**Oxfordshire Highways**

# Cogges Link Road
## Bat Survey

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# Executive Summary


- A “Bats in Trees survey” was carried out during 2002 and a full bat activity survey during 2003.
- Three species of bat have been identified in the study area – Noctule, Daubentons and Common Pipistrelles although densities were generally low.
- In addition, desktop survey information revealed the presence of Brown Long Eared bats and Natterers bats in the wider area.
- There is a particularly rich foraging area adjacent to the entrance of the country park.
- The eastern arm of the River Windrush is used as a commuting corridor.
- Mitigation measures should include minimising the number of trees felled and design of bridges to allow bats to continue to use their flyways.

# Contents

# 1 Summary of Survey Work

## 1.1 **2002 Bats in Trees Survey**

1.1.1 A 2002 database search revealed the presence of records for brown long eared bats within 300 metres of the road corridor in the Cogges Manor Museum area. A daytime walkover survey of the route was undertaken in 2002 (Appendix 1). During this process, all trees which could shelter bat roosts were inspected from the ground with the aid of binoculars, or climbed with the aid of a ladder. All cavities which could be investigated for signs of bat activity were assessed for evidence of bats in the form of droppings, staining and/or feeding signs. Trees which were identified as being potentially suitable for use by roosting bats were placed into a low, medium or high category depending upon the amount and size of the cracks, fissures and cavities within the tree.

1.1.2 At least eighteen potential bat roosting sites were found within six trees which were thought to be of local significance. All of the trees surveyed were placed into the *medium* category. Three of these six trees, namely trees 1, 2 and 4 lie on the footprint of the road and will therefore need to be felled. The remaining three trees lie directly adjacent to the footprint of the road and will not therefore be directly impacted upon.

1.1.3 Since the production of this report, recent amendments to the Habitats Regulations (see below) and licensing procedures with respect to European protected species (EPS) are now the responsibility of the Wildlife Management & Licensing Service of Natural England.

## 1.2 **2003 Bat Survey**

1.2.1 Subsequent to this initial 2002 survey, a full bat survey was undertaken by Nature Bureau in 2003 (Appendix 2). This used bat detectors to detect ultrasound signals produced by bats, and potential roost sites were noted.

1.2.2 Suitable areas of habitat were noted in the country park between the eastern and western channels of the Windrush, and at the eastern end of the scheme on Oxford Hill, however no roosts were identified.

1.2.3 Three species of bat were identified – Noctule (*Nyctalus noctula*), Daubentons (*Myotis daubentonii*) and Common Pipistrelles (*Pipistrellus pipistrellus*), although densities in the study area were generally low. The Common Pipistrelle was the most frequently observed bat, with foraging areas along hedgerows, and a particularly rich forage area adjacent to the entrance to the country park. Daubentons were found to be using the eastern arm of the River Windrush as a commuting route south.

1.2.4 Proposed mitigation measures include minimising the number of trees to be felled, and ensuring that no bats are present when any felling takes place. The design of bridges should allow bats to continue to use their flyways, and post construction; any damaged hedges should be reinstated.

## 1.3 Desktop Study

1.3.1 Records were requested from Thames Valley Records Centre for a 5Km search area around the scheme. These are shown in Appendix 3. In addition to the species identified in activity surveys there is a record for Natterers bat *Myotis nattereri*, approximately 3.5Km to the north of the study area and 6 records for Brown Long Eared bat *Plecotus auritus*, the nearest situated at Cogges Manor Farm, 400m north of the study area. Common Pipistrelle records correspond to areas within Witney and Ducklington, a village 1.5Km to the south of Witney.

## 1.4 Recent amendments in legislation

1.4.1 In August 2007 the Habitats Regulations were amended to more accurately transpose the Habitats Directive. The following text has been extracted from (1) DEFRA (2007) and (2) DEFRA 2007. Changes include:

- Removal of the 'incidental result defence', which previously covered acts which would constitute an offence but were the incidental result of an otherwise lawful activity.
- The addition of 'injure' as an offence to European protected species (EPS) (making the Habitat regulations more consistent with the Wildlife and Countryside Act,1981).
- Clarification of the definition of disturbance. It is an offence to deliberately disturb an EPS in such a way as to affect either a) the ability of any significant group of animals of that species to survive, breed, rear or nurture their young, or b) the local distribution or abundance of the species.

1.4.2 Amendments were also made to the Wildlife and Countryside Act to ensure there is no conflict between the legislation. Animal European protected species are protected by certain offences not covered under the Habitats Regulations. Most importantly it is an offence to:

- Intentionally or recklessly disturb an EPS while occupying a place of structure used for shelter or protection (protection against low level disturbance).
- Obstruct access to any place used for shelter or protection.

## 1.5 References

(1) DEFRA (2007), Guidance note on the Conservation (Natural Habitats, &c.) (Amendment) Regulations 2007

(2) DEFRA (2007), Amendments to the Habitats Regulations 1994: changes to species protection in England and Wales

# Appendix 1

Please note that this figure accompanying this report presents a previous scheme design, which was being assessed at the time this report was produced. While the scheme design has undergone some minor revisions, this report is still included as it presents valuable supporting information.

