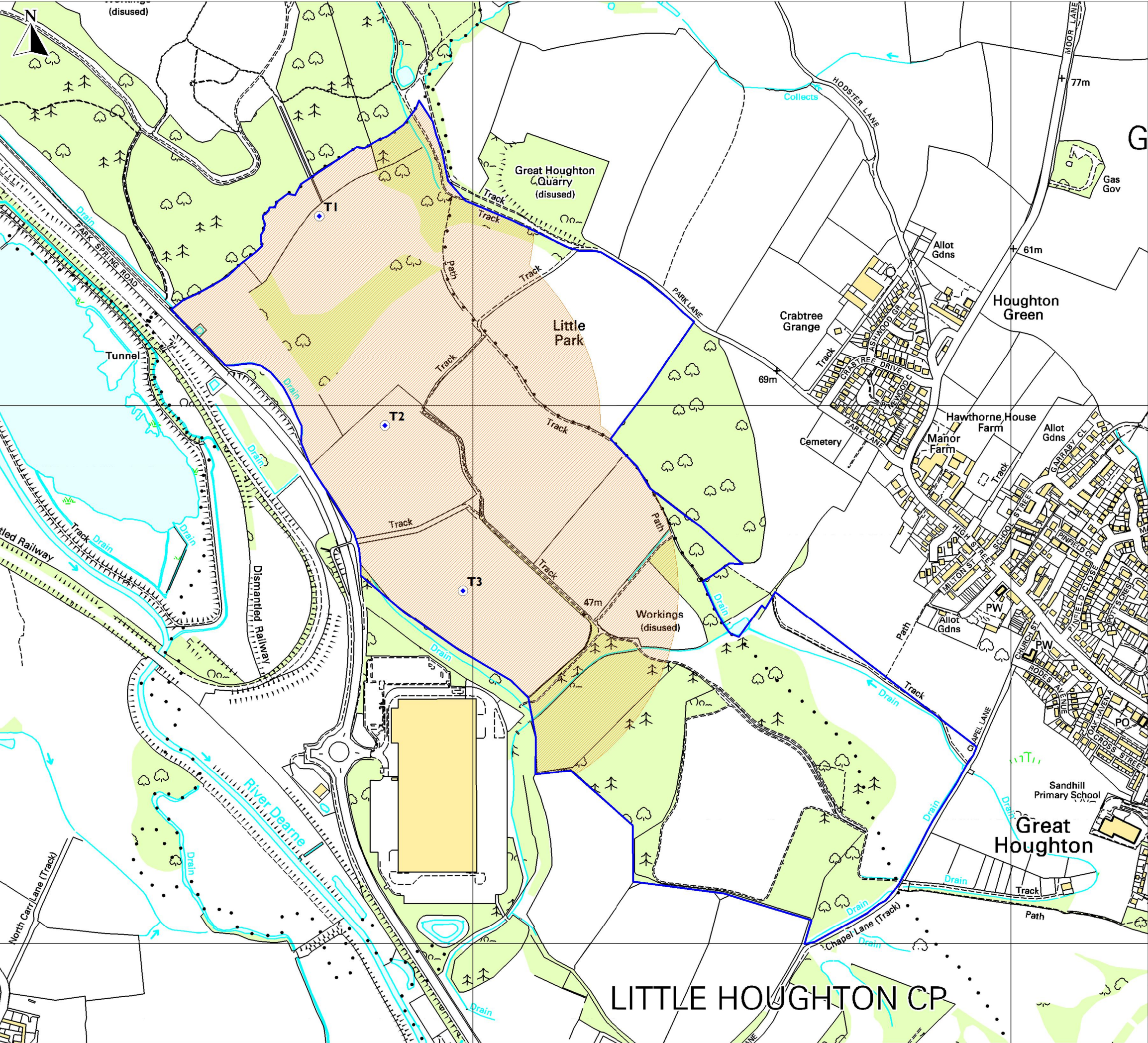




LEGEND

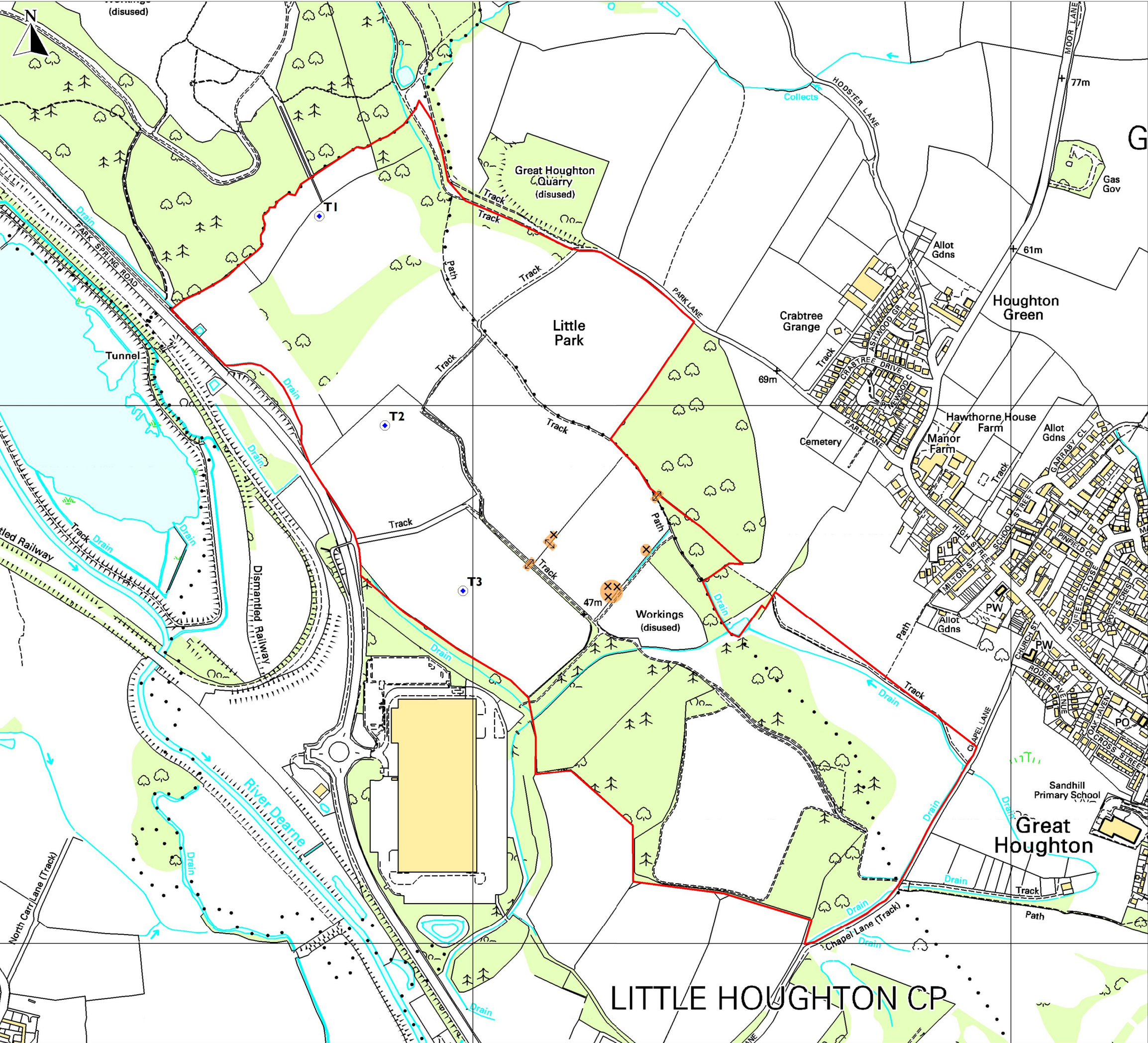
Site boundary

Badger survey area

Turbine Locations **P#** Turbine reference

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PARK SPRING WIND FARM		
Turbine locations and survey boundary		
DOCUMENT REFERENCE		LAST REVISION DATE
PSR043		July 2013
SITE DESIGN VERSION		SCALE
V5		1:7,000 @ A3
DRAWN	CHECKED	APPROVED
RH	LM	GS
PARSONS BRINCKERHOFF		EDF ENERGY
FIGURE I		



LEGEND

- Ecology survey area
- Turbine
- Mammal path
- Latrine
- T# Turbine reference

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PARK SPRING WIND FARM

Badger survey results

DOCUMENT REFERENCE	LAST REVISION DATE
PSR151	July 2013
SITE DESIGN VERSION	SCALE
V5	1:7,000 @ A3

DRAWN	CHECKED	APPROVED
RH	LM	GS

PARSONS
BRINCKERHOFF

EDF
ENERGY

FIGURE 2

9.3 ECOLOGY – OTTER & WATER VOLE SURVEY

PARK SPRING WIND FARM, OTTER
AND WATER VOLE REPORT

EDF Energy Renewables

Final

Park Spring Wind Farm, Otter and Water Vole Report

Prepared for

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EXECUTIVE SUMMARY

Parsons Brinckerhoff was commissioned by EDF Energy Renewables (EDF ER) to undertake water vole (*Arvicola amphibius*) and otter (*Lutra lutra*) surveys of a 90.4 Ha site adjacent to Park Spring Road near Great Houghton, Barnsley (grid reference SE422066). The surveys were required to accompany and inform the planning application for a proposed wind farm comprising three turbines and associated infrastructure (e.g. access tracks).

A desk study was carried out as part of the Phase 1 Survey. The field survey was undertaken on the 22nd and 23rd August 2011 by suitably experienced ecologists. Surveys for otter and water vole were carried out simultaneously and focussed on all water bodies and ditches within the site boundary, and one pond located less than 50 m from the site boundary. Ditches running outside of the survey boundary were not surveyed where they were under separate land ownership.

The desk study returned one result for otter within 2 km and three for water voles within 1 km. The field survey identified the presence of water voles in one of the ditches on site. No evidence of otters was present and the site was deemed largely unsuitable for habitation, but may provide corridor links.

The population of water voles was considered likely to be small with low numbers of feeding stations and only two latrines being identified. Although it is unlikely that the development will impact the population once in operation there is a chance that during construction, access tracks may impact the ditches and water bodies and therefore the habitat of the water voles. Water voles are at risk of habitat loss or deterioration; fragmentation; incidental injury and mortality.

It is likely that water voles will require mitigation should the access tracks pass within 5 m of the ditches that were identified as supporting or having potential to support a population. Where possible tracks and turbines will avoid the locations of the ditches, but when this is not possible, exclusion and habitat restoration or enhancement will be required to prevent a negative impact upon the population.

SECTION 1

INTRODUCTION

1 INTRODUCTION

1.1 Overview

1.1.1 Parsons Brinckerhoff was commissioned by EDF-ER to undertake water vole (*Arvicola amphibius*) and otter (*Lutra lutra*) surveys of a 90.4 Ha site adjacent to Park Spring Road near Great Houghton, Barnsley (approximate central OS grid reference SE422066). The surveys were required to accompany and inform the planning application for a proposed wind farm comprising three turbines and associated infrastructure (e.g. access tracks). The location of the proposed turbines is shown in Figure 1.

1.2 Site Context

1.2.1 The site was bordered to the north by woods, heathland and arable land; further north, an industrial area was present. To the east of the site habitats included woodland and arable land. Disused Great Houghton Quarry, which is surrounded by woodland, was situated to the east. To the south of the site a golf course and additional arable land was present with the village of Little Houghton beyond. Park Spring Road a warehouse and associated hard standing bordered the western site boundary; with the River Dearne, a large pond and associated wetland habitats were present beyond. A full description of the habitats present within and adjacent to the survey area is included in the Extended Phase 1 survey report¹.

1.3 Objectives

1.3.1 A desk study to gather information on records of otters and water voles and habitats of value to these species within a 2 km radius of the survey area.

1.3.2 Otter and water vole surveys were undertaken to achieve the following objectives:

- To undertake a field survey to identify the use of the site by otters and water voles;
- To make recommendations for appropriate mitigation measures where necessary; and
- To provide adequate ecological baseline information to support an Environmental Impact Assessment.

1.4 Otter Ecology

1.4.1 Otters are riparian mammals living near to streams and rivers upon which they rely on for their food source which consists of fish, amphibians, small mammals and birds. As a species, otters are widespread and can habituate almost any type of water way, providing that there are suitable places for resting and dens and there is plentiful food. A typical holt is beneath tree roots on the side of a stream or river that is located above the water level.

1.4.2 Otters will rest during the day in a holt or above ground in a 'couch' which is often a loose nest of grass. They are primarily nocturnal preferring to inhabit remote areas away from human disturbance, but they can also be found within towns and cities.

¹ Parsons Brinckerhoff (2011) *Extended Phase 1 Habitat Survey; Park Spring Wind Farm, Barnsley*

1.4.3 Due to the availability of food year round in the UK, otters are not seasonal for breeding and can produce a litter of cubs at any time of the year. In areas where food sources are seasonal, breeding will coincide with these times such that females are lactating at the time of the highest abundance of prey.

1.4.4 As otters are nocturnal and ordinarily a secretive animal, their tracks and signs are often the only evidence that the animals are in the area, however territories may include several water ways and extend for up to 40 km² so finding signs may be difficult. Spraints are often left in prominent places upon rocks or bridges and on the banks where the water level is unlikely to reach. This allows territories to be identified between individuals. They will also use regular tracks, resulting in clear runs between waterways and resting sites.

1.5 Water Vole Ecology

1.5.1 Water voles are small riparian mammals living within the banks of waterways. They are able to exploit a variety of waterways providing the flow of water is at a low speed. They require steep banks in which to burrow and ditches often provide the best habitat. As a short lived rodent, rarely reaching 3 winters, the populations often follow a boom/bust pattern. At present, water voles are facing a drastic decline linked with the large number of mink (*Neovision vison*) within the countryside and a decline in the quality of habitats.

1.5.2 Water voles feed on vegetation within and adjacent to the waterways. They will gather food cut into up to 10 cm length sections at feeding stations, sections will be cut at 45° angles. Water voles use regular latrines, so a pile up of droppings can identify the presence of an individual. They are active throughout the day but are often difficult to see so these signs are invaluable to identify presence.

1.5.3 Latrines are used to identify territories which may overlap during the winter, but in the breeding season (March to October) females are highly territorial. Females may produce up to five litters in a breeding season.

1.6 Legislation and Planning Context

1.6.1 Articles of wildlife and countryside legislation, planning policy guidance and references to both local and national biodiversity action plans and regional/local strategies and plans are referred to in this report.

1.6.2 The key legislation, planning policies and plans of relevance are:

- The Conservation of Habitats and Species Regulations 2010 (Habitats Regulations) (as amended);
- The Wildlife and Countryside Act 1981(as amended) (WCA);
- The Countryside and Rights of Way Act 2000 (CRoW);
- The Natural Environment and Rural Communities Act 2006 (NERC);
- National Planning Policy Framework 2012 (NPPF);
- The UK Biodiversity Action Plan (UKBAP); and
- The Local Biodiversity Action Plan (LBAP) for Barnsley;

Otter

- 1.6.3 Otters are a European Protected Species (EPS) and are fully protected under Schedule 5 of the Wildlife and Countryside Act (1981, as amended) and are listed on Schedule 2 of the Conservation of Habitats and Species Regulations 2010. This affords otters protection against:
- Deliberate capture, injury or killing;
 - Intentional or reckless disturbance;
 - Intentional or reckless damage, destruction or obstruction of any structure or place of shelter used by an otter;
 - Deliberate disturbance, in such a way that a significant effect would be made upon the survival, breeding or nurturing of a significant group of otters;
 - Deliberate disturbance that would result in an impact upon the survival, breeding, distribution or abundance of the species.
- 1.6.4 An activity that would contravene this protection would require an EPS licence from Natural England.
- 1.6.5 Otter are a priority species on the Barnsley Biodiversity Action Plan (BAP) and the UK BAP.

Water Vole

- 1.6.6 Water voles are fully protected under Section 9 of the Wildlife and Countryside Act (1981, as amended). This makes it an offence to:
- intentionally kill, injure or take water voles;
 - intentionally or recklessly damage,
 - destroy or obstruct access to a place that water voles use for shelter or protection; or
 - intentionally or recklessly disturb water voles whilst occupying a structure or place used for that purpose
- 1.6.7 Water voles are listed on the UK BAP, making them a priority species for conservation.

SECTION 2

METHODOLOGY

2 METHODOLOGY

2.1 Desk Study

2.1.1 As part of the Phase 1 Habitat Survey¹, a search was undertaken to obtain records for otters and water voles up to a 2 km radius from the survey area. The following sources were consulted to obtain the data:

- Sheffield Biodiversity Records Centre (SBRC)
- Barnsley Council Biodiversity Officer
- National Biodiversity Network (NBN) Gateway – accessed on 4th May 2011.
- Barnsley Biodiversity Action Plan

2.2 Field Survey

2.2.1 The field survey was undertaken on the 22nd and 23rd August 2011 by suitably experienced ecologists. The survey for the otter and water vole were carried out simultaneously and focussed on all water bodies and ditches within the site boundary, including one pond located less than 50 m outside the site boundary. Ditches running outside of the survey boundary were not surveyed where they were under separate land ownership.

2.2.2 Figure 2 identifies the location of the ditches and water bodies surveyed.

2.2.3 The weather conditions during the survey were warm and dry. The weather preceding the surveys had also been dry.

2.2.4 The surveys were designed to follow the standard best practise guidance^{2&3} such that:

- Otter signs such as animals (alive or dead), feeding signs, spraints, other secretions (anal jelly), pathways, slides, paw prints, holts and couches were identified along the waterways and banks. There is no optimal timing for otter surveys, however they should be carried out during dry weather rather than after a heavy spell of rain or during flooding as signs may be washed away.
- Water vole evidence was searched for along the waterway banks and within the channel. Signs included direct sighting, latrines, feeding stations (comprising chewed vegetation cut at 45° and flattened areas), burrow entrances, runs, pathways, footprints, and feeding lawns around burrow entrances.
- Other notes were made upon the habitat and channel characteristics that would indicate suitability for water voles or otters. This included, broad habitat type, substrate, depth and width, water speed, bordering land use, disturbance factors and presence of other aquatic mammals including potential predators.

2.3 Survey Limitations

2.3.1 The site was only surveyed once across the two days and therefore there is a possibility that signs may have been missed.

² Chanin, P., 2003. Monitoring the Otter, Conserving Natura 2000 Rivers, Monitoring Series No. 10

³ Strachan, R. and Moorhouse, T., 2006. Water Vole Conservation Handbook. 2nd Edition. WildCRU, Oxford.

- 2.3.2 The dry weather caused some areas of some ditches to dry out thus reducing suitability at that point in time for water voles and otters. There is a chance that during other times the water level may make them suitable for these species.
- 2.3.3 Neither of these limitations were deemed to be major and are not sufficient to render the survey results invalid.

SECTION 3

RESULTS

3 RESULTS

3.1 Desk Study

3.1.1 The data from the Biodiversity officer returned a number of both water vole and otter records within 10 km of the site. The resolution of the otter results were at 10 km so it was not possible to determine if any of these were within the survey boundary or not. Water voles were recorded 1.5 km to the south east of the site.

3.1.2 The desk study from the SBRC returned one otter record located approximately 1.7 km south of the boundary of the site, and three water vole records approximately 1 km south of the site.

3.2 Habitat

3.2.1 Eight ditches and two ponds were surveyed. Ponds 1 and 3 were dry and therefore not subject to rigorous survey; Pond 5, a balancing pond for Park Spring Road was also largely dry and considered unsuitable for otter and water vole during the survey. The Phase 1 survey report did not identify potential for protected species in Ponds 3 or 5. The ponds with some potential to support otter and water vole are described in Table 3.1.

