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The Cambourne to Cambridge Order

Cambridgeshire County Council

Transport and Works Act 1992

Transport and Works (Inquiries Procedure) Rules 2004

Inquiry into:

THE CAMBOURNE TO CAMBRIDGE ORDER

PROOF OF EVIDENCE

of

Paola Reason

of RSK Biocensus

On behalf of Cambridgeshire County Council

17 August 2025

Planning Inspectorate Reference: DPI/E0535/25/1

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Appendix 1: Barbastelle in the UK

Zeale (2011) indicated that the number of known maternity colonies in ~2008, prior to his study, was just 18 (he then identified a further six in south-west Wales). This is now understood to be a considerable underestimate and highlights the poor state of knowledge until very recently. Advances in technology have allowed new colonies to be identified, though these records still tend to be held by voluntary groups, treated as confidential and/or retained in 'grey literature'. Our understanding is increasing rapidly. By spring 2019, intensive survey had doubled the number of km² known to support barbastelle in Wiltshire – from 95 to 194 – over the previous two to three years (Harris, 2019). Prior to commencing the Hertfordshire Barbastelle Bat Project, only a single barbastelle maternity colony had been recorded during 2012 (Herts & Middlesex Wildlife Trust, 2019). Roosts were identified through radio-tracking and, targeting woodlands with acoustic records, the bat group increased the known distribution of the species across their county, including the known number and size of maternity roosts. In Norfolk, thanks to work undertaken since 2007 by the Norfolk Barbastelle Study Group, the species is now considered 'widespread' there, with 24 known maternity colonies in Norfolk alone (Harris, 2020).

Our understanding of their habitat use has also broadened. Using modelling, Zeale (2011) considered that this species was "*highly dependent on large areas of mature woodland*" and "*limited in its distribution by summer climate*". It is of note that he used two models. The second, which was used to predict the presence of maternity colonies, used all maternity colonies then known to 'train' the model; none of these were located in East Anglia. However, research from Italy indicates that the barbastelle can also exist in non-forested open landscapes (Ancillotto *et al.*, 2005) and thus may have been over-looked in habitats previously considered atypical. This certainly reflects the position in the UK. In Wiltshire, barbastelle have been recorded throughout the county, often in wooded landscapes, but also foraging and roosting on the fringe of urban areas, commuting across and foraging in very open landscapes such as Salisbury Plain, and even in the centre of a small town on a well-lit site (Harris, 2019).

An assessment of Britain's Mammals (Mathews *et al.*, 2018) concluded that there was insufficient evidence to determine any kind of population estimate and classed the population as 'vulnerable'. However, the Vincent Wildlife Trust (who are undertaking a wide-ranging acoustic survey over four years for the species) estimate a UK-wide population of 30,000 (<https://www.vwt.org.uk/species/barbastelle>), consistent with (and possibly derived from) Zeale and Natural England's own estimate of between 21,000 and 42,000 individuals in England.

Insufficient maternity colonies have been identified to determine "typical" colony size, though online information hosted by the University of Bristol suggests that "*10–20 females are typically found in nursery roosts*". Altringham (2003) indicates "*small nursery roosts, 10–20 females, rarely up to 100*", but this is based on European data, with roosts more common in buildings (unlike the UK).

There are seven SACs in the UK where barbastelle is a primary reason for site selection, and two further sites where this species is a qualifying feature, but not a primary reason for site selection. Estimated population sizes are available for four of these sites: two at 11 to 50 individuals (but one of these is, atypically, a maternity colony based in a building); and two at 51 to 100. For the remaining five sites, barbastelle are simply recorded as 'present'; none have been updated in recent years.

- A study carried out for the Norwich Northern Distributor Road (BSG Ecology, 2010) recorded peak counts of between 55 and 59 bats (adults and juveniles) emerging from a single tree-roost; at the time, this was considered atypically high.
- Roosts counts for the related (proposed) Norwich Western Link road recorded at least 105 bats for one maternity colony in recent years (L. Packman, pers. comm.)
- Ian Davidson-Watts (pers. comm.) recorded a peak colony count of 115+ barbastelle on the Isle of Wight in 2006.
- Through simultaneous counts of trees within a single woodland in Stevenage (by the Herts & Middlesex Wildlife Trust in 2019), a total count of 90 barbastelle was recorded.

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Appendix 1: Table 1 Latest SAC data (accessed July 2025 from online sources; all standard data forms marked as ‘updated December 2015)

SAC Name and code ‘Primary’ or ‘other’ selection	Count	Publicly accessible data from online sources, associated with records from each SAC.
Chilmark Quarries UK0016373 Main	“present”	
Ebernoe Common UK0012715 Main	“present”	Chichester.gov.uk website states that flightlines have been mapped through radio tracking studies but no links to anything stating number of bats.
Eversden and Wimpole Woods UK0030331	Min = 11, max = 50	In 2005 14 barbastelle females counted leaving a maternity roost in mature field maple (Damant & Vine, 2006)
Exmoor and Quantock Oakwoods UK003014 Main	Min 51, max = 100	
Mottisfont Bats UK0030334 Main	Min 51, max = 100	14 adult female bats trapped in radio tracking study May to August 2000 – 2005 (Zeale <i>et al.</i> , 2012)
North Pembrokeshire Woodlands/ Coedydd Gogledd Sir Benfro UK0030227 Main	“present”	British Island Bats vol 4 2023 had some data on Barbastelle population counts but it was for Pembrokeshire in general rather than just the SAC. “a minimum of 39 barbastelles were located from the roost counts and tracking data, though as adult females usually congregate together it is likely that most of the counted bats are adult females and making the presumption that juveniles were not yet volant and that equal number of males and females are born gives a likely minimum population size of 78 adult barbastelles within the study” (Dyer & Hargreaves, 2023)
Paston Great Barn UK0030235 Main	Min = 11, max = 50	7 females tracked in 2020 study in British Island bats vol 1 (Harris, 2020). Some info here on colony interactions with other known tree roosts in Norfolk. Very exciting!
Singleton and Cocking Tunnels UK003033 Other	“present”	Chichester.gov.uk website states that these tunnels are primarily a hibernation roost but no links to anything stating number of bats.
The Mens UK0012716 Other	Min = 50, max = 50	Chichester.gov.uk website states that flightlines have been mapped through radio tracking studies but no links to anything stating number of bats.

Appendix 2: Extracts of relevant papers

Point being made (para from main proof)	Paper title (extract follows)	Link
<p>Para 4.2.12</p> <p>Lepidoptera was the dominant order: 132 species across 30 orders/families were recorded and, of these, ten orders/families were recorded as being part of a barbastelle diet in another study.</p>	<p>Carr, A., Weatherall, A., Fialas, P., Zeale, M. R. K., Clare, E. L., and Jones, G. (2020) Moths consumed by the Barbastelle <i>Barbastella barbastellus</i> require larval host plants that occur within the bat's foraging habitats. Acta Chiropterologica, 22 (2). pp. 257-269.</p>	<p>https://www.ingentaconnect.com/contentone/miiz/actac/2020/00000022/00000002/art00003</p> <p>Extract # 1</p>
<p>Para 4.2.14</p> <p>Functional groups of European bat species are set out in Elmeros <i>et al.</i> (2016; pp4-5). Barbastelle are described as: “<i>Bats with medium manoeuvrability with a more straight flight pattern than bats in Category C [a category which includes pipistrelles]. They hunt and commute both in the away from vegetation and structures in a variety of flight heights. May occasionally fly but never hunt within vegetation. Commuting over open stretches tend to occur at medium heights (2 – 10 m) with no clear tendency to lower flight.</i>” Serotine are similarly categorised.</p>	<p>Functional groups reflect ecological niches occupied by bats taking into account species-specific differences in echolocation, manoeuvrability, flight behaviour and typical flight height. See Elmeros, M., Møller, J., Dekker, J., Garin, I., Christensen, M. & Baagøe, H. (2016) Bat mitigation measures on roads - a guideline.</p>	<p>https://www.cedr.eu/download/other_public_files/research_programme/call_2013/roads_and_wildlife/safebatpaths/Guidelines_for_bat_mitigation_on_roads.pdf.</p> <p>Extract # 2</p>
<p>Para 6.2.7</p> <p>Lighting can be a barrier to light-averse species (and even urban pipistrelles will seek to cross in darker areas (Hale <i>et al.</i>, 2015) if these are available...</p>	<p>Hale, J.D., Fairbrass, A.J., Matthews, T.J., Davies, G. and Sadler, J.P. (2015). The ecological impact of city lighting scenarios: exploring gap crossing thresholds for urban bats. Global Change Biology 21(7): 2467-2478.</p>	<p>https://onlinelibrary.wiley.com/doi/10.1111/gcb.12884</p> <p>Extract # 3</p>
<p>Para 6.3.11</p> <p>The Scheme will run single-decker buses that have a typical body height of 3.1m. Collision risk is therefore higher for those species that typically fly below this height.. Elmeros <i>et al.</i> (2016) categorises species according to flight characteristics; those typically flying below 5m, notably over open gaps, are those which would be most at risk (in Cambridgeshire, the <i>Myotis</i> and long-eared bats).</p>	<p>As Extract # 2</p>	<p>As Extract # 2.</p>

Point being made (para from main proof)	Paper title (extract follows)	Link
<p>Para 6.3.14</p> <p>Wang <i>et al.</i>, (2023; Appendix 2) noted the majority of studies indicate that wildlife/vehicle collisions are positively correlated with road width, number of lanes, road class, traffic volume, and speed limit (though bats were not referenced specifically).</p>	<p>Su, H., Wang, Y., Yang, Y., Tao, S., & Kong, Y. (2023). An Analytical Framework of the Factors Affecting Wildlife–Vehicle Collisions and Barriers to Movement. <i>Sustainability</i>, 15(14), 11181.</p>	<p>https://doi.org/10.3390/su151411181</p> <p>Extract # 4</p>
<p>Para 6.3.14</p> <p>A specific study of bat road mortality (Figueiredo Ramalho <i>et al.</i>, 2021) concluded road width, speed and volume were contributing factors to increased bat road mortality. Here, buses will limited to a speed of 50mph, slowing to 30mph at junctions and stopping at various points, which minimises the risk of mortality following a collision.</p>	<p>Fifueiredo Ramalho. D., Resende, D., Oliveira, T.F., Santos, R. A. L., Souza Aguiar, L. M. (2021) Factors influencing bat road casualties in a Neotropical savanna. <i>Perspectives in Ecology & Conservation</i>. Volume 19. Issue 2, April – June 2021. Pages 189-194.</p>	<p>https://www.perspectecolconserv.com/en-factors-influencing-bat-road-casualties-articulo-S2530064421000298</p> <p>Extract # 5</p>
<p>Para 6.3.16</p> <p>A meta-analysis of road collision data (Fensome and Mathews, 2016) found that low-flying species are more prone to collisions than high-flying species, and that juveniles (which fly from three or so weeks of age in summer) are more vulnerable to collisions than adults.</p>	<p>Fensome, A.G. & Mathews, F. (2016) Roads and bats: a meta-analysis and review of the evidence on vehicle collisions and barrier effects. <i>Mammal Review</i>. 46 (4), 311–323.</p>	<p>https://pmc.ncbi.nlm.nih.gov/articles/PMC5031215/pdf/MAM-46-311.pdf</p> <p>Extract # 6</p>
<p>Para 6.3.16</p> <p>This period of potentially higher risk (which should be considered against the parameters of bus operation) extends from emergence (barbastelle emerge between 12 and 36 minutes after sunset, with a mean average of 24 minutes after sunset (Zeale <i>et al.</i>, 2012)</p>	<p>Zeale M, Davidson-Watts I & Jones G (2012). Home range use and habitat selection by barbastelle bats (<i>Barbastella barbastellus</i>): implications for conservation. <i>Journal of Mammalogy</i> 93(4): 1110-1118.</p>	<p>https://www.researchgate.net/publication/280827344_Home_range_use_and_habitat_selection_by_barbastelle_bats_Barbastella_barbastellus_Implications_for_conservation</p> <p>Extract # 7</p>

Point being made (para from main proof)	Paper title (extract follows)	Link
Para 6.3.17 horseshoe bat populations are increasing. (Mathews <i>et al.</i> , 2018; BCT, 2025).	Bat Conservation Trust, 2025. The National Bat Monitoring Programme Annual Report 2024. Bat Conservation Trust, London.	www.bats.org.uk/our-work/national-bat-monitoring-programme/reports/nbmp-annual-report Extract # 8
	Mathews F, Kubasiewicz LM, Gurnell J, Harrower CA, McDonald RA, Shore RF. (2018). A Review of the Population and Conservation Status of British Mammals: Technical Summary. A report by the Mammal Society under contract to Natural England, Natural Resources Wales and Scottish Natural Heritage. Natural England, Peterborough.	https://publications.naturalengland.org.uk/publication/5636785878597632 Or directly here: A+Review+of+the+Population+and+Conservation+status+of+British+Mammals:+a+technical+summary Extract # 9

Paragraph 4.2.12 / Extract # 1

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A. Carr, A. Weatherall, P. Fialas, M. R. K. Zeale, E. L. Clare, *et al.*

TABLE 1. List of prey ($n = 120$) identified in 33 *B. barbastellus* faecal samples using high-throughput molecular sequencing. Confidence levels follow Razgour *et al.* (2011) and Hope *et al.* (2014) based on the BOLD identification system, whereby confidence level 1 = solid match (> 98.5%) to one species or match (> 98.5%) to more than one species, all belonging to the same genus; level 2 = match (> 98.5%) to more than one species belonging to different genera, only one of which was a UK species; and level 3 = match to several species of different genera, or to reference sequences only identified to family (> 98.5%). Presence of ears ([†]) indicates prey items from families known to possess hearing-based defences against echolocating bats (Roeder, 1974; Fullard, 1982; Scoble, 1992). Sequence similarity scores are rounded to the nearest decimal point

Order/Family	Species	Confidence level	Sequence similarity	Frequency of occurrence (n faecal pellets)
Lepidoptera				
Adelidae	<i>Nematopogon swammerdamella</i>	1	100	1
Coleophoridae	<i>Coleophora kuehnella</i>	1	99.6	1
Crambidae [†]	<i>Eudonia lacustrata</i>	2	99	2
	<i>E. mercurella</i>	1	99.6	2
	<i>Eurrhynx hortulata</i>	1	100	1
	<i>Scoparia basistrigalis</i>	1	99	3
	<i>Udea lutealis</i>	1	100	1
Depressariidae	<i>Agonopterix heracliana</i>	1	99.6	1
	<i>Carcina quercana</i>	1	100	1
	<i>Depressaria pastinacella</i>	1	100	1
Drepanidae [†]	<i>Polyplocia ridens</i>	1	100	1
	<i>Thyatira batis</i>	1	100	1
Erebidae	<i>Herminia grisealis</i>	1	99.6	2
	<i>H. tarsipennis</i>	1	100	1
	<i>Lymantria monacha</i>	1	100	1
	<i>Scoliopteryx libatrix</i>	1	100	2
	<i>Spilarctia luteum</i>	1	100	1
Geometridae [†]	<i>Aethalura punctulata</i>	1	100	1
	<i>Alcis repandata</i>	1	99.6	1
	<i>Apocheima pilosaria</i>	1	100	1
	<i>Asthena albulata</i>	1	100	2
	<i>Biston betularia</i>	2	99	1
	<i>Cabera pusaria</i>	1	100	2
	<i>Catarhoe rubidata</i>	2	99	1
	<i>Chloroclysta niata</i>	2	99	1
	<i>C. v-ata</i>	1	99.6	1
	<i>Cosmorhoe ocellata</i>	1	100	1
	<i>Cyclophora annularia</i>	1	99	1
	<i>Dysstroma truncata</i>	1	100	3
	<i>Ectropis crepuscularia</i>	1	100	1
	<i>Electrophaea corylata</i>	1	99.6	1
	<i>Epirrhoe alternata</i>	1	99.6	4
	<i>Eulithis prunata</i>	1	100	1
	<i>Eupithecia abbreviata</i>	1	99	6
	<i>E. absinthiata</i>	1	99.6	1
	<i>E. exigua</i>	1	99.6	1
	<i>E. plumbeolata</i>	2	99	1
	<i>E. subfuscata</i>	1	100	1
	<i>E. vulgata</i>	1	99	1
	<i>Gymnoscelis rufifasciata</i>	1	100	2
	<i>Hemithea aestivaria</i>	1	100	1
	<i>Hydriomena furcata</i>	1	100	1
	<i>H. impluviata</i>	1	100	1
	<i>Idaea aversata</i>	1	99.6	2
	<i>I. biselata</i>	1	100	5
	<i>Lampropteryx suffumata</i>	1	99	1
	<i>Lomaspilis marginata</i>	1	100	2
	<i>Lomographa bimaculata</i>	1	100	1
	<i>Odontopera bidentata</i>	1	100	4
	<i>Opisthographis luteolata</i>	1	100	2
	<i>Peribatodes rhomboidaria</i>	2	99	1
	<i>Perizoma affinitatum</i>	2	99	1
	<i>Petrophora chlorosata</i>	1	99	2
	<i>Scopula flodactata</i>	1	100	2
	<i>Selenia dentaria</i>	1	99	3
	<i>Trichopteryx carpinata</i>	1	100	1
	<i>Xanthorhoe designata</i>	1	99	1

TABLE 1. Continued

Order/Family	Species	Confidence level	Sequence similarity	Frequency of occurrence (n faecal pellets)
Gracillariidae	<i>X. fluctuata</i>	1	99	2
	<i>X. montanata</i>	1	100	5
Lymantriidae†	<i>Cameraria ohridella</i>	2	99.6	1
	<i>Euproctis similis</i>	1	100	1
Noctuidae†	<i>Abrostola tripartita</i>	1	99.6	2
	<i>Agrotis exclamationis</i>	1	100	7
	<i>A. ipsilon</i>	1	99	1
	<i>A. segetum</i>	1	99.6	5
	<i>Amphipyra pyramidea</i>	1	100	3
	<i>Anaplectoides prasina</i>	1	99	1
	<i>Apamea monoglypha</i>	1	99	4
	<i>A. sordens</i>	1	99.6	1
	<i>Atethmia centrargo</i>	1	100	1
	<i>Autographa gamma</i>	1	100	6
	<i>Caradrina clavipalpis</i>	1	100	1
	<i>C. kadenii</i>	2	99.6	1
	<i>C. morpheus</i>	1	100	1
	<i>Cerastis leucographa</i>	1	99.6	1
	<i>C. rubricosa</i>	1	99	1
	<i>Charanyca trigrammica</i>	1	100	1
	<i>Conistra vaccinii</i>	1	99	1
	<i>Cosmia trapezina</i>	1	100	3
	<i>Cryphia domestica</i>	1	99.6	1
	<i>Cucullia chamomillae</i>	1	100	2
	<i>Diarsia rubi</i>	1	99	1
	<i>Hoplodrina ambigua</i>	1	100	3
	<i>H. blanda</i>	1	99.6	1
	<i>H. octogenaria</i>	1	100	1
	<i>Hypena proboscidalis</i>	1	100	1
	<i>Lithophane socia</i>	1	99	1
	<i>Luperina testacea</i>	1	99.6	1
	<i>Mamestra brassicae</i>	1	100	1
	<i>Mesapamea secalis/didyma</i>	3	99	2
	<i>Mythimna impura</i>	2	99.6	2
	<i>Noctua comes</i>	1	100	1
	<i>N. fimbriata</i>	1	100	1
	<i>N. janthe</i>	1	100	2
	<i>N. pronuba</i>	1	100	9
	<i>Ochropleura plecta</i>	1	99.6	3
	<i>Oligia strigilis/versicolor</i>	3	99.6	1
	<i>Orthosia gothica</i>	1	99.6	1
	<i>O. gracilis</i>	1	99.6	1
	<i>O. incerta</i>	2	99	2
	<i>Phlogophora meticulosa</i>	2	99	5
	<i>Rivula sericealis</i>	1	99.6	1
	<i>Spaelotis ravidia</i>	1	99.6	1
	<i>Xestia c-nigrum</i>	1	100	3
	<i>X. xanthographa</i>	1	100	3
Nolidae	<i>Nola confusalis</i>	1	99.6	1
	<i>Nycteola revayana</i>	1	100	1
Notodontidae†	<i>Notodonta ziczac</i>	1	99.6	1
	<i>Pheosia gnoma</i>	1	100	2
Nymphalidae	<i>Maniola jurtina</i>	1	100	1
Pyrallidae†	<i>Cryptoblabes bistriga</i>	1	100	1
	<i>Endotricha flammealis</i>	1	100	3
Tortricidae†	<i>Archips podana</i>	2	99.6	1
	<i>A. xylosteana</i>	1	100	1
	<i>Pammene fasciana</i>	1	100	1
	<i>Pandemis cerasana</i>	1	99.6	1
	<i>Pseudargyrotoza convagana</i>	1	99.6	1
Diptera				
Drosophilidae	<i>Drosophila melanogaster</i>	1	100	1
Scathophagidae	<i>Scathophaga stercoraria</i>	2	99	1
Neuroptera				
Hemerobiidae	Hemerobiidae spp.	3	100	1

Paragraph 4.2.14 / Extract # 2

CEDR Call 2013: Roads and Wildlife

Functional groups of European bat species

- A. Extremely manoeuvrable bats, which often fly within foliage, or close to vegetation, surfaces and structures at variable flight heights. When commuting, they often follow linear and longitudinal landscape elements. Low-flying (typically < 2 m) when commuting over open gaps.
- B. Very manoeuvrable bats that most often fly near vegetation, walls, etc. at variable heights but occasionally hunt within the foliage. When commuting, they often follow linear and longitudinal landscape elements. Flying at low to medium height when commuting over open gaps (typically < 5 m).
- C. Bats with medium manoeuvrability. They often hunt and commute along vegetation or structures at variable heights, but rarely close to or within the vegetation. May also hunt in open areas. Commuting over open stretches generally takes place at low to medium heights (typically 2 – 10 m) with no clear tendency to lower flight.
- D. Bats with medium manoeuvrability with a more straight flight pattern than bats in category C. They hunt and commute both in the away from vegetation and structures in a variety of flight heights. May occasionally fly but never hunt within vegetation. Commuting over open stretches tend to occur at medium heights (2 – 10 m) with no clear tendency to lower flight.
- E. Less manoeuvrable bats that most often fly high and in the open airspace away from vegetation and other structures. These bats generally commute over open stretches at medium heights or higher (10 m and often higher). It must be stressed that even these species may fly quite low over open areas under certain conditions, e.g. when hunting insects over warm (road) surfaces, or when they emerge from a roost site.

Each bat species shows a large natural behavioural plasticity. Appropriate considerations to this behavioural plasticity and local habitat use and behaviour should be reflected in the planning of mitigation strategies in road projects.

Table 1. Provisional categorisation of European bat species to functional groups based on their typical flight behaviour and height. Brackets indicate that the knowledge on the species' flight behaviour is limited.

Latin name	Common name	In or near vegetation and surfaces			Open airspace	
		A	B	C	D	E
<i>Rousettus aegyptiacus</i>	Egyptian fruit bat				(X)	
<i>Rhinolophus hipposideros</i>	Lesser horseshoe bat	X				
<i>Rhinolophus ferrumequinum</i>	Greater horseshoe bat		X			
<i>Rhinolophus euryale</i>	Mediterranean horseshoe bat		X			
<i>Rhinolophus mehelyi</i>	Mehely's horseshoe bat		X			
<i>Rhinolophus blasii</i>	Blasius's horseshoe bat		(X)			
<i>Myotis daubentonii</i>	Daubenton's bat		X			
<i>Myotis dasycneme</i>	Pond bat			X		
<i>Myotis capaccinii</i>	Long-fingered bat			X		
<i>Myotis brandtii</i>	Brandt's bat		X			
<i>Myotis mystacinus</i>	Whiskered bat		X			
<i>Myotis aurascens</i>	Steppe whiskered bat		(X)			
<i>Myotis alcathoe</i>	Alcathoe bat		X			
<i>Myotis nipalensis</i>	Asiatic Whiskered bat		(X)			
<i>Myotis nattereri</i>	Natterer's bat	X				
<i>Myotis escalerai</i>	Iberian Natterer's bat	X				
<i>Myotis emarginatus</i>	Geoffroy's bat	X				
<i>Myotis bechsteinii</i>	Bechstein's bat	X				
<i>Myotis myotis</i>	Greater mouse-eared bat			X		
<i>Myotis blythii</i>	Lesser mouse-eared bat			X		
<i>Myotis punicus</i>	Maghreb Mouse-eared bat			(X)		
<i>Nyctalus noctula</i>	Common noctule					X
<i>Nyctalus lasiopterus</i>	Greater noctule					X
<i>Nyctalus leisleri</i>	Leisler's bat					X
<i>Nyctalus azoreum</i>	Azores noctule					(X)
<i>Pipistrellus pipistrellus</i>	Common pipistrelle			X		
<i>Pipistrellus pygmaeus</i>	Soprano pipistrelle			X		
<i>Pipistrellus hanaki</i>	Hanak's Pipistrelle			(X)		
<i>Pipistrellus nathusii</i>	Nathusius's pipistrelle			X		
<i>Pipistrellus kuhlii</i>	Kuhl's pipistrelle			X		
<i>Pipistrellus maderensis</i>	Madeira pipistrelle			(X)		
<i>Hypsugo savii</i>	Savi's pipistrelle				X	
<i>Vespertilio murinus</i>	Parti-coloured bat					X
<i>Eptesicus serotinus</i>	Serotine				X	
<i>Eptesicus nilssonii</i>	Northern bat				X	
<i>Eptesicus isabellinus</i>	Isabelline serotine				X	
<i>Eptesicus bottae</i>	Botta's serotine				X	
<i>Barbastella barbastellus</i>	Barbastelle				X	
<i>Plecotus auritus</i>	Brown long-eared bat	X				
<i>Plecotus macrobullaris</i>	Alpine long-eared bat	X				
<i>Plecotus sardus</i>	Sardinian long-eared bat	(X)				
<i>Plecotus austriacus</i>	Grey long-eared bat	X				
<i>Plecotus kolombatovici</i>	Balkan long-eared bat	(X)				
<i>Plecotus teneriffae</i>	Canary long-eared bat	(X)				
<i>Miniopterus schreibersii</i>	Schreiber's bent-winged bat				X	
<i>Tadarida teniotis</i>	European free-tailed bat					X



The ecological impact of city lighting scenarios: exploring gap crossing thresholds for urban bats

James D. Hale , Alison J. Fairbrass, Thomas J. Matthews, Gemma Davies, Jon P. Sadler

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SECTIONS

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Abstract

As the global population urbanizes, dramatic changes are expected in city lighting and the urban form, which may threaten the functioning of urban ecosystems and the services they deliver. However, little is known about the ecological impact of lighting in different urban contexts. Movement is an important ecological process that can be disrupted by artificial lighting. We explored the impact of lighting on gap crossing for *Pipistrellus pipistrellus*, a species of bat (Chiroptera) common within UK cities. We aimed to determine whether the probability of crossing gaps in tree cover varied with crossing distance and lighting level, through stratified field surveys. We then used the resulting data on barrier thresholds to model the landscape resistance due to lighting across an entire city and explored the potential impact of scenarios for future changes to street lighting. The level of illumination required to create a barrier effect reduced as crossing distance increased. **For those gaps where crossing was recorded, bats selected the darker parts of gaps.** Heavily built parts of the case study city were associated with large and brightly lit gaps, and spatial models indicate movement would be highly restricted in these areas. Under a scenario for brighter street lighting, the area of accessible land cover was further reduced in heavily built parts of the city. We believe that this is the first study to demonstrate how lighting may create resistance to species movement throughout an entire city. That connectivity in urban areas is being disrupted for a relatively common species raises questions about the impacts on less tolerant groups and the resilience of bat communities in urban centres. However, this mechanistic approach raises the possibility that some ecological function could be restored in these areas through the strategic dimming of lighting and narrowing of gaps.

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Abstract

Road mortalities caused by wildlife–vehicle collisions (WVCs) are the most obvious negative effect of roads on wildlife. Identifying the influencing factors and summarizing the spatial-temporal patterns of WVCs have been important research trends in recent decades. However, most studies have only considered a portion of the factors, and there remains a lack of a relatively complete framework, including the numerous factors of WVCs, as well as the underlying transmission mechanisms between factors. In this study, an analytical framework incorporating a wide range of previously discussed factors is constructed. The framework not only displays the possible direction of the influence of each factor on WVCs, but also summarizes some important potential explanations under some circumstances and reveals the main interactions between certain types of factors. From one perspective, the factors affecting WVCs can be divided into four categories: species characteristics, road and traffic characteristics, landscape and environmental characteristics, and driver-related factors and specific human activities. From another perspective, the factors affecting WVCs can be mainly categorized as those related to entering roads and those related to leaving roads safely. The study begins with a discussion of three important sub-frameworks: factors promoting road crossing, factors related to barriers to movement, and factors related to safe crossing. Finally, a suggestion is provided to promote the research on WVCs globally.

Keywords: wildlife–vehicle collisions (WVCs); crossing willingness; crossing avoidance; crossing ability; road ecology

Section 6.2 . Road and Traffic Characteristics

Road and traffic characteristics affecting WVCs include road design, road age, traffic volume, and vehicle speed. Road design includes the road class, road width, road curvature, road embankments, road verges, medians, road lights, roadside vegetation, and mitigation measures (Table 2).

Wider roads mean spending more time crossing, a higher traffic volume means fewer intervals to cross, and a higher vehicle speed means less time to react [62,115,116]. Although curves may lower the visibility of drivers [103], they may also reduce vehicle speed [60,128] and enhance drivers' attention [121]. Indeed, the majority of studies indicate that WVCs are positively correlated with road width, number of lanes, road class, traffic volume, and speed limit and are negatively correlated with road curvature [21]. Conversely, a high traffic volume can reduce the crossing willingness of some species and lower the risk of WVCs [58,60,62,88,134,135,136,137]. Additionally, it should not be overlooked that high traffic may depress the nearby population density via high road mortality, which causes road-kill hotspots to move to low-traffic segments [55,138]. Furthermore, high traffic may also make corpses disappear faster [55]. The negative relationship between the road width and the WVCs of certain species can be primarily attributed to the crossing avoidance of wide roads [118,123]. Husby (2016) conducted a rare study demonstrating a negative relationship between vehicle speed and the WVCs of birds, and the interpretation was that the sound of high-speed vehicles might alert birds earlier or that these vehicles might hit birds harder and throw them further off roads without detection [139].

Raised roads or roadsides with high embankments decrease the risk of WVCs of many species [68,104,128], but this may not be the case for birds [83]. Lao et al. (2011) and Valero et al. (2015) found that an increased shoulder width increases the likelihood of WVCs of some species [109,119]. Vegetated medians increase the WVCs of a number of species because they may attract species for food or protection or may reduce the width of the gap for crossing [68,128,131]. Even rigid median barriers may enhance the risk of WVCs by trapping wildlife on roads [113]. Road lights attract some species while repelling others [62]. Those who are attracted to roads by artificial lights may have a higher risk of WVCs [110,112,129,130]. Moreover, vehicle headlights may dazzle some nocturnal birds [83,128] or may cause some species to freeze, such as possums (*Trichosurus vulpecula*) and hedgehogs [55].

Roadside vegetation can be an attractive habitat to a wide range of wildlife or can act as a corridor for movement. A large number of species prefer to cross roads at sites hidden by vegetation cover, which may limit the awareness of drivers or wildlife [35,39,82,99,104,108,115,126]. Actually, the majority of studies show a positive correlation between roadside vegetation and WVCs [21]. In detail, the structure of roadside vegetation may also have an impact. For example, dense vegetation may force birds to fly higher and decrease the risk of WVCs [106,128]. When incubating birds nesting in low roadside vegetation flush from their nests, they often fly low over the open road and are very vulnerable to WVCs. Galantinbo et al. (2022) found that wood mice (*Apodemus sylvaticus*) are more likely to cross roads near taller shrubs or after firebreak openings [132].

Road fences are a very effective mitigation measure to reduce WVCs [40,102,105,111,120,122,124,133]. Moreover, WVCs are likely to be concentrated at fence ends because of the funnel effect of fences [40,102,122,125,131]. Similarly, Cserkés et al. (2013) noted the high rate of WVCs near crossing structures due to fence gaps [114]. Fences may also become traps for wildlife, resulting from bad design or maintenance [127]. For instance, some species can climb over or pass through fences and get trapped on roads [107,117].

As mentioned previously, species may improve their crossing ability with time. The road age may correlate with the change in local abundance or the interaction behavior (e.g., habituation) with roads [72].



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Research Letters

Factors influencing bat road casualties in a Neotropical savanna

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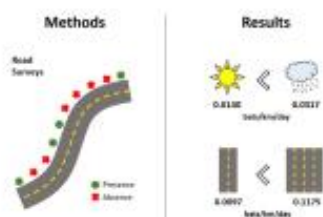
^d Programa de Pós-Graduação em Zoologia, Universidade de Brasília, Campus Darcy Ribeiro s/n, Asa Norte, CEP: 70910-900, Brasília, DF, Brazil



HIGHLIGHTS

- Estimation of over 4740 road-killed bats during a 5-year period.
- Phyllostomidae bats were the most affected by roadkill in the study area.
- Road casualties were more numerous during rainy season.
- Collisions occurred 12 times more in four-lane highways than in two-lane ones.
- Distance from water and presence of light were not significantly related to roadkill.

GRAPHICAL ABSTRACT



ARTICLE INFO

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Phyllostomidae
Roadkill
Wildlife-Vehicle Conflict

ABSTRACT

Collision with vehicles is one of the main causes of death for many vertebrates; however, little is known about bat roadkill. Thus, in this study we described bat roadkill in an area of Neotropical savanna and evaluated factors potentially affecting its occurrence. We surveyed 114 km of roads on the margins of protected areas in the Brazilian Federal District for 5 years. We analysed bat roadkill on three types of roads (dirt roads, two-lane paved highways, and four-lane paved highways) and recorded distance from water and presence of artificial light. Bat roadkill was calculated for 2-km sections and analysed using generalized linear mixed models (GLMMs) with the following independent variables: season, road type, presence of light, and distance from water. We used section nested within road as a random effect. We estimated a total of 4740 roadkilled bats and identified individuals from three families. Bat road casualties were more numerous in the rainy season and on four-lane highways, whereas proximity to water and presence of artificial light were not related to roadkill number. The higher roadkill rate during the rainy season may be explained by higher bat activity due to the increased availability of resources. Regarding the influence of road type, four-lane highways have the highest traffic volumes in the area and the highest speed limits, which are associated with higher roadkill rates. Bats represent the most diverse order of mammals in the Cerrado, where they provide many important ecological services, which need to be preserved.

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Introduction

Roadkill is the most obvious direct cause of wild vertebrate mortality related to habitat fragmentation by roads (Forman and

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Mammal Review



Mammal Review ISSN 0305-1838

REVIEW

Roads and bats: a meta-analysis and review of the evidence on vehicle collisions and barrier effects

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Keywords

barrier effect, bats, habitat fragmentation, meta-analysis, roads

*Correspondence author.

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 Returned for revision: 25 February 2016
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 Editor: KH

doi: 10.1111/mam.12072

ABSTRACT

1. Roads are a potential threat to bat conservation. In addition to the direct risk of collision of bats with vehicles, roads could pose a threat to bat populations as a result of habitat loss, degradation and fragmentation, and could act as barriers to movements of bats between habitats.
2. We performed a systematic review of the literature and conducted meta-analyses to assess the threat posed by roads to bats as a result of 1) collisions between bats and vehicles and 2) roads acting as barriers to movements of bats.
3. Based on collated records of 1207 bat road casualties in Europe, we found that low-flying species are more prone to collisions than high-flying species, and that juveniles are more vulnerable to collisions than adults. In addition, meta-analysis identified a significant bias towards male casualties. Casualties included rare species such as *Barbastella barbastellus* and geographically restricted species such as *Rhinolophus* species.
4. The bias towards male casualties could be indicative of greater natal philopatry or lower dispersal among females, or of sexual segregation in habitats of varying quality, i.e. females may occupy better quality habitats than males, and road density may be lower in better quality habitats.
5. Whether or not roads act as barriers to the movement of bats depends on a complex interplay of habitat and species-specific behaviour. For example, the presence of favourable habitat for bats – notably woodland – was found in this review to be linked with significantly reduced barrier effects but a heightened risk of collision.
6. Our data suggest that roads do pose a threat to bats. Future research should assess the contribution of traffic noise and street lighting to the barrier effect of roads. Where new road schemes are monitored by ecological practitioners, it is vital that consistent protocols are employed to ensure that bat activity can be compared before and after the road is built. Evidence from such research should be used to minimize the risks for bats of any roads built in the future, and to design safe crossing points for bats.

