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**HEDGEROW SURVEY, GREAT CRESTED NEWT SURVEY, DORMOUSE SURVEY AND HORSESHOE BAT ACTIVITY SURVEYS AT UNIVERSITY OF BATH, CLAVERTON DOWN, BATH**

**CLIENT: BATH UNIVERSITY**

**OUR REF: UNIBAT-UNIBAT-1624**

Issue	Date of Issue	Written By	Reviewed + Approved By
One	22 December 2008	MAW	HM



UNIBAT-UNIBAT-1624

**HEDGEROW SURVEY, GREAT CRESTED NEWT SURVEY, DORMOUSE SURVEY AND HORSESHOE BAT ACTIVITY SURVEYS AT UNIVERSITY OF BATH, CLAVERTON DOWN, BATH****EXECUTIVE SUMMARY**

In May 2008, ecosulis ltd was commissioned to undertake a hedgerow survey, a great crested newt survey, a dormouse survey and horseshoe bat activity surveys at Bath University, Claverton Down, Bath. These surveys follow recommendations from an extended Phase I habitat survey carried out in January 2008. The objective of these studies was to provide an ecological assessment of the site and highlight any potential constraints and opportunities that should be considered when preparing a masterplan for the site.

The site is situated to the east of Bath, and is centred on Ordnance Survey grid reference ST 772 645. The site, which covers an area of approximately 35.6ha, consists of amenity grassland (lawns and sports pitches), deciduous and coniferous woodland, hedgerows, water bodies and buildings and hardstanding. The site is currently used as a university campus. Members of staff of ecosulis ltd visited the site between May and November 2008 to undertake the surveys. Access was gained with the permission of the landowner.

The surveys were undertaken following current guidelines. Four hedgerows were identified as being classed as ecologically important under the Hedgerow Regulations (1997). No great crested newts or dormice were found during the surveys. The site is used by low numbers of lesser horseshoe bats for foraging and commuting. A possible roost is present within a quarry on site.

Recommendations relating to the findings in this report are listed below. Reference should be made to the Phase I habitat survey (report reference E1604UOB2UOB) for recommendations relating to ecological opportunities for the site.

- Retention of the ecologically important hedgerows on site, which also act as important wildlife corridors for local wildlife including lesser horseshoe bats and keeping a 5m buffer between hedgerows and development works
- Enhancements to the ponds on site to benefit amphibians

- Incorporation of Sustainable Drainage Systems in consultation with an ecologist to protect existing water bodies and also provide additional opportunities for wildlife
- Due to the good connectivity to good quality habitats, and the presence of dormice in the area, it is recommended that a precautionary approach is undertaken should any works affect the hedgerows
- Lighting should be directed away from hedgerows and woodlands
- Should works affect the North Road Quarry, further bat surveys should be undertaken due to the possible presence of a lesser horseshoe bat roost

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## **HEDGEROW SURVEY, GREAT CRESTED NEWT SURVEY, DORMOUSE SURVEY AND HORSESHOE BAT ACTIVITY SURVEYS AT UNIVERSITY OF BATH, CLAVERTON DOWN, BATH**

### **Introduction**

1. In May 2008, *ecosulis* ltd was commissioned to undertake a hedgerow survey, a great crested newt survey, a dormouse survey and horseshoe bat activity surveys at Bath University, Claverton Down, Bath. These surveys follow recommendations from an extended Phase 1 habitat survey carried out in January 2008 (report reference: E1604UOB2UOB).
2. The objective of this study was to provide a further ecological assessment of the site and highlight any potential constraints and opportunities to future development proposals, which will inform the proposed masterplan for the site.
3. Members of staff of *ecosulis* ltd visited the site between May and November 2008 to undertake the surveys. Access was gained with the permission of the landowner.
4. Following the evaluation of the site, habitats and species of conservation importance are highlighted and any potential constraints/opportunities to development are noted.
5. Recommendations have been provided, which aim to inform the development of the future masterplan for the site so that important ecological features can be retained, protected and enhanced. Such recommendations should be reviewed and expanded upon throughout the design stages.

### **NOMENCLATURE**

6. The common name only of flora and fauna species is given in the main text of this report; however, Latin names are used for species where no common name is available. A full species list with Latin names is listed in Appendix I. All plant names follow the nomenclature of Stace (1997).

### **GENERAL DESCRIPTION**

7. The site is situated to the east of Bath, and is centred on Ordnance Survey grid reference ST 772 645. The site, which covers an area of approximately 35.6ha, consists of amenity grassland (lawns and sports pitches), deciduous and coniferous woodland, hedgerows, water bodies and buildings and hardstanding. The site forms part of the main campus of the University of Bath.

8. To the north of the site are further university buildings, woodland and grassland areas, with Bathampton Down Golf Course beyond. Immediately to the east of the site is Bushey Norwood, an area of semi-improved grassland owned by the National Trust. Beyond this immediate boundary is a large area of woodland. To the south of the site is North Road, beyond which are residential properties and gardens. To the west of the site is Bathampton Down, an area of calcareous grassland situated on a hillside, with areas of woodland.

## **METHODOLOGIES**

### **Desk Study**

#### Habitats

9. Consultation was undertaken with Bath and North East Somerset Council to establish whether the hedgerows surveyed on site are historically important according to the Hedgerow Regulations 1997 and adjacent to any definitive right of way.

#### Species

10. The results of the former data search, which was undertaken alongside the Phase I habitat survey, were reviewed specifically for records within 2km of the site relating to great crested newts and dormice and 4km of the site relating to horseshoe bats. The data search undertaken alongside the Phase I habitat survey, comprised consultation with Bristol Region Environmental Records Centre (BRERC) and an online search of the NBN Gateway records.

### **Field Surveys**

#### Hedgerow Survey

11. Hedgerows were surveyed to determine if they are classed as having ecological importance under The Hedgerow Regulations 1997 or if they are species-rich as defined by the UK Biodiversity Action Plan (BAP).
12. Five hedgerows on site were surveyed following recommendations within the extended Phase I habitat survey report (report reference E1604UOB2UOB). All three hedgerows are over 20m in length and fulfilled the criteria to be classified as true hedgerows under the Hedgerow Regulations 1997 and were therefore surveyed. Each hedgerow was systematically walked and notes were taken of the presence of any associated features including ditches, walls, banks and adjoining ponds, hedgerows and woodland. The average number of woody species within 30m lengths (within each 100m section of hedgerow) was also noted along with

ground flora species and the cumulative length of gaps within each hedgerow. In addition the number of standard trees was also noted.

13. The hedgerow survey was carried out by Hannah Gibbons, an experienced ecologist of ecosulis ltd on 22 July 2008, according to Hedgerow Survey Handbook, Second Edition (Defra, 2007).

#### Great Crested Newt Survey

##### *Habitat Suitability Index*

14. A Habitat Suitability Index (HSI) assessment was carried out on 21 May 2008 and followed the recommended guidelines outlined in Oldham *et al.* (2000). The current status of each of the five ponds on site ponds was assessed (refer to Figure 2 for locations), including water level, vegetative cover and open surface area.