Table 3.1: Water body descriptions

Water body	Description	Suitability
D1	Narrow ditch with up to 2 cm water, some sections dry, water not moving at time of survey. Banks covered in vegetation with <i>Fragmites</i> sp. present providing a year round supply of food for water vole. Banks suitable for burrowing with a berm present. No presence of either species recorded.	Unsuitable for otter, some potential for water voles
D2	A dry, narrow and shallow ditch with rank grass vegetation within. Banks suitable for burrowing with a berm present. No presence of either species recorded.	Unsuitable
D3	A generally dry ditch with shallow banks unsuitable for burrowing with a berm present. Vegetation covering the banks with year round supply of food for water vole. No presence of either species recorded.	Unsuitable for otter, some potential for water voles
D4	A shallow dry ditch, less than 30 cm deep. No presence of either species recorded.	Unsuitable
D5	A dry ditch with steep banks suitable for burrowing. Rank vegetation with sporadic willow trees on banks, no food source for water vole. No presence of either species recorded.	Unsuitable
D6	Dry ditch with steep banks suitable for burrowing. Rank grass on banks with semi-mature trees. No food source for water vole. No presence of either species recorded.	Unsuitable
D7	A dry ditch with steep banks, rank grass and some scrub. No year round food source. No presence of either species recorded.	Unsuitable
D8	A substantial ditch up to 1 m wide at its widest with permanent water along the full length feeding into Pond 2. Heavily vegetated with willowherb, trees within the ditch and reeds and rushes throughout. Steep vegetated banks	Suitable for water vole

	suitable for burrowing. No presence of otters. Water vole latrines and feeding stations recorded.	
P1	Measuring approximately 20 x 15 m with shallow banks. Shallow water at edge with evidence of dogs regularly entering the water. Permanent water and food supply with vegetation on 50 % of the banks to provide cover.	Unsuitable for otter, limited potential for water voles
P2	Dry shaded by willow <i>Salix spp.</i> . During the phase 1 survey algal growth was recorded on this pond.	Unsuitable for otter or water vole
P3	Ephemeral pond, completely dry at the time of survey.	Unsuitable for otter or water vole
P4	Measuring approximately 20 m diameter, with permanent water and food supply. Steep banks suitable for burrowing and a berm present. Some limited vegetation cover on the bank side. No presence of either species recorded.	Suitable for water vole, limited potential to be used by otter.
P5	Balancing pond for Park Spring Road, largely dry at the time of survey. As recorded during the phase 1 survey, the pond was dominated by common reed, boarded by downy birch and gorse with limited aquatic vegetation.	Unsuitable for otter or water vole

3.3 Otter Survey

- 3.3.1 No otter signs were observed during this survey. It was noted however that the waterways provided sub-optimal habitat for dispersing otters. There was no evidence of a substantial food source for otters such as a substantial source of fish, however amphibians (such as frogs) and small mammals were present.

3.4 Water Vole Survey

- 3.4.1 One section of ditch (D8) showed signs of water vole presence. Two latrines and seven feeding stations were identified within the western half of this ditch.
- 3.4.2 In addition three ditches (D1, D3 and the remainder of D8) and one pond (Pond 1) had potential to support water voles, as described in Table 3.1. These areas are identified in Figure 3 along with the locations of the signs found as detailed below.

SECTION 4

DISCUSSION AND RECOMMENDATIONS

4 DISCUSSION AND RECOMMENDATIONS

4.1 Discussion

Otter

- 4.1.2 A record was returned approximately 1.7 km from the site boundary, however no confirmed presence of otter was found within the survey area in any water body. The water bodies on site were deemed unsuitable to support a permanent otter population due to poor quality and quantity of prey.

- 4.1.3 It is possible that otters may use the water bodies occasionally whilst dispersing but the ditches are not considered to be of importance to the local otter population. No mitigation measures are required for this species.

Water vole

- 4.1.4 Water voles have been confirmed on site within one of the ditches. Four other water bodies were considered to have potential to support water voles although no evidence of presence was recorded at the time of the survey.

- 4.1.5 It is likely that the site supported a small population of water voles or that the evidence found is part of a territory. It was not possible to identify the number of water voles on site, but the small number of feeding signs and latrines concentrated in a relatively small area suggests that there was not a large population.

- 4.1.6 Water voles will tend to use habitat up to 5 m of vegetation from the top of the bank and will use ditches as routes along which to disperse. It is therefore unlikely that the development will impact the population once in operation. However there is a chance that during construction, access tracks may impact the water bodies and therefore the habitat of the water voles. Water voles are at risk of habitat loss or deterioration; fragmentation and incidental injury or mortality through the construction phase of the development.

- 4.1.7 The proposed route for access tracks does not impact any of the ditches or water bodies with potential to support water voles, however should the layout change, further mitigation would be required. This is further discussed in 4.3.

4.2 Recommendations

- 4.2.1 No further survey or mitigation is recommended for otter.

- 4.2.2 Where possible all tracks will avoid the ditches and ponds on site, including a 5 m buffer around the banks of the water bodies. This will significantly limit the chance of injury to water vole and will prevent damage to the habitat. Assuming the layout remains as shown on Figure 1 the proposed development would be unlikely to cause further habitat fragmentation.

- 4.2.3 If it is deemed necessary to locate the tracks near to the water bodies, water voles will need to be excluded from the area as described in the Water Vole Conservation Handbook³. This should be done by displacing the animals from the development footprint and ensuring suitable habitat is available nearby for the individuals to move into.

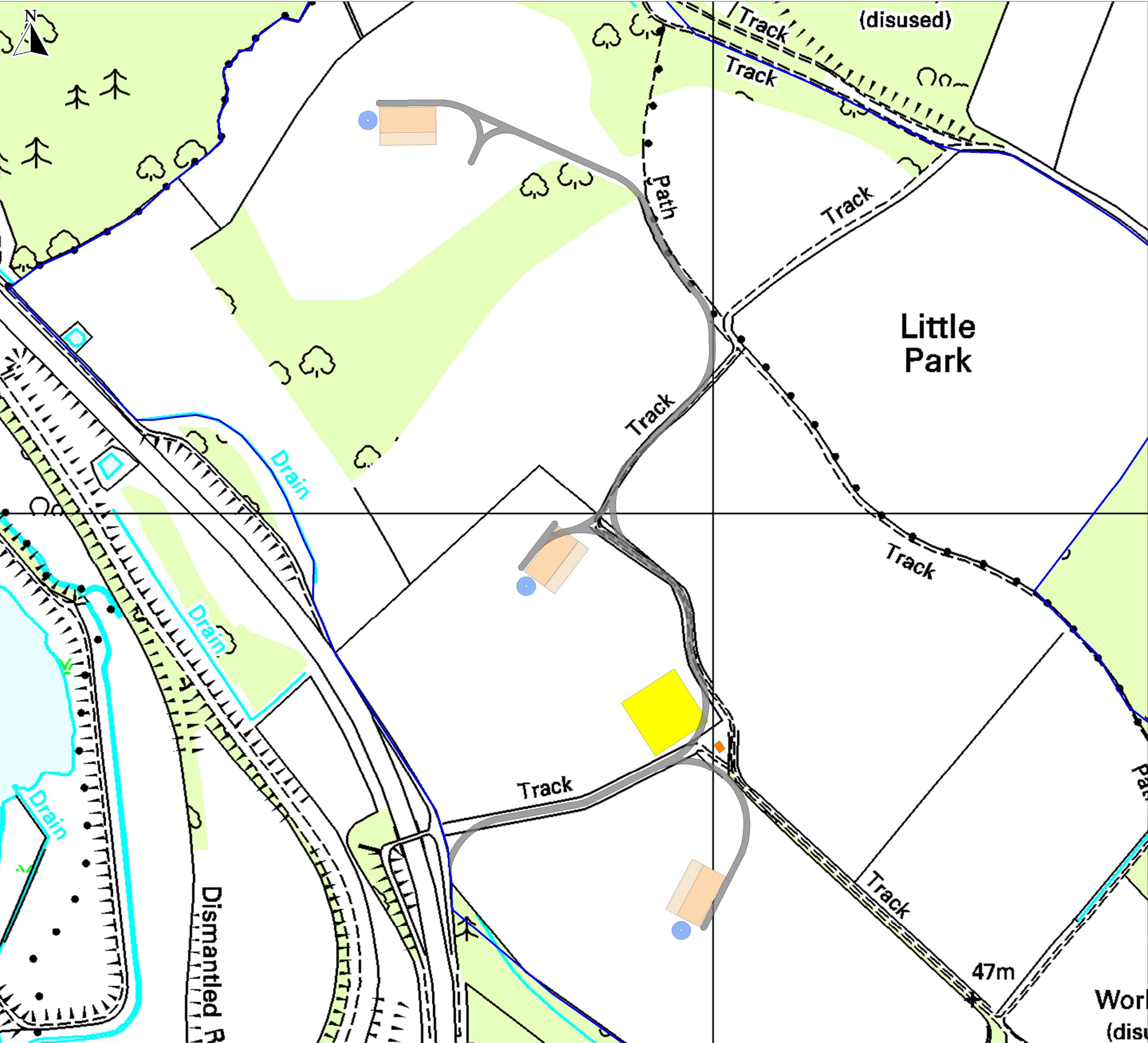
- 4.2.4 No culverts are proposed, however if new culverts are required, berms should be installed to allow water voles to pass through the culvert. A water vole may become water logged if submerged for long periods of time and this will affect their long term survival or cause drowning. The berm should be above normal water level. A box design will provide more light and will allow more airspace should the water course flood.
- 4.2.5 Where possible potential water vole habitat (water bodies and ditches) should be restored if it is impacted by the development. If this is not possible, further habitat should be enhanced to prevent a negative impact on the population. Ditches can be deepened and vegetation planted to encourage the water vole population to disperse into these areas.

SECTION 5

CONCLUSION

5 CONCLUSION

- 5.1.1 Water voles were present on site, however no evidence of otter was observed. The population of water voles was likely to be small with small numbers of feeding stations and only two latrines being identified.
- 5.1.2 It was considered unlikely that otters use the site permanently, and therefore this species was not considered further. Avoidance of impacts to water vole habitat should be sought in the first instance, however should access tracks need to be located within 5 m of the ditches that were identified as supporting or having potential to support a population further mitigation will be required.



LEGEND

- Site boundary
- Access track
- Crane hardstanding
- Blade laydown area
- Turbine foundation
- Substation
- Construction compound

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PARK SPRING WIND FARM		
Site Layout		
DOCUMENT REFERENCE PSR154	LAST REVISION DATE June 2013	
SITE DESIGN VERSION V5	SCALE 1:3,000 @ A3	
DRAWN RH	CHECKED LM	APPROVED MJ
PARSONS BRINCKERHOFF	EDF ENERGY RESOURCES	FIGURE I



LEGEND

- Ecology survey area
- Turbine
- Pond
- Pond - dry at time of survey
- Water body
- T# Turbine reference
- P# Pond reference
- D# Ditch reference

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PARK SPRING WIND FARM

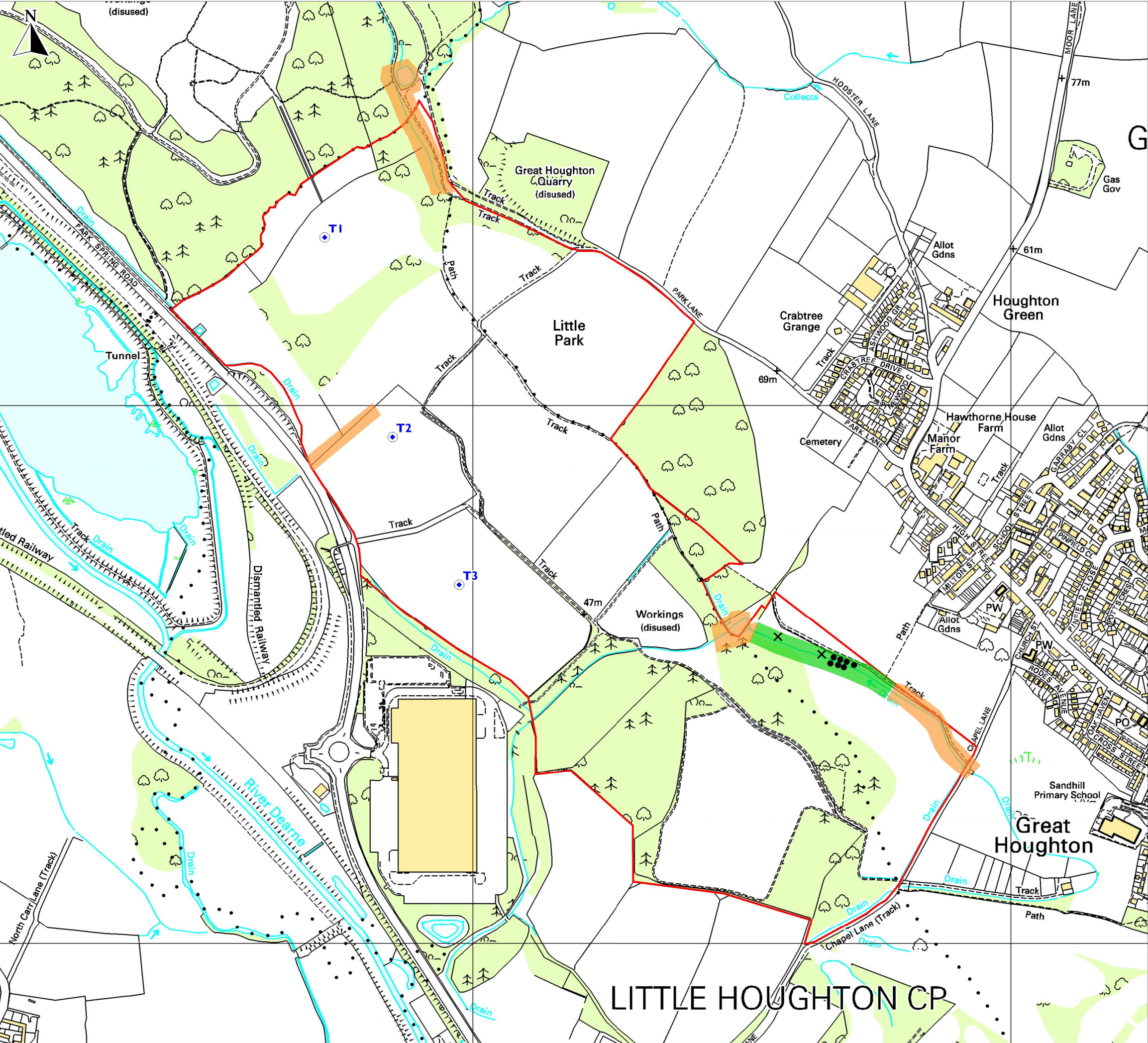
Water body locations

DOCUMENT REFERENCE	LAST REVISION DATE	
PSR160	July 2013	
SITE DESIGN VERSION	SCALE	
V5	1:7,000 @ A3	
DRAWN	CHECKED	APPROVED
RH	LM	GS

PARSONS
BRINCKERHOFF



FIGURE 2



LEGEND

- Survey area
- Turbine T# Turbine reference
- Potential to support watervoles
- Confirmed presence of watervoles
- × Latrine
- Feeding station

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PARK SPRING WIND FARM

Water bodies with potential to support or evidence of water voles

DOCUMENT REFERENCE	LAST REVISION DATE
PSR038	July 2013
SITE DESIGN VERSION	SCALE
V5	1:7,000 @ A3

DRAWN	CHECKED	APPROVED
RH	LM	GS

PARSONS
BRINCKERHOFF

EDF
ENERGY

FIGURE 3

9.4 ECOLOGY - BAT SURVEY

PARK SPRING WIND FARM,
BAT REPORT

EDF Energy Renewables

Final

Park Spring Wind Farm, Bat Report

Prepared for

EDF Energy Renewables
Endeavour House
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EXECUTIVE SUMMARY

Parsons Brinckerhoff was commissioned by EDF Energy Renewables (EDF ER) to undertake bat surveys on land adjacent to Park Spring Road, Barnsley. The surveys were required to support and inform the planning application for a new wind farm comprising three turbines and associated infrastructure (e.g access roads). The survey area comprised of approximately 90.4 ha of predominantly arable farmland and grazed pasture with a small area of woodland.

The table below sets out the survey aims, techniques and methods used.

Survey aim	Survey technique	Method
To gather information on existing bat records and habitats in the local area.	Desk study	Local record centre data search and web-based search.
To assess the potential for bat roosts to be adversely affected.	Ground-based tree inspections	Trees categorised as having negligible – high potential to support roosting bats.
To assess the species assemblage within the survey area.	Transect survey	Surveyors walked predetermined transects monthly from May 2011 – October 2011 and in April 2012. An additional transect survey took place in April 2013.
	Static detector surveys	Four locations monitored monthly for five consecutive nights in April – October 2011.
To assess the relative level of activity within the rotor swept zone and at ground level	At height static detector surveys	SM2 detector mounted on the met mast with microphones monitoring at heights of 5 m and 50 m between April and September 2012.
	Vantage point survey	Surveyors watched the selected turbine locations, noting the number of bats, species and height of bat flights from half an hour before to two hours after sunset in April and May 2013
To assess where bats were accessing the site from and whether any significant commuting routes crossing the site existed.	Commuting point survey	Surveyors stationed on the edge of the site recorded the flight paths of bats commuting onto or across the site in August 2011.

No sites designated for interest features which included bats were recorded. Four species of bat (Leisler's bat, pipistrelle, Daubenton's bat and brown long-eared bat) were recorded roosting within the search area. The closest record to the site was a roost of 50 pipistrelle located just over 700 m east of the nearest proposed turbine.

The ground-based tree inspections recorded four trees and one woodland block with high bat potential and seven with moderate bat potential. No confirmed roosts were recorded. Of the trees with high bat potential two were within 200 m of Turbine 3. No signs of roosting bats were recorded during the inspections or subsequent transect, vantage point, commuting route and static detector surveys and it was therefore concluded that these trees were not used by large numbers of roosting bats.

Two high risk bat species, noctule and Leisler's bat were recorded within the site. Generally low levels of activity were recorded, however in May 2011 a peak in the level of activity was recorded on static detectors located at the woodland and Turbines 1 and 2. This peak in activity lasted for approximately half an hour either side of sunset. The surveys undertaken at other times of the year and vantage point surveys undertaken in April and May 2013 did not recorded high levels of noctule activity or more than one or two noctule within the site at any one time suggesting that the activity peak was likely to have been intensive foraging activity, linked to the emergence of the imago (adult stage) of a particular species of insect prey in this area.

A common pipistrelle commuting route along the north-eastern boundary of the site (likely to have been primarily used by bats commuting from the large (50 bats) roost nearby) was well used during the commuting route surveys. Away from woodland edge, hedges, the north-eastern site boundary and tree lines the level of medium risk bat species activity (common and soprano pipistrelle) was low.

While the level of activity from low-risk species (*Myotis* species and brown long-eared bats) was as expected, for a rural site in South Yorkshire. Very little activity was recorded away from linear features or the pond in the east of the site (which is over 500 m from the nearest turbine location).

The at-height surveys showed that significantly more common pipistrelle, soprano pipistrelle and *Myotis* species activity was recorded at ground level than that recorded at height. No significant difference was recorded between the level of *Nyctalus* species or brown long-eared bat activity at height or ground level. This is because the spread of the data was too great, given the number of passes recorded, to produce a significant result.