INTRODUCTION

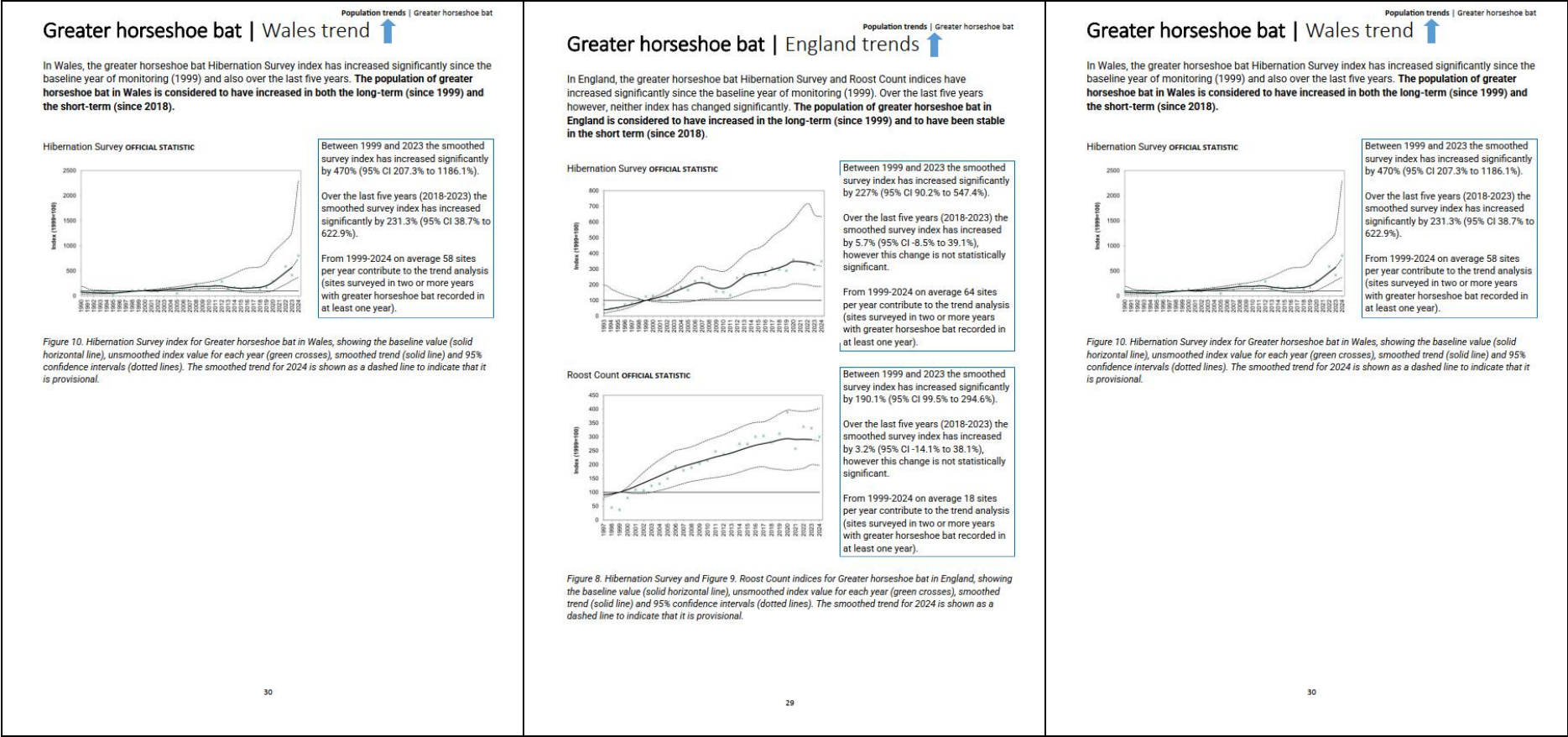
The road network is expanding rapidly throughout Europe. Between 2004 and 2013, over 630000 km of new roads were built, an average of at least 70000 km each year (Anonymous 2013). The network will expand further

during the next 5 years as the European Commission oversees the investment of €24 billion in the transport network by 2020 (Anonymous 2014a), while the UK government plans to invest more than £15 billion on 127 road-building projects, including 400 additional miles of motorway and major road widening schemes (Anonymous 2014b).

Paragraph 6.3.16 / Extract # 7

per bat). Average emergence time from day roosts was $24 \text{ min} \pm 6.9 \text{ SD}$ after sunset (range 12–36 min). After emergence, bats typically remained within woodland roost areas for $28 \pm 17.4 \text{ min}$ before commuting to foraging areas. On leaving woodland roost sites, bats initially made use of treelines and hedgerows for commuting but moved freely across open landscapes thereafter. Mean flight time was $357 \pm 24.5 \text{ min}$, which comprised $94\% \pm 2.4\% \text{ SD}$ of the total time spent outside of day roosts. Remaining time was spent night roosting ($\bar{X} = 24 \pm 10.9 \text{ min}$), split typically between two or three short roosting events. Mean time of final return to day roosts (minutes before sunrise) was highly variable among individual bats but consistently well before sunrise ($\bar{X} = 194 \pm 59.1 \text{ min}$). Return commutes were fast and direct, with no apparent use of linear landscape features.

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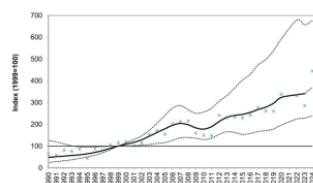


Greater horseshoe bat | UK/GB trends

Population trends | Greater horseshoe bat

In Great Britain, the greater horseshoe bat Hibernation Survey and Roost Count indices have increased significantly since the baseline year of monitoring (1999), and the Hibernation Survey index has also increased significantly over the last five years. **The population of greater horseshoe bat in Great Britain is considered to have increased in both the long-term (since 1999) and the short-term (since 2018).** Greater horseshoe bat is not known to occur in Northern Ireland and therefore the GB trends are in effect UK trends.

Hibernation Survey OFFICIAL STATISTIC

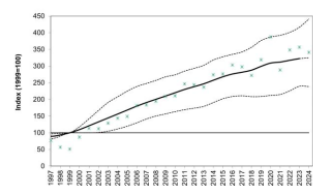


Between 1999 and 2023 the smoothed survey index has increased significantly by 241% (95% CI 128.4% to 557.8%).

Over the last five years (2018-2023) the smoothed survey index has increased significantly by 22.2% (95% CI 1.9% to 86%).

From 1999-2024 on average 122 sites per year contribute to the trend analysis (sites surveyed in two or more years with greater horseshoe bat recorded in at least one year).

Roost Count OFFICIAL STATISTIC



Between 1999 and 2023 the smoothed survey index has increased significantly by 222.5% (95% CI 139.5% to 316.2%).

Over the last five years (2018-2023) the smoothed survey index has increased by 12.1% (95% CI -9.4% to 39.9%), however this change is not statistically significant.

From 1999-2024 on average 22 sites per year contribute to the trend analysis (sites surveyed in two or more years with greater horseshoe bat recorded in at least one year).

Figure 6. Hibernation Survey and Figure 7. Roost Count indices for Greater horseshoe bat in the UK/Great Britain, showing the baseline value (solid horizontal line), unsmoothed index value for each year (green crosses), smoothed trend (solid line) and 95% confidence intervals (dotted lines). The smoothed trend for 2024 is shown as a dashed line to indicate that it is provisional.

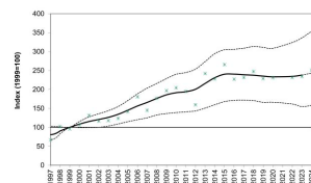
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Lesser horseshoe bat | England trends

Population trends | Lesser horseshoe bat

In England, the lesser horseshoe bat Hibernation Survey and Roost Count indices have increased significantly since the baseline year of monitoring (1999). Over the last five years the Hibernation Survey index has shown no significant change and the Roost Count index has declined significantly. **The population of lesser horseshoe bat in England is considered to have increased in the long-term (since 1999), and there is evidence to suggest it has declined in the short term**

Hibernation Survey OFFICIAL STATISTIC

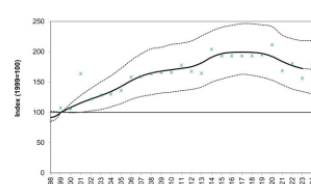


Between 1999 and 2023 the smoothed survey index has increased significantly by 137.8% (95% CI 54.8% to 236.2%).

Over the last five years (2018-2023) the smoothed survey index has increased by 0.2% (95% CI -25.1% to 21.2%), however this change is not statistically significant.

From 1999-2024 on average 71 sites per year contribute to the trend analysis (sites surveyed in two or more years with lesser horseshoe bat recorded in at least one year).

Roost Count OFFICIAL STATISTIC



Between 1999 and 2023 the smoothed survey index has increased significantly by 72.3% (95% CI 34.4% to 118.2%).

Over the last five years (2018-2023) the smoothed survey index has decreased significantly by -13.4% (95% CI -24% to -1.1%).

From 1999-2024 on average 53 sites per year contribute to the trend analysis (sites surveyed in two or more years with lesser horseshoe bat recorded in at least one year).

Figure 13. Hibernation Survey and Figure 14. Roost Count indices for Lesser horseshoe bat in England, showing the baseline value (solid horizontal line), unsmoothed index value for each year (green crosses), smoothed trend (solid line) and 95% confidence intervals (dotted lines). The smoothed trend for 2024 is shown as a dashed line to indicate that it is provisional.

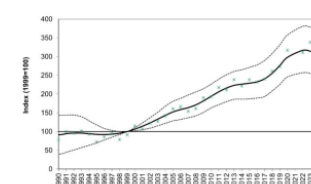
33

Lesser horseshoe bat | Wales trends

Population trends | Lesser horseshoe bat

In Wales, the lesser horseshoe bat Hibernation Survey and Roost Count indices have increased significantly since the baseline year of monitoring (1999) and the Hibernation Survey index has also increased significantly over the last five years. **The population of lesser horseshoe bat in Wales is considered to have increased in both the long-term (since 1999) and the short-term (since 2018).**

Hibernation Survey OFFICIAL STATISTIC

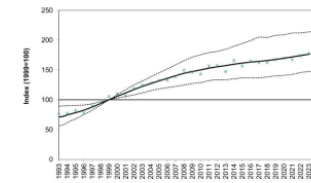


Between 1999 and 2023 the smoothed survey index has increased significantly by 214.4% (95% CI 155.1% to 278.1%).

Over the last five years (2018-2023) the smoothed survey index has increased significantly by 22.9% (95% CI 11.3% to 41%).

From 1999-2024 on average 86 sites per year contribute to the trend analysis (sites surveyed in two or more years with lesser horseshoe bat recorded in at least one year).

Roost Count OFFICIAL STATISTIC



Between 1999 and 2023 the smoothed survey index has increased significantly by 76.3% (95% CI 47.6% to 114.1%).

Over the last five years (2018-2023) the smoothed survey index has increased by 6.3% (95% CI -4.6% to 17.1%), however this change is not statistically significant.

From 1999-2024 on average 94 sites per year contribute to the trend analysis (sites surveyed in two or more years with lesser horseshoe bat recorded in at least one year).

Figure 15. Hibernation Survey and Figure 16. Roost Count indices for Lesser horseshoe bat in Wales, showing the baseline value (solid horizontal line), unsmoothed index value for each year (green crosses), smoothed trend (solid line) and 95% confidence intervals (dotted lines). The smoothed trend for 2024 is shown as a dashed line to indicate that it is provisional.

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Paragraph 6.3.17 / Extract # 9

Greater horseshoe bat *Rhinolophus ferrumequinum*

British population estimate

12,900 (Plausible Intervals (PIs) = 9,200–18,500).
Reliability score = 4.

Conservation status

Native. **IUCN Red list:** GB: LC; England: [LC]; Scotland: n/a; Wales: [NT]; Global: LC.

Article 17 overall assessment 2013: Annex II and IV; UK: Favourable; England: Favourable; Scotland: n/a; Wales: Favourable.



Caveats

Population size estimate may be affected by the following factors not included in the analysis:

- Not all maternity roosts are known, but confidence in the estimate is high owing to extensive study.
- Sex ratio in maternity colonies is uncertain.

Changes through time

- Harris et al. (1995) estimated a British population of 4,000-6,600. This was likely to be an underestimate owing to restricted knowledge of several key maternity roosts.
- Increases in indices of abundance have been measured by the National Bat Monitoring Programme at 32 maternity sites (5.2% per year since 1997) and hibernacula (4.8% per year since 1990).
- Population size — Increase (England, Wales). Range — Increase (England, Wales).

Drivers of change

- Reduction in prey availability owing to agricultural intensification.
- Protection of maternity roosts, but loss of mating roosts and disturbance of hibernation sites.
- Climate change, providing milder winters.
- Roads pose threat of habitat fragmentation and vehicle collisions.
- Artificial night lighting reducing habitat suitability.

Range based on 1995-2016 presence data. Areas with very isolated records may not have been included in the distribution — see main report Methods section 2.5 for more details.

Future prospects

- Population status — Increase
- Range status — Increase
- Habitat status — Stable

Lesser horseshoe bat *Rhinolophus hipposideros*

British population estimate

50,400 (Plausible Intervals = 36,000–72,000).
Reliability score = 3.

Conservation status

Native. **IUCN Red list:** GB: LC; England: [LC]; Scotland: n/a; Wales: [LC]; Global: LC.

Article 17 overall assessment 2013: Annex II and IV; UK: Favourable; England: Favourable; Scotland: n/a; Wales: Favourable.



Caveats

Population size estimate may be affected by the following factors not included in the analysis:

- Not all maternity roosts are known, but confidence in the estimate is high owing to extensive study.
- Sex ratio in maternity colonies is uncertain.

Changes through time

- Harris et al. (1995) estimated a British population of 14,000.
- Increase in hibernation records from the north of England and the Midlands.
- Increases in indices of abundance have been measured by the National Bat Monitoring Programme at maternity sites (3.6% per year since 1993) and hibernacula (5.6% per year since 1990).
- The JNCC 2012 Article 17 Report also notes an increasing population size trend.
- Population size — Increase (England, Wales). Range — Increase (England, Wales)

Range based on 1995-2016 presence data. Areas with very isolated records may not have been included in the area of distribution — see main report Methods section 2.5 for more details.

Drivers of change

- Reduction in prey availability owing to agricultural intensification.
- Climate change, providing milder winters.
- Roads pose a threat of habitat fragmentation and vehicle collisions.
- Artificial night lighting, reducing habitat suitability.
- Protection of maternity roosts, but disturbance of hibernation roosts.

Future prospects

- Population status — Increase
- Range status — Increase

Appendix 3: Outputs from ‘April meeting’ (issued to Natural England)

3.1 Minutes

3.2 Presentation

3.3 Technical Note 1 Surveys Summary and Mitigation Justification

AGENDA & MEETING NOTES

PROJECT NUMBER	Project number: 70086660	MEETING DATE	02 April 2025
PROJECT NAME	Cambridge To Cambourne	VENUE	MS TEAMS
CLIENT	Greater Cambridge Partnership	RECORDED BY	Ian Ellis
MEETING SUBJECT	Cambridge to Cambourne TWAO – Meeting on Natural England's Representation		

PRESENT	GCP: Jo Baker (JB) Natural England: Nick Downs (ND), Justin Tilley (JT), Catherine Duerden (CD) WSP: Gemma Cookson (GC), Ian Ellis (IE), Graham Higgins (GH)
APOLOGIES	WSP: Sarah Proctor (SP)
DISTRIBUTION	As above
CONFIDENTIALITY	Confidential

ITEM	SUBJECT	ACTION	DUE
1	Introduction		
1.1.	GC opened the meeting where it was proposed that the current meeting becomes the first of regular engagement meetings. Natural England will be provided with a signposting document and a supplementary data appendix regarding bats. Additionally, a Statement of Common Ground (SoCG) will be issued to underpin the engagement between the Applicant and Natural England. [These minutes should be read in conjunction with the presentation slide deck (attached pdf), reference is to which is made throughout this document e.g. Slide 1/32].	GC	
1.2.	GC highlighted that Sarah Proctor was unable to attend the meeting and for that reason the discussion on collision risk will take place in a subsequent meeting.		
1.3.	GC asked for people to bear in mind throughout the meeting that this is a bus route rather than an operational road and by its nature it is reducing future modelled traffic (including existing double decker buses) on the A1303, which runs adjacent to Madingley Wood Site of Special Scientific Interest (SSSI), along its southern border with no mitigation in place. The Scheme will instead operate with single height buses between the hours of 06:00 – 00:00 at a frequency of 20		

	movements per hour, further away from Madingley Wood SSSI and within landscape mitigation to prevent bat collisions with buses.		
1.4.	GC highlighted that Barbastelle colony roosts are located within Madingley Wood SSSI.		
1.5.	JB reminded the attendees that the development is a busway not a new road and the risks of impacts such as collision should be considered in that context.		
2	Coton Orchard Designation		
2.1.	GC acknowledges on behalf of the Applicant, that Coton Orchard is designated as a County Wildlife Site (CWS). While this was missing on Figure 5.2 of Appendix A, it was outlined elsewhere throughout Technical Report 5 of the ES.		
2.2.	GC provided a proposed excerpt of the SoCG relating to this point; this is subject to Natural England's agreement once issued.	CD (once SoCG issued)	
2.3.	ND mentioned that Coton Orchard is important and designated for moths, which needs to be considered with respect to Barbastelles.		
2.4.	IE clarified that Coton Orchard is designated only for traditional orchard habitat and not specifically for any other species (including moths or other invertebrates). Although, it is noted that the presence of 15 scarce invertebrate species is used in support of the assessment of traditional orchard habitat.		
3	Request for evidence to support loss of foraging habitat		
3.1.	GC gave an overview of Natural England's comments on this matter. Slide 7/32.		
3.2.	GC presented a variety of buffers around the Special Area of Conservation (SAC) noting that Zeale has recorded Barbastelle Bats commuting up to 20km. Slide 9/32.		
3.3.	<p>A GCP figure was presented showing hedgerows across the landscape. Slide 10/32. It was noted that the landscape is predominantly flat arable land.</p> <p>The pre and post development bat foraging habitat was presented. Slide 12/32.</p> <p>The Scheme includes commitments to providing habitat enhancement away from any deemed collision risk zone. While the Project is not subject to mandatory Biodiversity Net Gain (BNG), GCP aim to meet their policy of 20% gain.</p>		

3.4.	GC outlined that the Applicant firmly believes that there is sufficient evidence that foraging habitat (and Favourable Conservation Status (FCS)) will be maintained. Slide 13/32.		
4	Requests for further surveys		
4.1.	GC gave an overview NEs representation Slide 14/32. Then provided the data used to inform the assessment and the mitigation design for the Scheme. It was highlighted that there is a longstanding data sharing agreement with East West Rail which includes radiotracking work. This was agreed with Natural England through the pre-application DAS.		
4.2.	GC outlined the EWR radiotracking data is in addition to Scheme specific work, including work undertaken at Coton Orchard.		
4.3.	JB requests that this is fully considered when determining the need for any additional fieldwork.		
4.4.	The radiotracking work in 2022 targeted 8 woodlands. GC presented a figure showing the results of this work Slide 15/32. The Wimpole population moved east and west, with some crossing the M11 with no interaction with the Scheme. The Hardwick Wood population overlapped with the west of the Scheme near Bourne Airfield (where it was reminded that this is subject to a separate consented residential development) with some crossing of the A428. The Madingley Wood population (where 6 bats of a known colony of 28 bats were trapped and tracked) shows consistent movements in a north-west direction, notably towards a Golf Course with crossing of the A428 and the A14. Coton Orchard highlighted green on slide 16/32, is outside of both the home range and core foraging area of the Madingley population.		
4.5.	GC outlined that the Applicant therefore has a good understanding of where bats are moving.		
4.6.	Static data collection was undertaken by Cambridge Ecology in 2019-2020 and then by WSP in 2021-2022, inclusive of Coton Orchard. GC presented a map of data within Coton Orchard and the wider Scheme, allowing for bat registrations to be compared between Coton Orchard and other locations, such as the core radio tracked foraging areas. The peak passes per night (ppn) for Barbastelles recorded at the Orchard in September was 2.88, although recordings were low across the board in September, SD21 had a peak of 4.8 bats in comparison. Then looking across all locations and all months we have peak ppn (Not averages) of 48.2 in May at SD 21; and 22.6 in August at SD22, and 15.4 at SD 10 in August. Putting into context that 2.88 as a peak		

MEETING NOTES

	in the orchard is very low when compared to peak recordings at other locations. These other locations coincide with or are very near to the core foraging areas and home ranges.		
4.7.	JT queried if peak counts during September would indicate that these are bats dispersing after the breeding period. JT asked if any swarming sites (or likely swarming sites) have been identified in the area of search.		
4.8.	GC replied that neither Cambridge Ecology nor WSP have noted any likely swarming activity.		
4.9.	ND followed up JT 's query and outlined that there is a knowledge gap of functional linkage (FL) with the SAC in terms of swarming and hibernation sites. Are there any underground features known near the Project?		
4.10.	GC replied that WSP assessed hibernation suitability within 500m of the Scheme and there are no known suitable structures; the ice house at Madingley Hall was investigated but had collapsed and therefore is not suitable.		
4.11.	JB pointed out that the landscape is flat arable and tunnels, caves etc are not features found locally.		
4.12.	GC agreed that while it is not for the Applicant to determine FL in a wider sense for the SAC, the Applicant will engage with EWR to see if there is further knowledge available that will be useful. [Post meeting note: GC asked EWR, they do not hold specific data but the woodlands are most likely used for hibernation as per the findings of the A428 Caxton to Gibbet scheme.]	GC	
4.13.	GH also agreed to talk to the WSP geotechnical team to confirm that no suitable features are present.	GH	
4.14.	CD clarified Natural England's position in that they are concerned about the Madingley population in particular, including swarming, and its potential FL and not necessarily the SAC colony.		
4.15.	GC reminded the meeting that the working assumption through the DAS was that Madingley Wood is functionally linked so has been taken into account.		
4.16.	CD mentioned that in one of the technical reports, 28 bats were detailed as a peak at Madingley. So, the six bats tracked represents a low proportion and could not be said to provide representative movements of the whole colony.		
4.17.	GC pointed out that 20% random sampling of the colony is substantial and sufficient. For welfare reasons Natural England does not licence the tracking of a higher proportion of the population. Considering this,		

MEETING NOTES

	in addition to the static data taken in 2019 and 2020 across all seasons, clear assumptions on Barbastelle movements can be established.		
4.18.	ND asked about habitat association of the bats moving from Madingley e.g. those moving to the River Cam.		
4.19.	ND noted that Barbastelles are creatures of habit. It would be good to understand more about the habitat associations of the bats.		
4.20	GC replied that the golf courses with likely water supply are clear attractions, and wetlands / watercourses also featuring. Noting that none of this habitat is in the Scheme footprint.		
4.21	<p>GC stated she could provide more information on the habitat associations of the tracked Barbastelle.</p> <p>[Post Meeting Note: extract from EWR radiotracking report: <i>'The habitats within the core foraging areas for the bats captured in Madingley Wood SSSI included: deciduous woodland, including areas of ancient and seminatural woodland, wood pasture and parkland, new woodland planting, riparian habitat including mature broadleaved treelines and floodplain grazing marsh, agricultural land, hedgerows and ditches.'</i>]</p>	GC	
4.22	ND noted that this made sense and the association with golf courses provides important evidence. He further noted that there is limited woodland in the landscape and therefore shade at Coton Orchard could be important.		
4.23.	GC and IE highlighted that limited shade exists at the Orchard - the west end is intensively managed (through ride on mowers) and the east end is dense hawthorn scrub.		
4.24.	GC presented winter static data from around Coton Orchard showing low ppn.		
4.25.	CD pointed out that SD5 on the east boundary of Coton Orchard had up to 0.6 ppn.		
4.26.	GC noted this but reiterated that other areas clearly have higher ppn and are more favoured.		
4.27.	ND queried if part of what informs a peak is the presence of detectors at linear features.		
4.28.	GC confirmed all detectors were on linear features as standard.		
4.29.	ND considered that it does suggest that hibernation site is not too far away and asked about the presence of trees with flaky bark.		

4.30.	GC confirmed that Madingley Wood has such features. Madingley is also likely to provide a hibernation site.		
5	Coton Orchard – foraging and prey resource		
5.1.	GC gave an overview NEs representation Slide 23/32. GC repeated findings that Coton Orchard is not optimal habitat for Barbastelles.		
5.2.	JB added that Coton Orchard is commercially managed.		
5.3.	IE confirmed that intensive mowing was occurring during a spring site visit in 2024.		
5.4.	ND agreed that intensive mowing would suppress moth prey at a site.		
5.5.	CD noted a repeat of 3 individual barbastelles on the crossing point results (at eastern boundary) which may represent 10% of the Madingley population.		
5.6.	CD asked if 2019 data was included in analysis which included a record of 161 registrations between the July and September dataset (29/07/2019 - 04/08/ 2019).		
5.7.	GC acknowledged she was aware but that 1169 registrations were recorded in the core foraging area of Madingley between July and September dataset (29/08/2019 -02/09/2019). GC noted that Cambridge Ecology did not hold on to the data, so no timestamps are available to analyse this data further. GC did agree to layer the 2019 data where possible to give spatial use by bats.		
5.8.	GC stated we hold over 50 hours of emergence surveys across June, July and August within the orchard with only two Barbastelles recorded. With no Barbastelles recorded in this period from over 30 hours of emergence surveys along the northern boundary of the orchard and over 40 hours of emergence surveys along the southern boundary. This means there is very low Barbastelle activity in the period 2 hours after sunset.		
5.9.	ND hypothesised why relatively few Barbastelles were record in Coton Orchard – could they be more spread out so not being picked up by detectors? When foraging are they quieter so under recorded?		
5.10.	GC replied that the surveys used standard technique and higher densities were recorded elsewhere when clearly foraging. GC reiterated that the data collected is robust and sufficient at the Orchard in that we hold both quantitative from a statics perspective and a qualitative perspective (bat behaviour/number of bats from the crossings point data and emergence surveys).		

5.11.	GC then presented initial analysis of moth species recorded at the Orchard, where each moth species captured larval food plant has been identified. It should be noted that moths are drawn in by the light from a large area and will not be just representative of the orchard but the general area.		
5.12.	IE pointed out that there is a misconception that <i>Barbastelles</i> specialise on micromoths – a substantial proportion of prey recorded in published studies were from <i>Geometridae</i> and <i>Noctuidae</i> , which are, in general relatively large macro moths.		
5.13.	ND asked if the Applicant has looked at occurrence of larval foodplants to be lost?		
5.14.	GC replied that this is not possible from habitat data held and, in any case, it appears that <i>Barbastelles</i> are not specialists in any particular type of moth. Focus will therefore be to include the identified moth larval foodplants in the landscape specifications which have been identified during the moth survey in the Orchard (Slide 24/32). IE noted it is the biomass of moths that is important over the species.		
6	Crossing Points		
6.1.	GC outlined Natural England's comments on this matter (Slide 26/32) and stated that this will be discussed in a subsequent meeting.		
7	Lighting		
7.1.	GC outlined Natural England's comments on this matter (Slide 28/32) and stated that this will be discussed in a subsequent meeting.		
8	Conclusion		
8.1.	GC highlighted the main points discussed: <ul style="list-style-type: none"> ■ Coton Orchard CWS designation is acknowledged; ■ Data held is comprehensive both regionally and for the Orchard and no further surveys are proposed; and ■ Collision risk / lighting / landscape treatments will be discussed at future meetings. 		
8.2.	CD agreed to look at Natural England's calendar and respond about future meeting dates.	CD	
8.3.	CD returned to the observation of the '3 bats' at the Orchard and enquired if the Applicant knows enough to inform mitigation measures?		
8.4.	GC confirmed that there is enough survey information to make appropriate assumptions. GC asked whether NE, now they have seen all the data presented, agree this is the case?		

8.5.	ND stated they will come back to WSP and the Applicant as soon as possible to enable WSP to mobilise for surveys, should they be required, and that they will provide full justification for surveys if deemed necessary.	NE	
8.6.	CD asked if mitigation will be away from the Scheme but contiguous to Coton Orchard?		
8.7.	JB outlined an area to the south-east of Coton Orchard that will have attenuation ponds and a range of habitat. This would link Coton Orchard to the Coton Nature Reserve.		
8.8.	ND returned to the query about foraging in Coton Orchard and stated this is an important issue. Bats going back and forth may still be at risk despite low occurrence. It is helpful to know how Coton Orchard is managed, including mowing and the lack of large trees.		
8.9.	JB repeated earlier point about the development being a busway and collision risk will not be the same as a road.		
8.10.	GC noted that we are looking at the earliest timings of Barbastelle recorded across the Scheme records at the next meeting as there is little overlap between the bats and the operation of the bus.		
8.11.	ND agreed that looking at the first recording is important and it might be possible to show that Coton Orchard is not used as early evening shade.		
8.12.	CD queried the bus speed limit within Coton Orchard which goes from 30 mph to 50 mph - Natural England would prefer it to be consistent 30 mph.		
8.13.	JB responded that this is not ideal within the context of the business case for the Scheme.		
8.14.	ND asked if there is any further information on how bats were crossing the M11 and A14 which might assist the evidence base for this scheme?		
8.15.	GC stated she was aware of crossing at a 28m cutting and can look into that for future meetings.		
8.16.	CD asked about dates for the Public Inquiry.		
8.17.	JB responded that it will very likely be from mid September – mid November.		
8.18.	GH mentioned the Statement of Case which will be available next week.		

MEETING NOTES

8.19.	JB asked all to have in mind that mooted alternatives to the Scheme are directly alongside Madingley Wood SSSI. It is a misconception that that it is a better solution.		
8.20.	While noting that it is to be discussed at an alternative meeting ND and JB discussed Natural England's comments regarding 7m crossing points. ND clarified that this is based on the width of a rural road. JB stated that the Scheme cannot go beyond 7.3m.		
8.21.	ND stated it would be useful to understand how the local population are adapted to crossing gaps, lighting levels and whether they fly lower when crossing gaps, which might decrease the collision risk with double decker buses.		
8.22.	GC acknowledged that we will be doing a desk based assessment of the gaps and light levels that Barbastelles are within activity areas.		
8.23.	CD asked if it is worth considering planting in middle of the 'road'.		
8.24.	JB stated that this would be difficult to achieve with the agreement of the owners of Coton Orchard (Houston Crest Properties Ltd).		
8.25.	ATTACHED. Presentation: Cambourne to Cambridge Natural England Representation. April 2025.		

NEXT MEETING

It is proposed that the following meetings are scheduled:

w/c 12 May – Collision Risk / Landscape Treatments

w/c 23 June – Lighting

w/c 4 August – Outstanding Matters



Cambourne to Cambridge

Natural England Representation
April 2025

GCP WELCOME COMMENTS AND PROPOSE:

- A series of regular stakeholder engagement meetings over the coming months to discuss Natural England's Representations.
- Production and provision of a:
 - signposting document; and
 - supplementary data appendices.
- SOCG Issues log

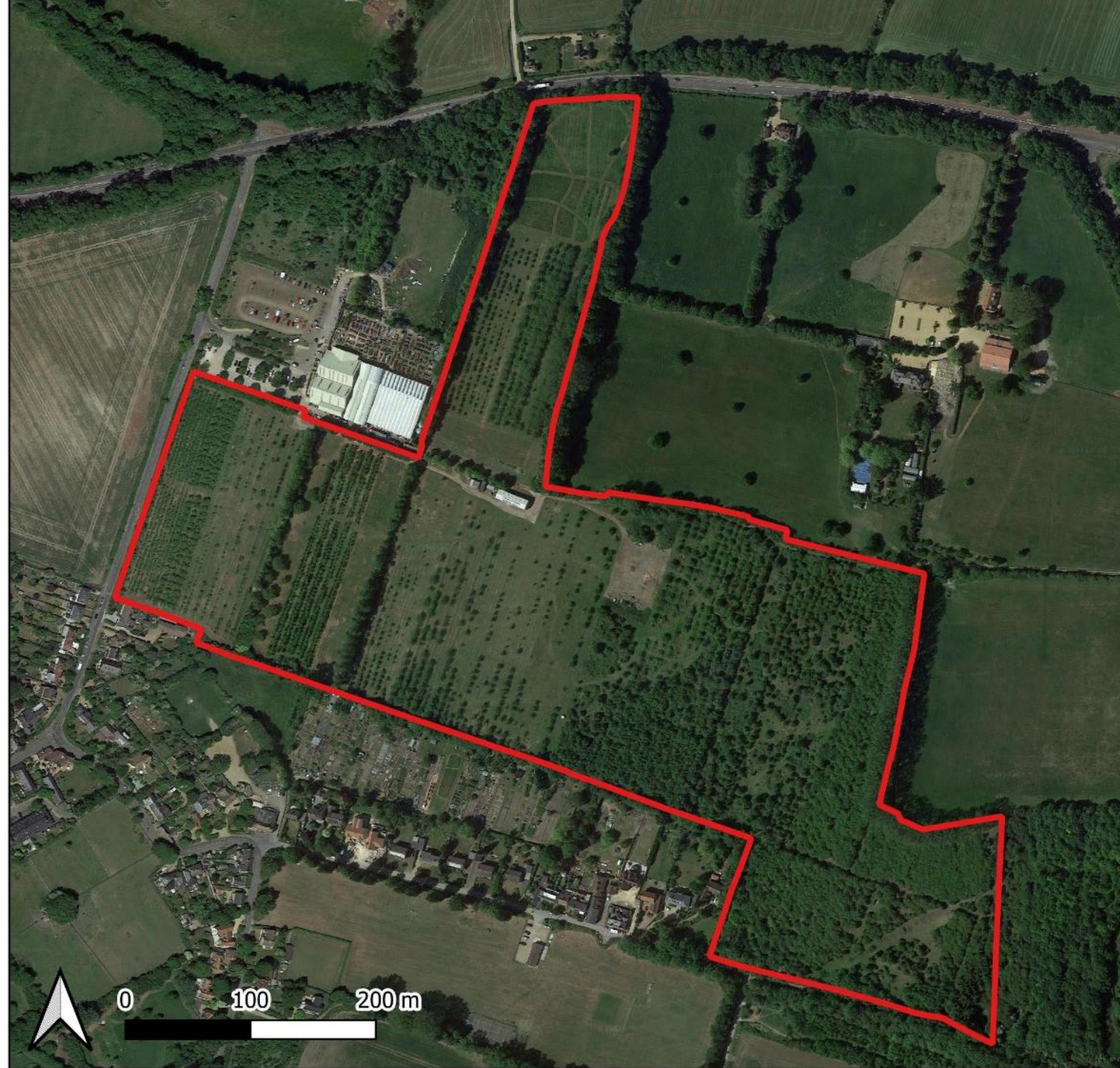
OVERVIEW OF KEY TOPICS RAISED BY NATURAL ENGLAND

- COTON ORCHARD CWS TO BE ACKNOWLEDGED
- ROBUSTNESS OF HRA, REQUEST FOR FURTHER SURVEYS - FORAGING & COTON ORCHARD
- COLLISION RISK
- CROSSING POINT MITIGATION - LANDSCAPE TREATMENTS
- LIGHTING

NATURAL ENGLANDS REQUEST FOR COTON ORCHARD CWS TO BE ACKNOWLEDGED

- *Coton Orchard has recently been designated as a County Wildlife Site (CWS) the map in Figure 5.2 of Appendix A of the Technical Report 5 – Ecology [C2C-11-TR05-00] should be updated.*

COTON ORCHARD CWS



ISSUE	NATURAL ENGLAND'S POSITION	APPLICANTS POSITION	STATUS
1. Coton Orchard CWS	Coton Orchard has recently been designated as a County Wildlife Site (CWS) the map in Figure 5.2 of Appendix A of the Technical Report 5 – Ecology [C2C-11-TR05-00] should be updated.	The designation of the CWS is acknowledged and it is confirmed that this designation does not alter the assessment of effects on the barbastelle and extant bat population. [link back to HRA Coton comments]	AGREED

NATURAL ENGLANDS REQUEST FOR EVIDENCE TO SUPPORT LOSS OF FORAGING HABITAT AS NO ADVERSE EFFECT ON INTEGRITY OF THE SAC

- *‘Insufficient evidence providing certainty that there will be no adverse effects on the integrity of the Eversden and Wimpole Woods SAC and to support the statement made within the HRA, which states: ‘the loss of these foraging areas are highly unlikely to have a significant effect on Barbastelle Bats given the availability of habitat in the wider landscape’.*

NATURAL ENGLANDS REQUEST FOR EVIDENCE TO SUPPORT LOSS OF FORAGING HABITAT AS NO ADVERSE EFFECT ON INTEGRITY OF THE SAC

We can provide signposting and supplementary information around:

- i. Habitat availability in the wider area (20km/10km Risk Zone)
- ii. Pre-construction and post-construction barbastelle foraging habitat
- iii. Habitat usage relative to the scheme area Detailing Core Foraging areas - covered by EWR radiotracking data,
- i. Static data, activity and Crossing Point data across the scheme covering Spring, Summer, Autumn and Winter



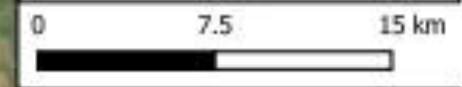
Legend:

- Scheme Boundary
- 10km Buffer
- 15km Buffer
- 20km Buffer
- 30km Buffer
- Special Areas of Conservation
- Special Protection Areas
- Ramsar Sites



FOR INFORMATION ONLY

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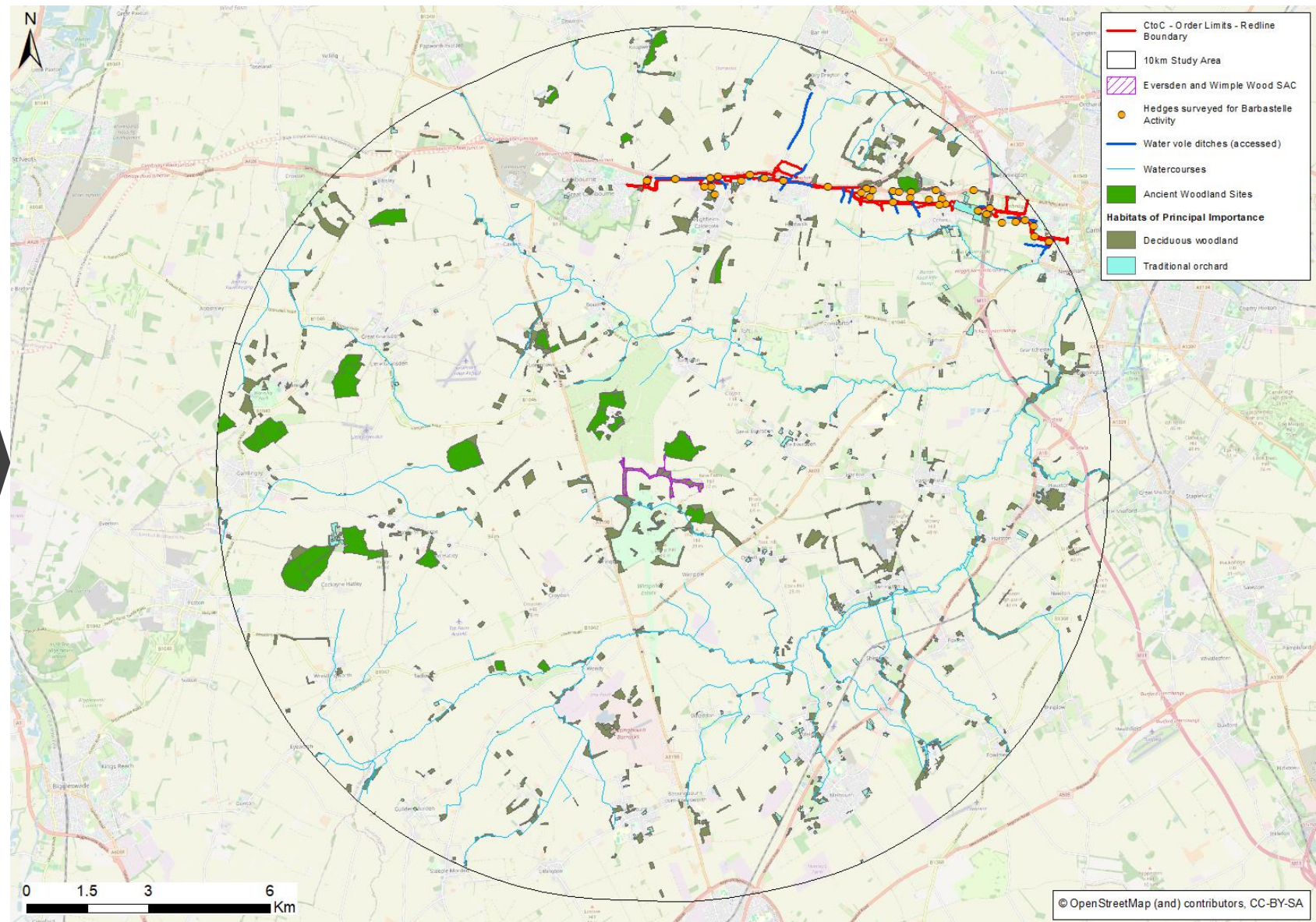


