connectivity to other woodlands and do not hold any significant understorey or ground flora typical of more valuable woodlands. A small block of coniferous plantation is located adjacent to Spicer House.

#### *6.5.3.8 Running Water*

Three streams run through or along the boundaries of the site. These streams were shallow or at least partially dry during the survey and emergent vegetation was limited to rush, willowherb and particularly on the stream along the southernmost boundary of the survey area, covered in a dense carpet of floating sweet-grass. No significant aquatic vegetation was recorded and no signs of protected species were found.

### **6.5.4 Mammals**

#### *6.5.4.1 Badger*

All results of the badger survey at the site, and any associated assessment and/or mitigation are included in the Confidential Annex.

#### *6.5.4.2 Water Vole*

All the streams and ditches were found to offer some potentially suitable habitat, but no signs of water vole presence were found.

#### *6.5.4.3 Otter*

Historical records indicate that otters are active at Ingbirchworth reservoir (750 m north-east, 2004). The site is connected to the reservoir by a stream/ditch although the streams within the site are considered to be sub-optimal habitat due to a lack of wooded banks and only shallow and narrow courses. The site does occur between the ponds at the clay quarry to the west of the site and the reservoir and could therefore be used as a commuting route. No evidence of otters was recorded along any of the water courses during the survey.

#### *6.5.4.4 Bats*

##### *Roosts*

Roost records were provided by the local bat group from the local area. Records included all the species likely to be found in this region including Pipistrelles, Brown long-eared, Daubenton's, Bandt's, Natterer's and Whiskered bats.

### *Foraging*

The majority of foraging activity recorded related to pipistrelle bats, with both the common and soprano pipistrelle species recorded, as well as noctule bats. Activity was also recorded by bats in the *Myotis* group. These species are very difficult to separate using spectrogram software and given the records of at least four of the five british *Myotis* species roosting in the wider region, it was not possible to identify these with confidence. Brandt's, Daubenton's, Natterer's and Whiskered bats are all in the *Myotis* group and have been recorded roosting in the surrounding area. Thus foraging activity may relate to any of these species.

#### **6.5.5 Reptiles**

The location and dominant habitat types within the site suggest that the site is unlikely to hold sizeable reptile populations. The nature of the Development and the lack of destruction to valuable habitats means that disturbance to any such populations would be minimal. No reptiles were observed on the site during any of the other ecology and ornithology surveys.

#### **6.5.6 Amphibians**

##### *6.5.6.1 Great Crested Newt*

No ponds are located within the survey area. The ponds in the adjacent clay quarry to the west and in the Ingbirchworth Nature Reserve could offer breeding habitat for this species. They are surrounded by tall rank grassland and dense dwarf shrub respectively, ideal for terrestrial habitat. The majority of the grassland within the site is grazed and very short offering considerably lower value terrestrial habitat. No records of great crested newt were received during the desk study other than historical records from Royd Moor Reservoir NHS, located over 650 m from the proposal site.

#### **6.6 Valued Ecological Receptors**

Using the baseline information detailed above, Table 6.4 details the identified VERs in the context of the Development. Reasoning for inclusion as a VER is also given, and a value assigned based upon the criteria detailed in Table 6.4.