##### *Netting*

15. A long-handled dip net was used to sample the water bodies around the perimeter at night, taking samples at regular intervals and checking for the presence of newts or larvae. Any newts found were identified to species, gender and life-stage, counted and recorded before being released.

##### *Torch Searches*

16. A search of the water bodies was conducted by torch light at night. All accessible stretches of the banks of the ditches and the pond were walked slowly. Approximately 2m sections of the water bodies were surveyed at any one time using a high-powered torch (500,000 candlepower), which was shone into each water body concentrating on the fringes to check for great crested newts. When the surveyor was satisfied that all newts had been counted, or that all areas have been fully searched, the surveyor moved along to the next 2m section. Newts were identified to species and sex (where possible) and total counts made.

##### *Egg Searches*

17. On each visit to the site a check of submerged vegetation and other suitable substrate was made to look for folded vegetation and eggs. If an egg was discovered this was identified to species level and the egg search stopped.

##### *Timing*

18. All three survey methods were carried out during the optimum great crested newt emergence and migration to pond period, between March and June in line with published guidelines (English Nature, 2001). Four presence/absence surveys were undertaken, two of which were undertaken between mid-April and mid-May.

*Weather Conditions*

19. The surveys were carried out when the temperature was consistently above 5°C during dry weather.

*Personnel*

20. All surveys were led by Kate Hayward, Technical Director of ecosulis ltd, working under an All England great crested newt licence issued by Natural England (20080953).

Dormouse Survey

21. Approximately 100 dormouse nest-tubes were set out in May 2008 within specific hedgerows and woodlands on site, determined during previous surveys as providing potential habitat for dormouse (Figure 3 provides locations). The nest tubes were set up in suitable habitat at distances approximately (no less than) 20m from one another. The tubes were then visited monthly, for seven months, and inspected for signs of dormouse activity. A nut search was not undertaken due to the limited abundance of hazel on the site.
22. Monthly surveys were undertaken between June and November 2008 in accordance with the Dormouse Conservation Handbook (Bright, Morris and Mitchell-Jones, 2006). The tubes were set out and checked on most occasions by Joel Green of ecosulis ltd, holder of Natural England dormouse licence 20080905, assisted by Mike Williams, an experienced ecologist from ecosulis ltd.

Horseshoe Bat Evening Activity Surveys

23. Methodologies followed current best practice guidance including those outlined within the Bat Mitigation Guidelines (English Nature, 2004), the Bat Workers' Manual (JNCC, 2004) and Bat Surveys – Good Practice Guidelines (Bat Conservation Trust, 2007).
24. Due to the close proximity of Bath and Bradford-on-Avon Bats Special Area of Conservation (SAC), designated for its greater horseshoe and Bechstein's bat populations (and also supports a population of lesser horseshoe bats although this species was not a primary reason for selection of the SAC), a full horseshoe bat survey was undertaken to assess the extent of use of the site by this species for foraging and commuting. Two evening surveys were undertaken twice monthly between May and September 2007 (i.e. total of ten site visits), led by Mike Williams, an experienced ecologist from ecosulis ltd and holder of Natural England bat licence no: 20083253. The surveys commenced at sunset and continued for three hours, using frequency division bat detectors and MP3 recording devices. The recordings

were later analysed using dedicated computer software to identify bat species, foraging activity and flight corridors.

### **Assessment Methodology**

#### Hedgerow Desk Study and Survey

25. There are a number of factors that determine whether or not a hedgerow is deemed important under the Hedgerow Regulations 1997. Examples of such factors are the hedgerows function, its age, its historical interest and its ecological interest. Advice regarding the historical value of the hedgerow on site has been taken from the Council and has not been assessed by *ecosulis* Ltd.
26. Under the Hedgerow Regulations 1997 a hedgerow is deemed to have ecological or landscape value if:
- It contains protected species of birds, animals or plants, listed on Schedules 1, 5 or 8 of the Wildlife and Countryside Act 1981
  - It is referred to in a record held by a Biological Record Centre as having held a Schedule 1 or 5 species between March 1992 and March 1997 or a Schedule 8 between March 1987 and March 1997
  - It contains species that are listed as endangered, extinct, rare or vulnerable in Red Data Books for plants, insects, stoneworts and invertebrates other than insects. It contains birds categorised as declining breeders in 'Red Data Birds in Britain'
  - It runs along a public right of way and includes at least four woody species, on average, in a 30m length and has at least two associated features
  - The hedgerow includes at least five woody species on average in a 30m length, combined with a number of associated features, further woody species or has some named uncommon tree species within its length
27. Hedgerows with an average of five or more species within a 30m length are defined as species-rich under the UK BAP.
28. Survey data gained on site was used to determine the status of each hedgerow according to the ecological criteria of the Hedgerow Regulations Act (1997) and the UK BAP.

#### Great Crested Newt Survey

29. The final HSI score gained for each water body can be used to predict the suitability of the habitat to support great crested newt. The Great Crested Newt Habitat

Suitability Index Guidelines (produced by the Amphibian and Reptile Group (ARG) UK 2007) suggests that a HSI score of less than 0.5 indicates a pond of poor suitability for great crested newt, a score of between 0.5 and 0.59 indicates a pond of below average suitability, a score of between 0.6 and 0.69 indicates a pond of average suitability, a score of between 0.7 and 0.79 indicates a pond of good suitability and a score of above 0.8 indicates a pond of excellent suitability. The final HSI score should not be used to prove that great crested newts are absent from water bodies. An assessment of the results of the HSI Survey was undertaken using standard methodology (Oldham et al. 2000 and ARG UK 2007).

30. For any water bodies found to support great crested newts, the population size class is calculated using the methodology recommended by English Nature (2001). From the results of the survey, the peak adult count per pond obtained over the survey period (six visits) from either the bottle-trapping or the torch searches is used to calculate the population size class of great crested newt for each pond:

Absent	No great crested newts recorded
Small	For maximum adult counts up to 10
Medium	For maximum adult counts between 11 and 100
Large	For maximum adult counts over 100

#### Dormouse Survey

31. An assessment of the presence of dormouse is based on visual evidence at the time of the survey, and apparent suitability of habitats present within the survey area, following guidelines set out in the Dormouse Conservation Handbook (Bright, Morris and Mitchell-Jones, 2006). The assessment also considers the surrounding land and level of connectivity.