Oxfordshire County Council

# Witney Cogges Link

# Bats in Trees Report

June 2002

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# 1 Introduction

## 1.1 Legislation

1.1.1 Bats and their roosts are protected by the Wildlife and Countryside Act 1981 (as amended), the Environmental Protection Act 1990 and more recently the Conservation (Natural Habitats, &c.) Regulations 1994.

1.1.2 Taken together the above legislation make it an offence to:

- Intentionally or deliberately kill, injure or capture (take) bats;
- Deliberately disturb bats (whether in a roost or not)
- Damage, destroy or obstruct access to bat roosts;

1.1.3 In this interpretation, a bat roost is any structure or place which a bat uses for shelter or protection. A Department of the Environment, Farming and Rural Affairs (DEFRA) licence is required before any disturbance or damage can take place to a bat roost.

1.1.4 Six bat species are listed under the Oxfordshire Biodiversity Action Plan (BAP). Pipistrelle (Pipistrellus spp), Barbastelle (*Barbastella barbastellus*) and Bechstein's (*Myotis bechsteinii*) bats are priority 1. Daubenton's (*Myotis daubentonii*), Brown long eared (Plecotus auritus) and Noctule (Nyctalus noctula) bats are priority 2 species.

1.1.5 The survey aimed to assess trees, with potential to harbour roosting bats that lie on or immediately adjacent to the footprint of the Cogges Link Road.

## 1.2 Ecology of Bats

1.2 16 species of bats breed in Britain. Their numbers have declined dramatically due to a variety of factors including habitat loss and damage to roost.

1.3 Bats use different roosts at different times of the year. Females gather together in maternity roosts in the summer to give birth and rear their single baby. In winter when prey becomes scarce, British bats hibernate in places with low constant temperatures such as mines, bridges and cavities in trees. They may wake occasionally but only become fully active again in the spring.

## 1.3 Bats and Trees

1.3.1 Bats favour mature beech, ash, oak and willow, although they will roost in trees of all types and sizes. Bats use these trees in two ways: firstly as roosting sites, e.g. holes, cracks, crevices and even under ivy, and secondly as foraging habitat.

1.3.2 Bats are nomadic, occupying tree roosts for long and short periods of time. In the course of a year, over 100 sites may be occupied by one colony.

# 2 Survey Methods

2.1.1 A daytime walkover survey of the route was undertaken. All trees that could shelter potential bat roosts were inspected from the ground with the aid of binoculars or climbed with an aid of a ladder. Using this method it was not possible to look into every hole because of access (specialist climbing equipment or a cherry picker would be required), and therefore assessment of the cavities and crevices in the crown of the trees was somewhat limited. All holes and cavities that could be investigated were assessed for evidence of current or past bat roosts, in the form of bats droppings, staining, and/or feeding signs. All features within the tree which had bat roosting potential were recorded along with their direction and height above ground. Trees, which were potentially suitable for use by roosting bats, were placed into a low, medium or high category depending on the amount and size of the cracks, fissures and cavities within the tree.

2.1.2 The decay of each tree was assessed using a decay-stage classification system (Vonhof & Barclay 1996).

| Stage | Description |
|---|---|
| 1 | Live, healthy, no decay; no obvious defects. |
| 2 | Live, usually unhealthy; obvious defects such as broken top, cracks or hollows present. |
| 3 | Recently dead, dead leaves still present, little decay; heartwood hard. |
| 4 | Dead; no leaves and few twigs present; top often broken; <50% of branches lost; bark loose; heartwood hard; sapwood spongy. |
| 5 | Dead; no branches or bark; broken off along mid-trunk; sapwood sloughing from upper hole; heartwood soft |
| | i) Dead; stubs >3m in height; heartwood soft; extensive internal decay; outer shell may be hard. |
| | ii) Dead; stubs <3m in height; heartwood soft; extensive internal decay; outer shell soft. |

# 3 Results

3.1.1 This table shows the results of the bat survey. The location of each tree is shown on the enclosed plan.

| **Tree no.** | **Decay** | **Species** | **DBH (cm)** | **Overall potential of tree to harbour bats** | **Holes** | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | **No.** | **Type** | **Direction** | **Height (cm)** |
| 1 | 2 | Ash | 60 | Medium | 1 | Rotten root | SWW | 25 |
| | | | | | 2 | Snapped branch with cracks | E | 600 |
| | | | | | 3 | Snapped branch with cracks | SE | 600 |
| 2 | 4 | Oak | 40 | Medium | 1 | Peeling bark | NW | 150 |
| | | | | | 2 | Peeling bark | N | 500 |
| | | | | | 3 | Peeling bark | S | 700 |
| 3 | 2 | Oak | 60 | Medium | 1 | Dead crown with numerous cracks | Various | 180 |
| | | | | | 2 | Pruning wound cavity | S | 250 |
| | | | | | 3 | Flaking Bark | S | 100 |
| 4 | 2 | Oak | 60 | Medium | 1 | Snapped branch with fissure | S | 350 |
| | | | | | 2 | Dead branch with cracks | S | 400 |
| | | | | | 3 | Cracked branch | N | 400 |
| 5 | 2 | Oak | 60 | Medium | 1 | Pruning wound cavity | W | 450 |

| **Tree no.** | **Decay** | **Species** | **DBH (cm)** | **Overall potential of tree to harbour bats** | **Holes** | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | **No.** | **Type** | **Direction** | **Height (cm)** |
| | | | | | 2 | Split branch | N | 500 |
| | | | | | 3 | Dead overhanging branch with flaking bark | W | 600 |
| 6 | 2 | Oak | 70 | Medium | 1 | Potential break-out cavity | N | 600 |
| | | | | | 2 | Cracks in bark throughout tree | Various | Various |
| | | | | | 3 | Overhanging branch with many cracks and a potential fissure | S | 600 |

