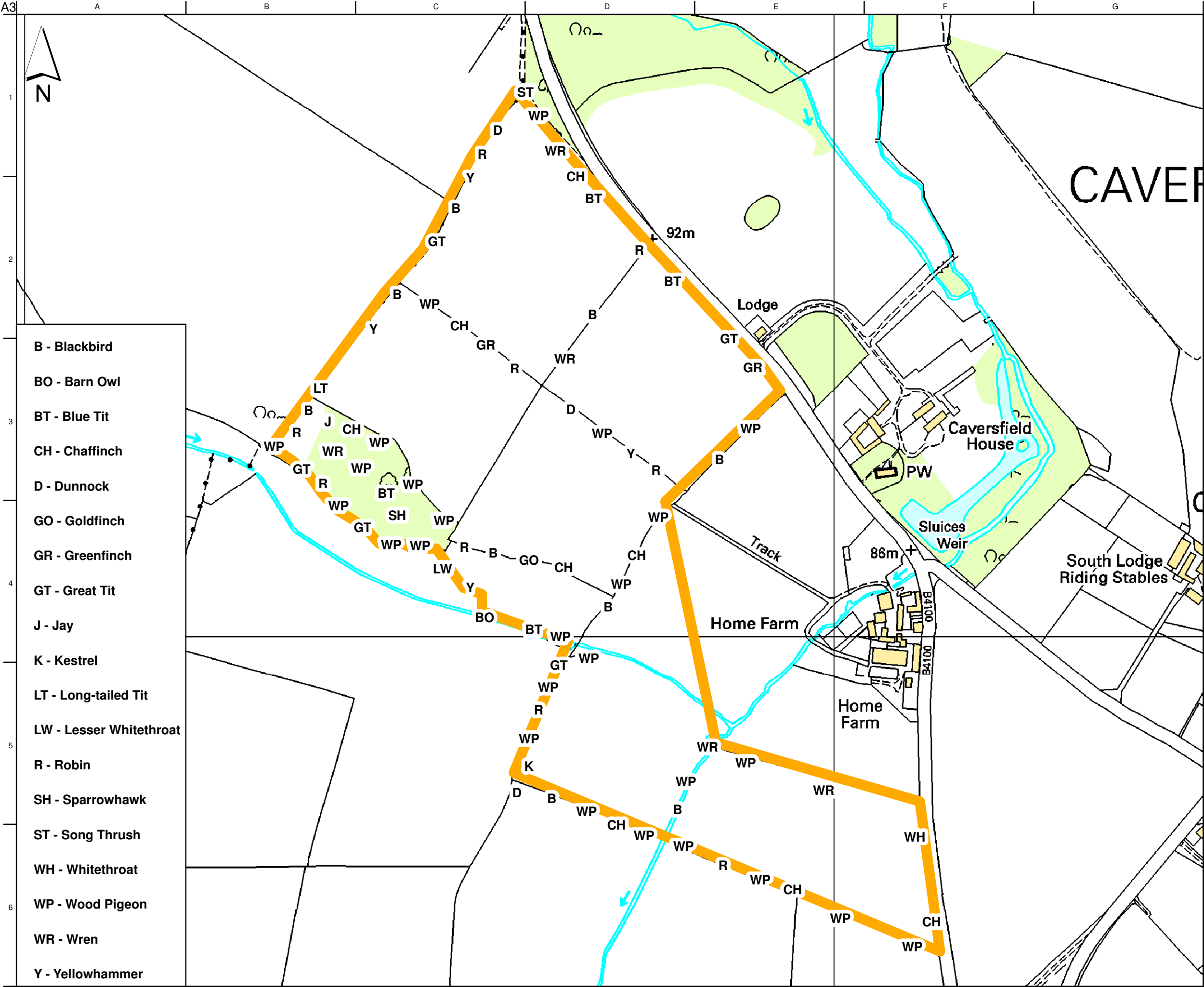


Figure 1 Breeding Bird Territory Location Map



Legend

Exemplar Site Boundary

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Client

A2 Dominion

Job Title

Bicester Eco-town Exemplar Site
Breeding Bird Survey

Drawing Title

Breeding Bird Territory
Location Map

Scale at A3

1:4,500

Discipline

Ecology

Drawing Status

Draft

Job No	Drawing No	Issue
213225-00	Figure 1	-

APPENDIX 7H

Arup (2010) Exemplar Site Bat Survey

A2 Dominion
Bicester Eco-Town
Exemplar Site Bat Survey

J/213000/213225-00

Issue | September 2010

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Document Verification

ARUP

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1 Introduction

1.1 Background

Arup has been commissioned by A2 Dominion to carry out a suite of protected species and habitat surveys for the proposed Bicester Exemplar Eco-Town development in Oxfordshire. This specific report details the surveys undertaken for bats.

The proposed development is located within a belt of (predominantly) grazing land that lies to the north west of Bicester (SP 577 251); the red line boundary area is shown in Figure 1. At present, the proposed development area consists of a matrix of farmland, with up to 10 grazed fields separated by species-rich hedgerows. A distinct lowland area with an ephemeral stream runs east to west through the south and central areas of the site and, midway along its course, this stream flows into a second ephemeral stream running north to south through the site alongside a small wooded copse.

1.2 Ecology and Legislation

1.2.1 Generic Legislation

This report and its recommendations have been produced in accordance with relevant legislation and best practice guidance. It also takes into account Planning Policy Statement 9 (PPS9) and other nature conservation policies within local and regional planning policy documents.

Legislation relating to ecological resources that are relevant to this appraisal includes the following:

- ***Wildlife and Countryside Act, 1981 (as amended)***. This Legislation still forms the primary means of protecting wildlife in the UK and provides the mechanism by which a number of international directives are implemented in the UK.
- ***Conservation (Natural Habitats &c.) Regulations, 1994***. This Act provides protection for European protected species such as bats, great crested newts and the hazel dormouse.
- ***Countryside and Rights of Way (CROW) Act, 2000***. The CROW Act strengthened the details of The Wildlife and Countryside Act in relation to Sites of Special Scientific Interest (SSSI) and threatened species.
- ***Natural Environment and Rural Communities (NERC) Act, 2006***. This Act puts an obligation on public bodies and statutory undertakers to ensure due regard to the conservation of biodiversity.
- ***Planning Policy Statement 9 (PPS9)***. This sets out the Government's planning policies on the protection of biodiversity and geological conservation through the planning system. The policies set out in PPS9 may also be material to decisions on individual planning applications.

The key principles of the PPS9 are stated as:

“Regional planning bodies and local planning authorities should adhere to the following key principles to ensure that the potential impacts of planning decisions on biodiversity and geological conservation are fully considered.....

(vi) the aim of planning decisions should be to prevent harm to biodiversity and geological conservation interests. Where granting planning permission would result in significant harm to those interests, local planning authorities will need to be satisfied that the development cannot reasonably be located on any alternative sites that would result in less or no harm. In the absence of any such alternatives, local planning authorities should ensure that, before planning permission is granted, adequate mitigation measures are put in place. Where a planning decision would result in significant harm to biodiversity and geological interests which cannot be prevented or adequately mitigated against, appropriate compensation measures should be sought. If that significant harm cannot be prevented, adequately mitigated against, or compensated for, then planning permission should be refused.”

In addition, PPS9 states:

“Development proposals provide many good opportunities for building-in beneficial biodiversity or geological features as part of good design. When considering proposals, local planning authorities should maximise such opportunities in and around developments, using planning obligations where necessary.”

In respect of species protection, PPS9 states:

“.....planning authorities should ensure that these species are protected from the adverse effects of development, where appropriate, by using planning conditions or obligations. Planning authorities should refuse permission where harm to the species or their habitats would result unless the need for, and benefits of, the development clearly outweigh that harm”.

1.2.2 Species Legislation

Bats may roost within buildings, other structures (such as bridges and caves) and mature trees, where there are suitable voids, crevices and other such cavities, allowing some protection from the elements and from disturbance. Within trees, for example, they may occupy crevices, splits or woodpecker-hole cavities within the main trunk, broken limbs or behind loose bark, as well as behind significant areas of ivy growth.

Most bat species prefer to forage within and across areas of wooded countryside, comprising hedgerows, rough grassland and scrub, and over open water where this is available. Those sites that offer a mosaic of these habitat types are therefore often those most favoured by bats.

Bats and places that function as their roost sites are afforded protection through the provisions of the Wildlife and Countryside Act 1981 (as amended), and the Conservation (Natural Habitats, &c.) Regulations 2010. It would constitute an offence to:

- kill, injure or capture a bat;

- damage, destroy or obstruct access to any bat breeding site or resting place; or,
- disturb a bat if it is likely to:
 1. impair its ability to -
 - o survive, breed or reproduce or rear/nurture young; or,
 - o hibernate or migrate; or,
 2. significantly affect the local distribution or abundance of the species to which they belong.

Should a roost site be confirmed within an area to be affected by development proposals, it is necessary to apply for a licence from Natural England, before any works which might potentially disturb the bats can be carried out. If the disturbance or destruction of that site is inevitable, mitigation and compensation measures would have to be put in place to ensure that the conservation status of the bats in question is not threatened or compromised.

Bats and other protected species are a material consideration of the planning process and the Natural Environment and Rural Communities (NERC) Act 2006 places a duty upon local authorities to have regard to biodiversity conservation in carrying out their duties.

1.2.3 Eco-Town Guidance

In addition to a range of legislation described above in section 1.2.1, a wealth of policy and other guidance is available to govern and direct development proposals in their responsibilities with regard to ecology and biodiversity. These include the recently-published governmental guidance that specifically sets out how to deal with Eco-Town proposals (Biodiversity Positive: Eco-towns Biodiversity Worksheet, TCPA, 2009). The key points of this guidance (referred to as the principal objectives for an Eco-Town Biodiversity Strategy) are as follows:

- **Protecting and enhancing the best of biodiversity:** key habitat areas supporting characteristic and uncommon species should be sustained, where conservation is the main priority.
- **Mitigating the impact of development and securing net biodiversity gain:** the inclusion of supplementary habitat areas that fulfil other green infrastructure functions and support more widespread and common species.
- **Integrating biodiversity within the built environment:** the incorporation of a high degree of permeability for wildlife within built areas and structures.
- **Increasing biodiversity's resilience and ability to adapt to climate change:** ensuring a robust connectivity of habitats that facilitates the wider movement and migration of species.

This provides a clear steer for the design of an Eco-Town proposal, such that the avoidance of key habitat areas must be the priority, followed by the retention and creation of a matrix of secondary habitats both within and outside of the built area, and that all of the above are robustly connected to facilitate future wildlife movements and dispersals. Other key elements of the approach include making provisions for management, funding and accountability, to ensure success.

All Eco-Town proposals should include an Eco-Town Biodiversity Strategy (ETBS) to be developed in tandem with the masterplan for the site. This will provide the framework for delivering net biodiversity gain, setting out what is to be achieved and the steps that are needed to achieve it and, most importantly, how biodiversity will be increased and enhanced in advance of and alongside development, rather than at the end of the development process. It should include specific measurable targets for net biodiversity gain, reflecting local priorities for biodiversity (and contributing to national and regional targets as appropriate) and it should take account of the challenges posed by climate change.

Specifically with respect to bats, the biodiversity guidance encourages:

- The retention of existing wooded areas and well-established standard trees;
- The installation of roost boxes for bats with domestic garden and wooded areas;
- The inclusion of bespoke bat roost features within new buildings, including the numbers of such features that is considered to be appropriate;
- Ensuring that artificial lighting is not a barrier to the nocturnal movements of bats; and
- The use of bats as a species indicator (of overall biodiversity value) during post-construction monitoring of new sites.

1.2.4 Biodiversity Targets

The UK Biodiversity Action Plan (UK BAP) was produced in accordance with the 1992 UN Convention on Biological Diversity. It describes the UK's biological resources and commits a detailed plan for the protection of these resources, focusing on key habitats and species considered to be of particular significance to nature conservation within a UK context.

The conservation priorities that will be most appropriate to the Bicester Eco-Town proposal are those listed within the UK and (at the lower tier) Oxfordshire Biodiversity Action Plans (BAPs). These list a number of key habitats and species that form the priorities for conservation in those areas and serve as an existing framework within which the Eco-Town can work and provide positive contributions to nature conservation at both local and national scales.

1.3 Aims and Objectives

The aims and objectives of this study were to:

- Identify the type, level and extent of bat activity within the Exemplar site;
- Appraise this level of interest in terms of the significance of the site for bats;
- Provide recommendations to ensure that potentially adverse impacts to bats are avoided within the masterplan and that appropriate enhancement measures are put in place; and

- Prescribe any further work necessary to ensure legal compliance at the time of future works on site.

1.4 Report Content and Layout

Following this introduction, Section 2 describes the methodology followed in carrying out this study. Section 3 summarises the results of the study and discusses the implications of these findings. Section 4 draws conclusions from the work and provides appropriate recommendations for moving forward.

At the end of the report, Figure 1 shows the locations of potential roost sites surveyed and transect routes followed, with Figure 2 illustrating the key areas of bat activity recorded during the surveys. Appendix 1 contains the full data sets pertaining to the bat surveys.

2 Methodology

2.1 Desk Study

A desk study was conducted within a 5km radius of the central grid reference for the site as part of the Phase 1 Habitat Survey (Arup, June 2010). Data on distributions of notable and protected species, including bats, were sourced primarily from the Thames Valley Environmental Records Centre. The Oxfordshire Bat Group was also consulted with respect to bat species that might be expected to occur within the vicinity of the site.

The UK and Oxfordshire Biodiversity Action Plans (BAPs) were reviewed for details of bat species that are targeted for conservation action either locally or nationally.

This contextual information can assist in determining those species likely to be affected by the proposed development, and has helped to focus the field surveys in searching for signs of bat species on site.

2.2 Field Survey

The field survey work was divided into three separate exercises: an initial scoping survey of the site, followed by a series of surveys to search for evidence of roost sites and a wider set of transect surveys to record bat activity across the site.

2.2.1 Scoping Survey

A scoping survey of the site was carried out by two experienced bat surveyors to identify those features of most likely to support bat roosts, which would then be subject to further survey work.

In addition, those features of most likely value to commuting and foraging bats (generally linear habitat features such as hedgerows and woodland edge) were also identified as the key routes for subsequent transect surveys.

Potential roost sites were identified following standard guidance, such as that provided by the Bat Workers Manual and Bat Survey Guidelines. Trees that offer roost opportunities for bats are generally mature, moribund or dead, with significant cracks, fissures or cavities (such as woodpecker holes) and/or significant areas of peeling bark or ivy cover within which bats can shelter. Buildings supporting potential for roost sites are generally older structures (but not exclusively so, pipistrelles will often use modern housing), with access to roof voids, cavity walls, and/or areas behind and around slipped tiles, lead flashing, window frames, soffit boxes and so on.

The setting of potential roost sites is also key in determining their likely use and value and most will have direct connectivity to semi-natural, linear features such as hedgerows, tree lines, woodland or field edges, to assist bats in navigating from and back to their roosts. Thus any well-connected linear feature comprising this sort of habitat was identified (and subsequently surveyed) as part of a transect route.

2.2.2 Roost Emergence Surveys

Each potential roost site identified was subject to three independent surveys, two at dusk and one at dawn (potential roost sites are shown in Figure 1). Where possible, these surveys were spread across a number of weeks or months, such that seasonal changes in bat activity could be taken into account.

Surveys at dusk, to identify bats emerging from roost features, are used to confirm roost sites and commuting routes away from these features, but surveys at dawn are often useful in pinpointing precise roost locations (within structures, for example), as light conditions are often better at this time of the day.

Dusk surveys were timed to occur between 30 minutes prior to sunset until 90 minutes after sunset. Dawn surveys were timed to occur between 120 minutes prior to sunrise and sunrise itself. These are the periods during which the vast majority of bat species would be expected to leave or return to their roost sites.

All were carried out during weather conditions known to be appropriate for bat activity. These were minimum temperatures of 7C, but preferably 10C, calm or very light winds only, and predominantly dry with no heavy rain.

Equipment used included heterodyne (Batbox III, Pettersson D200) and time expansion (Pettersson D240X) detectors, as well as Anabat SD1 remote-detecting units on some survey occasions. Where recorded, data was analysed using programmes such as Analook to confirm bat registrations and species identification.

Where seen or heard, observations such as bat characteristics, species, numbers, flight directions, heights and other behaviour, such as feeding buzzes, were noted to allow for the further interpretation of bat activity at that time.

2.2.3 Transect Activity Surveys

Each transect route was walked on two separate occasions (transect routes are shown in Figure 1), following a roost emergence survey. Methodologies followed were similar to those above, in terms of personnel, survey conditions, equipment and recording techniques; the transect routes were walked directly after a nearby roost emergence survey had been carried out, so the timing of these surveys were necessarily later (generally 90 minutes after dark, for a further 90 minutes).

This type of survey information is used to identify key features within the landscape used by bats for commuting along (to/from roost sites or between disparate foraging areas) or for foraging around. Bats will often use multiple foraging areas during the course of one night and so the survey of these features can reveal pertinent information on bat activity at any time during nightfall.

2.3 Assumptions and Limitations

No account can be made of the presence or absence of bats on any single survey occasion, as bat behaviour changes across the season, with bats moving between different foraging areas and roost sites with regularity. However, the level of survey effort and the spread of surveys across a number of months mean that it is very likely that no significant areas of bat activity have been overlooked.

3 Results and Discussion

3.1 Desk Study

There are records of three species of bat within 5km of the site, namely common pipistrelle (several), brown long-eared (several) and natterer's bat (one).

The Oxfordshire Bat Group (Dave Endacott (Oxfordshire Bat Group Recorder), *pers.com.*) would expect common and soprano pipistrelle, brown long-eared bat and noctule to be present across the study area, with roosts of common pipistrelle and brown long-eared bat known from houses in Chesterton, some 1.5km south of the site. Other species, such as serotine and/or leisler's bat, would be notable if found (the closest known leisler's roost is more than 10km from the study area, for example).

UK and Oxfordshire BAP priority species include soprano pipistrelle, brown long-eared bat and noctule, as well as other rare or restricted-range bat species not anticipated to be present on the site.

3.2 Field Survey

The below is a summary of the results obtained during the scoping, roost emergence and transect activity surveys. Full sets of results are provided in Appendix 2.

3.2.1 Scoping Survey

A total of nine potential roost locations were identified. These are shown in Table 1, below:

Table 1: Potential roost locations

Roost	Description
1	Home Farm: a modern detached house with adjacent outbuildings
2	Home Farm: farm units and converted barn buildings
3	Two adjacent mature horse chestnut trees, with substantial cracks/fissures
4	Mature oak tree (with owl box)
5	Mature grey poplar with two Schwegler bat boxes and log pile at base
6	Mature ash tree (with owl box) and adjacent mature willow (bird boxes)
7	Mature oak (with little owl box) with multiple holes and crevices
8	Dead mature oak (with bird boxes) with cracks and fissures
9	Dead mature horse chestnut, with woodpecker holes and hollow trunk

A total of three corridors of habitat likely to support the greatest levels of bat activity (both commuting and foraging activity) were identified during the scoping survey. These are shown in Table 2, below:

Table 2: Transect routes

Transect	Description
1	South: Route S of wooded copse adjacent to ditch line and hedgerow
2	Central: Route N of wooded copse adjacent to ditch line and hedgerow
3	North: Route along hedgerows to B4100 and adjacent to Home Farm

Furthermore, the church (St Lawrence's) at Caversfield, immediately east of the Exemplar site boundary, was identified as of potential and subsequently found to contain droppings believed to be those of brown long-eared bat (and possibly natterer's bat), during inspections of the church interior in July and September 2010. Therefore, this building formed the first confirmed roost site of the study and was surveyed further in September.

3.2.2 Roost Emergence Surveys

Surveys at the nine potential roost sites were carried out between mid May and early September 2010; these are shown in Table 3, below:

Table 3: Survey visit dates

Roost	Description	Visit 1	Visit 2	Visit 3
1	Modern farm house	17 th May	18 th May	21 st Sept
2	Farm units and barns	17 th May	18 th May	6 th July
3	Mature horse chestnuts	24 th June	29 th June	13 th July
4	Mature oak	24 th June	29 th June	21 st Sept
5	Mature grey poplars	30 th June	5 th July	3 rd Sept
6	Mature ash and willow	30 th June	5 th July	3 rd Sept
7	Mature oak	6 th July	8 th July	25 th August
8	Dead ash	6 th July	8 th July	25 th August
9	Dead horse chestnut	12 th July	2 nd Sept	21 st Sept

Six species were recorded during the roost emergence surveys, as follows: common pipistrelle, soprano pipistrelle, brown long-eared bat, noctule and

leisler's bat. There were occasional records of unidentified bats believed to be from the *myotis* group; of these, natterer's bat is probably the most likely to be encountered within this area.

The greatest levels of bat activity were recorded along the tree and stream line between Home Farm (potential roosts 1 and 2) and potential roosts 5 and 6.

Roost sites that were confirmed as occupied during the surveys were as follows; these are shown in Figure 2:

- 1) St Lawrence's Church - brown long-eared bat (unknown use; other species also possibly present, such as natterer's bat*)
- 2) Modern farm house - common pipistrelle (likely small maternity roost)
- 3) Mature willow tree - common pipistrelle (likely small numbers or individuals only)

*Data collected from the church, using an Anabat left just outside the building overnight, provided records of common pipistrelle (3), noctule (1) and brown long-eared bat (1).

3.2.3 Transect Activity Surveys

Surveys along the three transect routes were carried out between early June and early July; dates are shown in Table 4, below:

Table 4: Transect visit dates

Transect	Description	Visit 1	Visit 2
1	Southern boundary	11 th June	18 th June
2	Central tree/hedge line	18 th June	5 th July
3	Northern boundary	11 th June	24 th June

Four species were recorded during the transect surveys, as follows: common pipistrelle, nathusius' pipistrelle, noctule and an unidentified *myotis* species of bat, with the majority of registrations being those of common pipistrelle.

The single nathusius' pipistrelle was recorded during a survey along transect 2, in the very centre of the site (see Figure 2) and its identification determined by a combination of field observations and analysed Anabat recordings, where the peak frequency was recorded at 40kHz, typical of this species.

The only activity identified along Transect 1 was at the very top end of this route, in the vicinity of the wooded copse and then towards the end of this route, in the vicinity of roost 6 and the hedgerow down to the B4100 from this area. No activity was recorded in the central sections of this route.

Bat activity was recorded along much of the length of Transect 2, alongside the wooded copse, in the vicinity of roost 3, and following the central stream down to roost 5. Only the final hedgerow between roost 5 and the B4100 lacked bat activity during the surveys.

Very little or no bat activity was recorded along the first half of Transect 3, between the start point in the north of the site (adjacent to roost 8) and along the B4100. Conversely, there was considerable activity alongside Home Farm and following the tree and stream line south west past roosts 5 and 6. This line is well used by foraging and commuting bats.

3.3 Discussion

A total of seven species of bat have been recorded on the Exemplar site: common pipistrelle, soprano pipistrelle, nathusius' pipistrelle, brown long-eared bat, leisler's, noctule and an unidentified species of *myotis* bat. This latter species is most likely to have been natterer's bat, present on occasion, and most likely in association with the wooded areas of the site.

These species are relatively abundant within the wider district and county areas, with the exception of nathusius' pipistrelle and leisler's bat, which, although likely to be under-recorded, are still notable records for the site. The closest known roost of leisler's bat is 12 km to the west of the Exemplar site within the area of Charlbury; there are no known records of nathusius' pipistrelle within close proximity of the site, but they are known from the wider region (particularly in association with open water habitats).

Three roost sites have been confirmed within the Exemplar site area; St Lawrence's Church, Caversfield (immediately east of the site boundary), the modern farmhouse at Home Farm and a mature tree to the south-west of the farm. Although St Lawrence's falls beyond the direct area of impact of the proposals, it is very likely that bats from the church will commute or forage across the site (as is suggested by the other survey results). These roost sites support common pipistrelle and brown long-eared bats.

The level and extent of bat activity recorded (during the roost emergence and transect surveys) would suggest that large parts of the site are of local significance to a number of bat species. The key features, where significant levels of bat activity were encountered, appear to be as follows:

- The buildings and associated features – tree lines, hedgerows, gardens, stream around Home Farm
- The continuation of this tree and stream line SW to the end point of transect 3 (and beyond the site boundary)
- The dogleg stream line up NW through the centre of the site
- The tree line up to the wooded copse past roost 3
- The edge of the wooded copse (in the west of the site) to the start point of transect 2

All of the above are illustrated as key activity corridors for bats in Figure 2, at the end of this report.

Overall, the number of species and levels of activity noted during the surveys are in line with wider records of bat presence and the quality and condition of the habitats present. A total of seven species within an area of this size could be considered to be notable on a local scale. It is clear that the area supports some

valuable features of significance for local populations of bats and bats form an important component of the cumulative biodiversity value of the Exemplar site.

4 Conclusions and Recommendations

4.1 Summary

Arup was commissioned to carry out a bat survey of the Exemplar site, as part of the Bicester Eco-Town proposals. The information revealed by the survey will be used to inform the design of the masterplan in order to minimise adverse impacts to bats (and other protected species), create opportunities for biodiversity gain, and ensure legal compliance with respect to bats and their roosts during works.

A total of seven species of bat were encountered during the suite of surveys undertaken. These were all relatively abundant species in the context of the site, its surrounds and their recorded presence at county and regional levels. Of the seven species, Nathusius' pipistrelle and Leisler's bat were the most notable (with relatively few existing records in the area), although both species are probably under-recorded. Two roost sites were located within the site boundary (a farmhouse and a mature tree), with an additional roost just off site (a church).

4.2 Recommendations

As a result of these findings, a number of recommendations have been made, as follows. Many of these are based upon those contained within the Eco-Towns biodiversity worksheet (TCPA, 2009) and, for further information, this document should be consulted in tandem with this report. The detailed design of all mitigation measures should be carried out with the guidance of an experienced ecologist.

4.2.1 Impact Minimisation and Habitat Retention

- The two confirmed roost sites within the Exemplar site boundary (and the adjacent roost site very close by) should be left undisturbed, through their retention as a linked and uninterrupted green corridor, by the Eco-Town proposals. These are identified as confirmed roost sites on Figure 2.
- The features identified as of particular value to bats, specifically for commuting and for foraging, as well as those trees and buildings with roost potential (even where no bats were found during these surveys), should be retained in full. These are identified as the potential roost sites and key activity corridors on Figures 1 and 2 respectively. The wooded copse in the west of the site should be retained in full as a key element of this overall resource.
- Where any of the above is not possible, inspections of such features will be required prior to any potentially disturbing act to ensure that bats are not present. Where bats may later be affected, this may require an application for an EPS licence, which may in turn necessitate works to be carried out at certain times of year (where least direct disturbance to bats is likely), using low-impact techniques (such as the soft-felling of trees) and/or under the supervision of an ecologist.
- All artificial night lighting should be avoided or its use minimised in areas identified as of value to bats, as above. All lighting should be low-intensity, directional, hooded, and triggered by use, wherever possible, to

benefit bats and other nocturnal wildlife and minimise wider light spill and light pollution issues.