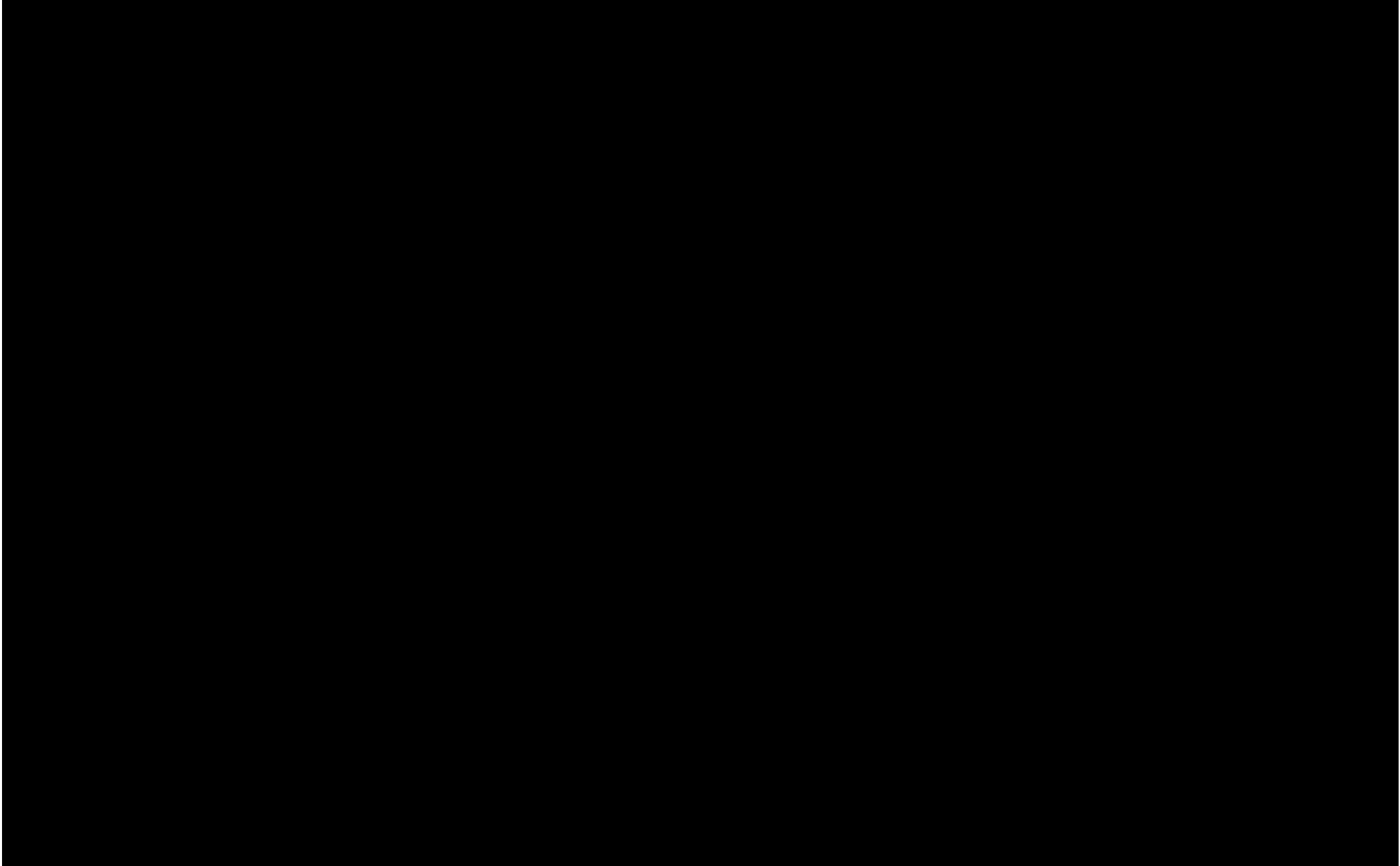
CLIENT:
Greater Cambridge Partnership

PROJECT:
Cambourne to Cambridge

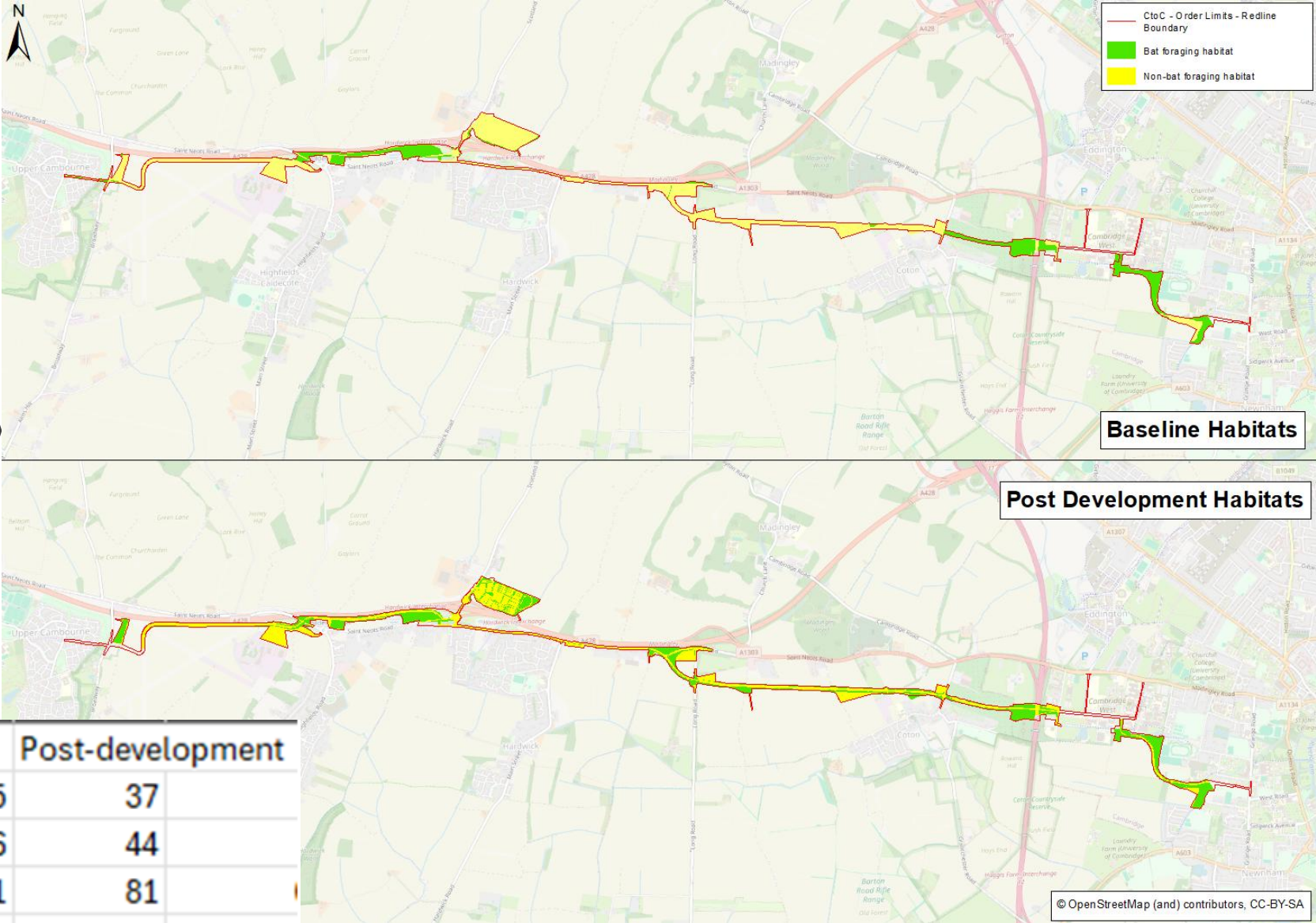
Figure 1: Map of Internationally Designated Sites

10km Impact risk Zone For Eversden and Wimpole SAC





BARBASTELLE HABITAT ASSESSMENT



	Baseline	Post-development
Bat Foraging Habitat	25	37
Non-bat Foraging Habitat	56	44
	81	81

ISSUE	NATURAL ENGLAND'S POSITION	APPLICANTS POSITION	STATUS
2.	<p>Insufficient evidence providing certainty that there will be no adverse effects on the integrity of the Eversden and Wimpole Woods SAC and to support the statement made within the HRA, which states: <i>'the loss of these foraging areas are highly unlikely to have a significant effect on Barbastelle Bats given the availability of habitat in the wider landscape'</i>. Resulting in a further survey request for foraging and availability of habitat.</p>	<p>Robust evidence of foraging habitat available:</p> <ul style="list-style-type: none"> • within 20km & 10km of Eversden and Wimpole Bat SAC. • pre and post construction barbastelle foraging availability. <p>Shows there will be no net loss of bat foraging habitat as a result of the Scheme. In addition, there is wider existing habitat available within and beyond the scheme that is fully accessible to maintain the favourable conservation status of the bat population.</p>	TO BE DISCUSSED

NATURAL ENGLANDS REQUEST FOR FURTHER FORAGING SURVEYS, PREY & COTON ORCHARD

- *The submitted Bat Activity Report [TR5.5] does not give enough consideration to foraging habitat, and the potentially most valuable foraging habitat impacted by the scheme (Coton Orchard) was not surveyed.'*
- *The potential impact of the scheme on ... micromoths should therefore be taken into account in order to assess potential impacts on barbastelles. An analysis of the larval and foodplants of the moths should be undertaken,*

Plate 4- Bare ground with moss and ruderal species.



Plate 5 – Scattered scrub and scattered trees



Plate 2 – Other neutral grassland with scattered scrub and traditional orchard

THIS DRAWING MAY BE USED ONLY FOR THE PURPOSES INTENDED AND ONLY WRITTEN DIMENSIONS SHALL BE USED

Legend

- Site
- Bare ground - g3c 73
- Other broadleaved woodland - w1g
- Other broadleaved woodland with traditional orchard - w1g 21
- Other neutral grassland, mown - g3c 64
- Other neutral grassland with scattered scrub and traditional orchard - g3c 10 21
- Other neutral grassland, mown with traditional orchard - g3c 64 21
- Hawthorn scrub - h3f
- Other neutral grassland with scattered scrub and trees - g3c 10 11
- Hedgerows
- Line of trees
- Target Nodes

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Revision Details	No.	Date	By

Drawing Status

FINAL

Job Title

Cambourne to Cambridge

Drawing Title

Coton Orchard UKHab

Scale at A1

1:1,500

Drawn: UKC/P2001

Page 1 of 1

Map of 100m

Map of 100m

Map of 100m

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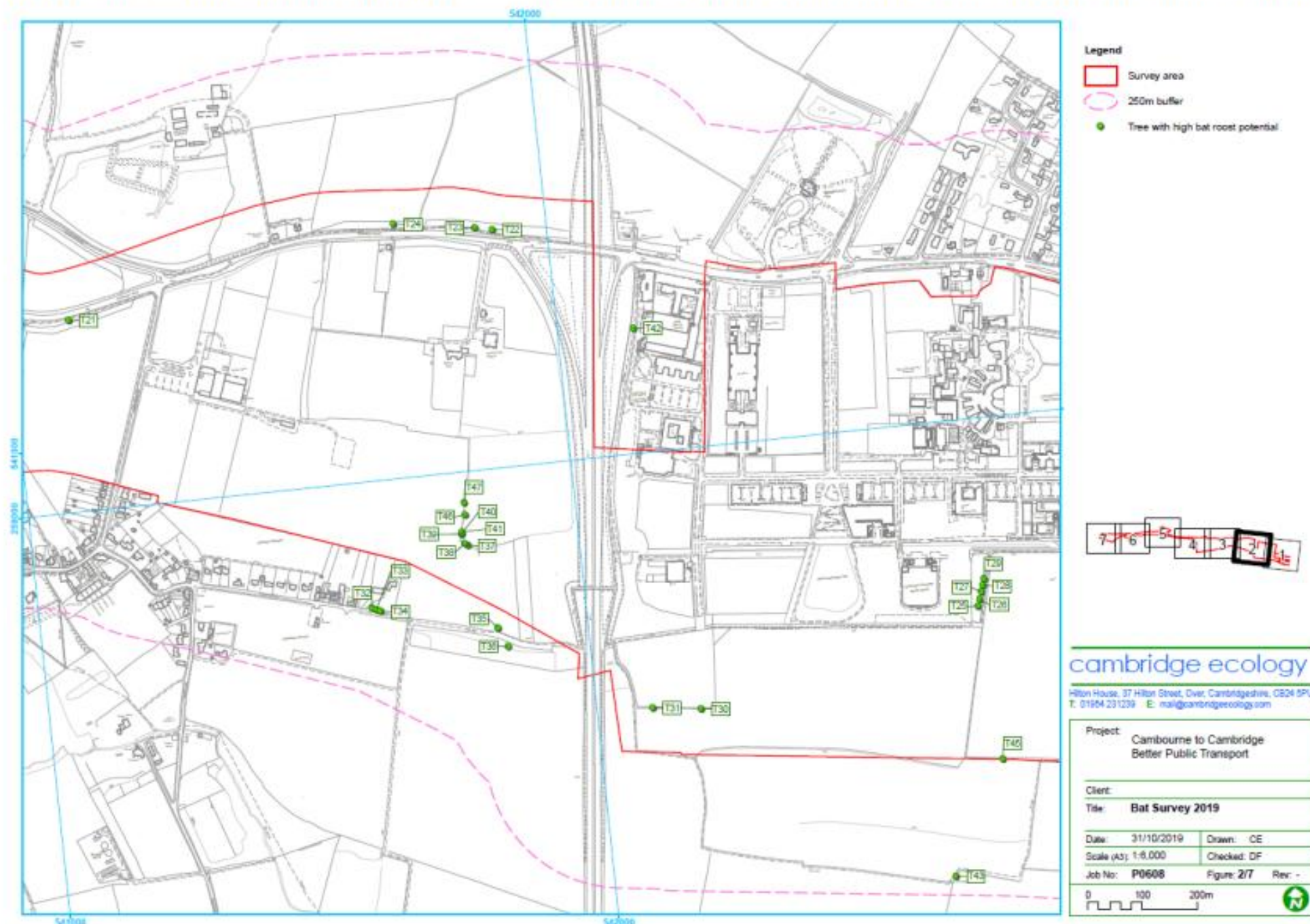


Crossing Point Surveys within and adjacent Coton Orchard CWS



Bat Activity at Coton Orchard CWS Crossing Point Locations

Crossing Point Location	Surveys Completed	Barbs recorded?	No. Barbs passes	Species	Date	Commuting Bats	Using features	Flights Heights	Barb Notes
CP2	2	No	0	Ppip, Ppyg, Nnoc, Nyc, Myo	21/07/2022	30	4	No note	None
					04/08/2022	7	1	No note	
CP3	2	Yes	3	Barb, Ppip,Ppyg, Nnoc	26/07/2022	11	0	2m (Nn), 1m (Nn)	One recording was of two Barbastelle foraging near to the hedgerow and over the orchard trees (one later flying south and one flying west), at a height of 2-4m. An additional Barbastelle was recorded flying up and down the field adjacent to the hedgerow foraging 4m or above but was not considered to be using the crossing point feature or commuting.
			2		04/08/2022	8	3	10m, 3-4m, >4m and 2-7m	Seven HnS barb passes. A further two Barbastelle passes were recorded foraging but not utilising the hedgerow, and one Barbastelle was observed foraging near the hedgerow at a minimum height of 4m
CP4	2	Yes	3	Barb, Ppip, Ppyg, Nnoc	26/07/022	32	1	5m	Three Barbastelle were also recorded heard and not seen
			0		08/08/2022	16	1	6m	None
CP13	3	No	0	Ppip, Ppyg,	21/07/2022	5	1	N/A	None
					08/08/2022	10	3	2m	
					23/08/2022	7	3	2m	



ISSUE	NATURAL ENGLAND'S POSITION	APPLICANTS POSITION	STATUS
3.	<p data-bbox="366 404 1006 1061">'The submitted Bat Activity Report [TR5.5] does not give enough consideration to foraging habitat, and the potentially most valuable foraging habitat impacted by the scheme (Coton Orchard) was not surveyed. This topic is expanded upon in parts 4 and 5, below.'</p> <p data-bbox="366 1182 1006 1346">Resulting in a further survey request for foraging and availability of habitat.</p>	<p data-bbox="1087 404 2145 1132">The activity surveys (static, crossing point and emergence) at Coton Orchard and radiotracking surveys, together with the UK Habitat Condition assessment shows that although the Orchard may support very low numbers of barbastelle bats, it is outside of the most valuable Core foraging areas and home ranges of the Eversden and Wimpole, Madingley or Hardwick barbastelle bat populations. Based upon the evidence, we do not agree that Coton Orchard is the most valuable foraging habitat impacted by the scheme.</p> <p data-bbox="1087 1203 2145 1360">We also consider we have sufficient survey information and do not propose to carry out further surveys in Coton or for foraging.</p>	<p data-bbox="2237 404 2466 496">TO BE DISCUSSED</p> <p data-bbox="2211 1103 2479 1260">Appendix 3.2 Page 23 of 32</p>

MOTH LARVAL FOOD PLANT ANALYSIS

Species	Family	Larval Food Plant Associations
<i>Argyresthia pruniella</i>	Argyresthiidae	Prunus avium
<i>Oegoconia deauratella</i>	Autostichidae	Asteraceae, Plantae
<i>Blastobasis adustella</i>	Blastobasidae	Plantae
<i>Blastobasis lacticolella</i>	Blastobasidae	
<i>Coleophora alcyonipennella</i>	Coleophoridae	Trifolium
<i>Acentria ephemerella</i>	Crambidae	Elodea canadensis
<i>Agriphila tristella</i>	Crambidae	Poaceae
<i>Chrysoteuchia culmella</i>	Crambidae	Poaceae
<i>Crambus perlella</i>	Crambidae	Poaceae
<i>Parapoynx stratiotata</i>	Crambidae	Elodea canadensis
<i>Pediasia contaminella</i>	Crambidae	Festuca ovina
<i>Pyrausta aurata</i>	Crambidae	Lamiaceae
<i>Agonopterix alstromeriana</i>	Depressariidae	Genista, Ulex
<i>Citix glaucata</i>	Drepanidae	Crataegus monogyna, Prunus spinosa
<i>Eilema complana</i>	Erebidae	Algae, Ascomycota
<i>Eilema griseola</i>	Erebidae	Ascomycota, Fagales
<i>Leucoma salicis</i>	Erebidae	Populus, Salix
<i>Lymantria monacha</i>	Erebidae	Quercus
<i>Phragmatobia fuliginosa</i>	Erebidae	Asteraceae

Species	Family	Larval Food Plant Associations
<i>Argyresthia pruniella</i>	Argyresthiidae	Prunus avium
<i>Oegoconia deauratella</i>	Autostichidae	Asteraceae, Plantae
<i>Blastobasis adustella</i>	Blastobasidae	Plantae
<i>Blastobasis lacticolella</i>	Blastobasidae	
<i>Coleophora alcyonipennella</i>	Coleophoridae	Trifolium
<i>Acentria ephemerella</i>	Crambidae	Elodea canadensis
<i>Agriphila tristella</i>	Crambidae	Poaceae
<i>Chrysoteuchia culmella</i>	Crambidae	Poaceae
<i>Crambus perlella</i>	Crambidae	Poaceae
<i>Parapoynx stratiotata</i>	Crambidae	Elodea canadensis
<i>Pediasia contaminella</i>	Crambidae	Festuca ovina
<i>Pyrausta aurata</i>	Crambidae	Lamiaceae
<i>Agonopterix alstromeriana</i>	Depressariidae	Genista, Ulex
<i>Citix glaucata</i>	Drepanidae	Crataegus monogyna, Prunus spinosa
<i>Eilema complana</i>	Erebidae	Algae, Ascomycota
<i>Eilema griseola</i>	Erebidae	Ascomycota, Fagales
<i>Leucoma salicis</i>	Erebidae	Populus, Salix
<i>Lymantria monacha</i>	Erebidae	Quercus
<i>Phragmatobia fuliginosa</i>	Erebidae	Asteraceae

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Moths consumed by the barbastelle *Barbastella barbastellus* require larval host plants that occur within the bat's foraging habitats

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Loss of foraging habitat and reductions in insect prey are key factors responsible for declines in bat populations. Identifying important bat foraging habitats and the ecological requirements and conservation status of prey provides evidence for appropriately targeted conservation interventions. We examined the foraging habits of the barbastelle, *Barbastella barbastellus*, at the

ISSUE	Natural England's Position	APPLICANTS POSITION	STATUS
4.	<p><i>The potential impact of the scheme on ... micromoths should therefore be taken into account in order to assess potential impacts on barbastelles. An analysis of the larval and foodplants of the moths should be undertaken,associated habitats should be included in mitigation plans (preferably within the vicinity of the orchard, and/or near commuting routes between Madingley Wood and the orchard) to increase micromoth numbers.</i></p>	<p>We have undertaken further moth larval food plant analysis from the results of the moth survey completed in Coton Orchard.</p> <p>Scientific research papers on barbastelle diet studies have determined which moths are most important to barbastelle and we will include these moth larval foodplants into the Landscaping specification within the Scheme footprint away from collision risk areas.</p>	<p>TO BE DISCUSSED</p>

NATURAL ENGLANDS POSITION ON CROSSING POINT MITIGATION AND LANDSCAPE TREATMENT

- Natural England state' *We strongly advise that 20m is much too wide for an effective crossing point, and request that the exact specifications and width of each crossing point be provided at this stage within a definitive plan. The gap between canopies should not be any wider than a standard two-lane road, preferably less – we believe this would be narrower than 7m, depending on the bus width. '*

GCPS RESPONSE ON CROSSING POINT MITIGATION AND LANDSCAPE TREATMENT

Current Actions:

- Bringing forward the Detailed Design at each of the crossing point locations
- Complying with standard mitigation guidelines
- To be discussed further in future meetings

NATURAL ENGLANDS POSITION ON LIGHTING

- For the provision and approval of detailed lighting plans and strategies for both the construction and operation phases of the CtoC Scheme. To detail:
 - pre-construction lux levels in areas of ecological sensitivity; and
 - modelled lux level changes for the subsequent phases.
- A review of the lighting mitigation measures included for the CtoC Scheme.
- For the provision of the Ecology Site Management Plan, including a review of mechanisms of provision of mitigation measures.

GCPS RESPONSE TO LIGHTING

Current Actions:

- Review and provision of figure to confirm to NE where the areas of ecological sensitivity are
- Assess lux levels at each location
- To be discussed further in future meetings

CONCLUSION

COTON ORCHARD CWS –

We acknowledge and agree on the Coton Orchard CWS

REQUIREMENT FOR FURTHER SURVEY –

Based upon the supplementary evidence and surveys from within Coton Orchard and the surrounding area including

- i. Habitat availability in the wider area (10km Risk Zone)
- ii. Pre-construction and post-construction barbastelle foraging habitat
- iii. Habitat usage relative to the scheme area Detailing Core Foraging areas - covered by EWR radiotracking data,
- iv. Static data, activity surveys (Crossing Point and emergence data) across the scheme across Spring, Summer, Autumn and Winter

We believe we have sufficient surveys on foraging areas to inform our HRA and do not propose to undertake further surveys

COLLISION RISK/ LANDSCAPE TREATMENTS / LIGHTING TO BE DISCUSSED AT FUTURE MEETINGS

- i. Bringing forward the Detailed Design at each of the crossing point locations
- ii. Bringing forward the pre- construction, construction and post construction lighting plans to include mitigation

PROPOSED DATES FOR FURTHER NE MEETINGS

- COLLISION RISK/ LANDSCAPE TREATMENTS – W/C 12th MAY
- LIGHTING – W/C 23rd JUNE
- OUTSTANDING MATTERS – 4th AUGUST



AOB / Questions

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1.0 INTRODUCTION

- 1.1.1 This Technical Note is part of the ongoing liaison with Natural England regarding the Cambourne to Cambridge Scheme (hereinafter referred to as the 'Scheme'). WSP submitted a Technical Note [CD25-41] to Natural England on 08/04/2022 detailing the proposed bat survey methodology and approach through the Discretionary Advice Service (DAS). This Note referenced an agreement with EWR on the sharing of radio-tracking data to identify foraging areas. In the DAS response received from Natural England (DAS 14298_391617) in July 2022 [CD25-42]), it was stated '*Natural England has no objection to the proposed approach to barbastelle bat survey and data gathering set out in [your] Technical Note [CD-41].*'
- 1.1.2 In January 2025, Natural England responded with a detailed representation [CD2-REP-11]. This considered the HRA was not sufficiently robust on the basis there were insufficient surveys of barbastelle bat foraging areas. However, importantly, this representation did not take into account the EWR data-sharing agreement that had been explained and accepted in the earlier DAS (as set out above), which provided home ranges and core foraging areas of the Madingley SSSI, Hardwick SSSI, Waresley and Gransden SSSI barbastelle colonies.
- 1.1.3 A meeting was held with Natural England on 02 April 2025 (the 'April Meeting'). The meeting was one of a series discussing Natural England's representations regarding the Scheme. The April meeting discussed Natural England's comments regarding (amongst other items) survey effort. This Technical Note explains the iterative approach to survey effort undertaken since 2017 to support the conclusions drawn in the Environment Statement (ES) Technical Report 5: Ecological Impact Assessment [EclA; CD1-10.01] and Technical Report Appendix: Statement to Inform Habitats Regulations Assessment (HRA) [CD1-11.11 TR5.11].
- 1.1.4 As part of the April meeting, Natural England requested that historic data was reviewed and taken into account when developing mitigation measures across the Scheme with particular attention given to Coton Orchard. The approach to assigning mitigation measures already took into account historic data but it is acknowledged there some of the background information on how this historic survey information was used had not been made available. This report therefore provides narrative on the methodology and chronology of bat activity surveys generally.
- 1.1.5 This Technical Note supplements the existing ES/HRA for which the overall conclusion of no residual impacts remains unchanged. It is therefore not proposed to republish these documents but provide background understanding where information is considered to be lacking.

2.0 SUMMARY OF DATA COLLECTED FOR THE SCHEME

2.1 Reports relevant to the Scheme

- 2.1.1 A wide range of bat surveys were completed by Cambridge Ecology on behalf of Mott MacDonald between 2017 and 2021 (prior to WSP's involvement). Surveys included:

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- Cambourne to Cambridge Better Public Transport: Stage 1 Bat Inspection Survey 2017-18. Final Report (Cambridge Ecology, 2018) [CD25-51]
- Cambourne to Cambridge Better Public Transport: Stage 1 Bat Inspection Survey 2018-19. Final Report (Cambridge Ecology, 2020) [CD25-52]
- Cambourne to Cambridge Better Public Transport: Stage 1 Bat Inspection Survey and Preliminary Bat Roost Assessment (Cambridge Ecology, 2021) [CD25-37]
- Cambourne to Cambridge Better Public Transport: Stage 2 Bat Activity Survey Report 2019-20 (Cambridge Ecology, 2020) [CD25-39]
- Cambourne to Cambridge Better Public Transport: Stage 2 Bat Activity Surveys 2021 (Cambridge Ecology, 2021) [CD25-38]
- Bat Transect and Crossing Point Surveys Cambourne to Cambridge (C2C) Additional Bat Surveys (Thomson Environmental Consultants, 2021) [CD25-36]

Survey Design and Approach

- 2.1.2 A gap analysis undertaken by WSP in 2021 identified the requirement for further surveys to resolve limitations relating to access, data validity, scope and methodology. A suite of surveys was undertaken by WSP from 2021/2022 to meet current standard methodologies allowing comparability of data spatially and across the seasons. These included:
- Hibernation assessments
 - Stage 1: Preliminary Bat Roost Assessments
 - Stage 2: Aerial Tree Inspections and Emergence/Re-entry Surveys
 - Automated/Static Detector Surveys (carried out across all the Seasons in as many accessible areas as possible).
 - Crossing-point (CP) Surveys
- 2.1.3 In parallel, Advanced Licence Bat Survey Techniques (ALBSTs) were completed by EWR in the post-maternity (August) and dispersal seasons (September) in 2022 [CD25-53]. This built upon ALBST surveys completed in the Eversden and Wimpole Special Area of Conservation (SAC) completed in 2021 [CD25-54] These included radio-tracking bats across eight woodlands surrounding the SAC; the SAC itself having been surveyed the previous year.
- 2.1.4 Whilst methodologies were set out in the ES [CD1-10.01], this technical note sets out to explain the iterative approach to survey design (in line with BCT survey guidance), thereby providing a comprehensive baseline on which to undertake an impact assessment.
- 2.1.5 The types and dates of different surveys undertaken is set out in full in Table 1. While there were localised access restrictions (e.g. within Coton Orchard in some years, including the current year), these did not apply across all periods when baseline data was being collected.



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- 2.1.6 As a whole, we believe that the whole data set, including the wide-ranging EWR and other publicly-available radio-tracking studies, is a sufficient baseline on which to undertake an impact assessment and to determine the location, extent and design of mitigation.



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Table 1: Survey and Assessment Data Summary

Survey / Assessment	Consultancy Responsible	Area Description	Months and years	Core Document Reference
Bat Roost Assessment of tree* and structural suitability assessment	Cambridge Ecology	2017-18 Survey area included Scheme red Line boundary between Grange Road and Bourn Airfield entrance, plus potential Travel hubs at Scotland Road and Madingley Mulch) with a 50m buffer beyond the Scheme boundary [Figure 1.1- CD25-51].	November 2017 and January 2018	CD25-51
Bat Roost Assessment of trees* and bridge (over Bin Brook) * Trees were not categorised as high moderate or high, but either has suitable bat features or not	Cambridge Ecology	2018-19 survey area included Scheme red line boundary between Grange Road and Bourn Airfield entrance, plus potential Travel hubs at Scotland Road and Madingley Mulch) with a 250m buffer [Figure 1.1- CD25-52].	December 2018 and February 2019	CD25-52
Bat Roost Assessment of the trees and structures (namely the bridge over Bin Brook)	Cambridge Ecology	2021 survey area comprised the proposed red route, plus an 80m buffer zone either side of the route. The route was located between Grange Road, Cambridge at the eastern end, and the entrance to eastern end of Cambourne off Broadway at the western end [Figure 1.1- CD25-37].	March 2021	CD25-37
Dusk emergence and dawn re-entry surveys of trees (structures scoped out)	Cambridge Ecology	2019 survey area comprised the red line boundary plus a buffer zone up to 250m beyond the red line boundary [see Figure 1.1- CD25-39]. All trees classified as having suitability were subject to entry/re-entry in line with the ‘High’ suitability classification within the 2016 Bat Conservation Trust (BCT) good practice guidelines ¹	June – August 2019	CD25-39
Dusk emergence and dawn re-entry surveys of trees and a single building	Cambridge Ecology	2021 survey area comprised the proposed red route, plus an 80m buffer zone either side of the route. The route was located between Grange Road, Cambridge at the eastern end, the entrance to eastern end of Cambourne off Broadway at the western end [Figure 1.1-CD25-38]. Update emergence -re-entry results of work carried out in 2019-2020. Plus emergence/re-entry surveys of one new Tree T51; 17 other trees; and one building (Gate House).	May – July 2021	CD25-38
Bat Activity Surveys	Cambridge Ecology	Survey area included Scheme red Line boundary between Grange Road and Bourn Airfield entrance, plus potential Travel hubs at Scotland Road and Madingley Mulch) with a 250m buffer [Figure 1.1- CD25-39]	Static detectors on linear features: June – August 2019 July – September 2019	CD25-39

¹ Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London



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Survey / Assessment	Consultancy Responsible	Area Description	Months and years	Core Document Reference
			September and October 2019 April – June 2020.	
Walked Transect Surveys (six)	Thompson Ecological Consultants	Selected locations within the Site, shown on Figure 1 and Figure 2 [CD25-36]	May to October 2021	CD25-36
CP (CP) Surveys (10)	Thompson Ecological Consultants	A total of six transects were identified along the corridor scheme which focus on habitat within 250m of the scheme alignment which are shown on Figure 1 and Figure 3 [CD25-36].	May to October 2021	CD25-36
Desk Study	WSP	A desk-based assessment Study Area of biological records for designated sites and protected and notable species within a 2km buffer of the Scheme boundary. The search for internationally designated sites for bats, specifically barbastelle was up to 30km from the Scheme boundary.	March 2022	CD1-11.05 TR5.05
CP / DEFRA Local Scale & Winter Automated Detector	WSP	The Scheme boundary and connected habitats at risk of severance from the Scheme.	May to September 2022 – CP November 2021 and April 2022 – Winter Automated Detector	CD1-11.05 TR5.05
Summer Automated Detector	WSP	The Scheme boundary and connected habitats at risk of severance from the Scheme	April to October 2022	CD1-11.05 TR5.05
Winter Survey Area for the GLTA and tree hibernation surveys	WSP	A 50m buffer of the centre line of the Scheme and within 120m of proposed illuminated junctions.	November 2021 and May 2022, with the majority of trees being surveyed within the optimal period for GLTA November to April, Inclusive	CD1-11.05 TR5.06
Tree aerial inspections and dusk emergence and dawn re-entry surveys	WSP	A 30m buffer around the Scheme, excluding the Proposed Bourn Airfield housing development [exceptions as detailed within CD1-11.05 TR5.06].	May to September 2022- Aerial June to September 2022 – dusk/dawn	CD1-11.05 TR5.06
Structure Hibernation Assessments	WSP	A 500m buffer of the centre line of the Scheme.	January to March 2022	CD1-11.05 TR5.06



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Survey / Assessment	Consultancy Responsible	Area Description	Months and years	Core Document Reference
Summer Structure Assessment	WSP	A 30m buffer of the Scheme boundary [exceptions as detailed within CD1-11.05 TR5.06].	05 May 2022	CD1-11.05 TR5.06
EWR Radio-tracking ²	EWR	<p>Trapping - Eversden and Wimpole Woods SAC, Hayley Wood SSSI & Waresley and Gransden Wood approximately 6km south of the Scheme</p> <p>Trapping - Waresley and Gransden Wood (c.7.7km SW), Elsworth Wood Site of Special Scientific Interest (SSSI) (c.2.9km NW), Kingston Wood SSSI (c.4.7km S), Knapwell Wood (c.1km N), Hardwick Wood SSSI (c.1.7km S), Madingley Hall (669m N), Madingley Wood SSSI (c.250m N) and Hauxton Wood (c.6.5km S).</p> <p>Trapping and Tracking - approximately 35km east to west and 25 km north and south, covering the available EWR options.</p>	<p>2023</p> <p>August and September 2022</p>	<p>Desk study summary provided within: CD1-11.05 and CD1-11.05 TR5.11</p> <p>Fully reported in: CD25-53 and CD25-54</p>
Radio-tracking Surveys	Reviewed by WSP	Bourne Airfield (BA) - Bucket Hill Plantation, approximately 700m south of the Scheme	<p>BA – Trapping only July, August, September 2015</p> <p>BA – Trapping and tracking – May, August, September 2016</p>	Desk study summary provided within: CD1-11.05 and CD1-11.05 TR5.11
Static Detector Surveys	WSP	<p>Static detector surveys at St Neots Roundabout within c150m of the bus route junction.</p> <p>Static detectors were placed at various locations including a lit roundabout and surrounding hedgerows north of Bourne Airfield to help develop a understand bat flight movements in a lit environment. Lux level readings also taken in the vicinity.</p> <p>2 statics south of Coton Orchard in woodland area and 1 on Scotland Road to top up missing data.</p>	May, June July 2025.	To be issued
CP Surveys	WSP	Existing roads (A1303 and A428) using thermal imaging software to track the flight of barbastelle bats crossing gaps of between 5m, 28m and 50m within core foraging areas.	June and July 2025	To be issued

² Further surveys are ongoing at the time of writing, for which a data-sharing agreement is in place (covered by a Non-disclosure Agreement. Some elements are therefore redacted from public information.

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2.2 Roost surveys

2.2.1 Bat roost surveys included ground-level tree assessments (GLTA), bat hibernation surveys (trees and structures) and summer aerial inspections and emergence re-entry surveys.

Trees

2.2.2 The following surveys were completed to good practice guidelines¹ available at the time:

- In 2017 and 2021, Cambridge Ecology undertook preliminary bat roost assessments of trees and structures within specified buffers detailed within **Table 1**. Subsequent dusk emergence and dawn re-entry surveys of trees were carried out to characterise bat roosts where necessary.
- In November 2021 to May 2022 WSP undertook GLTAs on all trees 30m buffer around the Scheme, excluding the Proposed Bourn Airfield housing development.
- In January to March 2022, trees with moderate or high suitability for roosting bats were subject to hibernation surveys either by tree-climbing or ladder inspections within 50m buffer of the centre line of the Scheme and within 120m of proposed illuminated junctions. Where appropriate, the bat suitability of the trees were reclassified.
- In May to September 2022, trees that remained categorised as moderate or high suitability for roosting bats were subject to aerial inspection surveys or dusk emergence/dawn re-entry surveys.

