A47 Blofield to North Burlingham Dualling

Scheme Number: TR010040

Volume 6
6.2 Environmental Statement Appendices
Appendix 8.11 – Bat Activity Crossing Point Survey Report

APFP Regulation 5(2)(a)

Planning Act 2008

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

December 2020

Infrastructure Planning

Planning Act 2008

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

A47 Blofield to North Burlingham Development Consent Order 202[x]

ENVIRONMENTAL STATEMENT APPENDICES
Appendix 8.11 Bat Activity Crossing Point Survey Report

Regulation Number:	Regulation 5(2)(a)
Planning Inspectorate Scheme Reference	TR010040
Application Document Reference	6.2
Author:	A47 Blofield to North Burlingham Dualling Project Team, Highways England

Version	Date	Status of Version
Rev 0	December 2020	Application Issue

Table of contents

1. Scheme introduction and location

1.1. Background

1.1.1. In February 2020, Sweco UK was commissioned by Highways England to undertake a bat activity crossing points survey between Blofield and North Burlingham in line with the Road Investment Strategy announced in 2014 (Highways England 2014). Full details on the site can be found in section 1.2. This is to inform the Environmental Statement (ES) Chapter for the A47 Blofield to North Burlingham Improvement Scheme.

1.1.2. This scheme improvements aim to:

- Improve accessibility to and around the region, reducing congestion and delays so encouraging more reliable journey times.
- Improve safety performance for all road users – drivers, public transport users, cyclists, horse riders and pedestrians - contributing to a 40% reduction target in accidents across Highways England's roads over the implemented schemes' first five years.
- Provide alternative access to local roads.
- Improve the environmental impact of traffic along the A47 route, particularly for the communities in the six scheme areas.
- Support economic growth in the Peterborough, Norwich and Great Yarmouth areas, improving overall road capacity.

1.1.3. This report provides details of bat activity crossing points surveys undertaken between Blofield and North Burlingham between July and September (inclusive) 2020.

1.1.4. This detailed baseline report provides a summary of the methodology and results of the surveys carried out, the impacts of the proposed development upon bats crossing the A47 and proposals for mitigation which are addressed in chapter six.

1.2. Scheme description

1.2.1. The site is located along the A47 in Blofield, Norfolk and is located between grid ref TG 3349 1012 to the west and TG 3887 1019 to the east. The proposed scheme involves:

- Upgrading the existing 2.6km section of single carriageway between Blofield and North Burlingham to dual carriageway. The new section of dual carriageway with junction improvements is proposed to be constructed to the south of the existing carriageway.

- Introducing a compact grade separated junction at B1140 Junction.
- Improving Yarmouth Road Junction
- Constructing a new overbridge at Blofield traversing the proposed A47 dual carriageway, connecting Yarmouth Road with the existing A47.
- Providing new drainage systems including an attenuation pond and retention of existing drainage systems where possible.

1.2.2. The survey area comprises the proposed route of the new road layout, and the scheme red line boundary. The area within the scheme red line boundary is primarily the existing A47 and agricultural fields with associated hedgerows, stands of trees, small woodlands, farm buildings and residential properties.

2. Ecological background

2.1. Previous studies

Desk study

2.1.1. A desk study undertaken at PCF Stage 1 and Stage 2 included the purchase of data from Norfolk Biodiversity Information Service (NBIS) which returned records of 22 bat roosts comprising six different species. In addition, records for up to 10 species were returned for bats within 10km of the Scheme including common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus*, barbastelle *Barbastella barbastellus*, noctule *Nyctalus noctula*, Leisler's *Nyctalus leisleri*, brown long-eared *Plecotus auritus*, serotine *Eptesicus serotinus*, Daubenton's *Myotis daubentonii*, Natterer's *Myotis nattereri* and Nathusius's pipistrelle *Pipistrellus nathusii* (Amey, 2017 and 2017a).

Phase 1 habitat surveys

2.1.2. An extended Phase 1 habitat survey of habitats within 100m of the outermost route options was undertaken in 2016, and updated in 2017, at PCF Stage 1 (Amey, 2017a, 2017b and 2017c). The survey identified the landscape as being of moderate quality for supporting commuting and foraging bats, as a predominantly arable landscape connected by hedgerows, lines of mature trees, grassland strips and pockets of woodland and scrub.

Phase 2 bat surveys

2.1.3. Activity surveys were undertaken in July, August, September and October 2017 (WYG, 2017) on the basis of the site having moderate quality habitat, as directed by Amey following PCF Stage 1 and 2 bat survey work and assessment of habitat suitability (Amey, 2017a). Transect routes were designed to encompass the different range of habitats within the site, with those habitats determined to have moderate to high potential for bat use as commuting routes and foraging areas being the main focus of the transects. The level of potential was classified according to Collins, (2016).

2.1.4. Twenty-four (24) activity surveys were conducted across six (6) transects in April, May and June 2018 (Highways England, 2018). Each transect followed the same route as those surveyed in 2017 and was subject to one survey visit per month, with one of those visits comprising both dusk and pre-dawn surveys. This was in accordance with Collins, (2016) guidelines for activity surveys on moderate quality habitat (one survey each month between April and October with one of those comprising a dusk and pre-dawn within a 24 hour period) and to complete a full survey season of activity surveys that was started in July 2017.

2.2. Legislation

2.2.1. All bats in the UK are protected under UK and European law as follows:

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

2.2.2. All UK species of bat are protected under Schedule 5of 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

2.2.3. All UK bat species are 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). This 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) and are afforded protection under Section 2 of the CHSR 2017 Regulation 42.

2.2.4. Under the CHSR, it is an offence to *inter alia*:

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

2.2.5. 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/she:

"*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".

2.2.6. 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)

2.2.7. Bats are also afforded more general protection in England (and Wales) under 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.

2.2.8. 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.

2.2.9. Seven species of bats (soprano pipistrelle *Pipistrellus pygmaeus*, brown long-eared, greater horseshoe *Rhinolophus ferrumequinum*, lesser horseshoe, *Rhinolophus hipposideros*, barbastelle *Barbastella barbastellus*, Bechstein's *Myotis bechsteinii* and noctule) are listed under Section 41 of the NERC Act 2006.

Norfolk Biodiversity Action Plan (BAP)

2.2.10. 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.

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 current A47 carriageway at which bats cross the carriageway ('crossing points')
- Identify if any rare bats (barbastelle) are using the A47 to cross over

- Assess the likely impacts upon commuting bats crossing the current A47 carriageway as a result of the scheme. The effectiveness of crossing structures are to be assessed by comparing the number of bats using the structure to cross, with those using the original pre-construction commuting route, and those crossing at risk of being killed by traffic
- Provide instructions for advised mitigation to be incorporated into the scheme design with regard to commuting (and foraging) bats.

2.3.2. The bat activity crossing points survey builds on the bat activity surveys previously undertaken in 2017 and 2018 and the bat emergence surveys undertaken in 2017 and 2018 focusing on potential areas where bats are present and where they cross the current and proposed A47 as indicated by the previous survey 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 and 2018
- The results of bat roost surveys previously undertaken in 2017 and 2018
- The proposed scheme design which follows the existing A47 along the south and works are to be done to the existing A47 and between this and the Proposed road
- Existing linear features on site including hedgerows and roads running perpendicular to the A47.

3.1.3. Table 3-1 below details the locations of the five potential crossing points chosen for further investigation and justifications for their selection. The five locations for the initial 2 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. The perpendicular hedgerows and linear features that would be bisected by the proposed scheme were locations that were subject to crossing point surveys. There are three of these and all were included. 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 2018 activity surveys. See Annex A for a figure showing the surveyed crossing points and Appendix 8.3: 2018 Bat Survey Report.

3.1.4. Other potential locations have been scoped out as from the previous activity surveys undertaken, activity was low across the whole scheme with common species recorded. It has been classified as low activity because most bats were recorded away from the A47 around Lingwood Woodland and field margins parallel to the A47 at a distance of between 200 and 350m from the road. The

majority of the 36 individual transects walked (six visits x six transects) across the scheme had fewer than five individual bats of commoner species recorded, only ten individual transects had more than five individual bats of commoner species recorded and six of these were the on same transect. This transect was located at North Burlingham and the bats were recorded in the woodland at the north of the village. The static detectors recorded very low levels of common species activity where placed at opposite sides of the existing A47 where there were no existing linear features and hedgerows crossing the A47, but had one hedgerow on one side only perpendicular to the A47. Higher levels of activity were recorded where hedgerows were bisected and at both sides of the A47. Bat activity was greater the further away from the existing A47 it was recorded. Parts of the existing A47 and the majority of the southern verge have no tree lines or hedgerows and any bats currently attempting to cross in these areas would be more likely to succumb to traffic collisions. The low level of the verges on the southern westbound carriageway additionally gave surveyors a good view of the proposed road immediately to the south and the proposed new road.