**Table 6.4: Valued Ecological Receptors**

VER	Value	Reasons - Comments
Ingbirchworth Nature Reserve	LOCAL	Designated at a Parish level for its interest as a semi-natural dry dwarf shrub habitat. Its small size and poor connectivity to other areas of similar habitats restricts its value to local level.
Acid Grassland/Dry dwarf shrub heath Mosaic	LOCAL	The presence of western gorse scrub which is included within the designations of Natural Heritage Sites in the wider area, <i>e.g.</i> Brock Holes NHS near Penistone, and the relative lack of improvement of the sward compared to surrounding areas makes this habitat and particularly the field in the south-east corner of the site of significant value to the local area. This habitat is, however, currently used for livestock grazing and could be vulnerable to a reduction in value should current management become more intensive.
Water Vole	LOCAL	Water voles receive full protection under the Wildlife and Countryside Act, 1981. They are also the subject of a BAP and of a LBAP in BMBC. However, no signs of water vole were found despite suitable habitat. Therefore, any local population or suitable habitat is unlikely to be of national significance, and is considered to be of local value.
Otter	LOCAL	Otters are a European protected species under Annex II of the Habitats Directive. They are also the subject of a UK-wide BAP and of a LBAP in BMBC. The site does hold habitat which could be used as a commuting route. Although otters are protected at international and national levels, there is no evidence of otters were found within the development site. Therefore, if the site is used by otters, it is unlikely to support an internationally or nationally significant population, and so any otter population at Spicer Hill is considered to be of local value.
Bats	REGIONAL	All bat species are protected by European law, under Annex II of the Habitats Directive, and pipistrelle bats are the subject of a UK-wide BAP and a LBAP in Barnsley. No roosts were confirmed within the site, however the assemblage of bat species using the the site for foraging is considered to be of regional value.
Reptiles	LOCAL	All reptile species are listed on Schedule 5 of the Wildlife and Countryside Act, 1981 (although only smooth snake and sand lizard are afforded full protection) and are the subject of UKBAPs. No reptiles were recorded within the site boundary and habitats are considered to be generally poor for this group. Reptiles are therefore considered to be of local importance.
Great Crested Newt	REGIONAL	Great crested newts are a European protected species under the Habitats Directive. They are also the subject of a UK-wide BAP and a LBAP in Barnsley. Suitable breeding habitat is also protected under the Habitats Directive. Habitat is largely unsuitable at Spicer Hill and no potential breeding ponds occur within the site boundary, and so any population present is unlikely to be of international or national importance. Any population and habitat is therefore considered to be of regional value.

## 6.7 Information Gaps

BMBC does not currently have a specific ecological records centre or similar service and therefore it was not possible to undertake a generalised desk study search from such a body. However, other than the habitats mentioned above the site is dominated by species-poor and heavily managed habitats which are considered unlikely to hold important populations of any protected or otherwise designated or notable floral or faunal populations.

Access into the clay quarry area to the west of the site was not established at the time of the surveys and therefore no Great Crested Newt survey was undertaken. As mentioned previously however these ponds are located within areas of potentially high value terrestrial habitat for any local populations which does not occur in any significant amount within the site boundary. The ponds within the Ingbirchworth Nature Reserve are also surrounded by suitable terrestrial habitat. These ponds are all fairly young and do not form parts of an existing network of ponds likely to hold other populations. The Development would involve limited impact upon low value habitats for this species and no records of this species were received from the wider area during the desk study.

Bat activity has been sampled in order to inform this assessment. At the time fieldwork to sample bat activity at this site was undertaken, there was no widely accepted guidance on survey methodologies. There are also gaps in our knowledge of the effects of wind turbines on bats. This gap is being addressed at a national level through various programmes of monitoring and research.

Because mammal receptors can move around between seasons, it is best practice to re-survey for these receptors prior to construction starting.

## 6.8 Assessment of Effects

### 6.8.1 Potential Construction Effects

#### 6.8.1.1 Ingbirchworth Nature Reserve

No significant effect is predicted on Ingbirchworth Nature Reserve. This designated site lies outside the site boundary. No significant habitat links between the reserve and the proposed Development site have been identified. This study has not identified any supporting processes (such as hydrological links) provided by the Development site that are required by the reserve. For these reasons no significant effect is predicted on this receptor.

#### 6.8.1.2 Habitats

There are four main ways in which habitat receptors may be affected during the construction phase

- Direct loss – this is the most obvious ecological effect, where areas occupied by a particular habitat are reduced in order to accommodate development infrastructure, turbine bases, crane pads, access tracks, control buildings and other elements of the Development. These losses are permanent in the context of this assessment;
- Disturbance – the effects of disturbance are variable in their extent, depending on the nature of the disturbance and sensitivity of the habitat receptor. Some disturbance types (for example, creation of temporary hard standing areas at the contractor's compound) result in long-term disturbance with extended recovery periods. In other cases (for example, installation of cables at the sides of access tracks) disturbance is short-term, and certain habitat types are able to recover quickly;
- Nutrient enrichment – organic enrichment of habitats is unlikely in the context of wind farm construction, but mineral enrichment can be an issue in some circumstances. Localised mineral enrichment can result where vegetation is being used to treat water

run-off from excavations or roads with high silt content, this is an undesirable effect on sensitive habitat receptors. Often limited direct habitat loss through creation of lagoons as pollution control measures is necessary to prevent mineral enrichment over a wider area; and

- Indirect effects – these primarily relate to changes in hydrology, the creation of access tracks and other infrastructure may change the pattern of drainage in an area.