2.2.3 The summer tree survey area was refined from the winter survey area to a 30m buffer around the Scheme, excluding the Proposed Bourn Airfield housing development. All trees within the Summer Survey Area were surveyed for potential loss of roost through tree removal, as well as disturbance through noise and lighting impacts during construction and operation, with the following exceptions:

- Trees that had been previously surveyed 2021 by Cambridge Ecology.
- Trees where existing landscape features (such as tall hedgerows and tree lines) will provide a buffer from potential impacts.
- Trees that were already likely subjected to existing high levels of noise and lighting disturbance through existing infrastructure (such as the A428 and existing street lighting).
- Trees within the proposed Bourn Airfield housing development were surveyed by Thomson Ecology.
- Negligible and low suitability trees. Low suitability trees have been recorded on a plan and will be considered as part of the bat mitigation strategy for the Scheme.

Structures

2.2.4 The surveys of structures were completed to good practice¹ available at the time. In 2017 and 2021, Cambridge Ecology undertook preliminary bat roost assessments of buildings within

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specified buffers detailed within **Table 1**. Subsequent dusk emergence and dawn re-entry surveys of trees were carried out to characterise bat roosts, where necessary.

- 2.2.5 In May 2022, WSP undertook a pre-works desk study prior to survey identifying buildings that would be indirectly affected by the Scheme, as it was anticipated that no buildings would be destroyed.
- 2.2.6 External inspections were undertaken of all structures within 30m of the Scheme boundary, with the following exceptions:
- Structures where existing landscape features (such as tall hedgerows and tree lines) will provide a buffer from potential impacts.
 - Structures adjacent to the proposed route where the buses will run online using existing road networks (such as St. Neots Road and within the Cambridge University campus) as such are already subject to impacts from the existing road network.
 - Structures within the proposed Bourn Airfield housing development site that will be surveyed by Thomson Ecology as part of their suite of ongoing surveys.
- 2.2.7 WSP undertook a review of aerial base-mapping and ordnance survey mapping to identifying structures with potential to support hibernation roosts within a 500m buffer of the centre line of the Scheme. The exterior of the identified structures were subject to a single survey visit, undertaken between January and March 2022.

2.3 Activity surveys

Automated/Static Detector Surveys

- 2.3.1 Bat activity surveys (using static detectors) were completed in accordance with Good Practice Guidelines¹, identifying bat species/species groups activity both spatially and temporally over the following sessions:
- In 2019 and 2020 Cambridge Ecology surveyed hedgerows across the Scheme over three active seasons Spring, Summer and Autumn.
 - In winter 2021-2022, 26 locations were surveyed for five nights each month between November and April to understand winter movements across the Scheme where these had not previously been completed.
 - In 2021-2022 WSP targeted surveys at ten locations for five nights each month. These surveys were completed between May and October, as per Good Practice Guidelines¹ of those areas ^{not} previously surveyed.

CP Surveys

- 2.3.2 To identify important corridors for commuting bats, two stages of CP surveys were completed as follows:

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Stage 1

- 2.3.3 In 2021, Thomson Environmental Consultants completed a series of six activity transects across the scheme, and eight CP surveys at linear feature locations within the Scheme boundary (Locations 1, 2, 5, 6, 7, 8, 9, 10). Survey locations were selected on the basis of Cambridge Ecology static data in 2019 and 2020: wherever a threshold of 50 barbastelle passes was recorded, to include hedgerows with peak barbastelle registrations in the dataset³. A total of four survey visits per location were completed; of these, two surveys were in June 2021, and two surveys were between September and October 2021.
- 2.3.4 To overcome the limitations of the Thomson data, WSP built upon this data set in 2022, and undertook a further two surveys at each of the Stage 1 CP locations to bring the total repeat surveys up to six as standard. Surveys were completed between July and August (which was previously missed) to ensure a full coverage of the bat activity period (particularly post-maternity dispersal flight period).
- 2.3.5 Furthermore, an additional survey was completed at three of the locations to compensate for the survey completed in October (which was outside of the core season, in accordance with best practice). This was completed between May to September.

Stage 2

- 2.3.6 None of the surveys completed in Phase 1 were repeated in Stage 2.
- 2.3.7 In 2022, WSP undertook a review of existing survey data and aerial imagery and identified a further 15 linear features severed by the Scheme that were not covered in the Stage 1 CP surveys.
- 2.3.8 Two scoping surveys were carried at each new location, whereby a threshold of ten common bat species registrations, or a single barbastelle registration, associated with the linear feature triggered the full six survey visits. To take account of the proximity of Madingley Wood SSSI maternity colony, and to ensure we held data throughout the maternity period, a full suite of six surveys were anticipated to be completed at seven locations within the Core Sustenance Zone (CSZ) for juvenile barbastelle⁴. The exception was where the data collected from the initial surveys was so low that there was no justification to complete the full suite anticipated.

Further Static-detector and CP Surveys

- 2.3.9 In 2025, in response to Natural England's concerns, further surveys are being undertaken during this summer. Further information was requested regarding barbastelle behaviour in its local context; specifically, to understand how barbastelle cross the existing road network. To inform this, a desk-study review of the EWR and Bourn Airfield radio-tracking data was completed. This

³ TE Hedgerow 19S (1169 registrations - not severed), not surveyed by WSP; WSP CP2 – TE Hedgerow 10 (161 registrations); WSP CP6 – TE Hedgerow 18 (110 registrations)

⁴ Taken as that defined in the Barbastelle Bats Exmoor and Quantocks Oak Woodlands Special Area of Conservation (SAC) Guidance on Development. Version 1.2 – April 2018.

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showed barbastelle bats were crossing existing roads with gaps of 28m and 50m within their home range/ core foraging areas.

2.3.10 To supplement this, additional CP surveys were undertaken between June and July 2025 using thermal-imaging cameras of these roads. Software has been applied to track and record the bats’ flight relative to the gap and associated vegetation. This information will be used to verify our understanding and aid detailed design, rather than to inform the impact assessment. These surveys are ongoing at the time of writing.

ADDITIONAL INFORMATION

3.0 ‘Early barbastelle’ Analyses

- 3.1.1 During the series of stakeholder meetings, Natural England requested additional information on the timing of barbastelle activity recorded. Further assessment of every barbastelle registration from WSP’s static detector surveys has been completed. The timings of all barbastelle registrations were assessed against sunset, to quantify early barbastelle movements and where these were located.
- 3.1.2 The first barbastelle registration recorded per static detector location per month was reviewed. From this assessment, the mean timing of the first barbastelle registration across all months and locations is 1 hours 47 minutes (1.79 hours) following sunset.
- 3.1.3 All barbastelle registrations recorded (not just the first call per location) was also assessed. Of all time-stamped barbastelle registrations, 80% were recorded more than 1.5 hours following sunset (see **Table 2**).

Table 2: Time of all barbastelle registrations

	Sunset to 1 hour	Over 1 hour to 1.5 hours	Over 1.5 hours to 2 hours	Over 2 hours to 3 hours	Over 3 hours to 4 hours	Over 4 hours to 6 hours	Closer to Sunrise
Count of Grouping	65	165	107	202	160	292	160
Minutes in period	60	30	30	60	60	120	n/a
Percentage of Total Registrations	5.6	14.3	9.3	17.6	14.00	25.4	13.9

3.1.4 A breakdown of the review of all barbastelle registrations is provided within **Table 3**. An early barbastelle registration was taken to be any registration within 1.5 hours following sunset, but a

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breakdown is given for 60 and 90 minutes, and all remaining registrations. At 60 minutes, it is dark or nearly so, dependent on the time of year and moon phase.

Table 3: Early barbastelle registrations

Static Detector No.	Location Description	Habitat type	Total barbastelle registrations		
			Sunset + 60 minutes	60-90 minutes	All remaining barbastelle registrations
1	On Bin Brook 1.6km east of M11, close to Cambridge	Watercourse	0	0	4
2	1.2km east of M11, close to Cambridge	Woodland edge	0	5	34
4	Woodland strip immediately adjacent to M11	Woodland edge	2	0	2
5	Eastern boundary of Coton Orchard CWS	Woodland edge	2	3	9
6	Hedgerow within Coton Orchard CWS	Field treeline	0	6	19
7	Hedgerow within Coton Orchard CWS	Field treeline	1	0	20
8	Western boundary Coton Orchard CWS	Roadside hedgerow	0	1	12
10	Hedgerow 298m south of Madingley	Field hedgerow	8	14	138
12	Hedgerow 1km west of Madingley, south of A428	Roadside hedgerow	7	21	22

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Static Detector No.	Location Description	Habitat type	Total barbastelle registrations		
			Sunset + 60 minutes	60-90 minutes	All remaining barbastelle registrations
13	Summer Location - Hedgerow on St Neot's Road, 1.14km west of Madingley	Roadside hedgerow	1	2	46
	Winter Location - Hedgerow 1.3km south west of Madingley	Field hedgerow	3	29	26
14	Field edge north of A428, 2.9km west of Madingley	Roadside Scrub	0	0	15
17	Roundabout north of Hardwick	Roadside scrub	1	0	2
18	Southern edge of A428, north of Bourn Airfield	Roadside Scrub	0	0	1
19	Tree group west of Bourne Airfield	Roadside treeline	6	4	14
21	Hedgerow 1.46km west of Madingley	Field treeline	11	38	384
22	Tree group south of A428- 2.2km west of Madingley	Field treeline	19	31	147
23	Hedgerow south of roundabout north of Hardwick	Field hedgerow	2	7	17
24	Flight path across A428 - Hardwick roundabout	Roadside treeline	2	4	3

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Static Detector No.	Location Description	Habitat type	Total barbastelle registrations		
			Sunset + 60 minutes	60-90 minutes	All remaining barbastelle registrations
27	County road north of A428, 2.9km west of Madingley	Roadside hedgerow	0	0	6

3.1.5 Thermal imagery CP surveys are being undertaken at locations where barbastelle have either previously been recorded crossing existing roads or at likely crossing locations. Early analysis of three of those surveys (completed on 23, 24 and 25 June along Madingley Road, south of Madingley Wood SSSI) have recorded barbastelle movements approximately 50 minutes following sunset. First barbastelle passes (prior to QA) are detailed below:

- 23 June – earliest barbastelle recorded was at 22:48, with sunset at 21:25
- 24 June – earliest barbastelle recorded was at 22:50, with sunset at 21:25
- 25 June – earliest barbastelle recorded was at 22:15, with sunset at 21:25

3.1.6 At this location, there are strong, tall linear features leading away from the wood along the road corridor.

4.0 Peak count analyses

4.1.1 Technical Report Appendix [CD1-11.05 TR5.05 2022] Bat Activity Report assesses the bat activity levels recorded across the Scheme. As stated in paragraph 3.4.11, 'Once triggered by ultrasound, the SM4 detectors record sound files with a duration of 15 seconds, which may contain a number of individual bat calls (or passes), or discrete groups of ultrasound 'pulses'.' Given this, for static detector surveys completed by WSP for the Scheme, a bat registration is a 15-second file, which contains at least one bat ultrasound 'pulse'. A single sound file may be counted more than once if multiple species (or species groups) are identified within it.

4.1.2 **Table 4** details the registrations per night (RPN) from the summer static detectors surveys carried out in 2022.

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Table 4: Static activity data from the Scheme, shown as registrations per night (RPN)

Species	Registrations Per Hour at each surveyed static detector location*									
	*location descriptions match those in Table 3									
	6	7	8	10	13	14	21	22	27	28
Barbastelle	1.15	0.88	0.36	4.47	1.33	0.39	11.83	6.42	0.32	0.00
Common pipistrelle	24.15	19.83	84.42	24.92	53.61	44.06	179.42	118.03	126.18	42.12
Soprano pipistrelle	20.50	14.88	26.81	26.47	15.94	10.58	39.72	18.75	20.64	1.12
Nathusius' pipistrelle	0.00	0.04	0.03	0.03	0.06	0.53	0.39	0.03	0.50	0.26
Myotis spp.	0.55	0.71	0.17	1.44	0.78	0.44	1.47	0.25	1.05	0.03
Noctule	0.80	1.25	1.50	0.81	0.14	0.61	0.33	0.22	1.73	0.26
Leisler's bat	0.35	0.13	0.06	0.06	0.08	0.00	1.61	0.00	0.09	0.00
Nyctalus spp.	0.30	0.58	0.42	0.92	0.64	0.36	22.86	0.53	0.95	0.03
Brown long-eared bat	1.15	0.63	0.69	0.89	0.83	0.08	4.53	0.42	0.18	0.00
Serotine	0.55	0.50	0.00	0.47	0.14	0.00	0.94	0.14	0.00	0.00

* Highest RPN per species in bold

4.1.3 As noted in **Table 4**, the highest RPN for all species bar two (Nathusius' pipistrelle and noctule) were recorded at static detector Location 21. This static detector location is on a North/South hedgerow 1.46km west of Madingley, 114.5m south of St Neot's Road and 132m south of the A428.

4.1.4 None of the static detector locations within Coton Orchard CWS (Locations, 6, 7 and 8) recorded the highest RPN for any of the species. The second highest RPN were recorded for soprano pipistrelle and noctule at Location 8, though neither could be described as high. The second highest RPN for Leisler's bat, serotine and brown long-eared bat were recorded at Location 6; again, none could be described as high, though it should be noted that brown long-eared bat is often under-recorded because of its quiet calls. Location 8 is a hedgerow on the western edge of

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the orchard parallel to Cambridge Road and Location 6 is a hedgerow running north-east/south-west within the western half of the orchard.

5.0 Errata and Limitations

- 5.1.1 Within Technical Report Appendix [CD1-11.05 TR5.05 2022] Bat Activity Report, a discrepancy is noted between the data assessed within Section 7, Summer Automated Survey Results, and Table TR5-5-2-3 within Annex B Survey Results. The data included within Section 7 is correct and therefore the conclusions drawn remain valid. The correct data has been used to produce Table 4 within this technical note.
- 5.1.2 Within Technical Report Appendix CD1-11.05 TR5.05 2022 Bat Activity Report, a discrepancy was found between this methodology and that stated in the Thomson bat activity report [CD25-36]. In CD1-11.05 TR5.05 it states that six CP locations were surveyed by Thomson, where in fact eight CP survey locations were surveyed. This is corrected within this Technical Note and no error in the datasets was found.
- 5.1.3 As barbastelle calls are often quiet, they can often not be correctly identified during the use of auto-identification analysis of sound files recorded by the static detectors. The calls can be obscured by louder calls. Due to this, as part of the data analysis approach detailed within paragraph 3.4.15 (and its bullet points) of Technical Report Appendix CD1-11.05 TR5.05 2022 Bat Activity Report, all bat call files and 10% of noise files were checked for the presence of barbastelle calls. To ensure that barbastelle calls have not been missed within the remaining files (remaining 90% of noise files), further analysis is underway. At the time of writing, 92,000 noise files have been checked and barbastelle calls have been recorded within less than 0.5% of those files. Therefore, at the time of writing, there is no material change to the activity levels recorded and the conclusions within the CD1-10.01 TR5.0 (EcIA) and CD1-11.11 TR5.11 (HRA) remain valid.
- 5.1.4 While reviewing 'barbastelle' registrations within the CP data as part of the early call analysis (Section 3.0), it was noted that a number were recorded before or very close to sunset. Given the location of the CP surveys, recording barbastelle at this time would have been unusual. It was confirmed that none of the 'heard not seen' registrations of barbastelle calls had been subject to quality assurance (QA) at the time of assessment. Therefore, all barbastelle registrations noted within the field notes were subject to QA by a Technical Director with 18 years of call identification experience. Table 5 details the CP locations and the reduction in the number with barbastelle registrations, removing locations CP3, CP4 and CP9 from the habitat features where barbastelle had supposedly been recorded within their vicinity. This information has been used and updated within Table 6, updating the justification of mitigation design and locations.

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Table 5: CP Barbastelle Calls Reviewed

CP Location	Barbastelle Presence Prior to QA	Barbastelle Presence Post QA
CP3	Yes	No
CP4	Yes	No
CP5	Yes	Yes
CP9	Yes	No
CP10	Yes	Yes
CP16	Yes	Yes
CP18	Yes	Yes
CP19	Yes	Yes

REVIEWING ALL DATA AND RATIONALE FOR MITIGATION

6.0 Data Compatibility

- 6.1.1 The availability of comparable data is an important factor when setting minimum criteria to justify mitigation and compensation approaches. In terms of the varying approaches and methodologies, the following defines comparable and non-comparable data:
- 6.1.2 **Bat Activity Assessment and Indices:** the survey approach and methodology used by Cambridge Ecology is not comparable to the data collected by WSP. Cambridge Ecology aimed to gain data samples over a wider area that were non-repeatable, providing individual spatial analysis per location. However, the data gathered by WSP was focused on data collection with a spatial and repeatable temporal assessment. However, the lack of comparable data in determining mitigation location and design is not a limiting factor. An indices measurement or threshold were not used to determine mitigation locations. The presence of barbastelle or other 'at risk' species was used as a grouped criterion only.
- 6.1.3 **CP Surveys:** as detailed within both CD25-36 and CD1-11.05 TR5.05 both survey approaches were in line with the required survey guidelines.
- 6.1.4 **Roost assessments:** the presence / likely absence data used to inform the roosting assessment does not need to be comparable. All the data has been assessed, and roosting suitability reassessed

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by WSP, across the Scheme. In addition, this data was not required to inform the location or design of the Landscape Treatment (crossing) mitigation.

7.0 Mitigation Assessment

- 7.1.1 Online and offline sections of the Scheme were assessed separately. Online sections of the route aim to retain existing vegetation; where this proves not to be possible, post-Scheme landscaping (subject to detailed design) will aim to replant at the appropriate height and density to retain existing function (navigational aid, screening for lighting etc).
- 7.1.2 Important commuting features as determined by CP surveys were the primary tool for scoping in mitigation for landscape treatments (safe crossing) for the off-line sections of the Scheme. As such, mitigation was scoped in based on the following (using data available at the time of writing):
- previously recorded as a crossing location for barbastelle, within the radio-tracking data used to inform this Scheme; and/or
 - at least one barbastelle registration during CP surveys; and/or
 - at least ten bat registrations of other (more common) species were recorded during CP surveys; and/or
 - barbastelle or 'at risk' species recorded during static detector surveys.
- 7.1.3 In additional, contextual information was also taken into consideration, including:
- Whether the feature was within or near to a:
 - barbastelle maternity colony's home range;
 - core foraging area; or
 - juvenile sustenance zone.
- 7.1.4 Consideration was also given to the ongoing liaison with Natural England and any commuting features that Natural England considered important for barbastelle.
- 7.1.5 In summary, the creation of a landscape feature (crossing), the location must be severed by the Scheme and meet one of the following criteria:
- have commuting barbastelle recorded during the CP surveys;
 - meet the other species threshold recorded during the CP surveys; or
 - if the crossing point does not meet the above two criteria, it must meet the remaining four criteria, as set out in within **Table 6**.
- 7.1.6 The results of this exercise are presented in **Table 6** and shown on Figure 1a and Figure 1b. In summary landscape feature (crossing) mitigation be created (and subject to detailed design) at the following CP (and Landscape Feature (crossing) number) locations:
- CP2: Landscape Treatment (Crossing) 4A

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- CP3: Landscape Treatment (Crossing) 5
- CP4: Landscape Treatment (Crossing) 5A
- CP5: Landscape Treatment (Crossing) 3A
- CP6: Landscape Treatment (Crossing) 1A
- CP9: Landscape Treatment (Crossing) 6
- CP16: Landscape Treatment (Crossing) 2A
- CP18: Landscape Treatment (Crossing) 7

7.1.7 During the meeting with Natural England in July 2025, it was anticipated that lighting would be avoided across all the landscape treatments. However, due to ongoing work reviewing the data and developing each design further, it has been since been identified that Landscape Treatments (Crossings) will be required at CP9 and CP18 and have now been included in the list above. At the meeting it was discussed with Natural England that lighting was required for H&S reasons at these two locations. and that the limited lighting was set within a wider dark landscape permeable to bats. At detailed design, ILP principles to avoid impacts on bats (GN 08/23 [CD22-02]) will be applied, such as screen planting, which will shield the CPs to ensure localised bat movements can continue. Screening through planting is successfully facilitating bat movements in the current lit landscape.



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Table 6: Summary of Data and Rational for Mitigation

CP Location	Radiotracking data: home range, core foraging area, flight path or JSZ	Commuting barbastelle data (WSP or Thomson data CP)	Threshold met for commuting 'other species' (CP data)	Static data Barbastelle: (CE or WSP data)	Static data ('at risk' species) (CE or WSP data)	Considered important for barbastelle by Natural England	Severed by the Scheme?	Severance Mitigation Required via the Scheme?	Type of Mitigation	Rational for mitigation	LIGHTING for H&S reasons
CP1			✓	✓	✓		No – partially lost but deadened section (goes into Cambridge University Sports ground)	No	Habitat Loss – Landscaping subject to Detailed Design for the Scheme	<ul style="list-style-type: none">Important commuting feature for common species east-west. Partial habitat loss at the end of the feature with continued E-W connectivity through landscaping, Landscape treatment therefore not necessary.Static data recorded for barbastelle and 'at risk' speciesWoodland and hedgerow currently severed north-south by farm access.	No street lighting
CP2		✓		✓	✓	✓	Yes	Yes	Landscape Treatment (Crossing) 4A No Lighting	Meets the criteria that it is an important commuting feature for barbastelle. In addition: <ul style="list-style-type: none">Static data recorded for barbastelle and 'at risk' speciesConsidered important by Natural England.	No street lighting
CP3	✓ JSZ Not in HR or CFA			✓	✓	✓	Yes	Yes	Landscape Treatment (Crossing) 5	Does not meet the criteria of being an important commuting feature for barbastelle or other species. however, it does pass due to meeting the remining four criteria: <ul style="list-style-type: none">In JSZ, not in Radio-tracked HR or CFAStatic data for barbastelleStatic data for 'at risk' species.Considered important by NE and potentially important in ES	No street lighting
CP4	✓ JSZ Not in HR or CFA			✓	✓	✓	Yes	Yes	Landscape Treatment (Crossing) 5A	Does not meet the criteria of being an 'important commuting' feature for barbastelle or other species. However, it does pass due to meeting the remining four criteria:	No street lighting



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CP Location	Radiotracking data: home range, core foraging area, flight path or JSZ	Commuting barbastelle data (WSP or Thomson data CP)	Threshold met for commuting 'other species' (CP data)	Static data Barbastelle: (CE or WSP data)	Static data ('at risk' species) (CE or WSP data)	Considered important for barbastelle by Natural England	Severed by the Scheme?	Severance Mitigation Required via the Scheme?	Type of Mitigation	Rational for mitigation	LIGHTING for H&S reasons
									No Lighting	<ul style="list-style-type: none">In JSZ, but not in HR/CFAStatic data for barbastelleStatic data for 'at risk' speciesConsidered important by NE and potentially important in ES	
CP5	✓ JSZ	✓	✓	✓	✓		Yes	Yes	Landscape Treatment (Crossing) 3A No Lighting	Meets the criteria that it is an important commuting feature for barbastelle. In addition: <ul style="list-style-type: none">Important commuting feature for common species including at-risk species.Within JSZ, south of MadingleyStatic data for barbastelleStatic data for 'at-risk' speciesConsidered potentially important in ES	No street lighting
CP6	✓ JSZ		✓	✓	✓		Yes	Yes	Landscape Treatment (Crossing) 1A No Lighting	Meets the criteria that it is an 'important commuting' feature for other species (common pipistrelle and 'at-risk' species). In addition: <ul style="list-style-type: none">Within JSZ, south of MadingleyStatic data for barbastelleStatic data for 'at-risk' species	No street lighting
CP9	✓ HR, CFA, FP			✓	✓	✓	Yes	Yes – partially	Landscape Treatment (Crossing) 6	Does not meet the criteria of being an 'Important Commuting' feature for barbastelle or other species. However, it does pass due to meeting the remining four criteria: <ul style="list-style-type: none">Within indicative flight path of IDW tracking and within HR and CFA of Hardwick Colony	No lighting at CP; landscaping.to screen from localised lighting at junction. Wider unlit landscape



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CP Location	Radiotracking data: home range, core foraging area, flight path or JSZ	Commuting barbastelle data (WSP or Thomson data CP)	Threshold met for commuting 'other species' (CP data)	Static data Barbastelle: (CE or WSP data)	Static data ('at risk' species) (CE or WSP data)	Considered important for barbastelle by Natural England	Severed by the Scheme?	Severance Mitigation Required via the Scheme?	Type of Mitigation	Rational for mitigation	LIGHTING for H&S reasons
										<ul style="list-style-type: none">Static data for barbastelleStatic data for 'at-risk' speciesConsidered potentially important in ES <p>Landscape Treatment: Planting to keep bats flying at height over double severance (bats currently doing this)</p> <p>Landscaping to buffer lighting at junction</p>	
CP10	✓ FP/HR/CFA	✓	✓	✓	✓		Yes	No - Subject to Detailed design by Consented Development Bourn Airfield	N/A	Meets the criteria that it is an important commuting feature for other species (common species). in addition: <ul style="list-style-type: none">Within HR/CFA of Hardwick ColonyWithin indicative FP	✓ H&S Junction Part of Bourn Airfield dark corridor. Consented and subject to Bourn Airfield Detailed Design
CP11				✓	✓		Yes	No	Habitat Loss – Landscaping subject to Detailed Design for the Scheme	<ul style="list-style-type: none">Not a commuting feature.Occasional barbastelle, BLE and <i>Myotis</i> on static dataOn edge of Cambridge City Suburbs, line of trees along the Bin Brook (trapezoidal channel).Landscaping subject to detailed design	No street lighting
CP12				✓			Yes	No	Habitat Loss – Landscaping subject to Detailed Design for the Scheme	<ul style="list-style-type: none">Not a commuting feature.Low numbers of barbastelle , BLE and <i>Myotis</i> on StaticLandscaping subject to detailed design	Temporary M11 Bridge Construction Lighting
CP13	✓ JSZ			✓		✓	Yes	No		<ul style="list-style-type: none">Not a commuting feature.	Lighting required for H&S at Coton junction where there



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CP Location	Radiotracking data: home range, core foraging area, flight path or JSZ	Commuting barbastelle data (WSP or Thomson data CP)	Threshold met for commuting 'other species' (CP data)	Static data Barbastelle: (CE or WSP data)	Static data ('at risk' species) (CE or WSP data)	Considered important for barbastelle by Natural England	Severed by the Scheme?	Severance Mitigation Required via the Scheme?	Type of Mitigation	Rational for mitigation	LIGHTING for H&S reasons
	Not in HR or CFA									<ul style="list-style-type: none">Low numbers of barbastelle, BLE and <i>Myotis</i> on static detector surveysLandscaping subject to detailed design	is existing lighting. ILP principles to be applied Wider dark landscape maintaining north-south, east-west (including orchard to the east) to maintain permeability.
CP14	✓ JSZ and in HR			✓	✓		Yes	No		<ul style="list-style-type: none">Not a commuting feature.Within JSZNorth node connected to CP 5, which has better hedgerow height and width, supports commuting bats (see above for mitigation)1 barbastelle recorded on CE static detector surveys (no WSP static survey).	No street lighting
CP15	✓ JSZ, HR, CFA			✓			Yes	No	Habitat Loss – Landscaping subject to Detailed Design for the Scheme	<ul style="list-style-type: none">Not a commuting featureIn JSZ, HR and CFANo WSP static data; CE recorded low barbastelle (two registrations)Landscaping to account for restricted access.	No street lighting
CP16	✓ JSZ, HR, CFA	✓		✓	✓		Yes	Yes	Landscape Treatment (Crossing) 2A No Lighting	<ul style="list-style-type: none">Commuting feature for barbastelleIn JSZStatic data for barbastelle	No street lighting
CP17	✓ JSZ, HR			✓	✓		Yes	No	Habitat Loss –	<ul style="list-style-type: none">Not commuting feature	No street lighting



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CP Location	Radiotracking data: home range, core foraging area, flight path or JSZ	Commuting barbastelle data (WSP or Thomson data CP)	Threshold met for commuting 'other species' (CP data)	Static data Barbastelle: (CE or WSP data)	Static data ('at risk' species) (CE or WSP data)	Considered important for barbastelle by Natural England	Severed by the Scheme?	Severance Mitigation Required via the Scheme?	Type of Mitigation	Rational for mitigation	LIGHTING for H&S reasons
									Landscaping subject to Detailed Design for the Scheme	<ul style="list-style-type: none">In JSZ and HRLow static detector registrations for barbastelle; higher static registrations for BLE	
CP18		✓		✓	✓		Yes	Yes	Landscape Treatment (Crossing) 7]	Meets the criteria that it is an important commuting feature for barbastelle. In addition: <ul style="list-style-type: none">WSP static data for barbastelleStatic data for 'at risk' species Landscaping subject to detailed design: tall trees retained either side of N-S severance <20m wide. Levels to be raised on each corner of junction and scrub planted.	H&S Lighting for junction on Long Road Landscaping subject to detailed design: ILP GN 08/23 principles to be applied Additional planting on east of N-S severance to form screen from lighting at junction to ensure continued movements north-south.
CP19		✓		✓	✓		No – runs parallel. Section to be temporally lost	No	Habitat Loss – Landscaping subject to Detailed Design for the Scheme	<ul style="list-style-type: none">Important commuting feature E-W.WSP static registrations for at-risk species However, the impact is habitat loss and not severance; landscaping subject to detailed design mitigation required to address landtake not severance.	Lighting for junction on St Neots Road Landscaping subject to detailed design. Wider movements maintained as no impact to mature vegetation providing a strong commuting feature with dark areas behind north of this junction.



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CP Location	Radiotracking data: home range, core foraging area, flight path or JSZ	Commuting barbastelle data (WSP or Thomson data CP)	Threshold met for commuting 'other species' (CP data)	Static data Barbastelle: (CE or WSP data)	Static data ('at risk' species) (CE or WSP data)	Considered important for barbastelle by Natural England	Severed by the Scheme?	Severance Mitigation Required via the Scheme?	Type of Mitigation	Rational for mitigation	LIGHTING for H&S reasons
CP20				✓			No	No	Habitat Loss – Landscaping subject to Detailed Design for the Scheme	<ul style="list-style-type: none">Not a commuting featureNear to a lit double roundabout at Scotland Road.Outside key sensitive areasStatic data for barbastelle (very low RPN).Travel Hub location: Landscaping to screen light. Subject to detailed design (via planning condition).	Landscaping to screen Scotland Road Travel hub. ILP GN 08/23 principles to be applied
CP21							Yes	No	Habitat Loss – Landscaping subject to Detailed Design for the Scheme	<ul style="list-style-type: none">Not a commuting featureBordered by M11 (noise) and Cambridge University (lighting)No static data for barbastelle or at-risk species	Temporary lighting during M11 crossing construction
CP22	✓ HR			✓			Runs parallel to Scheme	No	Habitat Loss – Landscaping subject to Detailed Design for the Scheme	<ul style="list-style-type: none">Not a commuting featureWithin Hardwick colony home rangeLow static RPN for barbastelleLandscaping to maintain flight height over A428	Future development in this area
CP23	✓ HR						Runs parallel to Scheme	No - Subject to Detailed design by Bourn Airfield Consented Development	N/A	<ul style="list-style-type: none">Not a commuting featureWithin Hardwick Bat colony home rangeAdjacent to new housing development; feature forms dark wildlife corridor.Low static RPN for barbastelle	Consented Bourn Airfield Development

TE = Thomson Ecology. BLE = Brown long-eared bat. CP = CP. SL=Static location. Flightpaths EWR = radio-tracking for EWR scheme; IDW = radio-tracking undertaken for Bourn Airfield.
HR = home range. CFA = core foraging area. FP = flight path. JSZ = juvenile sustenance zone. All as determined by radio-tracking data.

Appendix 4: Outputs from ‘June meeting’ (issued to Natural England)

4.1 Minutes

4.2 Presentation

4.3 Technical Note 2: Bats and Collision Exposure

MEETING NOTES

PROJECT NUMBER	Project number	MEETING DATE	09 June 2025
PROJECT NAME	Cambridge To Cambourne	VENUE	MS TEAMS
CLIENT	Greater Cambridge Partnership	RECORDED BY	Ian Ellis
MEETING SUBJECT	Cambridge to Cambourne TWAO – Meeting on Natural England's Representation		

PRESENT	GCP: Jo Baker (JB) Natural England: Nick Downs (ND), Justin Tilley (JT) and Catherine Duerden (CD) WSP: Graham Higgins (GH), Gemma Cookson (GC), Ian Ellis (IE) and Sarah Proctor (SP) RSK Biocensus: Paola Reason (PR)
APOLOGIES	
DISTRIBUTION	As above
CONFIDENTIALITY	Confidential

ITEM	SUBJECT	ACTION	DUE
1	Introductions		
1.1	GC led introductions and introduced PR and SP. PR will be the designated bat expert for the Scheme while SP will provide support on technical matters on Barbastelle bats. [These minutes should be read in conjunction with the presentation slide deck (attached pdf), reference to the relevant slide is made throughout this document e.g. Slide 1/50].		
1.2	GC outlined that key topics for discussion today would be: <ul style="list-style-type: none"> Collision risk (to be covered by SP); and Crossing point mitigation. 		
1.3	GC added that lighting would be covered in a future session.		
1.4	GC confirmed that minutes will be sent for April imminently and apologised for the delay in issuing. The actions according to those minutes were not discussed. [Post meeting Note: Minutes were issued on 25/6/2025 to all attendees]. [Post-meeting Note: Natural England's feedback from the April meeting and our responses are attached to these minutes.]	GC	

2	Collision Risk		
2.1	<p>SP outlined Natural England's key comments on collision risk [Slide 4/50] and outlined that WSP wanted to pull information together on the probability of bats and buses interacting to produce a 'timing risk window' (TRW) (overlap between typical bat activity and when buses passing through the Scheme). [Slide 5-6/50]</p> <p>Buses are due to run between 0600 – 0000hrs year-round. So, this is already a low-risk window without taking bat activity into account. TRWs are split in to (i) sunset to midnight and (ii) sunrise to 0600.</p> <p>It is assumed that bats move freely over the majority of the night.</p> <p>Overlap period between operational buses and bats is a smaller window of:</p> <ul style="list-style-type: none"> • Spring: 4.08 hours April and 3.20 hours May • Summer: 2.62 hours June, 2.77 hours July and 3.58 hours August • Autumn: 5.32 hours September and 7.32 hours in October 		
2.2	<p>SP presented a schematic of speed zones across the scheme from which we have assessed the time for a bus to travel across Coton Orchard [Slide 7/50].k.</p> <p>The TRW is the amount of time per evening that buses are travelling through Coton Orchard CWS. Key assumptions:</p> <ul style="list-style-type: none"> • Buses per hour = 20; • Time to pass through the orchard = 38 seconds: and • Total time for all buses to independently move through orchard = 760 seconds per hour. <p>Therefore, the overlap period further reduces to:</p> <ul style="list-style-type: none"> • Spring: To 0.86 hours of the 4.08 during April and 0.68 hours of the 3.20 during May • Summer: To 0.55 hours of the 2.62 during June, to 0.58 hours of the 2.77 during July and to 0.76 hours of the 3.58 during August • Autumn: to 1.12 hours of the 5.32 during September and to 1.54 hours of the 7.32 during October <p>This can be further considered against known barbastelle movements i.e. during summer when the average sunrise time is prior to 06:00am, barbastelle return to roost prior to the morning bus movements. During the other survey seasons when there is theoretical overlap, no barbastelle were recorded post- 06:00am on any of the Coton Orchard CWS detectors.</p>		

	Within the spring window, from the static detectors in the CWS, barbastelles weren't recorded until 2.38 hrs after sunset. [Slide 9/50].		
2.3	ND asked if they are not turning up at the CWS until 2 hours after sunset, where are they going?		
2.4	SP considered that they are most likely to stick within the Madingley Wood area where there is shelter.		
2.5	GC agreed with this hypothesis and that this would be consistent with statements within RP2974 Edition 1 Definition of Favourable Conservation Status for the barbastelle bat. <i>'When bats do emerge, they typically forage in woodland close to roosts where the ambient temperature is higher than in the surrounding open countryside and is less likely to fall below the threshold for insect flight (Greenaway 2008; Zeale 2011).'</i>		
2.6	ND repeated earlier concerns that the Coton Orchard CWS could also provide that shaded area. They noted that, WSP has not supported that theory, while adding that no detectors were placed in the middle of the orchard.		
2.7	SP noted that the area not surveyed is predominantly the dense area of scrub in the east of Coton Orchard, but that's where barbastelle bats were observed flying 'up and over'.		
2.8	GC added that, different survey data sets support the consideration that barbastelles are generally staying within their woodlands before arriving at the orchard.		
2.9	<p>SP continued with TRW showing the realistic window [Slide 11/50].</p> <p>Spring:</p> <ul style="list-style-type: none"> To within 0.00 and 0.57 hours during the 4.08 hours in April To 0.00 hours during the 3.20 hours in May – no overlap between bus activity and barbastelle movement recorded <p>Summer:</p> <ul style="list-style-type: none"> To 0.00 hours during the 2.62 hours June – no overlap between bus activity and barbastelle movement recorded To within 0.00 and 0.07 hours during the 2.77 hours in July To within 0.15 and 0.47 hours during the 3.58 hours in August <p>Autumn:</p> <ul style="list-style-type: none"> To within 0.27 and 0.63 hours during the 5.32 hours in September To within 0.67 and 0.93 hours during the 7.32 hours in October <p>It was noted that, for the months where no overlap was recorded, we are not inferring no risk of collision. Just that in all these</p>		

	<p>circumstances, there is reduced probability of a collision occurring. Non detection does not imply absence but would underline the precautionary nature of the assessment .</p> <p>Looking at levels of bat activity of higher and medium collision risk species: <i>Myotis</i> spp., barbastelle, brown long-eared bat, serotine were all represented by less than 1 registration per hour (common / soprano Pipistrelles were higher). So, the risk window can be reduced further.</p> <p><u>In summary: the probability of a collision is extremely low. [Slide 13/50]</u></p>		
2.10	SP presented an analysis to give a collision exposure score [Slide 15/50].		
2.11	<p>SP considers it an overestimate of risk as the calculation assumes uniform activity across the Orchard; however, bats have been recorded within specific locations (rather than at all locations uniformly across the orchard). In addition, this assessment doesn't consider flight height nor any possible avoidance behaviour. Crossing-point data shows that some bats including barbastelle are flying >4m, therefore above the risk window.</p> <p>The concluding level of risk very small [Slide 16/50].</p>		
2.12	SP noted that other factors that have not been considered would further reduce the calculated level of risk, such as reduction of foraging habitat and the likely deterrent effect of lights on the buses . These factors likely further reduce the risk of collision.		
2.13	<p>A technical note will be provided that details these assessments.</p> <p>[Collision Risk Technical Note attached]</p>	WSP	
2.14	While Natural England did not comment on the methodology or the results of the collision risk analysis, CD asked if WSP had looked at descriptive notes surveyors made at crossing points.		
2.15	SP replied that she had only looked at static data to get a consistent data set. Crossing-point data is a narrower and qualitative data-set.		
2.16	<p>GC further noted that crossing-point surveys are usually limited to 60 mins after sunset, though on this project extended to 120 mins to capture late-emerging species.</p> <p>In that data-set, 3 barbastelles were recorded crossing. CD referenced 7 'heard not seen' barbastelles. These will be further considered, but it was reiterated that the statics are a better more robust (i.e. repeatable and comparable) data set for the purpose of calculating collision risk</p> <p>GC noted that, if barbastelles did occasionally move out of woodlands earlier than the statics suggest a, that this was a rarer event (according</p>		

	<p>to the data collected to date), and that there was a general trend of barbastelles arriving at the Orchard later.</p> <p>[Post meeting note: We are looking into the timings of these heard not seen barbastelle recordings and became suspicious when they were timed from close to sunset. On reviewing the source files, it was apparent that these were not barbastelle. Apologies for any confusion.</p> <p>It would appear that these calls were not QA'd and it can be confirmed that all barbastelle calls within the crossing point data has since been subject to QA, ensuring that there are no other barbastelle/potential barbastelle recordings that could have been wrongly identified.</p> <p>We would add that all of the static data has been QA'd and that every call file has been checked for the presence of barbastelle.</p>		
2.17	SP returned to the precautionary nature of the assessment provided and outlined that it provides compelling evidence on the low risk of barbastelle collision. [Slides 17 &18]		
3	Crossing Point Mitigation / Landscape Treatments		
3.1	GC presented an overview of peak counts of the SAC and surrounding woodlands which support barbastelle populations. [Slide 19-20/50].		
3.2	<p>GC reminded the attendees of the data-sharing agreement with East West Rail (EWR) and presented core foraging and home ranges from this work, alongside flightpaths derived from Ian Davidson-Watts' radiotracking at Bourn Airfield and WSP's static data.</p> <p>From work undertaken by EWR, barbastelle are present in additional woodlands to the west beyond those identified as part of earlier studies. The original SACO estimate of 10- 50 barbastelle bats at Eversden and Wimpole is likely to be an underestimate as the radiotracking undertaken to date indicates a minimum count across the woodlands of at least 116 barbastelle.</p> <p>We consider that, not only is 116 bats an underestimate, but there is a large established and widespread population of barbastelle within Cambridgeshire</p>		
3.3	ND regarding radiotracking data - is it possible to get a rough idea of the number of bats tracked as proportion of population?		
3.4	GC noted that the conditions of the Natural England research licences only allow 20% of the assumed population to be tracked. Would expect that to be carried through on current licences.		
3.5	PR added observations from Sizewell: when radiotracking over a couple of years, tagged bats were distributed between a number of roosts on any one day. So counts are based on subset of the roosts		

	occupied on any one day, and it is therefore incredibly hard to get a count of the whole population. It is also often hard to get accurate counts from many roost tree given roost heights and locations within woodlands.		
3.6	ND brought up asymptotes of foraging bats where you can be confident that the home range of any additional bats do not add additional information to the overall home range. ND asks whether EWR did that? GC to confirm with EWR.	GC	
3.7	SP outlined that WSP have not looked at information on single bats.		
3.8	PR noted that there is a need to focus on mortality risk from the Scheme, there is no risk of territory removal. We can get extra data, but it needs to be relevant to the potential impacts.		
3.9	GC presented a slide outlining Natural England's representation on existing road assessment [Slide 23/50].		
3.10	GC presented a timeline of known barbastelle data and regional major infrastructure construction i.e. M11, A428 [Slide 25/50] The M11 has been in existence since 1975, with dualling of the A428 from 2007. While population data is patchy, there are peak counts of bats in woodlands throughout this period, so barbastelles are still present in the woodlands and roads do not appear to be a barrier to bat habitat landscape permeability in the area. This is consistent with the Natural England Definition of Favourable Conservation Status for barbastelle bat RP2974 which states ' <i>Roads, motorways, and other clearings in natural vegetation do not appear to be a major barrier to movement or dispersal in the landscape and so probably do not restrict habitat accessibility to a significant extent (Kerth & Melber 2009).</i> '		
3.11	GC added that flightlines of barbastelle around the consented Bourn airfield scheme show two clear bat flight paths crossing the A428 [Slide 24/50] (these flightlines are consistent with the findings of the EWR radio-tracking data). Measuring these flight paths across the A428 from canopy to canopy gives a width of approximately 50m [Slide 27/50] and 37m wide [Slide 28], respectively. The radiotracking data for the Madingley population[Slide 29/50] shows barbastelle are crossing at Madingley, where the gap is 4.5m [Slide 31/50] and 8m [Slide 32/50]; but also where the gap is 28m wide [Slide 30/50].		
3.12	GC outlined that we agree that there is a lack of knowledge on how barbastelle cross roads, but we do have evidence that confirms bats are crossing roads over successive years with gaps ranging from 5m – 50m.		