Table 3-1: Locations of the potential crossing points and justifications for their selection for further survey

Potential bat crossing point	Approximate grid reference and location description	Justification for selection as a potential bat crossing point
1	TG 34500 09929 A point east of Blofield at which High Noon Lane and Hemblington Road provide a potential linear feature across the A47 Width of road at this point is approximately 30m	High Noon Lane and Hemblington Road form a potential commuting route perpendicular to the A47 and bat activity was recorded in 2017 (WYG, 2017) and (Sweco, 2018) to the south-east and north-west of this point. The scheme design includes a proposed new junction immediately east of this location which would entail significant widening of the overall carriageway (including any proposed slipways and sideroads) at potential crossing point one. In order to determine if, and how, bats cross this section of the current A47 potential crossing point one has been chosen for survey. Barbastelle bats had been recorded on separate static detectors both north and south of this location on separate occasions.
2	TG 35865 10011 Width of road at this point is approximately 15m A point between Blofield and North Burlingham at the junction between Lingwood Road and the A47.	Lingwood Road and the hedgerow to the north of the A47 form a potential linear commuting route perpendicular to the A47. Previous bat roost surveys (undertaken in 2017 (WYG, 2017) and 2018 (Sweco, 2018) identified seven roosts in the area immediately to the south of this point (five at Poplar Farm, one at Oaklands and one at The Lindens) and one roost in a tree just north of the A47 (WYG, 2017). In 2017 a bat emerging form the tree was recorded foraging in a north/south direction along that hedgerow (WYG, 2017). Barbastelle bats had been recorded on separate static detectors both north and south of this location on separate occasions. Further investigation of this potential crossing point will identify whether bats from the roosts are commuting north/south across the existing and proposed A47.
3	TG 36236 09986 A point west of North Burlingham where the Main Road meets the A47 Width of road at this point is approximately 13m	During previously undertaken bat activity surveys bats have been recorded crossing this section of the A47. Surveys in 2017 recorded a bat crossing the main road and the A47 slightly east of this point (WYG, 2017) and Sweco surveys in 2018 also identified a bat crossing the A47 and, on a separate location, a bat crossing the Main Road at this same location (Sweco, 2018). A linear block of woodland lies south of the A47 perpendicular to the carriageway and there are multiple tree lines to the north of the carriageway, one of which runs along the Main Road connecting to a large block of woodland to the north of North Burlingham. These linear features combined

Potential bat crossing point	Approximate grid reference and location description	Justification for selection as a potential bat crossing point
		provide a potential commuting corridor for bats from the south of the A47 to access the large area of woodland as a foraging resource. In addition, there are three bat roosts in North Burlingham, identified during surveys in 2017, and bats have been recorded commuting along the Main Road east of North Burlingham (WYG, 2017). Further investigation of this potential crossing point will identify whether bats continue to cross this section of the A47 and how frequently.
4	TG 37352 09934 A point east of North Burlingham where the Main Road meets the A47 Width of road at this point is approximately 25m	This is considered a potential crossing point as a hedgerow to the north and a field margin with scattered trees to the south of the A47 form a potential commuting route perpendicular to the A47. Bats have been recorded foraging/commuting along the hedgerow to the north (WYG, 2017) and a bat roost is present in a tree along the field margin to the south of the A47. The scheme design includes a proposed new junction between North Burlingham and the B1140 Acle Road. At this location the width of the road shall be significantly increased due to the proposed new junction. In order to determine if, and how, bats cross this section of the current A47 potential crossing point four (which lies to the west of the proposed new junction location) has been chosen for survey, in addition to potential crossing point five to the east of the proposed new junction location.
5	TG 37723 09901 A point where the B1140 Acle Road from the south meets the A47. Width of road at this point is approximately 30m	This is considered a potential commuting route as a bat roost is present in the White House adjacent to the south of the A47 at the junction between the B1140 Acle Road and the A47. In addition, commuting/foraging bats have been recorded along the B1140 S Walsham Road (WYG, 2017). The scheme design includes a proposed new junction between North Burlingham and the B1140 Acle Road. At this location the width of the road shall be significantly increased due to the proposed new junction. In order to determine if, and how, bats cross this section of the current A47 potential crossing point five (which lies to the east of the proposed new junction location) has been chosen for survey, in addition to potential crossing point four to the west of the proposed new junction location. A barbastelle bat was recorded north of this location on a static detector.

3.1.5. During the surveys undertaken in 2020, one surveyor was positioned at either side of the A47 at the potential crossing point. Each surveyor was equipped with a full-spectrum bat detector ((Anabat Walkabout for surveys one and two; Elekon Batlogger M bat detector for surveys three to eight) 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, where this behaviour was directly observed. 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, AnalookW analysis software and BatExplorer. The recordings and the field notes from surveys one and two 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.

3.1.6. Annex A contains a map of the five surveyed potential 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 rare 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 with reference to Berthinussen and Altringham (2015). 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. 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.

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. A Pulsar Helion XP28 thermal imaging scope was used during the third survey undertaken at crossing point five on 12 August 2020 in order to have a visual observation of the bat in darker conditions and confirm whether or not the bats recorded on the detector were crossing the A47. The use of the thermal imaging

scope was proposed for a minimum of two of the six further surveys at each of the three chosen crossing points (one, two and five), 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.

3.2.5. 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)).

3.2.6. 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 are lower than 20km/h. All surveys were undertaken within the recommended weather conditions (see Table 4.1 below).

3.2.7. The initial two surveys were led by Diane Wood MCIEEM (Principal Ecologist, Sweco) who holds a level 2 Natural England bat class licence (registration number 2015-13155-CLS-CLS) and assisted by Ishbel Campbell ACIEEM (Senior Consultant Ecologist, Sweco), Beth Mell Grad CIEEM (Consultant Ecologist, Sweco), Lydia Waite (Ecology Field Assistant, Sweco) and Lewis Gospel (Ecology Field Assistant, Sweco). Surveys three to eight were undertaken by Ben Jervis BSc (Hons) MSc MCIEEM (Director/Principal Ecologist at Bench Ecology), Christine Hipperson-Jervis BSc (Hons) MCIEEM (Ecologist at Bench Ecology), Martin Brammah PhD MA(Cantab) BA(Hons) CEcol MCIEEM MRSB (Principal Ecologist), Beck Harrington-Harding BSc (Hons) Grad CIEEM (Ecologist), Alexandra Jackson MZool (Hons) (Graduate Ecologist), Sophie Barrell MEcol (Hons) Grad CIEEM (Ecologist), Sam Wilson BSc(Hons) ACIEEM (Ecologist), Richard Webber-Salmon BSc (Hons) Grad CIEEM (Ecologist), Joshua Stafford BSC (Hons) Grad CIEEM (Senior Ecologist) and Jonathan Durward MCIEEM, CEnv (Director/Principal Ecologist at JD 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. During the dusk surveys undertaken on 27 July 2020 at crossing points one and five heavy rain commenced 20 minutes after the survey start time at 21:00 (see Table 4.1). Intermittent heavy rainfall occurred for approximately 15 minutes. As such the surveys were re-started after the rainfall at 21:23 (crossing point one) and 21:15 (crossing point five) and continued until 1.5 hours after the start time

in order to collect a full 1.5-hour survey of data. Bat activity was recorded at both crossing points one and five with earlier emerging species (including common pipistrelle and noctule) recorded during both surveys. Bats were unlikely to have been outside the roost during the extremely heavy rainfall between 21:00 and 21:15 and as such it is considered unlikely that any earlier emerging species would have crossed the A47 during the period in which the surveys were suspended.

3.3.3. At crossing point one the view of surveyor two on the south of the A47 is significantly impeded by a dense, high growth of scrub growing adjacent to the A47 road verge. In order to increase the field of view of the crossing point over the A47 surveyors sat approximately 10m back from the scrub to more easily view over the scrub, however visual observation of crossing point one from the south was still very limited. Whilst surveyor one to the north of the A47 had a good view of the crossing point, the A47 is wider here where it merges from a dual to a single carriageway and as such having poor visibility from the south is not considered a limitation as this gives the surveyor a clearer view of the proposed road. At the four other crossing points, visibility was good at the north and south of the road as there are no hedgerows along the A47 at these points.

3.3.4. In some instances, survey timings differed from those set out in the methodology (see Section 3.2.2). Survey two of crossing point two (undertaken on 16 July 2020) started 15 minutes before sunset (as opposed to at sunset) and ended two hours 15 minutes after sunset ((as opposed to two hours 30 minutes after sunset) see Table 4.1)). Likewise, survey two of crossing point four (undertaken on 29 July 2020) started ten minutes before sunset (as opposed to at sunset) and ended two hours 20 minutes after sunset (as opposed to two hours 30 minutes after sunset). This was due to road closures on the A47. One of the aims of the longer 2.5-hour surveys is to identify any barbastelle bats crossing the road as barbastelle bats are a late-emerging species and research from the area shows that they spend time after emerging foraging near the roost before commuting further afield. As the surveys at crossing points two and four were undertaken for a significant amount of time after sunset (two hours 15 minutes and two hours 20 minutes respectively) the slight deviation from the outlined methodology is not considered a significant limitation. Survey two of crossing point three was started two minutes after sunset (as opposed to at sunset), however as surveyor one started surveying at 21:07 (see Table 4.1) and this survey is specifically targeted at later emerging species this is not considered a significant limitation.

3.3.5. Survey one of crossing point four (undertaken on 15 July 2020) started at sunset 21:11 (as opposed to 15 minutes before) and ended 1.5-hours after sunset (as opposed to as opposed to one hour 15 minutes after). Early emerging species (including soprano pipistrelle and noctule) were recorded, however passes of

these species may have been missed due to the survey starting at sunset as opposed to 15 minutes before sunset, as pipistrelle species will sometimes emerge from the roost before sunset. In addition, surveyor two on the south of the road did not start the survey until 21:42, 31 minutes after sunset, due to issues with surveyors travelling to site because of road closures further west on the A47. As surveyor one was in position at sunset is it considered less likely that any passes in the first half hour after sunset would have been missed. The proposal to use the thermal imagery scope for a minimum of two surveys at each of the further surveyed crossing points ((one, two and five) - see Section 3.2.4) was intended to mitigate the limitation imposed by darkness upon bat surveys. The use of thermal imagery would assist in gaining a visual observation of detected bats to confirm whether or not they crossed the A47 and at what heights. This would be particularly useful in aiding visual observations of species passing later during the survey including later emerging species such as barbastelle. Due to COVID-19 restrictions, only one survey of each point had the use of a thermal imaging camera. This does not invalidate the results as low numbers of bats would have still been recorded in the other surveys and mitigation sets out to try to keep all bats flying above the height of the traffic.

3.3.6. Survey one was undertaken with a 1.5 hour dusk starting before sunset and a 1 hour pre-dawn survey. All other surveys were undertaken with a 2.5 hour dusk starting at dusk or a 2.5 hr pre-dawn survey. After consultation with the NCC and NWLR ecologists and an email from the author of the methodology, Anna Fullford (formerly Berthinussen), it was decided to use this methodology on this scheme in order that we don't miss any early emerging pipistrelles, as we were aware of pipistrelle roosts very close to the A47 and later emerging barbastelles. This could be a limitation if some rarer bats were missed during the first survey or if commoner bats were missed emerging early in the second survey. Due to the late commencement of these surveys (mid July) because of COVID-19 restrictions and delays, extra initial surveys and the further six surveys could not be undertaken due to the end of August deadline for completion. Both crossing point locations where barbastelle were recorded in the vicinity of in the 2018 activity surveys (crossing points 2 and 5) were taken forward for further survey regardless of the fact that none were recorded at these crossing points in the initial two surveys. The bat hop mitigation has been included in the masterplan for four of the crossing point locations (1, 2, 3 and 4). Crossing point 5 is under the large proposed lit junction at the east of the scheme. The size and lighting at this junction would deter bats from crossing here.