Only one habitat receptor has been identified in this assessment and the potential effects on this receptor are discussed below:

#### *Acid Grassland/Dry dwarf shrub heath mosaic*

No direct habitat loss or disturbance of this receptor is predicted as none of the proposed infrastructure is located in this habitat type. Some infrastructure elements are positioned at the top of slopes which do run down to areas of semi-improved acid grassland. For this reason there is a possibility that sediment-laden run-off could result in mineral enrichment in this habitat, which would degrade its nature conservation importance.

Should the mosaic habitat be impacted upon as described above then this would be considered as a significant effect on this receptor in the absence of mitigation. Mitigation measures are proposed below.

#### *6.8.1.3 Water Vole*

There is no evidence that water vole are present within the Development site. No potential water vole habitat will be directly affected by construction activities. However, without mitigation there is a risk that habitat could be indirectly affected by pollution and sedimentation due to run-off and spillage, resulting in deterioration of water quality.

Water vole populations exist as a number of interacting sub-populations, which require empty areas of habitat to move in to. Therefore, although no sign of water voles were recorded it is possible that suitable habitat may become occupied in the future.

Due to this, there is a small chance of a measurable, and so significant, effect on any local population in the absence of mitigation.

#### *6.8.1.4 Otter*

The habitat present within the Development area is of little or no value to foraging otter, and no marginally suitable habitat will be directly affected during construction. Habitat may be indirectly affected by pollution and sedimentation due to run-off and spillage, resulting in deterioration of water quality.

Otters may cross large areas of open land when hunting for frogs. Historical records indicate otters are present in the general area, and so it is possible that individuals may cross this area rarely.

There is, therefore, a small chance of a measurable, and so significant, effect on the local population in the absence of mitigation.

#### *6.8.1.5 Bats*

Bats may be affected by foraging habitat loss and roost loss during construction. No roosts have been identified within the Development footprint and so the loss of roosts is not considered likely in this case. The nearest potential roost site, Spicer House, is located over 500 m from the nearest turbine.

The construction operation is not considered likely to result in any significant changes to the structure of the existing habitats and so the potential for loss of foraging habitats during construction is considered to be limited.

#### *6.8.1.6 Reptiles*

No reptiles were recorded within the site or during the desk study. Habitat of higher potential value to reptiles exists outside the Development area. The low potential of the habitats impacted on by the proposals and the lack of records from the general area suggest that important reptile populations are unlikely to be found within this area. It is considered that there would be no significant effect upon this group.

#### *6.8.1.7 Great Crested Newt*

There will be no direct loss of potential great crested newt breeding habitat through construction and terrestrial habitats affected by the Development are of low value for this species. However, potential breeding ponds located outside of the site may be affected by pollution and sedimentation through run-off and spillage resulting in a deterioration of water quality, and loss of suitable habitat.

Great crested newt populations exist in groups of related sub-populations, which require empty areas of suitable habitat for breeding and foraging to move in to. However, the site does not currently hold any potential breeding habitat and all turbine, track and site compound locations would be in areas of low value as terrestrial habitat. Due to this lack of impact upon important habitats and the lack of any desk study records in the wider area it is considered unlikely that there would be any significant impact on this species.

### **6.8.2 Potential Operational Effects**

#### *6.8.2.1 Ingbirchworth Nature Reserve*

No operational effects on Ingbirchworth Nature Reserve are predicted in this assessment.

#### *6.8.2.2 Habitats*

##### *Acid Grassland/Dry Dwarf Shrub Heath Mosaic*

No operational effects on habitat receptors have been identified in the operational phase of the Development.