4.2.2 Habitat Enhancement

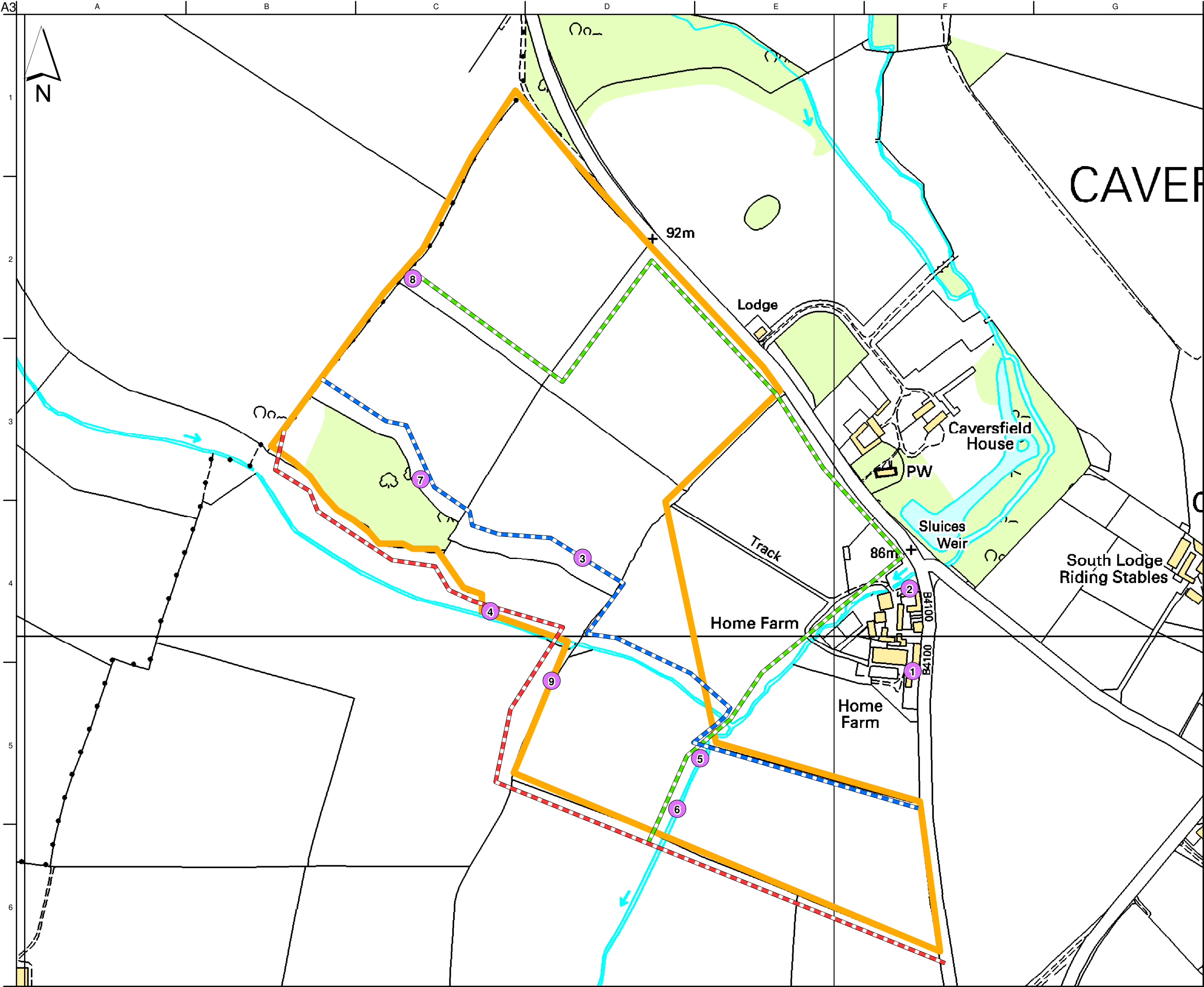
- Bespoke roost units should be created and installed throughout the built structures of the new Eco-Town area, including buildings and bridges. The Bat Conservation Trust suggests that an appropriate level of provision for bats in buildings would be 1 in 5 public buildings and 1 in 20 other structures (including private residencies). In the case of the public buildings in particular, this would involve the provision of free access (via tiles, for example) to roof spaces, for species such as brown long-eared bat, which require internal space for flight.
- Roost boxes should be provided on all trees identified as of roost potential during this survey, where these are not already present, assuming that these trees are retained within a corridor of habitat that is suitable for bat use. Additional boxes should be provided within the wooded copse within the north-west of the Exemplar site. Boxes should be provided in pairs, with varying orientations, and should comprise those box types known to be used by the three pipistrelle species, brown long-eared and noctule bats in particular (in total, this will equate to approximately 20 new roost boxes across the Exemplar site).
- Further enhancements could be made through wider landscaping measures (to include woodland planting and waterbodies of value to foraging bats) and the positive management of retained corridors of vegetation (to allow for the development of long grasses and shrubs that will offer insect prey).

4.2.3 Maintenance and Monitoring

- A site-wide Eco-Town biodiversity strategy should be created to include measures to ensure that all installed structures (e.g. roost boxes) and retained and created habitats are appropriately managed and maintained into the future.
- Bat activity should be monitored following the construction of the proposals to determine whether i) the roost sites remain active and ii) the pre-development patterns of (commuting and foraging) bat activity continue. Furthermore, new roost installations (units within buildings and boxes on trees) should be monitored to reveal the level of uptake of these features.

A1 Figures

A1.1 **Figure 1: Potential Roost and Transect Locations**



Legend

- Potential Bat Roosts
- Bat Survey Transects**
 - Transect 1
 - Transect 2
 - Transect 3
- Exemplar Site Boundary

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Issue	Date	By	Chkd	Appd

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Job Title
Bicester Eco-town

Drawing Title
**Potential Roost sites and
Transect Routes**

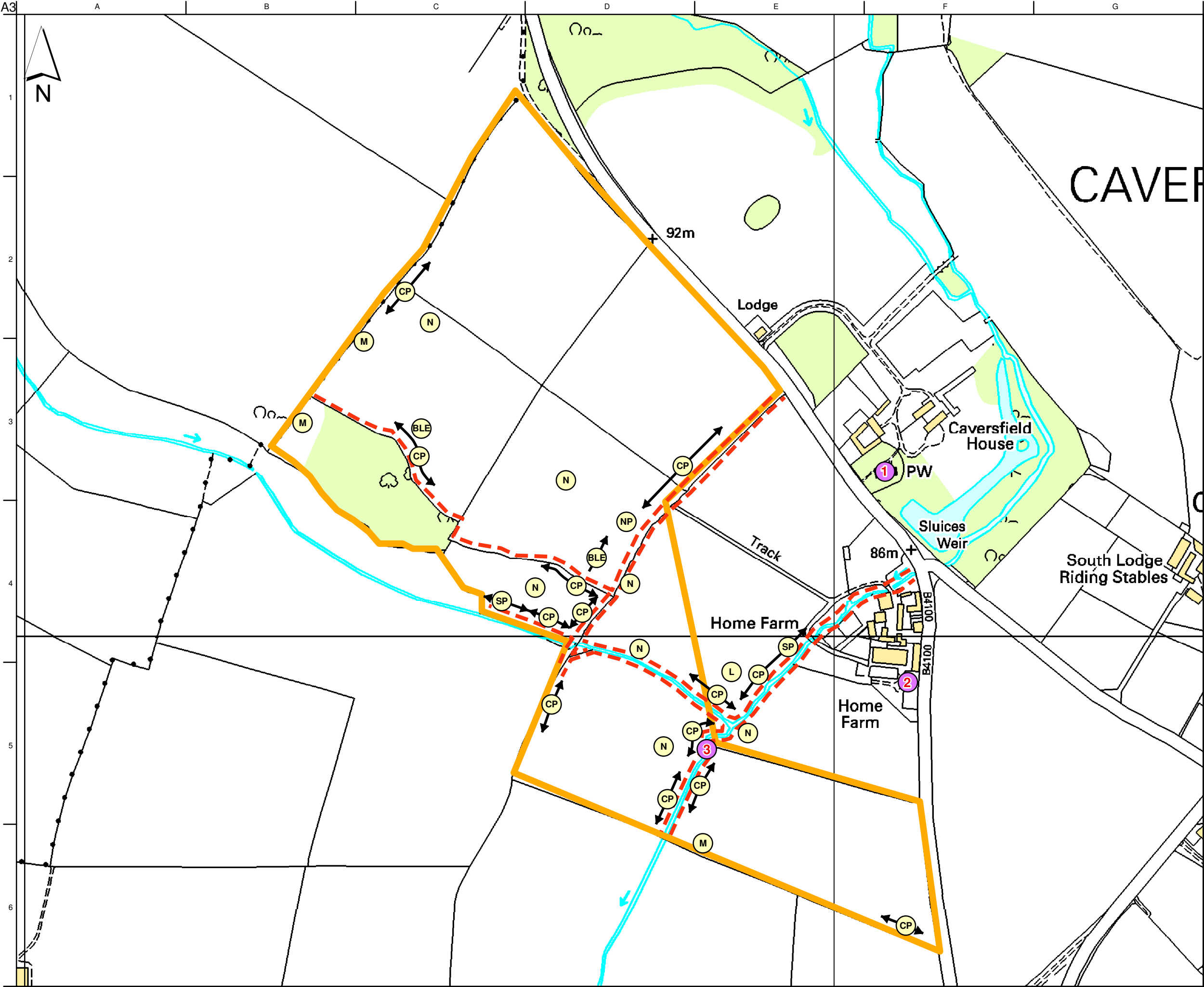
Scale at A3
1:4,500

Discipline
Ecology

Drawing Status
Draft

Job No 213225-00	Drawing No Figure 1	Issue -
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A1.2 **Figure 2: Bat Activity Recorded**



Legend

- BLE Brown Long-eared Bat
- CP Common Pipistrelle
- L Leisler's
- M Myotis Species
- N Noctule
- SP Soprano Pipistrelle
- NP Nathusius' Pipistrelle
- 1 Confirmed Roost Site
- Key Activity Corridor
- Exemplar Site Boundary

-	24-09-2010	AE	SC	AB
Issue	Date	By	Chkd	Appd

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Client
A2 Dominion

Job Title
Bicester Eco-town

Drawing Title
Key Areas of Bat Activity

Scale at A3
1:4,500

Discipline
Ecology

Drawing Status
Draft

Job No 213225-00	Drawing No Figure 2	Issue -
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A2 Survey Data

A2.1 Raw Survey Data

The data is divided into that obtained during potential roost surveys and during later transect (general bat activity surveys), below.

A2.1.1 Roost Emergence Surveys

Numbers of bat passes are highlighted where considered to be significant (>20 in single survey).

St Lawrence's Church, Caversfield

Anabat Data: 16th September (Overnight)

- 20:16 – Common Pipistrelle
- 20:38 – Common Pipistrelle
- 20:39 – Common Pipistrelle
- 21:05 – Noctule
- 00:28 – Brown Long-eared Bat

Roost 1: Modern farm house

Visit 1: 17th May (Dusk) – AB (A) – Dry, clear, light wind, 11C dropping, dusk at 21:15

- 21:19 – Common Pipistrelle
- 21:24 – Common Pipistrelle
- 21:32 – Common Pipistrelle
- 21:33 – Common Pipistrelle (2)
- 21:37 – Common Pipistrelle
- 21:39 – Common Pipistrelle
- 21:40 – Common Pipistrelle (4)
- 21:44 – Common Pipistrelle
- 21:45 – Soprano Pipistrelle
- 21:45 – Common Pipistrelle (3)
- 21:46 – Common Pipistrelle (2)
- 21:54 – Soprano Pipistrelle
- 21:55 – Common Pipistrelle (2) and Noctule
- 22:18 – Common Pipistrelle

Total bat passes: 23

Visit 2: 18th May (Dusk) – HKL – Dry, clear, light wind, mild 13C dropping, dusk at 21:18

- 21:15 – Common Pipistrelle – 1 emerged from house (where tiles meet brickwork)
- 21:23 – Common Pipistrelle – brief forage outside barn
- 21:25 – Common Pipistrelle – brief forage between house and barn
- 21:40 – Common Pipistrelle – brief forage between house and barn
- 21:57 – Noctule – 1 commute through overhead

Visit 3: 21st September (Dawn) – AB – Dry, calm, lingering fog, 9C, dusk at 06:20

- No registrations

Roost 2: Farm units and barns

Visit 1: 17th May (Dusk) – OB – Dry, clear, light wind, cool 11C dropping, dusk at 21:15

- 21:35 – Common Pipistrelle – brief forage from direction of house
- Not recorded – Common Pipistrelle – brief forage around outbuildings

Visit 2: 18th May (Dusk) – OB – Dry, clear, light wind, mild 13C dropping, dusk at 21:18

- No registrations

Visit 3: 6th July (Dawn) - AB (A) - Dry, clear, light wind, 10C; dawn at 04:40

- 03:21 – Common Pipistrelle – western end of farmyard, brief pass
- 03:34 – Common Pipistrelle – brief pass
- 03:38 - Common Pipistrelle – brief pass
- 03:47 - Common Pipistrelle – brief pass
- 03:51 - Common Pipistrelle – brief pass
- 03:53 - Common Pipistrelle – brief pass
- 03:54 – Common Pipistrelle and Noctule – two passing together
- 03:54 – Common Pipistrelle – two passes
- 03:55 – Common Pipistrelle – brief pass
- 03:57 – Common Pipistrelle – brief pass
- 03:58 – Common Pipistrelle – four passes
- 04:06 – Common Pipistrelle – four passes as above, commuting south to north

Total bat passes: 20

Roost 3: Mature horse chestnuts

Visit 1: 24th June (Dusk) – NW – Calm, warm, humid, high cloud cover, light W breeze, 20C; dusk at 21:37

- 22:21 – Unidentified bat, commuting overhead

Visit 2: 29th June (Dusk) – TS – Very warm, overcast, light southerly breeze, 22C; dusk at 21:27

- 22:00 – Common Pipistrelle (2) – Foraging alongside trees until 22:15
- 22:25 – Noctule – 1 foraging overhead across fields between roosts 3 and 4
- 22:38 – Common Pipistrelle – Foraging alongside hedgerow, central site
- 22:38 – Noctule – Foraging over central field N of roost 3

Visit 3: 13th July (Dawn) – TS – Overcast, light rain at times, calm, mild 15C; dawn at 05:00

- 03:45 – Common Pipistrelle – NW past front of tree
- 03:52 – Common Pipistrelle – S along perpendicular hedgerow
- 03:59 – Common Pipistrelle – passes until 04:05 between two trees
- 04:10 – Brown Long-eared Bat – NE past southernmost tree
- 04:15 – Common Pipistrelle (2) – in front of southernmost tree until 04:20
- 04:22 – Common Pipistrelle
- 04:27 – Common Pipistrelle (2) – regular circuits between trees until 04:35

Visit 4: 20th September (Dusk) – TS – Dry, overcast, moderate breeze, 12C; dusk at 19:05

- 19:36 – Common Pipistrelle – unseen
- 19:40 – Common Pipistrelle – unseen
- 19:44 – Common Pipistrelle – unseen
- 19:48 – Common Pipistrelle – flying south-east along hedgerow
- 19:49 – Common Pipistrelle – unseen, but foraging close by

Roost 4: Mature oak

Visit 1: 24th June (Dusk) – MS – Calm, warm, humid, high cloud cover, light W breeze, 20C; dusk at 21:37

- 22:26 - Common Pipistrelle – foraging
- 22:27 - Common Pipistrelle – foraging
- 22:30 - Soprano Pipistrelle – foraging
- 22:31 - Common Pipistrelle – seen flying low along hedge line

Visit 2: 29th June (Dusk) – JB – Very warm, overcast, light southerly breeze, 22C; dusk at 21:27

- 22:17 – Common Pipistrelle – foraging along adjacent hedge line until 22:25
- 22:28 – Common Pipistrelle – along winterbourne adjacent to potential roost

Visit 3: 20th September (Dusk) – JB – Dry, overcast, moderate breeze, 12C; dusk at 19:05

- 19:35 – Common Pipistrelle – commuting unseen
- 19:45 – Common Pipistrelle – foraging unseen
- 19:47 – Common Pipistrelle – commuting along hedgerow
- 19:50 – Common Pipistrelle – commuting along hedgerow

Visit 4: 21st September (Dawn) – JB – Dry, calm, lingering fog, 9C; dusk at 06:20

- No registrations

Roost 5: Mature grey poplars

Visit 1: 30th June (Dusk) – NH (A) – Calm, moderate cloud cover, warm, 20C; dusk at 21:25

- 22:02 – Common Pipistrelle – Commute S towards roost 6 in front of tree line
- 22:05 – Common Pipistrelle (2) – Rapid commute S in quick succession
- 22:07 – Noctule – overhead field edge, c.10m from tree line
- 22:08 – Common Pipistrelle (2) – Rapid forage back N along tree line
- 22:09 – Common Pipistrelle (2) – Rapid forage back N
- 22:10-19 – Common Pipistrelle – Continuous foraging (30 passes) up and down tree line until 22.19
- 22:10-20 – Soprano Pipistrelle – In with Common Pipistrelle activity (4 passes)
- 22:20-30 – Common Pipistrelle – Intensive patch of feeding (4-5 individuals) at meeting point of hedgerow and ditch line (32 passes)
- 22:30-31 – **Leisler's** (suspected) – 3 circuit passes over field edge
- 22:30-36 – Common Pipistrelle – again foraging up and down tree line adjacent to roost 5 (13 passes)
- 22:34-36 – **Leisler's** (confirmed) – seen well twice against backlit sky; noticeably smaller than noctule, several short foraging circuits about 5m up, 10m from tree line.
- 22:37 – Common Pipistrelle – brief unseen pass
- 22:38 – Common Pipistrelle – brief unseen pass
- 22:39 – Common Pipistrelle – brief unseen pass
- 22:42 – Common Pipistrelle – brief unseen pass

Total bat passes: 98

Visit 2: 5th July (Dusk) – NH (A) – Mild 16C (but rapid drop to 12C), part overcast, calm to light breeze; dusk at 21:20

- 22:04 – Common Pipistrelle – unseen overhead
- 22:07 – Common Pipistrelle – rapid commute S along tree line (from farm)
- 22:08 – Common Pipistrelle – unseen overhead
- 22:09 – Common Pipistrelle – unseen overhead
- 22:12 – Common Pipistrelle – circuit back and forth (2 passes) along tree line
- 22:15 – Common Pipistrelle – rapid commute N (back towards farm)
- 22:16-18 – Common Pipistrelle – constant foraging activity where hedge and ditch line meet including foraging up towards badger setts (10 passes)
- 22:19-22 – Common Pipistrelle – continuous foraging up and down tree line in front of roost 5 (12 passes)

- 22:23-26 – Common Pipistrelle – constant foraging activity in corner (10 passes)
- 22:28-31 – Common Pipistrelle – as above (9 passes)

Total bat passes: 48

***Visit 3:** 3rd September (Dawn) – OB – Calm, clear, damp, very cool, down to 7C; dawn at 05:45*

- 05:34 – Common Pipistrelle – commute north along tree line and return to roost within mature willow immediately north of poplar
- 05:39 – Common Pipistrelle – as above

Roost 6: Mature ash and willow

Visit 1: 30th June (Dusk) – AB – Calm, moderate cloud cover, warm, 20C; dusk at 21:25

- 22:04 – Common Pipistrelle – Brief forage past (came from west?)
- 22:05 – Common Pipistrelle – Brief forage past
- 22:08 – Unidentified pass
- 22:09-15 – Common Pipistrelle - Constant passes and feeding in front of tree line
- 22:25 – Probable Noctule overhead

Visit 2: 5th July (Dusk) – AB – Mild 16C (but rapid drop to 12C), part overcast, calm to light breeze; dusk at 21:20

- 22:07 – Common Pipistrelle – commuting pass south to north along hedge
- 22:10 – Common Pipistrelle (2) – commuting pass north to south
- 22:11 – Common Pipistrelle (2) – foraging close to water trough
- 22:12 – Common Pipistrelle (2) – foraging close to water trough
- 22:14 – Common Pipistrelle (2) – foraging close to water trough
- 22:16 – Common Pipistrelle (3) – foraging close to water trough
- 22:22 – Common Pipistrelle (3) and Soprano Pipistrelle (1) – foraging around water trough, north to the gate

Visit 3: 3rd September (Dawn) – CH – Calm, clear, damp, very cool, down to 7C; dawn at 05:45

- 05:33 – Common Pipistrelle – rapid commute north in direction of farm

Roost 7: Mature oak

Visit 1: 6th July – ML – Dry, clear, warm 18C; dusk at 21:24

- 21:41 – Unidentified – very faint registration
- 22:20 – Common Pipistrelle – passed along far side of hedgerow
- 22:23 – Unidentified – very faint registration
- 22:24 – Common Pipistrelle – passed along hedgerow
- 22:34 – Unidentified – possible distant Noctule
- 22:38 – Common Pipistrelle – circled overhead
- 22:40 – Unidentified – low frequency call
- 22:40 – Common Pipistrelle – passed along far side of hedgerow
- 22:43 – Unidentified – low frequency call
- 22:47 – Common Pipistrelle – passed along far side of hedgerow
- 22:50 – Brown Long-eared Bat (peak frequency 48) - unseen

Visit 2: 8th July (Dusk) – JB2 – Dry (light shower earlier), overcast, light breeze, warm 18C falling to 16C; dusk at 21:24

- No registrations

Visit 3: 25th August (Dawn) – NW – Mild to cool, 12C down to 10C, clear with little high cloud cover; dawn at 06:04

- 04:15 – Common Pipistrelle – commuting above path through woodland
- 04:43 – Pipistrelle sp – very faint registration at 45kHz
- 04:55 – Common Pipistrelle (2) – flying back and forth around area of gate and southern edge of woodland, until 05:06
- 05:14 – Unidentified (Brown Long-eared or Natterer's likely) – very faint feather-like registration at 45kHz, unseen

Roost 8: Dead ash

Visit 1: 6th July (Dusk) – TS – Calm, clear, warm, 18C; dusk at 21:30

- 22:15 – Common Pipistrelle – commuting NE past tree, along hedgerow
- 22:25 – Common Pipistrelle – commuting NE past tree, along hedgerow
- 22:30 – Noctule – commuting overhead
- 22:32 – Unidentified (peak frequency 48) – commuting past
- 22:35 – Noctule – commuting overhead
- 22:38 – Noctule/Serotine – commuting and foraging overhead

Visit 2: 8th July (Dusk) – OB – Dry (light shower earlier), overcast, light breeze, warm 18C falling to 16C; dusk at 21:24

- No registrations

Visit 3: 25th August (Dawn) – ML – Mild to cool, 12C down to 10C, clear with little high cloud cover; dawn at 06:04

- 04:43 – Common Pipistrelle – flew overhead along hedgerow
- 04:47 – Common Pipistrelle – as above
- 05:02 – Common Pipistrelle – as above
- 05:08 – Common Pipistrelle – as above
- 05:17 – Common Pipistrelle – as above

Roost 9: Dead horse chestnut

Visit 1: 12th August (Dusk) – TS – Calm, part overcast, warm, 18C; dusk at 21:30

- 22:03 – Common Pipistrelle – foraging pass in front of ash and horse cht
- 22:05 – Common Pipistrelle – as above
- 22:15 – Common Pipistrelle – as above
- 22:22 – Common Pipistrelle – as above
- 22:27 – Common Pipistrelle – as above
- 22:35 – Common Pipistrelle – foraging circuit around and behind ash

Visit 2: 2nd September (Dawn) – OB – Calm, clear but misty, damp, cool, down to 7C; dawn at 05:43

- No registrations

Visit 3: 21st September (Dusk) – TS – Dry, calm, moderate overcast, 20C; dusk at 19:03

- No registrations

A2.1.2 Transect Activity Surveys

Transect 1: South

Visit 1: 18th May – OB/HKL – Mild, calm, little cloud, 11C

- 23:07 – Myotis sp – circuit at top end of transect (NW corner of site)
- 23:37 – Common Pipistrelle – circuit adjacent to W bank of stream, S of Home Farm
- 23:40 – Myotis sp – circuit adjacent to E bank of stream, S of Home Farm
- 23:49 – Common Pipistrelle – adjacent to hedge line to B4100
- 00:00 – Common Pipistrelle - adjacent to hedge line to B4100

Visit 2: 10th June – OB/JB – Mild, 13 down to 11C, heavy overcast, moderate breeze

- 22: 08 – Common Pipistrelle – circuit at bottom end of transect, along hedgerow to B4100
- 22:10 – Common Pipistrelle – as above

Transect 2: Central

Visit 1: 18th May – OB/HKL– Mild, calm, little cloud, 11C

- 22:49 – Common Pipistrelle – adjacent to roost 3 chestnuts
- 22:51 – Common Pipistrelle – along adjacent N-S hedgerow
- 23:22 – Noctule – other side of N-S hedgerow
- 23:31 – Common Pipistrelle – circuit close to roost 5
- 00:42 – Common Pipistrelle – Moving along central hedgerow from Caversfield House across to stream/wooded copse
- 00:50 – Common Pipistrelle – as above
- 01:39 – Common Pipistrelle – as above
- 01:43 – Common Pipistrelle – as above

Visit 2: 5th July – AB/NH (A) – Dry, clear, light wind, 13C; dusk at 21:20

- 22:32 – Common Pipistrelle unseen
- 22:33 – Noctule – unseen overhead at corner of field
- 22:34 – Common Pipistrelle - unseen
- 22:36 – Noctule –unseen, along ditch line towards badger setts
- 22:46 – **Nathusius' Pipistrelle** - unseen, irregular, 'slappy' call, over central hedgerow in general proximity of woodland copse
- 22:53-54 – As above (3 passes)

Transect 3: North

Visit 1: 10th June – OB/JB – Mild, 13 down to 11C, heavy overcast, moderate breeze

- 22:15 – Common Pipistrelle – 2-3 individuals along tree and stream line adjacent to roost 6
- 22:21 – Common Pipistrelle – 3-4 individuals along tree and stream line adjacent to roost 5

Visit 2: 24th June – NW/MS – Calm, warm, humid, high cloud cover, light W breeze, temp; dusk at?