4. Results

4.1. Survey timings and weather conditions

4.1.1. Table 4-1 below shows a summary of the weather conditions during each of the activity crossing points surveys undertaken from July - September (inclusive) 2020.

Table 4-1: summary of the 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
14/07/2020 21:11 – 23:41	1 (survey 2)	Sunset 21:11	Temperature (°C): 15 - 14 Wind (Beaufort): 2 - 1 Cloud (%): 90/100* – 70/95* Precipitation: 0	Lydia Waite Lewis Gospel
	5 (survey 2)			Beth Mell Sarah Taylor
15/07/2020 21:11 – 22:26 (north) 21:42 – 22:26 (south)	4 (survey 1)	Sunset 21:11	Temperature (°C): 15 - 15 Wind (Beaufort): 2 - 2 Cloud (%): no idea Precipitation: 0 – light rain from approximately 21:55 to the end of the survey	Lydia Waite Sarah Taylor
16/07/2020 3:51 – 4:51	4 (survey 1)	Sunrise 4:51	Temperature (°C): 14 - 14 Wind (Beaufort): 0 - 0 Cloud (%): 90/100 - 95 Precipitation: 0	Lydia Waite Ishbel Campbell
16/07/2020 20:55 – 23:25	2 (survey 2)	Sunset 21:10	Temperature (°C): 18 - 17 Wind (Beaufort): 1 - 2 Cloud (%): 100 - 95 Precipitation: 0	Lydia Waite Ishbel Campbell
16/07/2020 21:12 – 23:42 (south) 21:07 – 23:40 (north)	3 (survey 2)			Sarah Taylor Lewis Gospel
27/07/2020 21:23 (20:43) – 22:53 (22:13)	1 (survey 1)	Sunset 20:55	Temperature (°C): 19 - 17 Wind (Beaufort): 2 - 2 Cloud (%): 30/40 - 100 Precipitation: 0 – 0 (heavy rain at 21:00 until 21:15)	Beth Mell Ishbel Campbell
27/07/2020 21:15 (20:40) – 22:45 (22:10)	5 (Survey 1)			Lydia Waite Lewis Gospel
28/07/2020 4:08 - 5:08	1 (Survey 1)	Sunrise 5:08	Temperature (°C): 12 - 12 Wind (Beaufort): 3 - 3 Cloud (%): 70/25Precipitation: 0 - 0	Beth Mell Ishbel Campbell
	5 (Survey 1)			Lydia Waite Lewis Gospel
	3 (Survey 1)			Beth Mell Lewis Gospel

Date and time	Crossing point (and survey number)	Sunset/ sunrise time	Weather conditions (start – end)	Surveyors
29/07/2020 4:06 – 5:10	2 (Survey 1)	Sunrise 5:10	Temperature (°C): 12 – 11 Wind (Beaufort): 2 - 2 Cloud (%): 100/70 – 100 Precipitation: 0 - 0	Lydia Waite Ishbel Campbell
	3 (Survey 1)			Beth Mell Lewis Gospel
29/07/2020 20:40 – 23:10	4 (Survey 2)	Sunset 20:50	Temperature (°C): 16 - 15 Wind (Beaufort): 2 - 1 Cloud (%): 60/90 - 95 Precipitation: 0 – 0	Ishbel Campbell Lewis Gospel
12/8/2020 20:25 – 22:55	5 (Survey 3)	Sunset 20:25	Temperature (°C): 20.9 – 18.5 Wind (Beaufort): 2 – 2 Cloud (Oktas): 1 – 0 Precipitation: none	No data
14/8/2020 3:06 – 5:36	2 (Survey 3)	Sunrise 5:36	Temperature (°C): 19.0 – 17.7 Wind (Beaufort): 3 – 2 Cloud (Oktas): 8 - 8 Precipitation: none (lighting in SE distance)	No data
19/8/2020 20:10 – 22:32	1 (Survey 3)	Sunset 20:10	Temperature (°C): 19.7 – 20.0 Wind (Beaufort): 5 – 3/4 Cloud (Oktas): 8 - 8 Precipitation: light rain from start of survey and continuous until 22:10	No data
24/8/2020 19:59 – 22:29	1 (Survey 4)	Sunset 19:59	Temperature (°C): 16.4 – 14.7 Wind (Beaufort): 1 – 2 Cloud (Oktas): 3 - 1 Precipitation: none	No data
	2 (Survey 4)		Temperature (°C): 18 - 16 Wind (Beaufort): 3 – 1 Cloud (Oktas): 2 – 4 Precipitation: none	No data
	5 (Survey 4)		Temperature (°C): 19 - 14 Wind (Beaufort): 2 – 2 Cloud (Oktas): 3 – 2 Precipitation: none	No data
25/8/2020 3:24 – 5:54	1 (Survey 5)	Sunrise 5:54	Temperature (°C): 15 - 16 Wind (Beaufort): 2 – 3 Cloud (Oktas): 8 - 8 Precipitation: light rain for the last 15 minutes	No data
	2 (Survey 5)		Temperature (°C): 17 - 19 Wind (Beaufort): 2 – 0 Cloud (Oktas): 8 - 8 Precipitation: light rain for the last 15 minutes	No data

Date and time	Crossing point (and survey number)	Sunset/ sunrise time	Weather conditions (start – end)	Surveyors
26/8/2020 19:55 – 22:25	5 (Survey 5)	Sunset 19:55	Temperature (°C): 15.4 - 16 Wind (Beaufort): 1 - 3 Cloud (Oktas): 8 - 8 Precipitation: light rain towards end	No data
	1 (Survey 6)		Temperature (°C): 17 - 14 Wind (Beaufort): 1 – 1 Cloud (Oktas): 4 – 0 Precipitation: none	No data
	2 (Survey 6)		Temperature (°C): 18 - 14 Wind (Beaufort): 1 – 1 Cloud (Oktas): 6 – 1 Precipitation: none	No data
27/8/2020 3:40 – 5:57	1 (Survey 7)	Sunrise 5:57	Temperature (°C): 16 - 15 Wind (Beaufort): 0 – 0 Cloud (Oktas): 8 - 6 Precipitation: start of survey delayed by heavy rain	No data
	2 (Survey 7)		Temperature (°C): 15.6 – 12.1 Wind (Beaufort): 1 – 1 Cloud (Oktas): 7 – 8 Precipitation: heavy rain delayed start of survey	No data
	5 (Survey 6)		Temperature (°C): 16 - 15 Wind (Beaufort): 0 – 0 Cloud (Oktas): 8 – 6 Precipitation: heavy rain delayed start of survey	No data
28/8/2020 19:43 – 22:20	5 (Survey 7)	Sunset 19:50	Temperature (°C): 14 - 13 Wind (Beaufort): 2 – 1 Cloud (Oktas): 8 - 5 Precipitation: none	No data
1/9/2020 3:39 – 5:59	5 (Survey 8)	Sunrise 6:06	Temperature (°C): 7 – 5.2 Wind (Beaufort): 1 – 0 Cloud (Oktas): 0 – 0 Precipitation: none	No data
3/9/2020 19:32 – 22:06	2 (Survey 8)	Sunset 19:36	Temperature (°C): 18.5 – 17.5 Wind (Beaufort): 3 – 2 Cloud (Oktas): 3 - 8 Precipitation: none	No data
9/9/2020 19:22 – 21:52	1 (Survey 8)	Sunset 19:22	Temperature (°C): 16.2 - 14 Wind (Beaufort): 1 – 1 Cloud (Oktas): 1 – 6 Precipitation: none	No data

* a higher percentage of cloud cover was recorded at the crossing point five location on 14/07/2020. **a higher percentage of cloud was recorded at the start of the dawn survey on 28/07/2020 at crossing point location one. In addition, there were inconsistencies between the weather data recorded by each surveyor at the same crossing point location (crossing point one).

4.2. Field survey results: surveys one and two

4.2.1. Confirmed instances of bats crossing the A47 (visually observed crossings) are listed below and provided in Table 4.1. In addition, all data and field notes from both surveyors (from opposite sides of the road) have been analysed for surveys one and two in order to identify any further 'potential unseen bat crosses' which may not have been visually observed, but bat call timings and observations indicate that a bat is likely to have crossed the road in order to made them. 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'. Identification of 'potential unseen bat crosses' has not been attempted for big bat species (noctule, serotine and Leisler's – abbreviated hereafter as NSL) as these species are louder and can be detected from a further distance and as such detection could be made from a bat flying at the other side of the A47 to the surveyor recording it. NSL are additionally known high-flying species

Crossing point one

Survey 2 dusk 14/07/2020 – surveyor 1 (north of the A47)

4.2.2. No bats were observed crossing the A47 by surveyor one. Two common pipistrelles were recorded by surveyor one during the survey but not crossing the road. No other species were identified.

Survey 2 dusk 14/07/2020 – surveyor 2 (south of the A47)

4.2.3. No bats were recorded crossing the A47 by surveyor two. In total 103 bat detections were recorded by surveyor two, foraging or commuting to the south of the scheme or heard and not seen. A minimum of four species were recorded including common and soprano pipistrelle, noctule, barbastelle and a minimum of one species of big bat (unidentified NSL).

4.2.4. 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 22:30 on both sides of the A47 common pipistrelle calls were recorded.

Survey 1 dusk 27/07/2020 – surveyor 1 (north of the A47)

4.2.5. Two bats were visually observed and recorded crossing (confirmed) the A47 by surveyor one, as detailed below:

- At 21:34 a common pipistrelle crossed the A47 at crossing point one flying at approximately 3m height.
- At 21:35 a soprano pipistrelle crossed the A47 at crossing point one flying at approximately 3m height.

4.2.6. In addition to the above confirmed crosses of which the surveyor visually observed, one additional potential cross was recorded at 21:49. A particularly loud, fast common pipistrelle call was heard (and recorded on the detector) which led the surveyor to believe the bat may have crossed the A47. However, the bat was not seen and as such this crossing cannot be confirmed.

4.2.7. In total 15 bat detections were made during the survey. A minimum of four species were detected including common and soprano pipistrelle, barbastelle and a minimum of one species of big bat (NSL).

Survey 1 dusk 27/07/2020 – surveyor 2 (south of the A47)

4.2.8. No bats were recorded crossing the A47. In total 15 bat detections were recorded during the survey. A minimum of two species were recorded including common pipistrelle, noctule, pipistrelle sp. (not Nathusius' pipistrelle) and a minimum of one species of big bat (NSL).