#### Evening Activity Surveys – Focusing on Horseshoe Bat Species

32. Assessment of the value of a site for bats is based on the following:
- The diversity of the species present
  - The occurrence of rarer species
  - Numbers of bats present/frequency of use
  - Range of habitat features which provide opportunities for bats e.g. foraging, commuting and roosting habitat

## RESULTS

### Hedgerow Survey

#### Desktop Study

33. Bath and North East Somerset Council responded with the following information regarding the historical importance of the hedgerows on site. The locations of the hedgerows are shown on Figure 1.
- Hedgerow 1a marks the boundary between the historic parishes of Bathampton and Monkton Combe, existing before 1850. The bounds of Bathampton appear in an Anglo-Saxon charter dated to 956 AD. There are also several archaeological sites close to this hedgerow, including a Bronze Age round barrow
  - Hedgerow 1b marks the boundary between the historic parishes of Bathampton and Monkton Combe, existing before 1850. The hedgerow forms part of Bathampton Camp, which is a Scheduled Ancient Monument, and Bathampton Down Iron Age and Romano-British field systems
  - Hedgerow 4 marks the boundary between the historic parishes of Claverton and Monkton Combe. The northern part of the hedgerow incorporates Bathampton Camp, which is a Scheduled Ancient Monument
34. The council Archaeological Officer has stated that due to the above, Hedgerows 1a, 1b and 4 are of historical importance.
35. Bath and North East Somerset Council also responded with information regarding any Public Rights of Way adjacent to the hedgerows. Hedgerows 1b and 4 are immediately adjacent to Public Rights of Way. Hedgerows 1a, 2 and 3 are all close to or crossed by Public Rights of Way but these do not run immediately adjacent to them for their whole length.

#### Hedgerow Survey

36. Five hedgerows were surveyed (Figure 1). Hedgerow 1 identified during the Phase 1 habitat survey, under the Hedgerow Regulations (1997), comprises of two hedgerows (Hedgerows 1a and 1b) due to the presence of an area of woodland adjacent to it (Figure 1). These hedgerows were surveyed separately during the survey. Of the five hedgerows surveyed four have ecological and landscape importance (Hedgerows 1a, 1b, 2 and 4) under the Hedgerow Regulations 1997. The same hedgerows are considered species-rich under the UK BAP. All hedgerows are shown on Figure 1 and are described in Table 1, below.

Table 1: Descriptions of Hedgerows Surveyed at the University of Bath

Hedgerow	Brief Description of Hedgerow	Additional Important Features	Status of Hedgerow
1a	<p>Approximately 170m in length with very few gaps and adjoining an area of woodland at its northern most point and another at its southern most point. A total of ten standard trees were recorded along the entire length. Eight woody species were recorded on average within a 30m length including hawthorn, dog-rose, hazel, ash, pedunculate oak, wild privet, field-rose and sycamore. Species within the ground flora include germander speedwell, ground-ivy, herb-Robert, agrimony, meadow vetchling, wood avens, male-fern, enchanter's-nightshade and lords-and-ladies.</p> <p>This hedgerow appears not to have been managed within the recent past and is succeeding into a line of mature trees.</p>	This hedgerow lies within 10m of two areas of woodland and a wall supports the hedgerow along its entire length	<b>Ecologically Important</b>  under the Hedgerow Regulations (1997) and UK BAP
1b	<p>Approximately 240m in length with very few gaps and adjoining an area of woodland at its eastern most point and another at its western most point. A total of 12 standard trees were recorded along the entire length. Six woody species were recorded on average within a 30m length including field-rose, hawthorn, sycamore, beech, ash, wild privet, an elm, hazel, yew and pedunculate oak. Species within the ground flora include germander speedwell, ground-ivy, herb-Robert, agrimony, meadow vetchling, upright hedge-parsley, male-fern, enchanter's-nightshade and lords-and-ladies.</p> <p>This hedgerow appears not to have been managed within the recent past and is succeeding into a line of mature trees.</p>	This hedgerow lies within 10m of two areas of woodland and a wall supports the hedgerow along its entire length.	<b>Ecologically Important</b>  under the Hedgerow Regulations (1997) and UK BAP
2	<p>Approximately 225m in length with very few gaps and adjoining an area of woodland at its southern most point. A total of 13 standard trees were recorded along the entire length. Eight woody species were recorded on average within a 30m length including elder, hawthorn, cherry, blackthorn, silver birch, dogwood, apple, hazel, spindle and field maple. Species within the ground flora include black bryony, bramble, creeping buttercup, herb-Robert, male-fern and enchanter's-nightshade.</p>	This hedgerow lies within 10m of an area of woodland	<b>Ecologically Important</b>  under the Hedgerow Regulations (1997) and UK BAP
3	A non-native planted hedgerow with a <i>Chamaecyparis</i>	N/A	<b>Not</b>

Hedgerow	Brief Description of Hedgerow	Additional Important Features	Status of Hedgerow
	species. This hedgerow is approximately 75m in length and marks the northern and western boundary of a tennis court. The ground beneath the hedgerow comprises bare earth.		<b>Ecologically Important</b>
4	<p>Approximately 620m in length with a few gaps. This hedgerow adjoins an area of woodland and another hedgerow at its northern most point. A total of 18 standard trees were recorded along the entire length. Eight woody species were recorded on average within a 30m length including beech pedunculate oak, ash, holly, sycamore, hazel, hawthorn, dog-rose, cherry, wild privet and field-rose. Species within the ground flora include wood avens, common bent, herb-Robert, male-fern, lords-and-ladies and enchanter's-nightshade.</p> <p>This hedgerow has recently been planted with young trees however the older sections of hedgerow appear not to have been managed within the recent past.</p>	This hedgerow lies within 10m of an area of woodland and a hedgerow	<b>Ecologically Important</b>  under the Hedgerow Regulations (1997) and UK BAP

## Great Crested Newt Survey

### Desktop Study

37. BRERC did not hold any records of Great Crested Newt within 2km of the site.
38. The NBN Gateway did not hold any records for great crested newts within 2km of the site.

### Great Crested Newt Survey

#### *Description of Water Bodies*

39. The HSI score is will be included within the final version of the report.
40. Five ponds are present within the site and were all surveyed for great crested newts. Figure 2 shows the location of these water bodies.
41. Pond 1 – HSI Score 0.45 (poor). A shallow pond approximately 1x1m and approximately 20cm deep, surrounded by stones and gravel and overgrown with rushes.
42. Pond 2 – HSI Score 0.51 (below average). A large lake lined with a plastic with a stony bottom, approximately 65m at its longest and approximately 90m at its widest and approximately 1.5m deep. The southernmost bank is concrete and the

remaining banks border on the grassland and some amenity planting of trees and shrubs such as alder and field maple. Marginal vegetation includes bulrush and soft-rush. This pond is stocked with large carp and several species of wildfowl were noted during a number of the visits.

43. Pond 3 – HSI Score 0.37 (poor). A concrete pond, with vertical concrete banks and some shading from nearby trees and buildings, approximately 10x15m and approximately 0.5m deep, stocked with fish and lacking in aquatic vegetation.
44. Pond 4 – HSI Score 0.35 (poor). A concrete pond, with vertical concrete banks and some shade from nearby trees and buildings, approximately 5x10m and approximately 0.5m deep, stocked with fish and lacking in aquatic vegetation.
45. Pond 5 – HSI Score 0.36 (poor). A concrete pond, with vertical concrete banks and some shade from nearby trees and buildings, approximately 10x12m and approximately 0.5m deep with a fountain, stocked with fish and lacking in aquatic vegetation.