- 23:02 – Common Pipistrelle – Top end of route near roost 8
- 23:05 – Common Pipistrelle – Top end of route near roost 8
- 23:25 – Common Pipistrelle – adjacent to Home Farm, near ditch line
- 23:28 – Common Pipistrelle – adjacent to Home Farm, near ditch line
- 23:38 – Common Pipistrelle – at least 4 bats, at wooded corner near roost 5

APPENDIX 7I

Arup (2010) Water Vole and Otter Survey

A2 Dominion

Bicester Eco-Town

Water Vole and Otter Survey

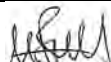
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This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Document Verification

ARUP

Job title		Bicester Eco-Town		Job number	
				213225-00	
Document title		Water Vole and Otter Survey		File reference	
Document ref		J/213000/213225-00			
Revision	Date	Filename	Water Vole and Otter Report Draft 1.docx		
Draft 1	20/09/10	Description	First draft		
			Prepared by	Checked by	Approved by
		Name	Megan Hooper	Austin Brown	Michael Bull
		Signature			
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			Prepared by	Checked by	Approved by
		Name	Megan Hooper	Austin Brown	Michael Bull
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		Filename			
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		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
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1 Introduction

1.1 Background

Arup have been commissioned by A2 Dominion to carry out a suite of protected species and habitat surveys for the proposed Bicester Exemplar Eco-Town development in Oxfordshire. This specific report is in respect of the riparian mammals, otter *Lutra lutra* and water vole *Arvicola terrestris*.

The proposed development is located within a belt of predominantly grazing farmland which lies to the north west of Bicester. (SP 577 251); the red line area is shown in Figure 1. At present the proposed development area consists of a matrix of farmland with up to 10 grazed fields separated by many high quality species rich hedgerows. A distinct lowland area with an ephemeral stream runs east to west through the south and central areas of the site, and midway flows into a second ephemeral stream running north to south throughout the site.

At present the farmland within the development area is being managed in a relatively sensitive manner with regards to biodiversity. This includes areas set aside for badger setts, numerous bird boxes, including barn owl (Latin) and kestrel (Latin) and the provision of bat boxes. Hedgerows have been maintained to produce a wide, continuous and mostly species rich structure and are playing an important part for biodiversity on the site.

1.2 Ecology and Legislation

1.2.1 Generic Legislation

This report and its recommendations have been produced in accordance with relevant legislation and best practice guidance. They also take into account Planning Policy Statement 9 (PPS9) and other nature conservation policies within local and regional planning policy documents.

Legislation relating to ecological resources that are relevant to this appraisal includes the following:

- ***Wildlife and Countryside Act, 1981 (as amended)***. This Legislation still comprises the primary means of protecting wildlife in the UK and provides the mechanism by which a number of international directives are implemented in the UK.
- ***Conservation (Natural Habitats &c.) Regulations, 1994***. This Act provides protection for European protected species such as bats and great crested newts.
- ***Countryside and Rights of Way (CROW) Act, 2000***. The CROW Act strengthened the details of The Wildlife and Countryside Act in relation to Sites of Special Scientific Interest (SSSI) and threatened species.

- ***Natural Environment and Rural Communities (NERC) Act, 2006.*** This Act puts an obligation on public bodies and statutory undertakers to ensure due regard to the conservation of biodiversity.
- ***Planning Policy Statement 9 (PPS9).*** This sets out the Government's planning policies on the protection of biodiversity and geological conservation through the planning system. The policies set out in PPS9 may also be material to decisions on individual planning applications.

The key principles of the PPS9 are stated as:

“Regional planning bodies and local planning authorities should adhere to the following key principles to ensure that the potential impacts of planning decisions on biodiversity and geological conservation are fully considered.....

(vi) the aim of planning decisions should be to prevent harm to biodiversity and geological conservation interests. Where granting planning permission would result in significant harm to those interests, local planning authorities will need to be satisfied that the development cannot reasonably be located on any alternative sites that would result in less or no harm. In the absence of any such alternatives, local planning authorities should ensure that, before planning permission is granted, adequate mitigation measures are put in place. Where a planning decision would result in significant harm to biodiversity and geological interests which cannot be prevented or adequately mitigated against, appropriate compensation measures should be sought. If that significant harm cannot be prevented, adequately mitigated against, or compensated for, then planning permission should be refused.”

In addition, PPS9 states:

“Development proposals provide many good opportunities for building-in beneficial biodiversity or geological features as part of good design. When considering proposals, local planning authorities should maximise such opportunities in and around developments, using planning obligations where necessary.”

In respect of species protection, PPS9 states:

“.....planning authorities should ensure that these species are protected from the adverse effects of development, where appropriate, by using planning conditions or obligations. Planning authorities should refuse permission where harm to the species or their habitats would result unless the need for, and benefits of, the development clearly outweigh that harm”.

1.2.2 Species Legislation

Water vole

Since April 2008, water voles have been fully protected through their inclusion in Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) with respect to Section 9. It is an offence to:

- Intentionally kill, injure or take (capture) a water vole;
- Possess or control a live or dead water vole, or any part of a water vole;

- Intentionally or recklessly damage, destroy or obstruct access to their breeding or resting places;
- Disturb water voles while they are in their breeding or resting places.
- Sell, offer for sale or advertise for live or dead water voles.

Offences under Section 9 carry a maximum penalty of a fine not exceeding Level 5 on the standard scale (currently £5,000), imprisonment for up to six months, or both.

There is no provision for licensing of actions that would otherwise be offences if the actions are for development, maintenance or land management. Works must fulfil the defence in the Act that permits otherwise illegal actions if they are *'the incidental result of a lawful operation and could not reasonably be avoided'*. Therefore avoidance and mitigation measures are required where water voles are present, to prevent an offence being committed.

If, after avoidance and mitigation measures, there is a risk that water voles are still present in their burrows within the working area then it may be necessary to trap them and relocate them to outside the working area. Natural England do not consider trapping and relocation to be incidental and therefore may issue a Conservation Licence for the works, assuming that there is no reasonable alternative to the work, there are no practical solutions to retaining the water voles at the location and there is some overall benefit to the conservation of the species (Natural England, 2008).

Otter

Otters are fully protected through their inclusion in Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and in Schedule 2 of The Conservation (Natural Habitats, etc.) Regulations 2010 as a European protected species. Under the legislation, it is an offence to intentionally kill, injure or take an otter as well as intentionally or recklessly damage, destroy or obstruct access to any structure or place used for shelter or protection by an otter or disturbing an animal while it is occupying a structure or place which it uses for that purpose.

Where works could result in an offence under the above legislation, Natural England may issue a licence for the works. To obtain this licence avoidance and mitigation measures will be required and there may be time constraints to the works. The licence application process can take up to 60 working days.

1.2.3 Eco-Town guidance

In addition to a range of legislation described above in section 1.2.1, a wealth of policy and other guidance is available to govern and direct development proposals in their responsibilities with regard to ecology and biodiversity. These include the recently-published governmental guidance that specifically sets out how to deal with eco-town proposals (Biodiversity Positive: Eco-towns Biodiversity Worksheet, TCPA, 2009). The key points of this (referred to as the principal objectives for an Eco-town Biodiversity Strategy) are as follows:

- **Protecting and enhancing the best of biodiversity:** key habitat areas supporting characteristic and uncommon species should be sustained, where conservation is the main priority.

- **Mitigating the impact of development and securing net biodiversity gain:** the inclusion of supplementary habitat areas that fulfil other green infrastructure functions and support more widespread and common species.
- **Integrating biodiversity within the built environment:** the incorporation of a high degree of permeability for wildlife within built areas and structures.
- **Increasing biodiversity's resilience and ability to adapt to climate change:** ensuring a robust connectivity of habitats that facilitates the wider movement and migration of species.

This provides a clear steer for the design of an eco-town proposal, such that the avoidance of key habitat areas must be the priority, followed by the retention and creation of a matrix of secondary habitats both within and outside of the built area, and that all of the above are robustly connected to facilitate future wildlife movements and dispersals. Other key elements of the approach include making provisions for management, funding and accountability, to ensure success.

All eco-town proposals should include an Eco-Town Biodiversity Strategy (ETBS) to be developed in tandem with the masterplan for the site. This will provide the framework for delivering net biodiversity gain, setting out what is to be achieved and the steps that are needed to achieve it and, most importantly, how biodiversity will be increased and enhanced in advance of and alongside development, rather than at the end of the development process. It should include specific measurable targets for net biodiversity gain, reflecting local priorities for biodiversity (and contributing to national and regional targets as appropriate) and it should take account of the challenges posed by climate change.

1.2.4 Biodiversity Targets

The UK Biodiversity Action Plan (UK BAP) was produced in accordance with the 1992 UN Convention on Biological Diversity. It describes the UK's biological resources and commits a detailed plan for the protection of these resources, focusing on key habitats and species considered to be of particular significance to nature conservation within a UK context.

The conservation priorities that will be most appropriate to the Bicester eco-town proposal are those listed within the UK and (at the lower tier) Oxfordshire Biodiversity Action Plans (BAPs). These list a number of key habitats and species that form the priorities for conservation in those areas and serve as an existing framework within which the Eco-town can work and provide positive contributions to nature conservation at both local and national scales.

The water vole and otter are both Priority Species in the UKBAP. Water vole is also listed on the Oxfordshire BAP.

1.3 Aims and Objectives

The aims and objective of the water vole and Otter surveys are to:

- assess the habitat suitability within the proposed development area for water vole and otter;
- determine the presence/likely absence of otter and water vole within suitable habitat within the proposed development areas; and

- outline mitigation measures that are required and should be considered during works in the event that water vole and/or otter are present on the site.

1.4 Report Content and Layout

Firstly, the desk based and field survey methodology is presented in Section 2 followed by the results and discussion in Section 3. The final conclusions and recommendations in Section 4 provide recommendations for the type of mitigation that will be required during works to protect water vole and otter.

2 Methodology

2.1 Desk Study

Records were obtained from Thames Valley Ecological Records Centre for otter and water vole with 5km of the proposed development area. Records were also obtained using the online source, the NBN Gateway.

2.2 Field Survey

The proposed development site was surveyed according to standard survey methodologies. The survey area is shown on Figure 2. The otter and water vole surveys were undertaken at the same time as the location of field signs are similar for both species. The survey was undertaken on the 7th June and 28th August 2010.

2.2.1 Water Vole Survey

Initial habitat suitability assessment was undertaken to determine the likely locations for water voles to be present within the proposed development area. This involved recording flow conditions, availability of food and cover, water quality and the indications that water vole will not be present such as signs of Mink.

The standard water vole survey methodology involves a detailed survey along both banks of a watercourse to record field signs including (Strachan and Moorhouse, 2006) the following:

- Faeces/latrines – droppings deposited in piles near to burrows and tracks.
- Feeding stations – food (grasses, sedges etc) collected and stored in piles on the bank and along the waters edge.
- Burrows – typically a series of holes along the waters edge, or below the water level.
- Nests – where burrows have been flooded and in areas with dense vegetation, large nests (rugby ball size) of grasses, sedges and rushes woven around the base of bank side plants can sometimes be found.
- Footprints – these can often be seen in wet mud and silt at the margins. The first and fifth toes of the water vole hind foot are at right angles to the three central toes and may be differentiated from rat prints in this way.

The optimal survey period for water vole is between mid-April and September (early October) when they are most active (Strachan and Moorhouse 2006). Surveys can also be undertaken in February, March, October and November although they are less active and therefore it is a suboptimal time for survey.

2.2.2 Otter Survey

The habitat was assessed for the suitability to support otter by identifying suitable watercourses and waterbodies that could be used by otters, and potential vegetated areas that could support otter holts and couches (temporary resting places).

Suitable areas were then surveyed for signs of otter including the following:

- Spraints (droppings) left on exposed rocks along the watercourse, protrusions from the bank such as tree roots, on frequently used paths (particularly exit points from the watercourse) and in close proximity to otter holts.
- Footprints in the mud or silt along the margins of the watercourse.
- Feeding remains such as the skins of amphibians.
- Otter paths indicated by parted vegetation or bare ground where otters frequently use the same path.
- Otter holts within holes in the river bank or within root systems of trees within adjacent habitat.
- Otter couches (resting places) indicated by flattened areas of vegetation with paths leading to the watercourse.

2.2.3 Survey Limitations

Vegetation growth was high. This can sometimes limit the visibility of field signs. However, the narrow watercourses were easily accessible and it was not considered to be a significant limitation to the survey.

The findings presented in this report represent those at the time of survey and reporting. Variations in these conditions will take place as a result of seasonal factors, and with the general passage of time.

It should also be noted that fauna may travel over wide areas and can have large home ranges and so can be overlooked within surveys. Species which are absent at the time of survey may also return to or colonise a site anew at any future time.

3 Results and Discussion

3.1 Desk Study

Water vole has been recorded on the River Bure in Bicester (TVERC, 2010) and within the wider area although there were no records specific to the proposed development area.

An otter spraint was recorded in 2008 at Trow Pool near Bucknell. This is a coarse and carp fishery (TVERC, 2010). Records of otter within the development area were not found on the NBN Gateway.

Potential water vole burrows were observed adjacent to the site along the watercourse at Home Farm during the Phase 1 Habitat Survey undertaken in April 2010 as shown on Figure 2. At this time there was a flow of water within the watercourse. However, no associated field signs were observed to confirm the presence of water vole at this time.

3.2 Field Survey

3.2.1 Habitat Suitability

The watercourses within the Exemplar site had started to dry significantly by the June survey and were dry in August 2010, as shown on Figure 2. While the dense vegetation on the banks and within the channel provide suitable cover and foraging resources, the lack of water for a significant part of the year renders this length of watercourse unsuitable for a permanent water vole population. However, the watercourse may be suitable at other times of year while the water is flowing. Potentially suitable connecting watercourses and waterbodies for water voles are present upstream and downstream of the site.

The vegetation along the banks of the watercourses and waterbodies are potential suitable for otters. Occasional areas of nearby woodland and scrub provide potential otter holt sites. However, food sources are lacking due to low or absent water levels within the waterbodies and watercourses within the surrounding area. The area may be suitable for otter during winter when water flow is higher.

3.2.2 Otter and Water Vole Survey

No field signs of otter or water vole were observed during the survey.

3.3 Discussion

It is considered unlikely that otter or water vole were present at the time of the survey. There are a few records of otter and water vole in the surrounding area. However, both species are, in general, expanding their range in the UK.

Water vole and particularly otter are mobile mammals that may move from adjacent areas into these waterbodies and watercourses while water levels are high.

4 Conclusions and Recommendations

It is considered unlikely that water vole and otter are present within the proposed development area at this time. However, they may populate the suitable sections of watercourses and waterbodies during periods of high flow.

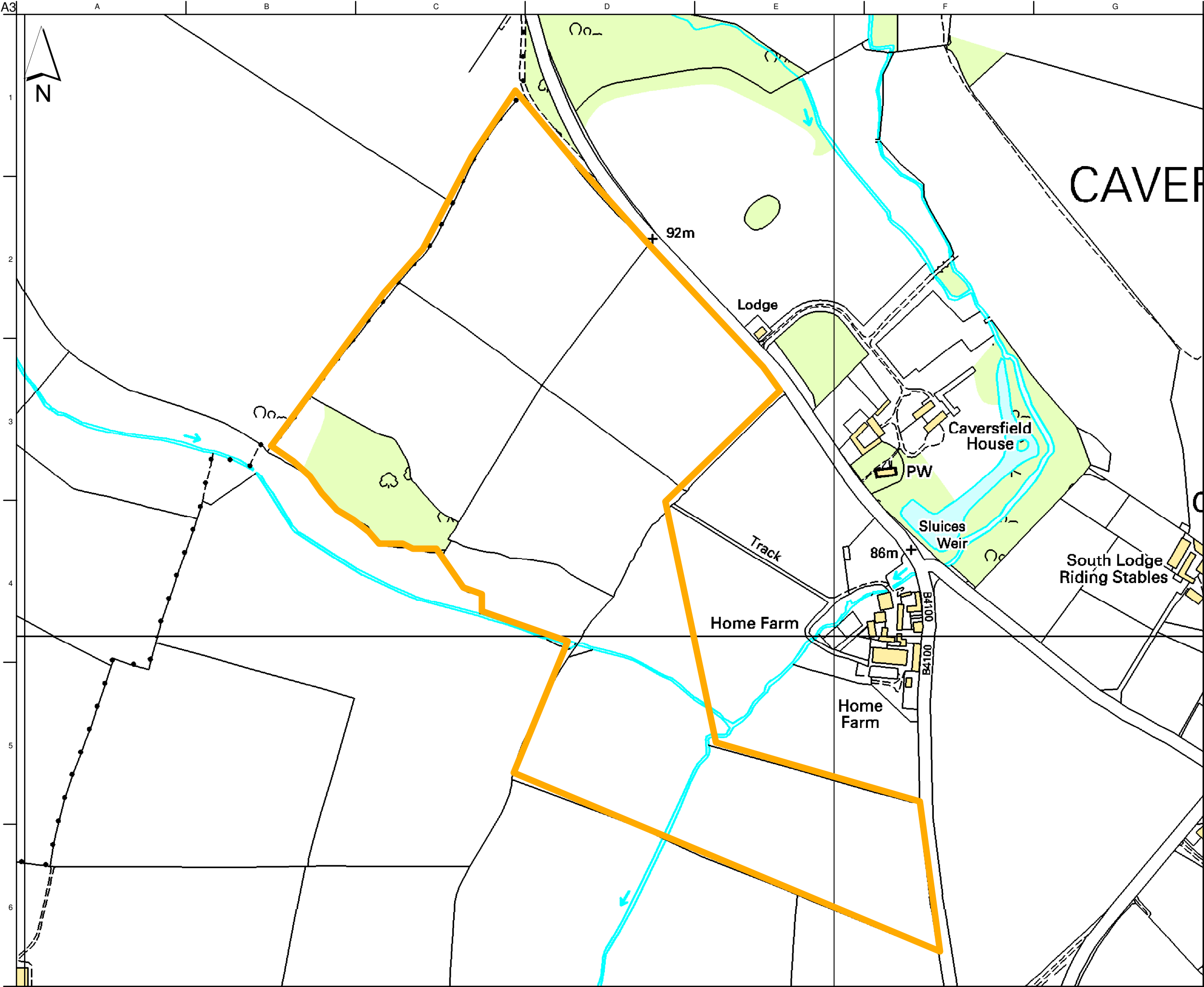
As a precaution a pre-start check for water vole and otter within watercourses and waterbodies to be affected by works should be undertaken prior to works. This check should be programmed to allow enough time to obtain Natural England licences and to undertake appropriate avoidance and mitigation measures prior to works.

If otter or water vole are found within the proposed development site then consultation should be undertaken with Natural England and it may be necessary to obtain a Natural England licence for the works.

Damage to the watercourses and waterbodies within the proposed development area should be avoided as they provide a future potential resource for otter and water vole.

A1 Figures

A1.1 Figure 1: Site area



Legend

Exemplar Site Boundary

-	22-09-2010	AE	SC	AB
Issue	Date	By	Chkd	Appd

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Client

A2 Dominion

Job Title

Bicester Eco-town

Drawing Title

Site Overview

Scale at A3

1:4,500

Discipline

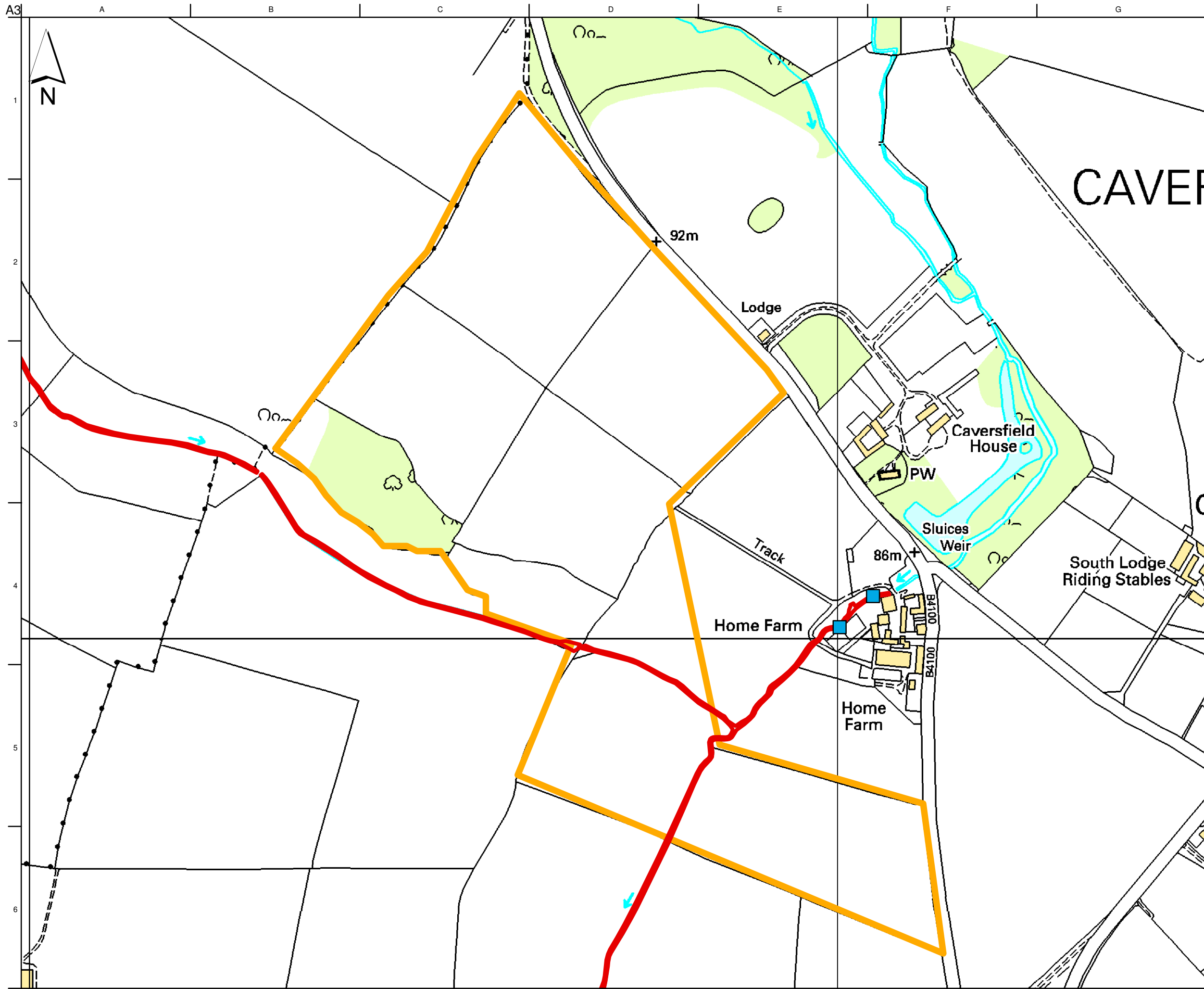
Ecology

Drawing Status

Draft

Job No 213225-00	Drawing No Figure 1	Issue -
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A1.2 Figure 2: Otter and water vole survey areas



Legend

- Possible Water Vole Borrows - April 2010
- Damp/Dry watercourse
- Wet watercourse
- Exemplar Site Boundary

-	24-09-2010	AE	SC	AB
Issue	Date	By	Chkd	Appd

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Client
A2 Dominion

Job Title
Bicester Eco-town

Drawing Title
Water Vole and Otter Survey Areas

Scale at A3
1:4,500

Discipline
Ecology

Drawing Status
Draft

Job No 213225-00	Drawing No Figure 2	Issue -
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APPENDIX 7J

Arup (2010) Dormouse Survey

A2 Dominion
Bicester Eco-Town
Dormouse Survey

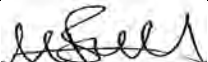
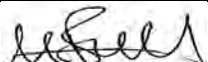
ISSUE | September 2010

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Document Verification

ARUP

Job title		Bicester Eco-Town		Job number 213225-00	
Document title		Dormouse Survey		File reference	
Document ref		J/213000/213225-00			
Revision	Date	Filename	Bat Report NH1.docx		
Draft 1	31/08/10	Description	First draft		
			Prepared by	Checked by	Approved by
		Name	Austin Brown	Andrew Barron	Michael Bull
		Signature			
Issue	30/09/10	Filename	Protected species - Dormouse report - ABarron review		
		Description	Minor changes		
			Prepared by	Checked by	Approved by
		Name	Austin Brown	Andrew Barron	Michael Bull
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
Issue Document Verification with Document					☒

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1 Introduction

1.1 Background

Arup has been commissioned by A2 Dominion to carry out a suite of protected species and habitat surveys for the proposed Bicester Exemplar Eco-Town development in Oxfordshire. This report is in respect of the hazel dormice (*Muscardinus avellanarius*).

The proposed development is located within a belt of predominantly grazing farmland which lies to the north west of Bicester. (SP 577 251); The red line area is shown in Figure 1. At present the proposed development area consists of a matrix of farmland with up to 10 grazed fields separated by many high quality species rich hedgerows. A distinct lowland area with an ephemeral stream runs east to west through the south and central areas of the site, and midway flows into a second ephemeral stream running north to south through the site.

At present the farmland within the development area is being managed in a relatively sensitive manner with regards to biodiversity. This includes areas set aside for badger setts, numerous bird boxes, including barn owl (*Tyto alba*) and kestrel (*Falco tinnunculus*), and the provision of bat boxes. Hedgerows have been maintained to produce a wide, continuous and mostly species rich structure and are playing an important part for biodiversity on the site.

1.2 Ecology and Legislation

1.2.1 Generic Legislation

This report and its recommendations have been produced in accordance with relevant legislation and best practice guidance. It also takes into account Planning Policy Statement 9 (PPS9) and other nature conservation policies within local and regional planning policy documents.

Legislation relating to ecological resources that are relevant to this appraisal includes the following:

- ***Wildlife and Countryside Act, 1981 (as amended)***. This Legislation still forms the primary means of protecting wildlife in the UK and provides the mechanism by which a number of international directives are implemented in the UK.
- ***Conservation (Natural Habitats &c.) Regulations, 1994***. This Act provides protection for European protected species such as bats, great crested newts and the hazel dormouse.
- ***Countryside and Rights of Way (CROW) Act, 2000***. The CROW Act strengthened the details of The Wildlife and Countryside Act in relation to Sites of Special Scientific Interest (SSSI) and threatened species.

- ***Natural Environment and Rural Communities (NERC) Act, 2006.*** This Act puts an obligation on public bodies and statutory undertakers to ensure due regard to the conservation of biodiversity.
- ***Planning Policy Statement 9 (PPS9).*** This sets out the Government's planning policies on the protection of biodiversity and geological conservation through the planning system. The policies set out in PPS9 may also be material to decisions on individual planning applications.

The key principles of the PPS9 are stated as:

“Regional planning bodies and local planning authorities should adhere to the following key principles to ensure that the potential impacts of planning decisions on biodiversity and geological conservation are fully considered.....