The surveys show that the operational risk to low and moderate risk species is low due to the way in which these species use the site; with bats generally keeping to traditionally used foraging habitat and foraging less often at height. The survey results show that the high risk *Nyctalus* group occasionally forages intensively in areas in which could put it at risk of collision or barotrauma. However this intensive *Nyctalus* activity was only recorded for a single hour in over 35 nights of static detector recording. In addition the number of individual *Nyctalus* bat species recorded using the site during surveys was always low.

A number of enhancements around the periphery of the site are recommended to encourage bats to commute around and utilise areas away from the proposed turbines locations.

SECTION 1

INTRODUCTION

1 INTRODUCTION**1.1 Overview**

1.1.1 Parsons Brinckerhoff was commissioned by EDF ER to undertake bat surveys of a 90.4 ha site adjacent to Park Spring Road near Great Houghton, Barnsley (approximate central OS grid reference SE422066). The surveys were required to accompany and inform the planning application for a proposed wind farm comprising three turbines and associated infrastructure (e.g access tracks). The location of the proposed turbines is shown in Figure 1.

1.2 Survey Area Context

1.2.1 The site was bordered to the north by heath with an industrial area present further north. The disused Great Houghton Quarry, woodland and arable farmland bordered the site to the north east with the village of Great Houghton to the east. To the south of the site, a golf course and additional arable land was present, with the villages of Little Houghton and Middlecliff beyond. Park Spring Road a warehouse and associated hard standing bordered the western site boundary. The River Dearne, a large pond and associated wetland habitats were present beyond Park Spring Road to the northwest of the site. A full description of the habitats present within and adjacent to the survey area is included in the associated Extended Phase 1 survey report.

1.3 Survey Objectives

1.3.1 The ecological study was undertaken to achieve the following objectives:

- To gather information on existing bat records and habitats of value to bats (e.g for commuting /foraging) within 10 km of the survey area;
- To assess the bat roost potential of all, buildings and trees within 200 m of each turbine;
- To assess the importance of the survey area to support foraging and commuting bats;
- To make recommendations for appropriate mitigation measures, where necessary; and
- To provide adequate ecological baseline information to support an Environmental Impact Assessment.

1.4 Legislation and Planning Context

1.4.1 Articles of wildlife and countryside legislation, planning policy guidance and references to both local and national biodiversity action plans and regional/local strategies and plans are referred to in this report. Their context and applicability is explained as appropriate in the relevant sections of the report and additional details are presented in Appendix 1.

1.4.2 The key legislation, planning policies and plans of relevance are:

- The Conservation of Habitats and Species Regulations 2010 (Habitats Regulations) (as amended);
- The Wildlife and Countryside Act 1981(as amended) (WCA);
- The Countryside and Rights of Way Act 2000 (CRoW);
- The Natural Environment and Rural Communities Act 2006 (NERC);
- National Planning Policy Framework 2012 (NPPF);
- The UK Biodiversity Action Plan (UKBAP); and
- The Local Biodiversity Action Plan (LBAP) for Barnsley.

SECTION 2

METHODOLOGY

2 METHODOLOGY

2.1 Overview

- 2.1.1 The survey methodology was designed using the standard best practice guidance^{1&2} for a low - medium risk site

2.2 Desk Study

- 2.2.1 As part of the Extended Phase 1 Habitat Survey a desk study was undertaken to collate and analyse existing records of bats historically found within 10 km of the survey area boundary in accordance with the best practice guidance (available at the time³). Data was also collected to identify any non-statutory and statutory designated sites for bats within 2 km and 10 km of the survey area respectively. Additional bat records within 10 km of the survey area were also requested. The following sources were consulted to obtain the data:

- South Yorkshire Bat Group;
- Barnsley Biological Records Centre; and
- Multi-Agency Geographic Information for the Countryside (MAGIC) website – accessed 15.02.13.

2.3 Field Survey

- 2.3.1 Field surveys comprised ground-based assessments of all trees within the fields surrounding the proposed turbine locations for their potential to support roosting bats.

- 2.3.2 A range of activity surveys were undertaken including:

- Transect surveys to assess the relative level of bat activity across the survey area;
- Commuting route surveys to record any bats commuting onto or across the survey area;
- Static detector surveys to record the level of bat activity across multiple nights in each turbine location as well as at a control within the application site boundary; and
- At height surveys to record any difference in the level of bat activity recorded at height (~50m) compared to that recorded near ground level (~5 m); and
- Vantage point surveys to confirm the number of bats utilising the proposed turbine locations and their flight patterns within these areas.

¹ BCT (2011) *Bat Surveys – Good Practice Guidelines: Surveying for onshore wind farms*. Bat Conservation Trust. London.

² Anon. (2009) *Natural England Technical Information Note TIN051; Bats and Onshore wind turbines*. Natural England, Peterborough, UK.

³ BCT (2011) *Bat Surveys – Good Practice Guidelines: Surveying for onshore wind farms*. Bat Conservation Trust. London.

2.4 Inspections

Tree and Hedge Assessments

- 2.4.2 A daytime assessment of all trees and hedges in the area around the proposed turbine locations was undertaken by a NE bat survey licensed Ecologist (details available on request) and two unlicensed assistants on 22nd July 2011 and 17th August 2011.
- 2.4.3 This involved a ground based inspection where the location, species, height, and any visible features which could potentially be used by roosting bats were noted for each tree and hedgerow. Features which have the potential for use by roosting bats include: rot holes; cavities; woodpecker holes; and peeling/raised bark. The features (together with the geographical and local habitat context) were used to grade each tree and hedgerow as having negligible, low, moderate or high potential to support roosting bats or if signs of bats are present the tree would be classed as a confirmed roost. The negligible, low, moderate and high potential categories are broadly equivalent to the categories 3 (negligible), 2 (low), 1 (moderate) and 1* (high) detailed in the BCT guidelines⁴ published since the design and implementation of the surveys. The features used to classify trees into the above categories are detailed in Appendix 2.

2.5 Activity Surveys

- 2.5.1 Transect surveys were planned following the best practice guidance available at the time⁵. Using the data collected in the Phase 1 Habitat Survey and aerial photos of the survey area, a circular transect route was designed to cover all habitat types and potential foraging and commuting features across the survey area as well as indicative turbine locations. The transect was approximately 5.5 km long and incorporated 24 no. five-minute point counts. The transect and point count locations are shown on Figure 2.
- 2.5.2 The transect was split into two halves, each half was simultaneously walked by one of two teams. Each team comprised a Natural England bat survey licensed Ecologist (details available on request) and an unlicensed assistant. The transect survey started at sunset and lasted for approximately two and a half hours. At, and between, each point count the number of bat passes (and where possible the species and number of bats) were recorded.
- 2.5.3 Transect surveys were undertaken on a single night each month between May and October 2011 (inclusive) and in April 2012. An additional transect survey took place in April 2013. Table 2.1, below, shows the date on which each transect survey was undertaken as well as the start and end locations for each of the two teams. The start location and direction walked (clockwise/anticlockwise) was varied throughout the year to attempt to reduce any sampling bias associated with the time of emergence and change in activity patterns throughout the night for each species.

⁴ Hundt L. (2012) *Bat Surveys: Good Practise Guidelines, 2nd edition*. Bat Conservation Trust

⁵ Anon (2011) *Bat Surveys – Good Practice Guidelines: Surveying for onshore wind farms*. Bat Conservation Trust. London.

Table 2.1: Date and times for transect surveys

Date	Team	Start Location	End Location	Start Time	End Time
18-May-11	1	21	10	21:04	22:53
	2	9	22		
23-Jun-11	1	22	9	22:37	00:35
	2	10	21		
21-Jul-2011	1	5	18	21:20	23:03
	2	17	6		
17-Aug-11	1	6	17	20:30	22:05
	2	18	5		
12-Sep-11	1	1	14	19:26	21:05
	2	13	2		
19-Oct-11	1	14	1	17:58	19:36
	2	2	13		
18-Apr-12	1	9	16	20:20	21:15
	2	21	3		
24-Apr-13	1	9	20 (missing PC10)	19:47	22:02
	2	21	8 (as well as PC 10)		

2.5.4 Table 2.1 shows the date, start and end location and time for each transect. The location of each transect route and point count is shown in Figure 2.

2.5.5 Weather conditions were recorded at the beginning of each transect survey along with any significant changes as the survey progressed. Weather data for each transect is included in the summary table in Appendix 6.

Analysis

2.5.6 Bat activity was standardised as the number of bat passes per minute. This enabled easy comparison between the different bat species recorded, the level of activity at each point count and the level of activity recorded across the year.

2.5.7 A bat pass is taken to be a series of echolocation calls from a single bat lasting for no more than 10 seconds. For example a single bat recorded for an entire five minute stop at a point count would represent 300 seconds of bat activity or 30 bat passes. This would equate to six passes per minute (ppm). If two bats were recorded at the point count for half the time the same number of bat passes would be noted and the same number of passes per minute given.

Commuting Route Surveys

2.5.8 To complement the transect surveys, five commuting route surveys were undertaken adjacent to linear features i.e. hedgerows, leading away from the survey area that may be used by commuting bats. Commuting route survey locations were chosen

using aerial photographs and OS maps. Locations with strong connectivity to the surrounding landscape were favoured with additional emphasis on those linear features which linked the survey area to areas with roosting potential (e.g. towns and woodland).

2.5.9 The commuting route surveys commenced half an hour before sunset lasting for approximately 2.5 hours. The location of each commuting route survey location is shown on Figure 3. Survey dates and weather conditions are detailed in Table 3.6.2 in the results section.

2.5.10 All commuting bat passes were recorded and, where possible, the species and direction of flight noted. Incidental records of foraging bats were also recorded but due to the fact that commuting route surveys were designed to record significant commuting routes onto or through the survey area rather than the relative level of bat activity in the area, foraging records were limited to a summary of the level of activity (low to high) and, where possible an estimate of the minimum number of bats present for each species recorded.

Equipment

2.5.11 For transect surveys undertaken in 2011 and 2012, surveyors used a Pettersson D240x combined time-expansion and heterodyne detector. During commuting route surveys, surveyors used either a Pettersson D240x combined time-expansion and heterodyne detector or a Duet Batbox combined frequency division and heterodyne detector. Detectors were connected to a Zoom H2 digital recording device. Transect surveys undertaken in 2013 were undertaken using a Wildlife Acoustics Echo Meter 3 (EM3) real-time-expansion detector with an integral recorder. Vantage Point Surveys used either an EM3 detector or a Titley Electronic Anabat SD2 frequency division detector.

2.5.12 On completion of each survey session, recorded Pettersson D240x and Batbox Duet calls which were not definitively identified in the field⁶ were analysed using BatSound v. 3.3.1.1 (Pettersson Elektronik AB, Uppsala, Sweden, 2002). EM3 calls were converted to ZCA format using Kaleidoscope v1.1.0 (Wildlife Acoustics 2013) then analysed using AnalookW v3.3q (Corben, 2006), any ambiguous calls were converted to WAV format using Kaleidoscope v1.1.0 (Wildlife Acoustics 2013) then analysed again using BatSound v3.3.1.1 (Pettersson Elektronik AB, Uppsala, Sweden, 2002). Anabat SD2 calls were also analysed using AnalookW v3.3q (Corben, 2006).

Static Detector Surveys

Surveys at Ground Level

2.5.13 Static detectors comprising Anabat II⁷ frequency division bat detectors connected to ZCAIM⁸ data recording unit or Anabat SDI⁹ detectors were deployed across the site, one at each proposed turbine location as well as a control next to a small semi-natural broadleaved woodland adjacent to the northern site boundary. The detectors were set to record from half an hour before sunset until half an hour after sunrise for five

⁶ Including all *Myotis*, brown long-eared bat and *Nyctalus* calls.

⁷ Titley Electronics, Ballina NSW, Australia

⁸ Titley Electronics, Ballina NSW, Australia

⁹ Titley Electronics, Ballina NSW, Australia

consecutive nights each month (in accordance with best practice guidance¹⁰) between May and October 2011 (inclusive) and April 2012.

- 2.5.14 The recordings were analysed using AnalookW v3.3q (Corben, 2006) Anabat data analysis software.

Table 2.2: Dates of SM2 activity

Month (2011/2012)	Date Anabat Detectors Installed	Date Anabat Detectors Collected
May	25 May	30 May
June	17 June	22 June
July	19 July	24 July
August	25 August	30 August
September	21 September	26 September
October	19 October	24 October
April (2012)	18 April	26 April

- 2.5.15 The static detectors were placed in the following habitat types present within the survey area:

- W – detector placed approximately 5 m from the edge of an arable cropped field angled towards the adjacent woodland edge.
- T1 – detector at proposed turbine location 1, in improved grassland (moved to the longer semi-improved tussocky grassland on the edge of the field, approximately 50 m to the northwest, after a detector was stolen in June 2011);
- T2 – detector at proposed turbine location 2, in arable cropped field; and,
- T3 – detector at proposed turbine location 3, in an arable cropped field.

- 2.5.16 Each static detector location is shown in Figure 3.

Surveys at Height

- 2.5.17 A static Song Meter 2¹¹ direct sampling bat detector was installed on the meteorological mast (shown on Figure 3) within the site in April 2012. The detector used two microphones to monitor bat activity one mounted at height (approximately 50 m from the ground) and one mounted at ground level (approximately 5 m from the ground).

- 2.5.18 The detector was set to record from half an hour before sunset until half an hour after sunrise for five consecutive nights each month between April and October 2012 (inclusive).

¹⁰ BCT (2011) *Bat Surveys – Good Practice Guidelines: Surveying for onshore wind farms*. Bat Conservation Trust. London.

¹¹ Titley Electronics, Ballina NSW, Australia

Analysis

- 2.5.19 Because static detectors record passes over the entire evening rather than just the initial 2-3 hours after sunset when bat activity is most abundant the number of bat passes per unit of time is likely to be considerably lower than those recorded during transect surveys. To allow standardisation of static detector surveys and enable comparison of all static detector surveys, the number of bat passes recorded per hour (pph) will be used. This compensates for the changes in sunrise and sunset times throughout the season allowing comparison of static detector data between months.
- 2.5.20 It is important to note that the static detector surveys were not standardised to passes per minute as the results of the transect surveys are. The results of the two different survey methodologies (static detector surveys and bat activity transect surveys) are not considered, or are intended to be, directly comparable due to the differences in detector sensitivity, survey period and objectives.
- 2.5.21 Using the assumption that both microphones would sample the same relative volume for each species and therefore the expected level of bat activity recorded would be the same (both for each of the four ground level static Anabat detectors (W, T1, T2 and T3) or for the static SM2 detector which monitored bat activity both at height and at ground level) a Chi Square Goodness of Fit (One Sample) Test was used to identify any significant differences from the expected level of bat activity.

2.6 Additional 2013 Surveys

2013 Vantage Point Surveys

- 2.6.2 The initial suite of surveys undertaken in 2011 identified noctule activity in the area around Turbines T1 and T2. To attempt to identify the number of individual bats and any regular flight lines in these areas vantage point surveys were undertaken in April and May 2013.
- 2.6.3 Surveys began 30 minutes before sunset and continued for up to two hours afterwards. The survey dates and times and weather conditions are in shown in Table 2.3 below.

Table 2.3: bat vantage point survey dates and weather conditions

Date	Start time	End time	Weather
25-Apr-13	19:49	21:50	Dry, 8/8 cloud cover, wind 1 - 3 (Beaufort), 9oC.
29-May-13	20:51	23:21	Showers until 22:00 then dry until 23:07 with additional showers, visibility reduced in wet weather, 8/8 cloud cover, wind 1 (Beaufort), 11oC.

- 2.6.4 One surveyor observed each turbine location (Turbines T1 and T2) using a full spectrum bat detector (EM3 or Anabat SD2) and binoculars. The species, number of bats and where possible the flight line and height were recorded.

2.7 Survey Limitations

Desk Study

- 2.7.2 It should be noted that an absence of desk study records for particular species does not necessarily convey an absence of such species in that area, but is often a facet of under-recording. Because the desk study is designed to give an overview of the species already recorded in the local area, and used as an indicative data prior to more detailed surveys such as bat activity and commuting route surveys, it is not considered to be a significant constraint.

Field Data

- 2.7.3 Bat surveys undertaken using bat detectors are inherently biased as bats with louder calls (such as the *Nyctalus* species) will be recorded at a greater distance (and therefore more frequently) than species which use quiet calls such as *Plecotus* sp. Species of bat with louder calls are species generally found using open habitats more frequently and therefore are species considered more likely to encounter turbines. This is not considered to pose a significant limitation as it has been taken into consideration when analysing the results.
- 2.7.4 Transect surveys undertaken in April 2012 were limited due to bad weather, constant, steady rain which set in after approximately an hour. The surveys were rescheduled to take place the following morning finishing at dawn but again, after an hour rain set in and the survey needed to be abandoned. A single common pipistrelle was recorded during the evening survey but curtailment of the survey due to poor weather conditions means that the results collected are not considered comparable to the results recorded in other months. It is likely that the rain in April represented relatively typical weather conditions in April 2012 and, as the level of bat activity is unlikely to be particularly high in April, it is reasonable to assume that the level recorded in May or October would be similar or higher. Therefore it is considered that, if the rain and the other survey results across the year are taken into account, it is possible to assess the impact of the development without the survey results showing the level of bat activity on a dry night in April.
- 2.7.5 In June 2011 the static detector at location T1 was stolen and the detector at location W failed meaning that no data was available for these two locations during this month. The lack of results in these two locations in June is taken into account in the discussion and conclusions section with a precautionary approach based on the results recorded on other detectors in June and the records for location A and B recorded at other times of the year.
- 2.7.6 In addition the static detector mounted on the met mast which monitored the difference in bat activity recorded at-height compared to that at ground level only recorded for one night in April 2012, three nights in July 2012 and five nights in September 2012. As this static detector monitored both ground level and at-height activity simultaneously there was no bias in terms of a higher level of recording at one of the two sampling points. The current best practise guidelines state that the need for at-height monitoring should be assessed on a site by site basis and goes on to emphasise the need at sites where clear felling or key holing is required. As the Park Spring site does not require such activities it is considered that just over 100 hours of recording across the bats active season provides enough data to draw sound conclusions with regards to representative bat activity levels.

- 2.7.7 Following the theft of detector T1 in June 2011 the location of the replacement detector was shifted approximately 30 m north to an area of tussocky semi-improved grassland on the edge of the field. Due to the short distance moved it is considered unlikely to affect the number of passes from bats with loud calls (*Nyctalus spp.*) recorded. Due to the fact that the detector was moved closer to a boundary, albeit a relatively insubstantial one, it is considered likely that the number of bat passes from species with quieter calls which are known to fly closer to edge habitat would be likely to increase rather than decrease giving a precautionary level (likely to be too high rather than too low) of activity during July, August, September and October.
- 2.7.8 Species identification by sonogram is limited (to a certain extent) by similarities in call structure. In addition all bats can modulate their calls according to the habitats they are navigating, their behaviour and the information they require at the time. This imposes limitations on reliable analysis particularly between species in the genera's *Plecotus*, *Myotis* and *Nyctalus*. Due to the geographical location and habitat structure within the survey area every *Plecotus* bat recorded was assumed to be a brown long-eared bat, *Plecotus auritus* and unidentified *Myotis* species were assumed to be either Daubenton's bat *Myotis daubentonii*, whiskered bat *Myotis mystacinus*, Brandt's bat *Myotis brandtii* or Natterer's bat *Myotis Nattereri*. *Nyctalus* species were separated where possible but grouped where overlap prevented reliable identification.
- 2.7.9 During the May Vantage Point survey the integral recording unit within the EM3 detector suffered a fault whereby it failed to record the bat passes. As the bats could still be seen and heard observational information was still gathered including the number of bats that were seen, flight behaviour and height data. Because the detector failed the species recorded in the T2 area cannot be verified.