#### *Netting*

46. The raw data for the netting survey is given in Table 2 below.

**Table 2: Great Crested Newt Bottle-trapping Survey Results, 2008**

<b>Netting</b>	Visit 1	Visit	Visit	Visit 4
Pond 1	0	0	0	0
Pond 2	0	0	0	0
Pond 3	0	0	0	0
Pond 4	0	0	0	0
Pond 5	0	0	0	0

47. Referring to Table 2 above, no great crested newts were recorded during the netting survey during the four visits undertaken.
48. No other amphibians were encountered during the netting surveys.

#### *Torch Searches*

49. The raw data for the torch searches is given in Table 3 below.

Table 3: Great Crested Newt Torch Searching Survey Results, 2008

<b>Torch Searches</b>	Visit 1	Visit	Visit	Visit 4
Pond 1	0	0	0	0
Pond 2	0	0	0	0
Pond 3	0	0	0	0
Pond 4	0	0	0	0
Pond 5	0	0	0	0

50. Referring to Table 3 above, no great crested newts were recorded during the torch searches on the four visits undertaken.

51. No other amphibians were encountered during the torchlight searches.

#### *Egg Searches*

52. No eggs of any newt or other amphibian species were found during any of the visits. Aquatic vegetation was limited or lacking within Ponds 3-5.

#### *Timing, Weather Conditions and Personnel*

53. Details on the timing of the survey and weather conditions are provided in Appendix II.

### **Dormouse Survey**

#### Desktop Study

54. BRERC did not hold any records of dormice within 2km of the site. The NBN Gateway has a record of dormouse approximately 3km to the north of the site.

#### Dormouse Survey

55. The dormouse survey focused on areas identified within the Phase I habitat survey as providing greatest opportunities for this species, namely the mature hedgerows and woodland. Figure 3 indicates the locations of the dormouse nest tubes. No dormouse or evidence of dormouse was recorded during the surveys.

## Bat Activity Survey

### Desktop Study

56. BRERC provided the following information regarding horseshoe bats within a 4km radius of the site:

Table 4: A Summary of Bat Records Provided by BRERC

Species	Number of records	Nearest record
Greater horseshoe bat	219	1km N of site
Lesser horseshoe bat	85	0.5km N of site

### *Web-based Search*

57. The NBN Gateway has the following records for bats within 10km grid square that the site falls within: Greater horseshoe bat, lesser horseshoe bat, Daubenton's bat, Natterer's bat, common pipistrelle and whiskered bat have been recorded within 1km of the site. Brandt's bat and brown long-eared have been recorded within 2km of the site.

### Horseshoe Bat Evening Activity Surveys

58. Table 5 below summarises the results from the horseshoe bat surveys, which incorporated the whole survey area. Figure 4 shows the transect that was walked during the survey and the location of the recordings. Details of the times of the surveys, and weather conditions are found in Appendix II.

Table 5. Results of Horseshoe Bat Evening Activity Survey 2008

DATE	LOCATION	TIME	SPECIES	NUMBER	BEHAVIOUR
29/5/08	2	21:42	Lesser horseshoe	1	Foraging
	2	21:45	Lesser horseshoe	1	Foraging
	2	21:48	Lesser horseshoe	1	Foraging
30/5/08	6	22:10	Lesser horseshoe	1	Brief pass
18/6/08	-	-	-	-	-
23/6/08	2	22:00	Lesser horseshoe	1	Brief pass
7/7/08	-	-	-	-	-
21/7/08	-	-	-	-	-

11/8/08	4a	21:15	Lesser horseshoe	1	Commuting south along fence line
	4	21:27	Lesser horseshoe	1	Foraging around woodland
	10	23:00	Lesser horseshoe	1	Foraging in "cave" in North Road Quarry
28/8/08	9	20:56	Lesser horseshoe	1	Commuting east along hedgerow
	9	20:58	Lesser horseshoe	1	Foraging
2/9/08	-	-	-	-	-
16/9/08	10	22:15	Lesser horseshoe	1	Foraging in "cave" at North Road Quarry

59. Referring to Table 5 above, lesser horseshoe bats were recorded on site in six of the ten surveys. Lesser horseshoes were not recorded during 18 June, 7 and 21 July and 2 September surveys. On 29 May between one and three lesser horseshoe bats were recorded foraging in Location 2 (Figure 2), the area of woodland in the south-east of the site. On 30 May one briefly passing lesser horseshoe was recorded at Location 6 (Figure 2), in the woodland area in the north-east of the site. On 23 June one lesser horseshoe bat was recorded in Location 2 (Figure 2), the area of woodland in the south-east of the site. On 11 August one lesser horseshoe bat was recorded commuting south along the fence line at Location 4a (Figure 2), to the south of the eastern boundary. A lesser horseshoe was recorded foraging at Location 4 (Figure 2), a small block of woodland on the eastern boundary. A further lesser horseshoe was recorded foraging at Location 10 (Figure 2), a small cave in North Road Quarry. On 28 August lesser horseshoe bat was recorded commuting east at Location 9 (Figure 2), the hedgerow on the northern site boundary. Two minutes later a lesser horseshoe was recorded foraging at this location. It is likely that this was the same bat. On 16 September one lesser horseshoe bat was recorded foraging at Location 10 (Figure 2), a small cave in North Road Quarry
60. No greater horseshoe bats were recorded throughout the surveys.

### **Ecological Evaluation**

#### Hedgerow Survey

61. Four hedgerows on site (Hedgerows 1a, 1b, 2 and 4) are considered to be of ecological and landscape importance under the Hedgerow Regulations (1997) and species-rich according to the UK BAP. The desk study has also identified three of

the hedgerows (1a, 1b and 4) to be historically important under the Hedgerow Regulations 1997.

#### Great Crested Newt Survey

62. The results of the survey indicate that great crested newts are absent from the water bodies on and adjacent to the site. No other amphibians were recorded during any of the surveys. The absence of results concurs with the generally suboptimal conditions found, including fluctuating water levels, litter/contamination, and the heavy shading of the water bodies, which results in limited aquatic biodiversity, and a corresponding lack of food for amphibians. The dense bankside vegetation also shades out the majority of other aquatic vegetation, leaving limited suitable egg-laying substrate. The results are consistent with the lack of records of great crested newts within 2km of the site.

#### Dormouse Survey

63. The hedgerows and woodlands on site comprise suitable habitat for dormice, however the habitats are patchy in places, and lack good numbers of nut and fruit-producing plants such as hazel and bramble.
64. Densities of dormice vary dependent on the quality of the habitat, with an average across the country of approximately 2.2 adults per hectare. The habitats on site, whilst suitable, are not optimal for dormice, however they are connected to large areas of good quality habitat in the surrounding area between which individuals can disperse. Despite no dormice being recorded on site during the 2008 surveys, this species has been recorded within the local area and it is possible that dormice may use the site in the future.

