LONDON-WEST MIDLANDS ENVIRONMENTAL STATEMENT

Volume 5 | Technical Appendices

CFA7 | Colne Valley

Bat trapping/radio tracking study - Colne Valley (EC-007-002)

Ecology

November 2013

VOL 5

ES 3.5.2.7.8

LONDON-WEST MIDLANDS ENVIRONMENTAL STATEMENT

Volume 5 | Technical Appendices

CFA7 | Colne Valley

Bat trapping/radio tracking study - Colne Valley (EC-007-002)

Ecology

November 2013

ES 3.5.2.7.8

Department for Transport

High Speed Two (HS2) Limited has been tasked by the Department for Transport (DfT) with managing the delivery of a new national high speed rail network. It is a non-departmental public body wholly owned by the DfT.

A report prepared for High Speed Two (HS2) Limited.

High Speed Two (HS2) Limited,
Eland House,
Bressenden Place,
London SW1E 5DU

Details of how to obtain further copies are available from HS2 Ltd.

Telephone: 020 7944 4908

General email enquiries: HS2enquiries@hs2.org.uk

Website: www.hs2.org.uk

Printed in Great Britain on paper
containing at least 75% recycled fibre.

Contents

List of figures

List of tables

Volume 5: Bat trapping/radio tracking study - Colne Valley Appendix EC-007-002

Ecological baseline data

1 Introduction

1.1 The context for the current survey

1.1.1 Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora, known as the Habitats Directive, was adopted in 1992. The main aim of the Habitats Directive is to promote the maintenance of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species listed on the Annexes to the Directive at a favourable conservation status, introducing robust protection for those habitats and species of European importance.

1.1.2 The Conservation of Habitats and Species Regulations 2010 (as amended) (referred to as the 'Habitats Regulations') implement the Habitats Directive into national legislation. Regulation 41 seeks to protect certain species (European Protected Species) and contains a range of prohibitions include deliberate taking, capture or killing, deliberate disturbance, and the deterioration or destruction of a breeding site or resting place of such an animal.

1.1.3 All species of bat are fully protected under the Habitats Regulation as European Protected Species through their inclusion on Schedule 2. In addition, certain species are Annex II species listed under the Directive, for which specific protection through the establishment of Special Areas of Conservation (SAC) applies. Several species of bat are also species of principal importance in England as identified in Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006)[1].

1.1.4 Construction of the Proposed Scheme will cross the Cone Valley and its constituent lakes and designated wildlife habitats on a viaduct. The construction of this viaduct has potential to disturb bat species and result in the loss of roosts and foraging and commuting habitat. Operation of the scheme may disrupt commuting and foraging flight lines.

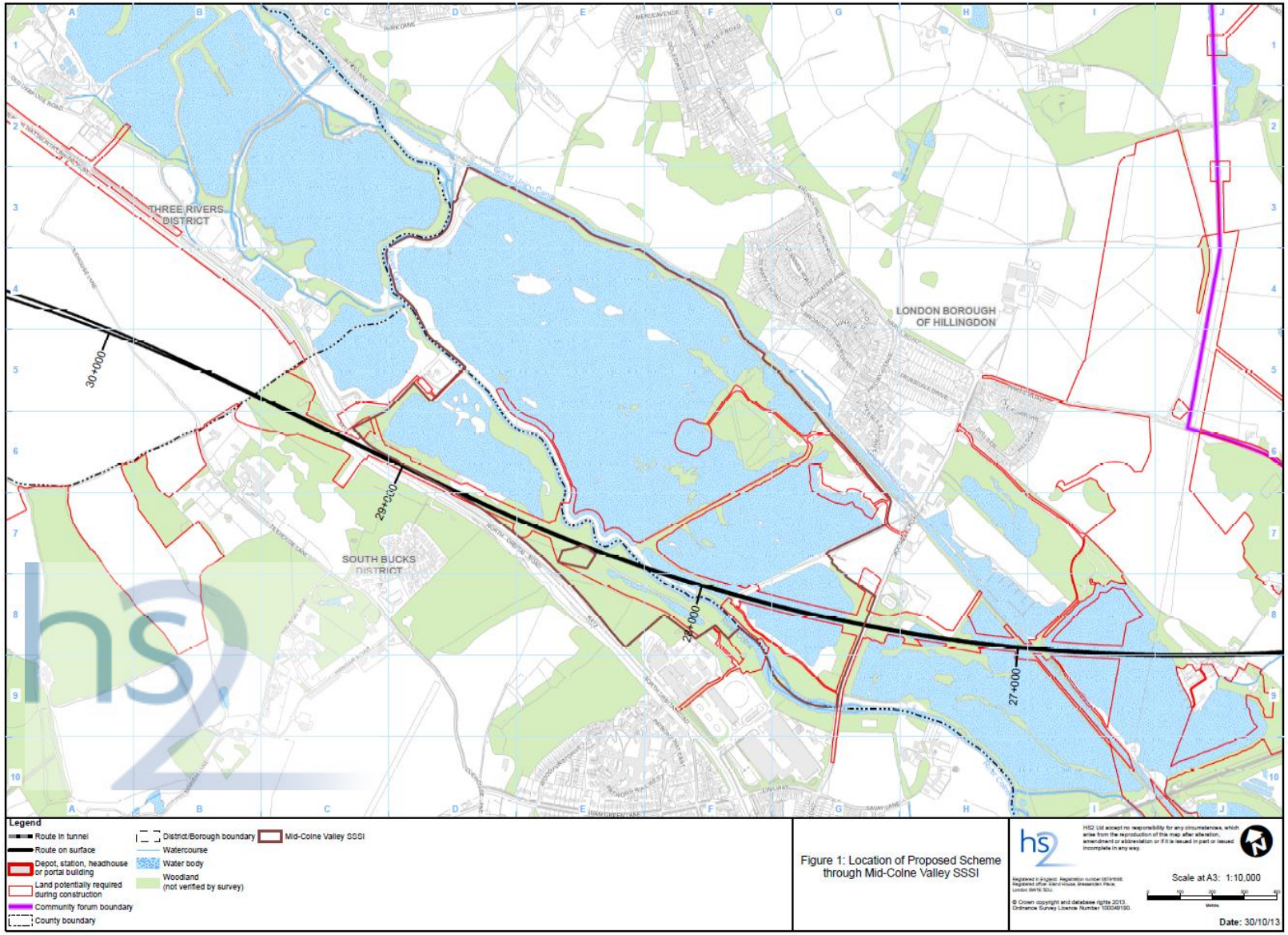
1.1.5 Accordingly detailed surveys were carried out in the land adjacent to where the viaduct will be constructed in order to define the impacts of the Proposed Scheme on the assemblage of bats and, if necessary, to inform appropriate mitigation.