SECTION 3

RESULTS

3 RESULTS

3.1 Summary

3.1.1 In summary, the following eight bat species/groups were recorded within the survey area following analysis of the desk study and survey results:

- Common pipistrelle;
- Soprano pipistrelle;
- Natterer's bat (a species from the *Myotis* genera);
- Daubenton's bat (a species from the *Myotis* genera);
- Unidentified *Myotis* spp.;
- Brown long-eared bat;
- Noctule; and
- Leisler's bat

3.1.2 Of the species / groups recorded four (*Myotis* sp. (including Daubenton's and Natterer's bat) and brown long-eared bat) are considered to be of low collision risk¹², two are considered to be of medium collision risk (common and soprano pipistrelle) but due to their abundance, nationally, the populations of these two species are considered to have a low risk from wind turbines and two of the species recorded are considered to be of high collision risk (noctule and Leisler's bat).

3.1.3 The level of activity within the survey area was considered to be low, for low and medium risk species and very low, for high risk species.

3.2 Desk Study

Designated Sites

3.2.2 In total five statutory designated sites and two non statutory sites were identified within 10 km and 2 km respectively. A table detailing the statutory and non statutory designated sites within 10 km of the proposed Park Spring Wind Farm is included as Appendix 3. None of these sites are designated for bat interest.

Bat Records

3.2.3 No bat records were reported within the survey area; however, 41 roosts were recorded in the 10 km (radius) search area around the survey area.

3.2.4 Of the 41 roosts two were Leisler's bat roosts, ten were unidentified pipistrelle roosts, one was a brown long-eared bat roost and three were Daubenton's bat hibernation roosts and one brown long-eared bat roost. The closest record was a pipistrelle roost

¹² Anon (2012) *Natural England Technical Information Note, Bats and Onshore Wind Turbines, Interim Guidance*.

containing 50 bats approximately 280 m¹³ to the east of the site boundary (over 700 m to the northeast of the nearest proposed turbine location).

3.2.5 Two other species were recorded by the desk study, namely: noctule and Natterer's bat although records also exist for an unidentified Myotis species.

3.2.6 The full list of bat records returned in the desk study is shown in Appendix 4 and Figure 4.

3.3 Tree and Hedgerow Inspections

3.3.1 Ground based tree and hedgerow inspections were undertaken for all trees and hedgerows surrounding the proposed turbine locations. Trees and trees within hedgerows (grouped when uniform standard trees were present) were assessed for their potential to support roosting bats. Species and height were also noted.

3.3.2 None of the hedges surveyed had above low potential to support roosting bats. No roosts were recorded within hedges in the survey area.

3.3.3 Four trees, were classed as having high bat roost potential, seven had moderate potential, four had low potential and twenty-one were classed as having negligible potential to support roosting bats. No trees were identified as confirmed roosts.

3.3.4 One woodland block, adjacent to Park Lane, was classed as having high bat roost potential, with nine small, young woodland blocks classed as having negligible potential to support roosting bats. No woodland blocks were identified as confirmed roosts.

3.3.5 The location and bat roost potential of each tree and hedge is shown on Figure 5, whilst the full inspection results are given in Appendix 5.

3.3.6 The distance between each tree with high potential to support a bat roost and the closest turbine is shown in Table 3.1 (below).

¹³ Although the exact location of the roost is not known, a precautionary approach has been taken whereby this distance is taken using the nearest point of the road which the roost is known to be located on.

Table 3.1 shows the distance between each tree / group of trees with high potential and the closest proposed turbine location.

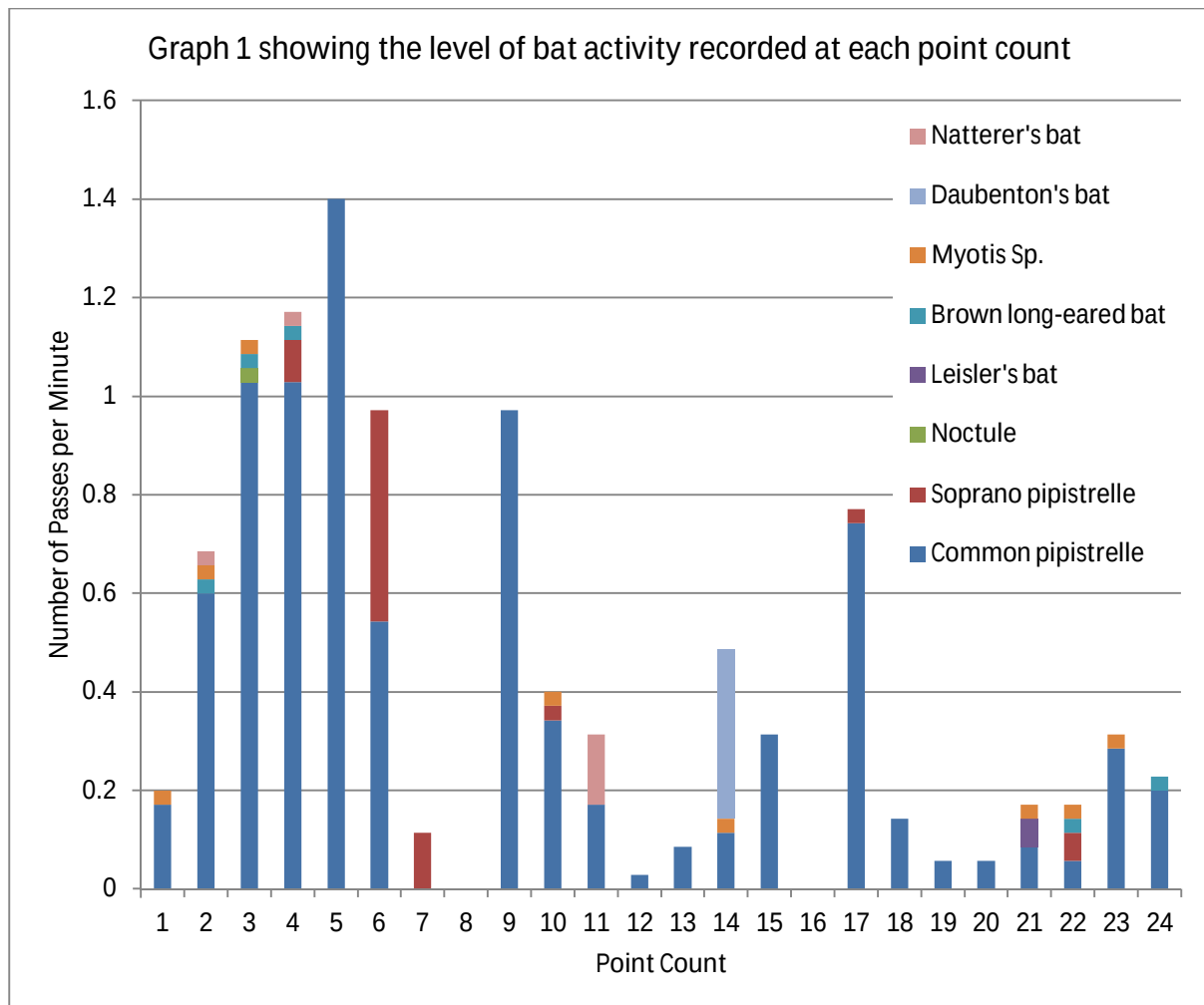
Tree / group of trees with high potential to support roosting bats	Nearest turbine	Separation distance (m)
T16	Turbine 3	135
T25	Turbine 3	166
T30	Turbine 3	233
T35	Turbine 3	570

3.3.7 The majority of bat roost potential for roosting bats within Tree 16 (a willow) lay within its hollow trunk. An inspection using a high powered torch and close focusing binoculars allowed the cavity to be viewed from the ground. Similarly some of the cavities in Tree 25 (an ash) could be inspected using this method. On inspection of both trees no bats or signs of bats were recorded although there is potential for these trees to be used by low numbers of roosting bats at other times of year it is concluded that a large roost would have left visible signs of use and/or emerging bats would be likely to have been picked up on one of the activity transect surveys undertaken. If a large roost was present it is also likely that significant activity would be recorded on the static detector located at turbine T3.

3.4 Transect Surveys

3.4.1 In total of seven bat species (Leisler's bat, noctule, common and soprano pipistrelle, Daubenton's bat, Natterer's bat and brown long-eared bat) were identified at transect point counts, with additional Myotis species passes which couldn't be identified to species level. No additional species were recorded between point count locations.

3.4.2 Detailed results of each transect survey are included in Appendix 6. Transect routes and point count locations are shown on Figure 2.



3.4.3 Graph 1 shows the high level of common pipistrelle activity relative to other species. Bat activity is particularly high at Point Counts (PC) 2 – 6, 9 and 17. Point Counts 2 – 4 are located along the north-western site boundary with Point Counts 5 and 6 located within and adjacent to the area of semi-natural broadleaved woodland. Point Count 9 is located on Chapel Lane, a track on the western edge of the site, rarely used by vehicles.

3.4.4 Of the two point counts at which no bat activity was recorded (PC 8 and 16), PC 8 was located on a boundary between the north of the site and agricultural land beyond, the second PC 16 was located within an arable field near the proposed location of the southernmost turbine.

High Risk Species

3.4.5 The only point count at which a Leisler's bat was recorded was Point Count 21 in July 2011. However a Leisler's bat was also recorded in June between Point Counts 1 and 24. The level of Leisler's activity recorded was too low to confidently identify preferred foraging or commuting habitat within the site.

- 3.4.6 Noctule were only recorded during transect surveys in April 2013 when a single pass at Point Count 3 was recorded. The level of noctule activity was too low to confidently identify preferred foraging or commuting habitat within the site.

Medium Risk Species

- 3.4.7 Common pipistrelle were recorded across much of the survey area although the level of activity wasn't particularly high at any particular point count. Point Counts 1, 11, 7, 8, 12, 13, 14, 16, 18, 19, 20, 21, 22 and 24 recorded lower levels of common pipistrelle activity (each one recording less than 0.2 ppm) than other point counts. The point counts at which lower levels of common pipistrelle activity were recorded were generally located in the centre of the site (near the three proposed turbine locations) or in relatively open habitats (such as Point Counts 7 and 8).

- 3.4.8 Soprano pipistrelle were recorded at just six point counts (PC4, 6, 7, 10, 17 and 22). With the exception of the activity recorded at Point Count 10 all soprano pipistrelle activity was recorded in May 2011 and April 2013. Therefore, while it can be stated that the overall level of use of the site by soprano pipistrelle was low, the level activity recorded was too low to confidently identify preferred foraging habitat within the site.

Low Risk Species

- 3.4.9 Of the low risk species recorded on site brown long-eared bats were recorded at Point Counts 2, 3, 4, 22 and 24 which are located in the north and northwest of the site. The fact that brown long-eared bats were recorded at each of these point counts just once each implies that their use of the site is not extensive even allowing for under-recording due to their quiet call.

- 3.4.10 Myotis species were recorded at 10 point counts (PC1, 2, 3, 4, 10, 11, 14, 21, 22 and 23). Of the Myotis activity recorded most was recorded at Point Count 14 (0.43 ppm) of which the majority (0.4 ppm) was deemed to be due to Daubenton's bat foraging over the adjacent pond.

- 3.4.11 The remaining Myotis activity recorded across the site was very low. A single Myotis species pass was recorded on the south eastern site boundary with the remaining Myotis activity recorded around the north west of the site and northern site boundary. With the exception of the Daubenton's bat activity recorded over the pond at Point Count 14 and three Natterer's bat passes (at PC 2, 4 and 11) none of the remaining Myotis activity could be identified to species level.

3.5 Commuting Route Survey

- 3.5.1 Five commuting route surveys were undertaken around the perimeter of the survey area focusing on areas of adjacent high quality foraging habitat and potential roosts. Figure 3 shows the location of commuting route surveys (CM1 – CM5) with the results of the surveys summarised in Table 3.2 below.

Table 3.2: Commuting Route Survey Results

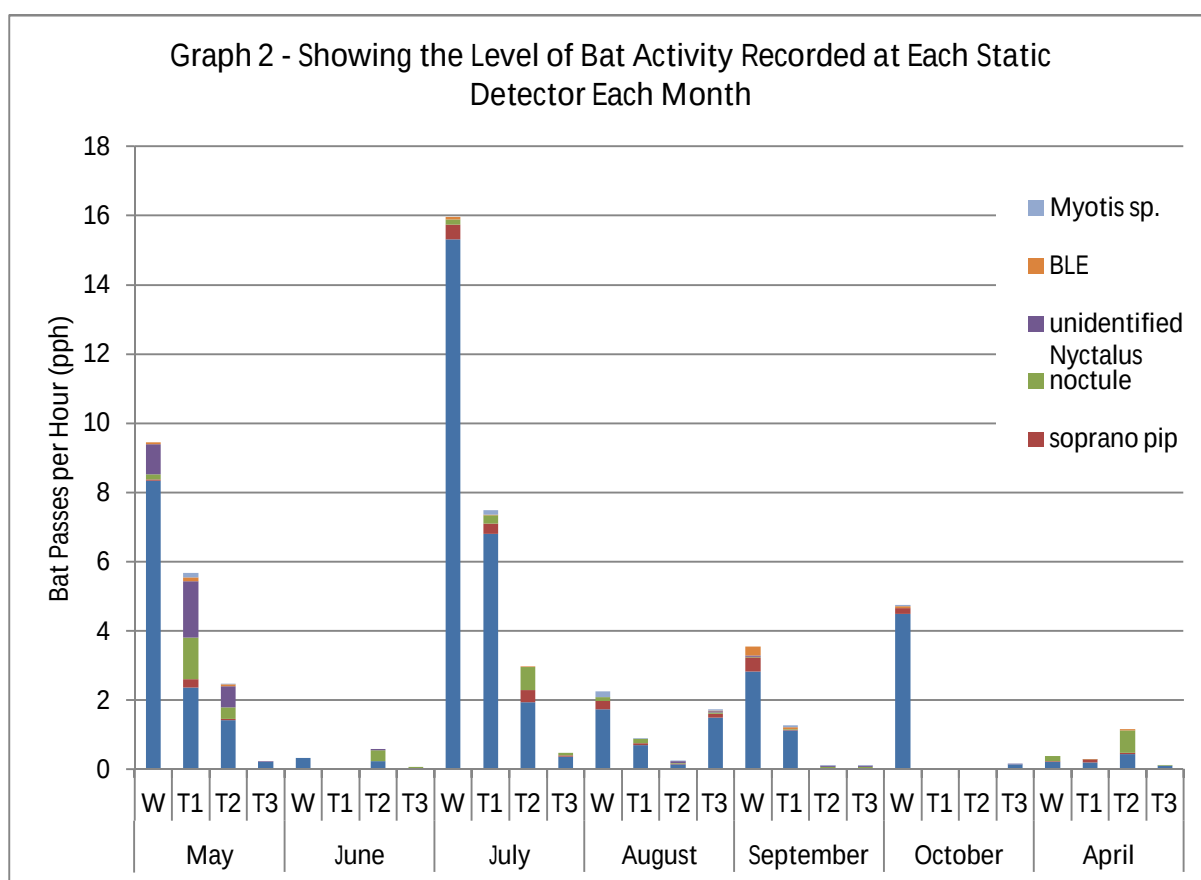
Commuting Point	Survey Date	Start Time	End Time	Start Temp	Weather	Cloud Cover (Octaves)	Wind (Beaufort)	Results
CM1	16 August 2011	20:18	22:45	15.6°C	Dry	3/8	3	Low levels of common and unidentified pipistrelle (most likely also common pipistrelle) recorded.
CM2	16 August 2011	20:18	22:45	15.6°C	Dry	3/8	3	Moderate levels of common pipistrelle recorded commuting east-west and west-east along Park Lane (estimate no more than 10 – 15 individuals). As most bats were initially recorded heading west it is likely that they were roosting in the village of Great Houghton. A single <i>Myotis</i> sp. bat was also recorded but not seen.
CM3	22 August 2011	19:50	22:15	17.4°C	Dry	7/8	3	Low numbers of common pipistrelle recorded commuting from within the site both over the pedestrian footbridge across the road to the south and along the southern site boundary. Low levels of foraging activity and a single <i>Myotis</i> pass also recorded.
CM4	23 August 2011	19:50	22:15	14.7°C	Dry	4/8	0	Very low levels of faint common pipistrelle activity recorded, thought to be bats using the adjacent tree lined lane.
CM5	23 August 2011	19:50	22:15	14.7°C	Dry	4/8	0	Low levels of unidentified pipistrelle activity recorded commuting up and down Chapel Lane.

3.5.2 Overall the level of bat activity recorded was low with most bats recorded identified as common pipistrelle. The commuting route surveys identified one well used, common pipistrelle, commuting route, along the northern site boundary (Park Lane) from Great Houghton. No other commuting route or species were recorded.

3.6 Static Detector Survey

All Species – ground level

- 3.6.2 Four, ground level, static detectors were deployed across the survey area for five nights per month between May and October 2011 inclusive and in April 2012. At least five species of bat were recorded on the ground level static detectors across the site namely: common pipistrelle, soprano pipistrelle, brown long-eared bat, noctule and Myotis sp. (some additional Nyctalus records could not be split between noctule and Leisler's bat).
- 3.6.3 The number of passes recorded per hour for each detector is shown in Graph 2 (below) with the location of each detector shown in Figure 3. The full breakdown showing the number of passes per hour for each species per detector, per month is given in Appendix 7.

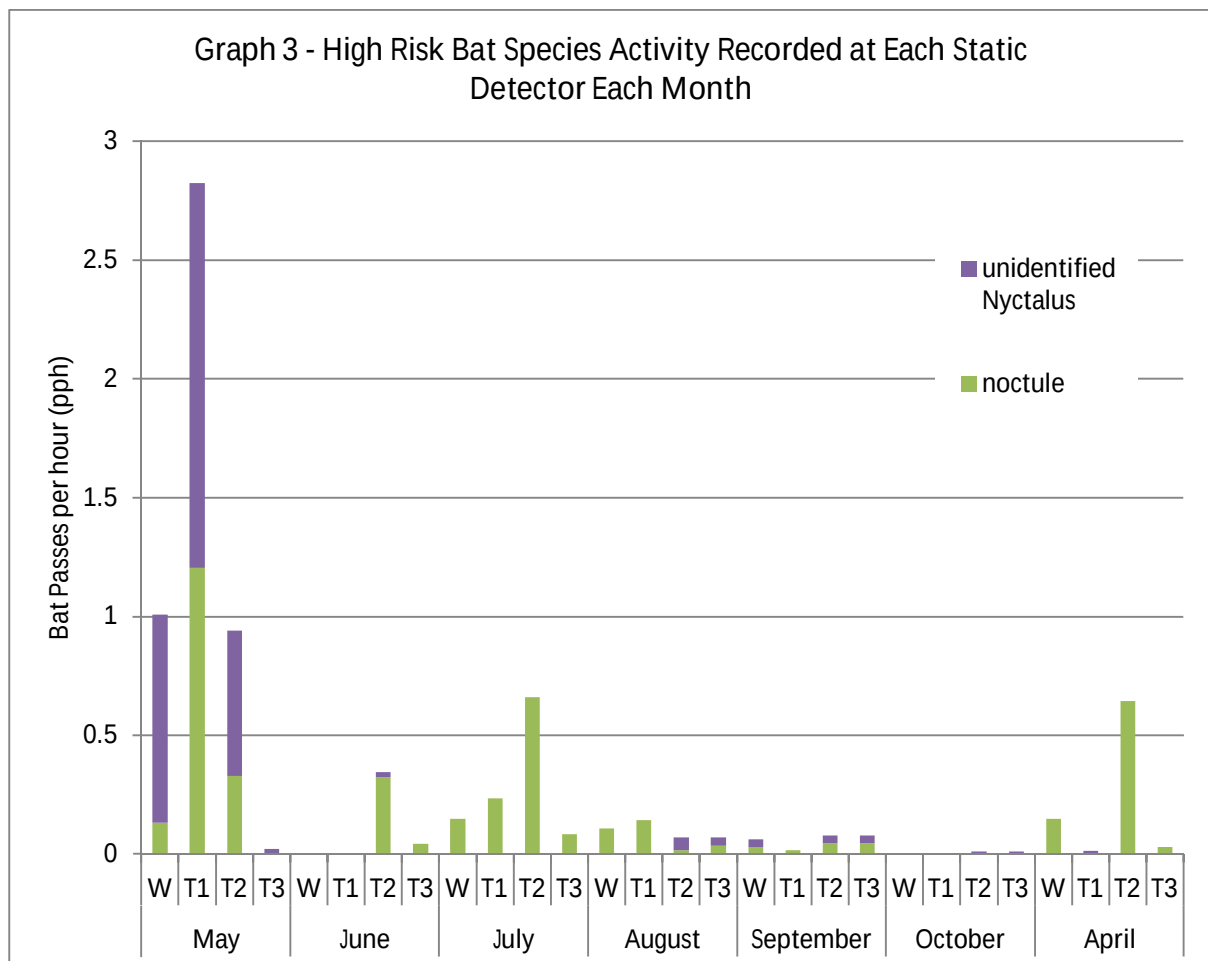


Abbreviations – BLE: brown long-eared bat, pip: pipistrelle.