4.2.9. The following bat detections were recorded by both surveyors and are considered, following data analysis, as potential unseen bat crosses of the A47:

- At 22:08 (on both sides of the A47) a common pipistrelle call
- At 22:43 on the south side and 22:42 on the north side of the A47 a common pipistrelle call
- At 22:48 (on both sides of the A47) a common pipistrelle call

Survey 1 dawn 28/07/2020 – surveyor 1 (north of the A47)

4.2.10. No bats were recorded crossing the A47. One bat was detected during the survey: an unseen soprano pipistrelle detected at 4:12. No other bats were detected.

Survey 1 dawn 28/07/2020 – surveyor 2 (south of the A47)

4.2.11. No bats were recorded crossing the A47 and no bat detections were recorded during the survey.

Crossing point two

Survey 2 dusk 16/07/2020 – surveyor 1 (north of the A47)

4.2.12. Three bats were observed crossing the A47 at crossing point two by surveyor 1 as detailed below:

- At 21:17 a big bat (NSL) crossed the A47 flying from north to south to the east of Lingwood Road, flying at approximately 30m height.
- At 21:26 a common pipistrelle crossed the A47 flying from north to south slightly to the west of Lingwood Road, flying at approximately 3m height.
- At 21:42 a common pipistrelle crossed the A47 flying from south to north slightly east of Lingwood Road, flying at approximately 10m height.

4.2.13. In total 33 bat detections were recorded during the survey and a minimum of three species were recorded including common and soprano pipistrelle, and a minimum of one species of big bat (NSL).

Survey 2 dusk 16/07/2020 – surveyor 2 (south of the A47)

4.2.14. In addition to observing the big bat crossing the A47 at 21:17 which was also observed by surveyor one (see Section 4.1.4) surveyor two observed the following bats crossing the A47:

- At 21:20 an unidentified, undetected bat crossed the A47 flying from north to south slightly west of Lingwood Road, flying at approximately 5m height.

4.2.15. In addition, an unidentified, undetected bat was observed at 21:26 flying south along Lingwood Road. It is considered that this is potentially the same bat (a common pipistrelle) as surveyor one recorded crossing the A47 within the same minute (see Section 4.1.4).

4.2.16. In total 12 bat detections were recorded during the survey and a minimum of two species were recorded including common pipistrelle and a minimum of one species of big bat (NSL).

4.2.17. The following bat detection as recorded by both surveyors and is considered a potential unseen bat cross of the A47:

- At 23:24 (on both sides of the A47) a common pipistrelle call.

Survey 1 dusk 28/07/2020 – surveyor 1 (north of the A47)

4.2.18. One bat was observed crossing the A47 as detailed below:

- At 21:37 a common pipistrelle crossed the A47 flying from south to north over Lingwood Road, flying at approximately 3m height.

4.2.19. A common pipistrelle at 21:39 and an undetected, unidentified bat at 21:40 were observed commuting adjacent to the north of the A47 slightly west of Lingwood Road.

4.2.20. In total nine bat detections were recorded during the survey and a minimum of two species were recorded including common pipistrelle and a minimum of one species of big bat (NSL).

Survey 1 dusk 28/07/2020 – surveyor 2 (south of the A47)

4.2.21. No bats were recorded crossing the A47. A potential single common pipistrelle pulse was detected at 21:52 however the call was not recorded by the surveyor and the analysis is not certain. In addition, the below call at 22:06 was recorded.

4.2.22. The following bat detection as recorded by both surveyors and is considered a potential unseen bat cross of the A47:

- At 22:06 (on both sides of the A47 and also at 22:05 on the north side) a common pipistrelle call

Survey 1 dawn 29/07/2020 – surveyor 1 (north of the A47)

4.2.23. No bats were recorded crossing the A47. One bat detection was made of a common pipistrelle at 4:14.

Survey 1 dawn 29/07/2020 – surveyor 2 (south of the A47)

4.2.24. No bats were recorded crossing the A47. Three bat detections were made during the survey with two species recorded: common and soprano pipistrelle, and one recording of a pipistrelle sp. (not Nathusius' pipistrelle).

4.2.25. No potential unseen bat crosses were identified from analysis of this survey data.

Crossing point three

Survey 2 dusk 16/07/2020 – surveyor 1 (north of the A47)

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

Survey 2 dusk 16/07/2020 – surveyor 2 (south of the A47)

4.2.27. One bat was recorded crossing the A47 as detailed below:

- At 21:37 a species of big bat (NSL) crossed the A47. The bat flew from north to south adjacent to the west of the easternmost main road/A47 junction

before flying along/above the A47 west for an approximate 35m stretch and moving off towards the south-west.

4.2.28. In total 18 bat detections were made during the survey. A minimum of three species were detected including common and soprano pipistrelle, and a minimum of one big bat (NSL) species.

4.2.29. The following bat detections were recorded by both surveyors:

- At 22:13 and 22:12 (on both sides of the A47) a common pipistrelle call. The surveyor on the south recorded foraging behaviour at 22:14.
- At 22:15 on the south side of the A47 and 22:14 on the north of the A47 a common pipistrelle call
- At 22:17 on the south side of the A47 and 22:16 on the north of the A47 a common pipistrelle call. The surveyor on the south of the A47 recorded foraging behaviour at 22:17.
- At 22:18 (on both sides of the A47) a common pipistrelle call. The surveyor on the north of the A47 recorded a visual of a common pipistrelle foraging and heading south at 22:18.

4.2.30. As the above common pipistrelle calls were recorded a minimum of once per minute, calls were recorded by both surveys and foraging behaviour was recorded multiple times it is considered likely that the calls can be attributed to one or small number of common pipistrelles foraging in the area. The bat/s may have crossed the road to forage along linear features on the road verge however it cannot be confirmed from analysis whether the bat crossed once, multiple times or not at all. As it is not possible to determine from the above calls how many times the bat/s crossed, one potential unseen common pipistrelle cross of the A47 has been recorded in Table 4.1 as the surveyor to the north of the A47 visually observed a bat foraging heading south.

Survey 1 dusk 28/07/2020 – surveyor 1 (north of the A47)

4.2.31. No bats were recorded crossing the A47. One bat was detected; an unseen soprano pipistrelle at 21:52. No other bats were detected by surveyor one during the survey.

Survey 1 dusk 28/07/2020 – surveyor 2 (south of the A47)

4.2.32. No bats were recorded crossing the A47. Two bat calls were detected: a noctule at 21:20 and a soprano pipistrelle at 21:51. Given that the soprano pipistrelle calls detected by both surveyors were within one minute of each other, it is considered that this is a potential unseen bat cross of the A47.

Survey 1 dawn 29/07/2020 – surveyor 1 (north of the A47)

4.2.33. No bats were recorded during the survey.

Survey 1 dawn 29/07/2020 – surveyor 2 (south of the A47)

4.2.34. No bats were recorded during the survey.

Crossing point four

Survey 1 dusk 15/07/2020 – surveyor 1 (north of the A47)

4.2.35. One bat was incidentally observed crossing the A47 after the survey ended as detailed below:

- At 22:38 a noctule crossed the A47 flying south to north.

4.2.36. Seven bat detections were recorded during the survey with a minimum of two species recorded; soprano pipistrelle and a minimum of one species of big bat (NSL).

Survey 1 dusk 15/07/2020 – surveyor 2 (south of the A47)

4.2.37. No bats were recorded crossing the A47. Two bat detections were made during the survey including a common pipistrelle and a species of big bat (NSL).

4.2.38. No potential unseen bat crosses were identified following data analysis.

Survey 1 dawn 16/07/2020 – surveyor 1 (north of the A47)

4.2.39. One bat was observed crossing the A47 as detailed below:

4.2.40. At 4:21 a noctule crossed the A47 flying south-west to north-east over the road just west of the junction between the Main Road and the A47. The noctule was flying at approximately 30m height.

4.2.41. In total five detections of big bats (NSL) were recorded during the survey.

Survey 1 dawn 16/07/2020 – surveyor 2 (south of the A47)

4.2.42. One bat was observed crossing the A47 by surveyor two as detailed below:

- At 4:38 a noctule crossed the A47 slightly west of the junction between the Main Road and the A47, flying south to north at approximately 20m height.

4.2.43. In total four big bat (NSL) detections were made during the survey. No other species was detected. As no species other than big bats (NSL) species were detected during this survey no attempt has been made to identify potential unseen bat crosses of the A47.

Survey 2 dusk 29/07/2020 – surveyor 1 (north of the A47)

4.2.44. One bat crossing was recorded by surveyor one during the survey as detailed below:

- At 22:22 a noctule crossed the A47 flying north at approximately 20m height.

4.2.45. In addition to the above recorded crossing, surveyor two also recorded two instances when bats were observed flying above the road; a common pipistrelle was recorded at 22:47 flying above the road traveling west at approximately 20m height and a noctule was recorded at 23:03 flying above the road going east at approximately 20m height. Foraging behaviour was noted for both these passes.

4.2.46. In total 69 bat detections were made during the survey. A minimum of two species were detected including common pipistrelle, noctule and a minimum of one big bat (NSL) species (the calls of which may also have been noctule/s).

Survey 2 dusk 29/07/2020 – surveyor 2 (south of the A47)

4.2.47. One bat was recorded crossing the road by surveyor two as detailed below:

- At 22:25 a common pipistrelle crossed the A47 going from north to south at approximately 5m height.

4.2.48. In addition to the above confirmed cross of which the surveyor visually observed, one additional potential cross was recorded at 22:19. A soprano pipistrelle call was heard (and recorded on the detector) with call characteristics which led the surveyor to believe the bat may have crossed the A47. However, the bat was not seen and as such this crossing cannot be confirmed.

4.2.49. In total 98 bat detections were recorded during this survey. A minimum of six species were recorded including common and soprano pipistrelle, brown long-eared, natterer's, barbastelle and a minimum of one species of big bat (NSL).