#### *6.8.2.3 Water Vole and Otter*

There will be an increased level of human activity around the wind farm site during the operational phase, in addition to ongoing farm management. This may potentially result in disturbance to water vole and otter, discouraging these species from foraging in or colonising the area. Otters are both crepuscular and nocturnal in their habits, and so this increase in activity is unlikely to result in a measurable impact. Water vole habitat is generally limited to 20 m around a watercourse, and so they are also unlikely to be greatly affected. Therefore the magnitude of this effect is predicted to be negligible in the absence of mitigation, and thus not significant.

#### *6.8.2.4 Bats*

The potential operational impacts on bats is an area where further research is urgently needed to better inform impact assessments of this type. There are a number of ways in which bats may be affected by the operation of the wind farm, and these are discussed below, however in each case research is required to better inform assessments.

Ultrasound emission has been highlighted as of potential concern in relation to bats, however the EUROBATS guidance indicates this is probably of limited impact<sup>8</sup>. At present there is no evidence that ultrasound from turbines has an effect on bat populations, and whilst further research is required, the existing body of professional opinion on this topic indicates it is unlikely to be significant.

There may be a loss of hunting areas because the area is avoided by bats. At present this impact can not be predicted with certainty as there have not yet been sufficient studies undertaken to allow quantitative prediction of this impact. The scale of the impact will depend on the level of activity in the area prior to construction and the extent to which bats avoid the area. The data available indicate that the area is used by an assemblage of foraging bats typical of the wider region. None of the habitat features recorded indicate that this is likely to be a foraging area of particular value in the context of the wider region, being relatively exposed and having few shelterbelts or other woodland features. However it is clearly used by foraging bats on the basis of the field survey evidence. It is currently not clear from the existing research and anecdotal evidence whether bats are discouraged from foraging close to turbines (and so suffer loss of foraging habitat) or are actively attracted to wind farms and so experience collision risk. On the basis of available information, there is no evidence that this particular site is sensitive with regard to bats.

There is a collision risk to foraging and migrating bats during the operational phase of the wind farm. At present there is no accepted framework for quantifying collision risk to bats. The significance of this potential impact is likely to be greater for migrating bats<sup>9</sup>. None of the species recorded in and around the Development are strongly migratory, although some (such as noctule) are known to make relatively long distance movements flying at heights within the rotor swept area. Noctule bats are known to be migratory in mainland Europe, but this behaviour has not been recorded in the UK population.

There may be a loss of or change in the position of flight corridors. On the basis of the topography, known roosts in the area and the data collected, no flight corridors have been identified. More intensive monitoring may help to identify preferred flight corridors, however it is not known with certainty the extent to which the positions of flight corridors are likely to change in the presence of wind turbines, and what the likely effect of this change will be at the population level.

The response of the assemblage of foraging bats using the Spicer Hill site is therefore difficult to predict with certainty. To date there is no clear published evidence of direct effects on bat populations as a result of wind farm developments. Collisions have been recorded at other sites, however the greatest concern in relation to collisions focuses on strongly migratory populations, which have not been recorded at Spicer Hill. Bat activity is concentrated along linear features, such as hedgerows and woodland edges, or around woodland and water features. Activity levels generally decrease as distance from these features increases, with some research suggesting a sharp decline beyond 70 m from water courses, and little deviation from features during commuting flights<sup>10</sup>. Turbines have been situated out in the open in arable and semi-improved grassland, where bat activity is low due to poor foraging opportunities, with the closest turbine being over 140m from the nearest woodland edge. No turbines interfere with any linear feature which may be used by bats as a commuting route. On this basis a significant effect on the assemblage of bats foraging at this site is considered to be unlikely, however monitoring and further research in this area would improve the confidence in prediction for this impact.

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<sup>8</sup> see note 2

<sup>9</sup> see note 2

<sup>10</sup> N.C. Downs and Racey, P.A. 2006. The use by bats of habitat features in mixed farm land in Scotland. *Acta Chiropterologica* **8**. 169-186.

#### *6.8.2.5 Reptiles and Great-crested Newt*

No significant operational effects on potential reptile or newt populations have been identified.