(vi) the aim of planning decisions should be to prevent harm to biodiversity and geological conservation interests. Where granting planning permission would result in significant harm to those interests, local planning authorities will need to be satisfied that the development cannot reasonably be located on any alternative sites that would result in less or no harm. In the absence of any such alternatives, local planning authorities should ensure that, before planning permission is granted, adequate mitigation measures are put in place. Where a planning decision would result in significant harm to biodiversity and geological interests which cannot be prevented or adequately mitigated against, appropriate compensation measures should be sought. If that significant harm cannot be prevented, adequately mitigated against, or compensated for, then planning permission should be refused.”

In addition, PPS9 states:

“Development proposals provide many good opportunities for building-in beneficial biodiversity or geological features as part of good design. When considering proposals, local planning authorities should maximise such opportunities in and around developments, using planning obligations where necessary.”

In respect of species protection, PPS9 states:

“.....planning authorities should ensure that these species are protected from the adverse effects of development, where appropriate, by using planning conditions or obligations. Planning authorities should refuse permission where harm to the species or their habitats would result unless the need for, and benefits of, the development clearly outweigh that harm”.

1.2.2 Species Legislation

Dormouse numbers have fallen significantly in the UK over the last 100 years both in terms of geographical distribution and numbers¹. Dormice are afforded the following legal protection:

- Full protection under the *Wildlife and Countryside Act, 1981 (as amended)*.

¹ Bright, P., Morris, P., Mitchell-Jones, T 2006. *The Dormouse Conservation Handbook*. English Nature, Peterborough

- European Protected Species, under the *Conservation (Natural Habitats & c.) Regulations 1994*.

Under these legislative instruments it is illegal to undertake the following activities:

- Intentionally or deliberately kill, injure or capture dormice;
- Deliberately disturb dormice whether in a place of rest or not; and/or
- Damage or destroy dormouse breeding sites or resting places.

Any activity that would result in a contravention of the above legislation would require a Natural England licence to avoid committing an offence.

1.2.3 Eco-Town guidance

In addition to a range of legislation described above in section 1.2.1, a wealth of policy and other guidance is available to govern and direct development proposals in their responsibilities with regard to ecology and biodiversity. These include the recently-published governmental guidance that specifically sets out how to deal with Eco-Town proposals (Biodiversity Positive: Eco-towns Biodiversity Worksheet, TCPA, 2009). The key points of this guidance (referred to as the principal objectives for an Eco-Town Biodiversity Strategy) are as follows:

- **Protecting and enhancing the best of biodiversity:** key habitat areas supporting characteristic and uncommon species should be sustained, where conservation is the main priority.
- **Mitigating the impact of development and securing net biodiversity gain:** the inclusion of supplementary habitat areas that fulfil other green infrastructure functions and support more widespread and common species.
- **Integrating biodiversity within the built environment:** the incorporation of a high degree of permeability for wildlife within built areas and structures.
- **Increasing biodiversity's resilience and ability to adapt to climate change:** ensuring a robust connectivity of habitats that facilitates the wider movement and migration of species.

This provides a clear steer for the design of an Eco-Town proposal, such that the avoidance of key habitat areas must be the priority, followed by the retention and creation of a matrix of secondary habitats both within and outside of the built area, and that all of the above are robustly connected to facilitate future wildlife movements and dispersals. Other key elements of the approach include making provisions for management, funding and accountability, to ensure success.

All Eco-Town proposals should include an Eco-Town Biodiversity Strategy (ETBS) to be developed in tandem with the masterplan for the site. This will provide the framework for delivering net biodiversity gain, setting out what is to be achieved and the steps that are needed to achieve it and, most importantly, how biodiversity will be increased and enhanced in advance of and alongside development, rather than at the end of the development process. It should include specific measurable targets for net biodiversity gain, reflecting local priorities for biodiversity (and contributing to national and regional targets as appropriate) and it should take account of the challenges posed by climate change.

1.2.4 Biodiversity Targets

The UK Biodiversity Action Plan (UK BAP) was produced in accordance with the 1992 UN Convention on Biological Diversity. It describes the UK's biological resources and commits a detailed plan for the protection of these resources, focusing on key habitats and species considered to be of particular significance to nature conservation within a UK context.

The conservation priorities that will be most appropriate to the Bicester Eco-Town proposal are those listed within the UK and (at the lower tier) Oxfordshire Biodiversity Action Plans (BAPs). These list a number of key habitats and species that form the priorities for conservation in those areas and serve as an existing framework within which the Eco-Town can work and provide positive contributions to nature conservation at both local and national scales.

1.3 Aims and Objectives

These surveys aim to establish the likely presence or absence of dormice at the exemplar site and the suitability of the site for this species regardless of presence. The report will offer mitigation and enhancements for this species where needed.

1.4 Limitations

The findings presented in this report represent those at the time of survey and reporting. Variations in these conditions will take place as a result of seasonal factors, and with the general passage of time.

It should also be noted that fauna may travel over wide areas and can have large home ranges and so can be overlooked within surveys. Species which are absent at the time of survey may also return to or colonise a site anew at any future time.

1.5 Report Content and Layout

Following this introduction, Chapter 2 covers survey methodologies, chapter 3 presents the results and discussion and chapter 4 covers conclusions and recommendations.

2 Methodology

2.1 Desk Study

A desk study was conducted within a 5km radius of the site. This utilised on-line research tools including Nature on the Map (www.natureonthemap.org.uk) and the National Biodiversity Network Gateway (www.nbn.org.uk). The search looked for local occurrences of dormice. Additional data were sourced from Thames Valley Environmental Records Centre.

UK Biodiversity Action Plans (UK BAPs) and Local Biodiversity Action Plans (LBAPs) were reviewed for relevant information. These plans list priority species and habitats for the country and its regions, and are the UK government's response to fulfilling its obligations to the Convention of Biological Diversity (CBD).

2.2 Field Survey

Field surveys followed the general methodology as set out in 'Dormouse Conservation Handbook'¹. In summary, with respect to the exemplar site, these were as follows:

1. Dormouse nest tubes were set out in suitable locations (informed from phase 1 habitat surveys and detailed hedgerow surveys). Tubes were set at a density of 1 per 20m of hedgerow and woodland edge habitat, where suitable. Figure 2 shows survey areas.
2. Tubes were checked for dormouse activity on a monthly basis (see Table 1), which totalled 5 surveys.
3. Hazel nut searches were undertaken in late September (dormice eat these in a diagnostic style).

Survey dates are shown in Table 1.

3 Results and Discussion

3.1 Desk Study

Results from the local biological records centre and NBN show no historical records of dormice within 5 km of the site.

Dormice are listed on the UK BAP due to their falling numbers and continued fragmentation of populations. At present they are not listed on the Local BAP for Oxfordshire.

3.2 Field Survey

Field surveys (nest tubes and nut searches) found no sign of dormouse activity. Table 1 below shows survey results.

Table 1 Dormouse survey results

Dormouse survey number	date undertaken	Results
Tube Set up	05-May	NA
1	27-May	All empty
2	21-Jun	All empty
3	19-Jul	All empty
4	02-Aug	All empty
5	13-Sep	All empty
Hazelnut search	15-Sept	Negative

3.3 Discussion

Although no signs of dormice were found during the survey works, the nature of the site would be suitable for a breeding population of dormice. This is due to the highly interconnected nature of suitable dormouse habitats on the site, mainly in the form of numerous high quality hedgerows.

4 Conclusions and Recommendations

The main reason for the decline in dormouse populations throughout their range in the UK is the fragmentation of their habitats often caused by changes in farming practices, large scale conurbations and reduced coppice woodland management. Although the exemplar site has a good system of ecologically high value hedges, it is however limited in terms of wooded areas, particularly coppice. This is further compounded by a lack of connectivity to suitable habitat within the wider landscape.

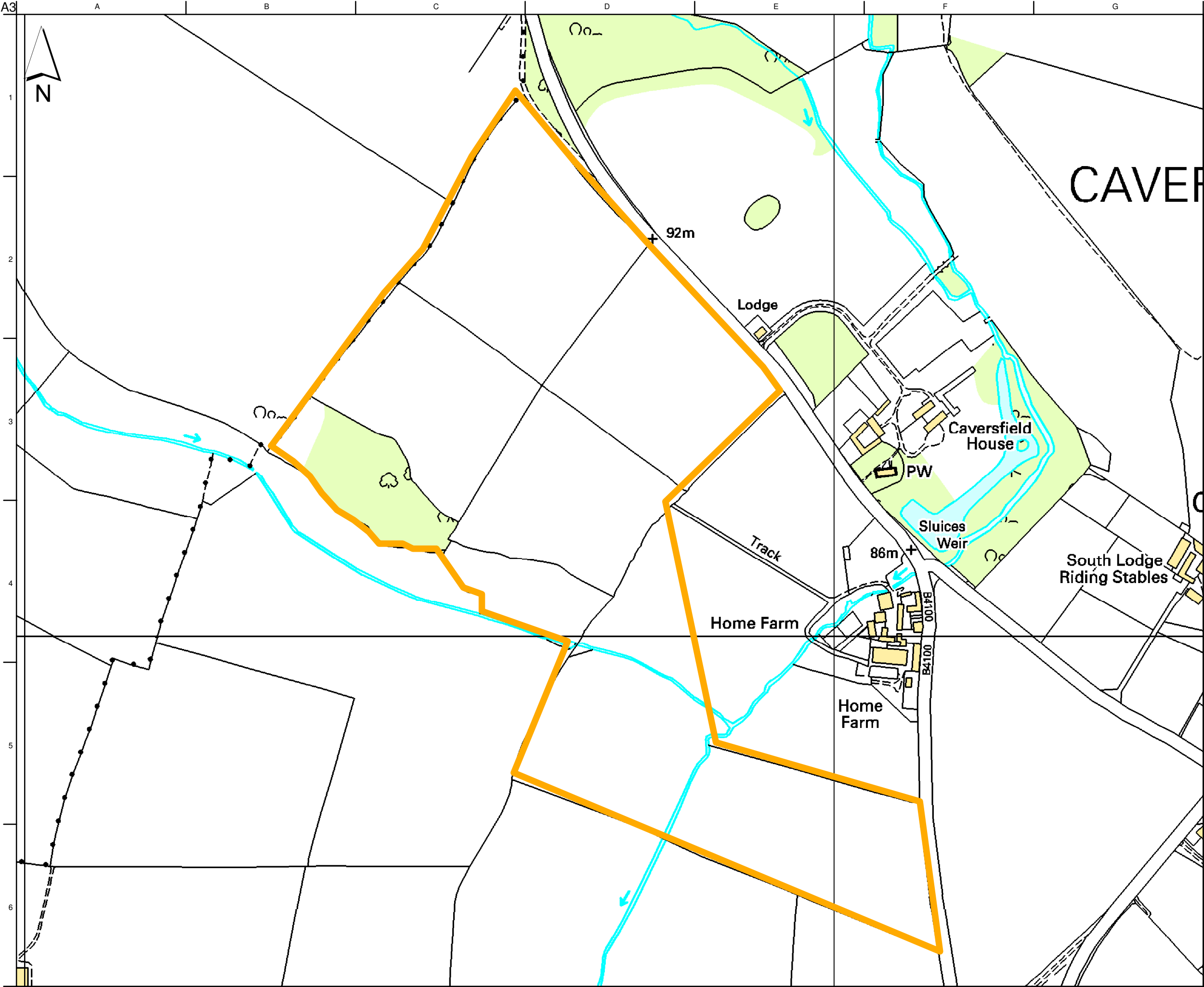
Dormice are highly vulnerable to local extinctions and as such are known to be valuable bio-indicators of the ecological health of an area. An area that can maintain a viable dormouse population or be suitable for recolonisation is an indicator of a significantly well managed ecological area.

To recognise the targets and aspirations set by Eco-Town legislation, and associated governmental and borough targets, the following recommendations are made:

1. Maintain on-site connectivity as is presently afforded by the high quality hedgerows.
2. Plant broadleaved woodland patches to create a mosaic of linked habitats.
3. Consider employing a coppice management regime to some areas of existing woodland and any newly planted woodland.
4. Increase the connectivity of dormouse habitats to the wider landscape; this could be achieved by planting more hedgerows and woodland areas.

Figures

A1.1 **Figure 1: Site Area**



Legend

Exemplar Site Boundary

-	22-09-2010	AE	SC	AB
Issue	Date	By	Chkd	Appd

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Client
A2 Dominion

Job Title
Bicester Eco-town

Drawing Title
Site Overview

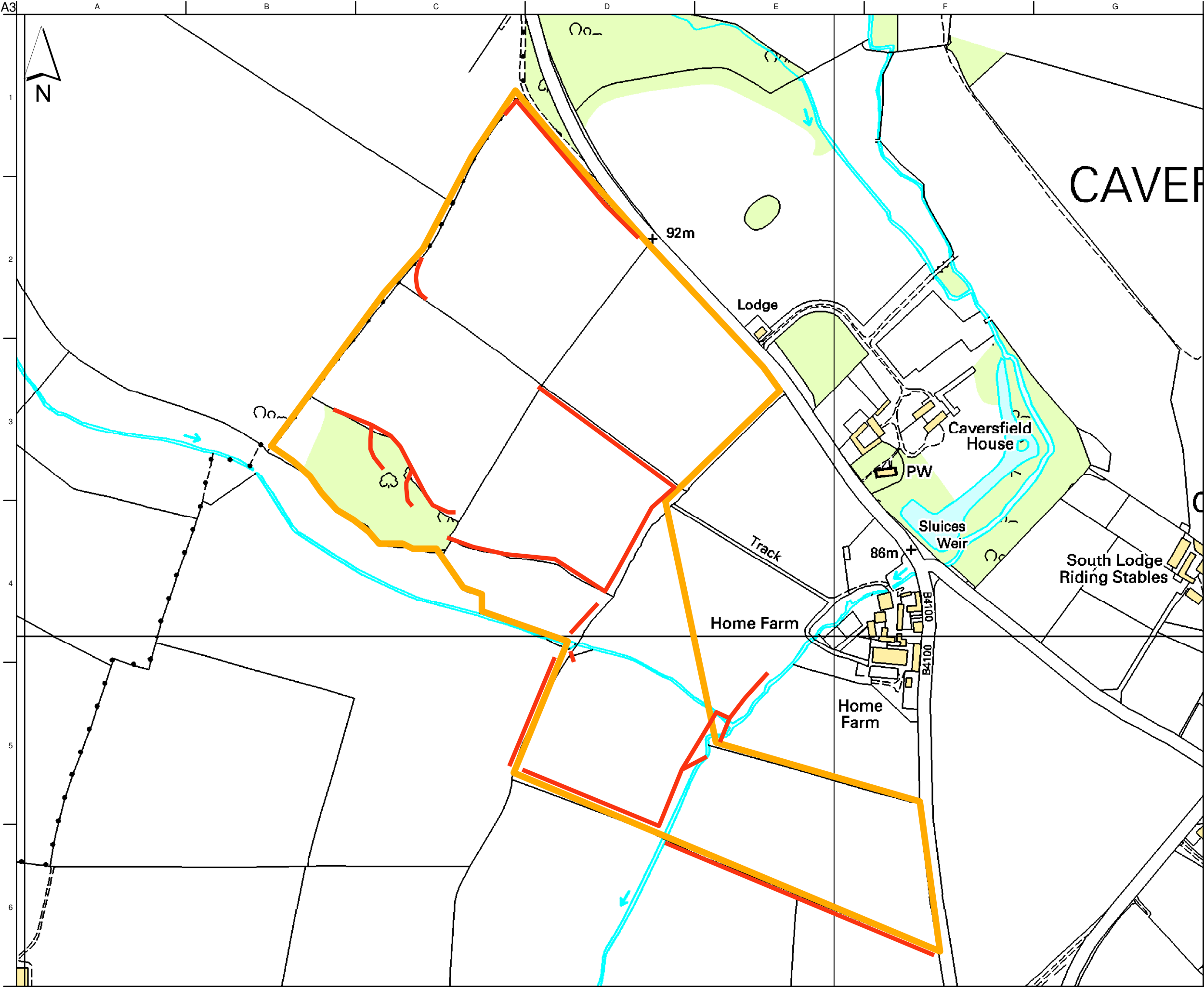
Scale at A3
1:4,500

Discipline
Ecology

Drawing Status
Draft

Job No 213225-00	Drawing No Figure 1	Issue -
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A1.2 **Figure 2: Survey Areas**



Legend

- Dormouse Survey Areas
- Exemplar Site Boundary

-	22-09-2010	AE	SC	AB
Issue	Date	By	Chkd	Appd

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Client
A2 Dominion

Job Title
Bicester Eco-town

Drawing Title
Dormouse Survey Areas

Scale at A3
1:4,500

Discipline
Ecology

Drawing Status
Draft

Job No 213225-00	Drawing No Figure 2	Issue -
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APPENDIX 7K

Arup (2010) Badger Survey

A2 Dominion
Bicester Eco-Town
Badger Survey

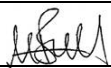
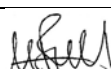
ISSUE | September 2010

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Document Verification

ARUP

Job title		Bicester Eco-Town		Job number 213225-00	
Document title		Badger Survey		File reference	
Document ref		J/213000/213225-00			
Revision	Date	Filename	Badger Survey Report OB1.docx		
Draft 1	27/08/10	Description	First draft		
			Prepared by	Checked by	Approved by
		Name	Oliver Barnett	Megan Hooper	Michael Bull
		Signature			
Issue	30/09/10	Filename	Badger_Survey_Report_OB1_MH_Eds2_(AB_rev) Issue.docx		
		Description			
			Prepared by	Checked by	Approved by
		Name	Oliver Barnett	Megan Hooper	Michael Bull
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
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1 Introduction

1.1 Background

Arup has been commissioned by A2 Dominion to carry out a suite of protected species and habitat surveys for the proposed Bicester Exemplar Eco-Town development in Oxfordshire. This specific report is in respect of badgers (*Meles meles*) and include both badger field surveys and badger bait marking surveys

The proposed development is located within a belt of predominantly grazing farmland which lies to the north west of Bicester. (SP 577 251); the orange line area is shown in Figure 1. At present the proposed development area consists of a matrix of farmland with up to 10 grazed fields separated by many high quality species rich hedgerows. A distinct lowland area with an ephemeral stream runs east to west through the south and central areas of the site, and midway flows into a second ephemeral stream running north to south through the site.

At present the farmland within the development area is being managed in a relatively sensitive manner with regards to biodiversity. This includes areas set aside for badger setts, numerous bird boxes, including barn owl, *Tyto alba*, and kestrel, *Falco tinnunculus*, and the provision of bat boxes. Hedgerows have been maintained to produce a wide, continuous and mostly species rich structure and are playing an important part for biodiversity on the site.

1.2 Ecology and Legislation

1.2.1 Generic Legislation

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- ***Conservation (Natural Habitats &c.) Regulations, 1994***. This Act provides protection for European protected species such as bats and great crested newts.
- ***Countryside and Rights of Way (CROW) Act, 2000***. The CROW Act strengthened the details of The Wildlife and Countryside Act in relation to Sites of Special Scientific Interest (SSSI) and threatened species.

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The key principles of the PPS9 are stated as:

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(vi) the aim of planning decisions should be to prevent harm to biodiversity and geological conservation interests. Where granting planning permission would result in significant harm to those interests, local planning authorities will need to be satisfied that the development cannot reasonably be located on any alternative sites that would result in less or no harm. In the absence of any such alternatives, local planning authorities should ensure that, before planning permission is granted, adequate mitigation measures are put in place. Where a planning decision would result in significant harm to biodiversity and geological interests which cannot be prevented or adequately mitigated against, appropriate compensation measures should be sought. If that significant harm cannot be prevented, adequately mitigated against, or compensated for, then planning permission should be refused.”

In addition, PPS9 states:

“Development proposals provide many good opportunities for building-in beneficial biodiversity or geological features as part of good design. When considering proposals, local planning authorities should maximise such opportunities in and around developments, using planning obligations where necessary.”

In respect of species protection, PPS9 states:

“.....planning authorities should ensure that these species are protected from the adverse effects of development, where appropriate, by using planning conditions or obligations. Planning authorities should refuse permission where harm to the species or their habitats would result unless the need for, and benefits of, the development clearly outweigh that harm”.

1.2.2 Species Legislation

Badgers are protected under the Protection of Badgers Act 1992. This makes it illegal to:

- kill, injure, take, possess, or cruelly ill-treat a badger or attempt to do so;
- to damage or destroy a sett;
- to obstruct access to a badger sett (or any entrance); or,
- to disturb a badger when it is occupying a sett (English Nature 1999).

Licences can be obtained from Natural England in order for development works that would result in disturbance or destruction of a sett to be legally undertaken.

Badgers are additionally afforded protection under Section 11 (Schedule 6, paragraphs 11 & 12) of the Wildlife and Countryside Act 1991 (as amended). This legislation relates to the methods used in capturing and killing badgers, prohibiting for example, the use of snares and traps.

1.2.3 Eco-Town guidance

In addition to a range of legislation described above in section 1.2.1, a wealth of policy and other guidance is available to govern and direct development proposals in their responsibilities with regard to ecology and biodiversity. These include the recently-published governmental guidance that specifically sets out how to deal with eco-town proposals (Biodiversity Positive: Eco-towns Biodiversity Worksheet, TCPA, 2009). The key points of this (referred to as the principal objectives for an Eco-town Biodiversity Strategy) are as follows:

- **Protecting and enhancing the best of biodiversity:** key habitat areas supporting characteristic and uncommon species should be sustained, where conservation is the main priority.
- **Mitigating the impact of development and securing net biodiversity gain:** the inclusion of supplementary habitat areas that fulfil other green infrastructure functions and support more widespread and common species.
- **Integrating biodiversity within the built environment:** the incorporation of a high degree of permeability for wildlife within built areas and structures.
- **Increasing biodiversity's resilience and ability to adapt to climate change:** ensuring a robust connectivity of habitats that facilitates the wider movement and migration of species.

This provides a clear steer for the design of an eco-town proposal, such that the avoidance of key habitat areas must be the priority, followed by the retention and creation of a matrix of secondary habitats both within and outside of the built area, and that all of the above are robustly connected to facilitate future wildlife movements and dispersals. Other key elements of the approach include making provisions for management, funding and accountability, to ensure success.

All eco-town proposals should include an Eco-Town Biodiversity Strategy (ETBS) to be developed in tandem with the masterplan for the site. This will provide the framework for delivering net biodiversity gain, setting out what is to be achieved and the steps that are needed to achieve it and, most importantly, how biodiversity will be increased and enhanced in advance of and alongside development, rather than at the end of the development process. It should include specific measurable targets for net biodiversity gain, reflecting local priorities for biodiversity (and contributing to national and regional targets as appropriate) and it should take account of the challenges posed by climate change.

1.2.4 Biodiversity Targets

The UK Biodiversity Action Plan (UK BAP) was produced in accordance with the 1992 UN Convention on Biological Diversity. It describes the UK's biological resources and commits a detailed plan for the protection of these resources,

focusing on key habitats and species considered to be of particular significance to nature conservation within a UK context.

The conservation priorities that will be most appropriate to the Bicester eco-town proposal are those listed within the UK and (at the lower tier) Oxfordshire Biodiversity Action Plans (BAPs). These list a number of key habitats and species that form the priorities for conservation in those areas and serve as an existing framework within which the Eco-town can work and provide positive contributions to nature conservation at both local and national scales.

1.3 Aims and Objectives

The aims and objectives of this study were as follows:

- Establish locations of badger activity both within the Bicester Eco-Town Exemplar site and the immediate surrounding area.
- Determine the number of badger clans currently utilising the site and its immediate surrounds.
- Determine the extent of badger clan territories within and in the immediate vicinity of the Eco-Town Exemplar site.
- Provide recommendations for measures to mitigate for adverse effects of the proposals.
- Provide recommendations for habitat retention and enhancement on site with regard to badgers.

1.4 Report Content and Layout

Following this section of the report, Section 2 will detail the methodology of the badger field surveys as well as the associated bait marking and desk studies. The results of the surveys and studies are presented in Section 3 along with a discussion on the potential implications of the reports' findings on the proposed development. Section 4 sets out the conclusions of the report along with recommendations aimed at minimising the potential impacts of the development on badgers and making use of opportunities for habitat enhancement on site with regard to this species.

2 Methodology

2.1 Desk Study

A desk study was conducted within a 3km radius of the central grid reference for the site. This utilised the on-line research tools Nature on the Map¹, and the Multi Agency Geographic Information for the Countryside website MAGIC². The search focussed on statutory sites designated for nature conservation within the vicinity of the proposed development area. Additional data on distributions of notable and protected species and non-statutory local sites for nature conservation were sourced from Thames Valley Environmental Records Centre.

UK Biodiversity Action Plans (UK BAPs) and the Biodiversity in Oxfordshire website³ (the local biodiversity action plans (LBAPs) were consulted for details of species of note that could be expected to occur in the area.

2.2 Field Survey

The survey for badger activity was undertaken by two experienced Arup ecologists on the 10th of May 2010, and comprised walkover surveys and visual examinations of the site and the immediate surrounds. This involved searching the site and surrounding areas whilst focusing on suitable habitats and features, including all linear features, areas of scrub, woodland and amenity grassland.

Surveys aimed at recording the occurrence of the following indicators of badger presence:

- Badger setts.
- Badger paths.
- The presence of dung pits. Dung pits may occur singularly or in groups when they are classified as a latrine. The presence of badger footprints or hairs along the lines of paths, near sett entrances, or on vegetation or fencing close to areas of activity.

Any of the above indicators found during surveys were recorded and have been subsequently used to develop an understanding of badger activity across the Eco-Town Exemplar site.

2.3 Bait Marking Study

A badger bait marking study was also undertaken to determine whether one or more badger clans are currently utilising the site. This followed recognised methodologies described in the RSPCA's 'The Problems with Badgers' publication (Harris *et al.* 1991).; A Phase 1 Ecological Survey of the site, undertaken in April 2010, made preliminary identification of two badger setts, both of which have multiple entrances.

¹ www.natureonthemap.org.uk

² www.magic.gov.uk

³ <http://www.oxfordshire.gov.uk>

The bait marking study was undertaken by first using a bait mix consisting of peanuts, syrup and small, coloured plastic beads, which were then left outside the various sett entrances at the two sett locations. Bait mixed with green and white beads was left at the entrances to the multi holed sett, which lies within the an area fenced off with post and rail fencing that is found at a location almost central to the various grazing pastures of Home Farm (see Figure 2, below).

A second bait mix, made using red and orange beads, was left outside various entrances to the sett which runs along the boundary of the small parcel of immature woodland found at the western extent of Home Farm.