4.2.50. The following bat detections within the same minute or a maximum of one minute apart were recorded by both surveyors and are considered potential unseen bat crosses of the A47:

- At 22:22 (on both sides of the A47) a common pipistrelle call
- At 23:05 (on both sides of the A47 and also at 23:06 on south side) a common pipistrelle call
- At 23:07 (on both sides of the A47) a common pipistrelle call
- At 22:12 on the south side of the A47 and 22:11 on the north side a common pipistrelle call

- At 22:55 on the south side and 22:56 on the north side a common pipistrelle call
- At 22:58 on the south side and 22:59 on the north side a common pipistrelle
- At 23:02 on the south side and 23:03 on the north side a common pipistrelle call

4.2.51. There were numerous other common pipistrelle calls recorded within the same minute or a maximum of one minute apart by both surveyors during the survey. However common pipistrelle activity was recorded on both sides of the A47 continuously at these times and it is considered likely that one or a small number of bats were foraging in the area. It is not considered possible to determine whether these calls may represent potential unseen bat crosses.

Crossing point five

Survey 2 dusk 14/07/2020 – surveyor 1 (north of the A47)

4.2.52. No bats were recorded crossing the A47 by surveyor one.

4.2.53. A common pipistrelle was seen foraging in the field to the north of the A47 directly opposite the junction between the A47 and B1140 Acle Road. A significant amount of big bat (NSL) and noctule activity was recorded throughout the entire of the survey (almost continuously). Big bats (NSL) were visually observed foraging beneath the streetlights on the southern boundary of the A47 adjacent to the White House and is thought that the large amount of big bat (NSL) activity throughout the survey can be attributed to this foraging behaviour.

Survey 2 dusk 14/07/2020 – surveyor 2 (south of the A47)

4.2.54. Three bats were recorded crossing the A47 by surveyor two as detailed below:

- At 22:21 a noctule crossed the A47 slightly east of the A47/B1140 Acle Road junction, flying from south to north.
- At 22:36 an unidentified bat species (seen but not recorded by the detector) crossed the A47 flying from the south over the B1140 Acle Road and north-west over the A47.
- At 23:06 a noctule crossed the A47 slightly west of the A47/B1140 Acle Road junction travelling from south to north.

4.2.55. In total 32 bat detections were recorded during the survey. Three species were recorded: noctule, common pipistrelle and nathusius' pipistrelle. No potential unseen bat crosses were identified following analysis of both datasets.

4.2.56. As with surveyor one, surveyor two recorded a significant amount of big bat (NSL) activity during this survey and observed big bats (NSL) foraging along the road verge under the lighting columns on both sides of the A47.

Survey 1 dusk 27/07/2020 – surveyor 1 (north of the A47)

4.2.57. No bats were recorded crossing the A47 by surveyor one. In total 38 bat detections were made consisting of noctule calls and four big bat (NSL) species calls (which may also have been noctule but it was not possible to determine to species level with certainty).

Survey 1 dusk 27/07/2020 – surveyor 2 (south of the A47)

4.2.58. No bats were recorded crossing the A47 by surveyor two. In total 36 bat detections (and an additional two potential detections) were made during the survey with a minimum of two species recorded including common pipistrelle and noctule. Calls which could only be determined as big bats (NSL) and not to species level were recorded throughout the survey, however given the high number of confirmed noctule calls recorded and the small time frames between the noctule calls and the big bat (NSL) calls, it is considered these big bat (NSL) calls are likely noctule.

4.2.59. One visual observation was recorded of a noctule foraging beneath the streetlights on the northern side of the road. A significant amount of noctule activity was recorded during the survey and as previous surveys (see Sections 4.1.42, 4.1.43 and 4.1.45) recorded the same high level of activity with visual observations of foraging under streetlights it is considered that noctules regularly undertake foraging in this area.

4.2.60. No potential unseen bat crosses of the A47 were identified following analysis as surveyor one only recorded species of big bat ((NSL) see Section 4.2.55).

Survey 1 dawn 28/07/2020 – surveyor 1 (north of the A47)

4.2.61. No bats were recorded crossing the A47. A potential pipistrelle call was recorded at 4:34, however the analysis is not certain and it is considered likely the recording shows noise.

Survey 1 dawn 28/07/2020 – surveyor 2 (south of the A47)

4.2.62. No bats were recorded by surveyor two during the survey.

Summary of bat crosses in surveys 1 and 2

4.2.63. Table 4-2 below details the summary of confirmed and potential bat crosses (over the A47) from each survey. Full, raw bat data from all surveys can be provided upon request.

4.2.64. Crossing points one, two and five were subject to a further six surveys following the initial two surveys. Crossing points two and five had relatively high numbers

(four and three respectively) of confirmed bat crosses in any one hour recorded during the second surveys on 16 July 2020 and 14 July 2020 respectively. At crossing points one and five large new junctions are proposed which shall greatly increase the width of the carriageway/hard estate which bats shall have to cross.

Table 4-2 : Summary of bats recorded crossing the A47 from first two surveys of all five crossing point locations

Crossing point	Survey, date and type	Crosses	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 2, 14/07/2020, dusk	**Confirmed** None **Potential** 22:30 common pipistrelle	0	1	0	0
	Survey 1, 27/07/2020, dusk	**Confirmed** 21:34 common pipistrelle (>3m) 21:35 soprano pipistrelle (>3m) **Potential** 22:08 common pipistrelle 22:42/43 common pipistrelle 22:48 common pipistrelle	2	1	0	0
	Survey 1, 28/07/2020, dawn	No confirmed or potential crosses	0	0	0	0
2	Survey 2, 16/07/2020, dusk	**Confirmed** 21:17 big bat (NSL) 21:20 unidentified bat 21:26 common pipistrelle	3 (4)	0	0 (1)	0

Crossing point	Survey, date and type	Crosses	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
		21:42 common pipistrelle **Potential** 23:24 common pipistrelle				
	Survey 1, 28/07/2020, dusk	**Confirmed** 21:37 common pipistrelle **Potential** 22:05/6 common pipistrelle	1	1	0	0
	Survey 1, 29/07/2020, dawn	No confirmed or potential crosses	0	0	0	0
3	Survey 2, 16/07/2020, dusk	**Confirmed** 21:37 big bat (NSL) **Potential** 22:18 common pipistrelle	1	1	0	0
	Survey 1, 28/07/2020, dusk	**Confirmed** None **Potential** 21:51/2 soprano pipistrelle	0	1	0	0
	Survey 1, 29/07/2020, dawn	No confirmed or potential crosses	0	0	0	0
4	Survey 1, 15/07/2020, dusk	**Confirmed**	1	0	0	0

Crossing point	Survey, date and type	Crosses	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
		22:38 noctule **Potential** None				
	Survey 1, 16/07/2020, dawn	**Confirmed** 4:21 noctule 4:38 noctule **Potential** None	2	0	0	0
	Survey 2, 29/07/2020, dusk	**Confirmed** 22:25 common pipistrelle **Potential** 22:11/12 common pipistrelle 22:22 common pipistrelle 22:55/56 common pipistrelle 22:58/59 common pipistrelle 23:02/03 common pipistrelle 23:05/06 common pipistrelle	1	6	0	0
5	Survey 2, 14/07/2020, dusk	**Confirmed** 22:21 noctule 22:36 unidentified bat	2 (3)	0	0 (1)	0

Crossing point	Survey, date and type	Crosses	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
		23:06 noctule **Potential** None				
	Survey 1, 27/07/2020, dusk	No confirmed or potential crosses	0	0	0	0
	Survey 1, 28/07/2020, dawn	No confirmed or potential crosses	0	0	0	0

Incidental sightings

4.2.65. During the dusk survey of crossing point two on 16 July 2020 surveyor two observed a barn owl *Tyto alba* flying south down Lingwood Road directly south of the junction with the A47.

4.2.66. During the dusk survey of crossing point four on 15 July 2020 surveyor two observed a barn owl perched on a road signpost adjacent to the north of the A47, south of North Burlingham.

4.3. Field survey results: surveys three to eight

4.3.1. Crossing points three and four had no further surveys as they had only one common species of bat confirmed as crossing the road either once or twice during the first two surveys. Crossing points one, two and five had six further surveys. Two of these three crossing point locations (points 2 and 5) that were taken forward for a further six surveys after the initial two, were subject to these further surveys even though they had fewer than 10 common bats crossing (1-5 for rarer bats) and did not trigger the need for further survey as stated in the Berthinussen and Altringham (2015) guidelines. This was to make sure we did not miss any of the rare barbastelles.

Crossing point one

Survey 3 dusk 19/8/2020

Species	Total confirmed bat crosses	Unseen bat detections (Yes/No)
Common pipistrelle	1	Yes
Soprano pipistrelle	2	Yes
Noctule	2	Yes
Serotine	1	Yes
Nyctalus sp.	1	No
Total crosses	**7**	

Survey 4 dusk 24/8/2020

Species	Total confirmed bat crosses	Unseen bat detections (Yes/No)
Common pipistrelle	2	Yes
Soprano pipistrelle	1	Yes
Noctule	0	Yes
Serotine	0	Yes
Total crosses	**3**	

Survey 5 dawn 25/8/2020

Species	Total confirmed bat crosses	Unseen bat detections (Yes/No)
Common pipistrelle	0	Yes
Total crosses	**0**	

Survey 6 dusk 26/8/2020

Species	Total confirmed bat crosses	Unseen bat detections (Yes/No)
Common pipistrelle	0	Yes
Soprano pipistrelle	0	Yes
Barbastelle	0	Yes
Total crosses	**0**	

Survey 7 dawn 27/8/2020

4.3.2. No bats were recorded during the survey.

Survey 8 dusk 9/9/2020

Species	Total confirmed bat crosses	Unseen bat detections (Yes/No)
Common pipistrelle	3	Yes
Soprano pipistrelle	0	Yes
Noctule	2	Yes
Serotine	1	No
Total crosses	**6**	

Crossing point two

Survey 3 dawn 14/8/2020

Species	Total confirmed bat crosses	Unseen bat detections (Yes/No)
Common pipistrelle	4	Yes
Soprano pipistrelle	0	Yes
Noctule	0	Yes
Serotine	1	No
Barbastelle	1	No
Brown long-eared	0	Yes
Total crosses	**6**	

Survey 4 dusk 24/8/2020

Species	Total confirmed bat crosses	Unseen bat detections (Yes/No)
Common pipistrelle	0	Yes
Soprano pipistrelle	0	Yes
Total crosses	**0**	

Survey 5 dawn 25/8/2020

Species	Total confirmed bat crosses	Unseen bat detections (Yes/No)
Common pipistrelle	0	Yes
Noctule	1	Yes
Total crosses	**1**	