### **6.8.3 Potential Decommissioning Effects**

As decommissioning activities are of a similar type and intensity as construction activities they often result in the same potential impacts.

#### *6.8.3.1 Ingbirchworth Nature Reserve*

Decommissioning could result in a similar level of impact on Ingbirchworth Nature Reserve as during the construction phase.

#### *6.8.3.2 Habitats*

Decommissioning may result in run-off and pollution through spillage on the habitat receptor "acid grassland/dry dwarf shrub heath mosaic". This may have a similar impact on these habitats as during the construction phase. No other potential impacts on habitat receptors have been identified in the decommissioning phase.

#### *6.8.3.3 Water Vole, Otter, Bats, Reptiles and Great Crested Newts*

Decommissioning could result in a similar level of impact on these receptors as during construction phase.

## **6.9 Mitigation**

The principal mitigation measure adopted to minimise the ecological impact of the Development has been the use of an iterative design process. Use has been made of ecological constraints feedback from surveyors on the site and ecological issues have been taken into account throughout the design process. This means that most mitigation measures are embedded within the overall design, allowing the opportunity to move turbines away from sensitive habitats or species. The drivers for the current three turbine layout have been landscape and visual considerations, however fewer larger turbines in this case allow increased buffers around potentially sensitive habitat features and result in a small overall land-take. This section presents specific measures adopted through the different phases of the Development. An ecological clerk of works would be appointed to oversee mitigation measures, and ensure best practise during the construction and decommissioning phases.

#### *6.9.1.1 Habitat Receptors*

The design process has avoided direct loss of more valuable habitats such as Western gorse scrub and heath.

A series of mitigation measures are detailed in Chapter 8: *Hydrology and Hydrogeology* of this ES to minimise the risk of pollution and sedimentation caused by run-off and spillage which may habitat receptors.

#### *6.9.1.2 Water Vole and Otter*

Loss of water vole and otter habitat has been avoided through the iterative design process.

The site will be resurveyed prior to construction. This will provide a double-check for any water vole populations or otter evidence that could have been overlooked in the original survey and also for any colonies/individuals that have moved into the area since the previous

survey. All turbines have been sited over 50 m from any watercourse as part of the iterative design process. If an otter shelter is located prior to construction, appropriate mitigation measures will be agreed with Natural England. This is likely to involve establishing a protected zone around the shelter to minimise the risk of disturbance.

Excavations over 0.5 m deep will be covered overnight or escape ramps provided to prevent otters and other mammals from becoming trapped.

A series of mitigation measures are detailed in Chapter 8 to minimise the risk of pollution and sedimentation caused by run-off and spillage which may affect water vole or otter habitat.

Best practice will be employed to reduce risk of disturbance, including avoiding any unnecessary plant movements close to watercourses.

#### 6.9.1.3 Bats

The site will be resurveyed during the current season for bat foraging activity and any roosts or potential roosts in order to provide more detailed baseline information to inform post construction monitoring.

Through the design process the guidelines published by Harsbuch and Bach<sup>11</sup> have been taken into account; these include minimum separation distances from roosts of 500 m and 200 m from woodland edge and other important foraging habitats. With the previous submission layout the 200 m buffer was not possible to implement in one instance (woodland to the west of the site, following a water course). This three turbine scheme now complies more fully with these guidelines by respecting all the recommended buffers. The design ensures that the nearest turbine is over 200 m from the woodland edge and stream; all turbines are located in open areas of limited foraging value<sup>12</sup>.

Should any monitoring highlight any significant or potentially significant numbers of bat collisions, there are a number of experimental mitigation measures that could be adopted, such as the creation of insect rich habitats away from turbines using managed manure piles.

#### 6.9.1.4 Reptiles

A small area of marginally suitable habitat will be lost during construction. This area will be searched by a competent ecologist before construction starts in this area, and the site ecologist will supervise the initial phase of construction operations in this area, implementing any mitigation measures necessary to protect individuals.