3.13	ND noted that the data is incredibly valuable, and asked if there were times of night for crossings and/or flight heights?		
3.14	GC confirmed that we do not – as these are existing road crossings, separate to our Scheme Crossing Points.		
3.15	<p>GC moved on to landscape treatments and outlined Natural England's representations on this matter [Slide 33-34/50].</p> <p>The Applicant has taken on board comments and are looking at options to reduce bus route landscape treatment widths.</p> <p>Our Crossing Point survey approach was to identify bat commuting routes which required mitigation. WSP applied the DEFRA guidelines and used the lowest possible threshold of a single barbastelle bat; alternatively (where no barbastelle): 10 bats commuting to trigger the requirement for a landscape treatment.</p> <p>[Post Meeting Note: Further information on Landscape Treatment process to be provided in Technical Note 3].</p>		
3.16	<p>GC presented the proposed landscape treatments showing planting and fencing.</p> <p>An overview of Crossing Points at Madingley and the Orchard Points 1A to 5 were provided [Slide 36/50]; to confirm, these locations are where at least 1 barbastelle bat was recorded.</p> <p>The only way to reduce width canopy-to-canopy at Madingley and Coton Orchard/wider scheme would be to take out swales and replace these with French drains. This results in an overall width (canopy-to-canopy) of between 7.5m and 16m.</p> <p>The trees proposed at landscape treatments would be the maximum maturity (height and canopy) to achieve good establishment rates; as the trees matured over time, the gaps between canopies would reduce.</p>		
3.17	SP noted that the population is clearly already crossing wider gaps along the Scheme length, but the Applicant wanted to work with Natural England to provide the best solution.		
3.18	While Natural England did not comment on the reduced widths, ND asked would there be scope to amend scheme designs?		
3.19	PR replied that there will be a limit to what WSP can do as time passed. However, given barbastelle generally leave their home woodlands after dark, the collision risk (as outlined above) is already low. In theory, one could keep modifying but such effort/change needs to be proportionate to the risk.		

	In fact, there needs to be a decision by Natural England between the benefit of removing a swale which has biodiversity value and sustainability benefits over a French drain design which does not.		
3.20	ND replied, noting that EWR radio-tracking information on bats crossing wide gaps doesn't give us the most useful information. It would be useful to understand more detail about <i>how</i> the bats are flying across existing road gaps.		
3.21	JB stated that if there is evidence for a design change (noting this Scheme is not at detailed design stage), we can review. But it needs to be evidenced.		
3.22	JB further noted that Planning Condition 18 does require the Scheme to be monitored and to amend mitigation if required and advised ND this should provide the reassurance needed.		
3.23	JB provided a link to conditions within the meeting.		
4	Conclusions		
4.1	<p>GC presented key conclusions from the information provided.</p> <p>WSPs analysis of earliest emerging bats within the static detector data shows barbastelle are generally and more typically not active in the scheme until 2 hours after sunset and have typically returned to roost before sunrise and 6am when buses start.</p> <p>The probability of collision shows bat/bus collisions are very unlikely given:</p> <ul style="list-style-type: none"> • The operation of buses is between 6am and midnight with minimal overlap of bat/barbastelle activity, particularly in the summer breeding months; and • The frequency of the buses is low at 20 passes. <p>Bats from Madingley are already crossing the A1303 with considerably higher traffic levels.</p> <p>A desk-based assessment of bat flightpaths shows barbastelles are crossing existing infrastructure covering gaps of between 5m-50m.</p> <p>In response to Natural England's request there is an option to design landscape treatments with a minimum canopy width of 7.5m and 16m between canopies at the orchard and Madingley (this is following the angled actual bat flight path which is larger than a perpendicular straight-line canopy to canopy).</p> <p>The combination of low trigger for mitigation, low collision risk and mitigation design within the capabilities of bats means we conclude there will be no adverse effect on the integrity of the E&W Special Areas of Conservation (SAC).</p>		

4.2	CD (did not comment on the conclusions) returned to the point made in the April 2025 meeting about speed limits at night-time in Coton Orchard. Considers it equivalent to a country road so reduced speed limit will help with that. Would also be good to see an overview of what would be either side of the busway in Coton Orchard in case it provided a sheltered corridor for moths.	WSP	
4.3	ND – regarding the Coton Orchard CWS– have you considered looking at Exmoor SAC guidelines?		
4.4	GC confirmed that the team are going to do that but it is a very different pristine habitat however, so the suitability of using this assessment needs to be considered.	WSP	
4.5	<p>PR added that it is dangerous (and likely inappropriate) to take information from other regions to apply here. East Anglia barbastelles use the landscape in a completely different way to those in Devon.</p> <p>[Post Meeting Note: We have reviewed the SAC Guidelines from the South West, it is our opinion that for the following reasons the Guidelines are not transferable:</p> <ul style="list-style-type: none"> • The Exmoor and Quantocks SAC guidelines are specifically designed for the local area based on radiotracking surveys completed on both Horner Wood and Hinckley Point C colonies. The methodologies for calculating the amount of replacement habitat are specifically linked to these area assessments and are therefore not directly transferable to other locations. • Horner Wood SSSI and surrounding Landscape is continuous oak wooded valley covering a large area; the Cambridge landscape supports woodland within a predominantly arable landscape. The bats are using the areas to commute and forage differently.] <p>To accurately reflect the Cambridge context it would require a bespoke SAC Supplementary Guideline for compensatory habitat within the Eversden and Wimpole SAC.</p> <p>In addition, the scheme involves very little land take and 20% Biodiversity Net Gain incorporating habitats beneficial to bats will be achieved.</p>		
4.6	CD concluded that the Natural England team will wait to receive technical notes and reissue Statement of Common Ground (SoCG) before responding.		
4.7	WSP to issue technical notes on Collision Risk and SoCG.		
4.8	Regarding fencing, ND advised having mesh sized such that bats can't fly through it, but not so small that it provides a wind break.		

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4.9	SP confirmed that the team are looking into that.	WSP	
5	Next meeting		
5.1	GC will provide dates for next meeting in an email.	WSP	
5.2	CD noted that she is not available in the first two weeks of July.		

NEXT MEETING

It is proposed that the following meetings are scheduled:

w/c 23 June – Lighting [actually timetabled 16 July]

w/c 4 August – Outstanding matters

Natural England response following April 2025 meeting	Reference to paragraphs above where this concern is addressed and/or response where required.
<p>Natural England's thoughts regarding the need for further survey effort: Orchard importance</p> <p>We believe that the surveys that have been undertaken do show that the orchard is a valuable foraging resource, as notes from the CP3 and CP4 surveys describe three occasions when (at least¹) three barbastelles (over 10% of the known Madingley Wood population) were foraging over/near the orchard trees at a height of 2-4m, or 'up and down the field [within the orchard] foraging' (which suggests that the short grass in this area does not seem to deter foraging). Although regular grass mowing of an area of the orchard is likely to prevent some moth species from completing their life cycles, the orchard consists of a mosaic of habitats which must still provide a habitat for some barbastelle prey. In addition to the survey results, this is evidenced by the number of moths highlighted in yellow as barbastelle prey from the Coton Orchard moth survey analysis presented in the slides – even if some may have originated outside of the orchard, as suggested in the meeting, it still shows the value of the immediate area. We therefore request that the reports and conclusions are amended to reflect this.</p>	<p>It is noted that radio-tracking data only captures a snapshot of the population at any time, but Coton Orchard lies outside the home range of the barbastelles tracked.</p> <p>Nonetheless, the assessment undertaken concludes that the orchard is of potential importance to barbastelle, and the mitigation in this location is designed to reflect that importance.</p> <p>The importance of moths to barbastelle was acknowledged to Natural England in the CtoC NE Meeting Minutes 02042025.</p> <p>The inclusion of moth larval food plants will be included in the Landscape Planting Specification/Strategy as outlined in para 5.14 of the Minutes and will be conditioned as part of the planning condition process.</p> <p>The HRA and ES are not being updated for the planning application; however, the following technical note is appended (with more to follow):</p> <ul style="list-style-type: none"> - Technical Note 2_Bats and Collision Exposure <p>Please note the post meeting note within 2.16. The three barbastelles recorded described as recorded at CP3 and CP4 have been QA'd and it can be confirmed are not barbastelle registrations.</p>
<p>¹ 'at least' because we are unsure what 'Seven HnS barb passes' means.</p>	<p>On investigation, these 'heard not seen' passes (<i>sic</i>) were mis-identified and were actually pipistrelles (see Post-mtg note in June minutes). Apologies for any confusion.</p>
<p>The above surveys seem to only be covering the immediate vicinity of the 'crossing point' features, and as the 'scrubby' part of the orchard could not be accessed, we still do not think this has been surveyed adequately – however, these are the options we propose ...</p>	<p>Access issues relate both to the Orchard itself (consent withdrawn) and the density of the scrub.</p>
<p>1. If the reports are amended to acknowledge that the whole orchard is a valuable (or at least potentially valuable) foraging resource, and will therefore be given an appropriately high standard of mitigation (to be discussed at later meetings, likely including the 30mph speed limit extending through the orchard), then we will not insist on further surveys of the orchard itself to prove its significance.</p>	<p>The assessment undertaken concludes that the orchard is of potential importance to barbastelle, and the mitigation in this location is designed to reflect that importance.</p> <p>A further potential mitigation measure under consideration would be to adopt a 30 mph speed restriction within the boundaries of Coton Orchard during periods when bats are active, though the need for this is uncertain given the short section over which this would apply and the already low collision risk (see para Error! Reference source not found., the presentation to Natural</p>

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Natural England response following April 2025 meeting	Reference to paragraphs above where this concern is addressed and/or response where required.
	England from 09 June 2025 , and the subsequent Technical Note 2_Bats and Collision Exposure
<p>2. If, however, the need for these report amendments and/or higher level of mitigation are disputed (as is currently suggested by the Applicant's position in SoCG Issue 3), further survey effort would be required in order to 'prove' that some or all of the orchard is not valuable foraging habitat. If this option is taken we would ask that, as a minimum, this should consist of 3 surveys over the course of this survey season, for a period of a week each, with at least four statics (in the best habitats that haven't already been surveyed) and two transects per survey (this would need further discussion).</p>	<p>As noted above, the assessment undertaken concludes that the orchard is of potential importance to barbastelle, and the mitigation in this location is designed to reflect that importance.</p>
<p>3. Regardless of the option chosen, Natural England would be grateful if the procedure described in Annex 6 of the Barbastelle Bats Exmoor and Quantocks Oak Woodlands Special Area of Conservation (SAC) Guidance on Development (methodology for calculating the amount of replacement habitat required) be carried out for the whole scheme (including Coton Orchard) – see attached pdf. In addition to hopefully validating current habitat creation plans, this methodology also provides a framework to compare Coton Orchard with other impacted habitats. When deciding the applicable 'Band' (Table 1, page 12, with corresponding scores in Table 4, page 43), please use the distance from the nearest known barbastelle population (e.g. Madingley or Hardwick) rather than the Eversden and Wimpole Woods SAC boundary.</p>	<p>The validity (or otherwise) of this approach was discussed in the June meeting, the minutes to which this note is appended.</p> <p>The applicant would remind Natural England that the Scheme footprint is small and there is already a commitment to 20% BNG. In addition, the landscaping specification/strategy will take into account the value of the moth larval food plants via a planning condition.</p>
<p>Foraging habitat mitigation design</p> <p>The current landscape plan for the passage through the orchard looked like it may be creating attractive bat habitat around the busway (e.g. open drainage ditches on either side of the roadway, combined with shelter from additional trees) and will need to be rethought. It seemed to be agreed in the meeting that current mitigation guidelines are generally focused on 'crossing points' and that different considerations need to be given to foraging habitat. We advise that habitat distance from the buses, bus speed, and lighting present will all have a bearing on bat mortality risk. Our main ask is not to put habitats that will generate insects close to the carriageway, except perhaps at specific crossing points. Whilst we will be happy to discuss the landscape plan in a future meeting, we do not currently have ready-made solutions, particularly given the constraints of the red-line boundary. You should consider whether your existing survey observations provide enough information to inform mitigation in these 'non-hedgerow' foraging areas within the orchard, (e.g. what was prompting the bat foraging up and down</p>	<p>As discussed in the July meeting, the points raised here are matters for detailed design.</p> <p>It would be possible to create swales, and habitat close to the busway, that is of limited value to invertebrates and therefore to foraging bats.</p> <p>It is of note that, in East Anglia, dry conditions tend to prevail, particularly in the summer months.</p> <p>The risk of bat collision has been demonstrated to be low in the calculations presented to Natural England in June, and followed up by the associated Technical Note (referenced above).</p>

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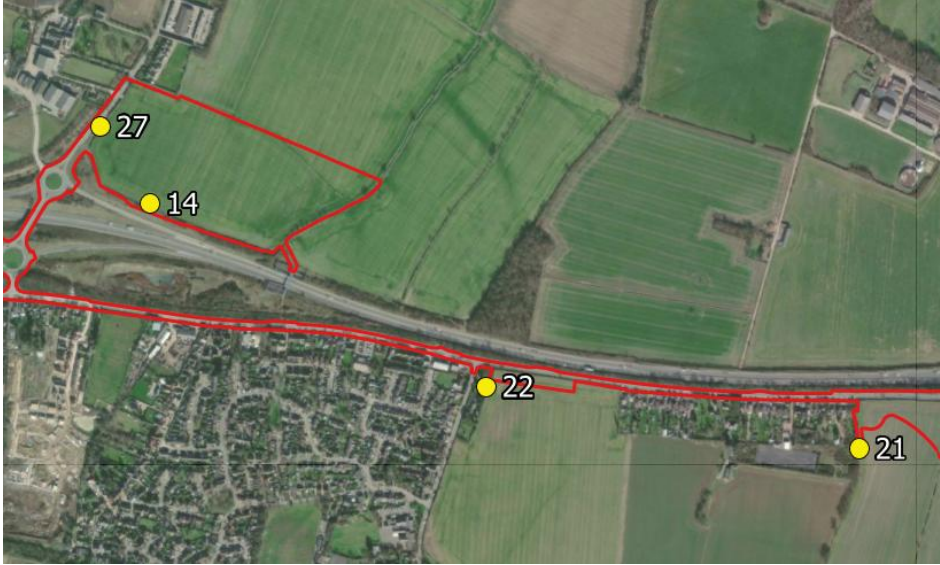
Natural England response following April 2025 meeting	Reference to paragraphs above where this concern is addressed and/or response where required.
the field to turn around?) - would additional field observations inform more effective mitigation designs?	
<p>Current road-crossing habits</p> <p>More knowledge of the current road-crossing habits of bats in the area would show what they are already habituated to, such as the width of gaps crossed before full darkness, and give more confidence in the effectiveness of mitigation design.</p> <p>Additionally, finding out where exactly the bats are crossing the A1303 near Madingley Wood could provide evidence for not widening it, if the closeness of the tree canopy over the road appears to be an important factor in allowing bats to cross at a safe height above the road. We therefore recommend targeted surveys with infrared cameras, as described in the final paragraph of part 3 of our representation.</p>	<p>As presented in the meeting of June 2025 to which these minutes are appended, bats are already crossing significant gaps over the A1303 and A428 (distances as set out in the minutes above).</p> <p>As also discussed in the July meeting, thermal camera surveys of bats crossing the A1303 by Madingley Wood showed bats crossing well after full darkness. There was no evidence that bats were leaving their 'home woodland' before dark, and no evidence of them crossing below vehicle height.</p> <p>We note that Kieran O'Malley's PhD study, found that an increasing distance between canopies actually increased barbastelle flight height.</p> <p>Post Meeting Note: A variance crossing heights were noted across the A1303. The 20m+ observation was correct the time of the Natural England liaison</p>
Additional comments following the meeting:	
<ul style="list-style-type: none"> As the swarming site(s) of barbastelles in this area is unknown, it is welcomed that the Madingley Wood population will be treated as 'functionally linked' to the Eversden and Wimpole Woods SAC population for the purposes of HRA. This should give equal importance to this population of bats as those at the SAC. 	Noted.
<ul style="list-style-type: none"> As mentioned in the meeting, the Technical Report Ecology specifies that the peak count of barbastelle bats identified in Madingley Wood was 28. It was stated in the meeting that only 6 bats had been radiotracked from Madingley Wood as part of the EWR study, and we would like to reiterate our point that the EWR map should therefore not be relied upon to give a complete picture of foraging areas or population overlaps. 	Noted; however, the number of bats tracked was restricted by Natural England's own welfare guidelines which apply to all projects, and such data form part of the whole 'jigsaw' on which our assessment is based.
<ul style="list-style-type: none"> We are pleased that a new analysis of bat hotspots will be undertaken and that this will include information from the 2019 surveys as well as the more recently collected data. Please ensure that you utilise the qualitative descriptions as well as the counts of bats, and highlight locations where bats were recorded foraging in non-crossing point locations. 	This is being undertaken and will be provided in Technical Note 3.
<ul style="list-style-type: none"> If not already done, it would be beneficial to map the first bat registration times (along with sunset, and if appropriate, sunrise times) to show which surveyed points had bats recorded before or very soon after full darkness, which were in darkness but before the bus stoppage time of 	<p>This is being undertaken and will be set out in Technical Note 3 (yet to be issued at date of writing).</p> <p>As discussed in the July meeting, thermal camera surveys of bats crossing the A1303 by Madingley Wood showed bats crossing well after</p>

MEETING NOTES

Natural England response following April 2025 meeting	Reference to paragraphs above where this concern is addressed and/or response where required.
<p>midnight, and which only had first registrations after midnight. As stated in part 3 of our representation, this would help to pinpoint the areas that should be prioritised for the highest quality mitigation measures.</p>	<p>full darkness. There was no evidence that bats were leaving their 'home woodland' before dark, and no evidence of them crossing below vehicle height.</p> <p>Analysis of our static data of 1151 Barbastelle bat registrations across all locations and the whole survey season shows that 80% (921 bat registrations) of all barbastelle calls were recorded over 1.5 hours after sunset.</p> <p>A total of 65 barbastelle bat registrations across all locations and the whole survey season (5.65% of all barbs recorded) was recorded within the first hour post sunset.</p> <p>Of the 5.65% earlier calls, the spread of these across the survey season recorded peaks in April (2.26% of all barbastelle passes recorded), July (1.56% of all barbastelle passes recorded) and October (1.04% of all barbastelle passes recorded).</p> <p>Of the 5.65% of earlier calls in regard to location, a peak of these earlier passes (1.65% of all barbastelle passes recorded) was recorded at static detector location 22. This static detector was located south of the A428 on the edge of a well vegetated garden. A small woodland block is located immediately north across the A428, and the static detector location is approximately 2.2km west of Madingley Wood SSSI. The bus route is on line along St Neots Road at this location.</p>

Post Meeting Note: A variance crossing heights were noted across the A1303. The 20m+ observation was correct the time of the Natural England liaison

MEETING NOTES

Natural England response following April 2025 meeting	Reference to paragraphs above where this concern is addressed and/or response where required.
	 <p>A single barbastelle registration was recorded within Coton Orchard CWS within the first hour post sunset. This was recorded at static location 7 during July.</p>
<ul style="list-style-type: none"> As discussed in the meeting, the records of higher numbers of bats around winter static point 9 may indicate that there is a nearby hibernation feature, and this should be investigated. 	<p>As discussed in the July Meeting it is considered Madingley and the other surveyed woodlands as part of the EWR radiotracking study provide a suitable hibernation resource. This is consistent with the findings of the National Highways A428 Caxton to Gibbett bat surveys where Boys Wood and Elsworth Wood SSSI were considered to support hibernating bats.</p>
<ul style="list-style-type: none"> Collision risk is due to be discussed in future meetings. However, regarding our request for a speed limit of 30mph through the entire orchard/scrub (from the Cambridge Road junction to the M11 crossing) and the comment that this may affect the viability of the scheme's time saving requirements – we do not agree and think that this distance of around 830m (the start and end of which is already proposed to be 30mph) would add minimal additional time to the bus journey when compared to the existing transport options. 	<p>As noted above, this is under consideration.</p>



Cambourne to Cambridge

Natural England Representation
Meeting 2 – Collision Risk and
Landscape Treatments
June 2025

Agenda

- Introductions
- Meeting Minutes
- Representations to be discussed confirmed
- Conclusions
- Next Meeting

OVERVIEW OF KEY TOPICS RAISED BY NATURAL ENGLAND

- COTON ORCHARD CWS TO BE ACKNOWLEDGED
- ROBUSTNESS OF HRA, REQUEST FOR FURTHER SURVEYS - FORAGING & COTON ORCHARD
- COLLISION RISK
- CROSSING POINT MITIGATION - LANDSCAPE TREATMENTS
- LIGHTING

NATURAL ENGLAND'S POSITION ON COLLISION RISK

- Natural England *‘disagree with the conclusion of paragraph 7.2.37 that there will be no adverse effects as a result of mortality from collisions. Given the low number of bats per colony, it may only take a handful of collisions to significantly reduce the population size of a colony. As stated above, the genetic health of one barbastelle colony is dependent on the genetic health of the colonies around it.’*
- *‘We advise that an analysis of the timings of first and last bat pass registrations (relative to sunset and sunrise), particularly for barbastelles, should be carried out....’*

Collision Risk Setting the Scene – All Bats

Timing Risk Window = Overlap of between 'typical' bat activity and when the buses passing through the Scheme

- The buses run between 06:00 and 00:00, all year round
- Without taking bat activity into account, the Timing Risk Windows are split:
 - Sunset and midnight.
 - Sunrise and 06:00
 - It should be noted that Summer only includes the dusk to midnight timings, as sunrise is prior to 06:00am, and the majority of bats will have returned to roost

Bats can move freely over the majority of the night, particularly when returning to roost when bats can be more spread out and travel more directly back to roost.

N.B. Text as per wording used within original presentation. Technical Note 2 supersedes this presentation

Collision Risk Setting the Scene – All Bats

Timing Risk Window = Overlap of between 'typical' bat activity and when the buses passing through the Scheme

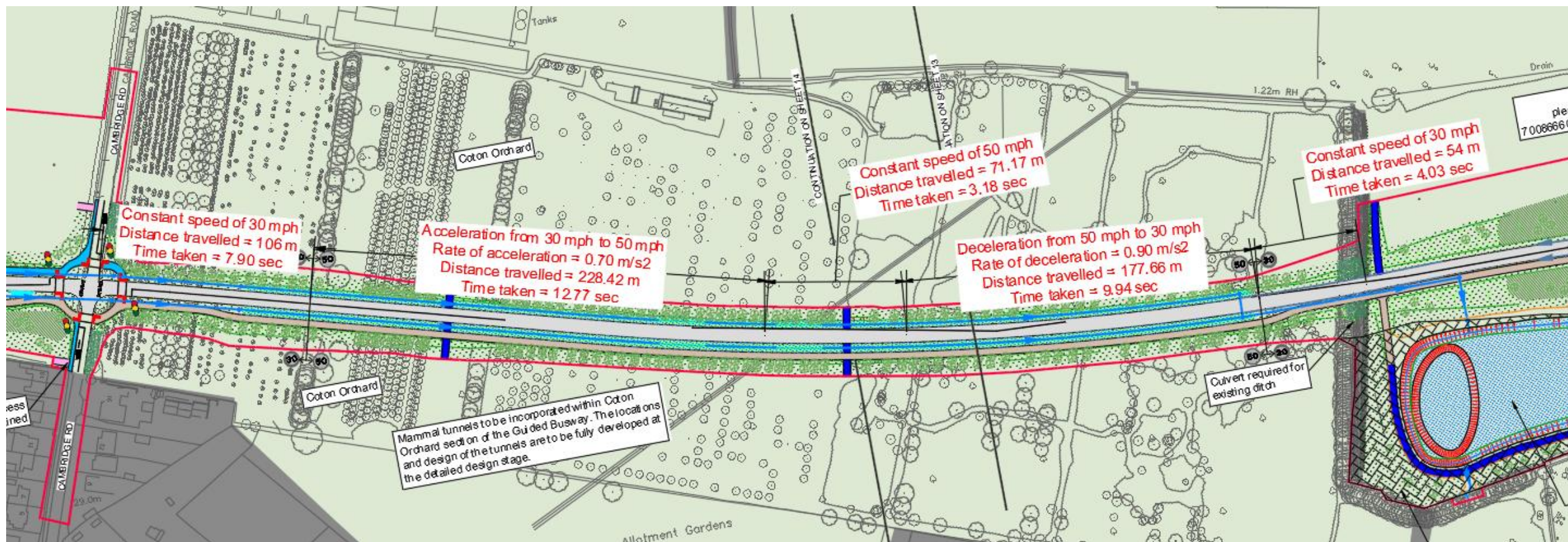
- Thus the overlap period between operational buses and bats is a very small window of:
 - Spring : 4.08 hours April and 3.20 hours May
 - Summer: 2.62 hours June, 2.77 hours July and 3.58 hours August
 - Autumn: 5.32 hours September and 7.32 hours in October

Noting the reduced window in summer, which is the higher seasonal window due to breeding and presence of juveniles

N.B. Text as per wording used within original presentation. Technical Note 2 supersedes this presentation

Collision Risk Setting the Scene – Coton Orchard and All Bats

Cotton Orchard CWS Specific Risk Window



N.B. Text as per wording used within original presentation. Technical Note 2 supersedes this presentation

Appendix 4.2 Slide 7 of 50

Collision Risk Setting the Scene – Coton Orchard and All Bats

Timing Risk Window = Overlap of between 'typical' bat activity and when the buses passing through the Scheme

- Realistically, the Timing Risk Window is not the entire time in which a bus could move through Coton Orchard CWS
 - It is the amount of time per evening that a bus is travelling through Coton Orchard CWS
- Buses per hours = 20
- Time to pass through the orchard = 38 seconds
- Total time for all buses to independently move through orchard = 760 seconds per hour

N.B. Text as per wording used within original presentation. Technical Note 2 supersedes this presentation

Collision Risk Setting the Scene – Coton Orchard and All Bats

Timing Risk Window = Overlap of between 'typical' bat activity and when the buses passing through the Scheme

- Thus, the overlap period between operational buses and bats further reduces:
 - Spring : To **0.86** hours of the 4.08 during April and **0.68** hours of the 3.20 during May
 - Summer: To **0.55** hours of the 2.62 during June, to **0.58** hours of the 2.77 during July and to **0.76** hours of the 3.58 during August
 - Autumn: to **1.12** hours of the 5.32 during September and to **1.54** hours of the 7.32 during October

Noting a drastic reduction in the Timing Risk Window and it should be noted that this is a combined time and not a continuous window of risk

Appendix 4.2 Slide 9 of 50

N.B. Text as per wording used within original presentation. Technical Note 2 supersedes this presentation

Collision Risk Setting the Scene – Coton Orchard and Barbastelle

Timing Risk Window = Overlap of between 'typical' bat activity and when the buses passing through the Scheme

- Taking recorded movements into account, this can be further considered in relation to barbastelle movement in Coton Orchard:
 - During Summer given the average sunrise time was prior to 06:00am, barbastelle are returning to roost prior to the morning bus movements
 - Additionally, no barbastelle were recorded post- 06:00am on any of the Coton Orchard CWS detectors throughout the remainder of the survey season
- Therefore, the earliest barbastelle record within the sunset risk window, was taken into consideration

Appendix 4.2 Slide 10 of 50

N.B. Text as per wording used within original presentation. Technical Note 2 supersedes this presentation

Collision Risk Setting the Scene – Coton Orchard and Barbastelle

- When barbastelle were recorded (None recorded in Location 8 during April, May or June), the earliest calls recorded range between:
 - Spring Post Sunset: 2.38 hours April and none in May
 - Summer Post Sunset:
 - Location 6: 2.73 hours July and August
 - Location 7: None in July and 3.02 hours August
 - Location 8: None in June, 3.22 hours July and 2.45 hours August
 - Autumn Post Sunset:
 - Location 6: 2.75 hours September and 3.18 hours October
 - Location 7: 3.15 hours September and 2.52 hours October
 - Location 8: 3.33 hours September and 3.38 hours October

Appendix 4.2 Slide 11 of 50

N.B. Text as per wording used within original presentation. Technical Note 2 supersedes this presentation

Collision Risk Setting the Scene – Coton Orchard and Barbastelle

Timing Risk Window = Overlap of between 'typical' bat activity and when the buses passing through the Scheme

- Thus, the overlap period between operational buses and barbastelle further reduces when activity is taken into account:
 - Spring :
 - To within **0.00 and 0.57** hours during the 4.08 hours in April
 - To **0.00** hours during the 3.20 hours in May – no overlap between bus activity and barbastelle movement recorded
 - Summer:
 - To **0.00** hours during the 2.62 hours June – no overlap between bus activity and barbastelle movement recorded
 - To within **0.00 and 0.07** hours during the 2.77 hours in July
 - To within **0.15 and 0.47** hours during the 3.58 hours in August
 - Autumn:
 - To within **0.27 and 0.63** hours during the 5.32 hours in September
 - To within **0.67 and 0.93** hours during the 7.32 hours in October

Appendix 4.2 Slide 12 of 50

N.B. Text as per wording used within original presentation. Technical Note 2 supersedes this presentation

Collision Risk Setting the Scene – Coton Orchard and All Bats – Activity Levels

Appendix
4.2 Slide
13 of 50

Timing Risk Window = Overlap of between ‘typical’ bat activity and when the buses passing through the Scheme

- Taking activity levels into account registrations per night vary across each of the ‘higher and medium risk’ species recorded in Coton Orchard CWS.
 - The higher and medium risk species are taken to be barbastelle, Myotis sp., brown long-eared bat (BLE), serotine, common pipistrelle and soprano pipistrelle
 - Of these, barbastelle, Myotis, BLE and serotine registrations per hour at static location 6, 7 and 8 are all below 1 Registration per Hour.
 - As would be expected common and soprano pipistrelle have higher recorded activity levels

Therefore, combining the lower number of registrations per hours, the short Timing Risk Window of bus movements, the probability of a bat and bus being at the exact point of collision is very low.

N.B. Text as per wording used within original presentation. Technical Note 2 supersedes this presentation

Estimated Probability of collision

Calculating collision exposure score:

$$\text{Bus Presence} = \frac{\text{Time to pass through the orchard (seconds)}}{\text{seconds in an hours/bus journeys per hours}}$$

$$\text{Bat Presence} = \frac{\text{species registrations per hour}}{\text{bus passes per hour}}$$

$$\text{Collision Exposure Score} = \text{Bus Presence} \times \text{Bat Presence}$$

Note: This is a simplification of a collision assessment and will be an **overestimate of risk**, as it assumes uniform activity levels across the entire orchard. However, collision risk would only be at specific locations. The RA doesn't take account of the survey sessions where no activity for that species was recorded. Additionally, flight height (in or out of risk zone) is not taken into account.

N.B. Text as per wording used within original presentation. Technical Note 2 supersedes this presentation

Estimated Probability of collision

Calculating the Probability of collision:

$$\text{Bus Presence} = \frac{38 \text{ Seconds}}{3600 \text{ seconds}/20}$$

$$\text{Bat Presence} = \frac{\text{species registrations per hour}}{20}$$

$$\text{Collision Exposure Score} = 0.21111 \times \text{Bat Presence}$$

Note: This is a simplification of a collision assessment and will be an **overestimate of risk**, as it assumes uniform activity levels across the entire orchard. However, collision risk would only be at specific locations. The RA doesn't take account of the survey sessions where no activity for that species was recorded. Additionally, flight height (in or out of risk zone) is not taken into account.

N.B. Text as per wording used within original presentation. Technical Note 2 supersedes this presentation

Estimated Probability of collision

Note: This is a simplification of a collision assessment and will be an **overestimate of risk**, as it assumes uniform activity levels across the entire orchard. However, collision risk would only be at specific locations. The RA doesn't take account of the survey sessions where no activity for that species was recorded. Additionally, flight height (in or out of risk zone) is not taken into account.

