

A47 North Tuddenham to Easton Dualling

Scheme Number: TR010038

Volume 6

6.3 Environmental Statement Appendices

Appendix 8.13 - Bat Crossing Point Report

APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed
Forms and Procedure) Regulations 2009

March 2021

Infrastructure Planning

Planning Act 2008

**The Infrastructure Planning
(Applications: Prescribed Forms and
Procedure) Regulations 2009**

The A47 North Tuddenham to Easton
Development Consent Order 202[x]

ENVIRONMENTAL STATEMENT APPENDICES
Appendix 8.13 - Bat Crossing Point Report

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1. Scheme introduction

1.1. Background

1.1.1. In June 2020 Sweco UK Ltd was commissioned by Highways England to undertake bat activity crossing point surveys between North Tuddenham and Easton on the A47 in line with the Road Investment Strategy announced in 2014 (Highways England 2014). This is to inform the Environmental Statement (ES) Chapter for the A47 North Tuddenham to Easton Dualling Scheme.

1.2. Scheme description and location

1.2.1. The A47 from North Tuddenham to Easton, comprising a single carriageway, is located approximately 10km to the west of Norwich and forms part of the main arterial highway route connecting Norwich and King's Lynn. The route currently experiences delays and high levels of congestion during peak hours. The situation is predicted to become worse with the proposed growth in residential development.

1.2.2. It is proposed to upgrade the existing 8.7km section of single carriageway between North Tuddenham and Easton to a dual carriageway. The new section of dual carriageway, with junction improvements, is proposed to be constructed to the north and south of the existing carriageway. This scheme will be referred to as the 'Proposed Scheme'.

1.2.3. The Proposed Scheme is considered to be a Nationally Significant Infrastructure Project (NSIP) under the Planning Act 2008 and therefore requires a Development Consent Order (DCO), issued by the Secretary of State, before construction and operation can commence.

1.2.4. The Proposed Scheme improvements will:

- improve accessibility to and around the region, reducing congestion and delays to enable more reliable journey times
- improve safety performance for all road users, contributing to a 40% reduction target in accidents across Highways England's roads over the implemented schemes' first five years in operation
- provide alternative access to local roads
- improve the environmental impacts of traffic along the A47 route, particularly for the communities of the six scheme areas
- support economic growth in the Peterborough, Norwich and Great Yarmouth areas by improving overall road capacity

2. Ecological background

2.1. Previous studies

Desk study

2.1.1. A desk study previously undertaken in 2016 included the purchase of bat records within 10km of the Proposed Scheme at the route options stage (where four route options were under consideration). In total 177 records of known bat roosts were returned for 10 species. Activity records were also received. Records were returned for the following species: Daubenton's *Myotis daubentonii*, Natterer's *Myotis nattereri*, whiskered/Brandt's *Myotis mystacinus/brandtii*, noctule *Nyctalus noctula*, serotine *Eptesicus serotinus*, common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus*, Nathusius' pipistrelle *Pipistrellus nathusii*, brown long-eared *Plecotus auritus* and barbastelle *Barbastella barbastellus*.

Phase 1 habitat surveys

2.1.2. During a previously undertaken Preliminary Ecological Appraisal (PEA) undertaken in 2016, at which stage four route options were being considered, the site was assessed as having 'high' suitability to support foraging and commuting bats. Habitats identified during the associated phase 1 habitat survey undertaken in 2016 include broadleaved and mixed semi-natural woodland, broadleaved plantation woodland, running water and hedgerows which would offer foraging and commuting opportunities for bats.

Phase 2 bat surveys

2.1.3. Activity surveys undertaken in 2019 identified the following species within the 'study area' (the Proposed DCO boundary and a 500m buffer): common, soprano and Nathusius' pipistrelle, noctule, brown long-eared, Leislars, Daubenton's, Natterer's, serotine and barbastelle. The surveys identified a requirement for crossing point surveys at the following locations where high levels of bat activity were recorded in both transect and static data:

- The Church Lane/A47 junction
- The Wood Lane/Berry's Lane/A47 junction
- Near to the A47/Taverham Road junction at the end of the trackway on Easton Estate.

2.1.4. Activity surveys previously undertaken in 2017 identified high levels of bat activity along the following inear features: Mattishall Lane, Church Lane, Mattishall Road, Norwich Road and Berry's Lane (WYG, 2017). In addition high levels of bat activity were recorded in the following areas:

- The woodland west of Taverham Road
- Honingham
- South of the A47 east of Blind Lane
- Sewarge Farm
- South of the A47 between Berry's Lane and Mattishall Lane
- North of the A47 between Taverham Road and Ringland Road

2.1.5. The following species were identified during the activity surveys undertaken in 2017; common, soprano and Nathusius' pipistrelle, noctule, brown long-eared, Leislers, Myotis sp., serotine and barbastelle.

2.1.6. Bat roost appraisal and dusk emergence/dawn re-entry surveys previously undertaken in 2017 and 2019 have identified a number of roosts within the PCF Stage 3 Proposed Scheme and 50m 'study area' for bat roosts, at the following locations:

- St Andrew's Church, Honingham
- St Peter's Church, Easton
- Church House Farm, off Taverham Road
- Oak Farm, Mattishall
- 16 trees

2.1.7. Further dusk emergence/dawn re-entry surveys undertaken in 2020 have identified confirmed bat roosts in a further five trees along the access drive to Hall Farm and potential bat roosts in a further two trees. All roosts found were day roosts of one or a few common pipistrelle, soprano pipistrelle, unidentified bat and brown long-eared bats. The closest barbastelle roost to the Proposed Scheme is approximately 1.3km north in Foxburrow Plantation. This is within the 6km core sustainance zone of this species (Collins, 2016).

2.2. Legislation

2.2.1. All UK species of bat are protected under Schedule 5 of the Wildlife and Countryside Act (WCA) 1981 (as amended), making it an offence to:

- damage or destroy a bat roost (whether or not occupied by bats at the time)
- intentionally or recklessly obstruct access to a bat roost
- intentionally or recklessly disturb a bat in its roost, or deliberately disturb a group of bats
- deliberately kill, injure or take any bat

- 2.2.2. In addition, all UK species of bat are European Protected Species (EPS) afforded protection under Section 2 of the Conservation of Habitats and Species Regulations (CHSR) 2017, Regulation 42.
- 2.2.3. Seven species of bat (soprano pipistrelle, brown long-eared bat, greater horseshoe bat *Rhinolophus ferrumequinum*, lesser horseshoe bat, *Rhinolophus hipposideros*, barbastelle, Bechstein's bat *Myotis bechsteinii* and noctule) are listed as priority species for conservation under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006. The S41 list is used to guide decision-makers such as public bodies including local and regional authorities, when carrying out their normal (e.g. planning) functions.
- 2.2.4. Local Biodiversity Action Plans (LBAP) identify habitat and species conservation priorities at a local level (typically at the County level) and are usually drawn up by a consortium of local government organisations and conservation charities. Soprano pipistrelle, brown long-eared bat, barbastelle and noctule bats are included in the Norfolk Biodiversity Action Plan Strategy.
- 2.2.5. For full details on relevant legislation and policy refer to Annex A.

2.3. Aims and objectives

- 2.3.1. The aim of the commissioned bat activity crossing points survey and this report are to:
- Identify the main points of the A47 carriageway at which bats cross the carriageway ('crossing points')
 - Identify the species and if any rare bats (barbastelle) are using the A47 to cross over
 - Assess whether bats are crossing the road at safe heights or whether they are likely to collide with traffic
 - Assess whether bats repeatedly use the same points to cross the road
 - Assess the likely impacts upon commuting bats crossing the A47 carriageway as a result of the Proposed Scheme
 - Provide instructions for advised mitigation with regards to commuting (and foraging) bats to be incorporated into the Proposed Scheme design.
- 2.3.2. The bat activity crossing points survey will build on the bat activity surveys previously undertaken in 2017 and 2019 focusing on potential areas where bats cross the current A47 as indicated by the previous activity surveys results.

3. Methodology

3.1. Field surveys

- 3.1.1. As bat activity crossing point surveys are a project-specific requirement which are likely to be necessary only on linear schemes of a certain scale, guidance in Collins (2016) is limited. As such guidance has been taken from 'Appendix G. Local effects of transport infrastructure & mitigation: best practice survey protocol and data analysis' of 'WC1060 Development of a Cost Effective Method for Monitoring the Effectiveness of Mitigation for Bats Crossing Linear Transport Infrastructure' (Berthinussen and Altringham, 2015) and 'Fumbling in the dark – effectiveness of bat mitigation measures on roads, Bat mitigation measures on roads – a guideline (Elmeros *et al.*, 2016).
- 3.1.2. Sections of the current A47 were chosen for further investigation as potential bat crossing points based on the following:
- The results of the previous bat activity surveys undertaken in 2017, 2019 and April 2020
 - The results of bat roost surveys previously undertaken in 2017, 2019 and 2020
 - The Proposed Scheme design
 - Current linear features on site including hedgerows and roads perpendicular to the A47
- 3.1.3. Table 3.1-1 below details the locations of the eleven potential crossing points chosen for further investigation and justifications for their selection. The five locations for the initial two surveys were chosen because the scheme design would cause the most impact to commuting landscape in those locations, where a bat had been noted to cross the road in the previous activity or emergence surveys or where barbastelle calls had been recorded on static detectors or in surveys.
- 3.1.4. The perpendicular hedgerows, woodland edges and linear features that would be bisected by the proposed scheme were locations that were subject to scoping. There are thirteen of these and eleven were subject to crossing point surveys. The other two had very little bat activity during the walked transect surveys and no roosts near them. One is semi-distant between the Blind Lane and Taverham Road junction and Easton roundabout which was scoped out as low bat activity along this feature was only recorded in two of the 18 walked transect surveys; the other was to the east of Honingham, just west of the roundabout with Norwich Road. This location had a lot of bat activity from common pipistrelle and noctule on one occasion out of 18 visits. All other hedgerows that would be impacted by the Proposed Scheme were looked at and

had no bats recorded commuting or foraging along them during the 2019 activity surveys. See Annex B for a figure showing the surveyed crossing points and Appendix 8.12: Bat Roost Survey Report.

3.1.5. Table 3.1-1 below details the locations of the potential crossing points chosen for further investigation and justifications for their selection. See Annex B for a drawing of the surveyed crossing points.

Table 3.1-1: locations of the crossing point surveys and justification for their selection for survey

Crossing point	Approximate grid reference and location description	Justification for selection for survey
1	TG 06221 13521 A point east of the Fox Lane junction and Poppy's Wood where the cycle path meets parallel to the A47 on the north and Oak Farm driveway meets the A47 on the south.	A bat roost was identified in [REDACTED] of the crossing point during 2019 surveys. The linear feature of the driveway and cycle path may act as a commuting route for bats connecting habitats to the south of the road to the Poppy's Wood on the north which has potential as a foraging resource.
2	TG 06764 13293 A point west of Hockering where Low Road meets the A47 on the south and an unnamed lane meets the A47 on the north.	The linear feature of the unnamed road and Low Road may act as a commuting corridor for bats to cross the A47. Relatively smaller numbers of bats, primarily common and soprano pipistrelles, were recorded along the A47 and the unnamed road during the 2019 activity surveys. Common pipistrelle and noctule were recorded on numerous occasions on Oak Road.
3	TG 07202 13026 A point south-west of Hockering where The Street meets the A47 on the north	High levels of bat activity were recorded along Mattishall Lane (slightly to the west of the crossing point) during the activity surveys undertaken in 2017. Relatively small amounts of pipistrelle activity were recorded further south on Mattishall Lane during the 2019 activity surveys. The linear features of The Street and Mattishall Lane may connect habitats to the north of the A47 with the woodland areas further south of the A47 which provide a potential foraging resource.
4	TG 07917 12874 A point south-east of Hockering where an unnamed road meets the A47 on the south and The Street meets the A47 on the north.	[REDACTED], adjacent to the unnamed road to the south of the A47, was identified as an area of high bat activity during the 2017 activity surveys. During the 2019 activity surveys a relatively high level of bat activity was recorded in on the edges of the woodland block adjacent to the south of the A47 at this location and along the River Tud to the south-east. Three roosts within trees [REDACTED] unnamed road to the south of the A47 where identified during surveys undertaken in 2019.
5	TG 08799 12596	During the activity surveys undertaken in 2019 a high level of common and soprano pipistrelle

Crossing point	Approximate grid reference and location description	Justification for selection for survey
	The Church Lane/Sandy Lane/A47 junction	activity was recorded both north and south of this location. The linear landscape features of Sandy Lane and Church Lane may act as a commuting corridor for bats, connecting the woodland parcels to the north and south of the A47.
6	TG 09751 12213 The Berry's Lane/Wood Lane/A47 junction	During the activity surveys undertaken in 2019 high levels of bat activity were recorded near this crossing point and crossing point surveys were suggested. This junction is where the Norwich Western Link Road is proposed to meet the A47 and the Proposed Scheme includes the construction of a new large junction here including two roundabouts. As such it is considered necessary to determine if and how bats use the road here.
7	TG 10512 11891 A point north-east of Honingham where the Easton Estates lane meets the A47 on the north and Hall Drive meets the A47 on the south.	During bat roost emergence/re-entry surveys undertaken in 2019 a high level of pipistrelle activity was noted on [REDACTED]
8	TG 10606 11831 A point north-east of Honingham where the river Tud crosses the A47.	The River Tud as a linear feature provides both a good foraging and commuting habitat for bats.
9	TG 11541 11180 A point east of St Andrew's Church and west of Taverham Road.	During surveys undertaken in 2017 and 2019 bat roosts were identified [REDACTED] crossing point. Activity surveys undertaken in 2017 identified the woodland to the north of the crossing point as an area of high bat activity and barbastelle calls heard shortly after sunset in the woodland. It was concluded there was a potential barbastelle roost nearby this location.
10	TG 11819 11177 The Taverham Road/Blind Lane/A47 junction.	Bat roosts (three in total) were identified at [REDACTED] during 2019 surveys, in addition to a tree roost to [REDACTED] of the crossing point. The 2019 activity surveys identified a very high level of multi-species bat activity within the woodland, and along the woodland edge, to the north east of the crossing point location. Barbastelle activity was relatively high in this woodland. The 2017 activity surveys identified an area of high bat activity to the north of the A47 between Taverham Road and Ringland Road and in the woodland to the north-west of the crossing point. In addition, barbastelle bats were heard in this woodland shortly after sunset during 2017 surveys and it was concluded there was potentially a roost nearby. The Proposed Scheme includes the construction of a large junction to the south of the current A47 route in this location.

Crossing point	Approximate grid reference and location description	Justification for selection for survey
11	TG 12691 11002 A point east of Taverham Road and west of Easton where a field entry meets the A47 on the north and a layby is on the south.	During surveys undertaken in 2019 a bat roost was identified within a tree [REDACTED] of the crossing point. Bat roosts were identified [REDACTED] of the crossing point during 2019 surveys, one of which was also previously identified during 2017 surveys. During 2019 surveys bat activity was identified along the field margins to the north and north-east of the crossing point including barbastelle activity.

3.1.6. During the surveys undertaken in 2020 one surveyor was positioned at either side of the A47 at the crossing point. They were equipped with a full spectrum bat detector (Anabat Walkabout) to aid detection of bats and made notes of the times and locations of bat calls and any bat activity that had been seen or heard (commuting, foraging or social calls). Particular attention was paid to bats crossing the A47, with flight height and direction recorded. The locations of the origins of the bat calls were plotted on a map. Bat calls were recorded in full spectrum format using the Anabat Walkabout detector for later analysis using Anabat Insight and AnalookW analysis software. The recordings and the field notes were used to help identify any bats crossing the A47, and the point of crossing, by comparing the notes of surveyors at each side of the A47.

3.1.7. Annex B contains a map of the surveyed crossing points.

3.2. Survey timings and weather conditions

3.2.1. The optimal survey season for undertaking bat activity surveys is between June to August, inclusive (Berthinussen and Altringham, 2015). The months of May and September are considered sub-optimal for survey, though acceptable with suitable weather conditions upon the professional judgement of the licensed ecologist (Berthinussen and Altringham, 2015).

3.2.2. Survey effort was based upon guidelines in Berthinussen and Altringham (2015) and upon research undertaken on barbastelle bats in the area for the Norwich Western Link Road (NWLR). Two surveys were undertaken at each potential crossing point with different survey times and lengths to target different species. ‘Survey one’ comprised a 1.5-hour dusk and 1-hour dawn undertaken on the same night. Dusk surveys started 15 minutes before sunset and ended 1-hour 15 minutes after sunset. Dawn surveys started 1-hour before sunrise and ended at sunrise. These surveys targeted earlier emerging species (such as pipistrelle species) which may sometimes emerge before sunset. After consultation with Norfolk County Council and the NWLR ecologists, and an email to the author of the methodology, it was decided to adapt the methodology to encompass late

emerging barbastelle bats. 'Survey two' comprised a 2.5-hour dusk survey starting at sunset and targeted later emerging species (such as the rare barbastelle bat). The research undertaken for the NWLR revealed that barbastelle bats in the area spend time foraging near the roost location after emerging and don't commute further afield until later in the evening. The two different surveys ensured that the early emerging pipistrelles and the late barbastelles were all taken into consideration.