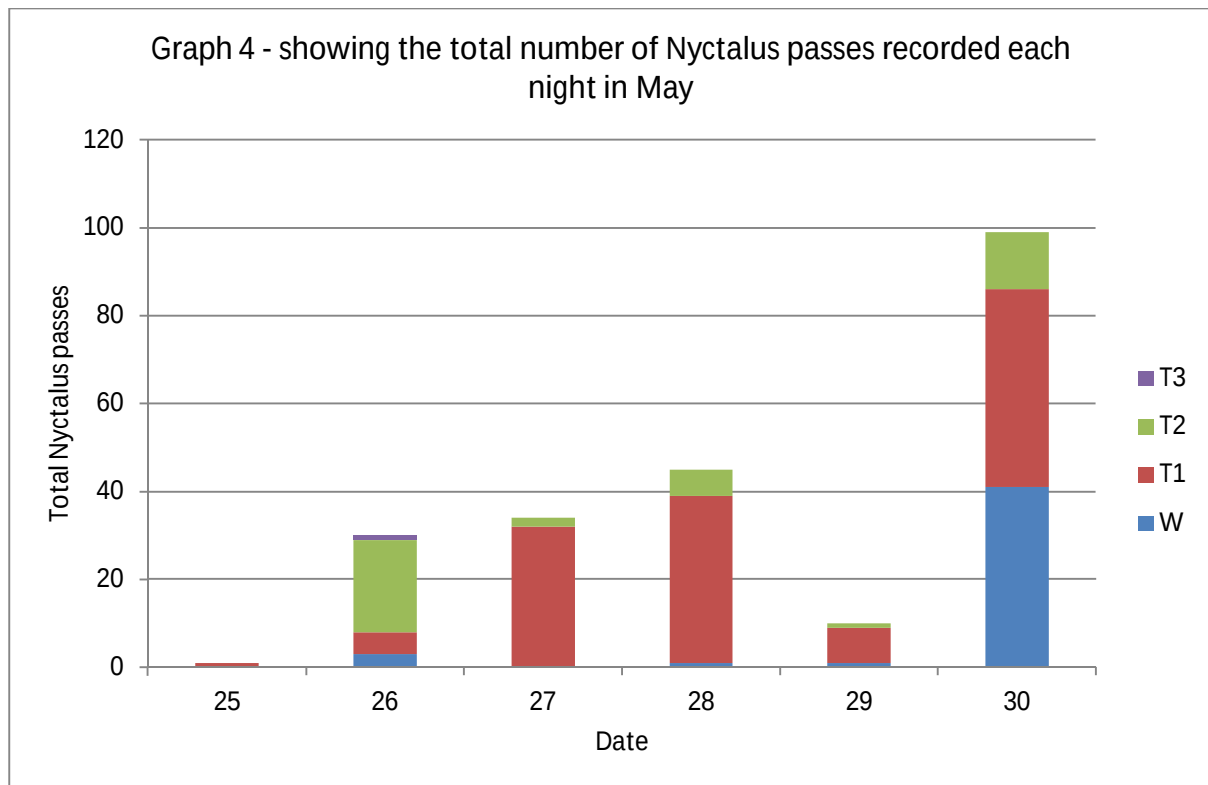
- 3.6.4 Graph 2 shows the average number of passes per hour for each bat species recorded at each static detector location in each month (May – October 2011 and April 2012). Note problems with the detectors W and T1 in June (detailed in the limitations section, Section 2.5.3) mean that the figures shown for these detectors in this month are likely to be under representative of the true level of bat activity.

High risk species

- 3.6.5 As shown in Graph 3 below, noctule and/or Nyctalus calls were recorded in every month sampled. A distinctive peak in May could be representative of a local roost (or roosts) well used during the transitional periods (Spring and Autumn). The fact that there is no corresponding peak in the Autumn results indicates that while this site is sometimes used in the transitional period other, alternative, sites are also likely to be present within the local area.

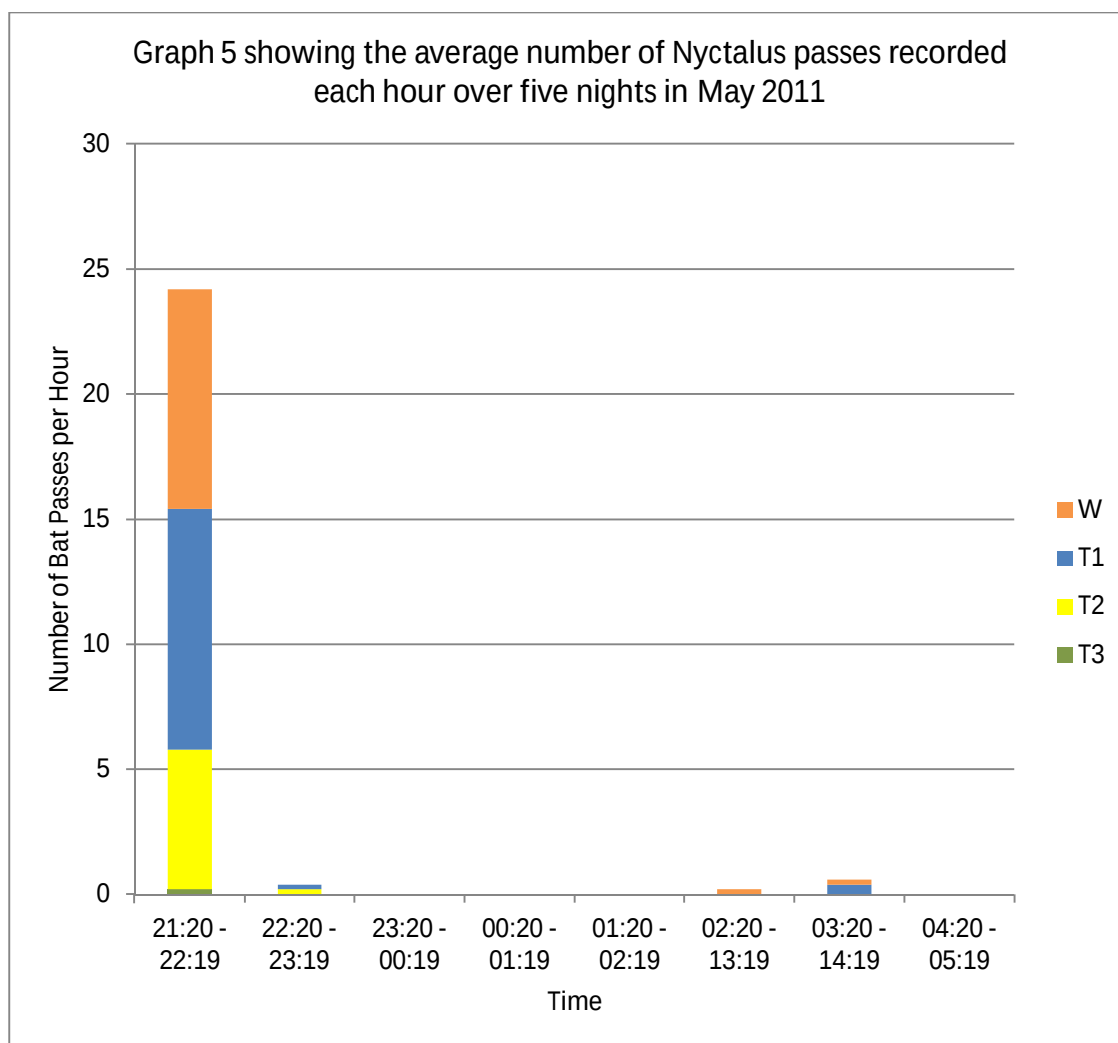


- 3.6.6 Although high levels of noctule and Nyctalus activity were recorded around the potential location of Turbine T1 in May overall the level of Nyctalus activity recorded was not significantly higher at any particular static detector location.
- 3.6.7 Due to the higher level of activity recorded in May the Nyctalus records were scrutinised further. The level of activity recorded within the site was not evenly distributed across the five night recording period; the total number passes recorded each night (during the six night recording period) varied between a single pass in the evening of 25 May and 99 passes on the evening of 30 May.



3.6.8

In addition to the variation in the level of activity between nights (shown in Graph 4 above), the level of activity was not spread evenly across each night. During May almost all (95%) Nyctalus activity recorded within the Park Spring Wind Farm site by static detectors was recorded in the first hour that detectors were active (half an hour before sunset until half an hour after sunset). The hourly level of activity each night is shown in Graph 5 below.



3.6.9 The peak level of activity recorded was a total of 98 Nyctalus passes recorded in a single hour on 30 May between 21:20 and 22:19 (NB on 30 May 2011 sunset was 21:22). Most of the 98 passes were recorded on the detector next to the woodland (43 passes) and the detector next to the proposed location of Turbine T1 (44 passes). This level of activity is indicative of a small number of bats foraging in the area around the two detectors during the first hour of the evening (most passes were a single bat although very occasionally two individuals were identifiable on one file).

3.6.10 This sporadic use of the site by low numbers of Nyctalus bats, particularly around the northern half of the site, is indicative that the site is of local importance to the population of noctule and Leisler's bats within the area.

Medium Risk Species

Common pipistrelle

3.6.11 Common pipistrelle was the most numerous species recorded by the static detectors within the site with an average of 1.48 passes per hour (pph). Across the active season most activity was recorded in July (4.9 pph), followed by May (2.5pph) dropping off for the remaining months April (1.0 pph), August (0.8 pph) September

(0.8 pph) and October (0.9 pph). The level recorded in June (0.1 pph) is not considered accurate due to the diminished length of time that the static detectors placed next to the wood and at the proposed location of Turbine T1 recorded for.

- 3.6.12 The level of activity was not evenly distributed across the static detectors with significantly more activity recorded on the static detector located adjacent to the wood than those detectors located at potential turbine locations (T1 – T3) (P 0.019).

Soprano pipistrelle

- 3.6.13 Very little soprano pipistrelle activity was recorded within the Park Spring site (0.08 pph). No seasonal trend was indicated by the data with soprano pipistrelle recorded most in July (0.2 pph) followed by April (0.1 pph). The data from other months (May, June, August, September and October) represents less than one pass every ten hours (<0.1 pph).

- 3.6.14 Although the number of passes recorded was low the static detector located adjacent to the wood recorded significantly higher levels of activity than detectors located at the proposed turbine locations (P 0.047).

Low Risk Species

- 3.6.15 Brown long-eared bat calls were recorded on all four static detectors. The detector located adjacent to the wood recorded most calls (0.8 pph) followed by the detector located at T1 (0.01 pph), the detector at T2 (0.009 pph) and then the detector at T3 (0.003 pph). The difference in the level of activity recorded was not statistically significant, most likely due to the low number of calls recorded at each location which in turn is likely to be due to the quieter call used by brown long-eared bats.

- 3.6.16 Although *Myotis* species were recorded on all four detectors the level of activity recorded was very low (0.02 pph). The detector adjacent to the wood recorded higher levels of activity (0.08 pph) than the other three detectors (T1 0.01pph; T2 0.009pph; T3 0.003pph) but the difference in the level of activity was not statistically significant.

3.7 Static Detector Survey at Height

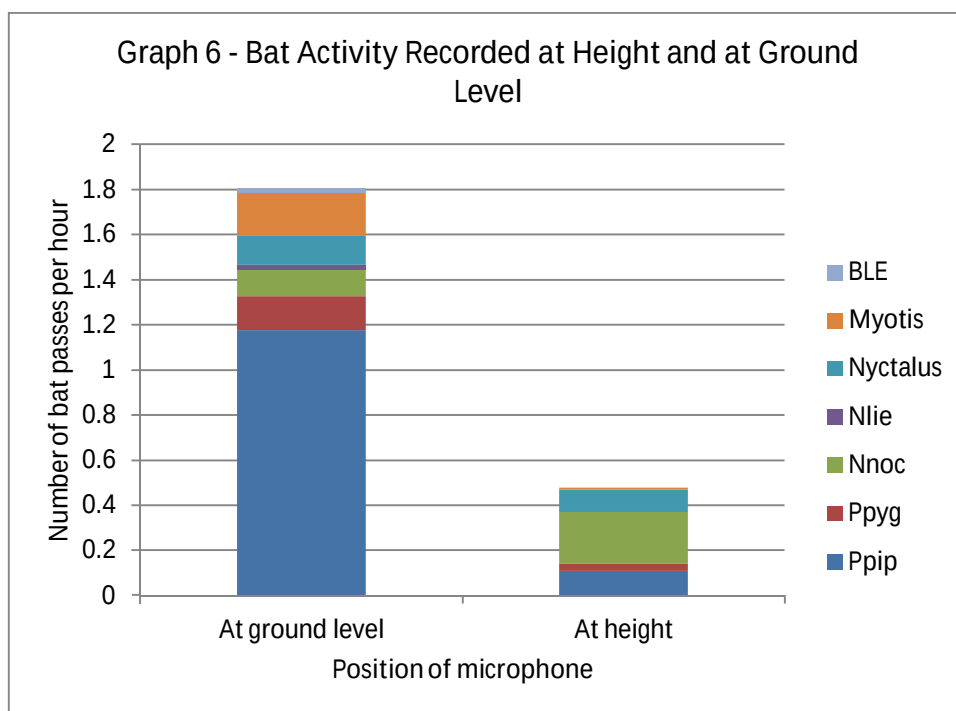
3.7.1 An SM2 detector was used to monitor bats at height (50 m) and at ground level (5 m) for a total of 100.2 hours across the months of April, July and September 2012.

All species

3.7.2 A total of 229 passes from six species/groups were recorded, namely: common pipistrelle; soprano pipistrelle; brown long-eared bat; noctule; Leisler's bat and Myotis species. As with the ground level recordings the Myotis species were not separated to species level and some Nyctalus records could not be split between noctule and Leisler's bat.

3.7.3 In total 21% of passes (0.48 pph) were recorded on the microphone placed at height and 79% of passes (1.81 pph) were recorded on the ground level microphone. The Chi Square Goodness of Fit (One Sample) Test showed that the level of activity was significantly higher at ground level and significantly lower than the null hypothesis.

3.7.4 The number of passes per hour recorded on the microphone at height and at ground level is shown in Graph 6 below and in Appendix 8.



High risk species

3.7.5 Higher levels of noctule activity were recorded at height (0.23 pph) than at ground level (0.12 pph) although the Chi Square Goodness of Fit (One Sample) Test showed that this difference in the level of activity was not significantly different from the null hypothesis (P 0.1). The spread of the data was too great, given the number of passes recorded, to produce a significant result.

3.7.6 In total just two typical Leisler's bat calls were recorded at ground level equating to 0.02 pph; no typical Leisler's bat calls were recorded at height although a number of Nyctalus calls were recorded both at ground level and at height. Excluding unidentified Nyctalus calls the level of Leisler's bat activity recorded was not significantly different from the null hypothesis (P 0.1).

3.7.7 Combining all Nyctalus species records does not result in a significant difference in the level of bat activity recorded at height or ground level from the null hypothesis (P 0.1).

Medium risk species

3.7.8 Common pipistrelle were the most recorded species on the meteorological mast mounted SM2 detectors with an average of 0.64 pph recorded across both microphones. The level of activity was substantially higher at ground level (1.18 pph) than at height (0.11 pph); this was found to be significantly different from the null hypothesis (P < 0.001).

3.7.9 Soprano pipistrelle were recorded just 18 times by the static detectors (an average of just 0.09 pph). Even so the level of activity was significantly greater at ground level (1.18 pph) than that recorded at height (0.03 pph) (P 0.01).

Low risk species

3.7.10 The majority of Myotis species passes were recorded at ground level (0.19 pph), although a very small proportion (0.001 pph representing a total of two passes) were recorded at height. The difference in the proportion of activity recorded at height when compared to that recorded at ground level and at height was significantly different to the proposed null hypothesis.

3.7.11 Although no brown long-eared bat activity was recorded at height the total level of activity recorded on the ground level detector (0.02 pph) was too low to differ significantly from the null hypothesis (P 0.1).

3.8 2013 Vantage Point Survey

3.8.1 Across the two vantage point surveys, at T1 and T2 turbine locations, a relatively low level of activity was recorded.

3.8.2 Species recorded during the vantage point surveys include common and soprano pipistrelles, Myotis species and noctule.

High Risk

3.8.3 Low levels of Nyctalus bat activity were recorded; just two passes recorded at the T1 location in April 2013, neither of which were seen. Above turbine T2 three Nyctalus passes were recorded however two of these were located in the same area just 1 minute apart are likely to have been the same bat. In addition the Nyctalus passes at T2 and T1 in April 2013 were recorded at the same time making it likely that both surveyors were recording the same bat. Therefore in April 2013 it is likely that the five Nyctalus registrations made by the two surveyors represented a bat within the survey area on just two occasions.

3.8.4 The May vantage point survey recorded a Nyctalus bat above T1 on just one occasion and no Nyctalus above turbine T2.

- 3.8.5 The vantage point surveys recorded *Nyctalus* species flying across open areas near proposed turbine locations, at heights of approximately 15-20 meters.
- Medium Risk
- 3.8.6 The majority of bat passes recorded during the survey were common and soprano pipistrelle. Individual bats were recorded at approximately 2 m above ground level using the scrub areas and hedges as commuting routes around the field boundaries where turbines are to be located.
- Low risk
- 3.8.7 Very low *Myotis* activity levels (just four records) were recorded on site, and no visual recordings of their flight paths of heights were made during the vantage point surveys.

SECTION 4

DISCUSSION

4 DISCUSSION

4.1 Status of Species Recorded

- 4.1.1 Of the bat species/groups recorded during the surveys *Myotis* sp. and brown long-eared bats are considered to be at “low risk” of collision with wind turbines due to their generally low flight patterns usually close to vegetation and away from areas in which turbines are usually sited. Common and soprano pipistrelle are considered to be at medium risk of collision although due to their larger population sizes (comparative to other bat species) wind turbines are considered to present a low risk to populations of these species. The two remaining species, noctule and Leisler's bat are considered to have a high risk of collision with wind turbines and due to their relative rarity, the risk to populations of these species is also considered to be high.