# 4 Evaluation

4.1.1 At least eighteen potential bat roosting sites were found within six trees. It is likely that more potentially suitable roost sites were present high up in the canopy of each tree. These roosting sites are believed to be of local importance.

4.1.2 The following three categories divide the trees in order of importance:

*High Bat Potential*

4.1.3 Trees in this category contain several potentially suitable roosting sites for bats, including one or more features that are insulated from the elements and therefore potentially suitable for hibernating bats.

4.1.4 There were no trees in this category.

*Medium Bat Potential*

4.1.5 Trees in this category contain several suitable summer roosting sites for bats. Also trees which are too large to inspect from the ground but are thought likely to harbour several roosting sites. All trees surveyed were placed in this category.

*Low Bat Potential*

4.1.6 Trees in this category contain only a small number of potentially suitable summer roosting sites:

4.1.7 There were no trees in this category.

## 4.2 Potential Construction Impacts

*Direct Impacts*

4.2.1 The survey showed that trees 1, 2 & 4 lie on the footprint of the road and will therefore need to be felled. This felling will result in the loss of at least 9 potentially suitable roost sites, this is considered to be of high magnitude to features of Local value. Therefore the loss of these trees is considered to be of slight significance to the local bat population.

4.2.2 Trees 3, 5 & 6 lie immediately adjacent to the road footprint. The trees and therefore the roost sites will not be directly affected by the scheme.

*Indirect*

4.2.3 The road could be severing hedgerows that bats use as commuting corridors. This may disrupt feeding activity and place an energetic burden on commuting bats.

4.2.4 Lighting of the carriage way may have a negative impact on the certain species of bats. Myotis species actively avoid lighted areas and this will disrupt their foraging areas.

# 5 Mitigation & Recommendations

5.1.1 Mitigation for the loss of the potential bat roosting sites should include attaching bat boxes to suitable trees and the use of native trees and shrubs in the hedgerows that are to be planted as compensation for losses.

5.1.2 Depending on the timescales involved it may be advisable to resurvey trees immediately prior to felling to ensure they have not deteriorated in condition and therefore increased in bat potential.

5.1.3 If a tree has been identified as having potentially suitable roosting sites, then a dawn and dusk survey should be undertaken the night before the tree is to be disturbed. This survey technique should ideally take place in the autumn which is outside the period where bats are either hibernating or rearing dependent young. This autumn felling window also avoids the breeding bird season.

5.1.4 If after a dawn and dusk survey the possibility of roosting bats could still not be ruled out, then they should be felled under the supervision of a licensed bat worker.

5.1.5 Should bats be recorded roosting in any of the trees that are affected by the scheme then a license from the Department for Environment, Food and Rural Affairs (DEFRA) would be sought before any disturbance takes place. Six weeks should be allowed for the license to come through.

5.1.6 Bridge design requires a minimum clearance of 1 metre either side of the banks and 2 metres in height to offset impacts on bat commuting routes.

5.1.7 Lighting of the road should be avoided where possible. Where lighting is unavoidable low intensity sodium lighting is preferable.

# 6 Residual Impacts

6.1.1 After mitigation, the short term loss of the potential bat roosting sites within the trees will probably be of slight to negligible significance. The long term impact will be of negligible significance.

# 7 References

Vonhof, M.J. & Barclay, R.M.R. (1996) Roost-site selection and roosting ecology of forest-dwelling bats in southern British Columbia. Canadian Journal of Zoology, 74, 1797-1805.

Mitchell-Jones, A.J. & McLeish, A.P. The Bat Workers' Manual. JNCC, Peterborough.