1.2 Site context and status

1.2.1 The Proposed Scheme will cross the Colne Valley across a viaduct approximately 15m in height. From east to west, the viaduct starts to the west of Harvil Road, before crossing Harefield No. 2 Lake, Grand Union Canal, Savay Lake, Korda Lake and the River Colne. Continuing west it crosses Battlesford Wood and then the A412 before ending at a point to the west of Tilehouse Lane. The extent of the Proposed Scheme within the Mid Colne Valley is shown on Figure 1.

[1] Natural Environment and Rural Communities Act 2006 (Chapter 16).London. Her Majesty's Stationery Office.

Figure 1: Location of Proposed Scheme through Mid-Colne Valley SSSI



1.2.2 Much of the route is within the Mid-Colne Valley Site of Special Scientific Interest (SSSI) that is designated for its wintering and breeding birds, woodland and river habitat. Bats are not a special interest feature of the SSSI. However, one of the reasons for the designation of the Hertfordshire and Middlesex Wildlife Trust nature reserve at Broadwater Lake through which the viaduct will pass is the presence of large numbers of Daubenton's bats.

1.3 2013 survey aims and approach

1.3.1 A number of bat activity transects and automated detector surveys were carried out in the Mid-Colne Valley SSSI in 2012. One ultrasound (SM2BAT+) detector was deployed to the west of Broadwater Lake and another was placed adjacent to woodland west of Tilehouse Lake South in the western part of the SSSI, for five nights in June, July and August 2012.

1.3.2 An initial assessment of the 2012 automated ultrasound detectors had indicated that, in addition to Daubenton's bats, high levels of Nyctalus activity (noctule and Leisler's bats) were associated with Broadwater Lake in the late summer.

1.3.3 Both species of the genus Nyctalus resident in the UK are direct and fast flying species (to over 50km/h) often at heights of 10-50m (Dietz et al., 2009). They are wide-ranging species, known to travel over 10km between roosts and foraging areas (BCT, 2010). Both species predominantly forage by aerial hawking, flying in straight lines, or occasionally circling and diving after food. Both species feed on a range of flying insects but crepuscular and nocturnal Diptera species are most frequently eaten (Vaughan, 1997). They are associated with a wide range of open habitats including deciduous woodland, parkland, pasture and water bodies. In particular, the interfaces between different habitat types are often used (Russ, 2012).

1.3.4 Noctule bats (Nyctalus noctula) are native and widespread but generally uncommon throughout the UK, tending to be more numerous in well wooded areas (Battersby, 2005). Field survey data from the 2011 National Bat Monitoring Programme suggests their numbers are stable (BCT, 2012). Leisler's bats (Nyctalus leisleri) are native and widespread but scarce throughout Great Britain, although they are common in Northern Ireland (Battersby, 2005). Historic population trends for Leisler's bat in the UK are unknown but may be increasing.

1.3.5 Desk study did not identify any existing information on roost location, movement routes, foraging areas or flight heights for Nyctalus species in the Mid-Colne Valley. This study was undertaken to provide information to help understand the potential effects on these species, as well as to inform the design of any appropriate mitigation. Surveys were undertaken to identify:

- the species and number of bats present;
- the location and type of any roost; and
- commuting routes for these species within the landscape.

1.3.6

2 Methodology

2.1 Survey area

2.1.1 The survey area for all trapping, transects and automated recording included an area on the western side of Broadwater and Korda lakes in Battlesford Wood between Ordnance Survey (OS) National Grid References TQ 04513 88336 in the south and TQ 03974 89913 in the north.

2.1.2 The bat transect route followed the course of the River Colne, north from Moorhall Road and along the western margins of both Korda and Broadwater lakes. It extended from north of the Denham Laboratories, between the River Colne and Tilehouse Lake South. The total transect length was approximately 2.7km long.

2.1.3 The survey area for radio tracking encompassed the habitats adjacent to the Proposed Scheme. All tracking in the survey area was undertaken from land parcels where access had been granted or suitable roads and public rights of way (PRoW).