#### 6.9.1.5 Great Crested Newt

Loss of suitable breeding habitat has been avoided through the iterative design process. The nearest turbine will be located over 300 m from a potential breeding pond, and the Development is in habitat that is not classed as "newt friendly"<sup>13</sup>, thus further reducing the likelihood of newts occurring the area of the Development.

A series of mitigation measures are detailed in Chapter 8: *Hydrology and Hydrogeology* of this ES to minimise the risk of pollution and sedimentation caused by run-off and spillage which may affect suitable great crested newt habitat.

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<sup>11</sup> Harsbuch, C. and Bach, L. 2005 "Environmental Assessment Studies on wind turbines and bat populations – a step towards best practice guidelines" Bat News

<sup>12</sup> See note 9.

<sup>13</sup> Oldham, R. S. Keeble, M.J.S., and Jeffcote, M. 2000 "Evaluating the Suitability of Habitat for the Great Crested Newt (*Triturus cristatus*) Herpetological Journal 10 143-155

### **6.9.2 *Habitat Management Plan***

The current value of the acid grassland/dry dwarf shrub heath mosaic habitat is restricted by an apparent lack of specific management to retain or enhance its quality and it could be susceptible to degradation if existing management becomes more intensive with regard to increased grazing and/or improvement. This habitat has the potential to be managed in such a way as to create a more natural acid/heathland area which would compliment and increase the viability of the heather/bilberry habitats present in close proximity at the Ingbirchworth Nature Reserve.

A management plan would be designed to enhance the existing ecological value of this habitat. Such a plan would meet the requests from Natural England, received during the desk study to improve quality, connectivity and quantity of this habitat in the local area. Details of such a plan could be agreed in consultation with Natural England.

The management plan will also be designed so as to conserve and improve the broadleaf plantation woodland following the stream to the north-west of the site. This would include the provision of stock-proof fencing, thinning where and when appropriate and replanting of native flora of local provenance where necessary to restore the understory and increase this habitat's biodiversity and ecological value.

### **6.10 RESIDUAL EFFECTS**

Table 6.6 details the predicted effects after mitigation has been considered. As decommissioning activities are of a similar type and intensity as construction activities, they often result in the same potential impacts. In the case of this development, mitigation measures during decommissioning are identical to those employed during construction and so are not repeated. This is likely to be precautionary as in practice many of the decommissioning impacts are likely to be of a smaller scale than the construction impacts.

In the context of the table below, short term means the duration of the construction phase, and long term means the duration of the operational phase (25 years).

**Table 6.6 Residual Effects**

VER	Value	Potential Effect	Mitigation	Magnitude of Change	Duration	Nature	Significance	Level of Certainty/Comments
<b>Construction Impacts</b>								
Ingbirch-worth Nature Reserve	LOCAL	No potentially significant effects identified		No change			Not significant	
Acid Grassland/Dry Dwarf Shrub Heath Mosaic	LOCAL	Indirect habitat degradation through mineral enrichment/spills	Avoidance of habitat at design stage, management plan to enhance quality of habitat receptor, pollution control measures described in Chapter 8	minor	Long term	Positive	Not significant	No potential negative impacts are predicted. Management plan predicted to improve quality of this habitat.
Water Vole	LOCAL	Loss of quality in potential habitat	Avoid potential habitat at design stage, habitat quality protected by hydrology mitigation and protection from plant movement	No change	Short term	Neutral	Not significant	Any indirect impact on habitat is considered unlikely after mitigation.
		Disturbance	Not predicted at present. Avoid through re-survey prior to construction. Escape ramps in excavations provided as a precaution.	No change	Short term	Neutral	Not significant	Disturbance is not currently predicted. Re-survey will improve confidence in predictions and avoid any potential effects on any new colonies establishing in the area.
Otter	LOCAL	Loss or degradation of suitable habitat	Layout and design avoids suitable habitat through constraints mapping. Other	No change	Short term	Neutral	Not significant	Any indirect impact on habitat is considered unlikely after mitigation.