Table 4.1 shows the published status of bats, both in the Barnsley area and nationally

Species	Status and Distribution	
	Status within the Barnsley Area ¹⁴	Status Nationally ¹⁵
Common pipistrelle	common and widespread	common
Soprano pipistrelle	no data	common
Brown long-eared bat	common with a restricted distribution	common
Daubenton's bat	common and widespread	common
Natterer's bat	common with a restricted distribution	fairly common
Whiskered bat	scarce	locally distributed
Brandt's bat	no data	common in the north and west of England rare or absent in the south and east
Noctule	scarce	uncommon
Leisler's bat	rare	scarce

- 4.1.2 Although whiskered bat and Brandt's bat were not specifically recorded within the Park Spring Wind Farm site a proportion of the *Myotis* calls which weren't determined to species level may have been either of these species.

- 4.1.3 As Table 4.1 above shows many of the bat species recorded within the site have a more restricted range or are less abundant in the Barnsley area than at a national level. This is likely to be due to the relatively high proportion of urban and suburban habitat present within this area which restricts the range of woodland specialists such as Natterer's bat and brown long-eared bat and bats which require open fields and

¹⁴ Carr G. and Parker M. (2009) *Barnsley Biodiversity Action Plan 2008 – 2012*. Barnsley Biodiversity Trust

¹⁵ Taken from Mitchell-Jones T. & Carlin C. (February 2012) Natural England Technical Information Note TIN051, Bats and Onshore Wind Turbines *Interim guidance*. Natural England.

rivers for foraging such as noctule and Leisler's bat. Therefore, although the presence of such areas of habitat are of value locally, as none of the species recorded within the Park Spring Wind Farm site were on the edge of their natural range, where suitable, rural, habitat is present it is likely that the distribution of these species is more accurately reflected by the national status and distribution rather than that within Barnsley borough.

4.2 Roosts

4.2.1 No bat roosts were recorded within the site. No buildings with potential to be used by roosting bats exist within the site and although the wood on the north-eastern site boundary and four trees have high potential to be used by roosting bats they are all more than 50 m from the nearest turbine; with the exception of Trees 16 and 25 they are all more than 200 m from the nearest turbine.

4.2.2 Current best practise guidance¹⁶ states "although it is not essential... to locate roosts of individual or low numbers of bats, sites with evidence of roosting by medium or high-risk species and/or roosts of district importance and above... that use the site may require additional surveys".

4.2.3 Trees 16 and 25 have the potential to be used by low numbers of bats at certain times of the year but it is considered likely that a significant roost would have been picked up either by the inspection of the cavity (from the ground), by the transect surveys or by increased levels of activity on static detector T2. Therefore, no further survey was deemed necessary to conclude that the favourable conservation status of the local bat population was extremely unlikely to be detrimentally affected by the occasional presence of low numbers of roosting bats within either T16 or T25 if the proposed wind farm became operational.

4.2.4 The installation of the turbines is likely to require the widening or creation of access tracks within the site. The current access track layout has been designed to avoid all trees with moderate or high potential to support roosting bats and therefore the installation can proceed without the need for further emergence and dawn survey. Should the layout change so that trees with moderate or high potential to be used by roosting bats are affected the need for further emergence and dawn survey and potentially a European Protected Species Licence would need to be considered.

4.3 Foraging and Commuting

High risk species

4.3.2 During the transect and commuting point surveys the level of activity from high risk bat species recorded was low; the level of activity recorded during on the static detectors was low across most of the survey nights but moderate levels of bat activity were recorded during the first hour of recording on 30 May 2011. The data shows that it is likely that on that occasion a low number of bats were using the area adjacent to the woodland and the area around T1 for foraging almost constantly for just under an hour.

4.3.3 The level of activity recorded on 30 May 2011 was higher than the average level expected for a rural site in lowland England. However, given that the number of bats recorded at any one time was just one or two individuals (during all surveys including dedicated vantage point surveys in these areas), which is in line with that expected

¹⁶ Hundt L. (2012) *Bat Surveys: Good Practice Guidelines, 2nd edition*. Bat Conservation Trust.

across the site, it is considered likely that bats which would usually forage over or commute across the site, remained in the area, perhaps to take advantage of a higher than usual concentration of insect prey (potentially linked to the emergence of the imago (adult) of a specific insect species).

- 4.3.4 Sporadic (potentially annual) peaks in the level of *Nyctalus* bat activity at a particular location are considered to be a moderate risk to low numbers of bats for a short duration. This could have a low impact on the local population but, due to the short duration and sporadic nature of the spike in activity levels, the risk posed to *Nyctalus* species would be unlikely to have an impact at a level any higher than this.

Moderate risk species

- 4.3.5 A common pipistrelle commuting route along the north-eastern boundary of the site was well used during the commuting route surveys. Away from woodland edge, hedges, the northern site boundary and tree lines the level of pipistrelle activity was low. Furthermore it was shown that the level of activity recorded at height was significantly lower than the level of activity recorded at ground level. This indicates that the proposed operation of the three turbines, in their current positions (shown in Figure 1), is unlikely to impact on the use of the site by foraging low and moderate risk species.

Low risk species

- 4.3.6 While the level of activity from low-risk species (*Myotis* species and brown long-eared bats) was as expected, for a rural site in South Yorkshire. Very little activity was recorded away from linear features or the pond in the east of the site (which is over 500 m from the nearest turbine location). Furthermore, very little low risk species activity was recorded at height, making the operation of the three proposed turbines in their current locations (shown in Figure 1) is very unlikely to impact on low risk species within the Park Spring Wind Farm site.

4.4 Conclusion

- 4.4.1 The surveys show that the operational risk to low and moderate risk species is low due to the way in which these species use the site; with bats generally keeping to traditionally used foraging habitat and foraging less often at height. The survey results show that the high risk *Nyctalus* group occasionally forages intensively in areas in which could put it at risk of collision or barotrauma. This intensive *Nyctalus* activity was only recorded for a single hour in over 35 nights of static detector recording.

4.5 Recommendations

- 4.5.1 It is recommended that turbines are sited to ensure a minimum of 50 m is maintained between the tip of the turbine blade and the nearest feature likely to be regularly used by foraging bats (plantation woodland block, tree, hedge line, river or pond) or known commuting route. The required stand-off buffer, at the time of survey, is shown in Figure 5.
- 4.5.2 Care should be taken to maintain the recommended stand-off distances during the micro-siting of the turbines. Over the 25 year operation of the turbines, trees and hedges surrounding turbine locations should be managed to ensure a minimum distance of 50 m is maintained between the tip of the turbine blade and the nearest part of the tree or hedge.

- 4.5.3 Enhancements in areas at least 200 m away from proposed turbines should be considered. Hedgerows should be planted or “gapped up” to enhance the connectivity along the north-eastern edge of the site between a large swathe of woodland to the north and the golf course to the south, both of which offer areas of high-quality foraging habitat. The management of arable field margins for wildlife, by the planting of strips sown with wild flower mixes or by the inclusion of beetle banks to enhance the quality of the cropped agricultural land for invertebrates and therefore foraging bats is also recommended. Proposed locations for enhancements are shown on Figure 6.
- 4.5.4 Monitoring of bat activity levels around the hub of each turbine should be undertaken for five consecutive nights per month (within the first two years of operation) using static detectors. High bat activity levels recorded at height while the turbine is operational should be flagged up and any correlations with weather conditions recorded. Assuming each turbine is operational during periods of high activity (and the pattern of operation is not changed to prevent this), The threshold for the requirement to implement further mitigation should be agreed with the Local Ecologist and Natural England.
- 4.5.5 To ensure the maintenance of the favourable conservation status of all species of bat it is recommended that the monitoring described above dictates the requirement for further, specific, monitoring and mitigation measures (e.g. mortality monitoring using trained dogs and / or operational cut-ins for individual turbines in certain conditions). If required, additional monitoring and mitigation would ensure that significant adverse effects are prevented. Specific details of additional mitigation measures would be developed in consultation with Natural England and the Barnsley Metropolitan Borough Council Ecologist.

SECTION 5

APPENDICES

5 APPENDICES**5.1 Appendix 1 – Summary of Legislation and Guidance for Notable and Protected Species and Habitats in the UK****Introduction**

The following Appendix sets out details of legislation within the UK and how this legislation applies to particular species groups. The key pieces of international and national legislation are described after which specific legislation pertaining to species or species groups are described in turn.

International and national legislation**EC Habitats Directive**

In 1992 the then European Community adopted Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora, known as the Habitats Directive. The main aim of the EC Habitats Directive is to promote the maintenance of biodiversity by requiring member states to introduce protection for these habitats and species of European importance. The mechanism for protection is through designation of Special Areas of Conservation (SACs), both for habitats and for certain species listed within Annex II. There are a number of species listed within Annex II of the Habitats Directive that are present within the UK; these include four lower plant species, nine higher plant species, six species of molluscs, six species of arthropods, eight species of fish, two species of amphibian, and nine species of mammal.

The Bern Convention

The Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention) came into force in 1982. The principal aims of the Convention are to ensure conservation and protection of wild plant and animal species and their natural habitats (listed in Appendices I and II of the Convention), to increase cooperation between contracting parties, and to regulate the exploitation of those species (including migratory species) listed in Appendix 3. To this end the Convention imposes legal obligations on contracting parties, protecting over 500 wild plant species and more than 1000 wild animal species.

Bonn Convention

The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention or CMS) was adopted in Bonn, Germany in 1979 and came into force in 1985. Contracting Parties work together to conserve migratory species and their habitats by providing strict protection for endangered migratory species (listed in Appendix 1 of the Convention), concluding multilateral agreements for the conservation and management of migratory species which require or would benefit from international cooperation (listed in Appendix 2 of the Convention), and by undertaking co-operative research activities.

Convention on Biological Diversity

The Convention on Biological Diversity (Biodiversity Convention or CBD) was adopted at the Earth Summit in Rio de Janeiro, and entered into force in December 1993. It was the first treaty to provide a legal framework for biodiversity conservation. Contracting Parties are required to create and enforce national strategies and action plans to conserve, protect and enhance biological diversity.

Wildlife and Countryside Act 1981 (as amended)

The Wildlife and Countryside Act 1981 (as amended) is the principle mechanism for the legislative protection of wildlife in Great Britain. However it does not extend to Northern Ireland, the Channel Islands or the Isle of Man. This legislation is the means by which the Convention on the Conservation of European Wildlife and Natural Habitats (the 'Bern Convention') and the European Union Directives on the Conservation of Wild Birds (79/409/EEC) and Natural Habitats and Wild Fauna and Flora (92/43/EEC) are implemented in Great Britain.

Conservation of Habitats and Species Regulations 2010 (as amended)

In the UK the Council Directive 92/43/EEC has been transposed into national laws by means of the Conservation (Natural Habitats, & c.) Regulations 1994 (as amended), and the Regulations (Northern Ireland) 1995 (as amended). The Regulations came into force on 30 October 1994, and have been amended several times. Subsequently the Conservation of Habitats and Species Regulations 2010 (as amended) was created which consolidates all the various amendments made to the 1994 Regulations in respect of England and Wales and is commonly known as the 'the Habitats Regulations'. In Scotland the Habitats Directive is transposed through a combination of the Habitats Regulations 2010 (in relation to reserved matters) and the 1994 Regulations. The Conservation (Natural Habitats, &c) Regulations (Northern Ireland) 1995 (as amended) transpose the Habitats Directive in relation to Northern Ireland.

The Regulations contain five Parts and four Schedules, and provide for the designation and protection of 'European sites', the protection of 'European protected species', and the adaptation of planning and other controls for the protection of European Sites.

Wild Mammals (Protection) Act 1996

The Act protects wild mammals from malicious or intentional harm.

Species and Habitat Specific Legislation**Mammals**

All wild mammals are protected under the Wild Mammals (Protection) Act 1996 from certain cruel acts; and for connected purposes. It is an offence to mutilate, kick, beat, nail, or otherwise inflict unnecessary suffering on any wild mammal.

Bats

All native UK bat species are fully protected by UK law under Schedule 5 and 6 of the Wildlife and Countryside Act (1981, as amended), and under Schedule 2 of the Conservation of Habitats and Species Regulations 2010 (as amended). It is illegal to deliberately capture, injure or kill a bat or to intentionally or recklessly disturb bats. It is also illegal to damage, destroy or intentionally or recklessly obstruct access to a breeding or resting place used by a bat.

Any activity that would result in a contravention of the above legislation would likely require an EPS licence from the relevant statutory body (NE, CCW or SNH). Works or mitigation activities involving interference with bats or bat shelters must be carried out by a licensed bat worker.

Hedgerows

The Hedgerows Regulations (1997) make provision for the protection of important hedgerows in England and Wales. The regulations affect hedgerows which are 20m or more in length, or connected at both ends to another hedgerow of any length.

They relate to hedgerows which are on, or adjoining land used for the following purposes: agriculture or forestry; the breeding or keeping of horses, ponies or donkeys; common land; village greens; Sites of Special Scientific Interest (which include all terrestrial SACs, NNRs, and SPAs) and Local Nature Reserves. They do not include hedges that is attached to, or marking the boundaries of a private house.

It is an offence to intentionally or recklessly remove or cause or permit another person to remove a hedgerow or intentionally or recklessly remove, or cause or permit another person to remove, a hedgerow which is the subject of a hedgerow retention notice.

Tree Preservation Order (TPO)

Part VIII of the Town and Country Planning Act (1990) and the Town and Country Planning (Trees) Regulations (1999) allows tree preservation orders (TPO) to be made by a Local Planning Authority in respect of trees or woodlands. This prohibits the cutting down, uprooting, topping, lopping, wilful damage, or wilful destruction of a preserved tree. Any tree is eligible for protection, regardless of age, species or size, no trees are automatically protected.

Tree Felling

Up to 5m³ of standing timber can be felled per quarter without requirement for a felling licence provided that no more than 2m³ is sold. There are a number of exemptions, refer to the Forestry Authority Website.

General Guidance on European Protected Species Licence Applications

Should a European Protected Species (EPS) be found on a development site, and where best practice guidance either cannot be followed or is not applicable an EPS licence will be required. The licence permits operations that fall outside the Good Practice Guidance an application for such a licence should be made to the relevant statutory body (NE, CCW or SNH) before any works can proceed. It is also possible to obtain a general licence that may cover an area rather than applying in each individual case for a separate specific/individual licence

Should the survey information be considered insufficient or the statutory body is not satisfied with the application, the licence application may be refused. This could potentially result in significant delays to a project, if not considered in time; however, early consideration of the potential presence of EPS on a site and an assessment of suitable mitigation measures to derogate such possibilities early in a project will negate this potential delay.

5.2 **Appendix 2 - Assessment of potential to support roosting bats – Grading System for Trees**

It should be noted that the grading system below applied at the time of survey may not necessarily reflect the condition of the tree at a later date. Should the physical characteristics of the tree change (due, for example, to storm damage or lightning strike) the category of the tree may need to be revised.

Category (Potential value)	Description
Negligible value	Trees without ivy or loose bark and cracks / fissures. Usually young or occasionally semi-mature specimens with small girth. Likely to be relatively isolated from suitable foraging habitat or commuting features. May be in well lit areas.
Low value	Trees with small amounts of ivy or some loose bark but no obvious cracks or fissures. Trees will usually be young or semi-mature.
Moderate value	Trees with some cracks and fissures (of usable depth) and /or large amounts of ivy / loose bark. Usually semi-mature or mature specimens. Trees tend not to have large splits, hollow trunks or woodpecker holes for example. If present suitable features are likely to be low level or shallower than those in trees with high potential.
High value	Usually mature or veteran trees with woodpecker holes / deep cracks and /or crevices. Often with a hollow trunk. May support dense ivy.
Confirmed roost	Bats discovered roosting within the tree, or recorded emerging from / entering the tree at dusk and / or dawn. Tree found to contain conclusive evidence of occupation by bats, such as bat droppings within a potential roost feature. A confirmed record (as supplied by an established source such as the local bat group) would also apply to this category.

5.3 Appendix 3 - Statutory and non-statutory sites within 10 km and 2 km of the survey area respectively

Site Name	Status	Distance and Direction from Central Grid Reference	Reason for Designation
Carlton Main Brickworks	Site of Special Scientific Interest (SSSI)	625m north	The special interests are within the Coal Measures strata. They include one of the best available exposures of the Top Marine Band.
Stairfoot Brickworks	Site of Special Scientific Interest (SSSI)	4,000m south west	The site contains exposures of the Aegiranum Marine Band which marks the Duckmantian-Bolsovia stage boundary of the Westphalian Series. The site provides the best available exposure of the Aegiranum Marine Band within the Pennine basin as well as the best available exposure of the ammonoid bearing part of the marine band in the world.
Bilham Sand Pits	Site of Special Scientific Interest (SSSI)	6,470m east	A section through the basal Permian sand and overlying limestones of the Cadeby formation. It is one of very few sites in this part of the Zechstein Basin showing the basal Magnesium Limestone overlying non-marine Permian sediments.
South Elmsall Quarry	Site of Special Scientific Interest (SSSI)	7,890m north east	The quarry shows the rocks of the Wetherby Member of the Zechstein Cadeby Formation. It is the best-exposed and most complete example of this type of reef making it unique among the British Marine Permian rocks
Denaby Igns	Site of Special Scientific Interest (SSSI)	9,295m south east	The site recalls the mosaic of open water, reed swamp and neutral grasslands making it one of the most diverse wetlands in the county. The site is notable for breeding, passage and wintering bird communities, as well as extensive invertebrates and plant communities.
Edderthorpe Igns	Local Wildlife Site (LWS)	77m west	Edderthorpe Igns is a site containing open water habitats, inundation grassland, wet woodland and shoreline habitats. The site supports a diversity of bird species. Species of note are those associated with wet lowland grasslands including redshank, snipe and lapwing.
West Haigh Wood	Local Nature Reserve / Local Wildlife Site (LWS)	657m north east	West Haigh wood is ancient woodland (in existence since 1600). Habitats on site include mixed deciduous woodland dominated with oak (<i>Quercus robur</i>). Archaeological features within the woodland include abandoned Victorian ponds.