2.2 Data search

2.2.1 Records from the South Buckinghamshire Bat Group (SBBG), and Buckinghamshire and Milton Keynes Environmental Records Centre (BMERC) obtained from sightings, detector surveys, trapping and tree and building inspections were reviewed.

2.3 Automated surveys

2.3.1 Four SM2BAT+ units were deployed in tandem on trees at four locations within the Mid-Colne SSSI, each within 25m of land required for construction of the Proposed Scheme (see Figure 2). Two units were secured at different heights on each tree. The lower microphones were positioned between 2m and 5m in height (referred to as 'ground level'), and the higher microphones were placed between 18m and 25m (referred to as 'canopy level') to assess differences in bat activity at different heights within the woodland.

2.3.2 The recording dates for each unit are detailed in Table 1. Units 1 and 2 were paired at locations 1, and 3. Units 3 and 4 were paired at locations 2 and 4. Each recorder was set up to record from 15 minutes prior to sunset until sunrise.

2.3.3 All full spectrum recordings were made in WACo format that were then later converted to both zero crossed (ZC) and WAV files. Analysis of the ZC files was undertaken using Analook V3.5 to the appropriate level for each species group. Calls were analysed to genus level for purposes of data confidence.

Table 1: Static recording dates for April – July 2013

SM2 reference	April recording dates	May recording dates	June recording dates	July recording dates
1	18-30	1-6, 9-15 and 21-28	4-5 and 11-20	3-10
2	18 and 24-26	1-6, 9-15 and 16-21	4-10	10-16
3	18-29	1-6, 9-14 and 21-25	4-10	3-9

SM2 reference	April recording dates	May recording dates	June recording dates	July recording dates
4	24-28	1-4, 9-22 and 26-28	26	24-27