N.B. the mean RPH for common and soprano pipistrelle has been added to the presentation to match Technical Note 2

Registrations Per Hour - Group	Species	Registrations Per Hour	Bat Presence	Bus Presence	Collision Exposure Score
Highest	Barb	0.26	0.013	0.2111	0.003
Lowest		0.03	0.0015	0.2111	0.0003
Highest	Myotis	0.12	0.006	0.2111	0.001
Lowest		0.02	0.001	0.2111	0.0002
Highest	BLE	0.20	0.01	0.2111	0.002
Lowest		0.02	0.001	0.2111	0.0002
Highest	Serotine	0.18	0.009	0.2111	0.002
Lowest		0.04	0.002	0.2111	0.0004
Highest	Common	20.11	1.01	0.2111	0.21
Lowest		0.52	0.026	0.2111	0.005
Mean		5.34	0.267	0.2111	0.056
Highest	Soprano	11.74	0.59	0.2111	0.12
Lowest		0.12	0.006	0.2111	0.001
Mean		2.31	0.116	0.2111	0.024

Collision Risk Setting the Scene – All Bats

- Collision Risk Timing is drastically reduced when the overlap between bus movement through Coton Orchard CWS and species activity levels are taken into consideration
- Given this, the probability of a bat (or specifically barbastelle), being at the same place as a bus passing through Coton Orchard CWS is very low
- Additionally, other deterrents have not been considered in this assessment. For example:
 - Once foraging habitat is removed to enable the Scheme, bats (and barbastelle) are less likely to pass be within close proximity of the passing buses in multiple locations
 - The lights on the buses will discourage bats and barbastelle from the Scheme footprint and from the route of the passing bus
- If this assessment method is taken into account at the other crossing features, the risk area reduces from around 637m to around c.12m per crossing feature location along the Scheme, further reducing the Timing Risk Window per crossing location, and lowering the probability of collision

N.B. Text as per wording used within original presentation. Technical Note 2 supersedes this presentation

Collision Risk – Further Considerations

- Mitigation in the form of Landscape Features are located at Coton Orchard CWS and other crossing point locations
- Numbers within the combined populations within the Cambridge area and this location being a stronghold
- Distances barbastelle in the location of the Scheme have been shown to cross a distance of just below c.50m

A technical note will be provided that details each of these assessments, so they can be reviewed separately.

N.B. Text as per wording used within original presentation. Technical Note 2 supersedes this presentation

Local barbastelle populations

Colony	Source	Emergence data	Foraging Distances
Eversden and Wimpole Bat SAC	SACO	11-50 bats. 2000-2001 Colony counts across 8 trees range from 13 to a 20 adult bats present.	
Madingley Wood SSSI	EWR Radiotracking Report 2022	Peak count of 28 bats in August 2022	Grantchester
Hardwick Wood SSSI	EWR Radiotracking Report	Peak count of 27 bats in August 2022	
Kingston Wood SSSI	EWR Radiotracking Report	Peak Count of 1 bat in August	
Waresley and Gransden SSSI	EWR Radiotracking Report	Peak Count of 10 bats in August 2022	
Hauxton Gravel Pits	EWR Radiotracking Report	No roost count	Great Chisil 13.5km south

Colony	Source		Foraging Distances
Eversden and Wimpole Bat SAC	SACO	11-50 bats. 2000-2001 Colony counts across 8 trees range from 13 to a 20 adult bats present.	Appendix 4.2 Slide 20 of 50
Wimpole Bat Colony	2001 Radiotracking	Peak count of 20 bats	6.5km from Roost
Wimpole Barbastelle bat Colony	Cambridge Bat Group Bat Detector Survey & Radiotracking 2000-2002	Peak count of 13 bats (May and August 2002) (acknowledging some missed)	11km from Roost
Wimpole Bat Colony	Cambridge Bat Group Radiotracking June 2005	Peak count of 23 bats (July 2004)	including Hardwick, Toft, High Cross near Cambridge, Grantchester (River Cam), Harlton, River Rhee, Bourn Brook
Wimpole Bat Colony	EWR Radiotracking Report 2020	Roost emergence surveys not fully completed.	Eversden Wood and the villages of Great Eversden, Toft and Comberton. Also to River Cam at Grantchester a distance of 10.2km from its tree roost.

ISSUE	NATURAL ENGLAND'S POSITION	APPLICANTS POSITION	STATUS
2.	<p>Natural England <i>‘disagree with the conclusion of paragraph 7.2.37 that there will be no adverse effects as a result of mortality from collisions. Given the low number of bats per colony, it may only take a handful of collisions to significantly reduce the population size of a colony. As stated above, the genetic health of one barbastelle colony is dependent on the genetic health of the colonies around it.’</i></p>	<p>Our analysis of earliest emerging bats shows:</p> <p>Barbastelle bats are not active in the scheme until 2 hours after sunset and have returned to roost before sunrise and 6am start.</p> <p>Our analysis of the collision exposure score concludes collision is very unlikely given:</p> <ul style="list-style-type: none"> • The operation of buses is between 6am and midnight with minimal overlap of bat/barbastelle activity is reduced, particularly in the summer breeding months. • The frequency of the buses is low at 20 per hour. <p>Furthermore, the radiotracking surveys from 2020 onwards show the local barbastelle population occupies woodlands widely across the area beyond the 10-51 barbastelles within E&W SAC and should be considered a stronghold.</p>	<p>TO BE DISCUSSED</p>

NATURAL ENGLAND'S REPRESENTATION ON EXISTING ROAD ASSESSMENT

- *'There is currently a lack of knowledge around how some bat species cross roads, including barbastelles, and populations in different locations may exhibit different behaviours and adaptations.'*
- *'The design of mitigation would also be aided by further investigation into the current road crossing behaviour of bats in the area.'*
- *'If it can be shown that bats from the local populations exhibit specific behaviours at existing roads, or are used to particular crossing features, it would give more confidence in the likely effectiveness of similar features incorporated into these proposals..'*

Major Linear Infrastructure within proximity to Madingley Bats

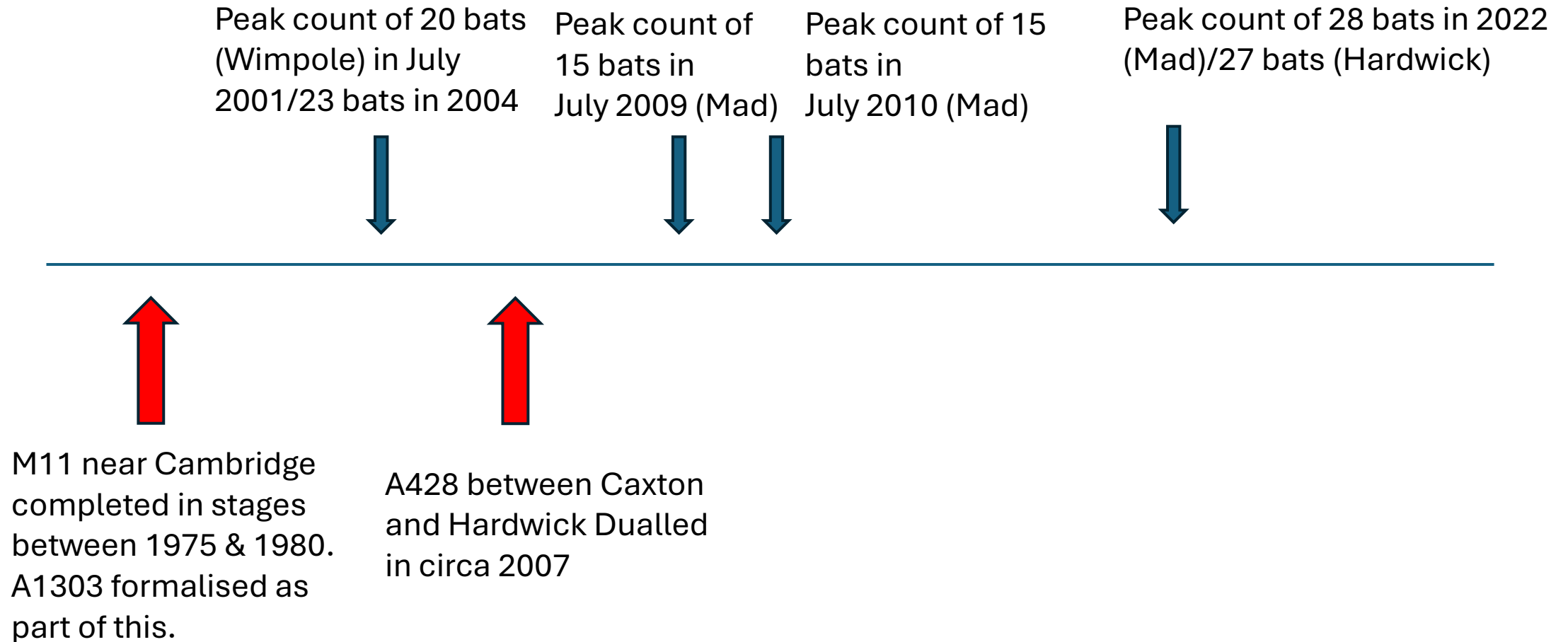
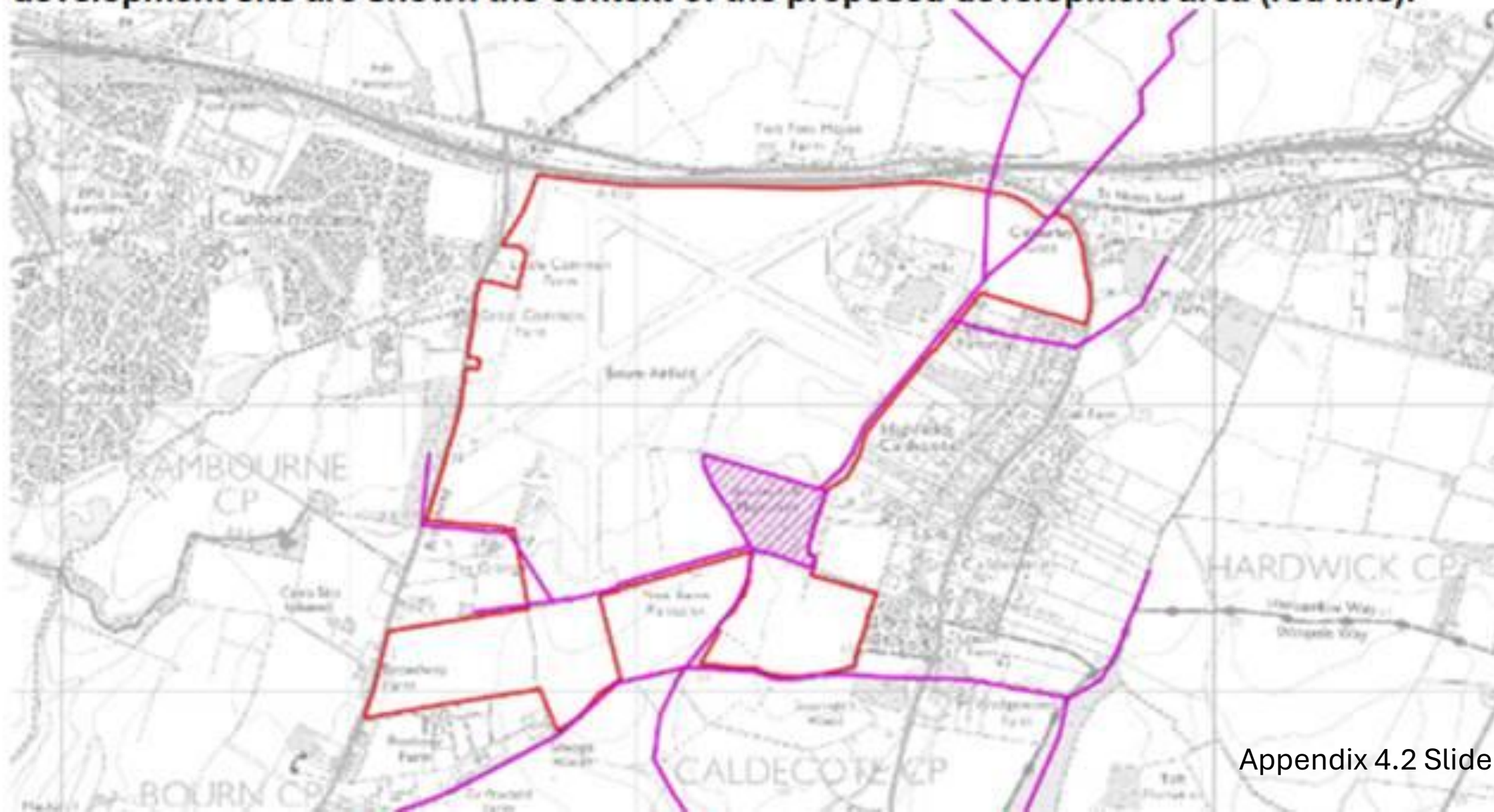


Figure 3. Key flight lines (purple lines) used by bats to pass through and around the proposed development site are shown the context of the proposed development area (red line).

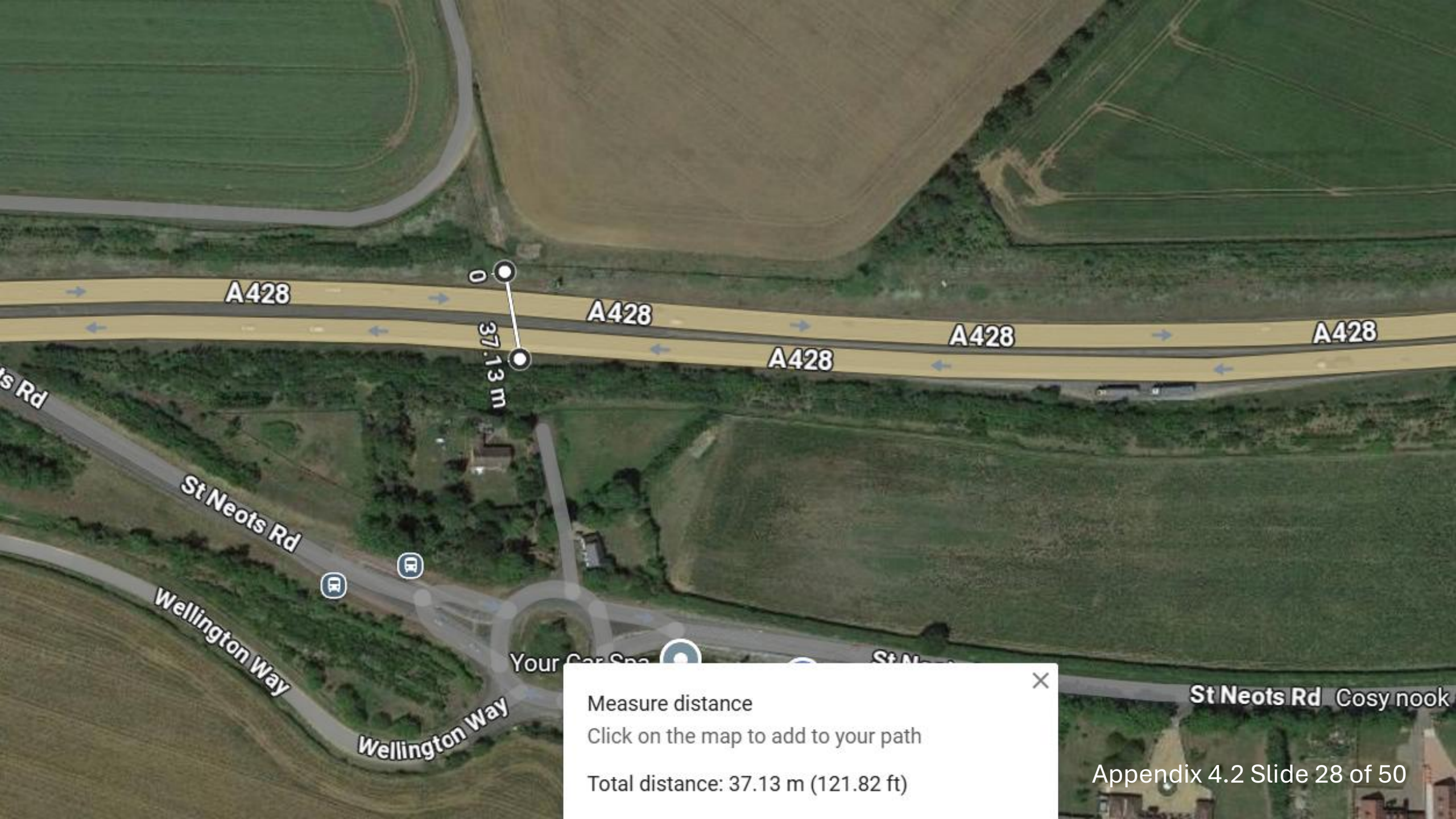




Measure distance

Click on the map to add to your path

Total distance: 49.88 m (163.65 ft)



Measure distance
Click on the map to add to your path
Total distance: 37.13 m (121.82 ft)

Major Linear Infrastructure within proximity to Madingley Bats



Madingley

Ruler

Line Path Polygon Circle 3D path 3D poly

Measure the distance between two points on the ground

Map Length: 28.04 Meters

Ground Length: 28.04

Heading: 323.85 degrees

☒ Mouse Navigation

Save

Clear



The Beauty
temporarily closed

Measure distance

Click on the map to add to your path

×



Madingley Rd

A1303

8.09 m
0

Measure distance
Click on the map to add to your path
Total distance: 8.09 m (26.54 ft)

NATURAL ENGLAND'S POSITION

ISSUE

APPLICANTS POSITION

STATUS

3

- *'There is currently a lack of knowledge around how some bat species cross roads, including barbastelles, and populations in different locations may exhibit different behaviours and adaptations.'*
- *'The design of mitigation would also be aided by further investigation into the current road crossing behaviour of bats in the area.'*
- *'If it can be shown that bats from the local populations exhibit specific behaviours at existing roads, or are used to particular crossing features, it would give more confidence in the likely effectiveness of similar features incorporated into these proposals..'*

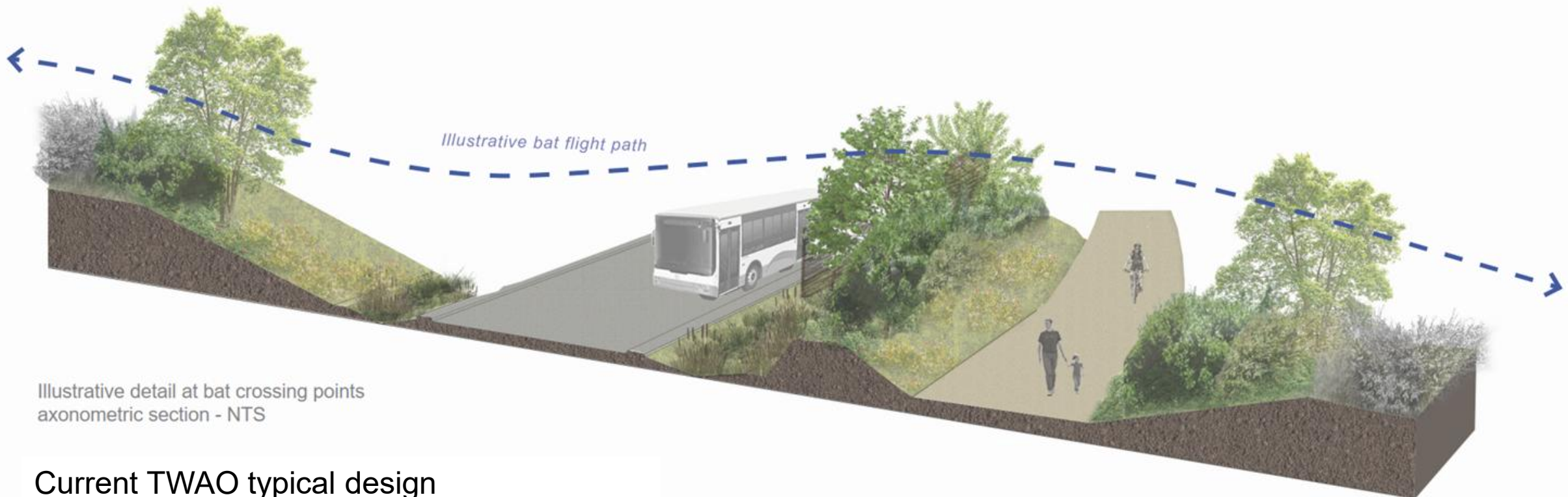
We have desk based evidence of radio tracked flight paths, static data and crossing point data which shows barbastelle bats crossing existing linear infrastructure over successive years (2016 and 2022 for the A428) where the open gap canopy to canopy ranges from <5m to ~50m showing the range at which barbastelles are crossing in this landscape.

TO BE
DISCUSSED

NATURAL ENGLAND'S REPRESENTATION ON LANDSCAPE TREATMENTS

- *The gap between the canopy heights either side of the new road should be less than 20m to encourage bats to maintain their flight height over the road'. We strongly advise that 20m is much too wide for an effective crossing point, and request that the exact specifications and width of each crossing point be provided at this stage within a definitive plan. The gap between canopies should not be any wider than a standard two-lane road, preferably less – we believe this would be narrower than 7m, depending on the bus width.*
- *Crossing points should therefore be no wider than this, and canopies should ideally be touching. The narrower the crossing point is, the better chance it will work, particularly if crossing points are likely to be used at dusk. Barbastelles would not cross a 20m gap at height before complete darkness, they would instead cross close to the ground where it is more shaded – this therefore would encourage collisions with traffic rather than preventing it, particularly in locations close to roost sites.*
- *We strongly advise that 20m is much too wide for an effective crossing point, and request that the exact specifications and width of each crossing point be provided at this stage within a definitive plan.*

- Locations overview
- 5 refined TWAO section + Coton Orchard principles
- Plan diagrams – TWAO mitigation and refined mitigation
- ‘**fencing**’ details



1A
Crossing point 6 – The ditch line
southwest of Madingley Wood;

2A
Crossing point 16 and static point 10 -
Hedgerow south of the American
Cemetery and Madingley Wood;

3A
Crossing point 5 and activity transect 2,
leg 3 – Hedgerow south of Madingley
Windmill, north of Coton Primary
School.

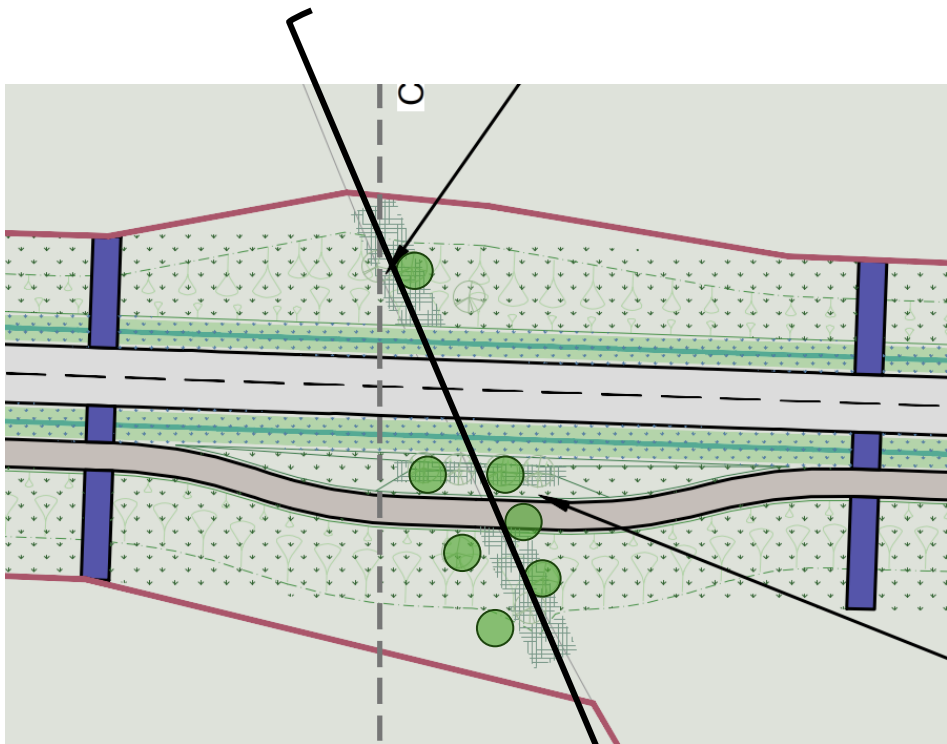
4A
Crossing point 2 and activity transect 3,
leg 4 – The eastern boundary of Coton
Orchard.

5A
Coton Orchard

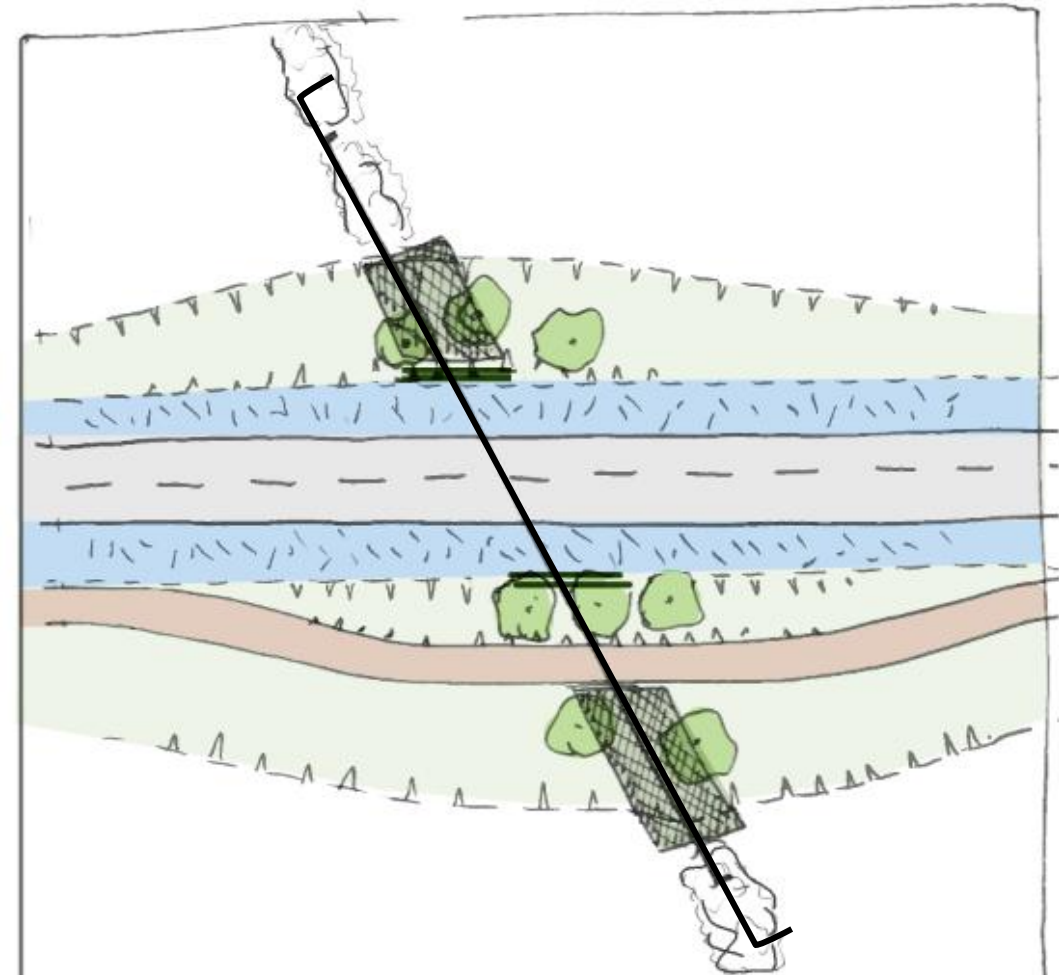
5
Coton Orchard



Landscape Treatment Locations



1A – TWAO mitigation drawing extract

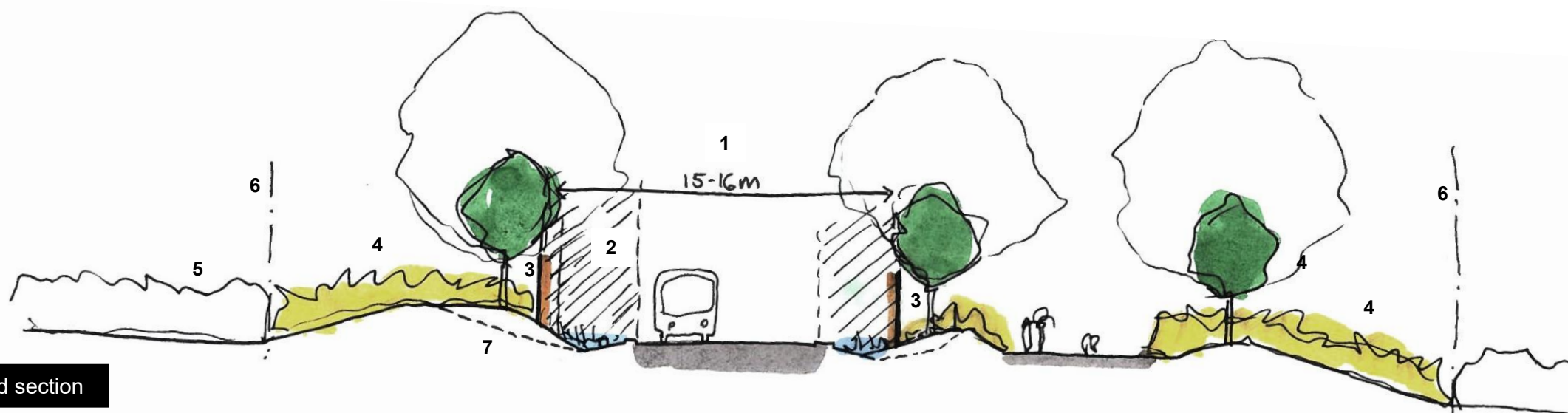


Revised mitigation measures

1A
 Crossing point 6 – The ditch line southwest of Madingley
 Wood;

**INDICATIVE MITIGATION OPTIONS - SUBJECT TO DETAILED DESIGN AND FURTHER DISCUSSION WITH
 NATURAL ENGLAND**

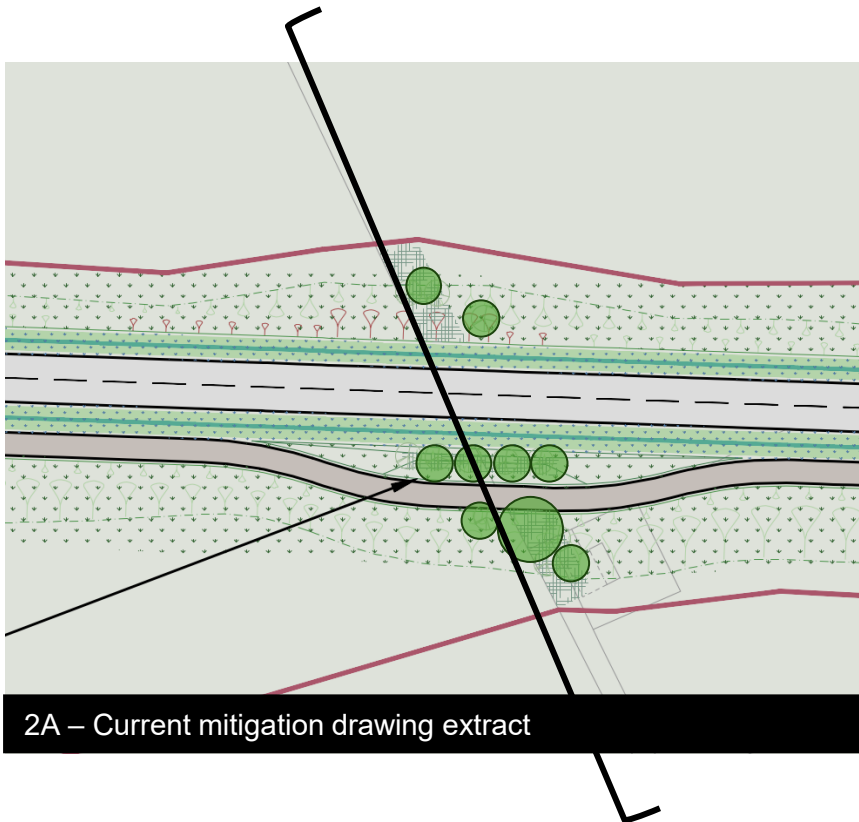
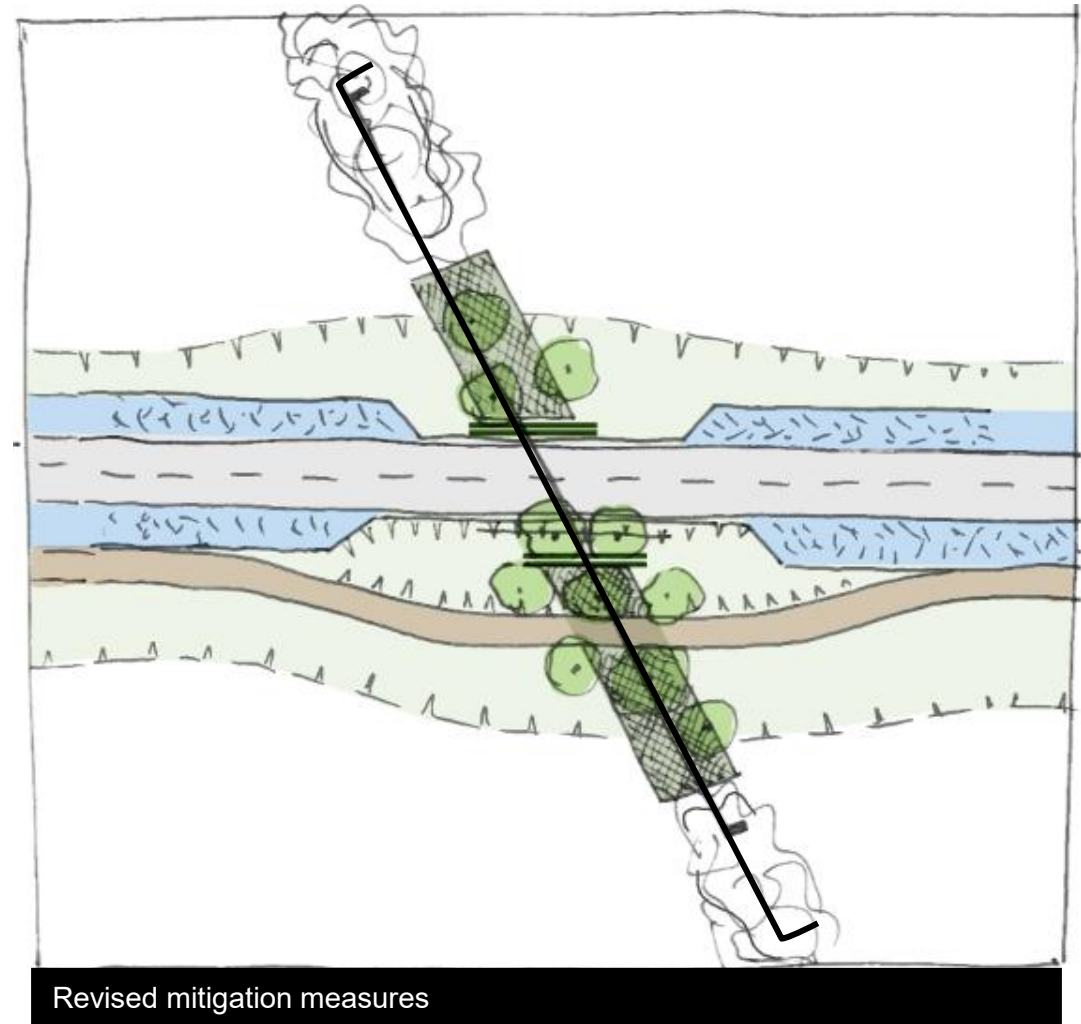
1. Mounds locally reshaped to minimise dim between trees
2. Vehicle visibility spays (to be kept clear)
3. Willow waffle fence + dense hedgerow (or greened fencing adjacent to private owned land)
4. Forgeable vegetation
5. Existing hedgerow
6. Red line boundary
7. Dashed line – current TWA topography



1A

Crossing point 6 – The ditch line southwest of Madingley Wood;

**INDICATIVE MITIGATION OPTIONS - SUBJECT TO DETAILED DESIGN AND FURTHER DISCUSSION WITH
NATURAL ENGLAND**

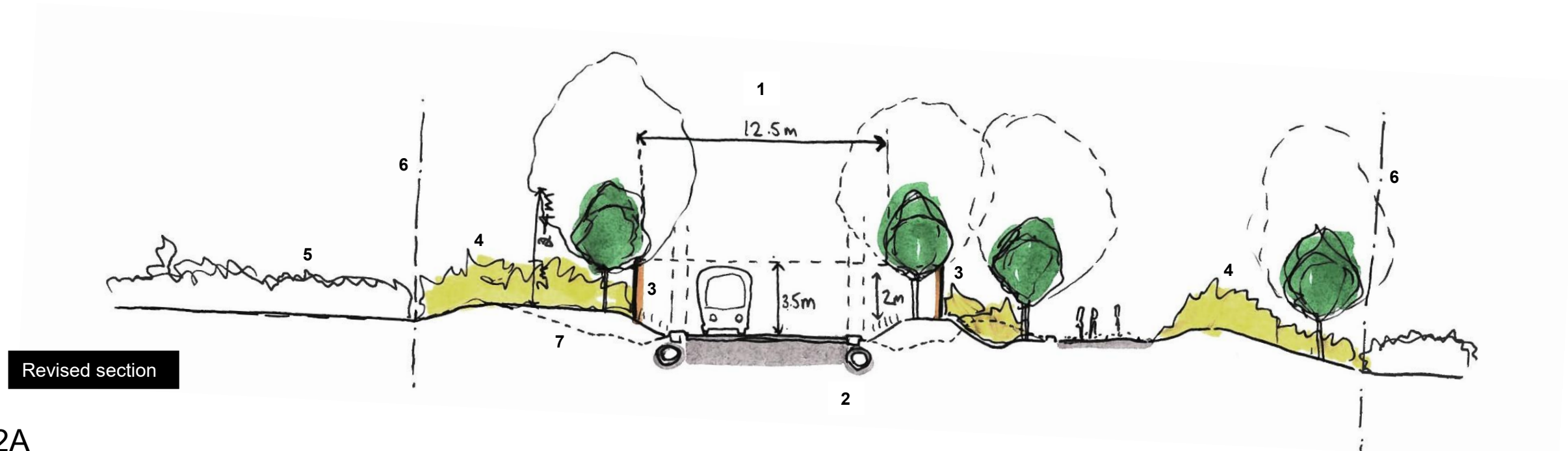


2A

Crossing point 16 and static point 10 - Hedgerow south of the American Cemetery and Madingley Wood;