5.4 Appendix 4 – Bat records found within 10km of the survey area

Grid Ref	Recorder	Year	Address/Location	Record type	Species	number
SE321 1	English Nature	2005	Wind Hill Avenue, Staincross	Roost		
SE320 5	English Nature	2004	Farow Close, Dodworth			
SE320 7	English Nature	2003	Oakworth Close, Barnsley	roost	Leisler's	
SE320 0	Natural England	2008	Hermit's Hill, Wortley	roost	Pipistrelle	
SE320 0	Natural England	2007	Hermit's Hill, Wortley			
SE330 6	English Nature	2003	Dodworth Road, Barnsley			
SE330 7	English Nature	2003	Gowber Road, Barnsley			
SE330 7	English Nature	2003	Barnsley			2
SE330 7	English Nature	2005	West Bourne Grove		Leisler's	
SE331 0	English Nature	2003	Charles Street, Carcroft			
SE330 7	English Nature	2005	Bond Road, Barnsley	roost	Leisler's	
SK339 5	English Nature	2003	MacKenzie Crescent, Burncross	Roost		4
SE340 6	English Nature	2003	Sackville Street, Barnsley			
SE340 6	English Nature	2003	Hopwood Street, Barnsley			
SE340 0	English Nature	2003	West Wood New Rd, Tankersley			
SK349 6	English Nature	2004	Charlton Drive, High Green	Roost		
SK349 6	English Nature	2004	Meadow Drive, Burncross		Pipistrelle	
SK349 6	English Nature	2003	Reaper Crescent, High Greave			
SE340 0	Natural England	2008	Walker Road, Tankersley			
SK349 5	Natural England	2008	Burncross			
SE340 1	English Nature	2006	Sheffield Road, Birdwell	Roost	Pipistrelle	
SK349	English	2006	MerbeckCrive, High		Pipistrelle	

Grid Ref	Recorder	Year	Address/Location	Record type	Species	number
8	Nature		Green			
SK3497	English Nature	2006	Cart Road, Chapeltown			
SE3403	Natural England	2010	Worsborough Mill		Pipistrelle	2
SE3506	English Nature	2005	Alarket Place, Barnsley	Roost	Pipistrelle	
SE3508	English Nature	2004	Ryecroft, Barnsley			
SE3500	English Nature	2005	Carr Lane, Tankersley	Roost	Pipistrelle	
SE3511	English Nature	2005	Buckingham Way Royston	Roost		
SE3507	Natural England	2008	Tredis Close, Barnsley	Roost	Pipistrelle	
SE3503	SYBG	2009	Button Mill Inn,		Common pipistrelle	44
SE3908	English Nature	2004	Sunnybank Drive, Cudworth	Roost		
SE3908	English Nature	2003	Sunnybank Drive, Cudworth			
SE4009	English Nature	2005	Greenbank Walk, Grimethorpe	roost	Pipistrelle	
SE4003	English Nature	2005	Alder Grove, Darfield			
SE4109	Natural England	2008	High Street, Grimethorpe			
SE4111	English Nature	2005	Common Road, Brierley	Roost		
SE4106	Natural England	2008	Nannmire Road, Darfield			
SE4109	Natural England	2008	High Street, Grimethorpe			
SE4101		2009	Cliffe Road		Noctule	
SE4101		2002	Cliffe Road		Pipistrelle	3
SE4101		2004	Cliffe Road			4
SE4101		2006	Cliffe Road			
SE4104	English Nature	2005	Ridgeway Avenue, Darfield			
SE410	English	2006	Giles Wood Crescent,			

Grid Ref	Recorder	Year	Address/Location	Record type	Species	number
0	Nature		Brampton			
SK4198	Natural England	2007	Hoover			
SE4104	Natural England	2007	Nannymire Road, Darfield		Pipistrelle	
SE4204	English Nature	2003	Middlewood Hall, Darfield			
SE4204	English Nature	2003	Attlee Crescent, Darfield			
SE4203	English Nature	2004	Commercial Road, Goldthorpe			
SE4207	English Nature	2005	Crabtree Drive, Barnsley	roost	Pipistrelle	50
SE4300	English Nature	2005	West Street, Wath-Upon-Deane	Roost		
SE4300	English Nature	2004	Stump Cross Road, Wath			
SE4301	English Nature	2003	Brook Farm Mews, Wath	Roost		
SE4300	English Nature	2005	Woodside Avenue, Wath	roost	Pipistrelle	
SK4397	English Nature	2003	Redmarsh Avenue, Rawmarsh			
SK4399	English Nature	2005	Flintway, Wath			
SE4300	Nick Bonsall	2008	Fitzwilliam Street, Wath	Roost		
SK4397	Natural England	2008	Hague Avenue, Rawmarsh	Roost		60
SK4397	Bob Croxton	2004	Birch Wood, Rawmarsh		Pipistrelle	12
SK4397	RMBC	2007	Victoria Park, Rawmarsh		Pipistrelle	15
SK4396		2006	Rawmarsh Methodist Church			43
SK4396		2006	Hague Lane, Rawmarsh			4
SE4305		2007	Fitzwilliam Street, Wath			
SK4397	Natural England	2007	Hague Avenue, Rawmarsh	Roost		
SE4300	Nick Bonsall	2005		Roost		
SK449	English	2003	Broadway, Swinton			

Grid Ref	Recorder	Year	Address/Location	Record type	Species	number
8	Nature					
SE4400	Natural England	2008	Cadman Street, Wath			
SK4496	Natural England	2008	Richards Way, Rawmarsh	Roost		
SK4498	Bob Croxton	2005	Rockingham Pottery Kiln	Roost	Brown Long Eared	
SK4498	RMBC	2002	Rockingham Pottery Kiln		Pipistrelle	
SK4498	RMBC	2002	Warren Vale Road, Swinton		Pipistrelle	
SK4499		2002	Racecourse Road		Common pipistrelle	
SK4497	RMBC	2007	Victoria Park, Rawmarsh		Common pipistrelle	
SK4498	RMBC	2002	Pottery Ponds, Wath		Daubenton's	4
SK4497		2003	Warren Vale, Swinton		Myotis species	3
SK4497		2003	Grange Road	Roost		
SK4497		2008	Warren Vale			
SK4496	English Nature	2006	St Nicholas Road	Roost		
SE4410	SYBG	2011		Maternity roost		
SE4502	English Nature	2004	Watermead, Bolton on Dearne	Roost		
SK4599	English Nature	2005	Albert Stree, Swinton			
SK4598	Natural England	2008	Low Woods Close, Swinton	Roost		15
SK4596		2005	Kilnhurst Road		Myotis species	
SK4599	RMBC	2004	St Margaret's Church Yard		pipistrelle	6
SK4597		2004	Collier Brook Marsh		pipistrelle	2
SE4506	English Nature	2006	Burnside, Thurnscoe		pipistrelle	
SK4599	English Nature	2006	Station Road, Swinton			
SE450	English	2006	Church Street, Bolton			

Grid Ref	Recorder	Year	Address/Location	Record type	Species	number
2	Nature		on Dearne			
SE4604	English Nature	2005	Lockwood Road, Goldthorpe		Pipistrelle	
SK4697	English Nature	2005	Meadow View Rd, Kilnhurst			
SK4698	English Nature	2005	Hoylake Drive, Swinton		Pipistrelle	
SK4695	Natural England	2008	Arran Hill, Thrybergh	hibernation roost	Pipistrelle	
SK4697		2008	Kilnhurst Road		Pipistrelle	4
SK4699	English Nature	2006	Charles Street, Swinton			
SK4796	RMBC	2004	Thrybergh Country Park		Myotis	
SK4896	English Nature	2003	Kilnhurst Road, Hooton Roberts	Roost		
SK4896	English Nature	2004	Ravenfield Lane			
SK4899	English Nature	2004	Denaby Lane, Old Denaby	Roost		
SK4999		2005	Grange Way, Denaby Main	Roost		
SK4995		2009	Rirsby Reservoir		Daubenton's	
SK5098	English Nature	2006	Park Road, Conisborough	roost	Pipistrelle	
SE5000	English Nature	2004	Woodlands, Doncaster			
SK5099	English Nature	2005	Doncaster Road, Denaby			
SK5199	SYBG	2010	Don Valley Gorge	Hibernation roost	Daubenton's	
SK5199	SYBG	2011	Don Valley Gorge	Hibernation roost	Daubenton's	
SK5199	SYBG	2011	Don Valley Gorge	Hibernation roost	Daubenton's	
SK5298	Natural England	2007	Cranswick, Conisborough	Roost		
SK5299	SYBG	2010	Edlington Tunnel		Natterers	
SK5299	SYBG	2010	Edlington Tunnel		Myotis	
SK529	Commercial	2007	Conisborough Viaduct		Pipistrelle	

Grid Ref	Recorder	Year	Address/Location	Record type	Species	number
9	al					
SK529 9	Commerci al	2007	Conisborough Viaduct		Myotis	
SK529 9	Commerci al	2007	Conisborough Viaduct		Pipistrelle	2
SK529 9		2005	Eland Way, Conisborough	Roost		
SK529 9	English Nature	2005	Woodsett Walk, Conisborough	Roost		
SK529 9	English Nature	2003	Cranswick Way, Conisborough	Roost		
SK529 8	Natural England	2008				

5.5 Appendix 5a – Tree Inspection Results

Trees, hedges and Woodland with Low, Moderate or High Bat Roost Potential

Tree	Potential	height	Species	Age	Features
T2	Low	18	Willow	mature	Dead branches.
T3	Low	20	Ash	mature	Broken and dead branches.
T4	Moderate	18	Sycamore	mature	Split, raised and damaged bark, broken branches and small hollow in bough.
T10	Low	22	London Plane	mature	Peeling bark, dead and broken branches.
T16	High	20	Willow	mature	Broken and dead branches with a hollow cavity in the trunk.
T22	Low	12	Sycamore	semi-mature	Small splits and some dead wood.
T24	Moderate	10	Ash	mature	Lots of dead wood, broken limbs and hollow branches.
T25	High	12	Ash	mature	Broken limbs and hollow branches.
T26	Moderate	12	Sycamore	mature	Large hole in trunk, some dead and broken limbs.
T27	Moderate	12	Sycamore	mature	Some dead wood, peeling bark and holes.
T29	Moderate	10	2 x Sycamore	semi-mature	Some dead wood and holes.
T30	High	10	Ash	semi-mature	Rotten on one major limb, dead at the top with many holes.
T31	Moderate	10	Sycamore	semi-mature	Dead wood missing limbs and holes.
T35	High	16	Willow	mature	Dead core with hollows, dead branches, broken and dead limbs.
T36	Moderate	24	Ash	mature	Broken and dead branches and limbs.
W6	High	18	Oak, sycamore, silver birch, beech, spruce and holly	mature	Trees with shallow rot holes, dead, broken limbs, broken branches and at least one tree with a dead core.
H7	Low	12	Double oak hedge	semi-mature	Dead broken and cut boughs/branches with some ivy.

*H denotes a hedgerow section, T denotes a tree or group of similar trees – detailed in description
Height is the tallest point on each hedge, and highest point on each tree or group of trees.*

Height of Trees, Hedges and Woodland with Negligible Bat roost Potential

Tree	Potential	Height	Tree	Potential	Height
H1	negligible	3	T11	negligible	10
H2	negligible	2.5	T12	negligible	12
H3	negligible	10	T13	negligible	12
H4	negligible	1.5	T14	negligible	12
H5	negligible	2	T15	negligible	12
H6	negligible	3	T17	negligible	16
H8	negligible	6	T18	negligible	10
H9	negligible	2.5	T19	negligible	16
H10	negligible	2	T20	negligible	8
H11	negligible	2	T21	negligible	6
H12	negligible	2	T23	negligible	7
H13	negligible	3	T28	negligible	8
H14	negligible	3	T32	negligible	12
H15	negligible	3	T33	negligible	12
H16	negligible	2.5	T34	negligible	12
H17	negligible	2	W1	negligible	10
H18	negligible	2.5	W2	negligible	10
H19	negligible	3	W3	negligible	10
H20	negligible	12	W4	negligible	12
T1	negligible	5	W5	negligible	8
T5	negligible	14	W7	negligible	16
T6	negligible	10	W8	negligible	4
T7	negligible	14	W9	negligible	7
T8	negligible	10	W10	negligible	16
T9	negligible	10			

5.6 Appendix 6 – Bat Transect Survey Results

N.B. the point count locations are shown on Figure 2.

Date	Transect Route	Between Point Count Bat Activity	Temp	Weather	Cloud Cover (octaves)	Wind (Beaufort)
18 th May 2011	North	Soprano pipistrelle recorded between point counts on a single occasion (PC 5-6). Common pipistrelle were recorded between each point count on four occasions (between PC 2 and 6).	13°C	Dry	1/8	0 - 1
	South	No between point count activity recorded.				
23 rd June 2011	North	Two Common pipistrelle and two Leisler's bat passes were recorded between point counts 1 and 2. Five additional common pipistrelle passes were recorded between point counts 2 – 5 (three of which were located between PC 3 and 4. A single brown long-eared bat pass was recorded between PC 5 and 6.	15°C	Dry	2/8	1 - 2
	South	Common pipistrelle passes were recorded between point counts 17, 18 and 19 with two common pipistrelle passes between PC 14 and 15 and another single pass between PC 13 and 14.				
21 st July 2011	North	Single common pipistrelle passes were recorded between point counts PC 19-20, 21-22 with two passes recorded between each of point counts PC 23 - 24 and 24 - 1.	15°C	Dry	7/8	0
	South	A single common pipistrelle pass was recorded along Chapel Lane between point counts 9 and 10 with a Myotis species recorded between Point Counts 11 and 12.				
17 th August 2011	North	A single noctule pass was recorded near the northern edge of the site, between Point Counts 1 and 24. Low levels of common pipistrelle activity were recorded between Point Counts 24 and 4. Three Myotis bat species passes were recorded between Point Counts 1 and 2.	15.4°C	Dry	3/8	0
	South	Single common pipistrelle passes between Point Counts 10 - 11, and 23 – 14 as well as single passes near Point Counts 12 and 15.				
12 th September 2011	North	Single common pipistrelle recorded social calling in the woodland near the north-eastern site boundary.	13.8°C	Dry	3/8	4 - 5
	South	No between point count activity recorded.				

19 th October 2011	North	No between point count bat activity recorded.	7.7°C	Dry	1/8	0-1
	South	No between point count bat activity recorded.				
18 th April 2012	North	No between point count bat activity recorded.	8°C	Dry / patches of drizzle for the first 50 mins before developing into persistent rain.	8/8	1
	South	No between point count bat activity recorded.				
24 th April 2013	North	A common pipistrelle pass was recorded between Points Counts 8 and 9 and 9 and 10.	13.1°C	Dry	8/8	1-2
	South	Two common pipistrelle passes were recorded between Point Counts 15 and 16. Five common pipistrelle passes were recorded between Point Counts 16 and 17 along the lane from the footbridge.				

5.6.1 May 2011

Point Count	Common pipistrelle	Soprano pipistrelle	Noctule	Leisler's Bat	Brown Long-eared Bat	<i>Myotis</i> species	Daubenton's Bat	Natterer's Bat	Total
1	0.2	0	0	0	0	0	0	0	0.2
2	3	0	0	0	0	0	0	0	3
3	1.2	0	0	0	0	0.2	0	0	1.4
4	0.8	0.6	0	0	0	0	0	0	1.4
5	5.8	0	0	0	0	0	0	0	5.8
6	0.2	3	0	0	0	0	0	0	3.2
7	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	0.2	0	0	0	0	0	0	0	0.2
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0.2	0	0	0.2
15	1.6	0	0	0	0	0	0	0	1.6
16	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0
22	0	0.4	0	0	0	0.2	0	0	0.6
23	0	0	0	0	0	0.2	0	0	0.2
24	1.4	0	0	0	0.2	0	0	0	1.6
Average	3.00	0.83	0.00	0.00	0.04	0.17	0.00	0.00	4.04

5.6.2 June 2011

Point Count	Common pipistrelle	Soprano pipistrelle	Noctule	Leisler's Bat	Brown Long-eared Bat	<i>Myotis</i> species	Daubenton's Bat	Natterer's Bat	Total
1	0	0	0	0	0	0	0	0	0
2	0.6	0	0	0	0.2	0	0	0	0.8
3	5.4	0	0	0	0	0	0	0	5.4
4	3.8	0	0	0	0	0	0	0	3.8
5	3.2	0	0	0	0	0	0	0	3.2
6	2.2	0	0	0	0	0	0	0	2.2
7	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0.6	0	0	0	0	0	0	0	0.6
15	0.6	0	0	0	0	0	0	0	0.6
16	0	0	0	0	0	0	0	0	0
17	4	0	0	0	0	0	0	0	4
18	0.2	0	0	0	0	0	0	0	0.2
19	0.2	0	0	0	0	0	0	0	0.2
20	0.4	0	0	0	0	0	0	0	0.4
21	0	0	0	0	0	0.2	0	0	0.2
22	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0
Average	4.42	0.00	0.00	0.00	0.04	0.04	0.00	0.00	4.50

5.6.3
July 2011

Point Count	Common pipistrelle	Soprano pipistrelle	Noctule	Leisler's Bat	Brown Long-eared Bat	<i>Myotis</i> species	Daubenton's Bat	Natterer's Bat	Total
1	0.4	0	0	0	0	0	0	0	0.4
2	0	0	0	0	0	0	0	0	0
3	0.2	0	0	0	0	0	0	0	0.2
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0
9	5.6	0	0	0	0	0	0	0	5.6
10	0.2	0	0	0	0	0.2	0	0	0.4
11	0.4	0	0	0	0	0	0	1	1.4
12	0.2	0	0	0	0	0	0	0	0.2
13	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0
18	0.2	0	0	0	0	0	0	0	0.2
19	0.2	0	0	0	0	0	0	0	0.2
20	0	0	0	0	0	0	0	0	0
21	0.6	0	0	0.4	0	0	0	0	1
22	0.4	0	0	0	0.2	0	0	0	0.6
23	2	0	0	0	0	0	0	0	2
24	0	0	0	0	0	0	0	0	0
Average	2.17	0.00	0.00	0.08	0.04	0.04	0.00	0.21	2.54

5.6.4
August 2011

Point Count	Common pipistrelle	Soprano pipistrelle	Noctule	Leisler's Bat	Brown Long-eared Bat	<i>Myotis</i> species	Daubenton's Bat	Natterer's Bat	Total
1	0.6	0	0	0	0	0.2	0	0	0.8
2	0.6	0	0	0	0	0.2	0	0.2	1
3	0.2	0	0	0	0.2	0	0	0	0.4
4	0	0	0	0	0.2	0	0	0.2	0.4
5	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0
9	1.2	0	0	0	0	0	0	0	1.2
10	2.2	0.2	0	0	0	0	0	0	2.4
11	0.6	0	0	0	0	0	0	0	0.6
12	0	0	0	0	0	0	0	0	0
13	0.6	0	0	0	0	0	0	0	0.6
14	0.2	0	0	0	0	0	2.4	0	2.6
15	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0
17	0.2	0	0	0	0	0	0	0	0.2
18	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0
Average	1.33	0.04	0.00	0.00	0.08	0.08	0.50	0.08	2.13

5.6.5 September 2011

Point Count	Common pipistrelle	Soprano pipistrelle	Noctule	Leisler's Bat	Brown Long-eared Bat	<i>Myotis</i> species	Daubenton's Bat	Natterer's Bat	Total
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0
Average	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

5.6.6

October 2011

Point Count	Common pipistrelle	Soprano pipistrelle	Noctule	Leisler's Bat	Brown Long-eared Bat	<i>Myotis</i> species	Daubenton's Bat	Natterer's Bat	Total
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	0.4	0	0	0	0	0	0	0	0.4
7	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0
Average	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08

5.6.7

April 2012

Point Count	Common pipistrelle	Soprano pipistrelle	Noctule	Leisler's Bat	Brown Long-eared Bat	<i>Myotis</i> species	Daubenton's Bat	Natterer's Bat	Total
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0.2	0	0	0	0	0	0	0	0
4	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A	N/A
5	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A	N/A
7	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A	N/A
8	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A	N/A
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0
16	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A	N/A
17	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A	N/A
18	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A	N/A
19	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A	N/A
20	N/A	N/A	0	N/A	N/A	N/A	N/A	N/A	N/A
21	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0
Average	N/A	N/A	0.00	N/A	N/A	N/A	N/A	N/A	N/A

5.6.9

April 2013

Point Count	Common pipistrelle	Soprano pipistrelle	Noctule	Leisler's Bat	Brown Long-eared Bat	<i>Myotis</i> species	Daubenton's Bat	Natterer's Bat	Total
1	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0
3	0.2	0	0.2	0	0	0	0	0	0.4
4	2.6	0	0	0	0	0	0	0	2.6
5	0.8	0	0	0	0	0	0	0	0
6	1	0	0	0	0	0	0	0	0.4
7	0	0.8	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0
17	1	0.2	0	0	0	0	0	0	0
18	0.6	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0
Average	1.29	0.21	0.04	0.00	0.00	0.00	0.00	0.00	0.71

Average values per five minutes across all transects (not including April 2012)