#### Horseshoe Bat Activity Survey

65. The hedgerows on site are being used by low numbers of lesser horseshoe bats for commuting and foraging. These hedgerows are usually unlit and provide good connectivity between suitable foraging habitats. The woodland in the south-east of the site is also used by foraging lesser horseshoe bats. This woodland is immediately adjacent to a sports pitch with floodlighting and it was noted that lesser horseshoes were not using this area when these lights were in use.
66. Greater horseshoe bats were not recorded during this survey. The habitat on site is suitable for greater horseshoe bats, which are known to roost nearby, however there is more suitable habitat in the surrounding area, such as sheep and cattle-grazed pasture. Grazed pasture is usually rich in species such as dung beetles, chafer beetles and crane-flies, which make up a large proportion of the diet of greater

horseshoe bats. Greater horseshoe bats are also sensitive to lighting and may avoid the campus due to flood lights and security lights.

67. During the Phase I habitat survey, the North Road Quarry was noted to have numerous cracks and several large cavities in the rock, and potential was identified for roosting bats. On two occasions single lesser horseshoes were observed in a small cave in the south of North Road Quarry. This cave has several large fissures and number of crevices, which lead at least several metres into the rock face and provides suitable roosting opportunities for horseshoe bats.

#### **FIELD OBSERVATIONS**

68. During the horseshoe bat activity survey other bat species were noted using the site, including noctule, common pipistrelle, soprano pipistrelle and *Myotis* species. Notable foraging areas for species other than horseshoes include the woodlands at Location 4 and 8, the hedgerow and adjacent car park at Location 5, the lake at Location 11 and the woodland at Locations 1-3. Mature trees throughout the site were also noted with the Phase I habitat survey to provide suitable roosting opportunities for other species of bat, including Bechstein's bat, a species associated with the Bath and Bradford-on-Avon Bats SAC.

#### **RECOMMENDATIONS**

69. The following recommendations expand upon some of those outlined within the Phase I habitat survey report (ecosulis ltd reference E1604UOB2UOB). However, consideration should still be given to other recommendations within the Phase I habitat survey report, such as those that relate to breeding birds, which have not been updated with respect to this report.

#### **Hedgerows**

70. It is recommended that all ecologically and historically important hedgerows (Hedgerows 1a, 1b, 2, and 4) on site are retained during and after the proposed development, if this is not practicable it is recommended that the four hedgerows of ecological and historical importance (Hedgerow Regulations 1997) and those considered to be species-rich (UKBAP) are retained on site. A hedgerow considered under the Hedgerow Regulations 1997 to be important can only be removed once a Hedgerow Removal Notice has been granted by the local planning authority.
71. It is recommended that Hedgerows 1a, 1b, 2 and 4 are managed for wildlife through the planting of additional young native saplings where they are sparse and through re-laying. The laid hedgerows should be managed on a rotational basis ensuring that

no more than one-third of each hedgerow is managed in any one year. Where possible a buffer zone of 5m should be kept between the hedgerows and woodlands and any development.

72. Should any proposals affect the historically important hedgerows, it is recommended that specialist advice is sought from an archaeological consultant.
73. It is recommended that additional hedgerows are incorporated into the future development proposals throughout the site to increase structural diversity and connectivity across the site. Species recommended for these additional hedgerows include pedunculate oak, ash, hawthorn, blackthorn, holly, wild privet, hazel, dog-rose, field-rose and field maple. It is recommended that the specimens utilised are sourced locally.

#### **Great Crested Newt**

74. Great crested newts are not present on site and as such pose no current constraint to any future development proposals. The ponds on site are unlikely to be colonised by great crested newt in the near future due to the general suboptimal condition of the ponds and the absence of records of great crested newt in the surrounding area. Four of the five ponds on site have poor suitability for great crested newts, and the remaining pond (Pond 2) has below average suitability. However, future development proposals may provide opportunities to enhance the ponds and improve the suitability of the habitat for great crested newt and other amphibians (and aquatic flora and fauna). This could be achieved through a number of measures, including management of the vegetation to provide a more diverse structure and species composition and planting of aquatic plants suitable for egg-laying by newts.
75. Should any development be undertaken within the vicinity of the ponds, systems within the development should be designed to include measures to safeguard water quality within the ponds, such as with the use of Sustainable Drainage Systems (SuDS). Such systems can provide a range of benefits to wildlife, particularly if designed in consultation with an ecologist.

#### **Dormice**

76. It is unlikely that dormice are currently present on site. However, due to the good connectivity to good quality habitats and the presence of dormice in the area, it is recommended that a precautionary approach is undertaken should any works affect the hedgerows or woodland on site. The recommended approach would be to undertake any necessary cutting of hedgerows and trees using hand-tools during the winter months (to avoid the dormouse breeding season and impacting on nesting

birds) to a height of 450mm. Heavy machinery should not be used between November and May as this can kill dormice hibernating at ground level. Heavy machinery can then be used from May to November. The recommendations given in the hedgerow section (above) will provide additional foraging opportunities for dormouse and provide more cover and shelter.

### **Bats**

77. It is recommended that the hedgerows and woodlands on site are retained and enhanced for foraging bats by planting up gaps with locally sourced native species. Should this not be possible, it is recommended that connectivity between key foraging habitats is maintained, and that further suitable foraging/commuting habitats be created on site.
78. Due to the usage of the hedgerows and woodlands by lesser horseshoe bats, which are particularly averse to strong light sources, it is recommended that lighting be directed away from these features. This will avoid impacts to all bat species.
79. Due to the usage of the cave in the North Road Quarry by lesser horseshoe bats, it is recommended that further surveys are undertaken on this feature, should any proposed development affect this feature either directly or indirectly (through for example lighting or severance of connective habitats).
80. Surveys of the trees, buildings and the quarry on site for roosting bats were not undertaken. Should any works affect any of these, further surveys may be necessary.