Survey 6 dusk 26/8/2020

Species	Total confirmed bat crosses	Unseen bat detections (Yes/No)
Common pipistrelle	0	Yes
Soprano pipistrelle	0	Yes
Noctule	0	Yes
Brown long-eared	0	Yes
Total crosses	**0**	

Survey 7 dawn 27/8/2020

Species	Total confirmed bat crosses	Unseen bat detections (Yes/No)
Soprano pipistrelle	0	Yes
Noctule	0	Yes
Barbastelle	1	No
Total crosses	**1**	

Survey 8 dusk 3/9/2020

Species	Total confirmed bat crosses	Unseen bat detections (Yes/No)
Common pipistrelle	3	Yes
Soprano pipistrelle	1	No
Noctule	2	Yes
Brown long-eared	1	No
Total crosses	**7**	

Crossing point five

Survey 3 dusk 12/8/2020

Species	Total confirmed bat crosses	Unseen bat detections (Yes/No)
Common pipistrelle	0	Yes
Soprano pipistrelle	0	Yes
Noctule	0	Yes
Leisler's	0	Yes
Total crosses	**0**	

Survey 4 dusk 24/8/2020

Species	Total confirmed bat crosses	Unseen bat detections (Yes/No)
Common pipistrelle	0	Yes
Noctule	0	Yes
Leisler's	0	Yes
Total crosses	**0**	

Survey 5 dawn 25/8/2020

Species	Total confirmed bat crosses	Unseen bat detections (Yes/No)
Soprano pipistrelle	1	Yes
Nathusius' pipistrelle	0	Yes
Noctule	0	Yes
Total crosses	**1**	

Survey 6 dawn 27/8/2020

Species	Total confirmed bat crosses	Unseen bat detections (Yes/No)
Noctule	0	Yes
Total crosses	**0**	

Survey 7 dusk 28/8/2020

Species	Total confirmed bat crosses	Unseen bat detections (Yes/No)
Common pipistrelle	0	Yes
Soprano pipistrelle	1	Yes
Noctule	2	Yes
Total crosses	**3**	

Survey 8 dawn 1/9/2020

Species	Total confirmed bat crosses	Unseen bat detections (Yes/No)
Brown long-eared	0	Yes
Total crosses	**0**	

4.3.3. As these surveys were conducted over a 2.5 hour period, the number of crosses by bats may be greater than was recorded during the initial first survey, but not the second survey.

5. Conclusions and requirements

5.1. Identified bat crossing points

Crossing point one

5.1.1. The highest number of bats confirmed crossing the A47 recorded at any one survey was at crossing point one where seven bats were recorded crossing during the third survey undertaken on 19 August 2020. A relatively high number of bats (six in total) were also recorded crossing during the eighth survey undertaken on 9 September 2020. Both these totals were over a 2.5 hour period.

5.1.2. The following species were confirmed crossing the A47 at crossing point one during four of the eight surveys undertaken. The number in brackets refers to the total number of confirmed only (discounting potential crosses from surveys one and two) crosses across all surveys:

- Common pipistrelle (7)
- Soprano pipistrelle (4)
- Noctule (4)
- Serotine (2)
- *Nyctalus* sp. (1)

5.1.3. Common and soprano pipistrelle, and noctule are the most common species observed crossing the A47 at crossing point one. Noctule are generally a high-flying species and would be crossing the road significantly above the traffic. Pipistrelle species however generally fly much lower and have been observed on two occasions crossing the A47 at crossing point one at approximately 3m height (see Section 4.2.5) which would result in a collision with traffic should a vehicle be passing at that time.

5.1.4. Pipistrelle's were recorded flying from the margin of the woodland on the south of the road northwards over the A47.

Crossing point two

5.1.5. The highest numbers of bats confirmed crossing the A47 at crossing point two that was recorded in any one survey is seven bats during the eighth survey undertaken on 3 August 2020. A relatively high number of bats (six in total) were also recorded crossing during the third survey undertaken on 14 August 2020 and a relatively moderate number of bats (four in total) during the second survey on the 16 July 2020.

5.1.6. The following species were confirmed crossing the A47 at crossing point two during six of the eight surveys undertaken. The number in brackets refers to the

total number of confirmed only (discounting potential crosses from surveys one and two) crosses across all surveys:

- Common pipistrelle (10)
- Noctule (3)
- Barbastelle (2)
- Soprano pipistrelle (1)
- Brown long-eared (1)
- Serotine (1)
- Big bat species (NSL) (1)
- Unidentified species (1)

5.1.7. Common pipistrelle bats were recorded during survey two undertaken on 16 July 2020 crossing the A47 at approximately 10m and 3m height, the latter of which would likely result in a collision should a vehicle have been passing at the same time.

5.1.8. Noctule bats, the second species most commonly recorded crossing the A47 at crossing point two, generally fly significantly higher than other species, and have been recorded crossing the A47 at approximately 30m height and as such would not likely be impacted by traffic collisions.

5.1.9. Bats have been recorded crossing the A47 in the vicinity of Lingwood Road going both northwards (on two occasions) and southwards (on three occasions) at crossing point two.

Crossing point five

5.1.10. The highest numbers of bats confirmed crossing the A47 at crossing point five that were recorded in any one survey is three bats during both the third and seventh surveys undertaken on 14 July 2020 and 28 August 2020 respectively.

5.1.11. The following species were confirmed crossing the A47 at crossing point five during three of the eight surveys undertaken. The number in brackets refers to the total number of confirmed only (discounting potential crosses from surveys one and two) crosses across all surveys:

- Noctule (4)
- Soprano pipistrelle (2)
- Unidentified species (1)

5.1.12. Bats have been recorded flying northwards across the A47 from Acle Road (the B1140) to the south.

5.2. Other bat activity near the A47

5.2.1. At crossing point five a high level of noctule activity was recorded around the crossing point. Noctules were observed foraging for a significant period around the A47 streetlights on both sides of the A47 at this location during surveys one and two (see Section 4.2.52, 4.2.55 and 4.2.58).

5.3. Impact assessment

5.3.1. The proposed scheme plans to significantly widen the A47 at all three crossing point locations (one, two and five) with new large junctions proposed at crossing point locations one and five.

5.3.2. A wider carriageway and junctions will result in a larger distance bats have to cross whilst commuting in order to reach foraging habitat and/or roosts at the other side of the road. Severance of current commuting routes and foraging areas may occur as a result of the two new proposed junctions and there will be an increased risk in collision as a result of the wider carriageway and higher amounts of faster moving traffic. Such severance may result in the avoidance and abandonment of habitats and roosts. In addition, increased lighting (at one junction only near crossing point 5) with the Proposed Scheme would impact the more light-averse species, such as *Myotis* species, from foraging near or commuting across the road.

5.4. Requirements

5.4.1. 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*"

5.4.2. 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".

5.4.3. 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.

5.4.4. As such, site-specific considerations include that at crossing point 2, the area is constricted with the existing A47, listed buildings, residential properties and groundwater and it would be physically impossible to create a green bridge or underpass. In addition, large infrastructural mitigation raises issues of significant

carbon, landscape and cost implications. The only other option is to encourage bats to fly higher over the road and avoid collisions with traffic by the use of placing high trees at the sides of the road where bats currently cross over it.

5.4.5. As there have been only 2 instances of a barbastelle crossing at this point, a pragmatic approach has been undertaken whereby we consider that a barrier of tall trees (extra heavy standard - at least 4.5m high at planting) at this location is cost effective, fits within the known constraints and provides required landscape screening. This mitigation is proportionate and would likely prevent bats crossing lower at the level of traffic, although this will be monitored and reviewed upon the results. There is currently no monitoring data available to prove that this mitigation works on dual carriageways, but it is effective on single road spans. It is the only option available and residual effects at point 2 are anticipated to be low.

5.4.6. At crossing points one, two and five, where bats have been identified crossing the A47 in higher numbers compared to crossing points three and four, semi-mature extra heavy standard native tree species are to be planted with specimens at least 4.5m high when planted. These extra heavy trees are also to provide a bat hop at crossing point four. The planting of trees perpendicular to the new Proposed Scheme route will create ‘bat hop over’ points to guide commuting bats over the roads at a height sufficient to avoid collisions with moving vehicles.

5.4.7. The only crossing point that is to have lighting is crossing point five. This crossing point had bat species recorded that are not particularly light averse, namely soprano pipistrelle and noctule.

5.4.8. All trees removed to facilitate works will be replaced on a like-for-like basis with fast-growing, semi-mature native species. Trees planted along field margins will not impact current land-use as farmland and will provide a feeding resource and commuting feature. Hedgerows removed will be replaced with species-rich native hedgerows. Some species such as brown long-eared and barbastelle, very faithfully stick to crossing points and where features will be severed, or gaps introduced this may have long-lasting effects on bat activity and behaviour.

5.4.9. A wildlife sensitive lighting scheme is being designed in consultation with a suitably experienced ecologist and lighting engineer to ensure that important foraging and commuting areas remain undisturbed during the construction and operational phases of the Proposed Scheme. Where lighting is necessary, the following measures should be considered to reduce adverse impacts:

- Consideration of hood design, lamp height and angle, to reduce light spill; particularly avoiding illuminating retained foraging and commuting habitat on the site such as mature trees, tree lines and hedgerows

- Use of less ultra-violet (UV) light emitting bulbs such as metal halide or high-pressure sodium
- Minimising hours of lighting to those absolutely necessary for safety and security purposes. Where possible lighting should avoid key periods of bat activity (i.e. sunset and sunrise). It should be considered how new technologies can be used to control lighting levels (e.g. dimming lights at certain times).

5.4.10. Further technical details are given in 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).

5.4.11. The landscaping should be designed to provide shelter, foraging opportunities and connected dark corridors throughout the site. It is recommended that a suitably qualified ecologist is consulted during the design of the landscaping scheme to advise on the creation and enhancement of habitats for bats (and other wildlife).

6. References

Amey (2017) Road Investment Strategy East Area 6 A47 Blofield to North Burlingham Environmental Assessment Report (A47 IMPS2-AMY-BB-ZZ-DO-J0024).

Amey (2017a). Preliminary Ecological Appraisal – A47 Blofield to North Burlingham. A47IMPS2-AME-BB-ZZ-DO-J0024-PEA.