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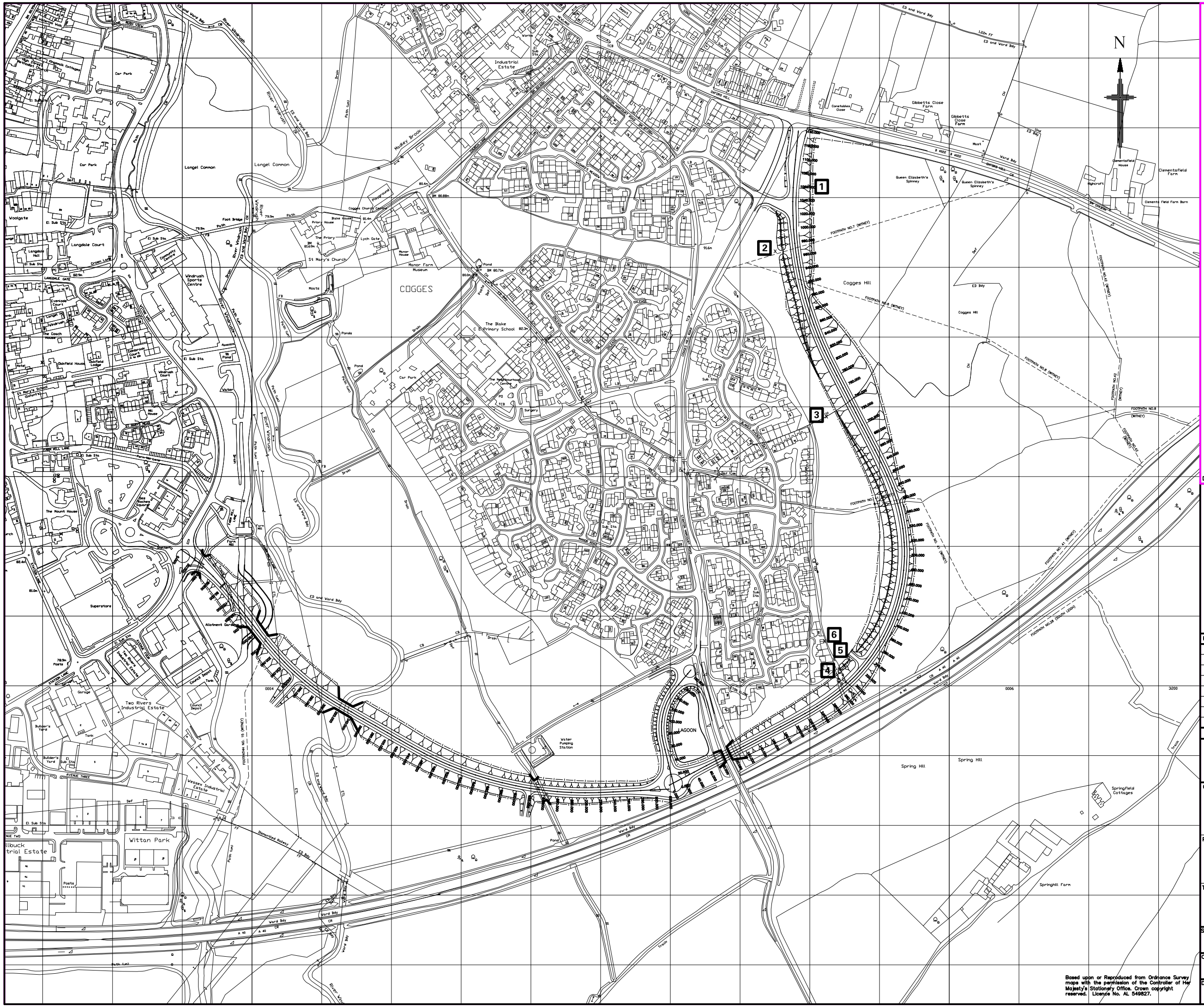


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Project
Bats In Trees Survey

Title
Witney Cogges Link Road

| Scale | Drawn By | Checked By | Approved By |
|---|---|---|---|
| 1:2500 | JG | HT | |
| | Date 26.6.02 | Date 26.6.02 | Date |

Clients Ref
087206

Drawing Number
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Rev

# Appendix 2

This report was originally prepared in support of the 2004 Environmental Statement and as such, covers both the Cogges Link Road study area and the Shores Green Slip Roads study area. Only information pertaining to the Cogges Link Road is relevant to this 2007 report.

# Bat Survey of the Witney Cogges Link Road

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June 2003

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Contents

# 1 Methodology

## 1.1 Walkover survey

An initial walkover of the site was carried out to identify any access problems and health and safety issues. In addition, areas that past experience predicts should be good habitat for bats were identified. Trees suitable for bat roosts were examined for tree holes and cracks and these were identified for later checking with a bat detector during the dusk to dawn surveys.

The site was surveyed as three areas indicated as A, B and C on Map 1: Survey Areas. Area A was all of the survey area to the west of the River Windrush. Area B was the arable and built up land east of the River Windrush, and Area C, the arable land confined by the Stanton Harcourt Rd, the B4022 and the A40.

## 1.2 Dusk / Dawn Surveys

Dusk to dawn surveys were carried out on Areas A, B and C. For Area C the survey was carried out in two parts, the southern part first. The survey was carried out using two different types of bat detector. A Stag Electronics Bat Box 3, which is a heterodyne type and a Stag Electronics Duet, a frequency division type. The survey of a section of Area A was also conducted with a time expansion type of detector, but equipment failure meant this type could not be used for the whole survey.

The heterodyne bat detector was tuned to 50 KHz as the majority of bats produce an ultrasound signal that has significant energy at this frequency. Once a bat was detected the bat detector was tuned up and down the frequency band to enable identification of the species of bat. It is not always possible to determine the particular species of bat but the different families can be differentiated. The type of detector used is most sensitive at 40 KHz to 60 KHz. However, because of the limited bandwidth of the detector, some species of bats can be missed, particularly the Horseshoe species. Whilst the occurrence of the Lesser Horseshoe (*Rhinolophus hipposideros*) was unlikely they are known to occur further north in very small numbers. For this reason the frequency division detector was used in addition to the other detectors in order to ensure that this species were not missed. Due to the different ultrasonic microphone used, the frequency division detector is particularly good at picking up Leisler's (*Nyctalus leisleri*), Noctules (*Nyctalus noctula*) and Serotine (*Eptesicus serotinus*).