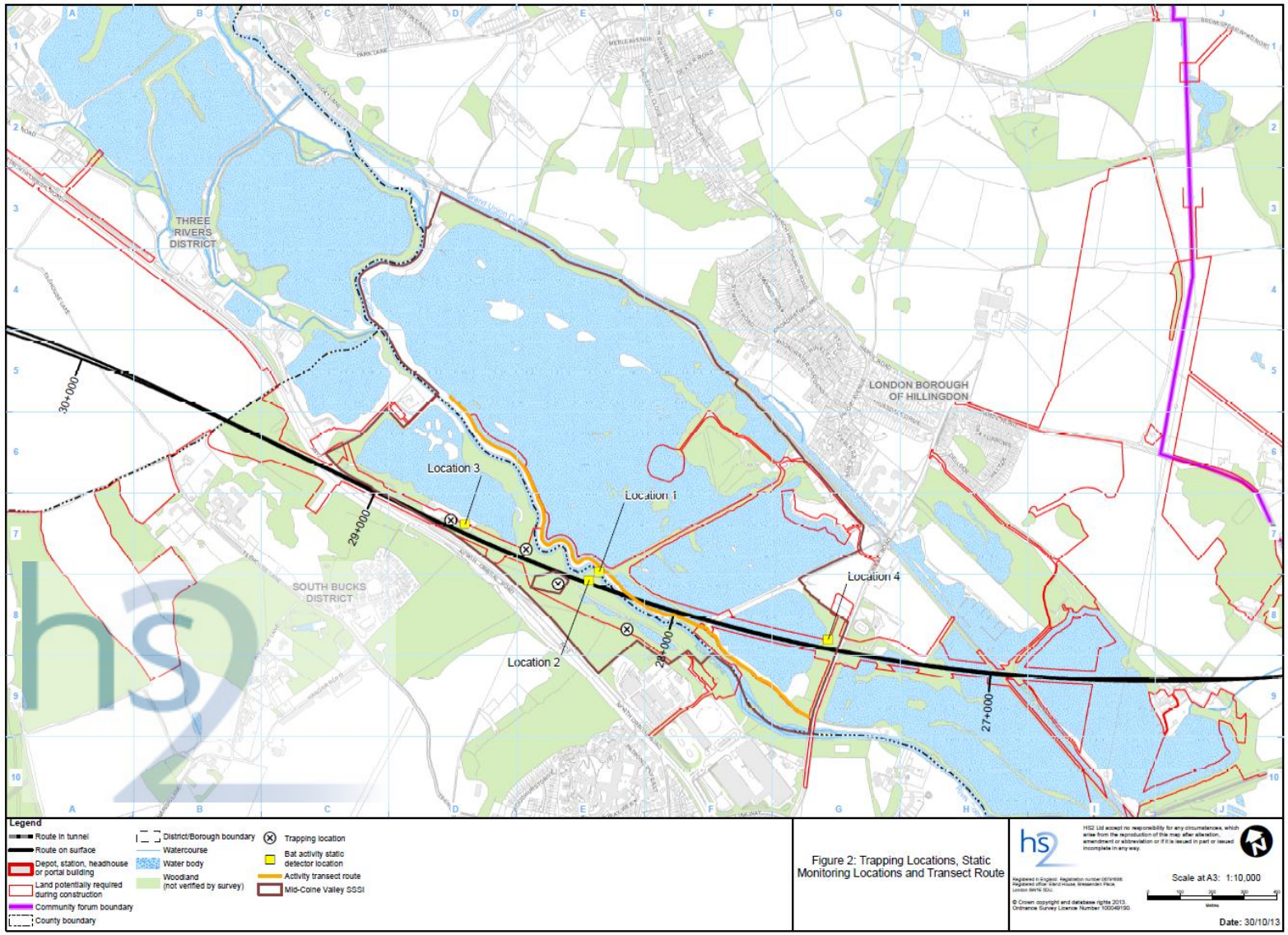
2.4 Transect surveys

2.4.1 Bat activity transect surveys were carried out along the wooded western edge of Broadwater Lake using a predefined route to the east and west of the Colne River between OS National Grid References TQ 04513 88336 in the south and TQ 03974 89913 in the north. All dusk surveys were undertaken from sunset for approximately 2 hours 30 minutes. Dawn surveys were undertaken for approximately 2 hours before sunrise. This transect was repeated on nine occasions between April and July (Table 2). Surveyors used SM2Bat+ units in conjunction with Bat Box Duet detectors connected to Edirol digital recorders. All recordings were made in WAV or WACo format.

Table 2: Transect survey dates April - July 2013

Survey date	Dusk/dawn
18 April	Dusk
20 May	Dusk
21 May	Dawn
26 June	Dusk
27 June	Dawn
4 July	Dusk
5 July	Dawn
17 July	Dusk
18 July	Dawn

Figure 2: Trapping locations, static monitoring locations and transect route



2.5 Trapping surveys

2.5.1 Three trapping surveys were carried out in June and September 2013. On 4 June 2013, three harp traps and three acoustic lures were deployed at 200m intervals within woodland and lakeside habitat along the route of the Proposed Scheme. On 2 and 12 September 2013 three harp traps and one triple high mist net were deployed at 200m intervals in the same area. The trapping locations are shown in Figure 2. The trapping commenced at sunset and lasted 3.5 to 4 hours on each survey night.

2.5.2 The bats captured in the harp traps and mist nets were removed from the traps by a suitably experienced and qualified person (under the direction of the licence holder) and Nyctalus species were transferred to a clean cloth bag. Bats of species other than Nyctalus were released in close proximity to the site of capture. At the end of each trapping sessions biometric information was obtained from any Nyctalus species bats captured. Each bat was sexed, weighed using a light line spring scale (Pesola), forearm measured using digital callipers (Sealey S0707), reproductive status ascertained and any other general health observations noted. Any bats that were selected for radio-tagging were retained to have a radio-transmitted attached and all other bats were released immediately in close proximity to the site of capture during the hours of darkness. Droppings were collected from captured individuals to aid in species identification. All animals were caught and handled under Natural England licence 20130853.

2.6 Radio-tracking study

2.6.1 Bats for radio-tagging were selected on the basis of their existing health. No underweight bats were selected and the weight of the radio-tag was always less than 5% of the animal's weight. Female bats were selected (and in particular reproductive females) for radio-tagging in preference to male bats, as this would enable the identification of important breeding colonies.

2.6.2 Transmitters were attached with Skin-Bond® (Pfizer Inc.) to the area between the shoulder blades from which fur had been clipped. The animals that were fitted with radio-transmitters were released on the same night of capture in close proximity to the capture site.

2.6.3 To determine the position of radio-tagged bats during the day (daytime roost locations) and night (commuting and foraging locations) the animals were radio-tracked on foot and by car by a minimum of two surveyors using a Biotrack 'Sika' receiver and a Yagi 3-element antenna on a height-adjustable and portable mast. A Yagi 5-element was used to provide information on daytime roosting locations. The position of each radio-tagged bat was determined by taking paired bearings sequentially from various known locations around the foraging area. Time, compass bearing, GPS reading and weather were recorded on data sheets in the field. The radio-tracking teams followed the bats from sunset for a maximum of eight hours. If the focal animal returned to the roost early then tracking of this animal was terminated after no further activity was recorded for one hour. The estimates of roosting locations were obtained by taken multiple bearings from different locations in the vicinity where the signal was emitted.

2.6.4 Each animal was radio-tracked for a maximum of three days, depending on how long contact with each radio-tagged animal was maintained. Bats were radio-tracked concurrently, whereby the radio-tracking teams would switch between radio-tag frequencies in order to obtain estimates of locations for different animals.

2.6.5 Where access was available, emergence of the bats from their roosts was monitored around dusk by direct observation. Counts of emerging bats were used to give a measure of minimum colony size.

2.7 Constraints

2.7.1 Nyctalus species bats typically fly fast and straight, at high altitudes. For this reason, following radio-tagged bats across the complex terrain was difficult. As a result not as much information was gained from this element of the study as had been hoped; the other elements of the study were heavily relied upon for developing an understanding of bat movements.

3 Results

3.1 Data search

3.1.1 Records of bats from SBBG and BMERC returned records of six bat species, as well as those for *Chiroptera* and *Pipistrellus*. Those identified to species level were:

- common pipistrelle (*Pipistrellus pipistrellus*);
- soprano pipistrelle (*Pipistrellus pygmaeus*);
- Daubenton's bat (*Myotis daubentonii*);
- noctule bat (*Nyctalus noctula*);
- serotine (*Eptesicus serotinus*); and
- brown long-eared bat (*Plecotus auritus*).

3.1.2 A total of 33 bat records were returned from locations between approximately 50m and 6.5km from the Proposed Scheme. The closest records to the site were for Daubenton's bat, noctule and soprano pipistrelle, and all dated from 2011. The most recent records returned were for Daubenton's bat, common pipistrelle, soprano pipistrelle and serotine, all dating from 2012 and from a location 5.6km from the Proposed Scheme.