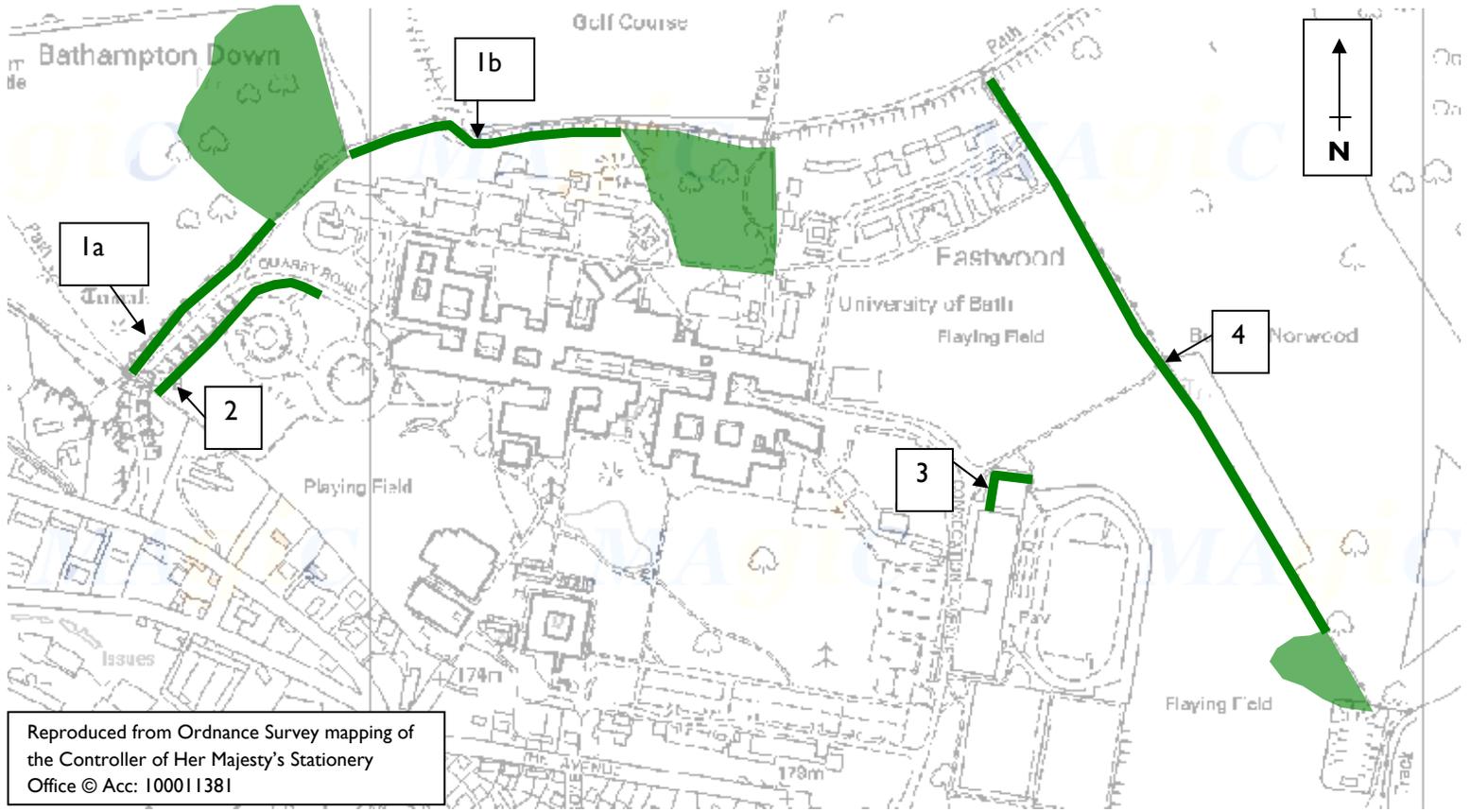
### **ECOLOGICAL OPPORTUNITIES**

81. Reference should be made to the Phase I habitat survey (report reference EI604UOB2UOB) for recommendations relating to ecological opportunities for the site.

### **LIMITATIONS OF SURVEYS**

82. This report records wildlife found during the survey and anecdotal evidence of sightings. It does not record any plants or animals that may appear at other times of the year and were therefore not evident at the time of visit. Some species that might use the site or be apparent at other times of year, or only in certain years, would not have been detected. Areas of dense undergrowth or inaccessible areas may preclude a detailed inspection and may have concealed species of note. None of the buildings were accessed and may contain further roosting opportunities not observed externally.

83. The behaviour of animals can be unpredictable and may not conform to standard patterns recorded in current scientific literature. This report therefore cannot predict with absolute certainty that animal species will occur in apparently suitable locations or habitats or that they will not occur in locations or habitats that appear unsuitable.
84. The data search can only provide information on species already recorded and cannot be taken to represent a complete overview of all species present in the survey site.
85. The advice contained in this report relate primarily to factual survey results and general guidance only. On all legal matters you are advised to take legal advice.



 <p>The Rickyard, Newton St Loe, Bath, BA2 9BT Tel: 01225 874040 Fax: 01225 874554</p>		
Client	University of Bath	
Project	University of Bath	
Title	<b>Hedgerow Survey Map</b>	
Date	Scale	Figure
July 2008	SCHEMATIC ONLY	I

**Key**

-  Hedgerow (1-4)
-  Woodland



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**Key**

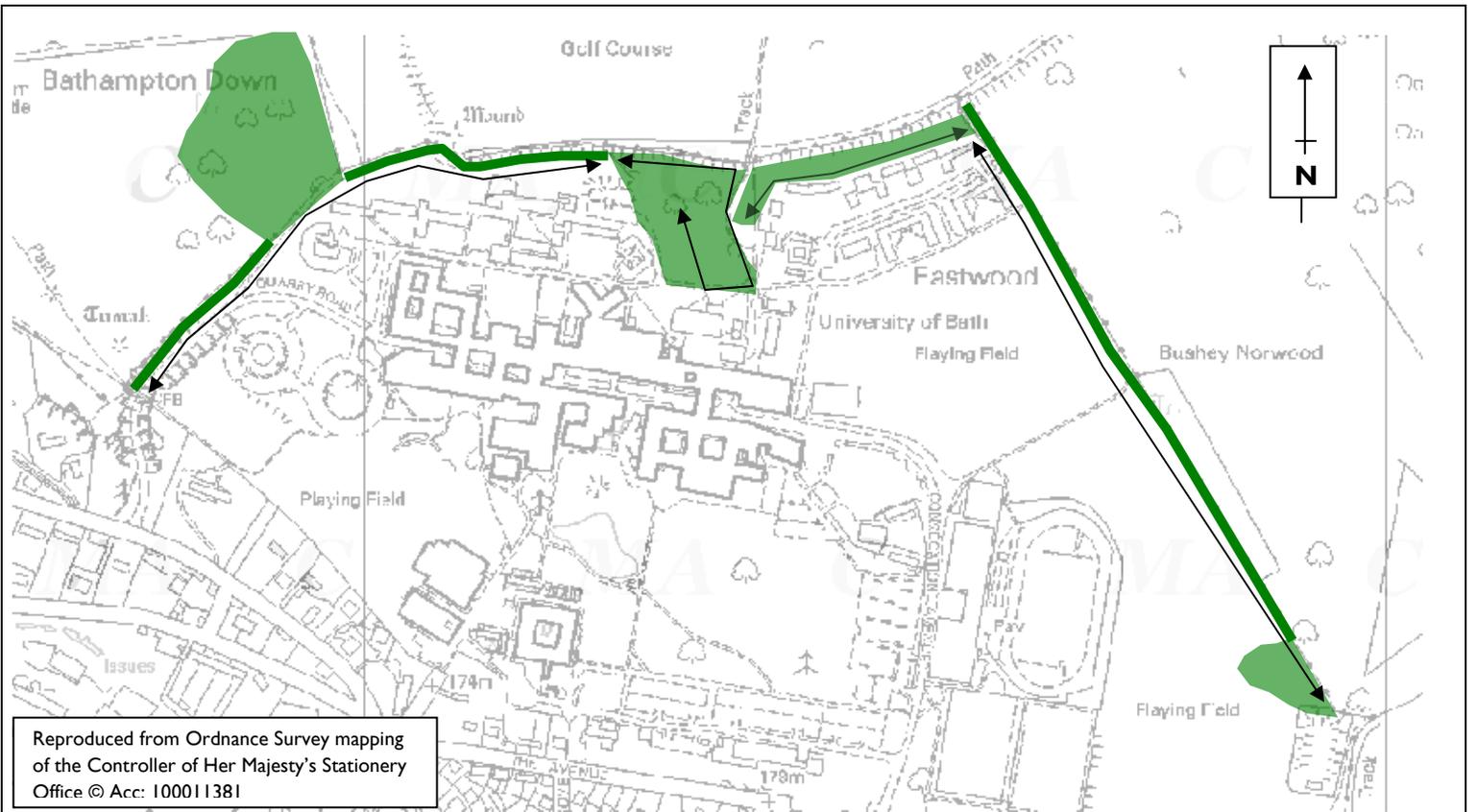
 Pond (1-5)