The survey began half an hour before dusk as Noctules often start to forage before dusk. A route around the perimeter and dominant features of the area was followed and direction of incoming bats was noted. Any possible roost sites were also monitored. This cycle was repeated noting areas

of activity, species of bat using that area and changes of activity with time. A half an hour before dawn, the flight paths noted during the early part of the night were monitored in order to confirm the direction of the roosts. Flight paths were also followed up in case swarming behaviour was observed indicating a roost (bats often swarm outside their roost before entering the roost for the day, it appears to perform some sort of social function but is not well understood).

# 2 Survey Results

See accompanying maps 1-4 at the end of this section (pages 9 - 12).

## 2.1 Habitat Suitability

During the walk-over habitats suitable for bats were identified. These are shown on Map 2: Habitat Areas.

Riverine habitats are popular with bats as they hold a wide range of insects, particularly if there is a good mix of riverside plants. The riverine habitat within the study area (shown by blue lines on Map 2) is characterised by a good range of riverside plants on the western arm of the River Windrush which in some areas is very heavily overgrown. The eastern arm of the river is more open with trees, mostly willows. Expected species would be Pipistrelles (*Pipistrellus pipistrellus, and P. pygmeus*), Whiskered (*Myotis mystacinus*) and Daubentons (*Myotis daubentonii*).

The green lines on Map 2 are the hedgerows, which are a feature of the area. These are for the most part large and situated on top of a ditch and bank. This type of feature is popular with Pipistrelles and Whiskered. However, when a hedgerow is bordering an arable field the width of the headland becomes significant, as does the width of the hedge. If the headland is small, insecticide over-spray and plough damage to the hedge restricts the range of insects available and it becomes a less useful forage resource. The hedgerows dotted with pink are areas of hedgerow that contain a large umber of gaps or consist of a monoculture of one woody species. Those hedges adjacent to the A40 also suffer from noise, turbulence and pollution. The pollution was particularly noticeable in the area where the A40 is in a cutting. The exhaust pollution was noticeable in the adjacent field. The road surface appears to be particularly noisy giving background noise on the bat detectors. The hatched pink areas indicate where it would be expected to find Leisler's, Noctules and Serotine foraging. Areas of pasture are a rich source of beetles and dung flies (the latter an important food source for Noctules). Area A, shown on Map 1, is grazed as is the area east of the B4022, so these should be good potential foraging areas. Parts of Area C consist of more intensively managed grassland and these areas may represent poorer foraging ground.

## 2.2 Roost Locations

No roosts were located in the area during the surveys.

## 2.3 Bat distribution

Three species of bat were identified during the surveys: Noctules, Daubentons and Common Pipistrelles.

### 2.3.1 Noctule (*Nyctalus noctula*).

At least three Noctule bats were detected hunting over the meadows to the east of the B4022, the area shown as blue crosshatch on Map 3: Daubentons and Noctules Foraging Areas. This area is typical of the preferred habitat of Noctules: cattle grazed grassland. It is likely the bats were foraging for dung flies. Leisler's bat is also known from the region and is difficult to separate from Noctules with a bat detector but the hunting behaviour of the bats detected suggested Noctule rather than Leisler's bat. There were a few passes detected over the rest of Area C but these bats were travelling at high altitude and speed, heading from the east towards the northwest. Since no feeding buzzes were detected, the bats were likely to be commuting to another preferred foraging area. No bats were observed travelling from the west towards the area in which they were foraging. Since the Noctule bat is exclusively a tree hole rooster the most likely roost site is in the Cogges Wood/Eynsham Park Hall area of extensive woodland.

### 2.3.2 Daubentons (*Myotis daubentonii*)

Daubentons bats, otherwise known as the Waterbat, were detected around and found to be using the eastern arm of the River Windrush, Map 3, blue line. The bats appear to be using the river as a commuting route south probably to the Ducklington/Standlake complex of water bodies, as no feeding buzzes were observed. At least six bats were detected passing down the river. However, no bats were detected returning up the river. This is not unexpected as work in Northamptonshire/Bedfordshire has shown that it is common for Daubentons to commute to a preferred foraging area by one route and return via another forming a large loop. No Daubentons were observed using the western arm of the river. This was due to the very overgrown nature of part of the waterway and the obstruction formed by Farm Mill. In addition the internal structure of the mill gave rise to a high level of ultrasonic background noise.