The bait marking study was undertaken over a two week period which commenced on the 11th of May, 2010. During this time bait mixes, as detailed above, were put out at the various entrances to the two badger setts every second or third day. Field surveys of the Eco-Town Exemplar site and its immediate surrounds were undertaken at similar intervals to check for badger latrines and dung pits containing coloured beads from either of the two bait mixes. In this way it was hoped to determine whether the two setts are inhabited by individuals of the same or different clans.

2.4 Limitations

It is possible that some evidence of the presence of badgers could have been overlooked because of the density of vegetation in certain places, where physical access was not possible. In these areas, however, careful inspection of the peripheral vegetation was made to identify possible entrances, paths or other indicators of badger access into these areas.

Additionally, badgers can cover wide areas, hold large territories and colonise or leave a site at any time. Therefore, survey results detailed here reflect the situation at the time of survey. No account can be made for changes to badger activity, such as new sett digging, since the time of the Arup surveys.

Results and Discussion

2.5 Desk Study

The results of the desk study show that records of badgers in the area date back some 27 years to January 2003. A total of 17 records exist which detail badger sightings from a variety of locations including Ardley Quarry & Cutting SSSI, the stretch of the B4100 road adjacent to Stoke Little Wood, and Stratton Audley Quarry.

2.6 Field Survey

The Phase 1 habitat survey undertaken in Spring 2010 identified two large badger setts within the boundaries of the Eco-Town Exemplar site. The field surveys which were subsequently undertaken revealed that both of these are active and are clearly occupied by a large number of individuals. This is borne out by the number of active entrances at each sett, the number of latrines and dung pits in the immediate vicinity, and the number of entrances with fresh bedding outside.

Figure 2 details the locations of the two setts. One is located almost centrally to the various grazing pastures of Home Farm and has been identified as a main sett. The main sett has in excess of 25 entrances, 10 to 12 of which showed signs of recent use over the course of the field surveys and associated bait marking study.

The second has been identified as an Annex sett and is located along the boundary of the small woodland copse found at the western extent of Home Farm. This sett is represented on Figure 2.

At the time of the survey there were in excess of 25 entrances to the Annex sett, though only six to eight of these showed signs of recent use.

Other outlier setts (both used and disused) exist within the boundaries of the Eco-Town Exemplar site, as identified on Figure 2. At the time of the surveys the outlier setts all had between one and two entrances.

The main, annex and outlier setts are connected by a network of paths which the badgers appear to regularly use for accessing suitable foraging areas. The most notable foraging area is the corridor of semi-improved pasture, which lies immediately adjacent to the ephemeral stone-bed stream that flows through the site in a south-easterly direction. This foraging area has been identified by the large number of foraging scrapes recorded during the field survey.

Over the months subsequent to the initial badger surveys, a number of incidental observations of badger foraging activity were made during bat emergence and dawn swarming surveys that were carried out on site. The vast majority of these occurred with this belt of semi-improved pasture, three of which involved several badgers.

During the course of the field survey it was recorded that the network of badger paths extend beyond the pastures of the Eco-Town Exemplar site and into the more arable landscape to the south. Foraging opportunities exist here in the form of hedgerows and associated field boundaries, though no scrapes, latrines or dung

pits were recorded in this area. Hence, it is likely the badgers are accessing other, more appropriate foraging habitat beyond the extent of the survey area.

2.7 Bait Marking Study

Despite concerted efforts over a two week period, the bait marking study failed to provide a definitive picture as to the extent of badger clan territories on site, or as to whether the site is occupied by more than one clan.

Latrines containing the red and orange beads from bait placed outside entrances to the large woodland outlier sett were found at various locations (see Figure 2), both to the west and east of the main sett. This would suggest that the badgers occupying the woodland copse annex and are of the same clan as those occupying the main sett, since the territory of the woodland outlier sett badgers appears to encompass and extend beyond the location of the main sett.

Individuals from the main sett clearly appear to be travelling and creating latrines and dung pits beyond the extent of the Eco-Town Exemplar site and the surrounding survey area. Only two latrines containing green and white beads were located during the course of the bait marking study despite significant quantities of bait being placed at the sett entrances over the survey period.

However, whilst one latrine containing green and white beads was found in the immediate vicinity of the main sett, the other was found to the west of the Eco-Town Exemplar site. Again, this would suggest that the individuals occupying these two setts represent the same clan and share foraging territories.

2.8 Discussion

The field survey and bait marking study detailed in this report reveal the Eco-Town Exemplar site to be an important location for badgers. The site currently supports a healthy and viable badger population.

The main sett is of considerable size and was recorded as having between 10 and 12 active entrances at the time of the survey.

The woodland copse annex and associated outlier setts are similarly extensive, with between six and eight active entrances recorded. When considering the number of currently inactive entrances which are also associated with both these setts, it would appear that badgers have occupied this area for many generations. Personal communication with the farm owner has suggested that badgers have been active on the site for at least 90 years and possibly longer.

The findings of the survey highlight the dependence of foraging badgers on the semi-improved pastures of the site. The pastures beyond the south western site boundary are also of significant importance for foraging badgers.

Construction and development works in these pastures are likely to impose significant long-term disturbance effects on badgers. These negative impacts could be alleviated to a degree by the implementation of a series of mitigation and enhancement measures. These should include the retention of several important habitats which are currently present, including key areas of pasture, the small woodland copse in the south west corner of the site, all hedgerows, and the belt of

riparian habitat which runs adjacent to the south western site boundary and through the south east section of the site.

To maintain viability of the local badger population it will also be necessary to ensure their continued access to foraging areas across the wider landscape as well as within the boundaries of the Eco-Town Exemplar site development. This will require the retention and maintenance of movement corridors and, potentially, the provision of new on-site foraging areas through the implementation of appropriate and considered planting schemes.

These recommendations are discussed in more detail below.

3 Conclusions and Recommendations

3.1 Habitat Retention & Enhancement

The Bicester Eco-Town Exemplar site development has the potential to significantly impact upon the badgers which currently occupy the site. These impacts will almost inevitably include:

- loss of foraging habitat;
- restrictions on badger dispersal and movement across the site and amongst the wider landscape as a whole;
- the severance of existing badger territories; and,
- a long-term increase in perceived disturbance to badgers, both during and post-construction.

The following measures will help to reduce these negative impacts, though it is likely it will not be possible to either fully or significantly mitigate for the adverse effects of the development on badgers.

- Retain habitat areas currently on site which are of key importance to badgers. These include: the small parcel of woodland in the south west corner of the site; the semi improved pastures; all hedgerows within the site boundaries; and the belt of riparian habitat which runs adjacent to the south western site boundary and through the south east section of the site.
- Design and implement a site planting scheme aimed at broadly replicating those habitats already present in the wider area such that areas of badger foraging habitat to be lost to development can be replaced in other locations on site as and where appropriate and feasible.
- Retain and enhance existing habitat corridors to facilitate the continued dispersal of badgers amongst foraging areas within the wider landscape.

3.2 Construction Phase Mitigation for Badgers

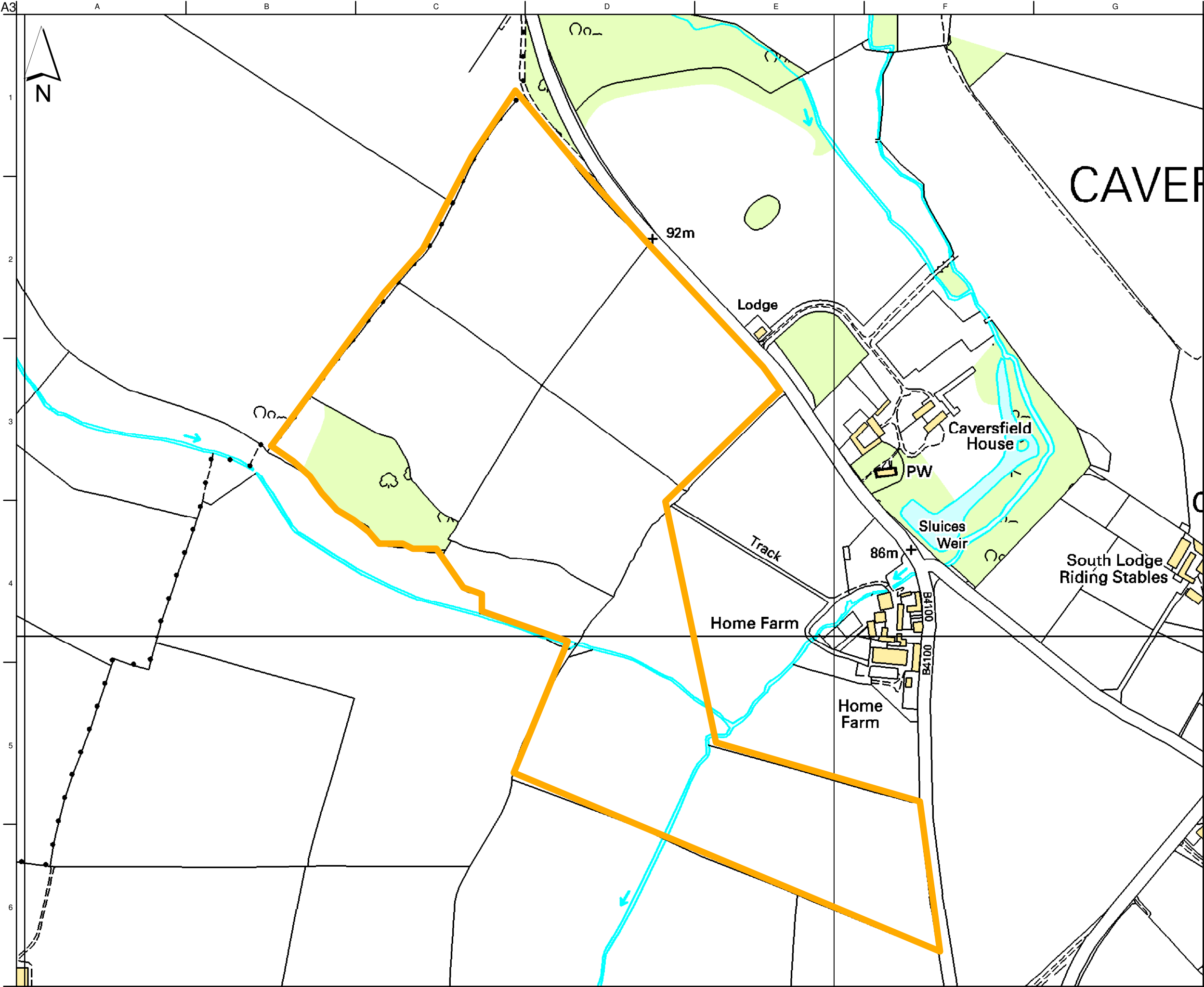
During the construction phase, badgers should be able to access appropriate foraging habitat both within the boundaries of the exemplar site development and beyond into the wider landscape. Badgers should be excluded from areas of active construction, and site personnel excluded from areas where there are badger setts or from retained areas of badger foraging habitat, via installation of 1.2m high stock-proof fencing. Any works that have the potential to disturb badgers or impact their foraging areas are likely to require an appropriate badger licence from Natural England before works could commence.

3.3 Post Construction Monitoring

So as to ensure that the implemented mitigation measures have been effective and to demonstrate that activity of badgers and their favourable population status have been maintained following completion of the works, it is recommended that a suite of monitoring visits are carried out.

Figures

Figure 1: Site area



Legend

Exemplar Site Boundary

-	22-09-2010	AE	SC	AB
Issue	Date	By	Chkd	Appd

ARUP
13 Fitzroy Street
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Client
A2 Dominion

Job Title
Bicester Eco-town

Drawing Title
Site Overview

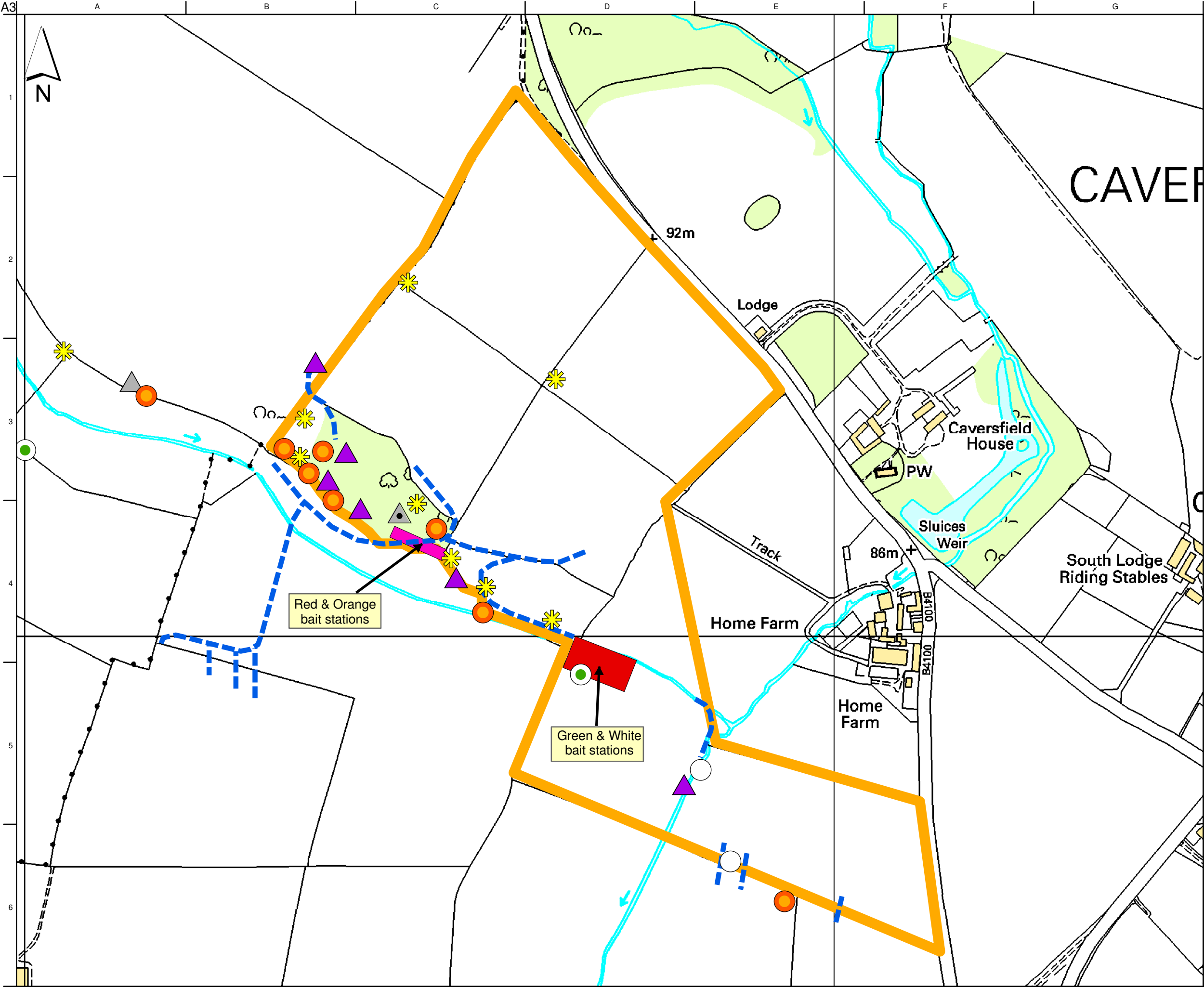
Scale at A3
1:4,500

Discipline
Ecology

Drawing Status
Draft

Job No 213225-00	Drawing No Figure 1	Issue -
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Figure 2: Badger survey results



Legend

- Latrine (not bait marked)
- Green/White bait latrine
- Red/Orange bait latrine
- ▲ Active outlier sett
- ▲ Disused outlier sett
- ▲ Disused outlier sett currently used by foxes
- ✱ Foraging scrape
- BadgerPaths
- Badger Main Set
- Badger Annex Set
- Exemplar Site Boundary

-	27-09-2010	DMc	OB	AB
Issue	Date	By	Chkd	Appd

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Client

A2 Dominion

Job Title

Bicester Eco-town

Drawing Title

Badger Field Survey
and Bait Marking Study

Scale at A3

1:4,500

Discipline

Ecology

Drawing Status

Issue

Job No	Drawing No	Issue
213225-00	Figure 2	-

APPENDIX 7L

Arup (2010) Colin Plant Associates (2010) Bicester Eco-town Masterplan and
Exemplar Site: Invertebrate Survey Report

Commissioned by
ARUP
13 Fitzroy St
London
W1T 4BQ

BICESTER ECO-TOWN MASTERPLAN & EXEMPLAR SITE INVERTEBRATE SURVEY REPORT

Report number BS/2541/10

October 2010

Prepared by
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1 INTRODUCTION AND METHODOLOGY

- 1.1 **Colin Plant Associates (UK)** were commissioned during June 2010 by **Arup** to undertake an investigation of invertebrates on an area of land to the north-west of Bicester in Oxfordshire upon which it is proposed to develop new housing.
- 1.2 An initial site visit was made on 29th June 2010, when a walk-over survey of the entire site was undertaken in order to determine the nature and extent of detailed survey work required. Subsequent visits were undertaken on

Date	Session	Activity
3 – 4 July	overnight	moth recording
4 July	day	terrestrial sampling;
16 – 17 July	overnight	moth recording
17 July	day	terrestrial sampling;
1 – 2 August	overnight	moth recording
2 August	day	terrestrial sampling;
22 – 23 August	overnight	moth recording
23 August	day	terrestrial sampling;
26 – 27 September	overnight	moth recording
27 September	day	terrestrial sampling;
7 – 8 October	overnight	moth recording
8 October	day	terrestrial sampling; aquatic sampling
21 October	day	terrestrial sampling; aquatic sampling

- 1.3 On all visits, terrestrial invertebrates were recorded by direct observations of both species and their signs (such as leaf mines and plant galls). In addition active sampling was also undertaken as follows:

Sweep-netting. A stout hand-held net is moved vigorously through vegetation to dislodge resting insects. The technique may be used semi-quantitatively by timing the number of sweeps through vegetation of a similar type and counting selected groups of species. This technique is effective for many invertebrates, including several beetle families, most plant bug groups and large number of other insects that live in vegetation of this type.

Beating trees and bushes. A cloth tray, held on a folding frame, is positioned below branches of trees or bushes and these are sharply tapped with a stick to dislodge insects. The same technique can be applied to tall perennial herbs and other plants that tower over a sward. Black or white trays are used depending upon which group of invertebrates has been targeted for search. Insects are collected from the tray using a pooter. This technique is effective in obtaining records of most arboreal species, including many beetle groups, bugs, caterpillars of Lepidoptera, spiders and others. It can be undertaken at any site where there are trees or bushes present although is rendered ineffective if the vegetation is wet or if the weather is windy.

Suction Sampling consists of using a converted leaf blower to collect samples from grass and other longer ground vegetation. The sample is then everted into a net bag and the invertebrates removed with a pooter. The advantage of suction sampling is that it catches species which do not fly readily or which live in deep vegetation. It is particularly productive for Coleoptera, some Diptera and Arachnida.

- 1.4 We also undertook passive sampling. This is effective because it does not depend upon the physical presence of the surveyor and it records species throughout the entire trap period.

Pitfall trapping. Vending-machine cups or similar are placed in the ground with the rim flush with, or slightly below, the surface. A fluid is added, containing ethylene glycol, sodium chloride and formalin with a little detergent to reduce surface tension. Holes made in the sides of the cups a couple of centimetres below the rim permit flood or rain water to drain without the traps overflowing and the catch becoming lost. Invertebrates simply fall into the traps.

Pitfall traps were established in compartment T1 (Gowell Farm area). This area was selected as being representative, in part because it was the least likely zone to be disturbed by harvest, ploughing or other activities that would destroy the traps.

- 1.5 **Actinic light trapping.** Normally, nocturnal recording of moths would involve operating 125-watt mercury vapour lamps from a portable generator. However, in order to trap a large number of separate sites on the same night, such a technique would have been difficult because of both the need to refuel generators and the potential security issues relating to the use of the very obvious lights. We therefore used small size actinic traps, operated from 12 volt burglar-alarm batteries, and left these running from early evening to the following morning. These units are discrete because, whilst still having an output in the safe zone of the UV range, their light output in the visible part of the spectrum is reduced; thus, they can be tucked away in undergrowth at the side of a track without passers-by noticing them. For the same reasons of light emission, they attract moths and other insects from a much shorter distance and so the resultant catch is usually more representative of the habitat selected, in comparison with that in mercury vapour traps which attract flying species from a much wider area of the countryside.
- 1.6 A formal search was undertaken for existing data was not specifically requested. After we had made an initial visual inspection of the habitats present on site we determined that this was likely to be unproductive. Nevertheless, during the course of the project we approached a number of key colleagues informally; as a result of this we are satisfied that no important invertebrate data has been overlooked.

2 OVERVIEW OF INVERTEBRATE HABITATS ON THE SITE

2.1 Preamble

- 2.1.1 The site is extensive, extending approximately three kilometres across at its widest points, although it is of an irregular shape. It occupies an area of level and slightly undulating lowland in the central part of England where it is separated from any maritime influence.
- 2.1.2 The lowest point of the site is marked by the 80 metre contour immediately north-east of Lord's Farm in the south, whilst the 100 metre contour runs through the churchyard at Bucknell village in the highest point to the north.
- 2.1.3 The soil appears to be based upon a clay component and does not seem to drain particularly rapidly after rainfall. The soil is evidently nutrient-rich and much of the site is given over to arable crop production.
- 2.1.4 Wildlife habitats here will be governed by these over-riding ecological parameters. They are now examined, specifically as they affect invertebrate ecology.

2.2 Terrestrial invertebrate habitats

- 2.2.1 Terrestrial habitats within the surveyed area are dominated by the overwhelmingly arable landscape. Most fields are ploughed annually and sown with a crop; those few which are not so treated are mostly pasture for cattle or sheep and so are often closely-grazed.
- 2.2.2 Hedges, rather than fences, define the field boundaries in most places. However, most of these hedges are likely to be of low value as invertebrate habitats – at least on a permanent basis. This is because almost all hedges are either trimmed or flailed, thus removing both invertebrates and their sources of food.
- 2.2.3 Recent research by personnel at Oxford University has shown that hedges, even poorly-structured monocultural ones, support a greater numerical abundance (though not necessarily a greater species diversity) of insects if there are standard trees retained within their lengths. A few of the hedges on the site do contain standard trees, mostly ash or oak and some of these appear to be mature and contain amounts of aerial dead timber (an important micro-habitat for invertebrates).
- 2.2.4 Marginal areas of fields are, in general, narrow or absent and when they are present they appear to be dominated by rank grasses. In general, most field margins appear to provide rather poor quality invertebrate habitats.
- 2.2.5 For similar reasons, transitional edge habitats, where there is a gradual physical change in height from low grassland to tall woodland, are very poorly represented and in most areas appear absent.
- 2.2.6 Woodland is represented by a number of small units. Most of these appear on the 1945 aerial photographs and so may be of some age, though the bulk of trees are young in comparison. Ash is the dominant tree in the landscape and is the main feature of these woodland units, usually joined by oaks and occasionally other trees.

- 2.2.7 These woodland units are widely spaced within the arable landscape and are joined only by relatively poor-quality hedges or else are quite isolated. Continuous woodland does not feature on the site and so true woodland invertebrates are probably absent.
- 2.2.8 Consequent upon this, and perhaps also upon the use of the small woodland units for pheasant rearing, the dead wood resource is minimal and other saproxylic habitats are also very poorly represented.
- 2.2.9 Other micro-habitat features are generally scarce. In the derelict yard of Gowell Farm, the remnants of a long-disused muck pile generated a healthy list of common rove beetles showing there to be a reservoir of such species in the area, but suitable habitat elsewhere on the site could not be found.

2.3 Aquatic invertebrate habitats

- 2.3.1 Both running water and static ponds are represented on the site and are now briefly discussed.
- 2.3.2 Most of the streams on the site were dry in the summer months and are generally regarded as being winterbournes. As such, their invertebrate complement will be minimal (although permanent winterbournes may develop a small but specialist fauna of water beetles in particular).
- 2.3.3 In summer months, searching for aquatic invertebrates in the dried or near dry courses will, quite obviously, be unproductive. Searching in the winter, though before the frosts, would probably reveal the greatest number of species.
- 2.3.4 During 2010, the return of water to the bulk of water courses started in September. Examinations undertaken in early October up to and including the final visit on 21st October 2010, showed that some of the watercourses remained dry, others were damp but lacked flowing water. Only the main stream, that flowing from near Crowmarsh Farm to pass under the railway embankment in the vicinity of Aldershot Farm before passing woodland south of Hawkwell Farm and so beyond the site boundary beneath Lord's Lane, contained a flow of water.
- 2.3.5 Two ponds were indicated to us in maps of the site. One is in the vicinity of Crowmarsh Farm (compartment A2 in the list below); the other is in the vicinity of Lower Farm, to the north (compartment A6).

3 SELECTION OF HABITAT AREAS FOR DETAILED EXAMINATION

- 3.1 It has been indicated above that largest part of the site is evidently unsuitable for invertebrates; this requires no sampling. However, the several small and localised habitat units across the site are of potential invertebrate interest and sampling of these was undertaken.
- 3.2 These terrestrial sample areas are defined in Map 1 where they are given recording compartment numbers that repeat in the species inventory at Appendices 1 and 2. These areas are now introduced in greater detail.

Terrestrial habitat compartment T1: Gowell Farm area

Gowell Farm is abandoned and the buildings are derelict. The concrete farmyard has been invaded by ruderal vegetation and scrub to provide a mosaic of young habitat that is poorly-represented elsewhere in the surveyed area.

Tree species here seem rather more varied than in the ash-dominated woodland units and include Elder, hawthorn, Sycamore, Turkey Oak, Damson, Sweet Chestnut, Birch and others.

Hedges here are overgrown and provide a stark, but ecologically welcome, contrast with the manicured hedges elsewhere on the site. The twigs of the hedgerow plants have become colonised with various lichens. A long-abandoned muck pile is still evident in a few places.

A mature oak tree, containing a reasonable quantity of aerial dead timber, guards the entrance to the farmyard on the southern side of the access track.

Actinic moth traps were operated by us in this compartment on selected dates.

Terrestrial habitat compartment T2

This appears to be a section of the former road. It is now isolated on the north side of the existing road and the marginal trees and bushes have become overgrown to provide something approaching a structured edge habitat – a feature that is very poorly represented on the site overall.

Trees here include Elm, Ash, Field Maple, birches, hawthorns, willows and poplars and are adorned with Ivy and occasional Hop plants. Non-natives such as cherry and Snowberry are also evident in a few places, but do not detract from the likely raised ecological value of this compartment.

Brambles dominate the under-storey in most places but there are also tall perennial herbs such as Great Willow-herb and other species that will inevitably add to the invertebrate biodiversity of this small area.

Actinic moth traps were operated by us in this compartment on selected dates.