Amey (2017b) A47 Schemes Blofield to North Burlingham Phase 1 Habitat Survey. A47 Corridor – Stage 2. Figure 9.1a. Drawing number: HE551490-AMY-EBD-BB_STG2-DR-EN-0001.

Amey (2017c) A47 Schemes Blofield to North Burlingham Phase 1 Habitat Survey. A47 Corridor – Stage 2. Figure 9.1b. Drawing number: HE551490-AMY-

Bat Conservation Trust (BCT) (2014). Artificial Lighting and Wildlife: Interim Guidance: Recommendations to help minimise the impact of artificial lighting. Available online at: https://cdn.bats.org.uk/pdf/BCT_Interim_Guidance_Artificial_Lighting_June_2014.pdf?mtime=20181101151319&focal=none (Accessed 23/9/2020).

Bat Conservation Trust (BCT) and Institution of Lighting Professionals (2018). Guidance Note 08/18 Bats and Artificial Lighting in the UK *Bats and the Built Environment Series.* Available online at: https://cdn.bats.org.uk/pdf/Resources/ilp-guidance-note-8-bats-and-artificial-lighting-compressed.pdf?mtime=20181113114229 (Accessed 23/9/2020).

Berthinussen, A and Altringham, J. (2015). WC1060 Development of a Cost Effective Method for Monitoring the Effectiveness of Mitigation for Bats Crossing Linear Transport Infrastructure. Final Report 2015. Available online at: http://sciencesearch.defra.gov.uk/Default.aspx?Module=More&Location=None&ProjectID=18518 (Accessed 05/03/2020).

CIEEM (2019). Advice Note on the Lifespan of Ecological Reports and Surveys. Available online at: https://cieem.net/resource/advice-note-on-the-lifespan-of-ecological-reports-and-surveys/ (Accessed 13/01/2020).

Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). The Bat Conservation Trust, London.

Elmeros, M., Møller, J. D., Dekker, J., Garin, I., Christensen, M., Baagøe, H. J., Ujvari, M. L. (2016). Fumbling in the dark – effectiveness of bat mitigation measures on roads, Bat mitigation measures on roads – a guideline. In CEDR Transnational Road Research Programme Call 2013: Roads and Wildlife. Conference of European Directors of Roads.

Highways Agency (2008).

Highways England (2017). A47 Bat Survey Report – A47 Blofield to North Burlingham.

Multi-Agency Geographical Information for the Countryside. Available online at: http://magic.defra.gov.uk/ (Accessed 13/01/2020).

Norfolk County Council (2011) *Species Action Plans*. Available at: http://www.norfolkbiodiversity.org/actionplans/speciesactionplans/#Mammals (accessed February 2020).