### 2.3.3 Common Pipistrelles (*Pipistrellus pipistrellus*)

The Common Pipistrelles made up the bulk of the bats detected in the study area. In Area A the bats were coming down the Windrush and then dispersing, some along the river, others into an area adjacent to the entrance to the nature reserve, shown by the blue line labelled 10 on Map 4. The area adjacent to the entrance to the Nature reserve was a particularly rich foraging area shown as the pink area labelled 1 on Map 4. Bats were present throughout the survey with a maximum of three bats hunting at the same time. Bats were detected foraging along both banks of the eastern arm of the Windrush and the east bank of the western arm, shown by the pink areas labelled 2. No

bats were detected within the industrial estate on the western boundary of the survey area. This may be due to the high level of lighting in the area. Bats only foraged the riverbanks to approximately the area shown on the map. The bats did not use the area further south. This southern area was strongly lit by a set of white light floodlights in the compounds on the industrial site and this was discouraging the bats from using that area. It was difficult assess numbers since the bats were flying circuits up one side of the river and down the other but it was probably two or three individuals.

As the night progressed the bats moved east across the river and foraged the hedgerows furthest away from the A40 (labelled 3 on map 4). The one exception to this was the pink area marked as 4 on Map 4. Here the corner of the field was sheltered from the A40 by a belt of trees and scrub. In addition the headland here was broad with the angle of the field being cut off. There was a bat present most of the night, though it is not clear if this was a single individual throughout the night. There was intermittent use being made of the hedgerow on the north side of the access road to the pumping station. No activity was recorded in the area north of this access road, which has been set aside and planted with saplings.

No activity was recorded in the housing estates. Gardens are generally popular with both Pipistrelles, but the gardens here were small and the whole area heavily lit. Greater use of the gardens may well increase as the gardens mature.

In the bulk of Area C few bats were recorded. The exception being the hedgerow marked 5 on Map 4 and the area of rough grass and trees labelled 6 on Map 4. In both these areas a single Pipistrelle was detected foraging during the middle of the night. Whether these bats were coming from the eastern side of the area or from the western side could not be ascertained.

The areas with most activity were the hedgerows on either side of the B4022. On the northern side, area 8, bats were detected hunting on both sides of the hedgerow and in the gardens of the houses. The hedgerow marked as area 7 was also foraged, becoming busier later on after midnight when the traffic on this road more or less ceased. Because it was so busy it was difficult to assess the numbers of bats as they interchanged foraging areas during the night but at least 4 or 5 individuals were foraging the area. The bats were also using the road as a commuting corridor, with the bats going in both directions up and down the road. It may be that bats are coming to the area from two sites. There is a green corridor i.e. a non-built up linear feature, from the river through the housing estate shown as a blue line labelled 9 on Map 4, which bats from the same roost as those using areas 1 and 2 on Map 4 may also be using. Certainly bats came up this route at dusk and were

coming and going along this route during the night. Bats also came northwest along the B4022, the blue line labelled 11 on Map 4, suggesting that there is a roost to the east. Further down the road on the western edge the hedgerow becomes predominately thorn and no bat activity was recorded here. A key feature of this road is it is unlit.