INDICATIVE MITIGATION OPTIONS - SUBJECT TO DETAILED DESIGN AND FURTHER DISCUSSION WITH NATURAL ENGLAND

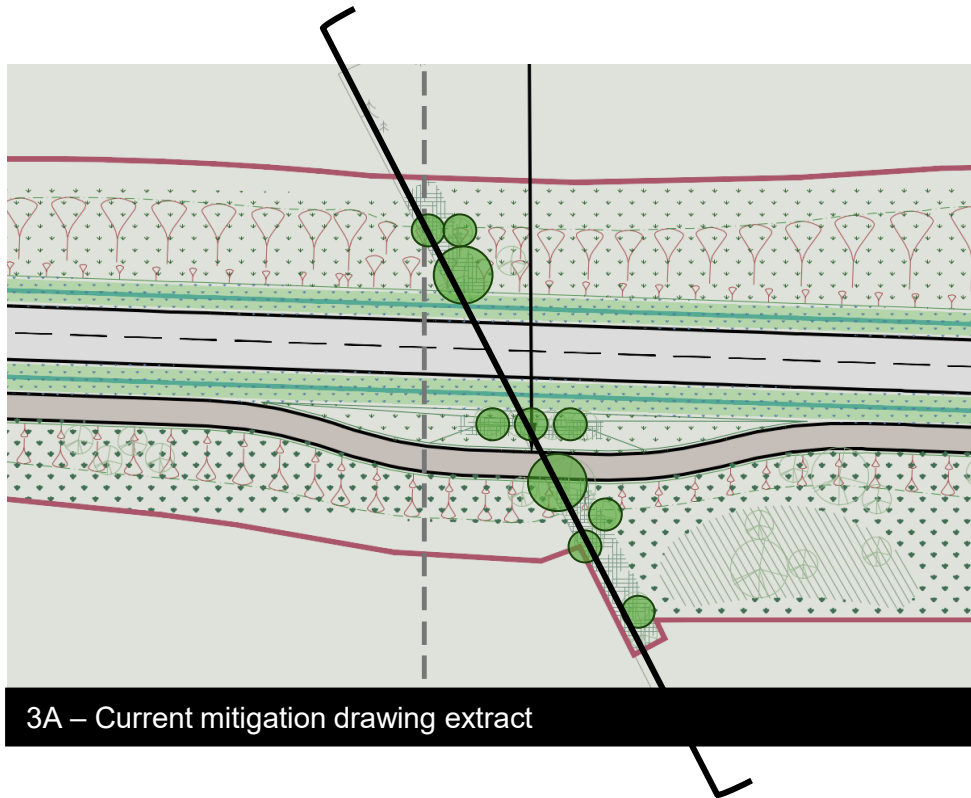
1. Mounds locally reshaped to minimise dim between trees
2. Channelled drains
3. Willow waffle fence
4. Forgeable vegetation
5. Existing hedgerow
6. Red line boundary
7. Dashed line – current TWA topography



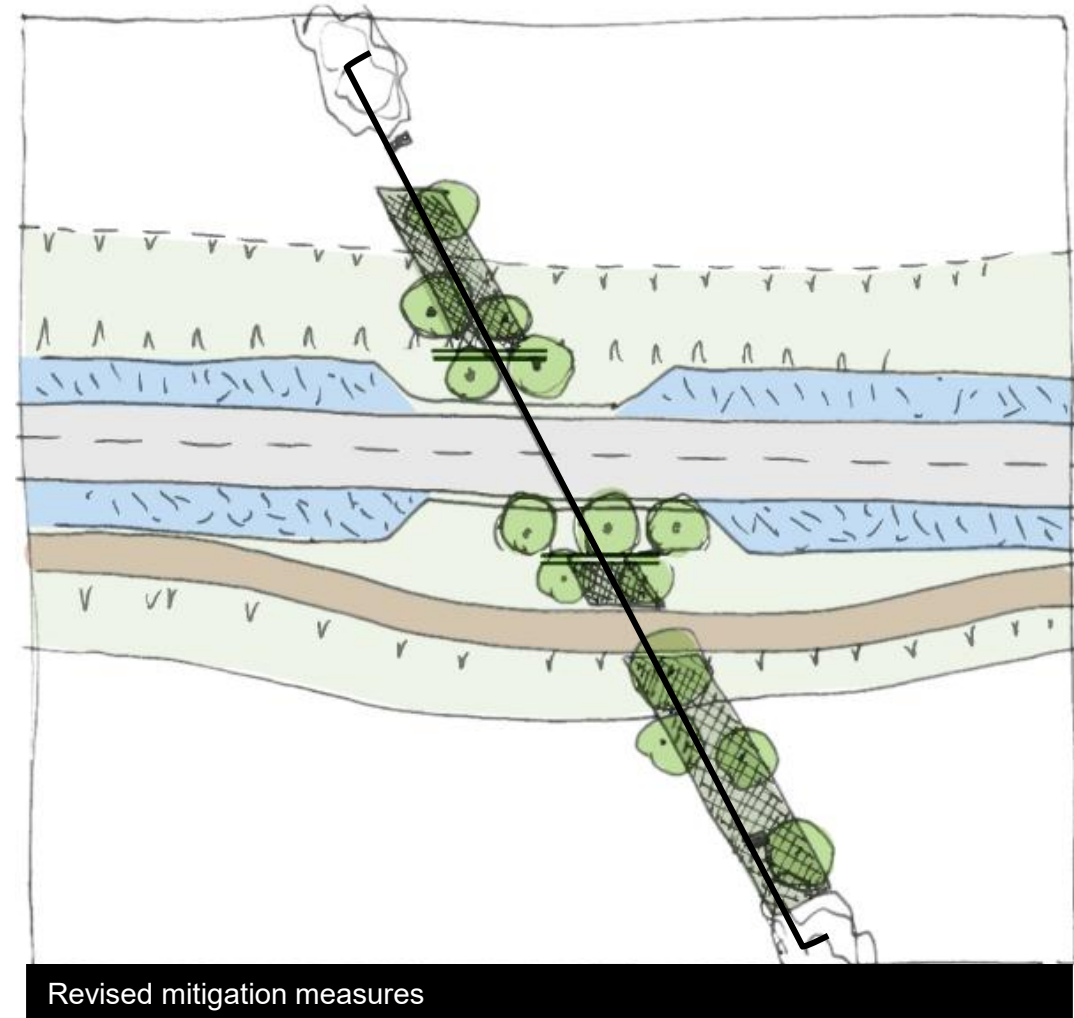
2A

Crossing point 16 and static point 10 - Hedgerow south of the American Cemetery and Madingley Wood;

INDICATIVE MITIGATION OPTIONS - SUBJECT TO DETAILED DESIGN AND FURTHER DISCUSSION WITH NATURAL ENGLAND

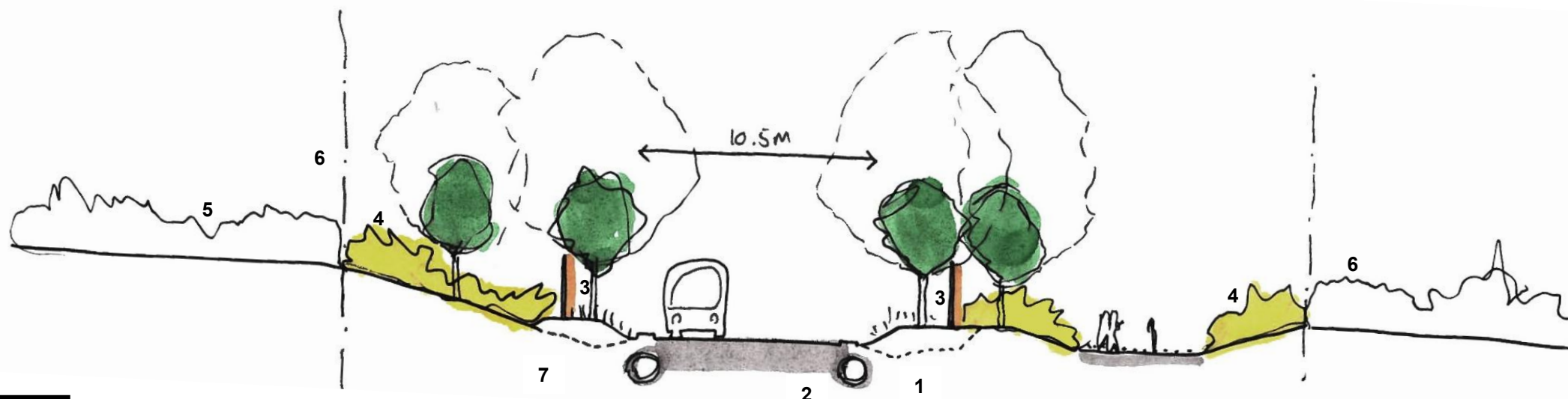


3A
 Crossing point 16 and static point 10 - Hedgerow south
 of the American Cemetery and Madingley Wood;



**INDICATIVE MITIGATION OPTIONS - SUBJECT TO DETAILED DESIGN AND FURTHER DISCUSSION WITH
 NATURAL ENGLAND**

1. Swales locally reshaped , swales > locally > channeled
2. Vehicle visibility spays (to be kept clear)
3. Willow waffle fence
4. Forgeable vegetation
5. Existing hedgerow
6. Red line boundary
7. Dashed line – current TWA topography

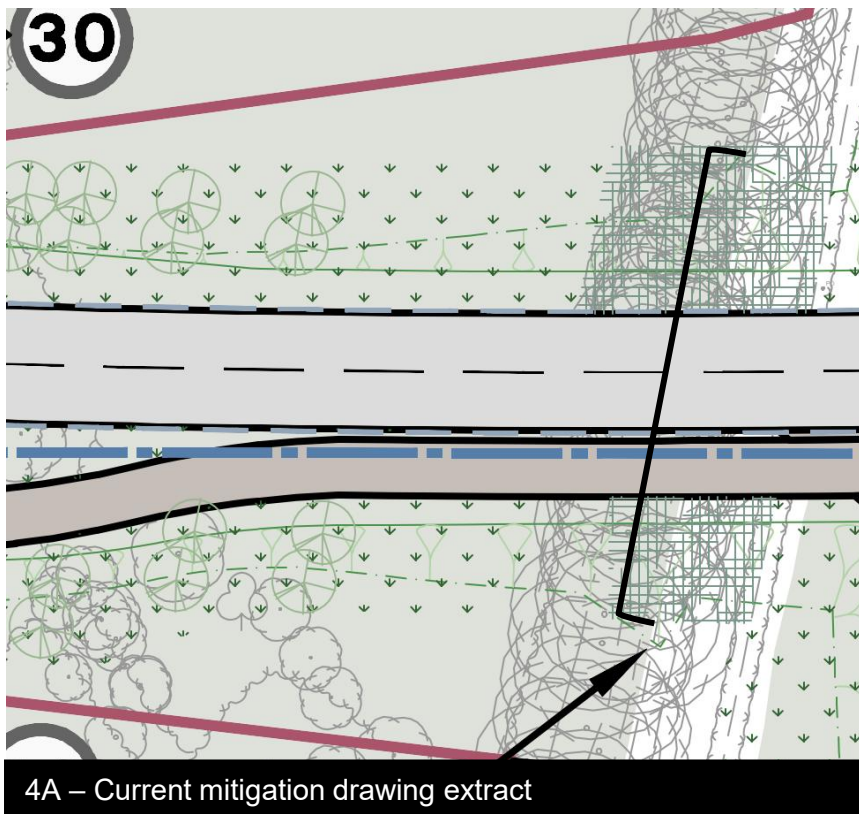
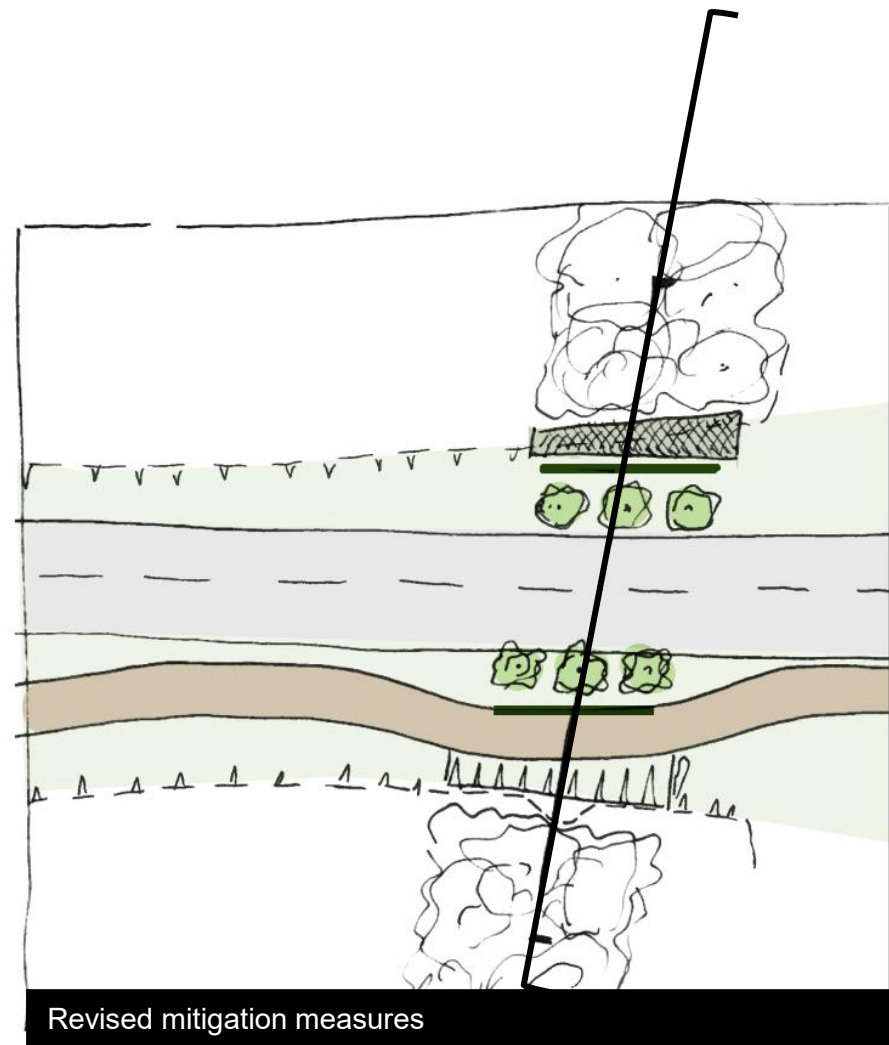


Revised section

3A

Crossing point 5 and activity transect 2, leg 3 – Hedgerow south of Madingley Windmill, north of Coton Primary School

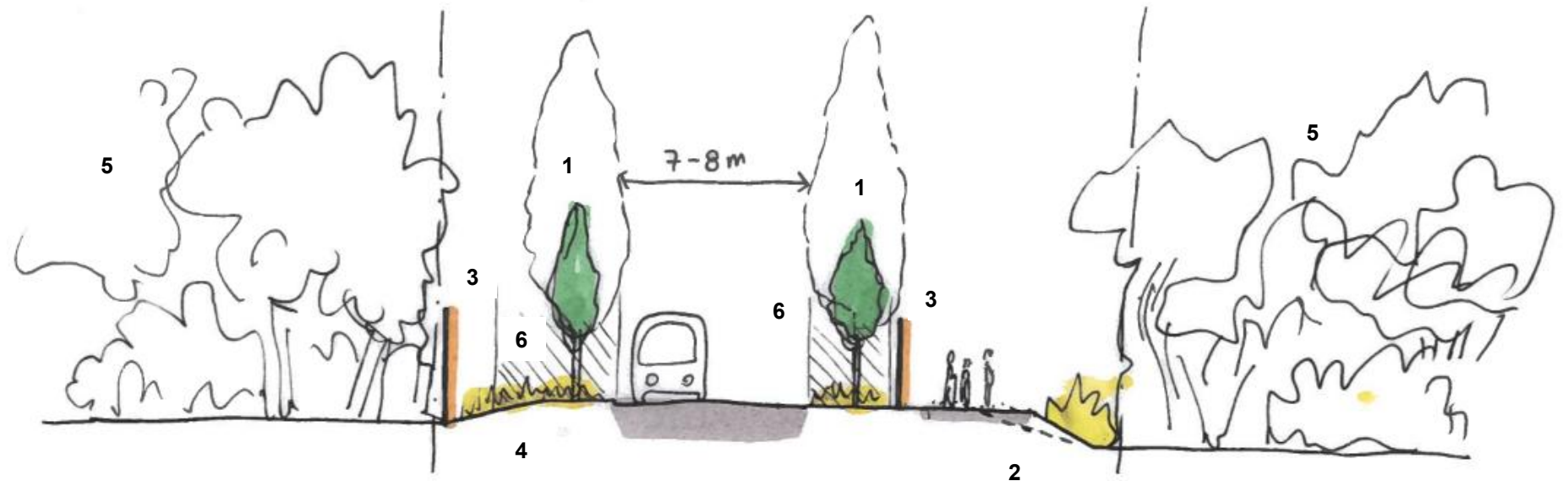
INDICATIVE MITIGATION OPTIONS - SUBJECT TO DETAILED DESIGN AND FURTHER DISCUSSION WITH NATURAL ENGLAND



4A
 Crossing point 2 and activity transect 3, leg
 4 – The eastern boundary of Coton Orchard.

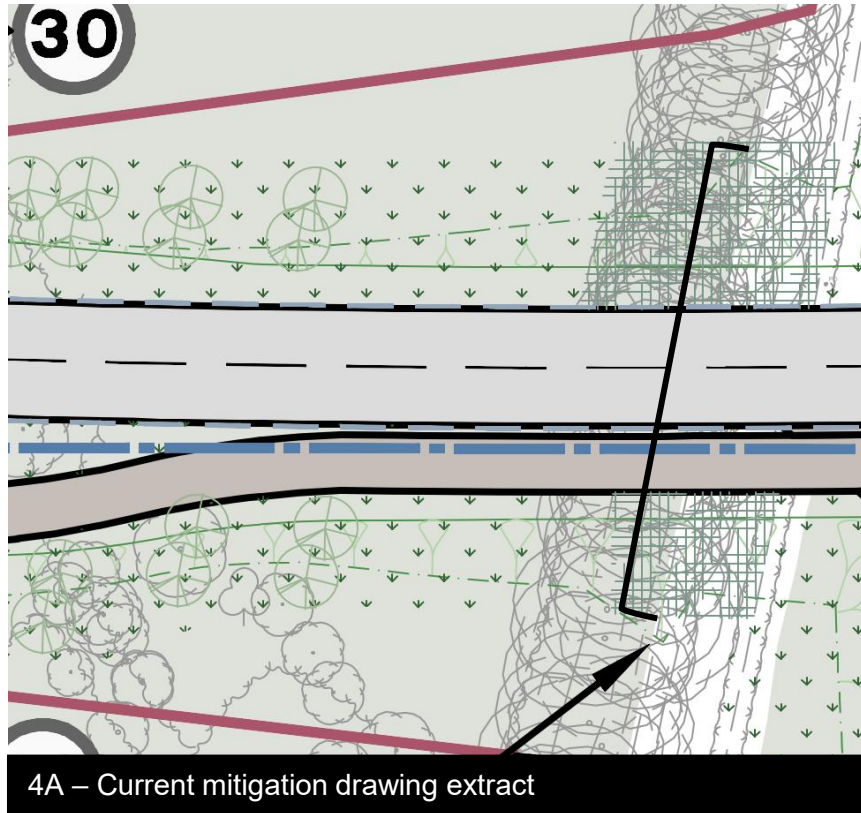
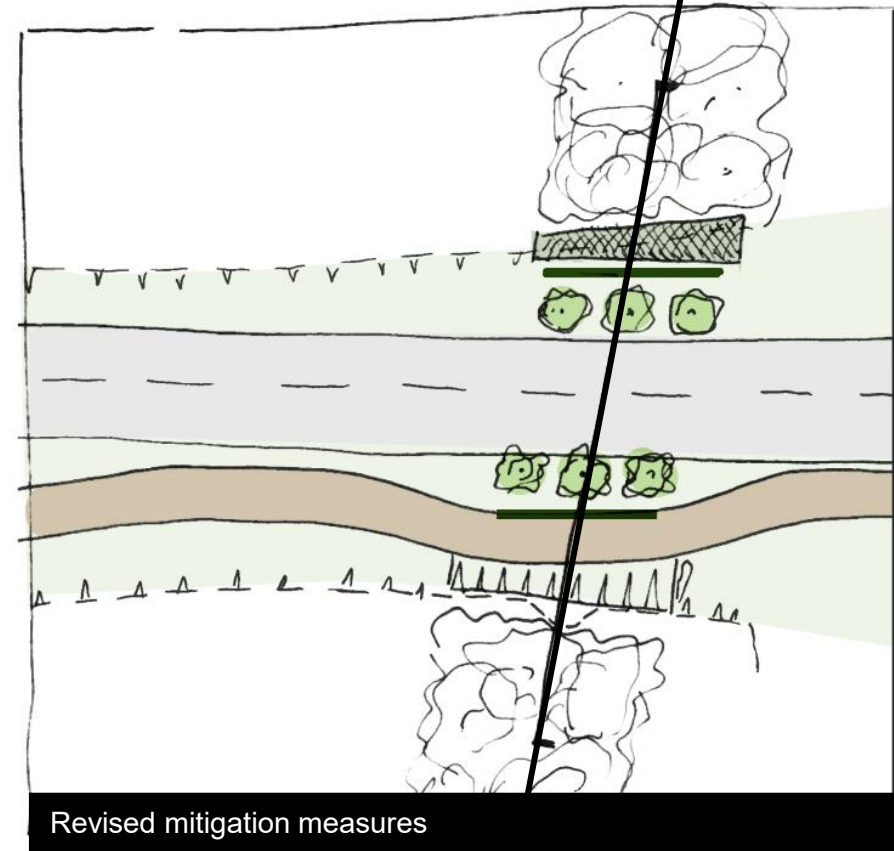
**INDICATIVE MITIGATION OPTIONS - SUBJECT TO DETAILED DESIGN AND FURTHER DISCUSSION WITH
 NATURAL ENGLAND**

1. Poplar (or similar with a 2m clear stem)
2. Mounds locally steepened (Dashed line – current TWOA topography)
3. Willow waffle fence (or similar)
4. Non-forgeable vegetation
5. Existing vegetation
6. Vehicle visibility spays (2m to be kept clear)



4A
Crossing point 2 and activity transect 3, leg 4 – The eastern boundary of Coton Orchard.

**INDICATIVE MITIGATION OPTIONS - SUBJECT TO DETAILED DESIGN AND FURTHER DISCUSSION WITH
NATURAL ENGLAND**



4A
 Crossing point 2 and activity transect 3, leg 4 – The eastern boundary of Coton Orchard.

**INDICATIVE MITIGATION OPTIONS - SUBJECT TO DETAILED DESIGN AND FURTHER DISCUSSION WITH
 NATURAL ENGLAND**

Fencing at localised
Crossing Points will need to
prevent foraging and be
structurally sound.



ISSUE	NATURAL ENGLAND'S POSITION	APPLICANTS POSITION	STATUS
4. Landscape treatments	<i>We strongly advise that 20m is much too wide for an effective crossing point, and request that the exact specifications and width of each crossing point be provided at this stage within a definitive plan.</i>	<p>We have reviewed the outline design and there is an option to narrow the distance between canopies by removing swales and introducing French drains. Distance between canopy widths would be between 7.5m and 16m at most.</p> <p>Noting that these distances follow the exact flightpath so are on an angle. Canopy to canopy using a perpendicular line from the bus route would be further reduced .</p>	TO BE DISCUSSED

Conclusions

Our analysis of earliest emerging bats shows: barbastelles are not active in the scheme until 2 hours after sunset and have typically returned to roost before sunrise and 6am start.

Our analysis on the probability of collision concludes it is very unlikely given:

- The operation of buses is between 6am and midnight with minimal overlap of bat/barbastelle activity, particularly in the summer breeding months.
- The frequency of the buses is low at 20 passes.

Furthermore, the radiotracking surveys from 2020 onwards show the local barbastelle population occupies woodlands widely across the area beyond the 10-51 barbastelles within E&W SAC and should be considered a stronghold.

Conclusions continued

A desk based assessment of bat flightpaths shows barbastelles are crossing existing infrastructure covering gaps of between 5-50m.

The landscape treatments are designed with minimum canopy width of 7.5m and 16m between canopys at most (this is following the angled flight path which is larger than a perpendicular straight line canopy to canopy).

The combination of low trigger for mitigation, low collision risk and mitigation design within the capabilities of bats means we conclude there will be no adverse effect on the integrity of the E&W SAC.

AOB / Questions



TECHNICAL NOTE 2

DATE:	23 July 2025	CONFIDENTIALITY:	Confidential
SUBJECT:	Bats and Collision Exposure		
PROJECT:	Cambourne to Cambridge	AUTHOR:	S.Proctor
CHECKED:	P.Reason	APPROVED:	G.Cookson

INTRODUCTION

As part of the ongoing liaison regarding the Cambourne to Cambridge Scheme (hereinafter referred to as the 'Scheme'), a meeting was held with Natural England on 09 June 2025 (June Meeting). The meeting was one of a series discussing Natural England's representations regarding the Scheme (correspondence dated 08 January 2025).

The June meeting discussed Natural England's comments regarding the risk of mortality from collision, caused by the Scheme; specifically:

- *Natural England 'disagree with the conclusion of paragraph 7.2.37 that there will be no adverse effects as a result of mortality from collisions. Given the low number of bats per colony, it may only take a handful of collisions to significantly reduce the population size of a colony. As stated above, the genetic health of one barbastelle colony is dependent on the genetic health of the colonies around it.'*
- *'We advise that an analysis of the timings of first and last bat pass registrations (relative to sunset and sunrise), particularly for barbastelles, should be carried out....'*

Information on the collision exposure of the Scheme was presented to Natural England in the June meeting, and this technical note provides a summary of the information provided.

The assessment below focusses on the orchard because this addressed specific concerns of stakeholders and it is where the busway cuts through green space rather than where the busway is online or alongside existing roads.

The calculations presented provide an overestimate of the collision exposure risk, for the following reasons:

- The assessment assumes uniform activity levels¹ and bat presence along the length of the bus route through the orchard i.e. that the bat activity levels recorded at fixed locations (Static locations 6, 7 and 8) on linear features within the Coton Orchard CWS could occur along the entirety of the orchard, even in the open grassland areas. However, collision risk is only relevant to specific locations i.e. where bat flight and the busway intersect.
- The assessment for each species does not take account of the survey sessions where no activity for that species was recorded².
- Flight height of bats recorded (activity which may have been above or below the collision risk zone) was not taken into account when determining bat presence; all bat registrations were used to estimate collision risk.
- Bats flying above 4m (as recorded for this Scheme) would be above the physical area of risk of collision, so these are excluded from the definition of the risk zone.

There is no agreed method for calculating risk of collision for bats with traffic. The model used here is as follows:

- corridor width and height define the available overlap zone;
- the Timing Risk Window (TRW – see below) defines temporal exposure; and

¹ In other words, it assumes that there is no localisation of activity i.e. that there is the same level of activity across the whole orchard footprint. This is unlikely, as some areas of the orchard are clearly less suitable than others, so risk is over-estimated.

² i.e. the figure used for mean activity is slightly higher than would be the case if all survey sessions that recorded no activity were included in that mean.

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- Bat activity.

COLLISION RISK CALCULATIONS

Setting the Scheme of Collision Risk

As part of the assessment, the Timing Risk Window (TRW), taken to be the overlap of between 'typical' bat activity and when buses are passing through the Scheme, was calculated to provide a proportionate view of the risk. A stage-by-stage breakdown of assessment is provided below (as presented at the June meeting), followed by a calculation of an 'collision exposure score' for different bat species.

STAGE 1

Planned bus movements along the Scheme are as follows:

- The buses run between 06:00 and 00:00, all year round
- Without taking bat activity into account, the TRWs are split:
 - Sunset to midnight.
 - Sunrise to 06:00 (excluding summer, when sunrise is prior to 06:00 so bat activity does not overlap with bus movements)

STAGE 2

The timing of 'typical' bat activity periods was taken into account to calculate the overlap with bus movements and assess the initial TRW for all species.

This demonstrates that the mean monthly **overlap period** between operational buses and bats is a much smaller window of:

- Spring: 4.08 hours April and 3.20 hours May
- Summer: 2.62 hours June, 2.77 hours July and 3.58 hours August
- Autumn: 5.32 hours September and 7.32 hours in October

The window in summer, which may represent a higher risk because of the presence of newly-flying juveniles, is the smallest of the three seasonal windows.

STAGE 3

To place the TRW into context, the time it would take for a single bus to travel through the orchard, using the current indicative speed limits, was calculated (see **Plate 1**). This assumes that the bus would not stop, and maximum speeds would be met (this would reduce the time a bus is present in the orchard but also overestimates the risk in terms of speed).

TECHNICAL NOTE 2

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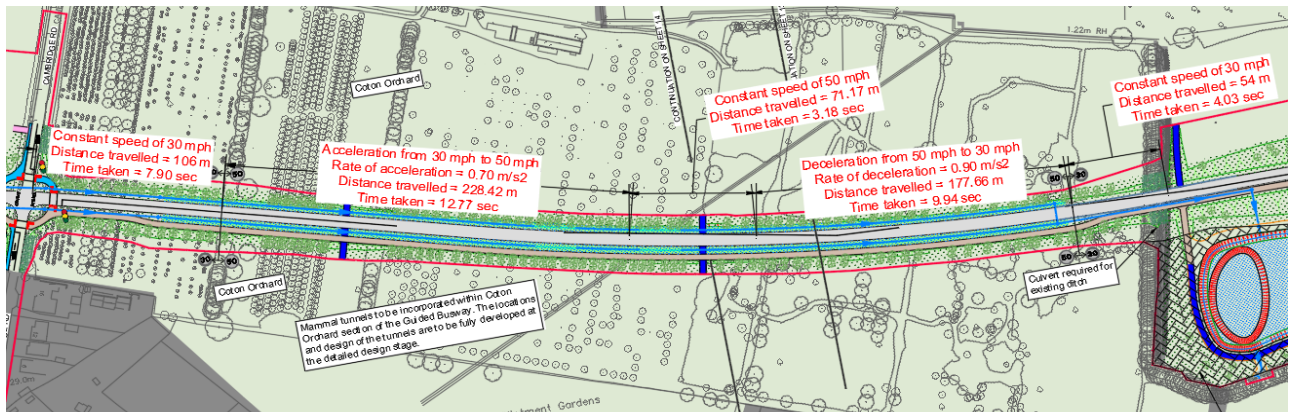


Plate 1: Coton Orchard CWS Calculation of Bus Speed

To define the TRW more specifically, the number of buses per hour to pass through Coton Orchard CWS (20 buses) is multiplied by the time for a single bus to pass through Coton Orchard CWS (38 seconds). Thus, the total time during which buses would be moving through the orchard collectively is 760 seconds per hour (though no more than two vehicles would be present at any one point within that hour, and for the majority of each hour (~80%) there would be none).

STAGE 4 – ALL BATS

The results from the Stage 2 and 3 calculations are then combined to assess the TRW for all bats in terms of the actual buses that would be travelling through the orchard during the overlap with periods when bats are active. These calculations are detailed in **Appendix A** Error! Reference source not found..

- Spring:
 - Of the 4.08 hours and 3.20 hours of an overlap window in April and May, respectively, the TRW is reduced to **0.86 hours during April** and **0.68 hours during May**.
- Summer:
 - Of the 2.62 hours, 2.77 hours and 3.58 hours of overlap window in June, July and August, respectively, the TRW is reduced to **0.55 hours during June**, **0.58 hours during July** and **0.76 hours during August**.
- Autumn:
 - Of the 5.32 hours and 7.32 hours of an overlap window in September and October, respectively, the TRW is reduced to **1.12 hours during September** and **1.54 hours during October**.

Importantly, whilst the length of each TRW (760 seconds) is represented as a block (the amount of time per evening that any one bus is travelling through Coton Orchard CWS), each TRW is actually a series of moments as a bus passes through (38s for each movement). This of course limits the likelihood of a bus and a bat being in the same place at the same time.

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IN RELATION TO BARBASTELLE

The above assessment assumes bats could be active from sunset and can be further refined in relation to actual records of each species' use of the orchard. This has been illustrated for barbastelle below.

To do this, static detector locations within Coton Orchard CWS (Locations 6, 7 and 8), were assessed for barbastelle registrations³. This assessment considered both the earliest barbastelle registrations within the orchard (after sunset, during the evening overlap period) and the presence of any barbastelle registrations during the morning overlap period.

For the second period, as noted above, average sunrise times are prior to 06:00am, so there is no overlap. However, even in the other two seasons, no barbastelle were recorded post 06:00am at any of the Coton Orchard CWS static detector locations. The theoretical TRW therefore only applies to the sunset period of overlap.

Within the orchard, the earliest registrations recorded in each month were:

- Spring Post-sunset:
 - 2.38 hours April; none recorded in May
- Summer Post-sunset:
 - Location 6: 2.73 hours July and August
 - Location 7: None recorded in July; 3.02 hours August
 - Location 8: None in June; 3.22 hours July; and 2.45 hours August
- Autumn Post-sunset:
 - Location 6: 2.75 hours September; 3.18 hours October
 - Location 7: 3.15 hours September; 2.52 hours October
 - Location 8: 3.33 hours September; 3.38 hours October

As bat activity is inherently variable (within limits), these figures are considered informative and not definitive. For the months where no overlap was recorded, an absence of records in any one month does not necessarily indicate that bats are always absent in that month. In addition, surveys being undertaken in summer 2025 using thermal imaging cameras confirms that bats leave Madingley Wood well after dark (earliest record at the time of writing is approximately 1.5 hours after sunset). Thus, the typically late arrival (with respect to sunset) of barbastelle at Coton Orchard does reduce the TRW still further. However, Natural England raised a concern that earlier registrations do/could occur on occasion; therefore, in the calculations that follow, the TRW has therefore NOT been reduced to take late arrival into account. This inflates the (low) risk of collision.

³ In response to a question raised by Natural England: the static detector data taken from the Coton Orchard CWS were used to inform these calculations as it based on consistent/measured periods of time (and therefore a repeatable survey measure). Crossing-point data was not taken into consideration as it gathers behavioural data, and represented a low number of individual bats.

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STAGE 5

Activity levels (i.e., static detector registrations per hour (RPH)) vary between species. Taking these into account, a calculation was made for each of the 'higher' and 'medium' risk species recorded in Coton Orchard CWS⁴. These were barbastelle, *Myotis* spp., brown long-eared bat (BLE), serotine, common pipistrelle and soprano pipistrelle.

For all except pipistrelle species, static detector activity levels (Location 6, 7 and 8) were all below 1 RPH.

Table 1 details the RPH for each of the higher and medium risk species for each static location within the orchard across all months.

Table 1: Stage 5 All Bats: Registrations Per Hour

Location	Month	RPH*					
		BARBAR	MYOSP	BLE	EPTSER	PIPPIP	PIPPYG
6	April	0.17	0.08	0.20	0.18	4.45	4.26
	May	0.17	0.08	0.20	0.18	4.45	4.26
	June	0.17	0.08	0.20	0.18	4.45	4.26
	July	0.15	0.08	0.10	0.18	4.45	1.98
	August	0.07	0.02	0.12	0.05	1.79	1.26
	September	0.06	0.06	0.20	0.04	3.61	4.26
	October	0.17	0.06	0.05	0.00	0.52	0.75
7	April	0.26	0.12	0.14	0.09	3.04	2.31
	May	0.26	0.12	0.14	0.09	3.04	2.31
	June	0.26	0.12	0.14	0.09	3.04	2.31
	July	0.03	0.07	0.05	0.07	2.31	2.31
	August	0.05	0.12	0.14	0.09	2.30	1.65
	September	0.26	0.00	0.02	0.06	3.04	1.37
	October	0.05	0.11	0.06	0.00	0.67	0.65
8	April	0.10	0.07	0.15	0.00	20.11	11.74
	May	0.00	0.00	0.02	0.00	1.67	0.12

⁴ Lower-risk species are those that tend to fly at height e.g. *Nyctalus*.

TECHNICAL NOTE 2

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Location	Month	RPH*					
		BARBAR	MYOSP	BLE	EPTSER	PIPPIP	PIPPYG
	June	0.00	0.07	0.05	0.00	19.16	11.74
	July	0.06	0.00	0.06	0.00	20.11	3.26
	August	0.10	0.02	0.15	0.00	8.37	3.25
	September	0.04	0.02	0.13	0.00	7.85	2.15
	October	0.05	0.02	0.06	0.00	7.73	0.46

* Where no bat registrations were recorded, the RPH was recorded as zero. However, using the Precautionary Principle, where no data was collected due to equipment failure or lack of access, the highest count recorded in other months was substituted.

Additionally, to address the fact that pipistrelle registrations can vary significantly between months, the mean RPH was calculated for common and soprano pipistrelle, across Locations 6, 7 and 8, across all months. This equates to 5.34 RPH and 2.31 RPH for common pipistrelle and soprano pipistrelle, respectively.

Collision Exposure Score

The information in Stages 1 to 5 set out the calculations that determine the TRW for each species. The TRW is then used in combination with the bus-pass duration, and recorded bat activity to generate a Collision Exposure Score.

This collision assessment will be an overestimate of risk, as it assumes uniform activity levels across the entire orchard. However, collision risk would only be at specific locations. The risk area also doesn't take account of the survey sessions where no activity for that species was recorded². Additionally, flight height (in or out of risk zone) is not taken into account.

The calculations used to inform this assessment are set out in **Table 2**.

Table 2: Calculations to inform collision risk

Factor	Formulae	Results
Bus presence	$= \frac{\text{Time to pass through the orchard (seconds)}}{\text{seconds in an hours/bus journeys per hours}}$	$\frac{38 \text{ Seconds}}{3600 \text{ seconds}/20} = 0.21$
Risk of bat presence during bus presence	$= \frac{\text{species registrations per hour}}{\text{bus passes per hour (i.e.20)}}$	Specific to each species: see Table 3: Collision Exposure Score Calculation per Species

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Collision Exposure Score = 0.21 (bus presence) x bat presence (specific to each species)

Table 3: Collision Exposure Score Calculation per Species

RPH - Group	Species	RPH	Bat Presence	Bus Presence	Collision Exposure Score
Highest	Barbastelle	0.26	0.013	0.21	0.003
Lowest		0.03	0.0015	0.21	0.0003
Highest	<i>Myotis</i>	0.12	0.006	0.21	0.001
Lowest		0.02	0.001	0.21	0.0002
Highest	BLE	0.20	0.01	0.21	0.002
Lowest		0.02	0.001	0.21	0.0002
Highest	Serotine	0.18	0.009	0.21	0.002
Lowest		0.04	0.002	0.21	0.0004
Highest	Common pipistrelle	20.11	1.0055	0.21	0.212
Lowest		0.52	0.026	0.21	0.005
Mean		5.34	0.267	0.21	0.056
Highest	Soprano pipistrelle	11.74	0.587	0.21	0.124
Lowest		0.12	0.006	0.21	0.001
Mean		2.31	0.116	0.21	0.024

Table 3 details the highest and lowest risk of at least one bat being in the **vicinity** of a bus once within an hour, during the TRW. The levels for common and soprano pipistrelle are higher than for other species, thus additional calculations were undertaken to set these in context.