Terrestrial habitat compartment T3

This is a small woodland unit typical of the many others on the site. It is dominated by Ash but other trees are also present. In general, the lower layers of flora beneath the canopy are restricted but at the edges in particular there is greater diversity of plant life and so potentially raised invertebrate interest.

Terrestrial habitat compartment T4

This is a zone of unmown vegetation with between a hedge and an arable field. As an invertebrate habitat it is likely to be poor, but it is a habitat type that is rare on the site and so was sampled.

Terrestrial habitat compartment T5

This is another Ash-dominated woodland, not dissimilar to compartment T3. Other trees here included elm and Elder and as always there is a dominance of brambles on the ground beneath the trees. However, unlike in T3, we were able to operate actinic moth traps in this unit on some visits.

Terrestrial habitat compartment T6: Grunthill Copse

This small woodland unit has a better mix of trees incorporated with the Ash that forms its basis. Deciduous oaks, elm, hawthorn, Field Maple and Beech all feature. These are joined by bramble and wild rose and there were also patches covered by White Bryony.

Actinic moth traps were operated by us in this compartment on selected dates.

Terrestrial habitat compartment T7

This is the small, Ash-dominated woodland behind the pond at Crowmarsh Farm. It is relatively small and uninteresting from an invertebrate viewpoint but it provides screening and micro-climate control for the adjacent pond.

Actinic moth traps were operated by us in this compartment on selected dates.

Terrestrial habitat compartment T8

This compartment does not feature in Map 1. It is a catch-all category for records of invertebrates made casually along hedgerows within the surveyed area.

- 3.3 The aquatic sample areas are also indicated in Map 1 where they are given recording compartment numbers that repeat in the species inventory at Appendices 2 and 3. These areas are now introduced in greater detail.

Aquatic habitat compartment A1

This section of the stream, near its source at a spring, flows across arable fields in a shallow channel that is bordered on each side by a strip of rank grassland vegetation extending about one metre. The channel is largely dominated by grasses and other invading terrestrial vegetation and no aquatic macrophytes were evident during sampling sessions.

Aquatic habitat compartment A2

This is the pond that separates Compartments A1 and A3. It was created artificially by mechanical excavation of the stream and is up to 4 metres deep in places (unconfirmed third party information). There is a zone of marginal vegetation that may be of value to invertebrates.

Aquatic habitat compartment A3

This is a section of the main stream as it runs under the cover of a hedge. It is largely shaded and there are no aquatic macrophytes evident.

Aquatic habitat compartment A4

This section of the main stream flows beneath the cover of another overgrown hedge and is equally shaded and devoid of aquatic plants.

Aquatic habitat compartment A5

This downstream section of the watercourse is also heavily shaded but as it emerges into young woodland light penetrates from the side. In this area it flows fairly rapidly over a gravel substrate but is sufficiently shallow that young pheasants released into the wood in the autumn simply walk across it when the surveyor approaches!

Aquatic habitat compartment A6

This ornamental pond does not feature on 1945 aerial photographs and so is evidently a more recent artificial construction.

4 RESULTS OF TERRESTRIAL INVERTEBRATE SAMPLING

4.1 Summary

- 4.1.1 Appendix 1 reports the complete list of insect taxa encountered during the survey. The list is annotated with formal National Status codes where these are better than “nationally common” and these status codes are explained in Appendix 2.
- 4.1.2 A total of 560 invertebrate species was recorded. This is an acceptable total for the effort input and indicates that the level of sampling achieved is adequate to permit an assessment of the site. The more noteworthy amongst these are now briefly discussed.

4.2 Species of conservation interest

- 4.2.1 Several categories of invertebrates are of raised significance in an ecological assessment. These categories are explained in Appendix 2 and the corresponding species are now examined.

Legally Protected Species

- 4.2.2 No invertebrate species that are afforded direct legal protection under any UK or European legislation were encountered during the survey.

UK Biodiversity Action Plan Priority Species

- 4.2.3 One UK BAP species was recorded during the survey.

The Small Heath Butterfly *Coenonympha pamphilus* is a grassland species that has declined in recent years. It was added to the UK BAP list at the end of 2007 though there are disagreements over the need for this action. It remains widespread, though it has declined numerically so that whereas twenty years ago it was usual to see dozens if an afternoon it is now more likely that less than twenty or so will be seen.

At Bicester, we saw only very few examples in the area around Gowell Farm (Compartment T1).

- 4.2.4 The list of UK Biodiversity Action Plan Priority Species *of moths* is divided into two sections. In the first, a total of 81 species are afforded the status of UK BAP Priority Species; none of these is recorded in the surveyed area nor is any likely to be present.
- 4.2.5 The second section is a list of 69 species that have declined in population by a significant amount in the past 25 years. These are not yet rare and are flagged as UK BAP species “**for research only**”. They were inadvertently included in the overall BAP list by non-specialists.
- 4.2.6 This has resulted a confusing situation; these species were not intended to be affected by the requirements of *Planning Policy Statement 9: Biodiversity and Geological Conservation*, published by the Office of the Deputy Prime Minister during 2005, which requires Local Authorities to take measures to protect the habitats of UK BAP species from further decline through policies in local development documents. They were merely flagged for special attention.

4.2.7 At Bicester, we have recorded 9 such “Research Only” moth species; several others are confidently predicted to be present.

Species	English name	Caterpillar feeds on	In terrestrial habitat area							
			1	2	3	4	5	6	7	8
<i>Agrochola lychnidis</i>	Beaded Chestnut	deciduous trees and shrubs and herbaceous plants (requires both)	+	+						
<i>Allophyas oxyacanthae</i>	Green Brindled Crescent	rosaceous trees and shrubs		+						
<i>Atethmia centrargo</i>	Centre-barred Sallow	ash - buds then flowers	+	+			+	+	+	
<i>Ecliptopera silaceata</i>	Small Phoenix	willow herbs, enchanter's nightshade		+						
<i>Hepialus humuli</i>	Ghost Moth	roots of grasses and herbaceous plants	+							
<i>Hydraecia micacea</i>	Rosy Rustic	herbaceous plants, especially docks, feeding in the rootstock	+							
<i>Melanchra persicariae</i>	Dot Moth	herbaceous plants	+							
<i>Tyria jacobaeae</i>	Cinnabar Moth	Ragwort	+							
<i>Xanthia icteritia</i>	Sallow	sallow/willow catkins - then on herbaceous plants		+						

Red Data Book Species

4.2.8 One species listed in the British Red Data Books (Shirt, 1987; Bratton, 1991) or which has been elevated to the status of Critically Endangered, Endangered, Nationally Vulnerable or Near Threatened (formerly Nationally Rare) by subsequent formal reviews is recorded in the present survey.

Stigmella samiatella is a minute micro-moth whose caterpillars feed internally in the leaves of Sweet Chestnut trees, leaving a whitish galley – or “mine”. It was provisionally placed in Red Data Book category 3, but has since proved to be widespread and common in the south of England wherever Sweet Chestnut grows. This may reflect a genuine range expansion, rather than it having been overlooked, but either way the status is not at all warranted.

Mines were found on a tree at Gowell Farm (compartment T1).

Nationally Scarce Species

- 4.2.9 No species recorded feature in the Nationally Scarce (formerly Nationally Notable - Na) category (see Appendix 2).
- 4.2.10 Five species recorded feature in the Nationally Scarce (formerly Nationally Notable - Nb) category (see Appendix 2).

The Shaded Pug moth (*Eupithecia subumbrata*) feeds as a caterpillar on a wide range of herbaceous plants. It is widespread across south-eastern England, though less frequent elsewhere, but it is only locally distributed and some apparently suitable sites do not seem to support it. On the basis that it might be declining, the Nationally Scarce status may be warranted.

Two adults were caught in an actinic trap at compartment T4.

The bark beetle *Kissophagus hederæ* feeds as a grub in the dead wood of mature ivy, and is usually only found in larger branches of the plant. This implies that established ivy, of some age is required so that this is in some way an indicator of habitat stability. Like many other species it is probably overlooked, but it appears to be genuinely absent from a great many sites examined.

We recorded adults in compartment T2.

Roesel's Bush-cricket *Metrioptera roeselii* has, recent years, undergone a very large expansion of range that is almost certainly climate-driven. In most years the insects develop without the ability to fly, but in favourable (hot) summers the females develop winged forms that are able to disperse after mating and establish populations in new areas. In the south-east of England, this cricket is present in considerable abundance in grassland habitats, including set-a-side, field margins, road verges and lightly grazed pastures where there is plenty of vegetation cover. The Nationally Notable status is no longer warranted and an unpublished document on the Internet has indeed reduced its status to Nationally Local.

We recorded adults at compartments T2 and T4 and also one in the rank grass that flanks aquatic compartment A1.

Phyllonorycter platanoidella is a leaf-mining micro moth that is very much under-recorded. In the south of Britain, it is widespread and expected wherever Norway Maple is established and its status is not warranted. There is debate over whether this is a separate species from some other *Acer*-feeding *Phyllonorycter* species.

We found abundant mines of this moth on fallen leaves at Gowell Farm (compartment T1).

The blue and red leaf beetle *Podagrica fuscicornis* feeds as a grub in the flowers and seeds of mallow (*Malva* species). The plant has become a common feature of verges, hedgerows and other sites and the distinctive beetle has become quite frequent in the past few years.

We found examples at Gowell Farm (compartment T1); the host plant does not appear to be widespread across the survey area. .

Nationally Local Species

4.2.11 Twenty-one species are listed formally as Nationally Local (see Appendix 2). These are:

Species	English name	Habitat associations	In terrestrial compartment							
			1	2	3	4	5	6	7	8
<i>Amara lunicollis</i>	a ground beetle	grasslands, open woodland, gardens etc	+							
<i>Andrena flavipes</i>	a solitary bee	nests colonially, usually tunnelling into a vertical face								+
<i>Anomoia purmunda</i>	a picture-winged fly	Larva feeds in the flesh of hawthorn berries	+	+				+		+
<i>Aphodius granarius</i>	a beetle	dung, rotting vegetation (compost heaps) and carcasses	+							
<i>Aphthona euphorbiae</i>	a leaf beetle	widely polyphagous	+	+	+	+	+	+	+	+
<i>Ceratapion carduorum</i>	a seed weevil	Thistles	+							
<i>Cordylepherus (Malachius) viridis</i>	a beetle	a common grassland species	+			+				+
<i>Crepidodera plutus</i>	a leaf beetle	Willows, especially Crack Willow - rarely on poplars		+						
<i>Curculio glandium</i>	a weevil	Oak trees	+							+
<i>Curculio pyrrhoceras</i>	a weevil	oak - causing leaf galls								+
<i>Dorytomus tortrix</i>	a weevil	in catkins of aspen and willow		+						
<i>Hylaeus annularis</i>	a yellow-faced bee	nests in hollow plant stems, such as docks, etc	+							
<i>Lasioglossum leucopus</i>	a solitary bee	excavates nest burrow in level ground – preferring ruderal sites	+			+				+
<i>Ledra aurita</i>	Hippopotamus froghopper	Oak trees					+			
<i>Nicrophorus vespilloides</i>	a beetle	carrion	+							
<i>Oplodontha viridula</i>	a soldier fly	marshes and pond margins						+		
<i>Phyllobius maculicornis</i>	a weevil	polyphagous on leaves of deciduous trees and shrubs		+				+		+
<i>Psylliodes chrysocephala</i>	a weevil	various Cruciferae		+						
<i>Pterostichus (Poecilus) cupreus</i>	a ground beetle	open grassy habitats - usually where damp	+						+	
<i>Rhamphus oxyacanthae</i>	a beetle	larva mines in leaves of hawthorn		+						
<i>Sicus ferrugineus</i>	a parasitic fly	parasitic fly on bumble bees			+	+	+			+

4.3 Other species of interest

- 4.3.1 A third party report from a source regarded as reliable indicates the presence of the **White-letter Hairstreak butterfly** (*Satyrrium w-album*) in association with a hedge containing elm re-growth in the extreme south-east corner of the site opposite Bignell Park. This butterfly declined drastically across Britain in the aftermath of the Dutch Elm Disease outbreak in the late 1970s and became extremely rare for several years. More recently it has apparently adapted to feeding (as a caterpillar) on elm suckers rather than requiring mature, flowering trees and has made a reasonable recovery. At 2010 it is widespread but rather local across southern and central England and is extending northwards, though it is absent from many apparently suitable sites and is nowhere numerically common.

5 RESULTS OF AQUATIC INVERTEBRATE SAMPLING

- 5.1 The species obtained by sampling representative aquatic habitats are presented in Appendix 3.
- 5.2 A rather low number of generally widespread and common species is recorded. This reflects the low quality of aquatic habitat on the site and is discussed below.

6 DISCUSSION

- 6.1 The initial impression of the whole site is that it is unlikely to be an invertebrate “hot-spot”. Arable fields dominate the entire landscape which is punctuated only by small and rather isolated tree groups, not really woodlands, and rarely other by features. A reasonable network of hedges provides for movement of animals across the land, but most are regularly trimmed so that their intrinsic value to invertebrates is regularly curtailed. Most water courses are dry in the summer and in any event are mostly lost beneath hedges.
- 6.2 Invertebrate data obtained by us during the survey have done more to support this visual impression than they have to alter it. The number of recorded invertebrate species is relatively high, and this certainly reflects an adequate recording effort within the available time window, but the composition of the species assemblage reveals a startling lack of species of conservation interest.
- 6.3 By definition, such more interesting species are less frequently found than the others in the list and the reason for their rarity, in a great many cases, is vested in their specialist ecologies. A phytophagous (vegetarian) insect that can feed on a wide range of plants is clearly more likely to be widespread in distribution and numerically abundant than one which is restricted to either a single family of plants or perhaps to a single species.
- 6.4 Finding these species on a site is key to assessing its overall ecological value, but proving an absence is rather more tricky than demonstrating a presence. It is frequently said that an experienced entomologist should be able to find at least one noteworthy species on almost any site in southern Britain, and this is probably true, and so the number of such rare species within the recorded assemblage, as well as an examination of their ecological associations, is also important.
- 6.5 Several noteworthy species have, in fact, been found in the present survey. However, only two of these truly warrant their status – The Shaded Pug moth and the beetle *Kissophagus hederæ*, which is associated with mature ivy. This is a very low total and it is, of course, inevitable that further survey will not only generate a longer species list but also that this might contain further interesting species. However, we are not of the opinion that the conclusions based on the present results would alter if extensive and detailed species listing was indeed undertaken.
- 6.6 Overall, therefore, we are of the opinion that the survey area supports a bare minimum of invertebrate interest. There are small areas of slightly better invertebrate habitat in the form of tree groups, water bodies and some other habitats and it is these that support the entire of the recorded invertebrate assemblage. These are now briefly discussed.
- 6.7 Tree groups are few, far between (isolated) and with the exception of compartment T2, apparently of low floral diversity. All appear to be dominated by Ash. The trees, generally, grow close together restricting the ground flora by reducing light penetration. Their boundaries with adjacent fields are mostly abrupt and transitional zones (edge habitats) are generally absent.
- 6.8 The single exception to this generalisation is the developing woodland in compartment T2. This is a section of the former main road that has now become isolated and is no longer subjected to management. Trees are growing to maturity, hedges have become overgrown and scrub is marching out from the edges across the former roadside verges where there is a greater diversity of herbs than can be found in most other parts of the site.
- 6.9 It is unsurprising to discover that this compartment has the highest species total of all the recorded compartments, with precisely 300 listed in Appendix 1. What this shows, quite clearly, is that areas of the site that are neglected – no longer managed – will develop a raised invertebrate value in a relatively short period of time. As if to prove this theorem, another abandoned area of the site, that around Gowell Farm (compartment T1), records the second highest invertebrate species diversity, with 294 taxa listed during 2010. Other areas of the site record significantly reduced species lists.

- 6.10 The network of hedges on the site is variable in quality. Almost all are either flailed or clipped on an annual basis. However, where hedges have grown very tall, this management is, in some sections, limited to the lower two or three metres; in these situations the uncut tops of the hedges present a better prospect for invertebrates.
- 6.11 Cutting hedges reduces intrinsic invertebrate interest for several reasons. Clearly, it directly removes the insects themselves. In the summer, this might be the actively feeding adults, whilst in the winter eggs, larvae, pupae and hibernating adults are lost. Since there is no evidence of the arisings being retained on this site, then there is no opportunity for mobile forms to return to the hedge. Additionally, it drastically reduces the food resource of many insects, notably nectar and pollen, by direct removal of flowering potential. As well as this it eliminates the transitional “edge habitat” zone that is of immense importance to invertebrates and other animal groups.
- 6.12 The best edges are those that are gradual, with the vertical component rising gradually through long grass, tall herbs and larger bushes to mature trees. This is illustrated in the following diagram:



- 6.13 Such edge habitats provide physical support for migration of invertebrates around the landscape; where the floral component is comprised of native rather than non-native species these edge habitats will also support a raised intrinsic invertebrate interest.
- 6.14 Most of the hedges on site appear to be poorly structured in this way and, in general, fields seem to be ploughed to within a metre or less of the base of their boundary hedges. They do nevertheless connect otherwise isolated areas of potential interest and their continued presence will be essential in the facilitation of movement of invertebrates around the landscape at Bicester. They ought to be retained and enhanced, or else replaced, in any proposed development.
- 6.15 Water-bodies on the site are few. Most ponds probably vanished a long time ago; no additional examples can be seen on 1945 aerial photographs. The largest pond currently extant (compartment A6) is entirely artificial, of recent creation and low in aquatic invertebrate interest.
- 6.16 Of potentially higher invertebrate ecology interest are the flowing water-courses. That which arises more or less on the boundary line of the survey area to the west of Crowmarsh Farm is spring-fed and so flows for most of the year, albeit rather slowly in the summer.
- 6.17 Most of the others were dry in the summer of 2010 and these may be seasonal features. Seasonal watercourses can develop a small but specialist invertebrate interest; unfortunately this could not be examined within the seasonal window available to us.

7 CONCLUSIONS

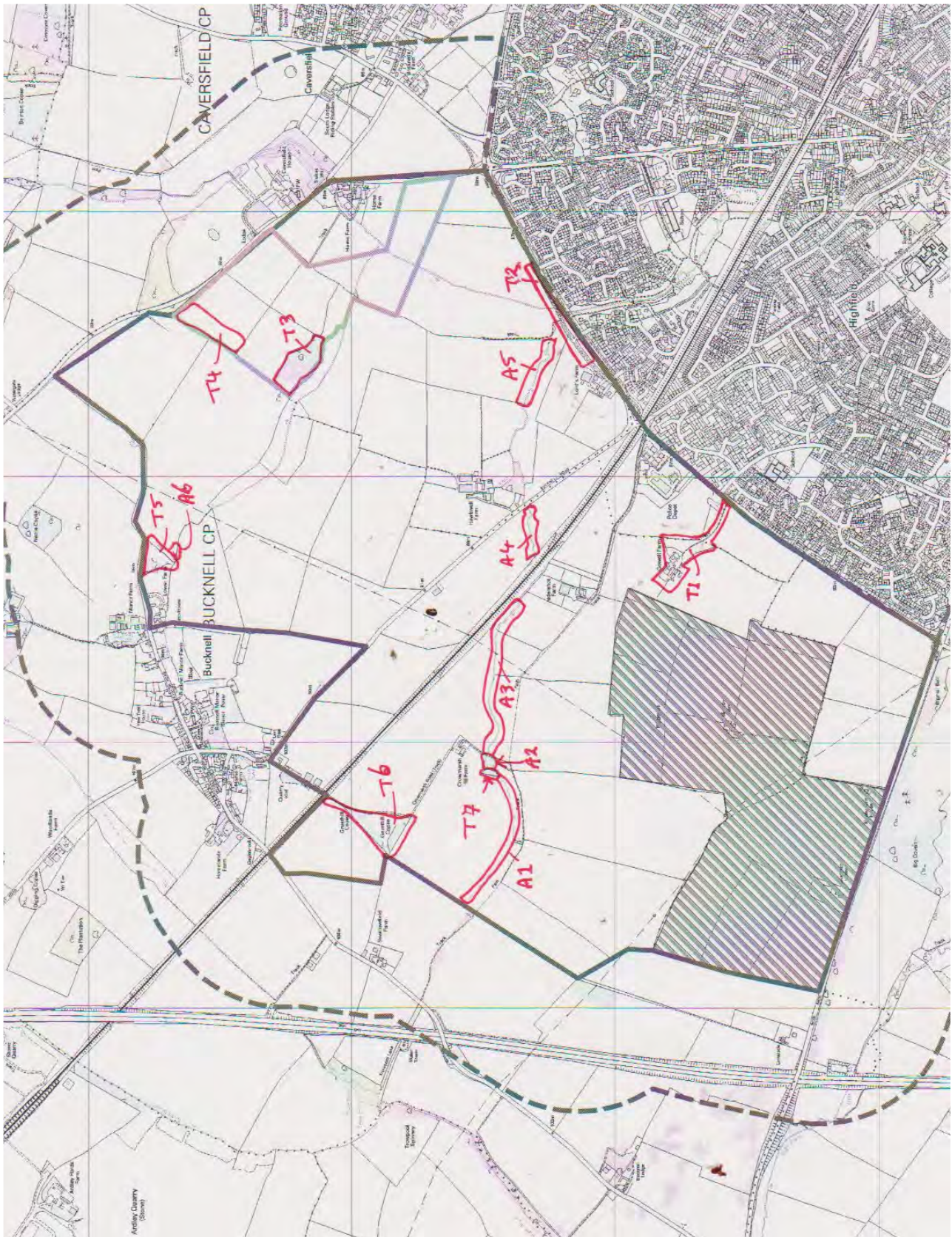
- 7.1 Overall, we are not able, on the basis of available data, to raise any specific invertebrate ecology-based objection to the proposed development of the Bicester site other than to comment that the overall reduction of open greenspace is inevitably detrimental to invertebrate ecology at the landscape level.
- 7.2 Nevertheless, the example of recording compartments T1 and T2 that withdrawal of management from this heavily manicured landscape will permit recolonisation by communities of invertebrates can be drawn upon to increase the value of any ecological mitigation package embarked upon for non-invertebrate reasons.
- 7.3 In particular, attention to the network of hedges would be valuable. Ideally, the network would be retained within the proposed development and wherever possible a more favourable hedgerow management regime should be installed. Not cutting one side of the hedge is desirable in some places; elsewhere a rotational cutting of hedges such that no section is cut more frequently than once every five years might be appropriate.
- 7.4 Retained tree groups could usefully be allowed to expand to occupy larger areas and to develop less well-defined boundaries. Incorporating these into amenity areas might allow for the development of better-structured edge habitats.

8 REFERENCES QUOTED IN THIS REPORT AND ITS APPENDICES

- Bratton, J. H. 1991 *British Red Data Books: 3. Invertebrates other than insects*. NCC
- Shirt, D. B. (ed.) 1987 *British Red Data Books: 2. Insects*. NCC
- UK Biodiversity Group 1999 *Tranche 2 action plans. Volume iv - invertebrates*. English Nature.

APPENDICES

MAP 1: THE SURVEYED AREA, SHOWING THE POSITIONS OF THE RECORDING COMPARTMENTS AND THEIR NUMBERS



APPENDIX 1: TERRESTRIAL INVERTEBRATE SPECIES RECORDED

National status codes are explained in Appendix 2.