- 3.2.3. At those potential crossing points where more than 10 bats (or 1-5 bats for rarer species) are recorded using a flight path across the A47 within one hour during either or both of the first two surveys undertaken, a further six 2.5-hour surveys were undertaken at that potential crossing point with at least three of all six further surveys being dusk surveys, in accordance with Berthinussen and Altringham (2015) and after consultation with Norfolk County Council and ecologists currently undertaking barbastelle bat surveys on the proposed Norwich Western Link Road (NWLR). The extension of survey length for all further surveys to 2.5 hours was used to maximise the potential for detecting the rarer barbastelle bat. The research undertaken for the NWLR revealed that barbastelle bats in the area spend time foraging near the roost location after emerging and don't commute further afield until later in the evening. Natural England was additionally consulted and raised no objection.
- 3.2.4. Crossing points one, seven, eight and nine were subject to further survey following the initial two surveys (see Section 4.2.1).
- 3.2.5. The use of the thermal imaging scope was proposed for a minimum of two of the six further surveys at each of the four chosen crossing points (one, seven, eight and nine) in order to have a visual observation of the bats in darker conditions and confirm whether the bats recorded on the detector were crossing the A47. A Pulsar Helion XP28 thermal imaging scope was used.
- 3.2.6. Species which are considered 'rare' for the above counts are those which are mentioned as such in Collins (2016) – the greater and lesser horseshoe, Bechstein's, barbastelle and grey long-eared – of which all except the latter are Annex II species under the Habitats Directive (1992 (the Council Directive 92/44/EEC)).
- 3.2.7. Berthinussen and Altringham (2015) recommend surveying at temperatures of 7°C and above at the start of the survey in dry conditions with wind speeds lower than 20km/h. All surveys were undertaken within the recommended weather conditions (see Table 1 below).
- 3.2.8. Surveys were undertaken by Diane Wood MCIEEM (Principal Ecologist, Sweco) who holds a level 2 Natural England bat class licence (registration number 2015-

13155-CLS-CLS), Chelsea Edwards (Senior Ecologist, Sweco) who holds a level 2 Natural England bat class licence (registration number 2018-33927-CLS-CLS), Ishbel Campbell ACIEEM (Senior Consultant Ecologist, Sweco), Beth Mell Grad CIEEM (Consultant Ecologist, Sweco), Lydia Waite (Ecology Field Assistant, Sweco), Lewis Gospel (Ecology Field Assistant, Sweco), Richard Webber-Salmon BSc (Hons) MCIEEM, Beck Harrington-Harding BSc (Hons) MCIEEM who holds a level 2 Natural England bat class licence (registration number 2020-49364-CLS-CLS), Alex Jackson MZool (Hons), Sophie Barrell MEdol (Hons) Grad CIEEM, Sam Wilson BSc (Hons) ACIEEM, Joshua Stafford BSc (Hons) Grad CIEEM, Jeremy Halls, Martin Brammah PhD MA (Cantab) BA (Hons) CEcol MCIEEM MRSB and Bench Ecology.

3.3. Limitations

- 3.3.1. The results of this survey will remain valid until September 2022. Beyond this period, if works have not commenced, it is recommended that a new review of the ecological conditions is undertaken (CIEEM, 2019).
- 3.3.2. The River Tud could not be surveyed at the location where the Proposed Scheme will bisect it. For health and safety reasons, the client would not allow surveyors to stand near the river at night. There were additional access restrictions to crossing point locations east of Wood Lane and north of the existing A47, as the landowner refused access to the whole area after 30 June 2020. The surveys were re-located to the nearest point at the existing A47. If bats will not cross the existing A47, they are unlikely to cross the wider Proposed Road.
- 3.3.3. During the surveys, surveyors were not allowed within 1.2m of the A47 as a health and safety measure. Due to the road verge at crossing point eight not being wide enough to allow surveyors to position there and safely survey adjacent to the live carriageway traffic management was employed on all surveys at crossing point eight. Surveyors were only allowed, with traffic management, to survey on the north side of the A47 and as such no surveyor was positioned on the south side of the A47. As the road itself (discounting the concrete verges of the bridge (over the River Tud)) is narrow here, approximately 8m, surveyors had a clear visual of bats across the full width of the road and as such this is not considered a significant limitation.
- 3.3.4. Several of the surveys at crossing point eight began late due to traffic management not being in place at the correct time. Dusk surveys on 17 August 2020, 18 August 2020, and 21 August 2020 began late with the latest survey on 21 August 2020 beginning 36 minutes after sunset as opposed to at sunset. As the design for further dusk surveys is a survey of 2.5-hour surveys commencing at sunset it is intended to allow for the recording of barbastelles and other late emerging species whilst also recording earlier emerging species such as common

and soprano pipistrelle. It is possible that surveys started late (after sunset) may miss instances of earlier emerging species crossing the A47.

- 3.3.5. During the initial surveys of crossing point one on 11 June 2020 and 20 July 2020, crossing point three on 1 July 2020 and crossing point seven on 12 June 2020 technical malfunctions with one of the surveyors detectors caused delays in the detectors recording bat passes; during the survey at crossing point three the start of recording was delayed by a significant amount of time (50 minutes). As such during each of these surveys bats were confirmed crossing visually however the species has not been possible to determine as there was no automated recording of the pass. These have been identified as 'undetected unidentified' crosses within Table 4.1-2 and Annex C.
- 3.3.6. During the surveys on 20 July 2020 at crossing point one surveyor one's detectors battery failed approximately 30 minutes prior to the end of the survey and at crossing point six one surveyor's detector battery failed approximately 1-hour 50 minutes prior to the end of the survey. No unidentified crosses have been recorded following the failure of the detector's batteries however, bat passes may have been missed.
- 3.3.7. Guidance states that a minimum of three of the further six surveys undertaken should be dusk surveys (see Section 3.2.3). The further surveys were planned for and undertaken in survey season 2020. Due to delays in surveys commencing and land access being arranged for the surveys due to COVID-19 restrictions it was not possible due to time and resourcing constraints to ensure each crossing point for further survey (one, seven, eight and nine) had a minimum of three dusk surveys. Crossing point eight did have three dusk surveys whilst crossing points one and seven each only had two and crossing point nine had one. Bats are generally more active just after sunset as opposed to before sunrise however as a number of dawn surveys recorded a high number of bats (4 August, 12 August and 18 August at crossing point seven and 18 August and 21 August at crossing point eight) this is not thought to be a constraint at these crossing points.
- 3.3.8. Due to resourcing issues associated with COVID-19 (see Section 3.3.7) two surveys were undertaken with only one surveyor (crossing point one on 13 August 2020 and crossing point eight on 19 August 2020). No bat crosses were identified at crossing point one during the survey on 13 August 2020 and it is possible that conformation of crossing was hindered by the lack of a second surveyor. Confirmed instances of bats crossing the A47 at crossing point eight were recorded on 13 August 2020.
- 3.3.9. In addition to the above surveys undertaken with one surveyor, survey one at crossing point six on 24 June 2020 was undertaken primarily with one surveyor on the north side of the A47. Due to unforeseen circumstances the second surveyor

was late and only began surveying on the south side of the A47 at approximately 22:16 approximately 1-hour 7-minutes late and 52-minutes after sunset. No potential crosses were identified during the survey, which ended at approximately 22:39. One confirmed cross was identified by surveyor two, however it is possible that crosses occurred during the first part of the survey which were missed.

- 3.3.10. The dawn survey of crossing point nine undertaken on 23 September 2020 was ended 21 minutes before sunrise due to heavy rainfall. Light rain had been occurring from approximately 30 minutes into the survey until the survey was terminated prematurely. As bats were recorded during the survey (five crosses in total) it is considered that bats were active despite the light rain and as such this survey is considered valid. The heavy rain would have also caught bats travelling back to roosts.
- 3.3.11. In order to visually observe bats and confirm whether they were crossing the A47, the use of a thermal imaging scope in a minimum of two of the six further surveys at crossing points one, seven, eight and nine was proposed (see Section 3.2.4).
- 3.3.12. However due to time constraints imposed due to COVID-19 and its associated restrictions earlier in the 2020 season, it was only possible to employ thermal imaging equipment on one survey at crossing points one, seven and nine (see Table 4.2-1). As such crossing point eight was not surveyed with the thermal imaging scope. This does not invalidate the results as visibility was very good at this point as the road here is narrow and as a precautionary method, the mitigation design sets out to try to keep all bats flying above the height of the traffic.
- 3.3.13. Vegetation at A47 roadsides is mature and the vast majority of bats fly at heights above it, currently keeping them above traffic collision height. Mitigation where it is not an underpass, includes for keeping bats flying at these heights.

4. Results

4.1. Initial surveys (surveys one and two)

Survey timings and weather conditions

4.1.1. Table 4.1-1 below shows a summary of the weather conditions during each of the initial activity crossing points surveys undertaken in June and July 2020.

Table 4.1-1: summary of the survey timings and weather conditions for each crossing point survey

Date and time	Crossing point (and survey number)	Sunset/sunrise time	Weather conditions (start – end)	Surveyors
11/06/2020 21:04 – 22:49	7 (survey 1)	21:19	Temperature (°C): 13 - 13 Wind (Beaufort): 0 - 0 Cloud (%): 100 - 100 Precipitation: light - none	Beth Mell Lydia Waite Ishbel Campbell
12/06/2020 3:31 – 4:31	7 (survey 1)	4:31	Temperature (°C): 13 – 13/14 Wind (Beaufort): 0 - 0 Cloud (%): 100 - 100 Precipitation: none	Beth Mell Lydia Waite Ishbel Campbell
18/06/2020 21:07 – 22:30	9 (survey 1)	21:22	Temperature (°C): 17 - 16 Wind (Beaufort): 0 - 0 Cloud (%): 25% Precipitation: none	Ishbel Campbell Lydia Waite
19/06/2020 3:31 – 4:31	9 (survey 1)	4:31	Temperature (°C): 12 - 12 Wind (Beaufort): 0 - 0 Cloud (%): 50 - 20 Precipitation: none	Ishbel Campbell Lydia Waite
22/06/2020 21:09 – 22:39	10 (survey 1)	21:24	Temperature (°C): 19 - 18 Wind (Beaufort): 1 - 1 Cloud (%): 0 Precipitation: none	Chelsea Edwards Lewis Gospel
23/06/2020 3:33 – 4:33	10 (survey 1)	4:33	Temperature (°C): 16/13 – 13/12 Wind (Beaufort): 0 - 1 Cloud (%): 0 - 5 Precipitation: none	Chelsea Edwards Lewis Gospel
23/06/2020 Crossing point 11: 21:09 – 22:39	11 (survey 1)	21:24	Temperature (°C): 20/19/18 – 17/16 Wind (Beaufort): 2 - 2 Cloud (%): 5-20 – 20/45 Precipitation: none	Beth Mell Lydia Waite
Crossing point 7: 21:24 – 23:54	7 (survey 2)			Chelsea Edwards Lewis Gospel
24/06/2020 3:33/36 – 4:33	11 (survey 1)	4:33	Temperature (°C): 17/15 – 16/14 Wind (Beaufort): 0 - 0 Cloud (%): 5-20 – 15/5 - 5 Precipitation: none	Beth Mell Lydia Waite

Date and time	Crossing point (and survey number)	Sunset/sunrise time	Weather conditions (start – end)	Surveyors
24/06/2020 Crossing points 2 and 6: 21:09 (22:16) – 22:39 Crossing point 9: 21:09 – 23:53	2 (survey 1)	21:24	Temperature (°C): 20/19 – 18/17 Wind (Beaufort): 0 - 0 Cloud (%): 0 – 0 Precipitation: none	Beth Mell Lydia Waite
	6 (survey 1)			Chelsea Edwards (Lewis Gospel)
	9 (survey 2)			Diane Wood Ishbel Campbell
25/06/2020 3:32/33 – 4:32/33	2 (survey 1)	4:32	Temperature (°C): 16 – 15/14 Wind (Beaufort): 0 - 0 Cloud (%): 0 - 0 Precipitation: none	Beth Mell Lydia Waite
	6 (survey 1)			Chelsea Edwards Lewis Gospel
25/06/2020 Crossing point 4: 21:08 – 22:53 Crossing point 10: 21:24 – 23:54 Crossing point 5: 21:09 – 22:39	4 (survey 1)	21:23	Temperature (°C): 22/20/19 – 19/18 Wind (Beaufort): 1 - 1 Cloud (%): 0 - 0 Precipitation: none	Ishbel Campbell Diane Wood
	10 (Survey 2)			Beth Mell Lydia Waite
	5 (survey 1)			Chelsea Edwards Lewis Gospel
26/06/2020 3:31/33 – 4:31	4 (survey 1)	4:31	Temperature (°C): 16 - 16 Wind (Beaufort): 1 - 1 Cloud (%): 10 - 30 Precipitation: none	Ishbel Campbell Diane Wood
	5 (survey 1)			Chelsea Edwards Lewis Gospel
29/06/2020 Crossing point 1: 21:07 – 22:37 Crossing point 11: 21:21 – 23:53	1 (survey 1)	21:22	Temperature (°C): 15 – 15/14 Wind (Beaufort): 4 - 4 Cloud (%): 100 – 100/85 Precipitation: none	Beth Mell Lydia Waite
	11 (survey 2)			Diane Wood Lewis Gospel
30/06/2020 3:36/3:47 – 4:36	1 (survey 1)	4:36	Temperature (°C): 14 - 14 Wind (Beaufort): 4 - 4 Cloud (%): 100 - 100 Precipitation: none	Beth Mell Lydia Waite
	8 (survey 1)			Diane Wood Lewis Gospel
30/06/2020 21:04 – 22:37	8 (survey 1)	21:23	Temperature (°C): 18 - 16 Wind (Beaufort): 2 - 2 Cloud (%): 75/100 - 65 Precipitation: none	Diane Wood Lewis Gospel
	8 (survey 1)			Diane Wood Lewis Gospel
1/07/2020 3:30/35 – 4:36	8 (survey 1)	4:35	Temperature (°C): 15 - 16 Wind (Beaufort): 3 - 3 Cloud (%): 60 - 100 Precipitation: none – fine drizzle from 4AM onwards	Diane Wood Lewis Gospel
	3 (survey 1)			Beth Mell Lydia Waite
1/07/2020 21:08 – 22:38	3 (survey 1)	21:23	Temperature (°C): 17/16 - 16 Wind (Beaufort): 0 - 0 Cloud (%): 60 - 50 Precipitation: none	Beth Mell Lydia Waite

Date and time	Crossing point (and survey number)	Sunset/sunrise time	Weather conditions (start – end)	Surveyors
2/07/2020 3:36 – 4:37	3 (survey 1)	4:37	Temperature (°C): 14 - 14 Wind (Beaufort): 0 - 0 Cloud (%): 100/30 - 40 Precipitation: none	Beth Mell Lydia Waite
2/07/2020 21:22 – 23:52/53	2 (survey 2)	21:22	Temperature (°C): (15 - 12) – 13/12 Wind (Beaufort): 0/1 – 0/1 Cloud (%): 100/90 – 100/70 Precipitation: none	Beth Mell Lydia Waite
	4 (survey 2)			Sarah Taylor Lewis Gospel
20/07/2020 21:05/12 – 23:36/42	1 (Survey 2)	21:06	Temperature (°C): 14 - 13 Wind (Beaufort): 0 - 0 Cloud (%): 30/5 - 5 Precipitation: none	Beth Mell Lydia Waite
	6 (survey 2)			Diane Wood Lewis Gospel
21/07/2020 21:05 – 23:35	3 (survey 2)	21:05	Temperature (°C): 14/13 – 13/12 Wind (Beaufort): 0 - 0 Cloud (%): 90 – 100/30 Precipitation: none	Beth Mell Lydia Waite
	8 (survey 2)			Diane Wood Lewis Gospel

Field survey results

4.1.2. Confirmed instances of bats crossing the A47 (visually observed crosses) are listed below and provided in Table 4.1-2. In addition, data and field notes from both surveyors (from opposite sides of the road) have been analysed for all surveys (except data comparing both sides of the road for surveys of crossing point eight, see section 3.3.3 and 4.1.3) in order to identify any further ‘potential unseen bat crosses’ which may not have been visually observed. Due to visibility limitations as light levels fall during the surveys it becomes harder to see bats and bats may cross the road without being seen (particularly on darker, more overcast nights). This is a common, unmanageable limitation of bat surveys. Bat calls of the same species that have occurred within the same minute or the following minute on both sides of the A47 have been considered ‘unseen potential bat crosses’ unless a surveyor has noted a visual observation of the bat in which it did not cross the road. Identification of ‘potential unseen bat crosses’ has not been attempted for big bat species (NSL) as these species are louder and can be detected from a further distance and as such a detection could be made from a bat flying at the other side of the A47. NSL are also known as high-flying species that are unlikely to collide with traffic. Potential unseen bat crosses are also provided in Table 4.1-2 below.