3.2 Automated surveys

3.2.1 Table 3 and Table 10 summarise the results for each automatic detector location and elevation across the 2013 survey period. See Figure 2 for locations of Trees 1, 2, 3 and 4.

Table 3: Location 1 ground level

Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring										
		Common pipistrelle	Soprano pipistrelle	Nathusius' pipistrelle	Pipistrelle species	Myotis species	Brown long-eared bat	Barbastelle	Noctule	Leisler's bat	Serotine	Large bat
18 April 2013 – 30 April 2013	13	2234	1123	141		7			16	3		14
01 May 2013 – 06 May 2013	6	2935	2662	672		4			45			
09 May 2013 – 15 May 2013	7	1840	852	1		4			19	1		
21 May 2013 – 28 May 2013	7	502	414			8			6			

3.2.2 High levels of activity were recorded for both common and soprano pipistrelle during 2013. Peak activity for common pipistrelle was in May with a peak count of 2935 ppn. Soprano pipistrelle activity was high in all sampling periods, rising in May to a peak count of 2662 ppn. High levels of activity were also recorded for Nathusius' pipistrelle (*Pipistrellus nathusii)* in April and May 2013, with peak counts of 141 and 672 ppn, respectively. *Myotis* species were recorded at low levels of activity during both April and May 2013. Moderate activity levels of noctule bats and low levels of Leisler's bats were recorded, with peak counts of 45 ppn and three ppn, respectively. *Nyctalus/Eptesicus* bat were recorded in low numbers during April 2013.

Table 4: Location 1 canopy level

Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring										
		Common pipistrelle	Soprano pipistrelle	Nathusius' pipistrelle	Pipistrelle species	Myotis species	Brown long-eared bat	Barbastelle	Noctule	Leisler's bat	Serotine	Large bat
18 April 2013	1		3		1				59			
24 April 2013 – 26 April 2013	3	1862	553	18	271	1			4			2
01 May 2013 – 06 May 2013	6	3195	1900		835	3			93	2	8	
09 May 2013 – 15 May 2013	7	8	2									
16 May 2013 – 21 May 2013	6	33	10						1			

3.2.3 Very high levels of common and soprano pipistrelle activity were recorded at the canopy level. Higher passes for common pipistrelles were recorded at canopy level compared to records at ground level, whereas the reverse was observed for soprano pipistrelle bats. *Myotis* species bats were active at low levels in both April and May 2013. Higher activity levels of noctules were recorded during May 2013 than in April 2013, along with small numbers of Leisler's and serotine bats. Low levels of *Nyctalus/Eptesicus* bat were also recorded during April 2013.

Table 5: Location 2 ground level

Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring										
		Common pipistrelle	Soprano pipistrelle	Nathusius' pipistrelle	Pipistrelle species	Myotis species	Brown long-eared bat	Barbastelle	Noctule	Leisler's bat	Serotine	Large bat
18 April 2013 – 29 April 2013	11	2139	2842	84		4			84	16	1	
01 May 2013 - 06 May 2013	6	1949	1174	549	9	5			25	5	4	107
09 May 2013 – 14 May 2013	6	62	84									1
21 May 2013 – 25 May 2013	4	2	20									

3.2.4 High levels of activity were recorded for all three pipistrelle species during 2013. Peak of activity for common and soprano pipistrelles was observed during April, whereas Nathusius' pipistrelle activity was greatest during May with a peak count of 549 ppn. Low activity for *Myotis* species bat was recorded in both April and May. High levels of activity for Noctule bats and low levels for Leisler's bat were recorded during April, whereas lower levels were recorded for both species during May. Higher levels of activity for indeterminate *Nyctalus/ Eptesicus* bats were also recorded during May.

Table 6: Location 2 canopy level

Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring										
		Common pipistrelle	Soprano pipistrelle	Nathusius' pipistrelle	Pipistrelle species	*Myotis* species	Brown long-eared bat	Barbastelle	Noctule	Leisler's bat	Serotine	Large bat
24 April 2013 – 28 April 2013	5	1859	1097	107	33	4		3	164		2	206
01 May 2013 – 04 May 2013	4	2233	1983	60	12	13		1	7	6	1	281
09 May 2013 – 15 May 2013	7	1485	913	1	20	6			16	5	1	297
16 May 2013 – 22 May 2013	7	1739	285	19	37	1		2	29		1	17

3.2.5 High levels of activity were recorded for all three pipistrelle species at canopy level during 2013. Peak of activity for common and soprano pipistrelles was recorded in May with 2233 and 1983 ppn respectively. Nathusius' pipistrelles activity was highest in April with 107 ppn. Low to moderate levels of *Myotis* species bat activity was recorded in April and May. Small numbers of barbastelle and serotine bats were observed in April and May, and noctule bats were also recorded in both months with the peak of activity recorded for this species in April. *Nyctalus/Eptesicus* bats were also seen to be highly active during both April and May 2013.