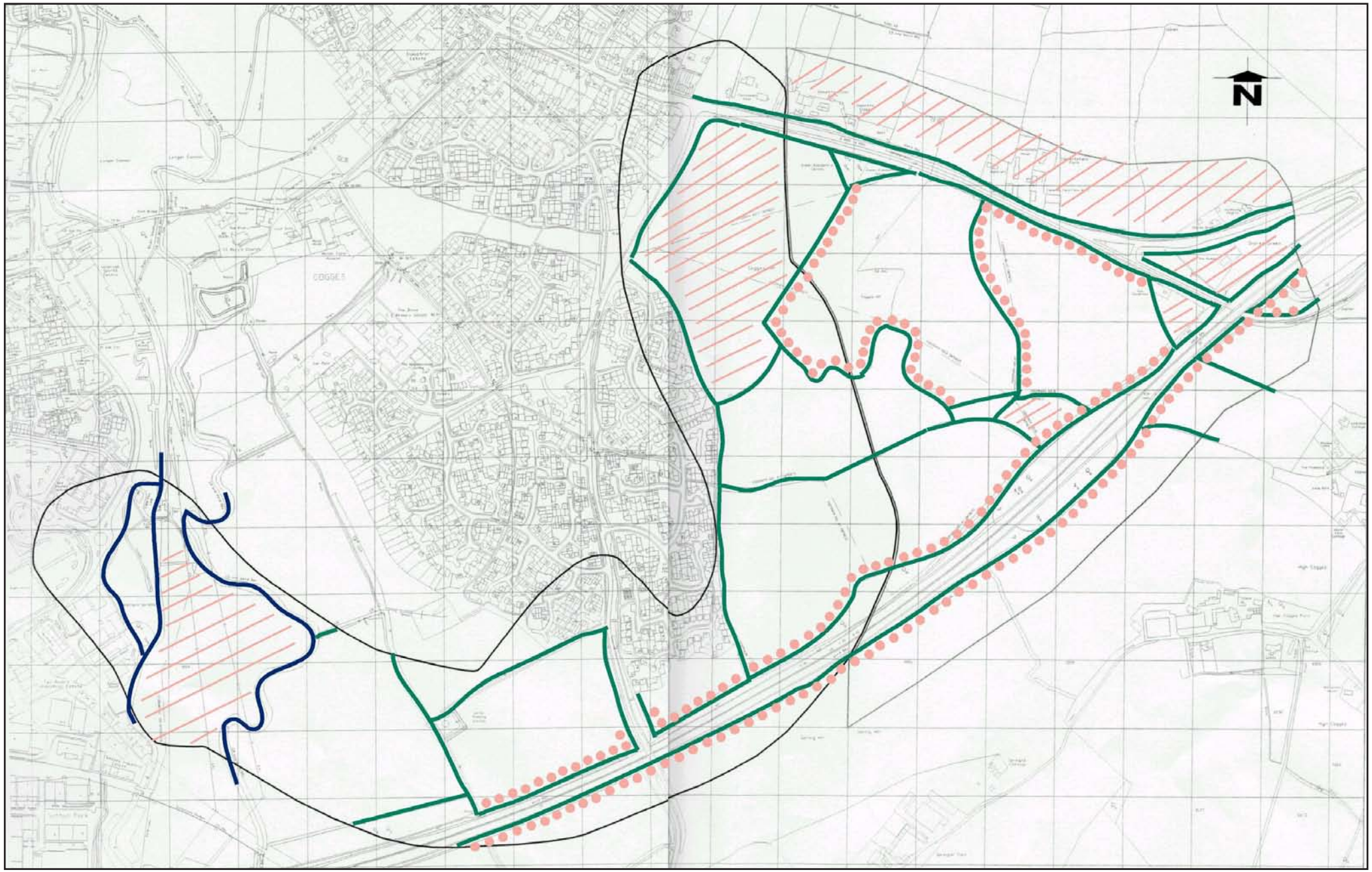
## 2.4 Population Estimates

The bat population density of the eastern side of the study area, Area A, is low considering the size of the hedgerows and the grazing meadow. In particular there were no Whiskered bats recorded, which are a species very much associated with large hedgerows. Area B and the western side of Area C were typical of a conventional (as opposed to organic) arable farming area with very low bat numbers considering the size of the available foraging areas. The absence of bats from the housing estates was a little unexpected but the estates are of recent origin and as the gardens mature there may be greater use made of these areas.

The eastern part of Area C was the most active in terms of bat foraging; there were common pipistrelles present during the whole of the foraging period, particularly in the gardens and eastern hedgerows. The population density was more typical of the rural landscape dominated by grazing as opposed to arable. The density of Noctules was very encouraging as this indicates that the habitat to the east of the B4022 is particularly good. Noctules take mostly beetles such as cockchafers and dung flies and their presence indicates good quality grazing land. The number of bats recorded here mean it can be considered an area of high activity.