VER	Value	Potential Effect	Mitigation	Magnitude of Change	Duration	Nature	Significance	Level of Certainty/Comments
			mitigation measures detailed in Chapter 8 (Hydrology & Hydrogeology).					
		Disturbance	Best practice will be implemented, including mammal escape ramps in any excavations.	No change	Short term	Neutral	Not significant	Disturbance could lead to an increase in stress for some individuals if otters are present, but no detectable effect is predicted at the population level after mitigation.
Bats	REGIONAL	Loss of roost and foraging habitat.	Layout and design avoids suitable habitat through constraints mapping.	No change	Permanent	Neutral	Not significant	Potential impact designed out through constraints mapping.
Reptiles	LOCAL	Loss or degradation of suitable habitat	Management plan will enhance quality of habitat.	No change	Permanent	Neutral	Not significant	Potential loss is considered trivial in local context. Management plan will improve the potential value of habitats in the area for this group.
		Disturbance	Works in marginally suitable habitat supervised by ecologist.	No change	Short term	Neutral	Not significant	Disturbance could lead to an increase in stress for some individuals if reptiles are present, but no detectable effect is predicted at the population level.
Great Crested Newt	REGIONAL	Loss or degradation of suitable habitat	Layout and design avoids suitable habitat through constraints mapping. Other mitigation measures detailed in Chapter 8 (Hydrology & Hydrogeology).	No change	Permanent	Neutral	Not significant	Any indirect impact on habitat is considered unlikely after mitigation.
		Disturbance	Design avoids suitable habitat	No change	Short term	Neutral	Not significant	This is considered very unlikely given the terrestrial habitats affected are unlikely to support

VER	Value	Potential Effect	Mitigation	Magnitude of Change	Duration	Nature	Significance	Level of Certainty/Comments
								newts.
<b>OPERATIONAL IMPACTS</b>								
Ingbirch-worth Reservoir	LOCAL	No likely significant effects predicted		No change			Not significant	
Acid Grass-land Dry Dwarf Shrub Heath Mosaic	LOCAL	No likely significant effects predicted	Enhancement through a management plan for this area	minor	Long term	positive	Not Significant	Management plan predicted to improve quality of this habitat during the operational phase.
Water Vole	LOCAL	Disturbance may reduce habitat suitability	Constraints mapping at layout stage	No change	Long term	Neutral	Not significant	No significant disturbance is predicted.
Otter	LOCAL	Disturbance may reduce habitat suitability	Constraints mapping at layout stage	No change	Long term	Neutral	Not significant	No significant disturbance is predicted.
Bats	REGIONAL	Collisions, loss of foraging habitat or changes to commuting routes	Monitoring, possibly manure pile diversions or other experimental techniques.	Monitoring required, not expected to result in a change at the population level	Long term	Negative	Not significant	Habitat is of low quality for foraging, and the nearest potential roost site is >300m from the nearest turbine. Monitoring will help to quantify the effect, but available evidence suggests a detectable effect at the population level is unlikely.
Reptiles	LOCAL	Disturbance may reduce habitat suitability		No change	Long term	Neutral	Not significant	No significant disturbance is predicted.

VER	Value	Potential Effect	Mitigation	Magnitude of Change	Duration	Nature	Significance	Level of Certainty/Comments
Great Crested Newt	REGIONAL	No potentially significant effect predicted		No change			Not significant	

## 6.11 STATEMENT OF SIGNIFICANCE

Overall, this site is not sensitive with respect to habitats and protected species. Mitigation is recommended to minimise potential negative effects on VERs identified. After mitigation is considered, the impact on VERs is assessed as *not significant*.

No important habitat is lost to the Development footprint and the inception of a management plan for the acid grassland/dry dwarf shrub heath mosaic habitat will be implemented that will improve the connectivity, quantity and quality of this habitat in the wider area. Such habitat improvement is likely to benefit the existing populations and possibly encourage new populations of natural flora and fauna. The habitat management plan will also involve improvements beneficial to local flora and fauna, including broadleaf woodland. Monitoring may help to improve our understanding of the responses of foraging bats to wind turbine developments.

Climate change is widely accepted as the cause of some adverse ecological events and predictions indicate that declines will occur in many habitat types and ecological taxa. It is also important in the decision making process to consider the positive contribution that the Development will have in tackling the issue of climate change.