Table 7: Location 3 ground level

Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring										
		Common pipistrelle	Soprano pipistrelle	Nathusius' pipistrelle	Pipistrelle species	*Myotis* species	Brown long-eared bat	Barbastelle	Noctule	Leisler's bat	Serotine	Large bat
04 June 2013 – 05 June 2013	1	573	507			191		1				
11 June 2013 – 20 June 2013	10	327	166	1		56		1	3		1	
03 July 2013 – 10 July 2013	7	8	201			1		1				

3.2.6 Moderate to high levels of soprano and common pipistrelles were recorded at this location with peaks of 573 and 507 ppn, respectively. High numbers of *Myotis* species were also recorded with a peak count of 191 ppn. Low numbers of barbastelle, noctule and serotine calls were recorded. Lower numbers of Nathusius' pipistrelle calls were recorded at this location adjacent to Broadwater Lake. This is compared with the other static detector monitoring locations within the woodlands and in more sheltered locations by the lake. During June 2013, low numbers of noctule bats and a single serotine bat were recorded.

Table 8: Location 3 canopy level

Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring										
		Common pipistrelle	Soprano pipistrelle	Nathusius' pipistrelle	Pipistrelle species	*Myotis* species	Brown long-eared bat	Barbastelle	Noctule	Leisler's bat	Serotine	Large bat
04 June 2013 – 10 June 2013	6	222	72			23						12
10 July 2013 – 16 July 2013	7	89	123			15						15

3.2.7 Moderate numbers of common and soprano pipistrelles were recorded at this location with peak counts of 222 and 123 ppn respectively. Moderate to low numbers of *Myotis* and *Nyctalus/Eptesicus* species bats were also recorded with peak counts of 23 and 15 ppn respectively. The activity levels for each species were generally lower compared with the static detector located at Tree 4.

Table 9: Location 9 ground level

Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring										
		Common pipistrelle	Soprano pipistrelle	Nathusius' pipistrelle	Pipistrelle species	*Myotis* species	Brown long-eared bat	Barbastelle	Noctule	Leisler's bat	Serotine	Large bat
11 June 2013 – 19 June 2013	9	225	69	2		1			18			
03 July 2013 – 09 July 2013	7	808	590	29		38			81			

3.2.8 Common, soprano and Nathusius' pipistrelles, noctule bats and *Myotis* species were recorded in similar numbers at both ground level and canopy level. Peak counts for these species at ground level were 808, 590, 29, 81 and 38 ppn respectively. The key difference at this height compared with canopy level is that of barbastelle bat calls recorded. At ground level no barbastelle bats were recorded, whereas at the canopy level moderate activity was recorded, with a peak count of 14 ppn.

Table 10: Location 4 canopy level

Date (night monitoring commenced to night monitoring ceased)	Number of nights detector deployed	Species peak night count during monthly monitoring										
		Common pipistrelle	Soprano pipistrelle	Nathusius' pipistrelle	Pipistrelle species	*Myotis* species	Brown log-eared bat	Barbastelle	Noctule	Leisler's bat	Serotine	Large bat
04 June 2013 – 10 June 2013	7	1547	600	6		29		14	238			
03 July 2013 – 09 July 2013	7	63	189	2		1		2	4			

3.2.9 Common and soprano pipistrelles were recorded in high numbers, whereas Nathusius' pipistrelles were recorded at comparatively lower numbers than at other locations and heights in the Mid-Colne Valley SSSI. Moderate levels of *Myotis* species activity and moderate levels of barbastelle bat activity were also recorded with peak counts of 29 and 14 ppn respectively. The barbastelle bat activity was comparatively higher at this location than at any other location or height in the Mid-Colne Valley SSSI. High levels of noctule bats were recorded during the June sampling period with peak night counts of 238 ppn. However, this species was recorded at considerably lower activity levels during July with a peak count of only four ppn.

3.3 Transect survey

Table 11: Total species pass counts for each activity transect survey during 2013

Date (night monitoring commenced to night monitoring ceased)	Total species passes during transect survey										
	Common pipistrelle	Soprano pipistrelle	Nathusius' pipistrelle	Pipistrelle species	*Myotis* species	Brown long-eared bat	Barbastelle	Noctule	Leisler's bat	Serotine	Large bat
Visit 1: Dusk 18 April 2013	64	164	1	1	12						1
Visit 2: Dusk 20 May 2013				7	2			8			
Visit 3: Dawn 21 May 2013	15							6			
Visit 4: Dusk 26 June 2013	72	319	112	53	24		2				4
Visit 5: Dawn 27 June 2013	111	239	6	10	3			1	6		
Visit 6: Dusk 04 July 2013	4	30			16	3					
Visit 7:Dawn 05 July 2013	10	23			6	1					3
Visit 8: Dusk 17 July 2013	22	138	3	36	60					4	
Visit 9: Dawn 18 July 2013	11	103	2		14			1		3	

3.3.1 Activity transect data recorded common, soprano and Nathusius' pipistrelle bats in high numbers throughout the 2013 season with peak counts of 111 common pipistrelle, 319 soprano pipistrelle and 112 Nathusius' pipistrelle passes per night (ppn). Moderate numbers of *Myotis* species were recorded with a peak count of 60 ppn. Low to moderate numbers of noctules were recorded with a peak count of 10 ppn. Moderate to low numbers of serotine, Leisler's and brown long-eared bats were recorded. Further to this, two barbastelle passes were recorded during one activity transect in June 2013.

3.3.2 A large proportion of the bat activity recorded was not observed. Where observed, *Myotis* and *Pipistrellus* species bats were foraging and commuting over the lakes and along the River Colne. No Nyctalus or serotine activity was observed.