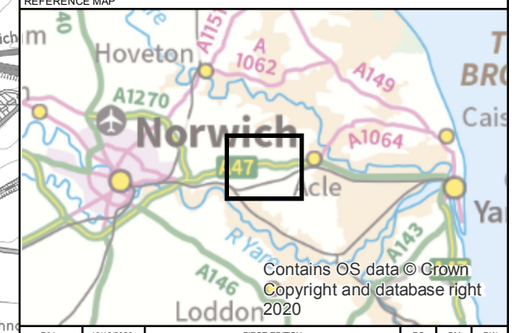
Annex A. Bat crossing point locations

N

LEGEND

Sheet extent

REFERENCE MAP



REV	DATE	REVISION NOTE	ORG	CHK'D	APP'D
P01	16/12/2020	FIRST EDITION	PC	BM	DW

DESIGNER

SWECO

CONTRACTOR

GallifordTry

CLIENT

highways england

PROJECT TITLE

A47 BLOFIELD TO NORTH BURLINGHAM

PROJECT STAGE

PCF STAGE 3

DRAWING TITLE

ANNEX A - BAT CROSSING POINT LOCATIONS AND SURVEYS 1 AND 2 RESULTS KEY PLAN TR010040/APP/6.3

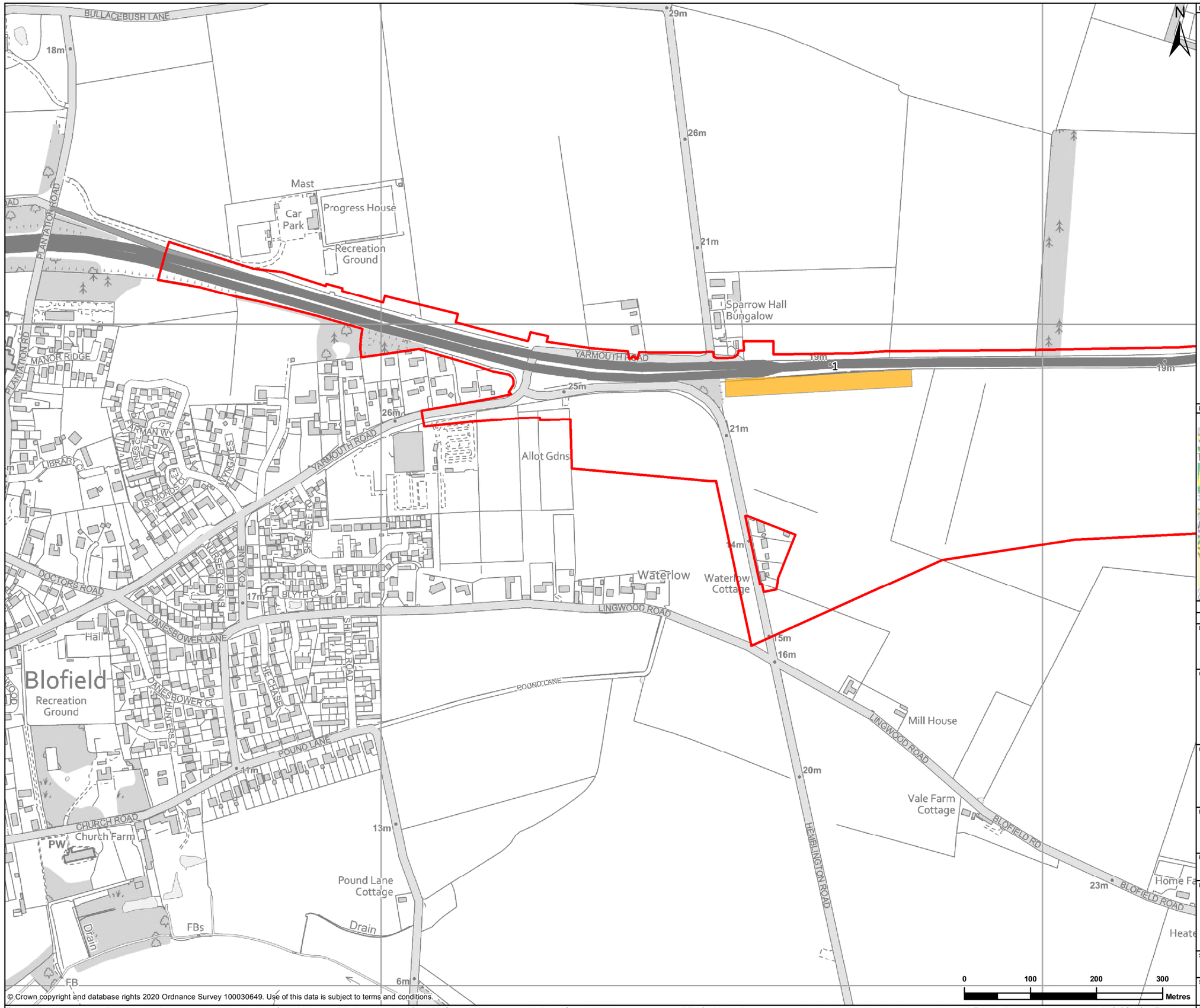
SUITABILITY

FOR INFORMATION

SHEET SIZE	SCALE	STATUS
A3	1:20,000	S2

DRAWING NUMBER

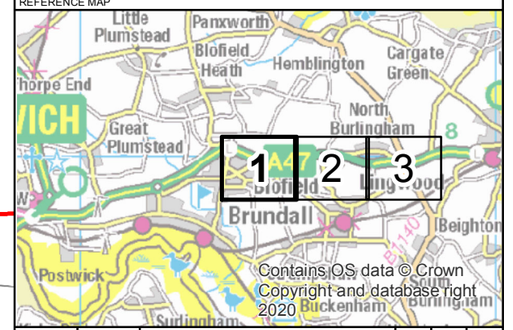
HE551490-GTY-EBD-000-DR-GI-30013



LEGEND

- Red line boundary
- Reptile results (2020)
- Reptile survey area

REFERENCE MAP



REV	DATE	REVISION NOTE	ORG	CHK'D	APP'D
P01	16/12/2020	FIRST EDITION	PC	BM	DW

DESIGNER

SWECO

CONTRACTOR

GallifordTry

CLIENT

highways england

PROJECT TITLE

A47 BLOFIELD TO NORTH BURLINGHAM

PROJECT STAGE

PCF STAGE 3

DRAWING TITLE

ANNEX A - REPTILE SURVEY AREAS AND RESULTS
SHEET 1 OF 3
TR010040/APP/6.2

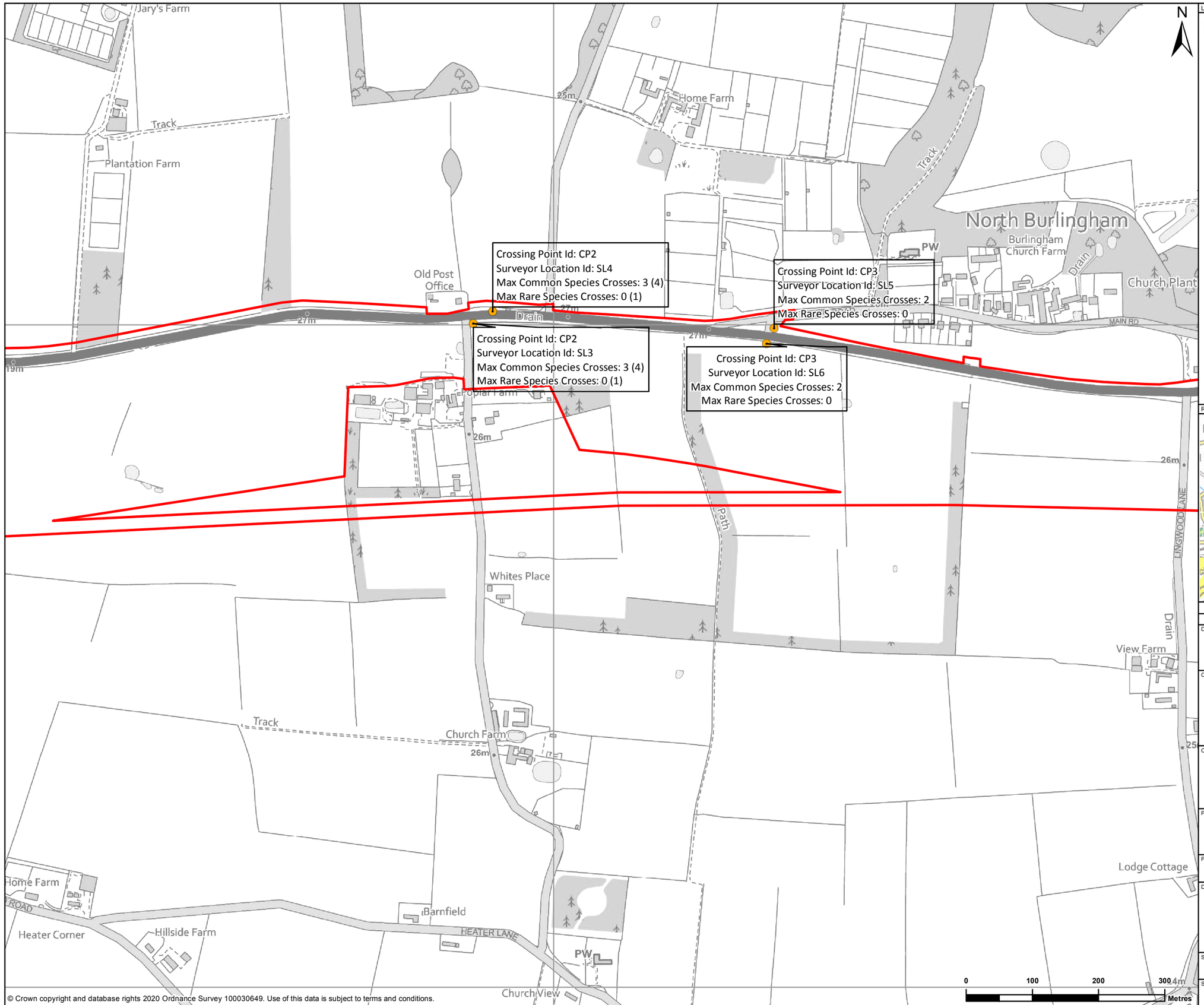
SUITABILITY

FOR INFORMATION

SHEET SIZE	SCALE	STATUS
A3	1:5,500	S2

DRAWING NUMBER

HE551490-GTY-EBD-000-DR-GI-30014



© Crown copyright and database rights 2020 Ordnance Survey 100030649. Use of this data is subject to terms and conditions.

This drawing should not be relied on or used in circumstances other than those for which it was originally prepared and for which Sweco UK Ltd was commissioned. Sweco UK Ltd accepts no responsibility for this drawing to any party other than the person by whom it was commissioned. This drawing has been prepared on behalf of Galliford Try by Sweco UK Ltd for the titled project or named part thereof and should not be relied upon or used for any other project without an independent check being carried out as to its suitability and prior written authority of Galliford Try being obtained. Sweco UK Ltd accepts no responsibility or liability for the consequences of this drawing being used for a purpose other than the purposes for which it was commissioned. Any person using or relying on this drawing for such other purpose agrees, and will by such use or reliance be taken to confirm his/her agreement, to indemnify Sweco UK Ltd for all loss or damage resulting therefrom.

N

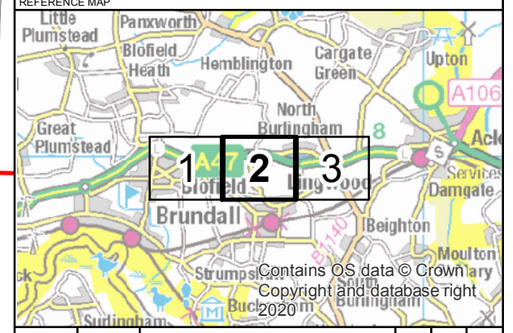
LEGEND

Red line boundary

Surveyor location*

Note:
* Maximum numbers of common species in any one hour and maximum numbers of rare species in any one hour is not necessarily within the same hour.
0(1) - Confirmed (potential).

REFERENCE MAP



REV	DATE	REVISION NOTE	ORG	CHK'D	APP'D
P01	16/12/2020	FIRST EDITION	PC	BM	DW

DESIGNER

SWECO

CONTRACTOR

GallifordTry

CLIENT

highways england

PROJECT TITLE

A47 BLOFIELD TO NORTH BURLINGHAM

PROJECT STAGE

PCF STAGE 3

DRAWING TITLE

ANNEX A - BAT CROSSING POINT LOCATIONS AND SURVEYS 1 AND 2 RESULTS
SHEET 2 OF 3
TR010040/APP/6.2

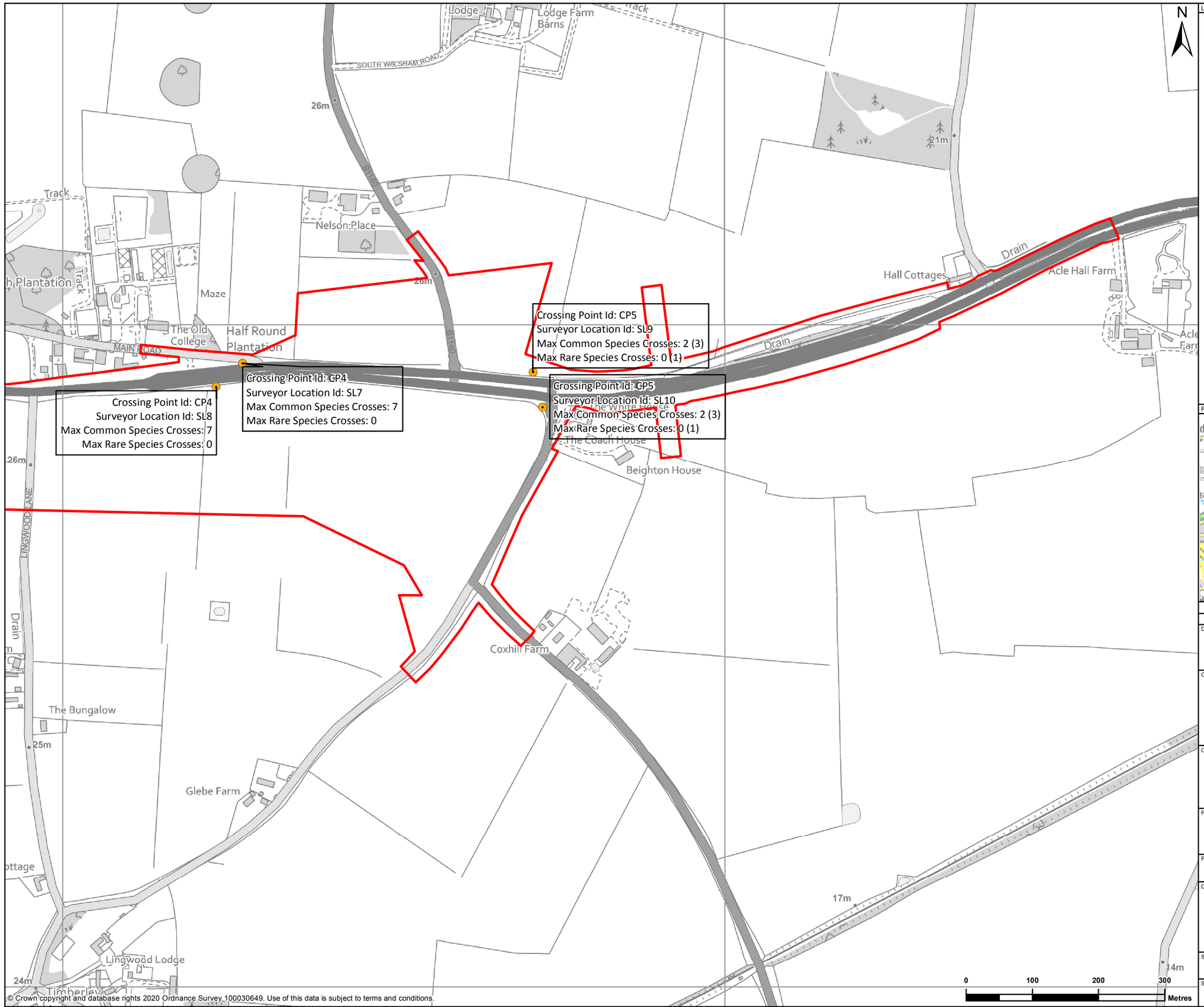
SUITABILITY

FOR INFORMATION

SHEET SIZE	SCALE	STATUS
A3	1:5,500	S2

DRAWING NUMBER

HE551490-GTY-EBD-000-DR-GI-30011

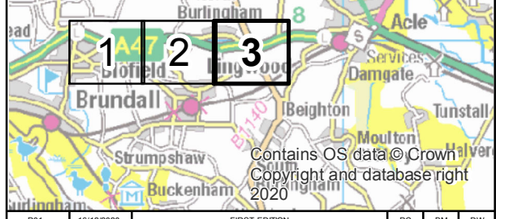


LEGEND

- Red line boundary
- Surveyor location*

Note:
* Maximum numbers of common species in any one hour and maximum numbers of rare species in any one hour is not necessarily within the same hour.
0(1) - Confirmed (potential).

REFERENCE MAP



REV	DATE	REVISION NOTE	ORG	CHK'D	APP'D
P01	16/12/2020	FIRST EDITION	PC	BM	DW

DESIGNER
SWECO

CONTRACTOR
GallifordTry

CLIENT
highways england

PROJECT TITLE
A47 BLOFIELD TO NORTH BURLINGHAM

PROJECT STAGE
PCF STAGE 3

DRAWING TITLE
ANNEX A - BAT CROSSING POINT LOCATIONS AND SURVEYS 1 AND 2 RESULTS
SHEET 3 OF 3
TR010040/APP/6.2

SUITABILITY
FOR INFORMATION

SHEET SIZE	SCALE	STATUS
A3	1:5,500	S2

DRAWING NUMBER
HE551490-GTY-EBD-000-DR-GI-30012