4.1.3. No attempt has been made to identify unseen potential bats crossing over the A47 for any of the surveys undertaken at crossing point eight. Due to safety concerns

at this crossing point traffic management was employed for each survey and surveyors were only able to stand on the north side of the road. As such no calls would have been recorded from a location to the south of the road and no comparison analysis can take place to identify unseen potential bat crosses.

- 4.1.4. For full survey results of the initial surveys one and two, including bat flight height, direction and location of individual crosses, and the total number of bat detections recorded during a survey see Annex C.

Table 4.1-2: summary of bats crossing the A47 from all surveys

Crossing point	Survey, date and type	Crosses (throughout the whole survey) and height at which the bat crossed	Total = maximum number of common bats in any one hour (confirmed) and within the same hour (potential)		Total = maximum number of rarer bats in any one hour (confirmed) and within the same hour (potential)	
			Confirmed	Potential	Confirmed	Potential
1	Survey 1, 29/6/2020, dusk	<p>Confirmed</p> <p>21:20 common pipistrelle (7m) 21:34 common pipistrelle (10-15m) 21:38 common pipistrelle (10m) 21:40 common pipistrelle (10m) 21:41 common pipistrelle (10m) 21:43 unidentified bat (10-15m) 21:50 unidentified bat (7m) 21:50 common pipistrelle (10m) 21:50 common pipistrelle (10m) 21:53 common pipistrelle 21:53 common pipistrelle (5-8m) 22:04 common pipistrelle (8m) 22:27 barbastelle (10m)</p> <p>Potential</p> <p>None</p>	11 (9)	0	1 (3)	0
	Survey 1, 30/6/2020, dawn	<p>Confirmed</p> <p>3:49 common pipistrelle (10-15m) 3:56 common pipistrelle (10m)</p>	5	1	0	0

Crossing point	Survey, date and type	Crosses (throughout the whole survey) and height at which the bat crossed	Total = maximum number of common bats in any one hour (confirmed) and within the same hour (potential)		Total = maximum number of rarer bats in any one hour (confirmed) and within the same hour (potential)	
			Confirmed	Potential	Confirmed	Potential
		4:03 common pipistrelle (10-15m) 4:12 common pipistrelle (10-15m) 4:16 common pipistrelle (7m) Potential 3:51 common pipistrelle				
	Survey 2, 20/7/2020, dusk	Confirmed 21:14 unidentified bat (10-12m) 21:16 unidentified bat (10-15m) 21:18 common pipistrelle (8m) 21:19 common pipistrelle (8m) 21:21 unidentified bat 21:21 common pipistrelle (8m) 21:26 common pipistrelle (7m) 21:51 common pipistrelle 21:54 common pipistrelle 22:03 two common pipistrelles (7m) Potential 21:43/44 common pipistrelle 22:00 common pipistrelle 22:30 common pipistrelle 22:34/35 common pipistrelle	11 (8)	5	0 (3)	0

Crossing point	Survey, date and type	Crosses (throughout the whole survey) and height at which the bat crossed	Total = maximum number of common bats in any one hour (confirmed) and within the same hour (potential)		Total = maximum number of rarer bats in any one hour (confirmed) and within the same hour (potential)	
			Confirmed	Potential	Confirmed	Potential
		22:44 common pipistrelle				
2	Survey 1, 24/6/2020, dusk	Confirmed None Potential 22:36/37 common pipistrelle	0	1	0	0
	Survey 1, 25/6/2020, dawn	No confirmed or potential crosses	0	0	0	0
	Survey 2, 2/7/2020, dusk	Confirmed None Potential 22:28 common pipistrelle 22:48/49 common pipistrelle 22:51/52 common pipistrelle 23:11 common pipistrelle 23:17 common pipistrelle	0	5	0	0
3	Survey 1, 1/7/2020, dusk	Confirmed 21:43 unidentified bat (3m) 22:32 common pipistrelle (5m) Potential 22:21 soprano pipistrelle (5-8m)	2	2	0	0

Crossing point	Survey, date and type	Crosses (throughout the whole survey) and height at which the bat crossed	Total = maximum number of common bats in any one hour (confirmed) and within the same hour (potential)		Total = maximum number of rarer bats in any one hour (confirmed) and within the same hour (potential)	
			Confirmed	Potential	Confirmed	Potential
		22:37 common pipistrelle				
	Survey 1, 2/7/2020, dawn	Confirmed 4:03 pipistrelle sp. (not <i>P. nathusii</i>) (5-8m) 4:08 common pipistrelle (8-10m) 4:10 common pipistrelle (10m) Potential None	3	0	0	0
	Survey 2, 21/07/2020, dusk	Confirmed None Potential 23:06 common pipistrelle	0	1	0	0
4	Survey 1, 25/6/2020, dusk	Confirmed 21:59 soprano pipistrelle (2-5m) 22:26 noctule (15m) 22:44 noctule (15m) Potential None	3	0	0	0
	Survey 1, 26/6/2020, dawn	No confirmed or potential crosses.	0	0	0	0

Crossing point	Survey, date and type	Crosses (throughout the whole survey) and height at which the bat crossed	Total = maximum number of common bats in any one hour (confirmed) and within the same hour (potential)		Total = maximum number of rarer bats in any one hour (confirmed) and within the same hour (potential)	
			Confirmed	Potential	Confirmed	Potential
	Survey 2, 2/7/2020, dusk	No confirmed or potential crosses	0	0	0	0
5	Survey 1, 25/6/2020, dusk	Confirmed 22:15 common pipistrelle (10m) 22:27 common pipistrelle (10m) 22:38 common pipistrelle (15m) Potential None	3	0	0	0
	Survey 1, 26/6/2020, dawn	Confirmed None Potential None	0	0	0	0
	Survey 2, 1/7/2020, dusk	Confirmed None Potential 22:20 common pipistrelle 22:55 common pipistrelle 23:07 soprano pipistrelle 23:12/13 Myotis sp. 23:47 soprano pipistrelle	0	4 (3)	0	0 (1)

Crossing point	Survey, date and type	Crosses (throughout the whole survey) and height at which the bat crossed	Total = maximum number of common bats in any one hour (confirmed) and within the same hour (potential)		Total = maximum number of rarer bats in any one hour (confirmed) and within the same hour (potential)	
			Confirmed	Potential	Confirmed	Potential
6	Survey 1, 24/6/2020, dusk	Confirmed 22:23 common pipistrelle (10m) Potential None	1	0	0	0
	Survey 1, 25/6/2020, dawn	No confirmed or potential crosses	0	0	0	0
	Survey 2, 20/7/2020, dusk	Confirmed 21:30 common pipistrelle (5-7m) 21:45 common pipistrelle (6m) Potential None	2	0	0	0
7	Survey 1, 11/6/2020, dusk	Confirmed 21:18/19 noctule (20m) 21:19 common pipistrelle (10m) 21:24 common pipistrelle (15m) 21:30 common pipistrelle 21:40 common pipistrelle (15m) 21:54 common pipistrelle (30m) 21:54 common pipistrelle 21:54 barbastelle 21:55 common pipistrelle	11 (10)	3	2 (3)	1

Crossing point	Survey, date and type	Crosses (throughout the whole survey) and height at which the bat crossed	Total = maximum number of common bats in any one hour (confirmed) and within the same hour (potential)		Total = maximum number of rarer bats in any one hour (confirmed) and within the same hour (potential)	
			Confirmed	Potential	Confirmed	Potential
		22:00 barbastelle 22:00 unidentified bat (20m) 22:05 common pipistrelle (20m) 22:19 brown long-eared (20m) Potential 22:01 common pipistrelle 22:01 soprano pipistrelle 22:03 barbastelle 22:13 common pipistrelle 22:32/33 common pipistrelle				
	Survey 1, 12/6/2020, dawn	Confirmed 3:36 soprano pipistrelle 3:41 unidentified bat (20m) 3:49 unidentified bat (20m) 3:56 common pipistrelle 3:59 unidentified bat (20m) 3:59 unidentified bat (20m) 3:59 unidentified bat (20m) Potential None	7 (2)	0	0 (2)	0

Crossing point	Survey, date and type	Crosses (throughout the whole survey) and height at which the bat crossed	Total = maximum number of common bats in any one hour (confirmed) and within the same hour (potential)		Total = maximum number of rarer bats in any one hour (confirmed) and within the same hour (potential)	
			Confirmed	Potential	Confirmed	Potential
	Survey 2, 23/6/2020, dusk	<p>Confirmed</p> <p>21:31 common pipistrelle (8m)</p> <p>22:11 pipistrelle sp.</p> <p>22:14 common pipistrelle</p> <p>Potential</p> <p>22:02 common pipistrelle</p> <p>22:03 common pipistrelle</p> <p>22:08/09 common pipistrelle</p> <p>22:10 common pipistrelle</p> <p>22:14/15 common pipistrelle</p> <p>22:18/19 common pipistrelle</p> <p>22:21/22 soprano pipistrelle</p> <p>22:26/27 common pipistrelle</p> <p>22:34 common pipistrelle</p> <p>22:59 common pipistrelle</p> <p>23:01/02 common pipistrelle</p> <p>23:02/03 soprano pipistrelle</p> <p>23:08/09 common pipistrelle</p> <p>23:17 common pipistrelle</p> <p>23:21 common pipistrelle</p> <p>23:30 common pipistrelle</p>	3	5	0	0

Crossing point	Survey, date and type	Crosses (throughout the whole survey) and height at which the bat crossed	Total = maximum number of common bats in any one hour (confirmed) and within the same hour (potential)		Total = maximum number of rarer bats in any one hour (confirmed) and within the same hour (potential)	
			Confirmed	Potential	Confirmed	Potential
		23:43/44 soprano pipistrelle				
8	Survey 1, 30/6/2020, dusk	Confirmed 21:27 noctule (10m) 21:27 pipistrelle sp. (10m) 21:28/29 noctule 21:32 common pipistrelle (7m) 21:33 common pipistrelle 21:37 common pipistrelle 21:39 common pipistrelle (4-7m) 21:41 common pipistrelle (6m) 21:49 common pipistrelle (10m) 21:51 common pipistrelle (10m) 21:56 pipistrelle sp. (8m) 22:05 common pipistrelle (8m) 22:28 barbastelle (5m) 22:34 common pipistrelle (15m)	12	N/A	1	N/A
	Survey 1, 1/7/2020, dawn	Confirmed 3:41 unidentified bat (5m) 3:46 soprano pipistrelle (7m) 3:55 common pipistrelle (3m)	14 (13)	N/A	0 (1)	N/A

Crossing point	Survey, date and type	Crosses (throughout the whole survey) and height at which the bat crossed	Total = maximum number of common bats in any one hour (confirmed) and within the same hour (potential)		Total = maximum number of rarer bats in any one hour (confirmed) and within the same hour (potential)	
			Confirmed	Potential	Confirmed	Potential
		3:55 common pipistrelle (3m) 4:05 common pipistrelle (5m) 4:07 soprano pipistrelle (8m) 4:13 common pipistrelle 4:15 common pipistrelle (5m) 4:17 common pipistrelle (5m) 4:21 soprano pipistrelle (5m) 4:21 big bat sp. (NSL) (25m) 4:23 pipistrelle sp. (5m) 4:24 soprano pipistrelle (4m) 4:25 pipistrelle sp. (5m)				
	Survey 2, 21/7/2020, dusk	Confirmed 20:57 common pipistrelle (10m) 21:01 common pipistrelle (12m) 21:03 common pipistrelle (10m) 21:06 soprano pipistrelle (8-10m) 21:08 soprano pipistrelle (8-10m) 21:08 common pipistrelle (10m) 21:09 unidentified bat (8-10m) 21:12 common pipistrelle (12m) 21:14 common pipistrelle (10m)	25 (24)	N/A	0 (1)	N/A

Crossing point	Survey, date and type	Crosses (throughout the whole survey) and height at which the bat crossed	Total = maximum number of common bats in any one hour (confirmed) and within the same hour (potential)		Total = maximum number of rarer bats in any one hour (confirmed) and within the same hour (potential)	
			Confirmed	Potential	Confirmed	Potential
		21:14 common pipistrelle (10m) 21:14 common pipistrelle 21:15 common pipistrelle (10m) 21:15 common pipistrelle (10m) 21:16 common pipistrelle (12-15m) 21:17 common pipistrelle (10m) 21:19 common pipistrelle (12m) 21:21 common pipistrelle (7m) 21:21 common pipistrelle (10m) 21:25 common pipistrelle (8-10m) 21:25 common pipistrelle (8-10m) 21:26 common pipistrelle (10m) 21:26 common pipistrelle (12m) 21:27 common pipistrelle (10m) 21:27 common pipistrelle (10m) 21:30 common pipistrelle (12m) 21:35 common pipistrelle				
9	Survey 1, 18/6/2020, dusk	Confirmed 21:32 noctule (30m) 21:41 noctule (30m) 22:12 soprano pipistrelle (6m)	4	1	0	1

Crossing point	Survey, date and type	Crosses (throughout the whole survey) and height at which the bat crossed	Total = maximum number of common bats in any one hour (confirmed) and within the same hour (potential)		Total = maximum number of rarer bats in any one hour (confirmed) and within the same hour (potential)	
			Confirmed	Potential	Confirmed	Potential
10		22:18 common pipistrelle (10m) Potential 22:12/13 common pipistrelle 22:29 barbastelle				
	Survey 1, 19/6/2020, dawn	No confirmed or potential crosses	0	0	0	0
	Survey 2, 24/6/2020, dusk	Confirmed 21:47 noctule (50m) 21:48 noctule (50m) 22:30 common pipistrelle (1.5m) 23:17 common pipistrelle (8-10m) Potential 21:52 noctule (50m)	3	1	0	0
	Survey 1, 22/6/2020, dusk	Confirmed 21:48 noctule (20m) 21:50 noctule (20m) 22:32 soprano pipistrelle Potential None	3	0	0	0
	Survey 1, 23/6/2020, dawn	Confirmed 3:34 common pipistrelle (5m)	1	0	0	0

Crossing point	Survey, date and type	Crosses (throughout the whole survey) and height at which the bat crossed	Total = maximum number of common bats in any one hour (confirmed) and within the same hour (potential)		Total = maximum number of rarer bats in any one hour (confirmed) and within the same hour (potential)	
			Confirmed	Potential	Confirmed	Potential
		<p>Potential</p> <p>None</p>				
	Survey 2, 25/6/2020, dusk	<p>Confirmed</p> <p>21:50 noctule</p> <p>22:28 noctule</p> <p>22:32 soprano pipistrelle (8m)</p> <p>22:39 soprano pipistrelle (5m)</p> <p>Potential</p> <p>22:04 soprano pipistrelle</p> <p>22:38/39 common pipistrelle</p> <p>22:40 common pipistrelle</p> <p>23:30 common pipistrelle</p> <p>23:33 common pipistrelle</p> <p>23:40 common pipistrelle</p> <p>23:42 common pipistrelle</p> <p>23:47/48 common pipistrelle</p>	4	3	0	0
11	Survey 1, 23/6/2020, dusk	<p>Confirmed</p> <p>21:51 noctule</p> <p>21:53 noctule</p> <p>21:55 big bat (NSL) (30m)</p> <p>22:03 noctule (25m)</p>	6	3	0	0

Crossing point	Survey, date and type	Crosses (throughout the whole survey) and height at which the bat crossed	Total = maximum number of common bats in any one hour (confirmed) and within the same hour (potential)		Total = maximum number of rarer bats in any one hour (confirmed) and within the same hour (potential)	
			Confirmed	Potential	Confirmed	Potential
		22:32 common pipistrelle (10m) 22:35 soprano pipistrelle (10-15m) Potential 22:27 common pipistrelle 22:29 soprano pipistrelle 22:31 common pipistrelle				
	Survey 1, 24/6/2020, dawn	No confirmed or potential crosses	0	0	0	0
	Survey 2, 29/6/2020, dusk	No confirmed or potential crosses	0	0	0	0

4.1.5. Of all bats confirmed crossing (140) only 2 crossed at an unsafe height (1.42%). 14 bats had no height recorded (10%). There was a total of 54 bats heard and not seen crossing the road but may potentially have when data from both sides of the road was compared (28%).

4.1.6. Additional field notes observed very occasional common and soprano pipistrelle foraging at less than 3m height along the existing A47 but not eventually crossing it.