Point Count	Common pipistrelle	Soprano pipistrelle	Noctule	Leisler's Bat	Brown Long-eared Bat	<i>Myotis</i> species	Daubenton's Bat	Natterer's Bat	Total
1	0.17	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.20
2	0.60	0.00	0.00	0.00	0.03	0.03	0.00	0.03	0.69
3	1.03	0.00	0.03	0.00	0.03	0.03	0.00	0.00	1.11
4	1.03	0.09	0.00	0.00	0.03	0.00	0.00	0.03	1.17
5	1.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.29
6	0.54	0.43	0.00	0.00	0.00	0.00	0.00	0.00	0.89
7	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.97
10	0.34	0.03	0.00	0.00	0.00	0.03	0.00	0.00	0.40
11	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.31
12	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
13	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
14	0.11	0.00	0.00	0.00	0.00	0.03	0.34	0.00	0.49
15	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.74	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.60
18	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
19	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
20	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
21	0.09	0.00	0.00	0.06	0.00	0.03	0.00	0.00	0.17
22	0.06	0.06	0.00	0.00	0.03	0.03	0.00	0.00	0.17
23	0.29	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.31
24	0.20	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.23
Average	0.35	0.03	0.00	0.00	0.01	0.01	0.01	0.01	0.40

5.7 Appendix 7 - Bat Activity Index Values for each species recorded at each static detector location per month

May 2011

	W	T1	T2	T3	Average
common pip	8.343065	2.364963	1.423358	0.218978	2.470073
soprano pip	0.043796	0.240876	0.043796	0	0.065693
noctule	0.131387	1.204379	0.328467	0	0.332847
unidentified Nyctalus	0.875912	1.620438	0.613139	0.021898	0.626277
BLE	0.065693	0.109489	0.043796	0	0.043796
Myotis sp.	0	0.131387	0.021898	0	0.030657
TOTAL	9.459853	5.671532	2.474452	0.240876	3.569343

June 2011

	W ¹⁷	T1 ¹⁸	T2	T3	Average
common pip	0.324324	0	0.237838	0.021622	0.145946
soprano pip	0	0	0	0	0
noctule	0	0	0.324324	0.043243	0.091892
unidentified Nyctalus	0	0	0.021622	0	0.005405
BLE	0	0	0	0	0
Myotis sp.	0	0	0	0	0
TOTAL	0.324324	0	0.583784	0.064865	0.243243

July 2011

	W	T1	T2	T3	Average
common pip	15.31915	6.808511	1.93617	0.361702	4.885106
soprano pip	0.425532	0.297872	0.361702	0.042553	0.225532
noctule	0.148936	0.234043	0.659574	0.085106	0.225532
unidentified Nyctalus	0	0	0	0	0
BLE	0.06383	0.021277	0.021277	0	0.021277
Myotis sp.	0	0.12766	0	0	0.025532
TOTAL	15.95745	7.489362	2.978723	0.489362	5.382979

¹⁷ NB Static Anabat detector malfunctioned after the first night of monitoring

¹⁸ NB Static Anabat detector was stolen

August 2011

	W	T1	T2	T3	Average
common pip	1.729569	0.695394	0.142645	1.497771	0.813076
soprano pip	0.249629	0.053492	0.017831	0.106984	0.085587
noctule	0.106984	0.142645	0.017831	0.035661	0.060624
unidentified Nyctalus	0	0	0.053492	0.035661	0.017831
BLE	0	0	0	0.017831	0.003566
<i>Myotis</i> sp.	0.178306	0.017831	0.017831	0.035661	0.049926
TOTAL	2.264488	0.909361	0.249629	1.729569	1.030609

September 2011

	W	T1	T2	T3	Average
common pip	2.829897	1.128866	0.030928	0.030928	0.804124
soprano pip	0.402062	0.015464	0	0	0.083505
noctule	0.030928	0.015464	0.046392	0.046392	0.027835
unidentified Nyctalus	0.030928	0	0.030928	0.030928	0.018557
BLE	0.262887	0.061856	0	0	0.064948
<i>Myotis</i> sp.	0	0.046392	0.015464	0.015464	0.015464
TOTAL	3.556701	1.268041	0.123711	0.123711	1.014433

October 2011

	W	T1	T2	T3	Average
common pip	4.495504	0	0.011988	0.143856	0.93027
soprano pip	0.155844	0	0	0	0.031169
noctule	0	0	0	0	0
unidentified Nyctalus	0	0	0.011988	0.011988	0.004795
BLE	0.071928	0	0	0	0.014386
<i>Myotis</i> sp.	0.023976	0	0	0.011988	0.007193
TOTAL	4.747253	0	0.023976	0.167832	0.987812

April 2012

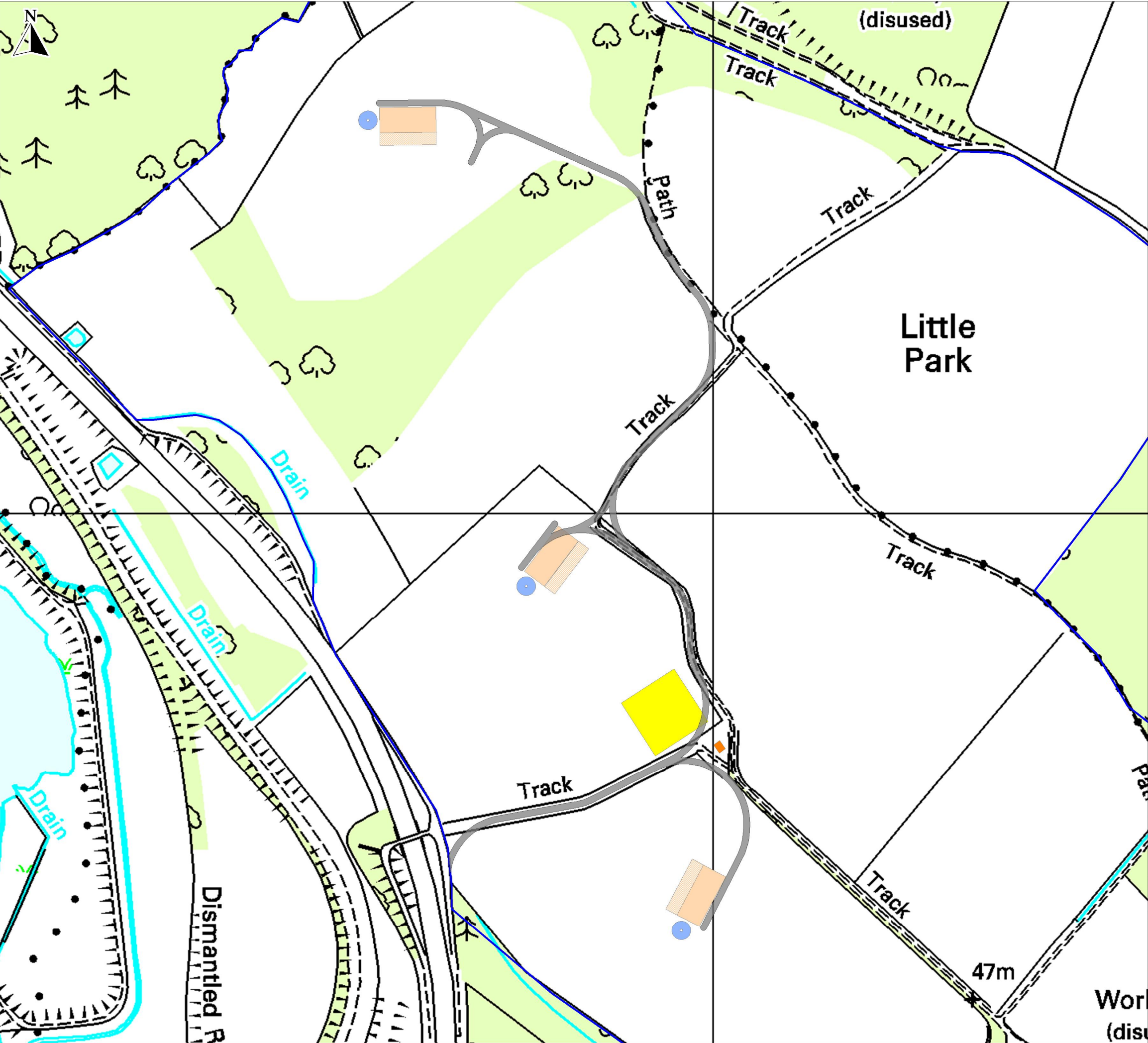
	W	T1	T2	T3	Average
common pip	0.224551	0.194611	0.434132	0.10479	0.958084
soprano pip	0.01497	0.07485	0.04491	0	0.134731
noctule	0.149701	0	0.643713	0.02994	0.823353
unidentified Nyctalus	0	0.01497	0	0	0.01497
BLE	0	0.01497	0.04491	0	0.05988
<i>Myotis</i> sp.	0	0	0	0	0
TOTAL	0.389222	0.299401	1.167665	0.134731	1.991018

Totals

	W	T1	T2	T3	Average
common pip	4.717294	0.776326861	0.518824	0.367258	1.483501
soprano pip	0.201135	0.041691628	0.058295	0.023318	0.075229
noctule	0.056318	0.107823175	0.189458	0.032062	0.098026
unidentified Nyctalus	0.112636	0.106385533	0.102016	0.017488	0.089477
BLE	0.077772	0.014376423	0.008744	0.002915	0.024507
<i>Myotis</i> sp.	0.032182	0.023002277	0.008744	0.011659	0.019947
TOTAL	5.197337	1.069605898	0.886082	0.4547	1.790688

5.8 Appendix 8 - Bat Activity Index Values recorded at heights of 50 m and 3 m.

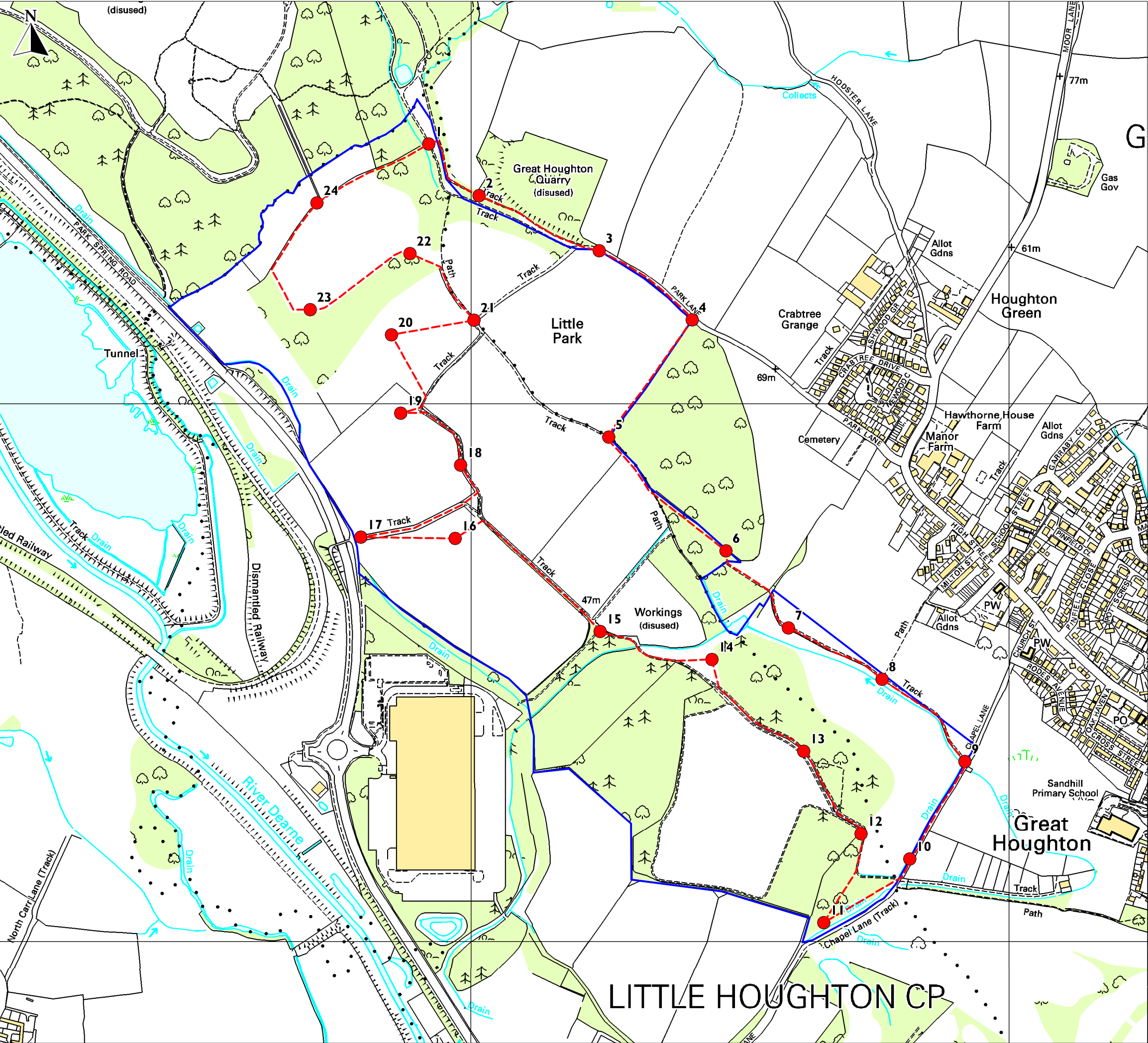
	April ground	April height	July ground	July height	September ground	September height	Ground Level Total	At Height Total
Common Pipistrelle	0.00	0.00	1.64	0.15	1.18	0.11	1.18	0.11
Soprano Pipistrelle	0.00	0.00	0.34	0.00	0.10	0.05	0.15	0.03
Noctule	0.00	0.00	0.37	0.71	0.03	0.06	0.12	0.23
Leisler's Bat	0.00	0.00	0.07	0.00	0.00	0.00	0.02	0.00
Unidentified <i>Nyctalus</i>	0.00	0.00	0.37	0.34	0.05	0.02	0.13	0.10
Unidentified <i>Myotis</i>	0.38	0.00	0.34	0.00	0.10	0.02	0.19	0.01
Brown Long- Eared Bat	0.00	0.00	0.00	0.00	0.03	0.00	0.02	0.00
Total	0.38	0.00	3.14	1.19	1.48	0.25	1.81	0.48



- LEGEND**
- Site boundary
 - Access track
 - Crane hardstanding
 - Blade laydown area
 - Turbine foundation
 - Substation
 - Construction compound

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PARK SPRING WIND FARM		
Site Layout		
DOCUMENT REFERENCE PSR154	LAST REVISION DATE June 2013	
SITE DESIGN VERSION V5	SCALE 1:3,000 @ A3	
DRAWN RH	CHECKED LM	APPROVED MJ
PARSONS BRINCKERHOFF	EDF ENERGY RESOURCES	FIGURE I

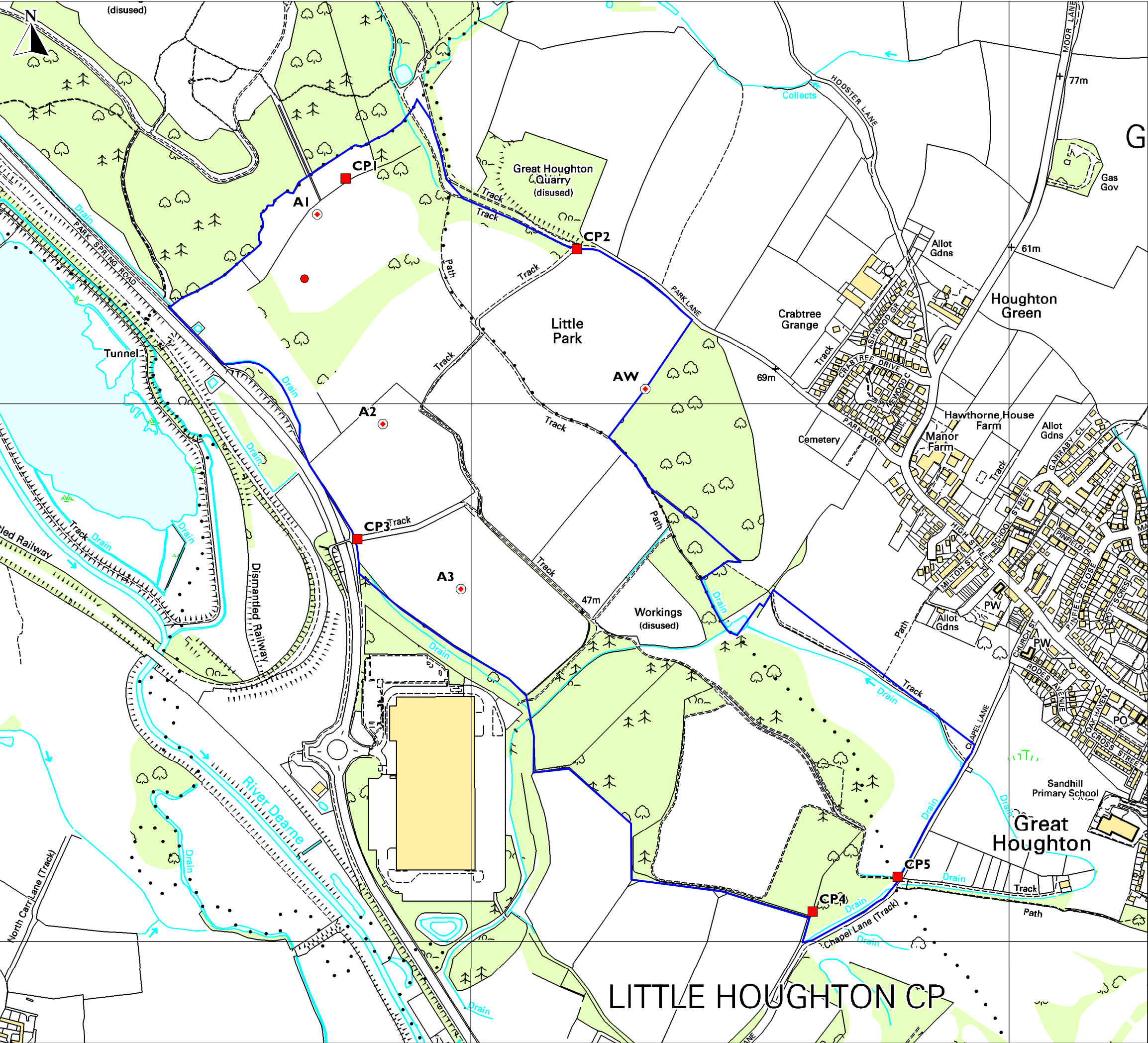


LEGEND

- Site boundary
- Transect route
- Point count locations # Location reference

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PARK SPRING WIND FARM		
Transect route and point count locations		
DOCUMENT REFERENCE	LAST REVISION DATE	
PSR153	July 2013	
SITE DESIGN VERSION	SCALE	
N/A	1:7,000 @ A3	
DRAWN	CHECKED	APPROVED
RH	LM	GS
PARSONS BRINCKERHOFF		EDF ENERGY
FIGURE 2		



- LEGEND
- Site boundary

Anabat location

Commuting point locations

SM2 on meteorological mast

A#

Anabat reference

CP#

Commuting point reference
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- | | | |
|---|---------------------------------|----------------|
| PARK SPRING WIND FARM | | |
| Commuting route and static detector locations | | |
| DOCUMENT REFERENCE
PSR155 | LAST REVISION DATE
July 2013 | |
| SITE DESIGN VERSION
N/A | SCALE
1:7,000 @ A3 | |
| DRAWN
RH | CHECKED
LM | APPROVED
GS |
| PARSONS
BRINCKERHOFF | EDF
ENERGY
RESOURCES | FIGURE 3 |