3.4 Trapping

3.4.1 A total of 39 bats were captured over the trapping surveys on 4 June, 2 and 12 September 2013. Bats of seven different species were captured, these were:

- whiskered bat (*Myotis mystacinus*);
- Natterer's bat (*Myotis nattererii*);
- common pipistrelle (*Pipistrellus pipistrellus*);
- soprano pipistrelle (*Pipistrellus pygmaeus*);
- Daubenton's bat (*Myotis daubentonii*);
- noctule bat (*Nyctalus noctula*); and
- brown long-eared bat (*Plecotus auritus*).

3.4.2 During the trapping survey on 4 June 2013, nine bats were captured. Eight of these bats were Daubenton's bat and one was a soprano pipistrelle. During the two surveys conducted on 2 and 12 September 2013, 30 bats were captured. 12 of these bats were Daubenton's and seven were soprano pipistrelle. The other 11 bats consisted of four Natterer's bats, two whiskered bats, two common pipistrelle, one brown long-eared bat and two noctules

3.4.3 The two noctule bats were captured on 12 September 2013. Both bats were female, one was a post-lactating adult and the other was a juvenile. The two noctules were fitted with radio-transmitters. All other bats were released close to the area of capture. Biometric data for all captured bats was recorded and detailed in Table 12.

Table 12: Biometric data

Date	Species	Sex	Age	Breeding Status	Weight	Forearm
4.6.13	M.dau	F	Adult	Pregnant	13.25	39.27
4.6.13	P.pyg	M	Adult	Mature	4.00	30.92
4.6.13	M.dau	F	Adult	Pregnant	13.00	38.85

Date	Species	Sex	Age	Breeding Status	Weight	Forearm
4.6.13	M.dau	F	Immature	Non-breeding	9.00	36.52
4.6.13	M.dau	F	Immature	Non-breeding	8.00	38.17
4.6.13	M.dau	M	Adult	Mature	8.00	39.39
4.6.13	M.dau	F	Adult	Non-breeding	8.00	38.23
4.6.13	M.dau	F	Adult	Pregnant	12.50	35.68
4.6.13	M.dau	M	Adult	Mature	9.00	38.47
2.9.13	M.nat	F	Adult	Post-lactating	9.00	40.12
2.9.13	M.nat	F	Adult	Post-lactating	9.50	38.67
2.9.13	M.dau	M	Adult	Post-lactating	11.00	39.22
2.9.13	M.dau	M	Adult	Non-breeding	11.50	38.61
2.9.13	M.dau	M	Juvenile	Immature	8.50	36.97
2.9.13	M.dau	F	Adult	Mature	9.50	38.21
2.9.13	P.aur	M	Adult	Immature	8.50	37.22
2.9.13	P.nat	M	Adult	Mature	9.50	40.98
2.9.13	P.pyg	M	Adult	Mature	5.50	32.41
2.9.13	P.pyg	F	Adult	Post-lactating	5.50	31.97
2.9.13	P.pyg	M	Juvenile	Immature	4.50	30.58
2.9.13	P.pyg	M	Juvenile	Immature	5.00	31.94
12.9.13	N.noc	F	Adult	Post-lactating	35.50	51.26
12.9.13	N.noc	F	Juvenile	Immature	28.50	46.92
12.9.13	M.dau	F	Adult	Post-lactating	10.50	41.92
12.9.13	M.dau	F	Adult	Post-lactating	9.75	40.01
12.9.13	M.dau	M	Adult	Immature	9.00	38.77
12.9.13	P.pyg	M	Adult	Mature	5.75	32.33
12.9.13	P.pip	M	Adult	Mature	5.25	30.94
12.9.13	M.mys	M	Adult	Mature	6.75	34.66
12.9.13	M.mys	M	Juvenile	Immature	5.75	34.22
12.9.13	P.pip	M	Juvenile	Immature	5.25	33.92
12.9.13	P.pyg	M	Juvenile	Immature	5.25	31.22
12.9.13	M.dau	M	Adult	Mature	9.50	39.66
12.9.13	M.nat	M	Adult	Immature	8.50	38.11
12.9.13	M.dau	F	Juvenile	Immature	9.00	37.65

Date	Species	Sex	Age	Breeding Status	Weight	Forearm
12.9.13	M.dau	F	Juvenile	Immature	8.75	37.92
12.9.13	M.dau	F	Juvenile	Immature	9.65	36.95
12.9.13	M.dau	M	Adult	Mature	10.50	38.14
12.9.13	P.pyg	M	Adult	Mature	6.00	33.25

3.5 Radio-tracking

3.5.1 The two female noctule bats fitted with radio-transmitters were radio-tracked in order to determine roosting locations, foraging locations and flightlines between roosts and foraging sites.

3.5.2 After the bats were released, one crossed the site and foraged in south Buckinghamshire and the other could not be found. Neither of the radio-tagged bats were traced again during the first two days after capture.

3.5.3 On the third day after capture, 15 September 2013, each bat was found to be using a different tree roost within Whippendell Woods, approximately 7km north of the trapping site. The two roosts were situated at OS National Grid references TQ 07715 98093 and TQ 08008 97622. High levels of noctule bat activity was observed in the vicinity of the roosts at emergence time, but precise emergence points could not be identified and accurate exit counts were not achievable. One of the bats flew north-west from Whippendell Woods, crossed the M25 and was lost. The second bat flew south-west from Whippendell Woods and was traced briefly south of Gerrard's Cross.