4.2. Further surveys

- 4.2.1. Crossing points one, seven, eight and nine were subject to further survey based upon the results of surveys one and two (see Table 4.1-2) and the criteria for further investigation as a bat crossing point (see Section 3.2.3). The following are justifications for their selection for further survey:
- At crossing point one a minimum of nine bats of common species and one barbastelle were confirmed to cross the A47 on 29 June 2020.
 - At crossing point seven a minimum of 10 bats of common species and two barbastelles were confirmed to cross the A47 on 11 June 2020.
 - At crossing point eight a minimum of 24 bats of common species were confirmed to cross the A47 on 21 July 2020.
- 4.2.2. Whilst at crossing point nine the highest number of common bats confirmed crossing in any one hour was four bats recorded on 18 June (which does not meet the criteria of over 10 or more bats of common species for further survey (see Section 3.2.3)), on that same date one potential cross of the rarer barbastelle was identified following data analysis. Previous activity surveys (see Section 2.1.3) have identified barbastelle activity to the south-east of the crossing point and along the edge of, and within, the woodland to the north of the crossing point. A high level of activity of other species has also been recorded within and along the woodland to the north. The Proposed Scheme includes the construction of a large junction to the south-west and new, wider carriageway directly to the south of crossing point nine and further surveys were undertaken in order to confirm whether this location may be considered a crossing point and established flight path of all species of bat and in particular barbastelle.
- 4.2.3. Table 4.2-1 below details the results of the further six surveys at crossing points one, seven, eight and nine. Those results under the headings 'additional crosses' are those crosses where no direction was determined due to either: the surveyor failing to note the direction down, or the surveyor did not visually observe the cross but a cross has been identified following data analysis where calls have been heard at either side of the A47. Notes on the heights of bat crosses, where recorded and available, are included within Table 4.3-1. A safe height of crossing is considered to be >5m. Any crosses below 5m are considered potentially at risk of collision with a HGV should one be passing at the time.

Table 4.2-1: survey information and results of the further surveys undertaken at crossing points one, seven, eight and nine

XP Ref	Survey date and type	Sunset/sunrise time and survey time	Surveyors	Weather conditions at the start and the end of survey(Temp in °C, % cloud, wind in Beaufort)	Bat species and number crossing	Crossing location and direction	Additional survey notes including notes on heights of bat crosses
1	5/8/2020 Dawn Thermal imaging scope	Sunrise: 5:22 02:48 – 5:22	Bench Ecology	Temp: 17.5 – 15.8 Cloud: Wind: 4/5 - 3 Precipitation: none	Common pipistrelle x3	North to south	Four bat crosses were considered to cross at an unsafe height (<5m). The unsafe crossings were at the same height as the hedgerow to the north of the A47 at approximately 3-4m high and considered to be above car height as a minimum.
					Common pipistrelle x1	South to north	
					Soprano pipistrelle x1	North to south	
1	13/8/2020 Dusk	Sunset: 20:24 20:24 – 22:54	Jeremy Halls	Temp: 20 – 18 Cloud: Wind: 2 – 2 Precipitation: none	None	N/A	Common pipistrelle, soprano pipistrelle and Myotis sp. were recorded during the survey.
1	17/8/2020 Dusk	Sunset: 20:16 20:16 – 22:46	Richard Webber-Salmon Beck Harrington-Harding	Temp: 20 – 18 Cloud: Wind: 1 - 1 Precipitation: none	Common pipistrelle x1+	North to south	
					Common pipistrelle x4+	South to north	
					Soprano pipistrelle x1	North to south	
					Additional crosses Unidentified sp. x1	N/A	
1	18/8/2020 Dawn	Sunrise: 5:44 3:11 – 5:44	Bench Ecology	Temp: 15.4 – 14.3 Cloud: Wind: 0 – 0 Precipitation: none	Common pipistrelle x1	South to north	One bat was considered to cross at an unsafe height (<5m). The unsafe crossing was at the same height as the hedgerow to the north of the A47 at approximately 3-4m high and considered to be above car height as
					Soprano pipistrelle x1	North to south	
					Additional crosses Common pipistrelle x5 Pipistrelle sp. x1	N/A	

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							a minimum.
1	21/9/2020 Dawn	Sunrise: 6:41 4:09 – 6:41	Bench Ecology	Temp: 11.6 – 9.2 Cloud: Wind: 1 – 0 Precipitation: none	Common pipistrelle x1	South to north	Brown long-eared and soprano pipistrelle were also recorded during the survey. The bat cross was at what is considered a safe height (>5m).
1	24/9/2020 Dawn	Sunrise: 6:46 4:19 – 6:39	Bench Ecology	Temp: 8.3 – 7.7 Cloud: Wind: 3 – ¾ Precipitation: none	None	N/A	Common and soprano pipistrelle were recorded during the survey.
7	4/8/2020 Dawn Thermal imaging scope	Sunrise: 5:19 2:50 – 5:19	Bench Ecology	Temp: 11.0 – 9.0 Cloud: Wind: 1 – 0 Precipitation: none	Common pipistrelle x1	North to south	It was noted that bats crossing the A47 during the survey generally did so at tree canopy height. All 11 bat crosses were at what is considered a safe height (>5m).
					Common pipistrelle x1	South to north	
					Additional crosses Common pipistrelle x6 Soprano pipistrelle x2 Barbastelle x1	N/A	
7	12/8/2020 Dawn	Sunrise: 5:35 3:03 – 5:33	Alex Jackson Sophie Barrell	Temp: 20 – 23 Cloud: Wind: 0 – 1 Precipitation: none	Common pipistrelle x3	North to south	Common pipistrelle have been recorded crossing at approximately 10m (not quite above the tree line) and above the tree line. Soprano pipistrelle have been recorded crossing below the tree line.
					Common pipistrelle x4	South to north	
					Soprano pipistrelle x2	North to south	
					Soprano pipistrelle x2	South to north	
					Noctule x1	South to north	
					Myotis sp. x1	North to south	
					Additional crosses Common pipistrelle x13 Soprano pipistrelle x1 <i>Nyctalus</i> sp. x1 Barbastelle x4	N/A	

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					<p>Potential Common pipistrelle x1 Noctule x2 Barbastelle x1</p>	N/A	
7	14/8/2020 Dusk	Sunrise: 20:25 20:22 – 22:55	Bench Ecology	Temp: 20.8 – 19.9 Cloud: Wind: 1 – 2 Precipitation: none	<p>Common pipistrelle x1 Common pipistrelle x11 Soprano pipistrelle x1 Barbastelle x2 Brown long-eared x1</p> <p>Additional crosses Common pipistrelle x3 Soprano pipistrelle x1 Pipistrelle sp. x1 Barbastelle x3</p>	N/A	Two bat crosses were at what is considered an unsafe height (<5m). These two unsafe crosses were that of a soprano pipistrelle and a brown long-eared.
7	18/8/2020 Dawn	Sunrise: 5:44 3:15 – 5:44	Sophie Barrell Jeremy Halls	Temp: 15 – 16 Cloud: Wind: 0 – 2 Precipitation: none	<p>Common pipistrelle x4 Common pipistrelle x3 Soprano pipistrelle x3 Soprano pipistrelle x1</p> <p>Additional crosses Common pipistrelle x7+ Barbastelle x2 Soprano pipistrelle x1</p>	N/A	A surveyor noted that as a soprano pipistrelle crossed the A47 it was almost hit by a HGV. In addition to those two barbastelle potential crosses, a further eight barbastelle passes were recorded. Brown long-eared were also recorded during this survey.
7	18/8/2020 Dusk	Sunset: 20:14 20:14 – 22:14	Beck Harrington- Harding Sam Wilson	Temp: 20 – 17 Cloud: Wind: 1 – 1 Precipitation: none	<p>Common pipistrelle x2 Common pipistrelle x5 Soprano pipistrelle x1 Soprano pipistrelle x3 Big bat sp. Unidentified bat sp.</p> <p>Additional crosses</p>	N/A	Barbastelle were recorded five times during the survey. Noctule, <i>Nyctalus</i> sp. and brown long-eared were also recorded during the survey.

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					Common pipistrelle x2 Soprano pipistrelle x1 Unidentified bat sp. x1		
7	22/9/2020 Dawn	Sunrise: 6:43 4:12 – 6:43	Bench Ecology	Temp: 9.8 – 8.2 Cloud: Wind: 1 – 1 Precipitation: none	Common pipistrelle x2	North to south	Natterer's, brown long-eared and noctule were also recorded during the survey. All bat crosses were at what is considered a safe height (>5m).
					Common pipistrelle x2	South to north	
					Soprano pipistrelle x1	North to south	
8	17/8/2020 Dusk	Sunset: 20:16 20:33 – 22:46	Bench Ecology	Temp: 17.7 – 18.1 Cloud: Wind: 0 – 0 Precipitation: none	Soprano pipistrelle x4	North to south	Prior to the start of the survey four soprano pipistrelles, one pipistrelle sp. and one noctule were observed crossing the A47 close to crossing point seven. Many crossings were recorded beneath the A47/river Tud bridge. One bat cross was at what is considered an unsafe height (<5m); a soprano pipistrelle which crossed at approximately 1.8m height.
					Noctule x1	North to south	
					<u>Additional crosses</u> Common pipistrelle x6 Soprano pipistrelle x3 Barbastelle x3 Brown long-eared x7 Noctule x1	N/A	
8	18/8/2020 Dawn	Sunrise: 5:43 3:10 – 5:40	Joshua Stafford Martin Brammah	Temp: 15 – 15 Cloud: Wind: 0 – 0 Precipitation: none	Common pipistrelle x4	North to south	Two barbastelle passes were also recorded during the survey. Common pipistrelle were recorded crossing the A47 at 2.5m and 15m height, and soprano pipistrelles were recorded crossing at 2.5m height.
					Common pipistrelle x2	South to north	
					Soprano pipistrelle x2	North to south	
					Soprano pipistrelle x2	South to north	
					<u>Additional crosses</u> Common pipistrelle x9 Soprano pipistrelle x2	N/A	

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8	18/8/2020 Dusk	Sunset: 20:14 20:27 – 22:44	Bench Ecology	Temp: 18.6 – 16.6 Cloud: Wind: 0 - 0 Precipitation: none	(Additional) crosses Common pipistrelle x13 Soprano pipistrelle x3 Barbastelle x4 Brown long-eared x1 Noctule x1	N/A	Extensive common and soprano pipistrelle foraging was recorded during the survey. Many bats crossed below the A47/river Tud bridge. All bat crosses were at a safe height (>5m).
8	19/8/2020 Dawn	Sunrise: 5:45 3:10 – 5:40	Martin Brammah	Temp: 17 – 16 Cloud: Wind: 0 - 0 Precipitation: none	Common pipistrelle x5	North to south	Common pipistrelles have been recorded crossing the A47 at the following heights: 2.5m, 3m, 6m and 8m. Unidentified bats have been recorded crossing the A47 above HGV height.
					Common pipistrelle x1	South to north	
					Unidentified bat sp. x1	North to south	
					Unidentified bat sp. x1	South to north	
					(Additional) crosses Common pipistrelle x1	N/A	
8	21/8/2020 Dawn	Sunrise: 5:49 3:19 – 5:40	Alex Jackson Joshua Stafford	Temp: 20 – 18 Cloud: Wind: 2/3 – ¾ Precipitation: none	Common pipistrelle x1	East to west	Soprano pipistrelles were recorded crossing the road at 1-2m, 3-4m and approximately 4m height, at the latter of which a bat took evasive action to avoid a HGV. Common pipistrelles were recorded crossing the A47 at 2m height. Six barbastelle passes were recorded during the survey. Brown long-eared and noctule were also recorded.
					Common pipistrelle x1	West to east	
					Soprano pipistrelle x2	East to west	
					Soprano pipistrelle x3	West to east	
					(Additional) crosses Common pipistrelle x14 Soprano pipistrelle x11	N/A	
8	21/8/2020 Dusk	Sunset: 20:09 20:40 – 22:35	Bench Ecology	Temp: 20.2 – 19.0 Cloud: Wind: 6 – 5/6 Precipitation: none	(Additional) crosses Common pipistrelle x4 Soprano pipistrelle x3 Barbastelle x3 Brown long-eared x2	N/A	Noctule were also recorded during the survey. Many bats crossed below the A47/river Tud bridge. All bat crosses were at

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							a safe height (>5m).
9	12/8/2020 Dawn	Sunrise: 5:33 3:03 – 5:33	Joshua Stafford Martin Brammah	Temp: 20 – 23 Cloud: Wind: 0 – 1 Precipitation: none	Soprano pipistrelle x1	South to north	In addition to the potential cross, three more barbastelle passes were recorded during the survey. Myotis sp., big bat sp., serotine (unverified calls) and unidentified species were also recorded during the survey.
					Noctule x1	South to north	
					Potential crosses Common pipistrelle x4 Soprano pipistrelle x4 Barbastelle x1 Noctule x1	N/A	
9	13/8/2020 Dawn Thermal imaging scope	Sunrise: 5:36 3:12 – 5:36	Bench Ecology	Temp: 17.8 – 17.6 Cloud: Wind: 1 – 2 Precipitation: none	Common pipistrelle x1	North to south	Barbastelle and serotine were also recorded during the survey. Based on a hedgerow approximately 5m high at either side of the A47 all bat crosses were at a safe height (>5m).
					Soprano pipistrelle x2	South to north	
					Noctule x2	North to south	
					Brown long-eared x1	North to south	
9	17/8/2020 Dusk	Sunset: 20:16 20:16 – 22:46	Sam Wilson Alex Jackson	Temp: 17 – 17 Cloud: Wind: 1 - 1 Precipitation: none	Noctule x1	South to north	Barbastelle passes were recorded 12 times during the survey. Myotis sp., brown long-eared, big bat sp. and unidentified bats were recorded during the survey.
					Additional crosses Common pipistrelle x1 Soprano pipistrelle x1	N/A	
9	19/8/2020 Dawn	Sunrise: 5:44 3:16 – 5:44	Bench Ecology	Temp: 17.3 – 14 Cloud: Wind: 2 – 1 Precipitation: none	Barbastelle x1	South to north	Common pipistrelle, noctule and brown long-eared were also recorded. Based on a hedgerow approximately 5m high at either side of the A47 all bat crosses were at a safe height (>5m).
					Additional crosses Soprano pipistrelle x1 Leisler's x1	N/A	
9	21/8/2020	Sunrise: 5:49	Bench Ecology	Temp: 20 – 18	Common pipistrelle x1	North to south	Myotis sp. and brown

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	Dawn	3:19 – 5:40		Cloud: Wind: 2/3 – ¾ Precipitation: none	Common pipistrelle x2 Soprano pipistrelle x2 Soprano pipistrelle x2 Noctule x1 Leisler's x1 Serotine x1 Barbastelle x1	South to north North to south South to north North to south North to south North to south South to north	long-eared were also recorded during this survey. Based on a hedgerow approximately 5m high at either side of the A47 all bat crosses were at a safe height (>5m).
9	23/9/2020 Dawn	Sunrise: 6:44 4:20 – 6:23	Bench Ecology	Temp: 16.7 – 15.9 Cloud: Wind: 0 – 2 Precipitation: spitting at 4:45, light rain from 5:40, heavy rain from 6:20	Common pipistrelle x1 Soprano pipistrelle x1 Soprano pipistrelle x1 Noctule x1 Serotine x1	North to south North to south South to north North to south South to north	It was noted that bats generally crossed the A47 at tree canopy height. Based on a hedgerow approximately 5m high at either side of the A47 all bat crosses were at a safe height (>5m).

5. Conclusions and requirements

5.1. Conclusion and impact assessment

5.1.1. Crossing points one, seven, eight and nine have been identified as locations at which bats cross the A47. Table 5.1-1 below details which species have been confirmed as crossing the A47 in any of the eight surveys undertaken and the lowest height at which species have been recording crossing the individual crossing points.

Table 5.1-1: further surveys summary including species confirmed crossing and lowest recorded heights

Crossing point	Species identified crossing the A47	Lowest height species have been recorded crossing
1*	Common pipistrelle	3-4m
	Soprano pipistrelle	No data
	Barbastelle	10m
7	Common pipistrelle	8m
	Soprano pipistrelle	Below HGV height/<5m
	Barbastelle	No data
	Noctule	20m
	Brown long-eared	<5m
	Big bat sp.	No data
	Myotis sp.	No data
<i>Nyctalus</i> sp.	No data	
8	Common pipistrelle	2.5m
	Soprano pipistrelle	1-2m/1.8m
	Barbastelle	5m
	Noctule	10m
	Brown long-eared	No data
	Big bat sp. (NSL)	25m
9*	Common pipistrelle	1.5m
	Soprano pipistrelle	6m
	Barbastelle	No data
	Noctule	30m
	Brown long-eared	No data
	Leisler's	No data
	Serotine	No data

*during one survey at crossing point 9 and crossing point one it was commented that bats were generally crossing at tree canopy height. In four of the six further surveys at crossing point 9 it was also noted that all bat crosses were at a safe height (>5m) based on an approximately 5m high hedgerow on either side of the A47.