Group / species	English name if available	National status	Ecological associations	Where found (see text section 3)							
				1	2	3	4	5	6	7	8
ARACHNIDA: ARANEA	SPIDERS										
Araneidae											
<i>Araneus diadematus</i>	the garden spider		ubiquitous								+
Linyphiidae											
<i>Lepthyphantes tenuis</i>	a spider		ubiquitous - often in grassland, but also a pioneer species	+			+				
<i>Linyphia triangularis</i>	a money spider		almost ubiquitous	+			+				
Pisauridae				+							
<i>Pisaura mirabilis</i>	a spider		more or less ubiquitous, but likes tall vegetation								
ARACHNIDA: ACARI	GALL MITES										
Eriophyiidae											
<i>Aceria crataegi</i>			causes galls on leaves of hawthorn	+	+				+		+
<i>Aceria macrorhynchus</i>			makes galls on Sycamore leaves	+							
<i>Aceria pseudoplatani</i>			causes galls on leaves of sycamore								+
<i>Phyllocoptes goniothorax</i>			causes galls on leaves of hawthorn	+	+				+		
ARACHNIDA: OPILIONES	HARVESTMEN										
Leiobunidae											
<i>Leiobunum rotundum</i>			Ubiquitous - under stones, logs etc		+						
Phalangidae					+						
<i>Oligolophus tridens</i>			ubiquitous species								
COLEOPTERA	BEETLES										
Anobiidae											
<i>Anobium punctatum</i>			larvae feed in dead timber	+	+						+
<i>Ptilinus pectinicornis</i>			larvae feed in dead tree branches and other dead timber		+						+
Anthicidae											
<i>Anthicus antherinus</i>			larvae in decaying grass litter - adults at flowers							+	
Apionidae	Seed weevils										
<i>Apion frumentarium</i>			broad-leaved docks	+							

Group / species	English name if available	National status	Ecological associations	Where found (see text section 3)							
				1	2	3	4	5	6	7	8
<i>Ceratapion carduorum</i>		Local	Thistles	+							
<i>Ceratapion gibbirostre</i>			thistles - in the stems		+					+	
<i>Malvapion malvae</i>			Malvaceae - especially <i>Malva sylvestris</i>		+						
<i>Perapion violaceum</i>			dock plants, the larvae mining the stems; widespread and common	+							
<i>Protapion apricans</i>			bird's-foot Trefoil and perhaps other legumes; widespread and common	+	+						+
<i>Protapion assimile</i>			clover, especially red clover; widespread and common								+
<i>Protapion dichroum</i>			Trifolium - widespread and almost ubiquitous								+
<i>Protapion trifolii</i>			various clovers; widespread and common								
<i>Trichapion simile</i>			Associated with birch foliage		+						
Byturidae											
<i>Byturus tomentosus</i>	the raspberry beetle		Brambles and raspberries	+	+	+		+	+	+	+
Cantharidae	Soldier beetles										
<i>Cantharis cryptica</i>			tall vegetation, especially at the woodland/grassland interface	+	+	+	+	+	+	+	+
<i>Malthinus seriepuncatatus</i>			broad-leaved woodland species		+						+
<i>Malthodes minimus</i>			woodland and scrub								+
<i>Rhagonycha fulva</i>			tall, rank vegetation in lowland areas	+	+	+	+	+	+	+	+
<i>Rhagonycha lignosa</i>			an arboreal species	+	+	+		+	+	+	+
<i>Rhagonycha limbata</i>			dry grasslands (formerly called <i>Rhagonycha femoralis</i>)	+	+		+				
Carabidae	Ground beetles										
<i>Amara (Curtonotus) aulica</i>			dry, well-vegetated sites, the adults climbing stems of Compositae at night to feed on the seed heads	+							
<i>Amara communis</i>			phytophagous species of open sites, hiding under leaf rosettes, stones, etc	+							
<i>Amara familiaris</i>			Phytophagous species of gardens and other open, dry and sunny habitats	+							
<i>Amara lunicollis</i>		Local	grasslands, open woodland, gardens etc	+							
<i>Amara similata</i>			phytophagous on ruderal vegetation, especially on waste ground	+							
<i>Bradycellus verbasci</i>			prefers light soils in open situations, including arable	+							
<i>Carabus violaceus</i>			fairly widespread in most habitats	+							
<i>Demetrias atricapillus</i>			amongst leaf litter and in grasslands	+							
<i>Dromius quadrimaculatus</i>			arboreal species of deciduous trees and occasionally on conifers	+	+				+		

Group / species	English name if available	National status	Ecological associations	Where found (see text section 3)							
				1	2	3	4	5	6	7	8
<i>Harpalus (Ophonus) puncticeps</i>			phytophagous species of open, ruderal habitat	+							
<i>Harpalus (Pseudophonus) rufipes</i>			ubiquitous	+							
<i>Loricera pilicornis</i>			ubiquitous, but especially near water and in damp grassland; feeds on springtails					+		+	
<i>Nebria brevicollis</i>			ubiquitous late summer and autumn species	+						+	
<i>Notiophilus biguttatus</i>			most open ground habitats	+						+	
<i>Pterostichus (Poecilus) cupreus</i>		Local	open grassy habitats - usually where damp	+						+	
<i>Pterostichus madidus</i>			ubiquitous	+						+	
<i>Pterostichus melanarius</i>			ubiquitous	+							
<i>Pterostichus nigrata s. str.</i>			wet, well-vegetated habitats, river banks and damp woodland	+						+	
<i>Pterostichus strenuus</i>			most habitats that are not too dry	+							
<i>Trechus quadristriatus</i>			ubiquitous in most open habitats during autumn	+	+						
Cerambycidae	longhorn beetles										
<i>Clytus arietis</i>			in dead wood - usually birch or willow, adults at flowers		+						
<i>Grammoptera ruficornis</i>			larvae in twigs and small branches; adults at flowers		+						
<i>Rhagium mordax</i>			larvae feed internally in well-rotten stumps and other timber, especially oak	+							
<i>Tetrops praeustus</i>			feed on a wide variety of deciduous trees						+		+
Chrysomelidae	leaf beetles										
<i>Altica lythri</i>			Associated with various willow-herbs (Onagraceae)		+						
<i>Aphthona euphorbiae</i>		Local	widely polyphagous	+	+	+	+	+	+	+	+
<i>Cassida rubiginosa</i>			various thistles, burdock and other Asteraceae	+							
<i>Chaetocnema hortensis</i>			feeds on various grasses		+						
<i>Crepidodera aurata</i>			willows - rarely on poplars		+						
<i>Crepidodera aurea</i>			poplars - occasionally on willows		+						
<i>Crepidodera fulvicornis</i>			Salix species		+						
<i>Crepidodera plutus</i>		Local	Willows, especially Crack Willow - rarely on poplars		+						
<i>Galerucella lineola</i>			Alder, Hazel and willows		+						
<i>Gastrophysa viridula</i>			larvae feed on dock leaves in damp meadows and elsewhere							+	
<i>Lochmaea crataegi</i>			Hawthorn - larvae mine the berries. Occasionally on Blackthorn or Rowan		+				+		+
<i>Longitarsus flavicornis</i>			ragworts								+
<i>Longitarsus luridus</i>			widely polyphagous								+
<i>Longitarsus parvulus</i>			feeds on many plant species								+

Group / species	English name if available	National status	Ecological associations	Where found (see text section 3)							
				1	2	3	4	5	6	7	8
<i>Oulema melanopa s. str.</i>			feeds on grasses - very common	+							+
<i>Phaedon tumidulus</i>			on various Apiaceae, especially cow parsley, angelica, hogweed etc								+
<i>Phyllodecta (Phratora) vulgatissima</i>			willows and perhaps poplars and Aspen		+						
<i>Phyllodecta (Phratora) vitellinae</i>			willows and poplars, including Aspen		+						
<i>Phyllotreta atra</i>			various Brassicaceae	+	+		+				
<i>Phyllotreta diademata</i>			various Brassicaceae				+				
<i>Phyllotreta nigripes</i>			various Brassicaceae		+		+				
<i>Phyllotreta undulata</i>			various Brassicaceae	+	+		+				
<i>Plagiodera versicolora</i>			Crack willow and other willows, occasionally Black Poplar		+						
<i>Podagrica fuscicornis</i>		NS(Nb)	mallow (Malva species)		+						
<i>Psylliodes chrysocephala</i>		Local	various Cruciferae		+						
<i>Psylliodes dulcamarae</i>			Woody nightshade (Solanum dulcamara)								+
<i>Psylliodes napi</i>			various Cruciferae	+							
<i>Sphaeroderma rubidum</i>			feeds on thistles and other Asteraceae	+							
<i>Sphaeroderma testaceum</i>			mainly on thistles	+							
Ciidae											
<i>Cis boleti</i>			fungi - in both brackets and caps		+						+
Coccinellidae											
<i>Adalia 10-punctata</i>	10-spot ladybird		predatory on other insects	+	+		+	+	+		+
<i>Adalia 2-punctata</i>	2-spot ladybird		predatory on other insects	+	+	+	+	+	+	+	+
<i>Anisostica 19-punctata</i>	19-spot ladybird		wetland habitats							+	
<i>Chilocoris renipustulatus</i>	kidney-spot ladybird		trees, especially on willows in wet areas		+						
<i>Coccinella 7-punctata</i>	7-spot ladybird		predatory on other insects	+	+	+	+	+	+	+	+
<i>Halyzia 16-guttata</i>	Orange ladybird		predatory on other insects	+	+	+	+	+	+	+	+
<i>Harmonia axyridis</i>	Harlequin ladybird		a recent colonist in Britain	+	+	+	+	+	+	+	+
<i>Propylea 14-punctata</i>	14-spot ladybird		predatory on other insects	+	+	+	+	+	+	+	+
<i>Rhyzobius litura</i>	a spotless ladybird		predatory on other insects				+				+
<i>Subcoccinella 24 - punctata</i>	24-spot ladybird		predatory on other insects	+	+	+		+	+	+	+
<i>Thea 22-punctata</i>	22-spot ladybird		feeds on mildews								
Curculionidae	Weevils										
<i>Anthonomus pedicularis</i>			larvae develop in hawthorn berries		+				+		+
<i>Barypeithes araneiformis</i>			ubiquitous amongst moss, litter, etc.		+						

Group / species	English name if available	National status	Ecological associations	Where found (see text section 3)							
				1	2	3	4	5	6	7	8
<i>Ceutorhynchus obstrictus</i>			various Cruciferae		+						
<i>Ceutorhynchus pallidactylus</i>			ecology unclear		+						
<i>Ceutorhynchus pollinarius</i>			Nettles		+						
<i>Cionus scrophulariae</i>			Figworts (Scrophularia species)		+						
<i>Curculio glandium</i>		Local	Oak trees	+							+
<i>Curculio pyrrhoceras</i>		Local	oak - causing leaf galls								+
<i>Curculio salicivorus</i>			birch, willow and other trees								+
<i>Dorytomus taeniatum</i>			the larvae feeds inside the female catkins of willow trees		+						
<i>Dorytomus tortrix</i>		Local	in catkins of aspen and willow		+						
<i>Euophrys confinis</i>			dead timber		+						
<i>Gymnetron pascuorum</i>			feeds on flowers of Plantago lanceolata - Ribwort Plantain								+
<i>Hypera nigrirostris</i>			Trifolium pratense - on the foliage								+
<i>Hypera postica</i>			Medicago, Melilotus and Trifolium - on the foliage								+
<i>Hypera rumicis</i>			Rumex species (docks) - on the foliage								+
<i>Nedus quadrimaculatus</i>			nettles - feeding on the flowers								+
<i>Otiorynchus singularis</i>			feeds on a variety of plant roots	+							
<i>Phyllobius maculicornis</i>		Local	polyphagous on leaves of deciduous trees and shrubs		+				+	+	
<i>Phyllobius oblongus</i>			polyphagous on broad-leaved trees and bushes								
<i>Phyllobius pomaceus</i>			Nettles		+				+		
<i>Phyllobius roboretanus</i>			nettle - feeding on the leaves and flowers		+						
<i>Phyllobius viridiaeris</i>			typically in hedges and other edge habitats								
<i>Polydrusus cervinus</i>			trees and shrubs - feeding on the leaves								+
<i>Polydrusus pterigomalus</i>			polyphagous on broad-leaved trees, especially oak	+							
<i>Rhamphus oxyacanthae</i>		Local	larva mines in leaves of hawthorn		+						
<i>Rhinoncus castor</i>			Dock plants								
<i>Rhynchaenus quercus</i>			larvae mine the leaves of oak trees	+	+				+		+
<i>Sitona lineatus</i>			various legumes	+	+	+	+	+	+	+	+
<i>Trichosirocalus troglodytes</i>			Plantains, usually in grassy places				+				+
Dermestidae											
<i>Anthrenus verbasci</i>			feeds on dead animal and plant matter, including dry carcasses		+						
Elateridae											
<i>Agriotes lineatus</i>			larvae feed on grass roots				+				
<i>Athous (Hemicrepidus) hirtus</i>			grassland, woodland rides, etc. The larvae feed in decaying wood and in soil								

Group / species	English name if available	National status	Ecological associations	Where found (see text section 3)							
				1	2	3	4	5	6	7	8
<i>Athous haemorrhoidalis</i>			the larva feeds on the roots of grasses		+						
<i>Kibunea (Cidnopus) minuta</i>			a species of dry grasslands				+				
Histeridae											
<i>Saprinus semistriatus</i>	a carrion beetle		feeds in carrion	+							
Kateretidae											
<i>Brachypterus glaber</i>			Nettles	+	+		+				+
<i>Brachypterus urticae</i>			Nettles	+	+	+	+				+
Latridiidae											
<i>Aridius bifasciatus</i>			litter, compost, tussocks etc - more or less ubiquitous								+
<i>Aridius nodifer</i>			litter, compost, tussocks etc - more or less ubiquitous								+
Leiodidae											
<i>Catops nigricans</i>			carrion	+							
Melyridae											
<i>Cordylepherus (Malachius) viridis</i>		Local	a common grassland species	+			+				+
<i>Malachius bipustulatus</i>	a malachite beetle		grasslands	+			+				+
Nitidulidae											
<i>Glischrochilus hortensis</i>			unknown association; adults usually in woodland		+						
<i>Meligethes aeneus</i>	a pollen beetle		various flowers	+	+	+	+	+	+	+	+
Scarabaeidae											
<i>Aphodius granarius</i>		Local	dung, rotting vegetation (compost heaps) and carcasses	+							
Scolytidae											
<i>Kisophagus hederæ</i>	a bark beetle	NS(Nb)	larva feeds in dead ivy wood		+						
<i>Scolytus scolytus</i>	elm bark beetle		under elm bark			+		+	+		
Scraptiidae											
<i>Anaspis fasciata (= humeralis)</i>			larvae in twigs of oak and other trees; adults at hawthorn blossom		+						
<i>Anaspis frontalis</i>			larvae in twigs of oak and other trees; adults at hawthorn blossom		+						
<i>Anaspis regimbarti</i>			larvae feed in large girth oak branches and decaying oak trunks		+						
Silphidae	Sexton Beetles										
<i>Necrodes littoralis</i>			carrion	+							
<i>Nicrophorus humator</i>			carrion	+							
<i>Nicrophorus vespilloides</i>		Local	carrion	+							
Staphylinidae	Rove beetles										

Group / species	English name if available	National status	Ecological associations	Where found (see text section 3)							
				1	2	3	4	5	6	7	8
<i>Aleochara curtula</i>			leaf litter, decaying vegetation etc	+							
<i>Aloconota gregaria</i>			plant litter - ubiquitous	+							
<i>Anotylus inustus</i>			leaf litter, carrion, dung and similar	+							
<i>Anotylus rugosus</i>			a detritus-feeding rove beetle	+							
<i>Anotylus sculpturatus</i>			grass tussocks, litter, dung etc	+							
<i>Atheta (Dimetrota) atramentaria</i>			larvae feed in animal dung - very common	+							
<i>Autalia rivularis</i>			associated with herbivore dung	+							
<i>Lathrobium brunnipes</i>			grass tussocks, litter, dung etc	+							
<i>Ocypus (Tasgius) ater</i>			carrion, dung, etc	+							
<i>Philonthus varius</i>			ubiquitous - in moss, litter, carrion, dung etc	+							
<i>Quedius curtipennis</i>			leaf litter, carrion, dung and similar	+							
<i>Quedius levicollis</i> (= <i>tristis</i>)			ecology unclear	+							
<i>Staphylinus brunnipes</i>			leaf litter, carrion, dung and similar	+							
<i>Tachyporus dispar</i>			a detritus-feeding rove beetle	+							
<i>Tachyporus hypnorum</i>			leaf litter, grass tussocks and similar micro-habitats	+							
<i>Tachyporus solutus</i>			leaf litter, carrion, dung and similar	+							
<i>Xantholinus linearis</i>			leaf litter, grass tussocks and similar micro-habitats	+							
CRUSTACEA: ISOPODA	WOODLICE										
Oniscidae											
<i>Oniscus asellus</i>			damp, but not wet, habitats everywhere	+	+	+	+	+	+	+	+
Philosciidae											
<i>Philoscia muscorum</i>			under stones etc	+	+	+	+	+	+	+	+
Porcellionidae											
<i>Porcellio scaber</i>			under stones etc								
Trichoniscidae				+	+	+	+	+	+	+	+
<i>Trichoniscus pusillus</i>			under stones, bark, etc		+						
DERMAPTERA											
Forficulidae											
<i>Forficula auricularia</i>	common earwig		generalist species	+	+	+	+	+	+	+	+
DIPTERA											
Agromyzidae											
<i>Agromyza alnibetulae</i>			larva mines the leaves of birch trees	+							
<i>Agromyza dipsaci</i>			larva mines leaves of teasel	+							
<i>Agromyza potentillae</i>			mines leaves of <i>Potentilla reptans</i> and other rosaceous plants		+						+

Group / species	English name if available	National status	Ecological associations	Where found (see text section 3)							
				1	2	3	4	5	6	7	8
<i>Amauromyza labiatarum</i>			mines leaves of <i>Lamium album</i> and other labiates		+						
<i>Liriomyza amoena</i>			mines leaves of elder	+		+		+			+
<i>Phytomyza heracleana</i>			mines leaves of <i>Heracleum spondylium</i>		+						
Asilidae	Robber flies										
<i>Dioctria baumhaueri</i>			predatory -mainly in edge habitats	+	+						
<i>Dioctria rufipes</i>			predatory -mainly in edge habitats	+	+						
<i>Leptogaster cylindrica</i>			grassland predator	+	+	+	+	+	+	+	+
Cecidomyiidae				+	+				+		+
<i>Dasineura crataegi</i>			forms galls on hawthorn		+						
<i>Dasineura marginemtorquens</i>			forms rosette gall on willows and salix		+						
<i>Iteomyia caprea</i>			larva galls the leaves of willows		+						
<i>Macrodiplosis volvens</i>			larva feeds on oak leaves causing a gall to form a gall	+					+		
Conopidae											
<i>Sicus ferrugineus</i>		Local	parasitic fly on bumble bees			+	+	+			+
Dolichopodidae											
<i>Chrysotus gramineus</i>			very common grassland species	+						+	
<i>Poecilobothrus nobilitatus</i>			aquatic larvae								
Empididae											
<i>Empis (Kritempis) livida</i>			predatory on other flies	+	+	+	+	+	+	+	+
<i>Empis (Xanthempis) trigramma</i>			predatory on other flies	+	+	+	+	+	+	+	+
Lauxaniidae											
<i>Sapromyzosoma 4-punctata</i>			saprophagous species usually in woodland		+						
<i>Tricholauxania praeusta</i>			larvae feed amongst decaying vegetation in damp, shady places		+						
Limoniidae											
<i>Austrolimnophila ochracea</i>			woodland - even small ones- the larvae feeding in dead wood							+	
<i>Cheilotrichia cinerascens</i>			damp places		+					+	
<i>Limonia nubeculosa</i>	a crane fly		woodland - the larvae feeding in leaf litter		+						
<i>Limonia tripunctata</i>			lowland deciduous woodland, the larvae developing in the soil/litter		+						
<i>Molophilus griseus</i>			damp hedgerows, ditches and woodland		+						
<i>Rhipidia (Limonia) duplicata</i>			various habitats, including woodland and grassland, the larvae feeding in animal dung	+							+
Lonchoceridae											
<i>Lonchocera furcata</i>			a more or less ubiquitous species in edge habitats		+						

Group / species	English name if available	National status	Ecological associations	Where found (see text section 3)							
				1	2	3	4	5	6	7	8
<i>Lonchoptera lutea</i>			ubiquitous species in edge habitats, saprophagous larvae		+					+	+
Platystomatidae											
<i>Platystoma seminationis</i>			larvae develop in decaying vegetable matter	+							
Ptychopteridae											
<i>Ptychoptera albimana</i>			damp habitats, including seepages								
Rhagionidae											
<i>Rhagio lineola</i>			woodland and scrub - especially at the edges							+	
<i>Rhagio scolopaceus</i>			woodland edge and other wooded areas - in clearings and at edges		+						+
<i>Rhagio tringarius</i>			damp habitats							+	
Sepsidae											
<i>Nemopoda nitidula</i>			shade-loving species, larvae in dung and carrion	+							
<i>Sepsis fulgens</i>			the most ubiquitous member of this group, feeding in mammal dung	+							
Stratiomyidae	Soldier flies										
<i>Beris chalybata</i>			associated with the scrub/grassland interface	+	+	+	+	+	+	+	+
<i>Beris vallata</i>			larvae require decomposing organic matter	+	+	+	+	+	+	+	+
<i>Chloromyia formosa</i>			ubiquitous	+	+	+	+	+	+	+	+
<i>Chorisops tibialis</i>			larvae require decomposing organic matter		+					+	+
<i>Microchrysa polita</i>			larvae require decomposing organic matter		+						+
<i>Oplodontha viridula</i>		Local	marshes and pond margins							+	
<i>Pachygaster atra</i>			woodland edge & scrubland species - larvae under dead bark of trees		+	+		+	+		
<i>Pachygaster leachii</i>			woodland edge & scrubland species - larvae under dead bark of trees		+						+
<i>Sargus iridatus</i>			larvae feed in rotting vegetation and similar material								
Syrphidae	Hoverflies										
<i>Baccha elongata</i>			shaded woodland		+						
<i>Cheilosia albitarsis/ranunculi female</i>				+							
<i>Cheilosia pagana</i>			larvae are thought to feed in the roots of <i>Anthriscus sylvestris</i>		+						
<i>Chrysotoxum bicinctum</i>			grassland species -associated with ants' nests	+			+				+
<i>Dasysyrphus albostrigatus</i>			aphid predator at woodland edge habitats		+						
<i>Dasysyrphus tricinctus</i>			aphid predator at woodland edge habitats		+						
<i>Epistrophe eligans</i>			mainly at edge habitats	+	+	+	+	+	+	+	+

Group / species	English name if available	National status	Ecological associations	Where found (see text section 3)							
				1	2	3	4	5	6	7	8
<i>Episyrphus balteatus</i>			ubiquitous species, partly immigrant, and a predator of aphids	+	+	+	+	+	+	+	+
<i>Eristalis arbustorum</i>			Larvae require damp habitats but adults are more or less ubiquitous	+	+	+	+	+	+	+	+
<i>Eristalis nemorum</i>			Larvae require damp habitats but adults are more or less ubiquitous		+						
<i>Eristalis pertinax</i>			Larvae require damp habitats but adults are more or less ubiquitous	+	+	+	+	+		+	+
<i>Eristalis tenax</i>			Larvae require damp habitats but adults are more or less ubiquitous	+	+	+		+	+	+	+
<i>Eupeodes corollae</i>			Grassland	+	+	+	+	+	+	+	+
<i>Eupeodes luniger</i>			Grassland	+	+	+	+	+	+	+	+
<i>Helophilus pendulus</i>			Larvae require damp habitats but adults are more or less ubiquitous	+	+	+	+	+	+	+	+
<i>Melanostoma mellinum</i>			Grassland	+	+	+	+	+	+	+	+
<i>Melanostoma scalare</i>			Grassland	+			+				
<i>Myathropa florea</i>			larvae are semi-aquatic							+	
<i>Neoascia podagrica</i>			edge-habitat species	+	+		+		+	+	+
<i>Pipizella viduata</i>			Larvae feed on root aphids on Umbelliferae								+
<i>Platycheirus albimanus</i>			ubiquitous - larvae prey on aphids	+	+	+	+	+	+	+	+
<i>Platycheirus clypeatus s. str.</i>			Damp habitats							+	
<i>Platycheirus scutatus s. str.</i>			an edge-habitat species		+						
<i>Rhingia campestris</i>			Cow dung	+							
<i>Sphaerophoria scripta</i>			Grassland	+	+	+	+	+	+	+	+
<i>Syritta pipiens</i>			larvae in decaying vegetation; adults at flowers	+	+	+	+	+	+	+	+
<i>Syrphus ribesii</i>			larvae are aphid predators on trees and bushes	+	+	+	+	+	+	+	+
<i>Syrphus vitripennis</i>			larvae are aphid predators on trees and bushes	+	+	+	+	+	+	+	+
<i>Volucella bombylans</i>			inquiline in nests of bumble bees		+						
<i>Volucella pellucens</i>			inquiline in nests of social wasps/hornet		+						
<i>Xylota segnis</i>			Damp, dead wood		+						
Tabanidae											
<i>Haematopota pluvialis</i>			damp habitats - adult females are blood sucking horseflies	+					+	+	
Tachinidae											
<i>Eriothrix rufomaculata</i>			larva parasitises moth larvae	+	+	+	+	+	+	+	+
Tephritidae											
<i>Anomoia purmunda</i>		Local	Larva feeds in the flesh of hawthorn berries	+	+				+		+

Group / species	English name if available	National status	Ecological associations	Where found (see text section 3)							
				1	2	3	4	5	6	7	8
<i>Euleia heraclei</i>			white-flowering Umbelliferae	+							
<i>Terellia ruficauda</i>			larvae gall the flowers of thistles	+							
<i>Urophora cardui</i>			larvae gall the flowers of thistles	+							
<i>Xyphosia miliaria</i>			larvae gall the flowers of thistles - ubiquitous	+							
Tipulidae	crane flies										
<i>Savtshenkia pagana</i>			more or less ubiquitous		+						
<i>Tipula oleracea</i>			ubiquitous, larvae feeding on roots of grasses	+	+	+	+	+	+	+	+
<i>Tipula paludosa</i>			ubiquitous, larvae feeding on roots of grasses	+	+	+	+	+	+	+	+
HETEROPTERA											
Acanthosomatidae											
<i>Acanthosoma haemorrhoidale</i>	hawthorn shield bug		hawthorn		+				+		+
<i>Elasmucha grisea</i>			birch, occasionally alder	+							
Anthocoridae											
<i>Anthocoris confusus</i>			trees and shrubs	+	+						
<i>Anthocoris nemoralis</i>			trees and shrubs	+	+	+		+	+	+	+
<i>Anthocoris nemorum</i>			low vegetation	+	+	+	+	+	+	+	+
Cimicidae											
<i>Orius niger</i>			low vegetation on a variety of dry sites				+				
Coreidae											
<i>Coriomeris denticulatus</i>			various legumes	+			+				
Cydnidae											
<i>Legnotus limbosus</i>			Bedstraws		+						
Lygaeidae											
<i>Chilacis typhae</i>			Reedmace - in the flower heads							+	
<i>Drymus brunneus</i>	a plant bug		amongst litter or moss in damp or shaded places		+						
<i>Heterogaster urticae</i>			Nettles	+	+	+	+	+	+	+	+
<i>Kleidocerys resedae</i>			trees and shrubs generally	+	+			+			
<i>Scolopostethus affinis</i>			usually on nettles	+							
Miridae											
<i>Adelphocoris lineolatus</i>			leguminous plants	+							
<i>Blepharidopterus angulatus</i>			a wide range of broad-leaved trees		+						
<i>Capsus ater</i>			Grassland	+			+				
<i>Cylloceria hystrix</i>			associated with oak	+					+		
<i>Deraeocoris lutescens</i>			predatory amongst trees and bushes	+	+	+		+	+	+	

Group / species	English name if available	National status	Ecological associations	Where found (see text section 3)							
				1	2	3	4	5	6	7	8
<i>Deraeocoris ruber</i>			nettles, brambles as similar rough vegetation	+	+	+		+	+	+	
<i>Dicyphus epilobii</i>			<i>Epilobium hirsutum</i>		+						
<i>Dryophilocoris flavo-4-maculatus</i>			associated with oak	+			+				
<i>Harpocera thoracica</i>			Oaks -solitary and in woods	+			+				
<i>Heterotoma meriopterum</i>			edge habitats - especially in association with nettles	+							
<i>Leptoterna dolabrata</i>			found in a wide range of grassland habitats	+	+		+				+
<i>Liocoris tripustulatus</i>			stinging nettle	+	+		+				
<i>Megalocoleus molliculus</i>			a common plant bug associated with Yarrow	+							
<i>Miris striatus</i>			associated with oak	+				+			
<i>Notostira elongata</i>			grasslands								
<i>Orthotylus marginalis</i>			willow trees, occasionally alder and apple trees		+						
<i>Pantilus tunicatus</i>			alder and birch - on the catkins	+							
<i>Phylus melanocephalus</i>			restricted to oak trees					+			
<i>Phytocoris varipes</i>			dry, open grasslands are preferred. Partly vegetarian and partly a predator				+				
<i>Plagiognathus arbustorum</i>			polyphagous, but usually associated with stinging nettles	+							
<i>Stenodema laevigatum</i>			grasslands	+			+				+
<i>Stenotus binotatus</i>			grasslands	+			+				+
Nabidae											
<i>Himacerus apterus</i>	a damsel bug		a tree-dwelling species		+						
<i>Nabis ferus</i>			dry sites, especially ruderal grassland				+				
Pentatomidae											
<i>Aelia acuminata</i>			Thistles				+				
<i>Dolycoris baccarum</i>			polyphagous species of dry habitats				+				
<i>Eysarcoris fabricii</i>			probably polyphagous		+						
<i>Palomena prasina</i>			trees and shrubs	+	+			+	+	+	+
<i>Pentatoma rufipes</i>	The Forest Bug		tree-dwelling predator that often flies far from woodland	+	+						
<i>Troilus luridus</i>	a plant bug		a predator on broad leaved trees and occasionally on pines		+						
Tingidae											
<i>Physatocheila dumetorum</i>	a lacebug		hawthorn		+				+		+
<i>Tingis ampliata</i>			creeping thistle								+
<i>Tingis cardui</i>			spear thistle - <i>Cirsium vulgare</i>								+
HOMOPTERA: AUCHENORHYNCHA	FROGHOPPERS										