4 Discussion

4.1 Data search

4.1.1 The data search results identified six species of bat within the wider surroundings of the area, all of which were subsequently identified within the survey area during automated detector surveys, activity transect surveys or trapping surveys. The assemblage includes nationally common species, most of which are widespread in the UK (BCT 2011). The exception was serotine bat species that is uncommon and restricted to the south of the UK. Field survey data from the 2011 National Bat Monitoring Programme suggests that numbers of all six species are stable or increasing (BCT, 2012).

4.2 Automated recorder surveys

4.2.1 The automated detector survey was designed to compare levels of bat activity at ground level and at canopy level, and the survey results indicate that the patterns of activity differ according to species. Common and soprano pipistrelle passes constituted a large proportion of the total number of calls. Common pipistrelle activity levels was high at both ground level and canopy level but were generally greatest at canopy level indicating use of a large height range, including those that will be occupied by the proposed viaduct.

4.2.2 Soprano pipistrelle and Nathusius' pipistrelle demonstrated the opposite pattern of canopy use to common pipistrelles with highest peak counts at ground level. Although both species were recorded at both recording heights, the results give a strong indication that these species predominantly utilise lower elevations, below the height of the proposed viaduct.

4.2.3 *Myotis* and barbastelle activity was recorded at such low levels throughout the survey period and area, that it is not possible to draw any conclusions regarding their preferred forgaing and commuting heights.

4.2.4 The *Pipistrellus*, *Myotis* and barbastella genera in the UK comprise small, agile bat species that forage and commute in both cluttered and open environments, including woodland and over water (Russ, 2012). These species are likely to be active in the vicinity of the Proposed Scheme.

4.2.5 The highest peak counts for noctules were recorded at canopy level. Leisler's bat and serotine activity were recorded in very low numbers and the pattern of peak counts did not indicate a clear tendency for either species to fly more at ground or canopy level. However, when the peak pass counts for these two species are considered along with those passes identified only to Nyctalus or Eptesicus, there is an indication that these species predominantly fly at canopy level.

4.3 Activity transect surveys

4.3.1 At least nine bat species were recorded and/or observed in flight during the activity transect surveys. These included *Myotis* species, common, soprano and Nathusius' pipistrelles, brown long-eared bat, barbastelle, noctule, Leisler's bat and serotine. High levels of activity by common and soprano pipistrelle bats and *Myotis* bats were recorded throughout the survey area. However, activity appeared slightly more concentrated in the southern parts of this area. Nathusius' pipistrelles were also recorded commuting along the River Colne. Low numbers of passes by noctules, Leisler's bats and possibly serotines were also recorded in the south and west of the survey area.

4.4 Trapping surveys

4.4.1 Trapping surveys captured a total of 39 bats of seven different species. Of the bat species assemblage identified from the automated surveys and the activity transect surveys, Nathusius' pipistrelle, barbastelle, Leisler's bat and serotine were not captured. Species of the *Myotis* genus confirmed as present on the site by the trapping survey were Daubenton's bat, whiskered bat and Natterer's bat.

4.4.2 The results of the trapping surveys indicate that Daubenton's bat and soprano pipistrelle are abundant within the survey area, and that a greater variety of species use this area later in the season. Three harp traps and acoustic lures were deployed during the trapping survey on 4 June 2013. The same equipment, with the addition of a triple-height mist net was deployed during the trapping surveys on 2 and 12 September 2013. A greater range of species were The additional equipment used during September 2013 may have increased capture rates but broadly confirmed the findings of the automated detector surveys and activity transect surveys, with regard to the species assemblage present in the survey area.

4.5 Radio tracking surveys

4.5.1 The trapping survey captured two noctule bats that were only traced on the final day of tracking. The only roosts the bats were found to use within the wider surroundings of the survey area were within Whippendell Woods, approximately 7km to the north. Neither bat was confirmed as flying within the survey area again, although one bat did fly south-west from Whippendell Woods to forage south of Gerrard's Cross, close to the Mid-Colne Valley SSSI. These results indicate that this fast-flying species is wide-ranging and that the Mid-Colne Valley SSSI constitutes only a small proportion of their foraging area.

4.6 Overview

4.6.1 In addition to providing baseline data on the bat assemblage within the Mid-Colne Valley SSSI, the primary aim of the study was to obtain data on the use of the site by Nyctalus species bats. No Nyctalus species roosts were identified within the survey

area. It was confirmed that both noctules and Leisler's bats use the site, and that noctules predominantly fly at canopy height as opposed to near ground level.

5 References

Battersby, J. (Ed) & Tracking Mammals Partnership (2005), *UK Mammals: Species Status and Population Trends. First Report by the Tracking Mammals Partnership.* JNCC/Tracking Mammals Partnership, Peterborough.

BCT (2012) *National Bat Monitoring Programme – Annual Report 2011*. Bat Conservation Trust, London.

BCT (2010), *Leisler's Bat Factsheet*. Bat Conservation Trust, London.

BCT (2010), *Noctule Factsheet*. Bat Conservation Trust, London.

BCT (2011), *The state of the UK's bats.* Bat Conservation Trust, London.

Russ, J. (2012), *British Bat Calls: A Guide to Species Identification*. Pelagic Publishing, Exeter.