- 5.1.2. Potential adverse impacts upon commuting bats using the identified crossing points (one, seven, eight and nine) as a result of the Proposed Scheme include an increased risk of mortality as the bats have to cross a wider carriageway and severance of bat flight paths/commuting routes. Severance of flight paths and commuting routes can in turn lead to difficulties in reaching well-used, important foraging resources which may be located at the opposite side of the A47 as the roosting location/s.
- 5.1.3. At crossing point one bats were commonly recorded flying across the A47 from or down the section of the cycle path perpendicular to the A47. At this crossing point there is further risk of severance of this identified bat flight path as in addition to the proposed A47 carriageway becoming much wider at this location than the existing carriageway, there will also be a new slip road slightly to the north. An increase in risk of collision may result of widening of the carriageway at this location. The majority of bats crossing at this location have been recorded doing so above 5m height (see Table 4.1-2), however the survey undertaken using thermal imaging methods on 5 August 2020 (survey three) recorded 80% of crosses occurring below 5m at an unsafe height (see Table 4.2-1).
- 5.1.4. Likewise, at crossing point seven the majority of bats visually observed during surveys one and two, and further surveys (see Table 4.2-1), have been recorded crossing the road at a safe height (>5m) see Table 4.1-2) however further surveys at this crossing point have recorded one soprano pipistrelle and one brown long-eared crossing the A47 below 5m in height (see Table 4.2-1).
- 5.1.5. At crossing point eight in particular a higher risk of mortality due to collision with traffic will occur as a result of the unmitigated Proposed Scheme as bats have been recorded generally crossing the A47 lower at this location (see Table 5.1-1). Soprano pipistrelles have been recorded crossing at crossing point eight at as low as 1-2m and 1.8m height, whilst common pipistrelles and barbastelles have been recorded crossing as low as 2.5m and 5m respectively.
- 5.1.6. At crossing point nine the risk of an increase in collision as a result of the Proposed Scheme is lower as, in most instances, bats have been recorded flying at safe heights (>5m). This crossing behaviour is likely due to the two hedgerows parallel either side of the A47 which are approximately 5m in height forcing the bats to fly over them when commuting across the A47.

5.2. Requirements – crossing point mitigation

- 5.2.1. The trigger for further survey does not automatically equate to being a trigger for substantial mitigation. There is no guidance in Berthinussen and Altringham (2015) on what triggers should be used to determine mitigation. We contacted the author Dr Anna Berthinussen earlier this year on the issue and have written

correspondence confirming that they “don’t specify a trigger for providing mitigation. We didn’t want to be too prescriptive as the need for mitigation will really be site and species-specific”

- 5.2.2. We also consulted with Natural England this summer on barbastelle bat mitigation and in essence their response was for us to use our professional judgement and “be most appropriate based on the available evidence”.
- 5.2.3. Currently, there are no types of mitigation (green bridges, underpasses or bat hops) that have been proven to work as there has only been a small amount of monitoring surveys undertaken at them. Although underpasses have evidence of working on narrower roads when located on the bats’ original flight path if they are high enough. Bats have also been recorded using underpasses on the M1 that have been there for many years (Personal observation).
- 5.2.4. There will be impacts from severing the commuting routes during site clearance and construction, but at each location mitigation will be completed as soon as each construction phase is complete. Compensatory planting is proposed along the verges of the scheme and other parts of the road that have not been found to be regularly, well-used crossing points during these surveys to mitigate the loss of foraging habitats and to shield suitable habitat and roosts from disturbance. Copses of trees and woodland grassland mosaics are proposed along the scheme to act as ‘stepping stones’ between suitable roosting and foraging habitat.
- 5.2.5. At crossing point 1, site considerations include the very close proximity of Oak Farm, which means an underpass or green bridge cannot be constructed. In addition, large infrastructural mitigation raises issues of significant carbon, landscape (mature woodland to the north would need to be removed) and cost implications. Hop-overs including heavy standard trees of 4.5m in height at initial planting are to be placed at either side of the crossing point with further woodland planting down the side roads perpendicular to the A47.
- 5.2.6. There is an underpass close to Mattishall Lane near crossing point 2. Only a small number of bats used this point to cross the road and it was not taken forward for further survey. The underpass is to be over 5m high and planting leading into it will be kept at a low height to discourage any bats from flying over the road.
- 5.2.7. At crossing point 7, there is to be an underpass of 4.5m in height to the east of Wood Lane roundabout. This is approximately 200m west of crossing point 7 flight path. Tree and shrub planting will encourage bats to fly west to the underpass and the be low enough to encourage them under it.
- 5.2.8. The bridge over the River Tud at crossing point 8 is being constructed at a low height of 2.7m. Along the rest of the river are mature trees which are high and bats currently fly also. Bats are to be encouraged to go over the bridge at this point by

keeping the tree line on the river banks and adding high mesh fencing along the bridge sides so there is a level height along the river for bats to fly along and miss the traffic beneath.

5.2.9. The 3.4m high underpass west of St Andrew's Church is approximately 290m to the west of crossing point 9. Tree and shrub planting will encourage bats to fly west to the underpass and the be low enough to encourage them under it.

5.2.10. There is a WCH overbridge to the east of St Peter's Church approximately 300m east of crossing point 11. At crossing point 11, only a small number of bats used this point to cross the road and it was not taken forward for further survey. High trees are to be planted at either side of the overbridge and along the run up to it to encourage any bats to fly over the bridge to cross the road.

5.3. Requirements – general mitigation

5.3.1. The following mitigation measures should be adhered to as good practice:

- Any trees removed to facilitate works should be replaced like-for-like with native species (preferably fast-growing) to retain any areas potentially used for foraging and/or, in the case of tree lines, commuting routes
- Any sections of hedgerows removed should be reinstalled with native species to maintain potential commuting corridors
- A sensitive lighting scheme is being designed by a suitably qualified ecologist and lighting engineer to ensure that semi-natural habitats (the River Tudd, woodland areas, hedgerows, tree lines) which provide foraging resources and commuting corridors are not disturbed during construction and operation. Lighting is only being installed at the two proposed junctions. Guidance can be taken from the Bat Conservation Trust's (BCTs) and the Institute of Lighting Professionals *Guidance Note 08/18 Bats and Artificial Lighting in the UK* (2018) and *Artificial Lighting and Wildlife: Interim Guidance: Recommendations to help minimise the impact of artificial lighting* (BCT, 2014).
- Night lighting and working should be kept to a minimum. If it necessary to light the site at night, lights should be hooded to avoid spill over of light and direct light to the ground, in addition to directing light away from any natural habitat features such as the River Tudd, woodland, tree lines or hedgerows.
- A suitably qualified ecologist should be consulted with regards to the landscaping design in order to ensure bat commuting corridors and foraging resources are maintained and to provide suggestions for enhancement opportunities of the landscape post-construction for bats.

5.4. Monitoring

5.4.1. Monitoring surveys of bat crossing points at the four locations where the full eight surveys were undertaken, plus the new bridge over the River Tud, the three

underpasses and the overbridge to be created will be undertaken in years 1, 3 and 5 of operation. If a reduction in numbers crossing is observed, further mitigation may be required.

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Annex A. Legislation and policy

All bats in the UK are protected under UK and European law.

Wildlife and Countryside Act (WCA) 1981 (as amended)

All UK species of bat are protected under Schedule 5 of the WCA 1981 (as amended), making it an offence to:

- damage or destroy a bat roost (whether or not occupied by bats at the time)
- intentionally or recklessly obstruct access to a bat roost
- intentionally or recklessly disturb a bat in its roost, or deliberately disturb a group of bats
- deliberately kill, injure or take any bat

The Conservation of Habitats and Species Regulations (CHSR) 2017

Included in Annex II and IV of EC Directive 92/43/EEC on the Conservation of Natural Habitats and of the Wild Fauna and Flora (the Habitats Directive 1992) as obligated by the Bern Convention (1979) which implements the Conservation of Habitats and Species Regulations 2017 making it a European protected species (listed under Schedule 2). All bat species in the UK are European Protected Species (EPS) afforded protection under Section 2 of the CHSR 2017 Regulation 42.

Under the CHSR, it is an offence if you:

- deliberately capture, injure or kill any wild animal of a EPS
- deliberately disturb wild animals of any such species
- deliberately take or destroy the eggs of such an animal
- damage or destroy a breeding site or resting place of such an animal

With specific reference to the offence of disturbance, Regulation 39(1) of the Conservation of Habitats and Species (Amendment) Regulations 2012 states that a person commits an offence if he:

“deliberately disturbs wild animals of any such species [i.e. a European Protected Species] in such a way as to be likely significantly to affect:

(i) the ability of any significant group of animals of that species to survive, breed, or rear or nurture their young; or

(ii) the local distribution or abundance of that species”.

Where development will result in damage to, or obstruct access to, any bat roost (whether occupied or not) or risks harming or significantly disturbing bats, a European Protected

Species Licence (EPSL) is required from Natural England to allow the development to proceed.

Natural Environment and Rural Communities Act (NERC)

Bats are also afforded more general protection in England (and Wales) within the Natural Environment and Rural Communities Act (NERC) 2006. This imposes a duty on all public bodies, including local authorities and statutory bodies, in exercising their functions, “*to have due regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity*” [Section 40 (1)]. It notes that “*conserving biodiversity includes restoring or enhancing a population or habitat*” [Section 40 (3)]. Consequently, attention should be given to dealing with the modification or development of an area if aspects of it are deemed important to bats, such as roosts, flight corridors and foraging areas.

Section 41 (S41) of this Act requires the Secretary of State to publish a list (in consultation with Natural England) of habitats and species which are of principal importance for the conservation of biodiversity in England. The S41 list is used to guide decision-makers such as public bodies including local and regional authorities, when carrying out their normal (e.g. planning) functions.

Seven species of bats (soprano pipistrelle, brown long-eared, greater horseshoe, lesser horseshoe, barbastelle, Bechstein’s and noctule) are listed under Section 41 of the NERC Act 2006.

Norfolk Biodiversity Action Plan (BAP)

Local Biodiversity Action Plans (LBAP) identify habitat and species conservation priorities at a local level (typically at the County level) and are usually drawn up by a consortium of local government organisations and conservation charities. Soprano pipistrelle, brown long-eared bat, barbastelle and noctule are included in the Norfolk Biodiversity Action Plan Strategy.

Annex B. Crossing point locations



LEGEND

- Suvery location

REFERENCE MAP

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002	10/02/2021	First Edition	AC	EC	BA
REV	DATE	REVISION NOTE	ORG	CHK'D	APP'D

DESIGNER

SWECO

CONTRACTOR

GallifordTry

CLIENT

highways england

PROJECT TITLE

A47 NORTH TUDDENHAM TO EASTON

PROJECT STAGE

PCF STAGE 3

DRAWING TITLE

BAT SURVEY LOCATIONS
SHEET 3 OF 4
TR010038/APP/6.2

SUITABILITY

FOR INFORMATION

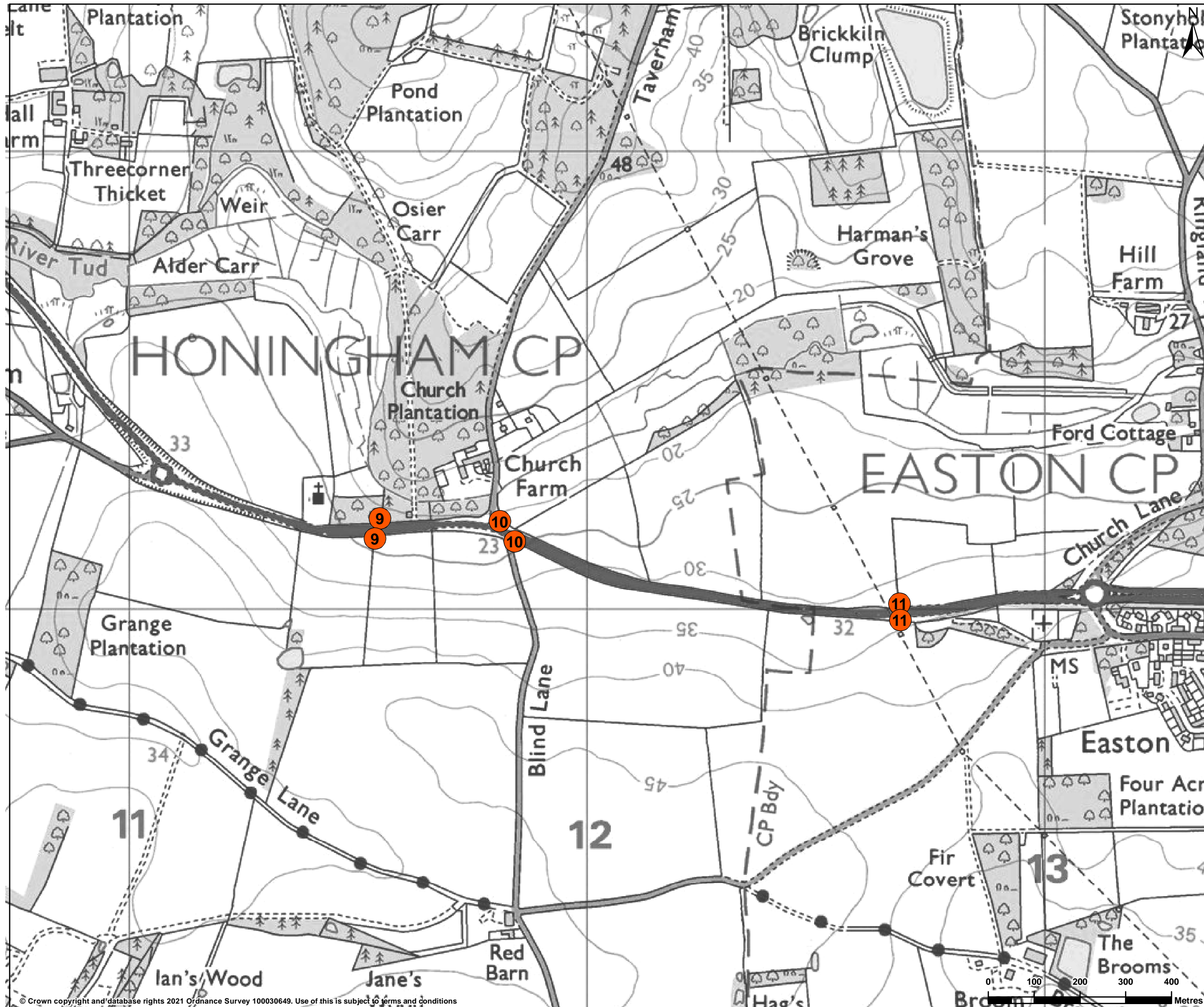
SHEET SIZE	SCALE	STATUS
A3	1:8,000	S2

DRAWING NUMBER

HE551489-GTY-EBD-000-DR-LB-30023

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LEGEND

- Suvery location

REFERENCE MAP

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C02	10/02/2021	First Edition	AC	EC	BA
REV	DATE	REVISION NOTE	ORG	CHKD	APPD