Group / species	English name if available	National status	Ecological associations	Where found (see text section 3)							
				1	2	3	4	5	6	7	8
Cercopidae											
<i>Aphrophora alni</i>	a froghopper		larvae feed under froth on a wide range of trees and shrubs		+						
<i>Neophilaenus campestris</i>			dry, open grassland				+				+
<i>Philaenus spumarius</i>	spittle-bug/Cuckoo-spit bug		larvae feed under froth on a wide range of herbaceous plants	+	+	+	+	+	+	+	+
Cicadellidae											
<i>Cicadella viridis</i>			grasses and rushes in marshy places							+	
<i>Iassus lanio</i>			usually on oak, occasionally on other trees	+							
<i>Oncopsis tristis</i>			birch trees	+							
Cixiidae											
<i>Tachycixius pilosus</i>			grasses		+		+				
Delphacidae											
<i>Stenocranus minutus</i>			grasses in a range of habitats							+	
Issidae											
<i>Issus coleoptratus</i>			various tree species		+						
Ledridae											
<i>Ledra aurita</i>	Hippopotamus froghopper	Local	Oak trees					+			
HOMOPTERA: STENORHYNCHA	HOPPERS AND APHIDS										
Aphididae											
<i>Dysaphis crataegi</i> agg.			forms galls on hawthorn	+	+				+		
HYMENOPTERA: ACULEATA	BEEES, WASPS AND ANTS										
Apidae											
<i>Andrena bicolor</i>			open woodland and grassland - nests in the ground								+
<i>Andrena flavipes</i>	a solitary bee	Local	nests colonially, usually tunnelling into in a vertical face, in dry sandy sites								+
<i>Bombus lapidarius</i>	red-tailed bumble bee		ubiquitous	+	+	+	+	+	+	+	+
<i>Bombus lucorum</i>	white-tailed bumble bee		ubiquitous	+	+	+	+	+	+	+	+
<i>Bombus pascuorum</i>	common carder bee		ubiquitous	+	+	+	+	+	+	+	+
<i>Bombus pratorum</i>	a bumble bee		ubiquitous		+						
<i>Bombus terrestris</i>	buff-tailed bumble bee		ubiquitous	+	+	+	+	+	+	+	+
<i>Halictus rubicundus</i>			ground nesting solitary bee		+						
<i>Halictus tumulorum</i>			ground-nesting solitary bee in a range of habitats		+						

Group / species	English name if available	National status	Ecological associations	Where found (see text section 3)							
				1	2	3	4	5	6	7	8
<i>Hylaeus annularis</i>	a yellow-faced bee	Local	nests in hollow plant stems, such as docks, etc		+						
<i>Lasioglossum leucopus</i>		Local	excavates nest burrow in level ground - preferring ruderal sites		+		+				+
<i>Lasioglossum morio</i>			excavates nest burrows in level ground	+	+						
<i>Lasioglossum smeathmanellum</i>			excavates nest burrows in level ground		+						+
<i>Osmia rufa</i>			a red mason bee - nests in holes in trees or hard vertical cliffs	+							
Chrysididae											
<i>Chrysis ignita</i>	Ruby-tailed wasp		cleptoparasitic on eumenid wasps, especially <i>Ancistrocerus</i> species		+						
Eumenidae											
<i>Ancistrocerus trifasciatus</i>			nests in dead plant stems	+							
Formicidae											
<i>Lasius niger s. str.</i>	common black ant.		generalist species	+	+		+				+
<i>Myrmica rubra</i>	a red ant		ubiquitous	+	+						+
Sphecidae											
<i>Trypoxylon attenuatum</i>			preys on spiders. Nests in plant stems, beetle tunnel or other cavities		+						
Vespidae											
<i>Vespula germanica</i>	a common social wasp		ubiquitous		+						+
<i>Vespula vulgaris</i>	a common social wasp		ubiquitous							+	+
HYMENOPTERA: PARASITICA	GALL WASPS										
Cynipidae											
<i>Andricus curvator</i>			forms a gall on an oak leaf	+					+		
<i>Andricus kollari</i>			forms the oak marble gall	+					+		
<i>Andricus ostreus</i>			forms a gall on an oak leaf	+					+		
<i>Biorhiza pallida</i>			forms the oak apple gall	+					+		
<i>Cynips divisa</i>			forms a gall on oak	+					+		
<i>Neuroterus numismalis</i>			forms the button spangle gall on oak leaves						+		
<i>Neuroterus quercusbaccarum</i>			forms the hairy spangle gall on oak leaves	+					+		
<i>Neuroterus tricolor</i>			causes galls on oak leaves						+		
HYMENOPTERA: SYMPHYTA	SAWFLIES										
Argidae											
<i>Arge ochropus</i>			larvae feed on wild rose						+		

Group / species	English name if available	National status	Ecological associations	Where found (see text section 3)							
				1	2	3	4	5	6	7	8
<i>Arge ustulata</i>			sallow, birch and hawthorn are all recorded as foodplants		+						
Cephidae											
<i>Calameuta pallipes</i>			a grassland sawfly	+							
<i>Cephus cultratus</i>			larvae mine the stems of grasses				+				
<i>Cephus pygmaeus</i>			larvae mine the stems of grasses	+			+				
Tenthredinidae											
<i>Aglaostigma aucupariae</i>			larvae feed on bedstraws								
<i>Athalia cordata</i>			ubiquitous sawfly species	+							
<i>Athalia liberta</i>			ubiquitous sawfly species		+						
<i>Dolerus niger</i>			ubiquitous sawfly species		+						
<i>Nematus ribesii</i>			ubiquitous sawfly species		+						
<i>Pontania bridgmannii</i>			larva causes galls on willow leaves		+						
<i>Profenusa pygmaea</i>			larva mines the leaves of oak trees		+				+		
<i>Tenthredo livida</i>			ubiquitous sawfly species		+						
LEPIDOPTERA:	BUTTERFLIES										
Hesperiidae											
<i>Thymelicus sylvestris</i>	Small skipper		grassland	+							
Lycaenidae											
<i>Celastrina argiolus</i>	Holly blue		both holly and ivy are required - as there are two generations per year		+						
<i>Polyommatus icarus</i>	Common blue		various legumes, especially Bird's-foot Trefoil	+							
<i>Quercusia quercus</i>	Purple Hairstreak		oak trees - including isolated examples	+							
<i>Satyrus w-album</i>	White-letter Hairstreak		Elm – feeding on suckers as well as mature trees								+
Nymphalidae											
<i>Aglais urticae</i>	Small tortoiseshell		larvae feed on Stinging Nettle								+
<i>Coenonympha pamphilus</i>	Small Heath	BAP	grassland	+							
<i>Cynthia cardui</i>	Painted lady		immigrant species	+							+
<i>Inachis io</i>	Peacock		nettles		+						
<i>Maniola jurtina</i>	Meadow brown		grassland species		+		+				
<i>Pararge aegeria</i>	Speckled wood		grasses in light woodland or scrub		+						
<i>Polygonia c-album</i>	Comma		nettles	+							
Pieridae											
<i>Pieris napi</i>	Green-veined white		ubiquitous	+							
<i>Pieris rapae</i>	Small white		ubiquitous	+							

Group / species	English name if available	National status	Ecological associations	Where found (see text section 3)							
				1	2	3	4	5	6	7	8
LEPIDOPTERA:	MOTHS										
Agonoxenidae											
<i>Blastodacna hellerella</i>			hawthorn - in the berries						+		
Arctiidae											
<i>Eilema complana</i>	Scarce Footman		lichens - especially on trunks, fences etc		+						
<i>Tyria jacobaeae</i>	Cinnabar	BAP(R)	Ragwort	+							
Bucculatricidae											
<i>Bucculatrix ulmella</i>			oak	+							
Choreutidae											
<i>Anthophila fabriciana</i>	Nettle-tap		nettles		+						
Coleophoridae											
<i>Coleophora flavipennella</i>			oak	+							
<i>Coleophora lutipennella</i>			oak	+							
Drepanidae											
<i>Cilix glaucata</i>	Chinese Character		blackthorn, hawthorn and other rosaceous bushes		+						
Gelechiidae											
<i>Teleiodes luculella</i>			oak	+							
Geometridae											
<i>Biston betularia</i>	Peppered Moth		deciduous trees and herbaceous plants		+						
<i>Cabera exanthemata</i>	Common Wave		Salix species and aspen		+						
<i>Colostygia pectinataria</i>	Green Carpet		bedstraws	+	+			+	+	+	
<i>Cosmorhoe ocellata</i>	Purple Bar		bedstraws	+							
<i>Crocallis elinguaris</i>	Scalloped Oak		deciduous trees		+						
<i>Ecliptopera silaceata</i>	Small Phoenix	BAP(R)	willow herbs, enchanter's nightshade		+						
<i>Epirrhoe alternata</i>	Common Carpet		bedstraws	+	+			+	+	+	
<i>Eupithecia centaureata</i>	Lime-speck Pug		various flowers	+	+			+	+	+	
<i>Eupithecia subumbrata</i>	Shaded Pug	NS(Nb)	herbaceous plants				+				
<i>Eupithecia vulgata</i>	Common Pug		herbaceous plants	+	+				+		
<i>Hydriomena furcata</i>	July Highflier		Salix species	+	+			+	+	+	
<i>Idaea aversata</i>	Riband wave		herbaceous plants - especially bedstraws	+	+			+	+	+	
<i>Idaea biselata</i>	Small Fan-footed Wave		dandelion, plantain, Polygonum etc		+						
<i>Lomaspilis marginata</i>	Clouded Border		sallow, willow, poplar - rarely hazel		+						
<i>Opisthograptis luteolata</i>	Brimstone Moth		deciduous trees		+						
<i>Peribatodes rhomboidaria</i>	Willow Beauty		deciduous trees	+	+					+	

Group / species	English name if available	National status	Ecological associations	Where found (see text section 3)							
				1	2	3	4	5	6	7	8
<i>Xanthorhoe montanata</i>	Silver-ground Carpet		herbaceous plants - especially bedstraws	+	+						
<i>Xanthorhoe spadicearia</i>	Red Twin-spot Carpet		herbaceous plants - especially bedstraws	+							
Gracillariidae											
<i>Acrocercops brongniardella</i>			mines leaves of oak	+					+		
<i>Aspilapteryx tringipennella</i>			Ribwort plantain		+						
<i>Caloptilia robustella</i>			oak	+	+						
<i>Caloptilia stigmatella</i>			sallow and poplar		+						
<i>Caloptilia syringella</i>			caterpillar mines leaves of ash, hawthorn or lilac		+	+		+	+	+	
<i>Cameraria ohridella</i>			larva mines the leaves of Horse Chestnut - a recent colonist in Britain, from Europe								+
<i>Parornix anglicella</i>			mines leaves of hawthorn	+	+			+	+		
<i>Parornix finitimella</i>			Blackthorn	+							
<i>Phyllonorycter acerifoliella</i>	= sylvella		mines leaves of field maple		+				+		
<i>Phyllonorycter blancardella</i>			mines leaves of apple	+							
<i>Phyllonorycter cerasicolella</i>			mines leaves of cherry		+						
<i>Phyllonorycter corylifoliella</i>			mines leaves of hawthorn and other rosaceous shrubs, rarely on birch	+	+				+		+
<i>Phyllonorycter geniculella</i>			mines leaves of sycamore	+							+
<i>Phyllonorycter harrisella</i>			mines leaves of oak	+					+		+
<i>Phyllonorycter maestingella</i>			mines leaves of beech						+		
<i>Phyllonorycter messaniella</i>			mines leaves of oak, beech, hornbeam and sweet chestnut	+					+		
<i>Phyllonorycter oxyacanthae</i>			mines leaves of hawthorn and other rosaceous shrubs		+				+		
<i>Phyllonorycter platanoidella</i>		NS(Nb)	mines leaves of Norway Maple	+							
<i>Phyllonorycter quercifoliella</i>			mines leaves of oak	+					+		
<i>Phyllonorycter salicicolella</i>			mines leaves of willows		+						
<i>Phyllonorycter spinicolella</i>			mines leaves of blackthorn	+							
<i>Phyllonorycter trifasciella</i>			mines leaves of honeysuckle and snowberry		+						
<i>Phyllonorycter tristrigella</i>			mines leaves of elm			+		+	+		
<i>Phyllonorycter ulmifoliella</i>			mines leaves of birch	+							
Hepialidae											
<i>Hepialus humuli</i>	Ghost Moth	BAP(R)	roots of grasses and herbaceous plants	+							
Lyonetiidae											
<i>Lyonetia clerkella</i>			mines leaves of rosaceous bushes and trees, birch etc	+	+						
Momphidae											

Group / species	English name if available	National status	Ecological associations	Where found (see text section 3)							
				1	2	3	4	5	6	7	8
<i>Mompha ochraceella</i>			willow-herbs, mining the leaves		+						
<i>Mompha raschkiella</i>			Rosebay Willow-herb - mining the leaves		+						
Nepticulidae											
<i>Ectoedemia atricollis</i>			rosaceous trees, especially hawthorn, mining the leaves	+	+				+		+
<i>Ectoedemia subbimaculella</i>			larva mines leaves of oak						+		
<i>Stigmella anomalella</i>			mines leaves of rose						+		
<i>Stigmella atricapitella</i>			mines leaves of oak	+					+		
<i>Stigmella aurella</i> agg.			mines leaves of bramble	+	+	+		+	+	+	+
<i>Stigmella basiguttella</i>			mines leaves of oak	+							
<i>Stigmella crataegella</i>			mines leaves of hawthorn	+	+						+
<i>Stigmella hybnerella</i>			mines leaves of hawthorn	+					+		+
<i>Stigmella oxyacanthella</i>			mines leaves of hawthorn	+	+				+		+
<i>Stigmella plagicolella</i>			mines leaves of blackthorn	+							
<i>Stigmella roborella</i>			mines leaves of oak						+		
<i>Stigmella ruficapitella</i>			mines leaves of oak and perhaps Sweet Chestnut	+					+		
<i>Stigmella salicis</i>			mines leaves of willow and willow		+						
<i>Stigmella samiatella</i>		pRDB3	mines leaves of Sweet Chestnut	+							
<i>Stigmella speciosa</i>			mines leaves of sycamore	+							
<i>Stigmella tityrella</i>			mines leaves of beech						+		
Noctuidae											
<i>Abrostola tripartita</i>	Spectacle		nettles	+	+					+	
<i>Acronicta aceris</i>	Sycamore		Horse Chestnut, Sycamore and other deciduous trees	+							
<i>Agrochola lychnidis</i>	Beaded Chestnut	BAP(R)	deciduous trees and shrubs and herbaceous plants (requires both)	+	+						
<i>Agrotis exclamationis</i>	Heart and Dart		herbaceous plants	+	+			+	+	+	
<i>Agrotis puta</i>	Shuttle-shaped Dart		herbaceous plants	+	+			+			
<i>Allophyes oxyacanthae</i>	Green Brindled Crescent	BAP(R)	rosaceous trees and shrubs		+						
<i>Amphipyra pyramidea</i>	Copper Underwing		deciduous trees and bushes		+						
<i>Apamea lithoxyla</i>	Light Arches		grasses	+							
<i>Apamea monoglyph</i>	Dark Arches		grasses	+	+			+	+	+	
<i>Atethmia centrigo</i>	Centre-barred Sallow	BAP(R)	ash - buds then flowers	+	+			+	+	+	
<i>Autographa gamma</i>	Silver Y		nettles and other herbaceous plants - rarely surviving winter. Immigrants from Europe are regular	+							+
<i>Axylia putris</i>	Flame		herbaceous plants	+							

Group / species	English name if available	National status	Ecological associations	Where found (see text section 3)							
				1	2	3	4	5	6	7	8
<i>Cosmia pyralina</i>	Lunar-spotted Pinion		deciduous trees and bushes			+					
<i>Cosmia trapezina</i>	Dun-bar		deciduous trees	+	+			+			
<i>Diachrysia chrysitis</i>	Burnished Brass		nettles and other herbaceous plants	+	+						
<i>Discestra trifolii</i>	Nutmeg		Atriplex and Chenopodium	+							
<i>Gortyna flavago</i>	Frosted Orange		in the stems of thistle, burdock and similar plants	+							
<i>Hoplodrina alsines</i>	Uncertain		herbaceous plants	+	+			+	+	+	
<i>Hoplodrina ambigua</i>	Vines Rustic		herbaceous plants - especially dandelions	+	+			+	+	+	
<i>Hydraecia micacea</i>	Rosy Rustic	BAP(R)	herbaceous plants, especially docks, feeding in the rootstock	+							
<i>Hypena proboscidalis</i>	Snout		nettles	+							+
<i>Lacanobia oleracea</i>	Bright-line Brown-eye		herbaceous plants					+			
<i>Melanchra persicariae</i>	Dot Moth	BAP(R)	herbaceous plants	+							
<i>Mesapamea didyma</i>	Lesser Common Rustic		grasses						+	+	
<i>Mesapamea secalis</i>	Common Rustic		grasses	+	+				+		
<i>Mesoligia furuncula</i>	Cloaked Minor		grasses	+							
<i>Mythimna impura</i>	Smoky Wainscot		grasses	+							+
<i>Mythimna pallens</i>	Common Wainscot		grasses	+							
<i>Noctua comes</i>	Lesser Yellow Underwing		herbaceous plants	+	+			+	+	+	
<i>Noctua janthe</i>	Lesser Broad-bordered Yellow U		herbaceous plants	+	+			+	+	+	
<i>Noctua pronuba</i>	Large Yellow Underwing		herbaceous plants	+	+			+	+	+	
<i>Nycteola revayana</i>	Oak Nycteoline		oak leaves	+							
<i>Ochropleura plecta</i>	Flame Shoulder		herbaceous plants		+				+		
<i>Oligia latruncula</i>	Tawny Marbled Minor		grasses	+	+						
<i>Omphaloscelis lunosa</i>	Lunar Underwing		grasses	+							
<i>Phlogophora meticulosa</i>	Angle Shades		herbaceous plants	+							
<i>Rivula sericealis</i>	Straw Dot		grasses - especially Brachypodium species	+	+					+	
<i>Xanthia icteritia</i>	Sallow	BAP(R)	sallow/willow catkins - then on herbaceous plants		+						
<i>Xanthia togata</i>	Pink-barred Sallow		catkins of willow and poplar - then on herbaceous plants		+						
<i>Xestia c-nigrum</i>	Setaceous Hebrew Character		herbaceous plants	+	+			+	+	+	
<i>Xestia triangulum</i>	Double Square-spot		deciduous trees and shrubs		+						
Nolidae											
<i>Nola cucullatella</i>	Short-cloaked Moth		blackthorn and hawthorn					+			
Notodontidae											

Group / species	English name if available	National status	Ecological associations	Where found (see text section 3)							
				1	2	3	4	5	6	7	8
<i>Notodonta ziczac</i>	Pebble Prominent		poplars and willows/sallows		+						
<i>Phalera bucephala</i>	Buff-tip		deciduous trees		+						
<i>Ptilodon capucina</i>	Coxcomb Prominent		deciduous trees		+						
Oecophoridae											
<i>Agonopterix heracliana</i>			umbellifers, especially cow parsley, hogweed and Angelica	+							
<i>Batia unitella</i>			under loose dead bark, feeding on fungi	+				+			
<i>Carcina quercana</i>	The Flat Cooper		deciduous trees and bushes		+						
Pyralidae											
<i>Acentria ephemerella</i>			submerged aquatic plants							+	
<i>Agriphila straminella</i>			grasses	+	+			+	+	+	
<i>Agriphila tristella</i>			grasses	+	+			+	+	+	
<i>Catoptria pinella</i>			grasses	+	+			+	+	+	
<i>Chrysoteuchia culmella</i>			grasses	+	+			+	+	+	
<i>Conobathra repandana</i>			oak - usually feeding high in the canopy		+						
<i>Crambus perlella</i>			grasses	+							
<i>Endotricha flammealis</i>			trees and herbaceous plants - then on leaf litter					+	+		
<i>Eudonia mercurella</i>			mosses on trunks, walls etc		+						
<i>Eurrhynx hortulata</i>			nettles		+						
<i>Phlyctaenia coronata</i>			elder, Viburnum, lilac, privet		+						
<i>Phycita roborella</i>			oak					+			
<i>Pleuroptera ruralis</i>			nettles	+	+					+	
<i>Scoparia ambigua</i>			thought to feed amongst mosses	+							
Sphingidae											
<i>Deilephila elpenor</i>	Elephant Hawk-moth		rosebay willow-herb		+						
<i>Laotloe populi</i>	Poplar Hawk-moth		poplars and willows/sallows	+	+						
Tischeriidae											
<i>Tischeria ekebladella</i>			mines leaves of oak	+					+		
Tortricidae											
<i>Acleris ferrugana</i>			oak						+		
<i>Acleris forsskalleana</i>			maple, sycamore		+				+		
<i>Agapeta hamana</i>			thistles - in the roots	+			+				
<i>Aleimma loeflingiana</i>			oak, occasionally hornbeam and maple/sycamore		+						
<i>Apotomis betuleta</i>			birch	+							
<i>Cydia pomonella</i>			fruits of rosaceous trees, especially apple	+							

Group / species	English name if available	National status	Ecological associations	Where found (see text section 3)							
				1	2	3	4	5	6	7	8
<i>Cydia splendana</i>			oak		+						
<i>Endothenia gentianaeana</i>			teasels - in the seed heads	+							
<i>Epiblema scutulana</i>			thistles - in the root and lower stem								+
<i>Epiblema uddmanniana</i>			Rubus spp., mainly brambles	+	+			+	+	+	+
<i>Epiphyas postvittana</i>			deciduous trees	+	+			+	+	+	
<i>Eucosma cana</i>			thistles and <i>Centaurea nigra</i> - in the flower head	+							
<i>Eudemis profundana</i>			oak	+							
<i>Hedya salicella</i>			<i>Salix alba</i> and other <i>Salix</i> species		+						
<i>Pandemis corylana</i>			deciduous trees and shrubs	+	+			+	+	+	
<i>Pandemis heparana</i>			deciduous trees and shrubs	+	+			+	+	+	
<i>Pseudargyrotoza conwagana</i>			ash and privet in the fruits and seeds	+	+			+	+	+	
<i>Rhopobota naevana</i>			trees and shrubs - especially ivy and blackthorn		+					+	
<i>Spilonota ocellana</i>			trees, shrubs and herbaceous plants	+	+			+	+		
<i>Tortrix viridana</i>	Green Oak Tortrix		oak	+					+		
<i>Zeiraphera isertana</i>			oak						+		
Yponomeutidae											
<i>Acrolepia autumnitella</i>			woody nightshade (bittersweet) and deadly nightshade		+						
<i>Argyresthia bonnetella</i>			caterpillar feeds in the shoots of hawthorn						+		
<i>Argyresthia brockeella</i>			birch and alder	+							
<i>Argyresthia goedartella</i>			birch and alder	+							
<i>Plutella xylostella</i>			primary immigrant from overseas; temporary resident on Cruciferae	+	+	+	+	+	+	+	+
<i>Prays fraxinella</i>			feeds in buds, shoots and leaves of ash trees	+	+	+		+	+	+	+
<i>Scythropia crataegella</i>			hawthorn - sometimes blackthorn						+		
<i>Swammerdamia caesiella</i>			birch	+							
<i>Swammerdamia pyrella</i>			hawthorn, apple and pear are recorded		+						
<i>Ypsolopha parenthesella</i>			oak, hornbeam, birch, hazel and other trees						+		
<i>Ypsolopha scabrella</i>			apple and hawthorn	+							
<i>Ypsolopha sequella</i>			maple and sycamore		+						
MECOPTERA	SCORPIONFLIES										
Panorpidae											
<i>Panorpa germanica</i>			edge habitats		+		+				+
MYRIAPODA: CHILOPODA	CENTIPEDES										
Cryptopidae											

Group / species	English name if available	National status	Ecological associations	Where found (see text section 3)							
				1	2	3	4	5	6	7	8
<i>Cryptops hortensis</i>			amongst litter - often synanthropic	+							
Lithobiidae											
<i>Lithobius forficatus</i>			many habitats	+							
<i>Lithobius microps</i>			detritivorous	+							
MYRIAPODA: DIPLOPODA	MILLIPEDES										
Julidae											
<i>Tachypodoiulus niger</i>	a snake millipede		many habitats and often found climbing trees		+						
NEUROPTERA	LACEWINGS										
Chrysopidae	Green lacewings										
<i>Chrysopa perla</i>			aphid predator amongst herbage	+	+		+				+
<i>Chrysoperla carnea s.str.</i>			aphid predator of trees and bushes	+	+	+	+	+	+	+	+
<i>Cunctochrysa albolineata</i>			predatory on aphids in tree foliage		+					+	
<i>Nineta flava</i>			thought to be associated with oak, feeding on aphids on the leaves						+		
Coniopterygidae	Wax flies										
<i>Conwentzia psociformis</i>			arboreal on deciduous trees		+						
Hemerobiidae	brown lacewings										
<i>Hemerobius humulinus</i>			trees and bushes, hedges, etc		+						
<i>Hemerobius lutescens</i>			trees and bushes, hedges, etc	+	+						
<i>Hemerobius micans</i>			oak		+				+		
<i>Micromus paganus</i>			ubiquitous, but usually in association with wood or scrub		+						+
<i>Wesmaelius subnebulosus</i>			larvae are aphid predators on trees and bushes		+	+					+
ORTHOPTERA											
Acrididae											
<i>Chorthippus brunneus</i>	Field grasshopper		grassland	+			+				
Tettigoniidae											
<i>Leptophyes punctatissima</i>	Speckled Bush-cricket		rough herbage and scrub		+						
<i>Meconema thalassinum</i>	Oak Bush-cricket		oak trees, especially when at the woodland edge		+						
<i>Metrioptera roeselii</i>	Roesel's Bush-cricket	NS(Nb)	long grassland		+		+				
<i>Pholidoptera griseoaptera</i>	Dark Bush-cricket		scrub and edge habitats		+						
PSOCOPTERA	BARK LICE										
Ectopsocidae											
<i>Ectopsocus petersi</i>			associated with trees and bushes		+						
Stenopsocidae											

Group / species	English name if available	National status	Ecological associations	Where found (see text section 3)							
				1	2	3	4	5	6	7	8
<i>Graphopsocus cruciatus</i>			associated with broad-leaved trees		+						