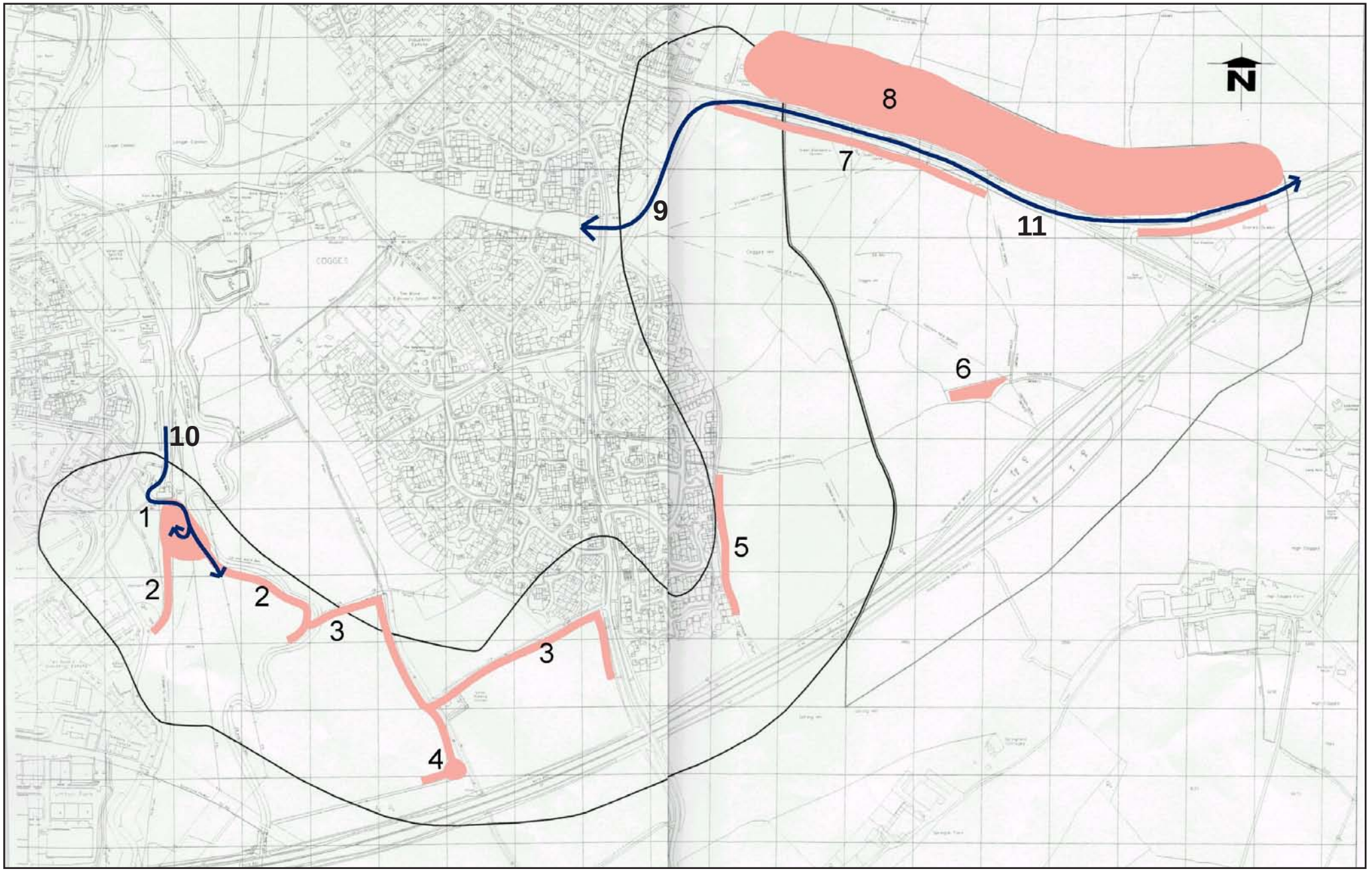
## 2.5 Maps 1-4


Map 1. Survey areas




Map 2. Habitat areas


Map 3. Daubentons and Noctules forage areas




Map 4. Common Pipistrelle forage areas

# 3 Mitigation

## 3.1 Mitigation prior to construction

There are a considerable number of potential roost sites in trees contained within the study area. In particular areas 3, 4, 5 and 6 on Map 4. The number of trees to be felled should be kept to a minimum and each tree checked just prior - one to two days maximum - to felling. This is to ensure that no bats are actually using the trees when the felling takes place. The times to avoid are May to July as this is when the bats have dependant young, and during the hibernation season of October to March. These times are approximate as weather conditions can have a considerable effect on the bat's behaviour. If Farm Mill is to be demolished then it needs to be inspected for bats prior to demolition. No bats were observed using the building during the survey but it cannot be ruled out.

To ensure that the bats can continue to use their flyways the bridges across the Windrush need to be sufficiently large to enable the bats to fly through. An aperture of at least a meter either side of the banks and a height of 2 meters should be sufficient.

## 3.2 Mitigation post-construction

All hedges damaged during the construction should be reinstated with a good mix of native hedgerow trees such as ash, field maple and oak, and an under storey of native shrubs, rather than by a monoculture of thorn. Hedgerows re-instated along the road edges using a suitable mixture of trees and shrubs will not only act as a navigation feature but will also help to shield against turbulence. If at all possible no street lighting should be installed along the planned link road. If street lighting has to be installed, then very low intensity sodium lighting would be the preferred option.

# 4 References

Greenaway, F and Hutson A.M. Field guide to British Bats, Coleman 1990

Schober, W and Grimmberger, E Bats of Britain and Europe, Hamlyn 1993

Mitchell-Jones, A.J. and McLeish, A.P. The Bat Workers Manual, 2nd edition, JNCC 1999

# 5 Appendix 1 – Names and contact details of surveyors

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# Appendix 3 Desktop data

| Sex/ stage | Date | Grid ref. | Site | Sub-site/ Locality | UK Legislation | European Legislation | UK BAP Status |
|---|---|---|---|---|---|---|---|
| | 03-Apr-05 | SP352131 | Wood Lane, Delly End, Hailey. | | Schedule 5 - all parts (W&C Act 1981) | Conservation Regulations 1994 | |
| | 02-Jun-93 | SP354079 | Oxon tetrad 3406 | Ducklington | Schedule 5 - all parts (W&C Act 1981) | Conservation Regulations 1994 | Priority Sp. |
| | 07-Jul-92 | SP360108 | Oxon tetrad 3610 | Witney | Schedule 5 - all parts (W&C Act 1981) | Conservation Regulations 1994 | Priority Sp. |
| | 07-Jul-92 | SP360108 | Oxon tetrad 3610 | Witney | Schedule 5 - all parts (W&C Act 1981) | Conservation Regulations 1994 | Priority Sp. |
| | 27-Oct-93 | SP345139 | Oxon tetrad 3412 | Witney | Schedule 5 - all parts (W&C Act 1981) | Conservation Regulations 1994 | |
| | 24-Aug-94 | SP362095 | Cogges Manor Farm | | Schedule 5 - all parts (W&C Act 1981) | Conservation Regulations 1994 | |
| adult | 28-Sep-97 | SP362095 | Cogges Manor Farm | | Schedule 5 - all parts (W&C Act 1981) | Conservation Regulations 1994 | |
| | 02-Nov-91 | SP374130 | Oxon tetrad 3612 | Witney | Schedule 5 - all parts (W&C Act 1981) | Conservation Regulations 1994 | |
| | 17-Nov-88 | SP385125 | Oxon tetrad 3812 | private house | Schedule 5 - all parts (W&C Act 1981) | Conservation Regulations 1994 | |
| | 27-Sep-94 | SP401080 | Oxon tetrad 4008 | South Leigh | Schedule 5 - all parts (W&C Act 1981) | Conservation Regulations 1994 | |