DESIGNER

SWECO

CONTRACTOR

GallifordTry

CLIENT

highways england

PROJECT TITLE

A47 NORTH TUDDENHAM TO EASTON

PROJECT STAGE

PCF STAGE 3

DRAWING TITLE

BAT SURVEY LOCATIONS
SHEET 4 OF 4
TR010038/APP/6.2

SUITABILITY

FOR INFORMATION

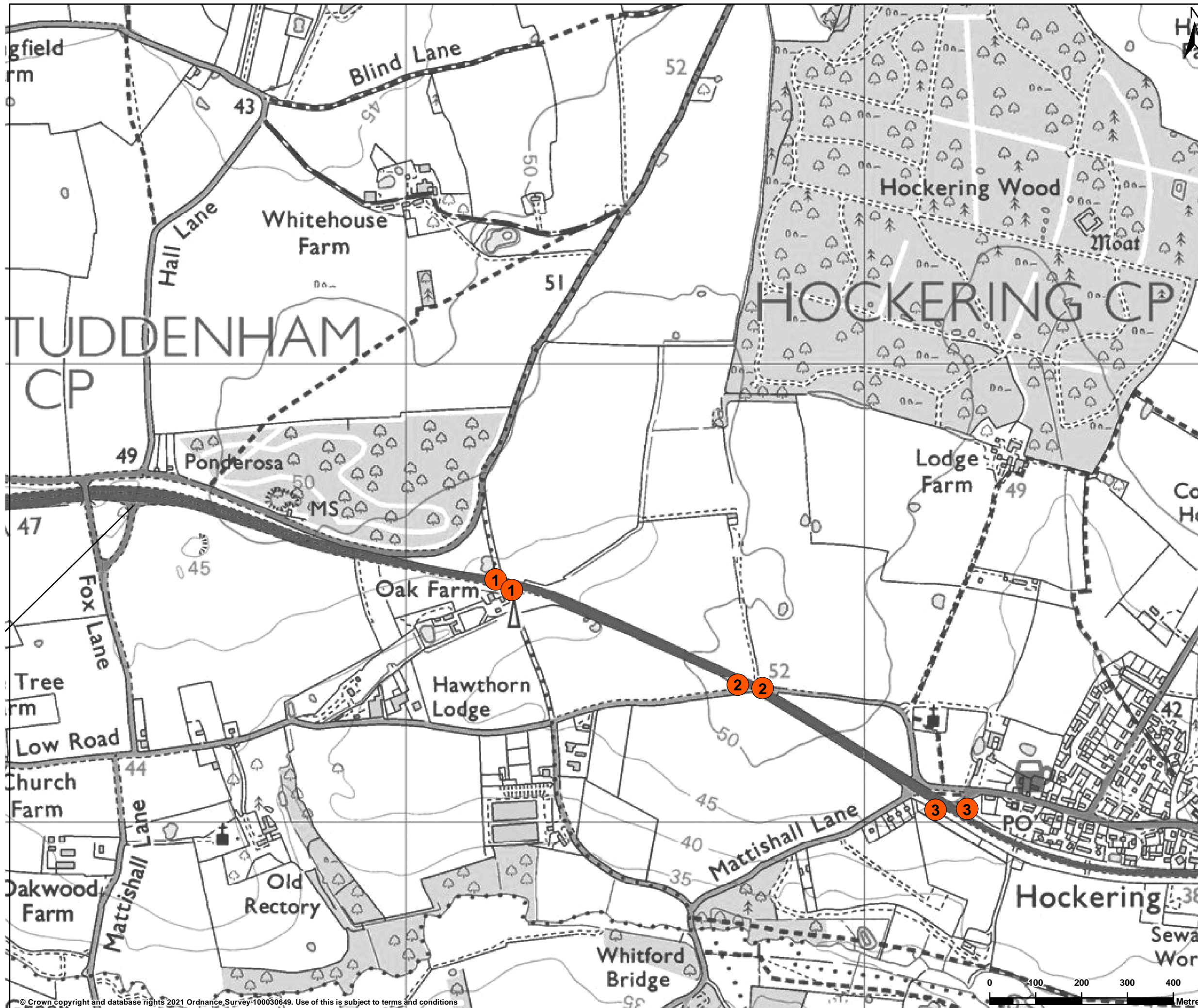
SHEET SIZE	A3	SCALE	1:8,000	STATUS	S2
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DRAWING NUMBER

HE551489-GTY-EBD-000-DR-LB-30024

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LEGEND

- Orange circle: Suvery location

REFERENCE MAP

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C02	10/02/2021	First Edition	AC	EC	BA
REV	DATE	REVISION NOTE	ORG	CHKD	APPD

DESIGNER

SWECO

CONTRACTOR

GallifordTry

CLIENT

highways england

PROJECT TITLE

A47 NORTH TUDDENHAM TO EASTON

PROJECT STAGE

PCF STAGE 3

DRAWING TITLE

BAT SURVEY LOCATIONS
SHEET 1 OF 4
TR010038/APP/6.2

SUITABILITY

FOR INFORMATION

SHEET SIZE	SCALE	STATUS
A3	1:8,000	S2

DRAWING NUMBER

HE551489-GTY-EBD-000-DR-LB-30021

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LEGEND

- Suvery location

REFERENCE MAP

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C02	10/02/2021	First Edition	AC	EC	BA
REV	DATE	REVISION NOTE	ORG	CHKD	APPD

DESIGNER

SWECO

CONTRACTOR

GallifordTry

CLIENT

**highways
england**

PROJECT TITLE

A47 NORTH TUDDENHAM TO EASTON

PROJECT STAGE

PCF STAGE 3

DRAWING TITLE

BAT SURVEY LOCATIONS
SHEET 2 OF 4
TR010038/APP/6.2

SUITABILITY

FOR INFORMATION

SHEET SIZE	SCALE	STATUS
A3	1:8,000	S2

DRAWING NUMBER

HE551489-GTY-EBD-000-DR-LB-30022

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Annex C. Full initial survey results

Crossing point one

Survey 1 29/06/2020 dusk – surveyor 1 (north of the A47)

The following confirmed bat crosses of the A47 were recorded by surveyor one during the survey:

- At 21:34 a common pipistrelle crossed the A47 from south to north flying at approximately 10 – 15m height.
- At 21:38 a common pipistrelle crossed the A47 from the south to fly down the cycle path on the north flying at approximately 10m height.
- At 21:40 a common pipistrelle crossed the A47 flying south at approximately 10m height.
- At 21:41 a common pipistrelle crossed the A47 flying northwards at approximately 10m height.
- At 21:50 two common pipistrelles crossed the A47 flying northwards and down the cycle path at approximately 5 – 10m height.
- At 21:53 a common pipistrelle crossed the A47 flying southwards at approximately 5 – 8m height.
- At 22:04 a common pipistrelle crossed the A47 flying northwards at approximately 8m height.
- At 22:27 a barbastelle crossed the A47 flying southwards at approximately 10m height.

In addition, an unidentified bat was observed crossing the road further west of the crossing point location at 21:43. The bat was flying southwards at canopy height (approximately 10 -15 m height). Whilst this cross was slightly further west than the crossing point location, it has been counted within Table 4.1-2 in the main body of the report as the new junction at this location within the Proposed Scheme will directly impact the stretch of the A47 this bat was seen to cross.

In total 20 bat detections were recorded by surveyor one during the survey recording common pipistrelle and a single barbastelle call.

Survey 1 29/06/2020 dusk – surveyor 2 (south of the A47)

Surveyor two observed the crossing recorded by surveyor one at 21:40 (see above) in addition to seeing a common pipistrelle cross towards the north at 21:49 which is considered one of the same crosses as surveyor one recorded at 21:50. The following instances of bats crossing the A47 were also recorded by surveyor two:

- At 21:20 a common pipistrelle crossed the A47 flying northwards at approximately 7m height.
- At 21:50 an unidentified bat crossed the A47 flying southwards at approximately 7m height.
- At 21:53 a common pipistrelle crossed the A47 flying from the north to the south then from the south back to the north in a circular flight path.

In total three common pipistrelle detections were made by surveyor two during the survey.

No potential unseen bat crosses of the A47 were identified following data analysis.

Survey 1 30/06/2020 dawn – surveyor 1 (north of the A47)

The following five confirmed instances of bats crossing the A47 were recorded by surveyor one during the survey:

- At 3:49 a common pipistrelle crossed the A47 flying from north to south at approximately 10 – 15m height.
- At 3:56 a common pipistrelle crossed the A47 flying from north to south at approximately 10m height.
- At 4:03 a common pipistrelle crossed the A47 flying from north to south at approximately 10 – 15m height.
- At 4:12 a common pipistrelle crossed the A47 flying from the woodland adjacent to the cycle path on the north to the south at approximately 10 – 15m height.

At 4:16 a common pipistrelle flew out into/over the centre of the road from the south and then flew back south. This is not considered a cross of the A47 as the bat did not fully cross the A47 and reach the habitats to the north of the road.

Surveyor one also recorded a potential common pipistrelle cross at 3:51 when the bat was observed flying northwards directly perpendicular to the A47. Neither surveyor observed the bat crossing the road however surveyor one considered it likely that it did and as such this is included as a potential bat cross in Table 4.1-2 in the main body of the report.

In total surveyor one recorded 13 common pipistrelle detections during the survey with no other species detected.

Survey 1 30/06/2020 dawn – surveyor 2 (south of the A47)

Surveyor two recorded one confirmed bat cross of the A47 during the survey:

- At 4:16 a common pipistrelle crossed the A47 from down the cycle path on the north of the A47 flying southwards at approximately 7m height.

In addition, two common pipistrelles were observed at 3:54 flying from the south out over the A47 and back again in an arc of flight over the road at approximately 10m height. As these bats flew immediately back to the same side of the road it is considered that they were potentially foraging along vegetation on the road verges (hedgerows, woodland) and their behaviour is considered to not necessarily demonstrate a commonly used commuting route. As such these have been omitted as crosses from Table 4.1-2 in the main body of the report.

No bat detections were recorded by surveyor two during this survey and as such no potential unseen bat crosses have been identified.

Survey 2 20/07/2020 dusk – surveyor 1 (north of the A47)

The following confirmed bat crosses were visually observed by surveyor one:

- At 21:14 an unidentified bat crossed the A47 flying from the line of trees adjacent to the A47 on the south to the cycle path on the north, flying at approximately 10 – 12m height.
- At 21:16 an unidentified bat crossed the A47 flying from the line of trees adjacent to the A47 on the south to the cycle path on the north, flying at approximately 10 – 15m height.
- At 21:18 an unidentified bat crossed the A47 flying from the lane/gate entryway on the south to the cycle path on the north, flying at approximately 12 – 15m height.

Surveyor one also recorded two common pipistrelles potentially crossing the A47, one at 21:38 and one at 21:47, however these passes cannot be confirmed as crosses and so have been omitted from Table 4.1-2 in the main body of the report.

In total 20 bat detections were made by surveyor one during the survey in addition to three potential detections of common pipistrelle. Two species were identified: common and soprano pipistrelle.

Survey 2 20/07/2020 dusk – surveyor 2 (south of the A47)

Surveyor 2 also recorded a bat (common pipistrelle) crossing the A47 flying from south to north at 21:18, however it was recorded as flying at approximately 8m height. It is not possible to either confirm or refute whether this is the same bat crossing or whether each surveyor has observed a different bat. As such, one bat pass, of a common pipistrelle, has been recorded at 21:18 in Table 4.1-2 in the main body of the report.

The following confirmed bat crosses were visually observed by surveyor two:

- At 21:19 a common pipistrelle crossed the A47 flying north at approximately 8m height.

- At 21:21 an unidentified bat crossed the A47 flying north.
- At 21:21 a common pipistrelle crossed the A47 flying north at approximately 8m height.
- At 21:26 a common pipistrelle crossed the A47 flying north at approximately 7m height.
- At 21:51 a common pipistrelle crossed the A47 several times whilst flying in a circle above the road (counted as one cross only in Table 4.1-2 in the main body of the report).
- At 21:54 a common pipistrelle crossed the A47 whilst flying out from the north side, across to the southern road verge/boundary and back to the north along the cycle path.
- At 22:03 two common pipistrelles crossed the A47 flying from the cycle path where it leaves the road on the north to a tree near the lane/gate entryway on the south at approximately 7m height.

In addition to the above confirmed crosses, surveyor two also recorded a common pipistrelle at 22:09 which flew from the cycle path on the north out above the road, flew along the A47 for a stretch, and then flew back to the north side of the road. As this bat did not 'cross' the A47 it has not been included in Table 4.1-2 in the main body of the report.

In addition to one potential common pipistrelle call, 24 bat detections were recorded in total by surveyor two during the survey. A minimum of two species were identified including common pipistrelle and a minimum of one species of big bat (a noctule, serotine or leisler's bat (NSL)).

The following bat detections were recorded by both surveyors and are considered, following data analysis, as potential unseen bat crosses of the A47 (discounting those calls recorded at the times of the above confirmed crosses and calls recorded at times when surveyors noted visual observations of bats which did not cross the A47):

- At 21:44 on the south side of the A47, and 21:43 and 21:44 on the north side of the A47 common pipistrelle calls
- At 22:00 on both sides of the A47 common pipistrelle calls
- At 22:30 on both sides of the A47 common pipistrelle calls
- At 22:34 on the south side and 22:35 on the north side of the A47 common pipistrelle calls
- At 22:44 on both sides of the A47 common pipistrelle calls

Crossing point two

Survey 1 24/06/2020 dusk – surveyor 1 (north of the A47)

Surveyor one recorded no confirmed bat crosses over the A47 during the survey. One common pipistrelle detection was recorded at 22:37 by surveyor one during the survey. No other bats were detected.

Survey 1 24/06/2020 dusk – surveyor 2 (south of the A47)

Surveyor two recorded no confirmed bat crosses over the A47 during the survey. One detection of a common pipistrelle was recorded at 22:36 in addition to a potential detection of a big bat sp. (NSL), however it is considered likely this detection is merely noise. The common pipistrelle detection was recorded the minute before that common pipistrelle recorded by surveyor one and as such this is considered a potential unseen bat cross of the A47.

Survey 1 25/06/2020 dawn – surveyor 1 (north of the A47)

Surveyor one recorded no confirmed bat crosses over the A47 during the survey. No bat detections were recorded by surveyor one during the survey.

Survey 1 25/06/2020 dawn – surveyor 2 (south of the A47)

Surveyor two recorded no confirmed bat crosses over the A47 during the survey. No bat detections were recorded by surveyor one during the survey.

Survey 2 2/7/2020 dusk – surveyor 1 (north of the A47)

No confirmed bat crosses of the A47 were recorded by surveyor one during the survey. In total 35 bat detections were recorded and species identified include common and soprano pipistrelle, and barbastelle the latter of which was only recorded once. The surveyor noted that bat activity at the location seemed to begin approximately one hour after sunset and the first bat was detected at 22:27 one hour and five minutes after sunset. Common pipistrelle foraging behaviour was observed at 22:43; the bat was seen flying along the hedgerow adjacent to the north of the A47 going west.

Survey 2 2/7/2020 dusk – surveyor 2 (north of the A47)

Surveyor two recorded no confirmed bat crosses of the A47. At 22:37/38 a common pipistrelle was observed flying above the road going west, however as this bat was not observed crossing from one side of the road to the other it is not included as a cross in Table 4.1-2. In total surveyor two recorded nine common pipistrelle detections. No other species were detected.

The following bat detections were recorded by both surveyors and are considered, following data analysis, as potential unseen bat crosses of the A47 (discounting those

calls discussed above at 22:37/38 and 22:43 for which the origin has been identified by visual sighting):

- At 22:28 on both sides of the A47 common pipistrelle calls
- At 22:48 on both sides of the A47 (and 22:49 on the north side) common pipistrelle calls
- At 22:51 on the south side and 22:52 on the north side of the A47 common pipistrelle calls
- At 23:11 on both sides of the A47 common pipistrelle calls
- At 23:17 on both sides of the A47 common pipistrelle calls

Crossing point three

Survey 1 1/7/2020 dusk – surveyor 1 (north of the A47)

No confirmed instances of bats crossing the A47 were recorded by surveyor one. One potential cross was recorded; at 22:21 a soprano pipistrelle was observed flying from down The Street out over the A47 heading south at approximately 5 – 8m height. However, due to very low light levels, the surveyor could not make out if the bat reached the other side of the A47. As the bat was not seen to come back northwards it is considered this was a potential bat cross and is included in Table 4.1-2 as such.

In total seven bat detections were recorded. Common and soprano pipistrelle only were recorded and soprano pipistrelle foraging behaviour was identified.

Survey 1 1/7/2020 dusk – surveyor 2 (south of the A47)

Surveyor two recorded the following confirmed instances of bats crossing the A47 during the survey:

- At 21:43 an unidentified bat crossed the A47 flying south at approximately 3m height.
- At 22:32 a common pipistrelle crossed the A47 flying north at approximately 5m height.

In total five detections of common pipistrelle were recorded by surveyor two. No other bat species were detected.

6.1.1. The following bat detection was recorded by both surveyors and is considered, following data analysis, as a potential unseen bat cross of the A47 (discounting those calls at the times above identified as confirmed crosses):

- At 22:37 on both sides of the A47 common pipistrelle calls

Survey 1 2/7/2020 dawn – surveyor 1 (north of the A47)

Three bats were recorded crossing the A47 by surveyor one during the survey:

- At 4:03 a pipistrelle sp. (not Nathusius' pipistrelle *Pipistrellus nathusii*) crossed the A47 flying north at approximately 5 – 8m height.
- At 4:08 a common pipistrelle crossed the A47 flying north at approximately 8 – 10m height.
- At 4:10 a common pipistrelle crossed the A47 flying north at approximately 10m height.

In total five bat detections were recorded including common pipistrelle and a pipistrelle sp. (either common or soprano pipistrelle).

Survey 1 2/7/2020 dawn – surveyor 2 (south of the A47)

No bats were recorded as confirmed crossing the A47 by surveyor two during the survey. A common pipistrelle was observed at 3:51 flying along and around the tree line on the south side of the A47 and it is considered likely the bat was foraging. In total four detections of common pipistrelle were recorded.

No potential unseen bat crosses were identified following data analysis.

Survey 2 21/07/2020 dusk – surveyor 1 (north of the A47)

No bats were recorded crossing the A47 by surveyor one during the survey. In total 10 bat detections were made recording a minimum of two species including common pipistrelle and a minimum of one big bat (NSL) species.

Survey 2 21/07/2020 dusk – surveyor 2 (south of the A47)

No bats were recorded crossing the A47 by surveyor two during the survey. In total six bat detections were made during the survey including one potential common pipistrelle call of one single pulse. A minimum of two species were detected including common pipistrelle and a minimum of one species of big bat (NSL).

The following bat detection was recorded by both surveyors and is considered, following data analysis, as a potential unseen bat cross of the A47:

- At 23:06 on both sides of the road common pipistrelle calls

Crossing point four

Survey 1 25/6/2020 dusk – surveyor 1 (north of the A47)

Surveyor one recorded two confirmed instances of bats crossing the A47 during the survey as detailed below:

- At 22:26 a noctule crossed the A47 flying north-east at approximately 15m height.