The Rickyard, Newton St Loe,  
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Client	University of Bath	
Project	University of Bath	
Title	Location of ponds	
Date	Scale	Figure
June 2008	SCHEMATIC ONLY	2





The Rickyard, Newton St Loe,  
Bath, BA2 9BT  
Tel: 01225 874040 Fax: 01225 874554

**Key**



Hedgerow



Woodland



Location of dormouse tubes

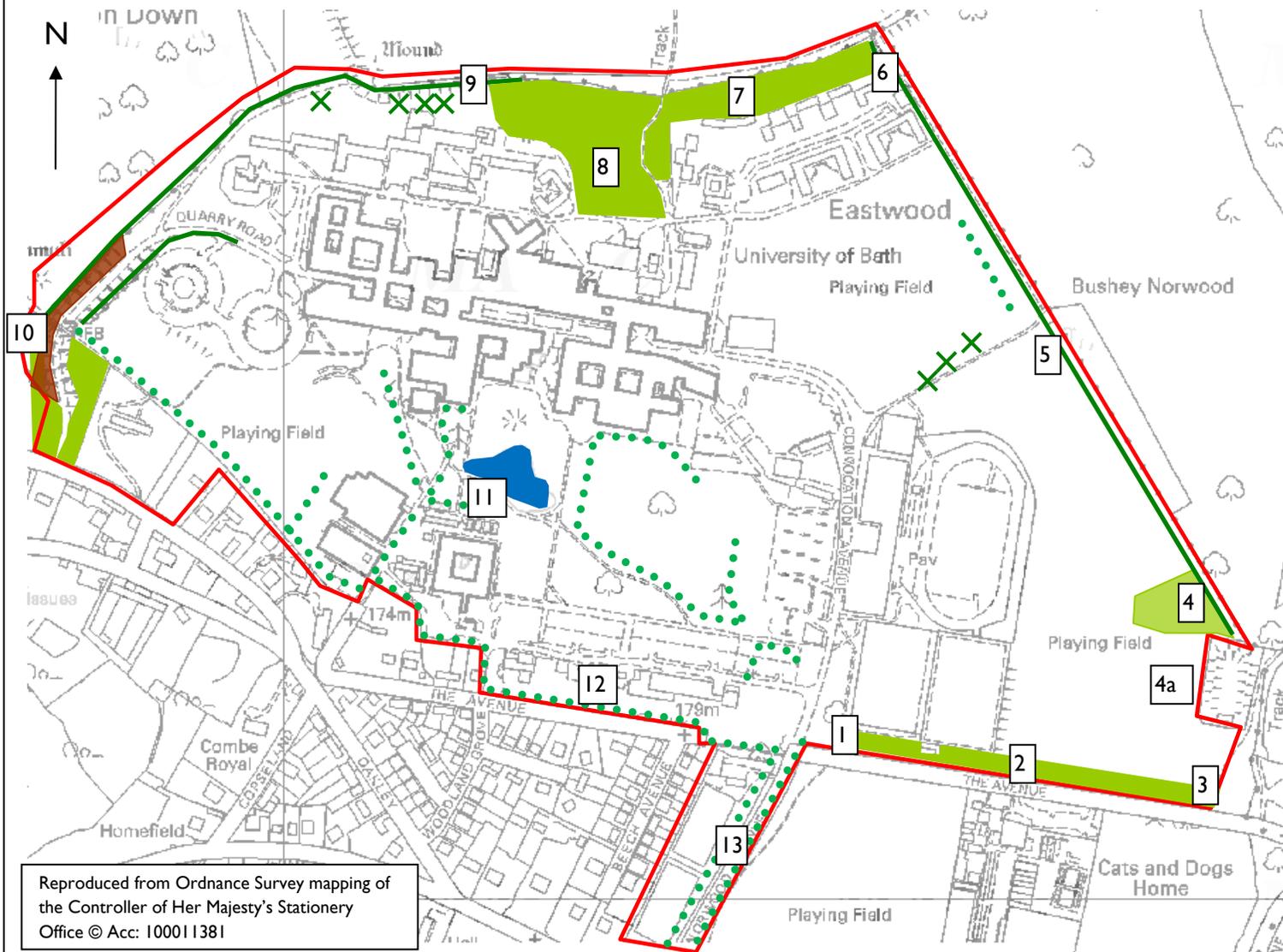
Client	University of Bath	
Project	University of Bath	
Title	Location of dormouse tubes	
Date	Scale	Figure
October 2008	SCHEMATIC ONLY	3

The Rickyard, Newton St Loe,  
Bath, BA2 9BT  
Tel: 01225 874040 Fax: 01225 874554

Client	University of Bath	
Project	University of Bath	
Title	Location of bat records	
Date	Scale	Figure
September 2008	SCHMATIC ONLY	4

**Key**

-  Site Survey Boundary
-  Amenity Planting/Scrub
-  Woodland
-  Standard trees
-  Lake
-  Hedgerows
-  North Road Quarry
-  Location of bat records (1-13)



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**APPENDIX I: SPECIES LIST**