- At 22:44 a noctule crossed the A47 flying north-east at approximately 15m height.

In total three detections of noctule were recorded by surveyor one during the survey. No other species was detected.

Survey 1 25/6/2020 dusk – surveyor 2 (south of the A47)

In addition to observing the noctule crossing the road at 22:26, surveyor two recorded one further bat cross of the A47 during the survey as detailed below:

- At 21:59 a soprano pipistrelle crossed the A47 flying northwards at approximately 2 – 5m height.

In total nine bat detections were made by surveyor two during the survey. Species include common and soprano pipistrelle, and noctule. No potential unseen bat crosses were identified following data analysis.

Survey 1 26/6/2020 dawn – surveyor 1 (north of the A47)

No bats were recorded crossing the A47 and no bats were detected during the survey by surveyor one.

Survey 1 26/6/2020 dawn – surveyor 2 (south of the A47)

No bats were recorded crossing the A47 and no bats were detected during the survey by surveyor two.

Survey 2 2/7/2020 dusk – surveyor 1 (north of the A47)

No bats were confirmed crossing the road by surveyor one during the survey. In total six bat detections were recorded during the survey including identified noctule calls and unidentified big bat species (NSL) calls.

Survey 2 2/7/2020 dusk – surveyor 2 (south of the A47)

No bats were confirmed crossing the road by surveyor two during the survey. In total six bat detections were recorded by surveyor two during the survey including four noctule calls, one big bat species (NSL) call and one call which is considered either a big bat species (NSL) or a brown long-eared.

No potential unseen bat crosses over the A47 were identified following data analysis.

Crossing point five

Survey 1 25/6/2020 dusk – surveyor 1 (north of the A47)

Surveyor one confirmed three instances of bats crossing the A47 as detailed below:

- At 22:15 a common pipistrelle crossed the A47 flying south at approximately 10m height.
- At 22:27 a common pipistrelle crossed the A47 flying south at approximately 10m height. This bat crossed the road approximately 10m west of the surveyor location however is still considered to have crossed at crossing point five.
- At 22:38 a common pipistrelle crossed the A47 flying south at approximately 15m height. This bat crossed the road approximately 15m east of the surveyor location however is still considered to have crossed at crossing point five.

In total 11 bat detections were recorded by surveyor one during the survey identifying the following three species: common and soprano pipistrelle and noctule.

Survey 1 25/6/2020 dusk – surveyor 2 (south of the A47)

Surveyor two recorded no confirmed instances of bats crossing the A47 during the survey. In total two noctule and one common pipistrelle detections were recorded during the survey. No potential unseen bat crosses have been identified.

Survey 1 26/6/2020 dawn – surveyor 1 (north of the A47)

No bats were confirmed crossing the A47 by surveyor one during the survey. In total five common pipistrelle detections were recorded during the survey. No other species were recorded.

Survey 1 26/6/2020 dawn – surveyor 2 (south of the A47)

No bats were confirmed crossing the A47 by surveyor two during the survey. No bat detections were recorded during the survey. No potential unseen bat crosses have been identified.

Survey 2 1/7/2020 dusk – surveyor 1 (north of the A47)

Surveyor one recorded no confirmed instances of bats crossing the A47 during the survey. In total 13 bat detections were made with four species identified: common and soprano pipistrelle, noctule and a Myotis sp.

Survey 2 1/7/2020 dusk – surveyor 2 (south of the A47)

Surveyor two recorded no confirmed instances of bats crossing the A47 during the survey. In total surveyor two recorded 27 bat detections. A minimum of four species were recorded including common and soprano pipistrelle, noctule and a minimum of one Myotis sp.

The following bat calls were recorded, but not visually observed, by both surveyors one either side of the road and are considered, following data analysis, potential unseen bat crosses over the A47:

- At 22:20 on both sides of the A47 common pipistrelle calls
- At 22:55 on both sides of the A47 common pipistrelle calls
- At 23:07 on both sides of the A47 soprano pipistrelle calls
- At 23:12 on the north and 23:13 on the south of the A47 Myotis sp. calls
- At 23:47 on both sides of the A47 soprano pipistrelle calls

Crossing point six

Survey 1 24/6/2020 dusk – surveyor 1 (north of the A47)

No instances of bats crossing the A47 were confirmed by surveyor one. No bats were detected by surveyor one during the survey, despite surveyor one manually recording two noctules and two common pipistrelles throughout the survey.

Survey 1 24/6/2020 dusk – surveyor 2 (south of the A47)

Surveyor two recorded one confirmed bat cross over the A47 as detailed below:

- At 22:23 a common pipistrelle (undetected and as such unverified) crossed the A47 flying north at approximately 10m height.

In total five detections of common pipistrelle were recorded by surveyor two during the survey. No other species were detected and no potential unseen bat crosses over the A47 were identified.

Survey 1 25/6/2020 dawn – surveyor 1 (north of the A47)

No instances of bats crossing the A47 were confirmed by surveyor one. In total 18 bat detections were recorded by surveyor one during the survey including big bat species (NSL), common and soprano pipistrelle, and noctule.

Survey 1 25/6/2020 dawn – surveyor 2 (south of the A47)

No instances of bats crossing the A47 were confirmed by surveyor two. No bat detections were recorded by surveyor two during the survey.

Survey 2 20/7/2020 dusk – surveyor 1 (north of the A47)

Two confirmed instances of bats crossing the A47 were recorded by surveyor one as detailed below:

- At 21:30 a common pipistrelle (undetected and as such unverified) crossed the A47 flying north at approximately 5 – 7m height.
- At 21:45 a common pipistrelle crossed the A47 flying north at approximately 6m height.

In total three detections of bats were made during this survey, including a common pipistrelle detection at 21:45, a soprano pipistrelle detection and a Myotis sp. detection.

Survey 2 20/7/2020 dusk – surveyor 2 (south of the A47)

No bats were recorded crossing the A47 by surveyor two. No bats were detected during the survey.

Crossing point seven

Survey 1 11/6/2020 dusk – surveyor 1 (north of the A47)

The following bats were confirmed crossing the A47 by surveyor one during the survey:

- At 21:18/19 a noctule crossed the A47 flying south at approximately 20m height.
- At 21:19 a common pipistrelle crossed the A47, flying out from Easton Estates lane on the north, along the A47 westwards for short stretch then away from the road heading south. The bat flew at approximately 10m height.
- At 21:30 a common pipistrelle crossed the A47 flying north.
- At 21:54 a common pipistrelle and barbastelle crossed the A47 flying south.
- At 21:55 a common pipistrelle crossed the A47 flying north.
- At 22:00 a barbastelle crossed the A47 flying south.
- At 22:00 an unidentified bat crossed the A47 flying north at approximately 20m height. Two other bats were recorded at 22:00 by surveyor one in addition to the above barbastelle; noctule and common pipistrelle. Given the height of the flight path, 20m, it is considered likely that this is a noctule, however this cannot be confirmed. As such it is entered into Table 4.1-2 as an unidentified sp.

In addition to the above crosses, at 21:58 surveyor one observed two common pipistrelles fly out from Easton Estates lane on the north of the A47, over the road to the tree line on the south side of the road and back again to the north of the A47. As these bats were likely foraging along the road verge habitats (woodland/trees) and not crossing the road to

reach other habitats further back from the road they have not been included as crosses within Table 4.1-2.

In total 73 bat detections were recorded by surveyor one during the survey identifying four species: common and soprano pipistrelle, noctule and barbastelle. A relatively large amount of bat activity was recorded during this survey at this crossing point in comparison to the level of activity at the majority of other crossing points. The majority of the activity recorded was attributed to pipistrelle bats and it is considered the high level of activity is recorded is due to the close proximity of the roosts down the Easton Estates lane identified during surveys undertaken in 2020.

Survey 1 11/6/2020 dusk – surveyor 2 (south of the A47)

The following bats were confirmed crossing the A47 by surveyor two during the survey:

- At 21:24 a common pipistrelle crossed the A47 flying north from Hall Road on the south at approximately 15m height.
- At 21:40 a common pipistrelle crossed the A47 flying north from Hall Road on the south at approximately 15m height.
- At 21:54 a common pipistrelle crossed the A47 flying north from Hall Road on the south at approximately 30m height.
- At 22:05 a common pipistrelle crossed the A47 flying north-east towards the Easton Estates Lane from Hall Road on the south at approximately 20m height.
- At 22:18/19 a brown long-eared crossed the A47 flying north-east towards the Easton Estates Lane from Hall Road on the south at approximately 20m height.

In addition to the above surveyor two also recorded, at 21:17, a foraging common pipistrelle which flew out from Hall Road on the south to the north side of the A47 and immediately back to the south. As this bat was using the road verge habitats to forage and not crossing the road to reach other habitats it has not been included as a cross in Table 4.1-2.

In total 18 detections of bats were recorded by surveyor two during the survey identifying five species: common and soprano pipistrelle, noctule, barbastelle and brown long-eared.

The following bat detections were recorded by both surveyors on either side of the road either within the same minute or within one minute of each other and are, following data analysis, considered potential unseen bat crosses over the A47:

- At 22:01 on both sides of the A47 common pipistrelle calls
- At 22:01 on both sides of the A47 soprano pipistrelle calls
- At 22:03 on both sides of the A47 barbastelle calls

- At 22:13 on both sides of the A47 common pipistrelle calls
- At 22:33 on the south and 22:32 on the north side of the A47 common pipistrelle calls

Survey 1 12/6/2020 dawn – surveyor 1 (north of the A47)

The following confirmed bats crossing the A47 were recorded by surveyor one during the survey:

- At 3:36 a soprano pipistrelle crossed the A47 flying south.
- At 3:56 a common pipistrelle crossed the A47 from the Easton Estates lane on the north heading south.

A relatively high level of activity was recorded. In total thirteen bat detections were recorded by surveyor one during the survey. Common and soprano pipistrelle, barbastelle and brown long-eared were identified.

Survey 1 12/6/2020 dawn – surveyor 2 (south of the A47)

The following confirmed bats crossing the A47 were recorded by surveyor two during the survey:

- At 3:41 an undetected unidentified bat crossed the A47 flying from Hall Road on the south to the Easton Estates lane on the north at approximately 20m height.
- At 3:49 an undetected unidentified bat crossed the A47 flying from Hall Road on the south to the Easton Estates lane on the north at approximately 20m height.
- At 3:59 an undetected unidentified bat crossed the A47 flying south over the road and down Hall Road at approximately 20m height.
- At 3:59 two undetected unidentified bats crossed the A47 flying from Hall Road on the south to the Easton Estates lane on the north at approximately 20m height.

Due to issues with the used Anabat walkabout detector (see Section 3.3.4) only one bat detection, of a barbastelle at 3:29, was recorded by surveyor two during the survey. No potential unseen bat crosses over the A47 have been identified.

Barbastelle calls were recorded by both surveys at 3:29, however as these calls were only one second apart and there were no other calls, it is considered possible that the bat may have been commuting or foraging on one side of the road and was merely detected by the surveyor at the other side of the A47. As such it has not been included as a potential cross in Table 4.1-2.

Survey 2 23/6/2020 dusk – surveyor 1 (north of the A47)

The following bats were confirmed crossing the A47 during the survey by surveyor one:

- At 21:31 a foraging common pipistrelle crossed the A47 flying north at approximately 8m height and continuing northwards on the Easton Estates lane.
- At 22:11 a pipistrelle sp. (common or soprano pipistrelle) crossed the A47 flying from the vegetation lining the Easton Estates lane heading south-west across the road.
- At 22:14 a common pipistrelle crossed the A47 flying out from the Easton Estates lane on the north directly over the road heading south.

Surveyor one also observed pipistrelle bats foraging at the southern end of the Easton Estates lane and occasionally flying out in foraging circles over the A47. This behaviour has not been included as a bat cross of the A47 as the bats were using the road verge habitats to forage as opposed to crossing the road to reach foraging habitats further afield. A relatively high level of pipistrelle commuting and foraging activity was recorded during the survey.

In total 124 bat detections were recorded by surveyor one during the survey, including one detection of a big bat species (NSL) and nine instances of unidentified bat calls. Species identified include common and soprano pipistrelle, noctule and barbastelle.

Survey 2 23/6/2020 dusk – surveyor 2 (south of the A47)

No confirmed instances of bats crossing the A47 were recorded by surveyor two during the survey. In total 219 bat detections were recorded by surveyor two during the survey including two unidentified bat calls, common and soprano pipistrelle calls, one noctule call, and two unidentified calls which are attributable to either brown long-eared bats or species of big bat (NSL).

Surveyor two recorded a common pipistrelle foraging approximately 15m above the A47/Hall Road junction. In addition, surveyor two noted a significant decrease in bat crossing behaviour when cars were passing the crossing point location, however it is not clear whether this was due to a decrease in visibility. A risk of mortality was noted with regards to common pipistrelles observed foraging at approximately 5m height near the road.

The following bat calls were recorded on both sides of the A47 and are considered, following data analysis, as potential unseen bat crosses over the A47:

- At 22:02 on both sides of the A47 common pipistrelle calls
- At 22:03 on both sides of the A47 common pipistrelle calls

- At 22:09 on the south and 22:08 on the north of the A47 common pipistrelle calls
- At 22:10 on both sides of the A47 common pipistrelle calls
- At 22:14 on the north and 22:15 on the south side of the A47 common pipistrelle calls
- At 22:19 on the south and 22:18 on the north side of the A47 common pipistrelle calls
- At 22:22 on the south and 22:21 on the north of the A47 soprano pipistrelle calls
- At 22:26 on the south and 22:27 on the north side of the A47 common pipistrelle calls
- At 22:34 on both sides of the A47 common pipistrelle calls
- At 22:59 on both sides of the A47 common pipistrelle calls
- At 23:02 on the south and 23:01 on the north side of the A47 common pipistrelle calls
- At 23:03 on the south and 23:02 on the north of the A47 soprano pipistrelle calls
- At 23:09 on the south and 23:08 on the north side of the A47 common pipistrelle calls
- At 23:17 on both sides of the A47 common pipistrelle calls
- At 23:21 on both sides of the A47 common pipistrelle calls
- At 23:30 on both sides of the A47 common pipistrelle calls
- At 23:44 on the south and 23:43 on the north of the A47 soprano pipistrelle calls

As surveyor two recorded multiple common pipistrelle detections every minute except one between 21:28 and 21:59 no attempt has been made to identify any potential unseen common pipistrelle crosses within this time period. As both surveyors recorded almost constant common pipistrelle activity between 22:37 and 22:53 no attempt has been made to identify potential unseen common pipistrelle passes within this time period.

Crossing point eight

Survey 1 30/6/2020 dusk – surveyor 1 (north-east of the A47)

The following confirmed instances of bats crossing the A47 were recorded by surveyor one during the survey:

- At 21:27 a noctule crossed the A47 flying north at approximately 10m height.
- At 21:32 a common pipistrelle crossed the A47 flying north at approximately 7m height.

- At 21:33 a common pipistrelle crossed the A47 flying over the bridge going north.
- At 21:37 a foraging common pipistrelle crossed the A47 flying over the bridge heading north.
- At 21:39 a foraging common pipistrelle crossed the A47 flying over the bridge at approximately 4 – 7m height.
- At 21:49 a foraging common pipistrelle crossed the A47 flying over the bridge and then north at approximately 10m height.
- At 22:28 a barbastelle crossed the A47 flying south at approximately 5m height.
- At 22:34 a foraging common pipistrelle crossed the A47 flying north at approximately 15m height.

Surveyor one recorded a relatively high level of bat activity at crossing point eight including a high level of foraging activity. Surveyor one noted that all instances of bats commuting along the route of the A47 (either west to east or east to west) were on the north side of the A47. In total 30 bat detections were made. Four species were identified: common and soprano pipistrelle, noctule and barbastelle.

Survey 1 30/6/2020 dusk – surveyor 2 (north-west of the A47)

In addition to observing the common pipistrelle crossings the A47 at 21:37 and 21:39, surveyor two confirmed the following further crosses:

- At 21:27 a pipistrelle sp. (common or soprano pipistrelle) crossed over the A47 bridge flying north at approximately 10m height.
- At 21:28/29 a noctule crossed over the A47 bridge flying north. It is possible, following data analysis, this is the same cross recorded at 21:27 by surveyor one however it is considered a cross and included in Table 4.1-2.
- At 21:41 a common pipistrelle crossed the A47 flying north-east at approximately 6m height.
- At 21:51 a common pipistrelle crossed the A47 flying north-east at approximately 10m height.
- At 21:56 a pipistrelle sp. (common or soprano pipistrelle) crossed the A47 flying north at approximately 8m height.
- At 22:05 a common pipistrelle crossed the A47 flying north at approximately 8m height.

At 21:33 surveyor two recorded a soprano pipistrelle crossing over the A47 bridge flying north at approximately 8m height and then foraging over the A47. In addition, surveyor two recorded several instances when bats foraging/flew along the road corridor. A high level of activity was recorded during the survey by surveyor two relative to that recorded at other crossing points. In total 53 bat detections were recorded by surveyor two. In addition

to one unidentified bat call and several big bat sp. (NSL) calls a minimum of four species were identified including common and soprano pipistrelle, noctule and barbastelle.

Survey 1 1/7/2020 dawn – surveyor 1 (north-east of the A47)

The following instances of bats crossing the A47 during the survey were confirmed by surveyor one:

- At 3:41 an undetected unidentified bat crossed the A47 flying north at approximately 5m height.
- At 3:46 a soprano pipistrelle crossed the A47 flying north at approximately 7m height.
- At 3:55 two common pipistrelles crossed the A47 flying south at approximately 3m height. The surveyor noted the bats were extremely close to oncoming traffic.
- At 4:05 a common pipistrelle crossed the A47 flying south at approximately 5m height.
- At 4:15 a common pipistrelle crossed the A47 flying south at approximately 5m height.
- At 4:17 a common pipistrelle crossed the A47 flying south at approximately 5m height.
- At 4:21 a soprano pipistrelle crossed the A47 flying south at approximately 5m height.
- At 4:21 a big bat sp. (NSL) crossed the A47 flying north at approximately 25m height.
- At 4:25 a common or soprano pipistrelle crossed the A47 flying south at approximately 5m height. This was recorded as a very quick pass.

In total 20 bat detections were recorded by surveyor one during the survey. Common and soprano pipistrelle and noctule were identified in addition to one further unidentified big bat sp. (NSL) call.

Survey 1 1/7/2020 dawn – surveyor 2 (north-west of the A47)

In addition to observing the common pipistrelle crossing at 4:17, the following instances of bats crossing the A47 were recorded by surveyor two during the survey;

- At 4:07 a soprano pipistrelle crossed the A47 flying north-east at approximately 8m height.
- At 4:13 a common pipistrelle crossed the A47 flying south.
- At 4:23 a common or soprano pipistrelle crossed the A47 flying north at approximately 5m height.

- At 4:24 a soprano pipistrelle crossed the A47 flying south at approximately 4m height. This has been recorded as a separate cross to that recorded by surveyor one at 4:25 (see above) as surveyor two detected a separate soprano pipistrelle call at 4:25 which is considered potentially the same bat as surveyor one observed crossing.

Surveyor two also recorded soprano pipistrelles flying under the A47/River Tud bridge at 3:44/45.

In total surveyor two detected 32 bat calls during the survey with a minimum of four species identified including common and soprano pipistrelle, noctule, barbastelle and potentially one other species of big bag (NSL).

Survey 2 21/7/2020 dusk – surveyor 1 (north-east of the A47)

Surveyor one confirmed the following instances of bats crossing the A47 during the survey:

- At 21:01 a common pipistrelle crossed the A47 flying north at approximately 12m height.
- At 21:03 a common pipistrelle crossed the A47 flying north-east at approximately 10m height.
- At 21:08 a common pipistrelle crossed the A47 flying north-east at approximately 10m height.
- At 21:14 a common pipistrelle crossed the A47 approximately 20m east of the River Tud bridge flying north.
- At 21:16 a common pipistrelle crossed the A47 approximately 20m west of the River Tud bridge flying north at approximately 12 – 15m height.
- At 21:19 a common pipistrelle crossed the A47 flying north at approximately 12m height.
- At 21:21 a common pipistrelle crossed the A47 flying north-east at approximately 7m height.
- At 21:21 a common pipistrelle crossed the A47 flying north at approximately 10m height.
- At 21:26 a common pipistrelle crossed the A47 east of the River Tud bridge flying north-east at approximately 10m height.
- At 21:26 a common pipistrelle crossed the A47 west of the River Tud bridge flying north-east at approximately 12m height.
- At 21:30 a common pipistrelle crossed the A47 flying north at approximately 12m height.

In total 19 bat detections were recorded by surveyor one during the survey. A minimum of four species were identified including common and soprano pipistrelle, barbastelle and a minimum of one species of big bat (NSL).

Survey 2 21/7/2020 dusk – surveyor 2 (north-west of the A47)

In addition to observing those crosses recorded by surveyor one at 21:01, 21:03, 21:19 and 21:21 surveyor two recorded the following additional confirmed bat crosses over the A47:

- At 20:57 a common pipistrelle crossed the A47 flying north at approximately 10m height.
- At 21:06 a soprano pipistrelle crossed the A47 flying north at approximately 8 – 10m height.
- At 21:08 a soprano pipistrelle crossed the A47 flying north at approximately 8 – 10m height.
- At 21:09 an unidentified, undetected bat crossed the A47 approximately 10m east of the bridge flying north at approximately 8 – 10m height.
- At 21:12 a common pipistrelle crossed the A47 flying north at approximately 12m height.
- At 21:14 three common pipistrelles crossed the A47 approximately 10 -15m east of the River Tud bridge flying north at approximately 10m height. One of these bats is considered the same common pipistrelle observed by surveyor one. As such the other two bats shall be included in Table 4.1-2 as separate crosses.
- At 21:15 two common pipistrelles crossed the A47 flying north at approximately 10m height.
- At 21:17 two common pipistrelles crossed the A47 approximately 20m west of the River Tud bridge flying at approximately 10m height. One of these bats is considered the same bat recorded crossing by surveyor one at 21:16 and as such one cross shall be recorded in Table 4.1-2 for surveyor two's observation.
- At 21:25 two common pipistrelles crossed the A47 flying south at approximately 8m and 10m height.
- At 21:27 two common pipistrelles crossed the A47 flying north at approximately 10m height.
- At 21:35 a common pipistrelle crossed the A47 flying north.

In total 75 bat detections were recorded by surveyor two during the survey. A minimum of five species were recorded including common and soprano pipistrelle, barbastelle, brown long-eared and a minimum of one species of big bat (NSL). A high level of bat activity was recorded relative to that bat activity which has been recorded at other crossing points.

Crossing point nine

Survey 1 18/6/2020 dusk - surveyor 1 (north of the A47)

The following confirmed bat crosses over the A47 were observed by surveyor one during the survey:

- At 21:32 a noctule crossed the A47 flying south at approximately 30m height.
- At 21:41 a noctule crossed the A47 flying south at approximately 30m height.

In total 16 bat detections were recorded by surveyor one during the survey identifying four species: common and soprano pipistrelle, noctule and barbastelle. In addition, one unidentified call was recorded.

Survey 1 18/6/2020 dusk – surveyor 2 (south of the A47)

In addition to observing the two confirmed crosses recorded by surveyor one at 21:32 and 21:41, surveyor two visually observed and recorded a further two potential (although likely) crosses as detailed below:

- At 22:12 a soprano pipistrelle flying south-west at approximately 6m height. This bat was also detected, but unseen, by surveyor one on the north side of the road.
- At 22:18 a common pipistrelle flying south at approximately 10m height.

In total six confirmed bat detections were recorded by surveyor two during the survey and one potential noctule detection. Four species were identified including common and soprano pipistrelle, noctule and barbastelle.

The following bat calls were recorded on both sides of the A47 and are considered, following data analysis, potential unseen bat crosses over the A47:

- At 22:12 on the south side and 22:13 on the north side of the A47 common pipistrelle calls
- At 22:29 on both sides of the A47 barbastelle calls

Survey 1 19/6/2020 dawn – surveyor 1 (north of the A47)

Surveyor one recorded no confirmed bat crosses over the A47 during the survey. A soprano pipistrelle was observed foraging along the hedgerow on the northern verge of the A47 and a soprano pipistrelle was recorded commuting west parallel to the north of the A47. Despite surveyor one manually recording five bats during the survey including soprano pipistrelle and noctule, and visually observing a minimum of two bats during the survey, only one bat detection was automatically recorded; that of a noctule at 4:05.

Survey 1 19/6/2020 dawn – surveyor 2 (south of the A47)

Surveyor two recorded no confirmed observations of bats crossing the A47 during the survey. One observation was recorded of a common pipistrelle flying behind the surveyor in the field to the south of the A47. Three common pipistrelle calls were detected. No potential unseen bat crosses have been identified.

Survey 2 24/6/2020 dusk – surveyor 1 (north of the A47)

Surveyor one observed the following bats crossing the A47 during the survey:

- At 21:47 a noctule crossed the A47 flying south at approximately 50m height.
- At 21:48 a noctule crossed the A47, first flying north-east over the to above the A47 then flying beyond the A47 north-west beyond the A47 in a semi-circular flight path at approximately 50m height.
- At 22:30 a common pipistrelle crossed the A47 flying north at approximately 1.5m height.

Noctule and pipistrelle foraging behaviour was recorded during the survey. A higher amount of activity was recorded during this survey in contrast to survey one at crossing point nine, however this is likely due to the survey length for crossing point two being 2.5 hours in total as opposed to the 1.5-hour dusk survey for survey one.

At 21:52 surveyor one recorded a potential noctule crossing the A47 cross heading south at approximately 50m high. As the flight path of this bat was so high it was difficult to determine whether it definitely crossed the A47 and as such it is included in Table 4.1-2 as a potential cross.

In total seven bat detections were recorded by surveyor one during the survey. A minimum of four species were detected: common and soprano pipistrelle, noctule, a *Myotis* sp. and a species of big bat (NSL).

Survey 2 24/6/2020 dusk – surveyor 2 (south of the A47)

Surveyor two observed the below bat crossing the A47 during the survey:

- At 23:17 a common pipistrelle crossed the A47 approximately 30m west of surveyor two's location flying south at approximately 8 – 10m height. Whilst this cross was 30m west of the surveyor location it still occurred where there will be a large new junction immediately south of where the current A47 route is located. As such it is included in Table 4.1-2.

In total 40 bat detections were recorded by surveyor two during the survey. A minimum of five species were recorded: common and soprano pipistrelle, barbastelle, noctule, a *Myotis* sp. and a minimum of one species of big bat (NSL). The automatic bat classification tool on Anabat Insight software has identified one call recording by surveyor

two during this survey as a Bechstein's bat with an 85% degree of certainty and no other possible identifications. Whilst data analysis and automatic species identification of data collected during these surveys and during activity surveys undertaken in 2019 (RSK, 2020) has suggested Bechstein's are present on site, a review of the results of bat surveys undertaken to inform the Norwich Western Link Road scheme has identified no findings of Bechstein's. It is not known how reliable the automatic identification feature on Anabat Insight is and as such it can not be confirmed whether the recording was that of a Bechstein's or another species of Myotis.

No potential unseen bat crosses over the A47 were identified following data analysis.

Crossing point 10

Survey 1 22/6/2020 dusk – surveyor 1 (north of the A47)

6.1.2. The following instances of bats crossing the A47 were confirmed by surveyor one during the survey:

- At 21:48 a noctule crossed the A47 flying south from western side of Taverham Road at approximately 20m height.
- At 21:50 a noctule crossed the A47 flying south from Taverham Road at approximately 20m height.

In total four noctule calls were detected by surveyor one during the survey.

Survey 1 22/6/2020 dusk – surveyor 2 (south of the A47)

No instances of bats crossing the A47 were confirmed by surveyor two during the survey. In total 22 bat detections were recorded by surveyor two during the survey identifying three species: common and soprano pipistrelle and noctule.

No potential unseen bat crosses over the A47 were identified.

Survey 1 23/6/2020 dawn – surveyor 1 (north of the A47)

Surveyor one recorded no confirmed instances of bats crossing the A47 during the survey. In total two common pipistrelle calls were detected by surveyor one during the survey.

Survey 1 23/6/2020 dawn – surveyor 2 (south of the A47)

The following confirmed instance of a bat crossing the A47 was observed by surveyor two during the survey:

- At 3:34 a common pipistrelle crossed the A47 flying south at approximately 5m height.

The common pipistrelle call detected at 3:34 was the only bat call detected by surveyor two during the survey.

No potential unseen bat crosses were identified.

Survey 2 25/6/2020 dusk – surveyor 1 (north of the A47)

The following confirmed bat crosses over the A47 were recorded by surveyor one during the survey:

- At 21:50 a noctule crossed the A47 flying north-west. No estimate of height was made as the bat was flying very high. The flight path was above the height of a HGV.
- At 22:32 a soprano pipistrelle crossed the A47 flying north-west across the A47 and Taverham Road at approximately 8m height.

In total 58 bat detections were recorded by surveyor one during the survey. A minimum of four species were detected: common and soprano pipistrelle, noctule and a Myotis sp. Further detections of a big bat species (NSL) were also recorded.

Survey 2 25/6/2020 dusk – surveyor 2 (south of the A47)

The following confirmed bat crosses over the A47 were recorded by surveyor two during the survey:

- At 22:28 a noctule crossed the A47 and flew along the western verge of Blind Lane.
- At 22:39 a soprano pipistrelle crossed the A47 flying north from Blind Lane at approximately 5m height.

At 22:04 a soprano pipistrelle was observed by surveyor on the northern side of the A47 flying south out over the road. As the surveyor did not see this bat cross the road, but the direction of its flight path suggests it may have done, this is recorded in Table 4.1-2 as a potential bat cross of the A47.

Surveyor two also recorded a common and a soprano pipistrelle flying along and around the hedgerow parallel to the south of the A47 west of Blind Lane. It is considered that this hedgerow is potentially used by bats as a commuting and/or foraging corridor.

In total 54 bat detections were recorded by surveyor two during the survey. A minimum of three species were detected: common and soprano pipistrelle and noctule. Additional big bat (NSL) calls were detected.

The following bat calls have been detected by both surveyors on either side of the A47 in instances when bats were not visually seen, and as such have been identified, following data analysis, as potential unseen bat crosses over the A47:

- At 22:39 on the south side of the A47 and 22:38 on the north side common pipistrelle calls
- At 22:40 on both sides of the A47 common pipistrelle calls
- At 23:30 on both sides of the A47 common pipistrelle calls
- At 23:33 on both sides of the A47 common pipistrelle calls
- At 23:40 on both sides of the A47 common pipistrelle calls
- At 23:42 on both sides of the A47 common pipistrelle calls
- At 23:48 on the south side and 23:47 on the north side of the A47 common pipistrelle calls

Crossing point 11

Survey 1 23/6/2020 dusk – surveyor 1 (north of the A47)

The following bats were confirmed crossing the A47 by surveyor one during the survey:

- At 21:51 a noctule crossed the A47 flying south. There was no height estimate for this observation as the bat was flying very high. The surveyor noted that the bat was flying significantly above the tree canopies.
- At 21:53 a noctule crossed the A47 flying south-west. There was no height estimate for this observation as the bat was flying very high. The surveyor noted that the bat was flying significantly above the tree canopies.
- At 22:35 a soprano pipistrelle crossed the A47 flying south at approximate 10 – 15m height. The flight path was observed as above HGV height.

In total 13 bat detections were recorded by surveyor one during the survey. Three species were identified: common and soprano pipistrelle, and noctule.

Survey 1 23/6/2020 dusk – surveyor 2 (south of the A47)

The following instances of bats crossing the A47 were confirmed by surveyor two during the survey:

- At 21:55 a big bat (NSL) crossed the A47 flying south-west at approximately 30m height.
- At 22:03 a noctule crossed the A47 flying south over the road, east along the verge habitat and then off towards the south. The bat was flying at approximately 25m height.
- At 22:32 a common pipistrelle crossed the A47 flying north to the field entry lane/gate at approximately 10m height.

Surveyor two also recorded a soprano pipistrelle flying east along the south verge habitat. In total 10 bat detections were recorded by surveyor two during the survey including common and soprano pipistrelle, noctule and one big bat species (NSL) call.

The following calls were recorded on both sides of the A47 and are, following data analysis, considered potential unseen bat crosses over the A47:

- At 22:27 on both sides of the A47 common pipistrelle calls
- At 22:29 on both sides of the A47 soprano pipistrelle calls
- At 22:31 on the south side and 22:31 on the north side of the A47 common pipistrelle calls

Survey 1 24/6/2020 dawn – surveyor 1 (north of the A47)

No bats were detected during the survey.

Survey 1 24/6/2020 dawn – surveyor 2 (south of the A47)

No bats were detected during the survey.

Survey 2 29/6/2020 dusk – surveyor 1 (north of the A47)

Surveyor one confirmed no bat crosses over the A47 during the survey. In total four bat detections were recorded including soprano pipistrelle calls, an unidentified pipistrelle (common or soprano) calls and unidentified big bat sp. (NSL) calls.

Survey 2 29/6/2020 dusk – surveyor 2 (south of the A47)

Surveyor two confirmed no bat crosses over the A47 during the survey. Pipistrelle foraging behaviour was observed in the field to the north of the A47.

In total 15 bat detections were recorded by surveyor two during the survey. A minimum of four species were identified including common and soprano pipistrelle, barbastelle and a minimum of one big bat species (NSL).

No potential unseen bat crosses were identified following data analysis.