<b>Common Name</b>	<b>Latin Name</b>
<b>Flora</b>	
Agrimony	<i>Agrimonia eupatoria</i>
Alder	<i>Alnus glutinosa</i>
Apple	<i>Malus domestica</i>
Ash	<i>Fraxinus excelsior</i>
Beech	<i>Fagus sylvatica</i>
Black bryony	<i>Tamus communis</i>
Blackthorn	<i>Prunus spinosa</i>
Bramble	<i>Rubus fruticosus agg</i>
Bulrush	<i>Typha latifolia</i>
Cherry	<i>Prunus sp.</i>
Common bent	<i>Agrostis capillaris</i>
Creeping buttercup	<i>Ranunculus repens</i>
Dog-rose	<i>Rosa canina</i>
Dogwood	<i>Cornus sanguinea</i>
Elder	<i>Sambucus nigra</i>
Elm	<i>Ulmus procera</i>
Enchanter's-nightshade	<i>Circaea lutetiana</i>
Field maple	<i>Acer campestre</i>
Field-rose	<i>Rosa arvensis</i>
Germander speedwell	<i>Veronica chamaedrys</i>
Ground-ivy	<i>Glechoma hederacea</i>

Hawthorn	<i>Crataegus monogyna</i>
Hazel	<i>Corylus avellana</i>
Herb-Robert	<i>Geranium robertianum</i>
Holly	<i>Ilex aquifolium</i>
Lord's-and-ladies	<i>Arum maculatum</i>
Male-fern	<i>Dryopteris filix-mas</i>
Meadow vetchling	<i>Lathyrus pratensis</i>
Pedunculate oak	<i>Quercus robur</i>
Silver birch	<i>Betula pendula</i>
Soft-rush	<i>Juncus effusus</i>
Spindle	<i>Euonymus europaeus</i>
Sycamore	<i>Acer pseudoplatanus</i>
Upright hedge-parsley	<i>Torilis japonica</i>
Wild privet	<i>Ligustrum vulgare</i>
Wood avens	<i>Geum urbanum</i>
Yew	<i>Taxus baccata</i>
<b>Fauna</b>	
Bechstein's bat	<i>Myotis bechsteinii</i>
Brandt's bat	<i>Myotis brandtii</i>
Brown long-eared bat	<i>Plecotus auritus</i>
Common pipistrelle	<i>Pipistrellus pipistrellus</i>
Daubenton's bat	<i>Myotis daubentoni</i>
Dormouse	<i>Muscardinus avellanarius</i>

Great crested newt	<i>Triturus cristatus</i>
Greater horseshoe bat	<i>Rhinolophus ferrumequinum</i>
Lesser horseshoe bat	<i>Rhinolophus hipposideros</i>
Natterer's bat	<i>Myotis nattererii</i>
Noctule	<i>Nyctalus noctula</i>
Serotine	<i>Eptesicus serotinus</i>
Soprano pipistrelle	<i>Pipistrellus pygmaeus</i>
Whiskered bat	<i>Myotis mystacinus</i>

**APPENDIX II: SURVEY INFORMATION****Great Crested Newt Surveys**Table 1. Summary Survey Information: Pond 1

Date	Visit	Air Temperature	Vegetation Cover	Torch Power	Turbidity
20/05/08	1	11.8	5/5	500,000-1,0000000	4/5
21/05/08	2	13.3	5/5	500,000-1,0000000	3/5
27/05/08	3	13.0	5/5	500,000-1,0000000	5/5
28/05/08	4	12.0	5/5	500,000-1,0000000	4/5

Table 2. Summary Survey Information: Pond 2

Date	Visit	Air Temperature	Vegetation Cover	Torch Power	Turbidity
20/05/08	1	11.8	1/5	500,000-1,0000000	4/5
21/05/08	2	13.3	1/5	500,000-1,0000000	4/5
27/05/08	3	13.0	1/5	500,000-1,0000000	3/5
28/05/08	4	12.0	1/5	500,000-1,0000000	3/5

Table 3. Summary Survey Information: Pond 3

Date	Visit	Air Temperature	Vegetation Cover	Torch Power	Turbidity
20/05/08	1	11.8	0/5	500,000-1,0000000	4/5
21/05/08	2	13.3	0/5	500,000-1,0000000	4/5
27/05/08	3	13.0	0/5	500,000-1,0000000	4/5
28/05/08	4	12.0	0/5	500,000-1,0000000	4/5

Table 4. Summary Survey Information: Pond 4

Date	Visit	Air Temperature	Vegetation Cover	Torch Power	Turbidity
20/05/08	1	11.8	0/5	500,000-1,0000000	4/5
21/05/08	2	13.3	0/5	500,000-1,0000000	4/5
27/05/08	3	13.0	0/5	500,000-1,0000000	4/5
28/05/08	4	12.0	0/5	500,000-1,0000000	4/5

Table 5. Summary Survey Information: Pond 5

Date	Visit	Air Temperature	Vegetation Cover	Torch Power	Turbidity
20/05/08	1	11.8	0/5	500,000-1,0000000	4/5
21/05/08	2	13.3	0/5	500,000-1,0000000	4/5
27/05/08	3	13.0	0/5	500,000-1,0000000	4/5
28/05/08	4	12.0	0/5	500,000-1,0000000	4/5



## Horseshoe Bat Evening Activity Surveys

Table 6. Summary Survey Information: Horseshoe Bat Activity Surveys

Date	Visit	Time	Temperature	Weather
29/05/08	1	Start: 21:20	Start: 17°C	Start: No wind and some cloud cover
		Finish: 00:20	Finish: 16°C	Finish: Slight breeze and some cloud cover
30/05/08	2	Start: 21:20	Start: 18°C	Start: Slight breeze and some cloud cover
		Finish: 00:20	Finish: 16.5°C	Finish: Slight breeze and some cloud cover
18/06/08	3	Start: 21:30	Start: 14°C	Start: Strong wind, some cloud cover
		Finish: 00:30	Finish: 12°C	Finish: Strong wind, some cloud cover
23/06/08	4	Start: 21:30	Start: 15°C	Start: Mild wind, heavy cloud cover
		Finish: 00:30	Finish: 13°C	Finish: Mild wind, some cloud cover
07/07/08	5	Start: 21:20	Start: 14.5°C	Start: Moderate wind, total cloud cover
		Finish: 00:20	Finish: 13°C	Finish: Mild wind, total cloud cover
21/07/08	6	Start: 21:20	Start: 16°C	Start: Light wind, total cloud cover
		Finish: 00:20	Finish: 15°C	Finish: Light wind, total cloud cover
11/08/08	7	Start: 20:30	Start: 15°C	Start: Light wind, total cloud cover
		Finish: 23:30	Finish: 13.5°C	Finish: No wind, total cloud cover
28/08/08	8	Start: 20:15	Start: 17°C	Start: Light wind, total cloud cover
		Finish: 23:15	Finish: 15°C	Finish: No wind, total cloud cover
02/09/08	9	Start: 20:00	Start: 15°C	Start: Moderate wind, heavy cloud cover
		Finish: 23:00	Finish: 13°C	Finish: Light wind, some cloud cover
16/09/08	10	Start: 19:30	Start: 13°C	Start: Moderate wind, some cloud cover
		Finish: 22:30	Finish: 11°C	Finish: No wind, some cloud cover