- For common pipistrelle, there were two occasions across all three static detector locations where this higher level of activity was recorded, namely: June Location 8 at 19.16 RPH; and July (also Location 8) at 20.11 RPH.
- For soprano pipistrelle, this higher level of activity was recorded at a single location and a single month, namely: June Location 8 at 11.74 RPH.

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If the activity is averaged out across all locations for the July peak noted above for common pipistrelle, this reduces the activity level to 7.07 RPH from 20.11, resulting in a Collision Exposure Score of 0.07 from the 0.212.

As per **Table 3**, assessing the Collision exposure score as an average across the entire summer survey season reduces the risk for both pipistrelle species, to 0.056 for common pipistrelle and 0.024 for soprano pipistrelle. For all other species at all other times, the risk is extremely low.

Further considerations

The risk of collision based on the above is already very low but is considered an over-estimate. As noted within the introduction:

- The assessment assumes uniform activity levels, therefore, 'bat presence as recorded within the orchard' to determine risk, i.e. that any bat recorded within the Coton Orchard CWS could collide with a bus. However, collision risk is only relevant to specific locations i.e. where bat flight and the busway intersect.
- The assessment for each species does not take account of the survey sessions where no activity for that species was recorded (i.e. bat activity is variable, but the maximum recorded on any one occasion has been used), and all bats recorded have been assumed to be 'at risk' i.e. in the location of the busway, and at a height where collision could occur. Both these factors inflate the risk because not all bats will be within or adjacent to the busway, nor flying below 4m.
- No avoidance action is assumed. Collision would not be the inevitable result of a bat and a bus being in proximity.
- No mitigation is considered.

CONCLUSION

Mitigation in the form of landscape crossing features is designed to provide safe crossing-points. A low threshold has been used to select the location of these mitigation features, with features being implemented wherever a commuting barbastelle has been recorded (as in, wherever at least one barbastelle registration was detected). The combination of the low threshold of implementation, and the landscape structure's design, further reduces the risk of collision.

Finally, the impacts of mortality on the local (and wider) barbastelle population, should any occur, would also be moderated by the fact that the population appears widespread and robust.

The combination of the very low collision risk, the low threshold triggering mitigation and the mitigation design, as well as the robust nature of the local and wider populations, means we conclude there will be no adverse effect on the favourable conservation status of barbastelle and other bat species and no adverse effect on the integrity of the Eversden and Wimpole Bat SAC. This note supports the conclusions detailed



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within both the Environmental Statement Technical Report 5: Ecological Impact Assessment (EclA) and Technical Report Appendices 5.11 (Statement to Inform Habitats Regulations Assessment Habitat Risk Assessment).



APPENDIX A

DATE:	09 June 2025	CONFIDENTIALITY:	Confidential
SUBJECT:	Bats and Collision Exposure		
PROJECT:	Cambourne to Cambridge	AUTHOR:	S.Proctor
CHECKED:	P.Reason	APPROVED:	G.Cookson

Table 4: Stage 2 and Stage 4 - All Bats: TRW Calculation

Location	Month	Buses per hour	Bus Start	Bus End	Mid-Month Sunset	Mid-Month Sunrise	Dusk Overlap (sunset to midnight (Hrs))	Dawn Overlap (Bus Start to Dawn (Hrs))	Combined Overlap (Hrs)	No. Buses During Dusk Overlap	Risk Time Across overlap window- Dusk (Hrs)	Risk Time Across overlap window - Dawn (Hrs)	Combined Risk Window (Hrs)
6	April	20	06:00	00:00	19:58	06:03	4.03	0.05	4.08	81	0.85	0.0106	0.86
	May	20	06:00	00:00	20:48	05:05	3.20	0.00	3.20	64	0.68	0.0000	0.68
	June	20	06:00	00:00	21:23	04:38	2.62	0.00	2.62	52	0.55	0.0000	0.55
	July	20	06:00	00:00	21:14	04:57	2.77	0.00	2.77	55	0.58	0.0000	0.58
	August	20	06:00	00:00	20:25	05:43	3.58	0.00	3.58	72	0.76	0.0000	0.76
	September	20	06:00	00:00	19:15	06:34	4.75	0.57	5.32	95	1.00	0.1196	1.12
	October	20	06:00	00:00	18:06	07:25	5.90	1.42	7.32	118	1.25	0.2991	1.54
7	April	20	06:00	00:00	19:58	06:03	4.03	0.05	4.08	81	0.85	0.0106	0.86
	May	20	06:00	00:00	20:48	05:05	3.20	0.00	3.20	64	0.68	0.0000	0.68
	June	20	06:00	00:00	21:23	04:38	2.62	0.00	2.62	52	0.55	0.0000	0.55
	July	20	06:00	00:00	21:14	04:57	2.77	0.00	2.77	55	0.58	0.0000	0.58
	August	20	06:00	00:00	20:25	05:43	3.58	0.00	3.58	72	0.76	0.0000	0.76
	September	20	06:00	00:00	19:15	06:34	4.75	0.57	5.32	95	1.00	0.1196	1.12
	October	20	06:00	00:00	18:06	07:25	5.90	1.42	7.32	118	1.25	0.2991	1.54
8	April	20	06:00	00:00	19:58	06:03	4.03	0.05	4.08	81	0.85	0.0106	0.86
	May	20	06:00	00:00	20:48	05:05	3.20	0.00	3.20	64	0.68	0.0000	0.68
	June	20	06:00	00:00	21:23	04:38	2.62	0.00	2.62	52	0.55	0.0000	0.55
	July	20	06:00	00:00	21:14	04:57	2.77	0.00	2.77	55	0.58	0.0000	0.58
	August	20	06:00	00:00	20:25	05:43	3.58	0.00	3.58	72	0.76	0.0000	0.76
	September	20	06:00	00:00	19:15	06:34	4.75	0.57	5.32	95	1.00	0.1196	1.12
	October	20	06:00	00:00	18:06	07:25	5.90	1.42	7.32	118	1.25	0.2991	1.54

Appendix 5: Outputs from ‘July meeting’ (issued to Natural England)

5.1 Minutes

5.2 Presentation

MEETING NOTES

PROJECT NUMBER	Project number	MEETING DATE	16 July 2025
PROJECT NAME	Cambridge To Cambourne	VENUE	MS TEAMS
CLIENT	Greater Cambridge Partnership	RECORDED BY	Abbey Haycock
MEETING SUBJECT	Cambridge to Cambourne TWAO – Meeting on Lighting		

PRESENT	GCP: Jo Baker (JB) Natural England: Nick Downs (ND) and Catherine Duerden (CD) WSP: Graham Higgins (GH), Gemma Cookson (GC), Abbey Haycock (AH), Stuart Morton (SM) RSK: Paola Reason (PR)
APOLOGIES	Ian Ellis; Sarah Proctor; Justin Tilley
DISTRIBUTION	As above
CONFIDENTIALITY	Public

ITEM	SUBJECT	ACTION	DUE
1	Introductions [These minutes should be read in conjunction with the presentation slide deck (attached pdf); reference to the relevant slide is made throughout this document e.g. Slide 1/57].		
1.1	GC introduced the presentation and ran through the meeting agenda [Slide 2/57]. GC welcomed SM from the lighting team and introduced Natural England (NE).		
2	Past topics and points of discussion		
2.1	GC discussed past actions. It was acknowledged that NE requested further surveys or mitigation within the orchard. GC confirmed there is no access to Coton Orchard to undertake further surveys, but within the ES , we have acknowledged Coton Orchard's potential importance and committed to mitigation. [Post-mtg note: WSP responded to NE 's responses to the 'April meeting' in an attachment to the 'June meeting' minutes, issued 25 June 2025]		
2.2	GC raised that WSP have conducted a Collision Risk analysis which takes into account when bats are generally active on the scheme (barbastelle are late emerging from woodlands) and the limited bus operation (20 buses per hour which stop at midnight) The risk assessment [based on the orchard where		

	<p>NE had expressed the greatest concerns] concludes there is a very low risk of collision.</p> <p>[Post-mtg note: the minutes of the previous meeting and associated Technical Note 2: Collision risk was issued to NE on 25/07/2025.]</p>		
2.3	GC introduced SM and referenced his past experience with bats and lighting design [Slide 4/57].		
2.4	<p>SM set out the meeting aims [Slide 5/57].</p> <ul style="list-style-type: none"> • Overview of Natural England's Representation on Lighting. • Overview of HSE ruling and applicability to this discussion. • Summarise our aspirations for lighting provision. • Review existing bat activity in the area. • Review existing lighting in the area. • Review proposed lighting in the area. • Line by line response for each of NE's representations. • Agree next steps. 		
3	Introduction to Lighting Existing and Proposed		
3.1	<p>GC summarised NE representation on lighting [Slide 6/57] and noted that NE would have an opportunity to review and approve detailed lighting plans produced by GCP.</p> <p>The 'crossing points' on the busway [i.e. where landscape treatments are proposed] have no change in baseline lighting - not just mitigation buffering - in line with NE's representation.</p>		
3.2	<p>SM spoke about a recent ruling from HSE [Slide 7/57] and that Cambridge County Council (CCC) were fined £6 million for safety failings leading to fatalities regarding the operation of an existing busway.</p> <p>Risks included the public seeking to cross busway at dangerous points, and a fatality occurred from a pedestrian struck at an unlit site.</p>		
3.3	<p>SM mentioned avoiding the provision of lighting is a first principle, and lighting would only be applied or extended where there is a clear safety case. [Slide 8/57]</p> <p>SM outlines the principles that GCP will follow, which align with ILP GUIDANCE NOTE 08/23 BATS AND ARTIFICIAL LIGHTING AT NIGHT. Above all, to be responsible with lighting provision.</p>		

<p>3.4</p>	<p>SM introduced the existing lighting baseline with satellite images of the CtoC Scheme. [Slides 9-12/57]</p> <p>The Scheme area is primarily dark but there are significant local areas of illumination, and assets are a mixed range of light sources, with some types now known not to be good for wildlife such as compact fluorescent lighting. SM noted that CCC are upgrading to LED warm white light; the degree of warmth will vary depending on location. In addition, lights (as current practice and in future) are dimmed across the County from 10pm - 6am to 60%</p> <p>SM introduced the Proposed Lighting Baseline to understand the impact of existing scheme</p> <p>Intense areas include Cambridge University.</p> <p>SM marked existing lighting along the route:</p> <p>Green shows existing lighting operation present, which will be retained.</p> <p>Red shows proposed- illustrating that these are limited in location/extent</p> <p>Blue - proposed retention of unlit areas</p> <p>Slide 11/57</p>		
<p>3.5</p>	<p>SM said that Satellites rely on reflectivity, line-of-sight and how cameras interpret the visual light spectrum, which is why we have to undertake site visits still [Slide 13/57].</p> <p>The Lighting team undertook site visits on 2nd and 3rd July 2025 in line with standards and best practice guideline; these visits were critical to understanding the night-time environment. For example: the Cambridge War Memorial shows as dark on satellite imagery but is lit on site.</p> <p>An illuminance meter was used to establish and understand current baseline levels of illumination and ambient lighting in the area.</p> <p>The ecology team also did a night-time drive-through on 30 June (from sunset to midnight).</p>		
<p>4.0</p>	<p>Areas of ecological sensitivity</p>		
<p>4.1</p> <p>Note that Slide 16 has been redacted for inclusion in Proof of Evidence</p>	<p>GC set out NE's further Representations on Lighting [Slide 14/57] and explained areas of ecological sensitivity based on radio tracking data:</p> <ul style="list-style-type: none"> • Highfields - Caldecot / Hardwick • Madingley SSSI <p>Gc noted that NE's concerns for Coton Orchard have also been taken on board.</p> <p>She reiterated that the area west of Cambridge is particularly dark, and bats do cross the area by crossing roads, and most of the busway will be unlit.</p>		

4.2	<p>From the 'ecology night-drive', it was observed that the area west of Cambridge [Slide 17/57] has plenty of mature tree-lined avenues, with streetlighting, but with dark areas for barbastelles to move through. Presence here is confirmed by barbastelle records from both radiotracking (SACO) and from GCP static data.</p> <p>West of the city and the wider road network has densely vegetated verges of mature trees (up to 20m tall at Madingley) and scrub, which appear to form a significant barrier to street lighting, forming a dark corridor on the unlit side away from the road. Edge-adapted bats such as Barbastelle, can use these dark areas [Slide 18/57]. The lux level readings behind these densely vegetated areas are much reduced, and well below tolerable limits of bats (e.g. dark corridor stipulated to be at most 0.5 Lux by ILP, Emma Stone)</p>		
5	Lighting- Highfields /Caldecot / Hardwick		
5.1	<p>A key ecologically sensitive area [Slide 19/57], as there is confirmation of bat flight paths from radiotracking in area. The vegetation appears to be forming a barrier against lighting here.</p>		
5.2	<p>SM stated there is a H&S need to extend lighting on the northwestern arm of roundabout to around 120m, to cover the conflict area with busway intersecting on existing road.</p> <p>Everything blue on the image will remain dark. [Slide 20/57]</p>		
5.3	<p>JB stated that south-west of this junction is the consented Bourn Airfield development, where there will be a large increase of lighting (this is outside of the busway footprint).</p>		
5.4	<p>SM said the East will remain clear, and to the west we're not lighting the bus way at all, consistent with the Bourn Airfield dark corridors. [Slide 21/57]</p>		
5.5	<p>GC said that [on Slide 21/57] barbastelle are moving in this area [REDACTED]</p> <p>The new development to the west incorporates a dark corridor around its perimeter. The Lighting Design ensures that existing and proposed lighting don't form a barrier and there is wider landscape permeability.</p>		
5.6	<p>SM WSP have conducted light surveys in the area [Slide 22/57]; Points 3, 6 and 7 are on the existing illuminated highway, and coming in at 12 LUX, which is standard. The lighting is going where it should be.</p>		
5.7	<p>GC said that there is a dark area behind the lit roundabout, taken near point 4 [Slide 19/57] which is showing at 3-4 LUX at 1.5m and 8.14 at ground-level In the dark area behind, the readings were 0.9, 0.8, 0.1; that is a dramatic decrease not far back from the roundabout, so bats can avoid the lighting here.</p>		

5.8	<p>SM stated that the roundabout is illuminated to current standards, between 10pm & 6am the lighting dims to 60% output, and WSP are not expecting any construction lighting during the 'active bat season'.</p> <p>Where there is a safety case <u>and</u> legislated species in area, the first point-of-call is to lower light levels to 7.5 LUX Expect lighting to be turned on 4.5, 1/3rd of existing lighting.</p> <p>WSP will reach an agreement with CCC on specification, lower light levels and reduction in blue light</p>		
5.9	<p>GC said that even when GCP combine existing and proposed lighting, lit areas are sufficiently localised enough for bats to navigate through the landscape.</p> <p>Slide 23/57 summarises the situation at Hardwick, and notes:</p> <p>Bats can continue to move through a wider dark permeable landscape.</p>		
6	Lighting - Long Road and Madingley [Slides 24-29/57]		
6.1	<p>ND asked how the lighting proposals relate to the bats current crossing behavior, ensuring bats can continue to do what they are currently doing. If not, is there a sensible alternative that doesn't affect current behaviour.</p>		
6.2	<p>SM noted that this is a challenging area: lighting on the junction needs to mitigate the safety issues posed by driving at night (important not to pass through rapidly alternating lit and dark areas so that eyes can adjust), so the lighting has to extend between junctions here. [Slide 25/57 and Slide 26/57]</p>		
6.3	<p>GC stated that this lit junction is outside of the home range and core foraging of the Madingley bat colony, but static data shows barbastelle bats still move east-west and north-south in this junction area.</p> <p>It is hard to perceive from plan-view images. However, on driving through at night (important to do), there are extensive mature trees and dense vegetation on the approach to Madingley roundabout. Barbastelles are moving along these dark vegetated areas.</p>		
6.5	<p>SM stated that at this proposed junction there are currently no street lights at the junction of St Neots and Long Road.</p> <p>GC added that the dark corridor north of St Neots road will remain unlit enabling continued east-west movements. Also the area immediately south of Madingley SSSI will remain unlit enabling continued north-south movements, ensuring barbastelles can still move through the wider landscape</p>		
6.6	<p>SM summarised the situation at Madingley [Slide 29/57], and noted:</p> <p>Bats can continue to move through a wider dark permeable landscape.</p>		

7	Lighting – Coton [Slide 30/57]		
6.1	SM introduced the impacts on the Coton stage of the busway; on the adjacent Cambridge Road, lighting is by fluorescent lamps which is a bit outdated (not many around anymore). WSP is keen to avoid ultra violet light so will be specifying LEDs.		
6.2	SM stated the existing lighting needs to be extended slightly to ensure potential areas of conflict and bus stops are lit, to prevent fatalities in these areas.		
6.3	GC says that landscape treatments for bat crossing will remain unlit enabling north south movements in the wider area. [Post Meeting Note: Following a review of the data the lighting within crossing point locations 9 and 18 will need to be reviewed, which will be subject to detailed design].		
6.4	SM introduced the results of the light survey [Slide 32/57] showing 9.5 LUX under the fluorescent lights at Cambridge Road at Coton Orchard.		
6.5	GC noted that, on the other, unlit side of the hedgerow at this location (there was no lighting in orchard), there was bat activity. The static at this location (Cambridge Road at Coton Orchard on the other side of the lit hedgerow) recorded NO barbastelle registrations/night (RPN) in winter and a peak of 1.2 barbastelle RPN per night in August. To put this in context, at a comparable time and month in Madingley (within the home range where our landscape treatments are, 15.4 RPN were recorded. The crossing-point surveys here recorded a peak of three commuting common and soprano pipistrelle, but no commuting barbastelle.		
6.6	There will be no other lighting in the orchard and none of the landscape treatments will be lit enabling bat movements north-south, and east west.		
6.7	SM summarised the situation at Coton [Slide 33/57] , and noted: Bats can continue to move through a wider dark permeable landscape.		
7	Response to NE's representations		
7.1	GC summarised GCP response to NE Issue 1 [Slide 34/57] <i>NE request to see and approve detailed lighting plans and strategies for both construction and lighting (etc).</i> Slide 34/57 summarises GCP's response to date. Overall, there is significant but localised lighting in a predominantly dark landscape. Lighting plans will be part of a planning condition; these will continue to evolve through		

	discussions with Cambridgeshire County Council where there are ecologically sensitive areas.		
7.2	<p>[Slide 35/57 and 38/57] <i>Crossing point should be shown to have no change from the baseline and there just shouldn't be just some mitigation</i></p> <p>GCP can confirm that there is no lighting proposed at locations where there are landscape treatments, There is just one discreet bit of lighting at a public right of way which crosses the busway (so deemed as a safety requirement.), but this is distant from the landscape treatments in that area, and JB suggested GCP can put that on motion sensor, as that crossing is barely used.</p> <p>Examples: Slides 36/57 and 37/57</p>		
7.3	<p>In response to further NE representations [Slides 39-41/57], construction compounds are all located within Red Line Boundary. Compounds will have standard working hours, 24/7 security patrols in place of lighting in the more remote compound areas. The main compound won't be lit though there may be exceptions where they may need to be lit due to traffic management.</p> <p>There will be a Construction Environmental Management Plan and a Landscape Ecology Management Plan.</p>		
7.4	<p>In response to NE presentation regarding a 10-m corridor [Slides 42, 43/57], GC noted that Local Authority Guidance states 10m is acceptable as a minimum dark corridor for major developments.</p> <p>ND replied that relying on a 10m width without taking into account other variables wouldn't always be a useful thing to do. It has to be specific to the project and location, noting that 3m could be fine, providing there's a source of shade, a hedge line or a wall that provides that shaded continuous line. Nick added 10m isn't actually too wide when you're going to have a lot of other light sources around, that would be impacting on that 10m dark corridor.</p> <p>It was reiterated that this is a predominantly dark landscape which will remain so. Such localised lighting still allows for landscape permeability. Also, where the lighting is to be applied, it will be of a type and nature that's optimal for bats, while satisfying the lighting H&S requirements.</p> <p>ND said WSP need to make sure the corridor is continuous and with no dead ends. GC responded that the design would ensure this is the case.</p> <p>GC reiterated again that this is localised lighting within a large expansive dark landscape, which may not be so apparent when focusing on lit junction areas. However, there is much space in between and, even at junctions, mature vegetation gives screening.</p>	WSP	

7.5	<p>In response to NEs representation on Slide 44/57 regarding low barbastelle flight, PR asked where that assertion had come from, as this didn't reflect what she understood/had heard, having consulted other experts very familiar with tracking barbastelle.</p> <p>ND suggested it was not in any literature, he doesn't think there is any (published) evidence. However, he had observed barbs when there was a degree of light when commuting or foraging, and he had seen them flying close to the ground.</p> <p>PR asked how close to the ground? ND responded it depended on landscape, but within a metre or so and sometimes half a metre. ND is keeping an open mind and asked WSP what they had observed when/where bats were flying higher and when/if flying close to continuous shaded lines when relatively light.</p> <p>ND noted that his observations related to a barbastelle foraging over a sugar beet field before it was quite dark (at Sizewell, Suffolk). PFR noted this was not the same circumstance as a barbastelle commuting through the landscape and crossing gaps over roads.</p> <p>GC pointed out the description of barbastelle flight characteristics from the CEDR report.</p> <p>Also analysis of the earliest emerging bat from Madingley Wood showed barbastelles tend not to be active outside of woodlands until (on average) 2.6 hours after sunset which would be in darkness (in keeping with the observations of many others). WSP looked at around 60 early registrations, and only 3 were between 0.5-0.8 hours after sunset.</p> <p>[Slide 45/57]</p>		
8	Additional surveys [Slides 46-51]		
8.1	<p>GCP are conducting surveys at existing road crossings to see how barbastelles behave, recording bats (as Natural England had requested). This is being done at Madingley Wood (A1303) as they are moving out of their 'home' woodland, and across two locations on the A428.</p> <p>WSP are using thermal imaging alongside statics to capture images of bats using statics to identify species where possible. GC showed footage that showed the Madingley bats' flight paths within and above the canopy with bats flying at more than 20m height [Slide 49-51]. The data hasn't yet been fully analysed yet as a lot of data is being captured, but it does show that barbastelle and bats moving out well after sunset. Surveys continue until end of July.[Post meeting note: Numerous heights were later recorded via further analysis.]</p> <p>There was also some indication that bats were moving away from headlights as cars approached, though difficult to be certain at present.</p>		
8.2	<p>ND hadn't seen an example of such monitoring! When ND saw barbastelles flying low (previously), it wasn't where there were gaps in tree to tree - just in open. ND thinks GCP had</p>	WSP	

	<p>captured some really notable data that would be of use to wider industry.</p> <p>He also noted that, at Madingley, there was canopy for bats to follow but will be more challenging where that's not the case.</p>		
8.3	<p>GC stated we can make landscape treatments as attractive as possible for bats, by increasing the habitat quality and quantity leading up to them but also need to take account that the risk of collision is very low.</p> <p>PR stated that it seemed to be that bats may be evading vehicles, and we might have more confidence in this later on (after more analysis). PR had heard of this happening in the early 2000s on A40 scheme; the Haycocks [researchers] had observed greater horseshoe bats hanging next to road and not passing until cars cleared.</p>		
9.0	Planning Conditions		
9.1	Following a recap of the lighting situation [Slide 52/57] , GC shared Slide 53/57 detailing the Planning Conditions that will be applied to the lighting proposals.		
10.0	Conclusions [Slides 54-56]		
10.1	<p>Pre-construction / Existing Light Operation -</p> <ul style="list-style-type: none"> Completed pre-construction lux level plans/ nighttime lux-level surveys & ecology team night-drive of scheme and wider area. West of Cambridge is predominantly a dark landscape (A428/A1303/M11 are predominantly unlit) with localised significant lighting existing in the Hardwick and Madingley barbastelle home ranges and core foraging areas (localised junctions). <p>The existing localised lighting at are junctions/roundabouts which have significant mature and dense trees/shrubs lining roads. This is also seen within the West Cambridge are. This likely acts as screening, providing dark areas behind allowing movements for more sensitive to light bat species. (Light readings in the field –behind vegetation have low lux levels supporting this)</p>		
10.2	<p>Construction –</p> <ul style="list-style-type: none"> Compounds will be unlit with security patrols, unless tasks require them to be lit, which would be on rare occasions. CEMP - standard working hours of no lighting with the exception of temporary working at night for discrete areas of work. 		
10.3	<p>Operation –</p> <ul style="list-style-type: none"> Ethos has been to avoid lighting except for areas with H&S requirement. Recent HSE ruling that unlit 		

	<p>pedestrian crossings caused fatalities on bus routes in Cambridge.</p> <ul style="list-style-type: none"> • Bat Ecologists have reviewed the lighting across the scheme including Ecologically sensitive areas. • All Landscape Treatments designed for commuting bats are unlit. • Existing lighting in combination with the limited new lighting provision localised to interspersed junctions (driven/pedestrian and cycling) and Travel Hubs maintains wide ranging dark areas, avoiding fragmentation and ensuring landscape permeability to the bat populations ensuring no adverse effect on the integrity of the SAC. • The new lighting provision will be subject to a Planning Condition 		
11.0	Questions		
11.1	<p>CD asked regarding footpaths whether going to be studs or bollards or a fence between footpaths and busway, on the safety aspect.</p> <p>JB responded saying they could use an option of solar studs for route indicative purposes rather than for illuminating for safety purpose. SM said they are good quality and robust (e.g. against flooding (having used these on a Worcestershire County Council schemes).</p>		
11.2	<p>ND noted that, for crossing points, the threshold over which barbastelle bats will use hasn't been defined. ND doesn't know how wide a gap they'll cross and that is complicated by how that might be influenced by light levels. What will work for barbastelles might not for <i>Myotis</i> for example. General rule is good to have hop-over trees as close together as possible for broader effectiveness across a range of species.</p>		
11.3	<p>GC went back to issue of taking out swales to reduce gaps. At what point does taking out swales to reduce gap width become less of a benefit, given French or piped drains are not as sustainable an option.</p> <p>PR said there is a low risk of collision: even with a worst-case scenario of no landscape treatment, would that matter and materially increase the risk? We think not, because frequency of buses is so low compared to a main road for example. Bats are coping with incidental mortality on current roads close to the roost woodland.</p> <p>Should swales (the more sustainable option) be removed to accommodate the low number of buses?</p> <p>CD said you can't compare traffic from this main road to this busway; rather should compare it to country roads because of infrequency (noting that dead pheasants are seen on country roads). The applicant should be careful with comparison.</p>	WSP	

	<p>JB responded with buses are significantly below the level of risk of country roads (in terms of traffic volumes). WSP will default to swales if NE reduce or remove this requirement. CCC (The client) are looking from a clearer steer from NE given the limited risk of mortality.</p> <p>ND said this is a good point, NE weren't too sure of the level of foraging barbastelles in the orchard and didn't want to create a sink of mortality next to busway by having the swales.</p> <p>GC stated that the swales were not designed to be bat foraging habitat but could provide more biodiversity benefit over a French drain.</p> <p>JB responded that, during the summer in Cambridgeshire, majority of time swales are going to be dry, only on occasion wet. CCC / WSP can look on data of rainfall, but problems more with drought at the moment. Question for NE - decision to be made on relative merits [width of gap v. type of drains]. This is something GCP could accommodate but again want a steer.</p> <p>ND noted the wish to maximise biodiversity potential and not have a significant mortality risk.</p> <p>ND said if WSP had data on bat responses to traffic that could feed into this, this would be valuable. For example if the bats react to light and noise before they are at risk of being hit this needs to be taken into account. If WSP can give evidence, ND said maybe he is worrying unnecessarily. He didn't want to remove something that may be beneficial.</p> <p>JB is happy to agree to further thought as the scheme approaches detailed design, room to discuss and maybe have more survey work. Final decisions such as species mixes doesn't have to be finalised right now, happy to work alongside.</p> <p>JB responded that there would be an opportunity for additional planning conditions if required, if specific points of objection remained, conditions would provide peace of mind.</p> <p>.</p>		
11.4	<p>Also that dialogue could continue alongside discussions over the statement of comment ground (SoCG) and inquiry preparation</p> <p>GH suggested a meeting to determine where the scheme has agreement before public inquiry; perhaps need two meetings to cover all subjects.</p> <p>Post-meeting note: SoCG was issued as Version 1 on 25 July 2025, with a meeting set to discuss this on 29 July 2025.</p>	CCC / WSP	
11.5	<p>GC responded that WSP would issue the June minutes shortly.</p> <p>Post-meeting note: the June minutes and Tech Note2 Collision Risk was issued on 23 July 2025.</p>		

MEETING NOTES

11.6	<p>JB confirmed that, until the scheme gets into detailed design stage, the design will not be absolutely nailed down, so don't have to get to a hard final decision.</p> <p>What would be ideal is to reach an agreement that there are a couple of alternatives where NE may want a chance of further dialogue to decide which one is more suitable. WSP could determine how such options would be expressed in a planning condition if appropriate.</p>	WSP	ASAP
	NO OTHER BUSINESS		

NEXT MEETING

It is proposed that the following meetings are scheduled:

2 meetings within 2 weeks [the first was held on 29 July 2025; the second is scheduled for 7 August 2025].



Cambourne to Cambridge

Natural England Representation
Meeting 3 – Lighting
July 2025

Agenda

- Introductions
- Meeting Minutes – need to go through April Minutes – any outstanding actions?
- Representations to be discussed confirmed
- Conclusions
- Next Meeting

OVERVIEW OF KEY TOPICS RAISED BY NATURAL ENGLAND

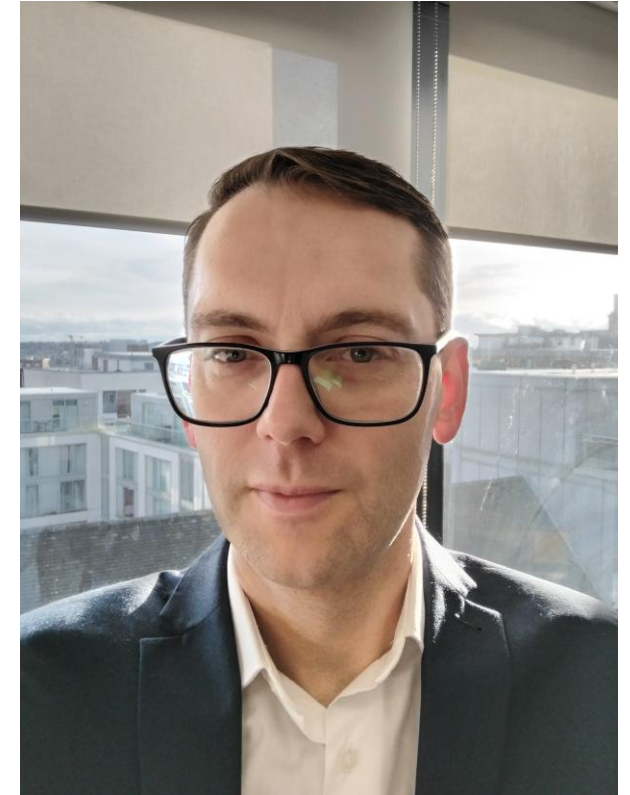
- COTON ORCHARD CWS TO BE ACKNOWLEDGED
- ROBUSTNESS OF HRA, REQUEST FOR FURTHER SURVEYS - FORAGING & COTON ORCHARD
- CROSSING POINT MITIGATION - LANDSCAPE TREATMENTS
- COLLISION RISK
- LIGHTING

Introductions

Stuart Morton, Associate Director,

Lighting & Energy Solutions, WSP

- Institution of Lighting Professional (ILP) Technical Committee member.
- Represented ILP at House of Lords enquiry into the effects of Artificial Light on Human Health in 2023.
- Co-author of ILP Guidance Note 08 – Bats and Artificial Lighting at Night and various case studies held within the document.
- Presented papers on avoidance in the mitigation hierarchy across sector including Bat Conservation Trust and Institute of Civil Engineers.



AIM FOR TODAY

- Overview of Natural England's Representation of Lighting.
- Overview of HSE ruling and applicability to this discussion.
- Summarise our aspirations for lighting provision.
- Review existing bat activity in the area.
- Review existing lighting in the area.
- Review proposed lighting in the area.
- Line by line response for each of NE's representations.
- Agree next steps.

Natural England's Representation on Lighting

1. Natural England therefore requests that we see and approve detailed lighting plans and strategies for both the Construction and Operation phases before agreeing to this scheme.
2. This should include details of the current Pre-Construction lux levels in areas of ecological sensitivity, in addition to the modelled lux level changes for the subsequent phases.
3. [Bat] Crossing points should be shown to have no change from the baseline. There should not be just 'some' mitigation/buffering for increased levels of lighting, as is stated in paragraph 7.4.27 of the Technical Report 5 – Ecology [C2C-11-TR05-00] – the increased lighting should be completely mitigated for where it needs to be.
4. Natural England requests to see the Ecology Site Management Plan to make sure lighting and illuminated compounds are sensibly located.
5. We advise that a '10m dark corridor', as specified in paragraph 7.4.30 is not wide enough, particularly if there are strong light sources nearby. More information is needed to back up paragraph 7.4.31, i.e. an explanation of how the dark corridors will be maintained and monitored, and exactly what the 'appropriate additional or remedial measures' would be.
6. Barbastelles would not cross a 20m gap at height before complete darkness, they would instead cross close to the ground where it is more shaded – this therefore would encourage collisions with traffic rather than preventing it, particularly in locations close to roost sites.
7. The following guidance note, published 2023, should also be followed: Guidance Note 8 Bats and Artificial Lighting | Institution of Lighting Professionals

Recent ruling by HSE

CCC have recently been fined circa £6 million due to safety failings and fatalities on the operation of the existing guided Busway by the Health & Safety Executive.

Fundamentally the HSE stated there were two distinct risks linked to the busway;

- members of the public seeking to cross the Busway at designated crossing points and
- risks to members of the public when they were in its vicinity or seeking to travel alongside it.

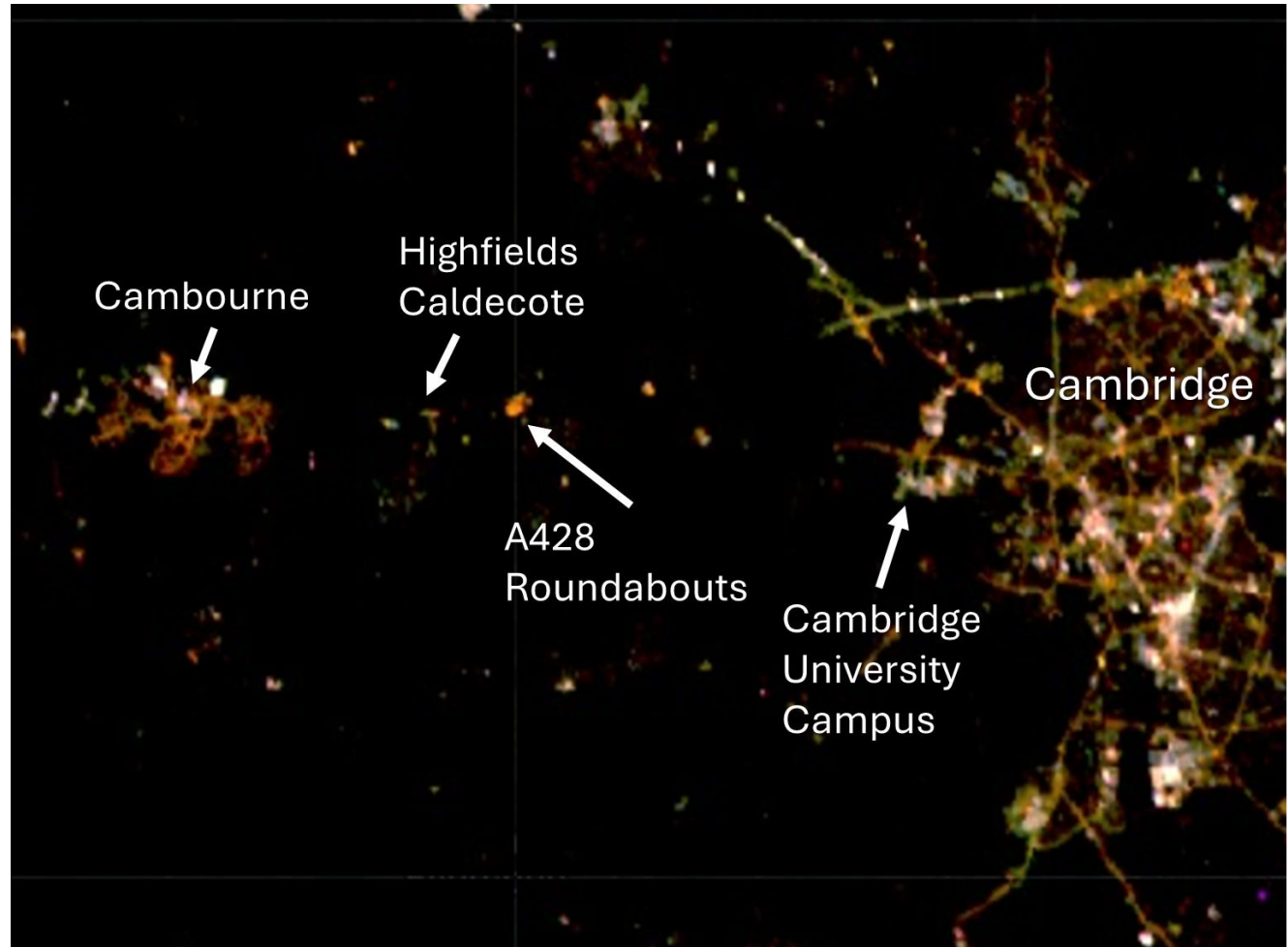
For our consideration is that one of the fatalities unfortunately involved a pedestrian struck at an unlit designated crossing after dark. The absence of lighting was cited as a contributory factor, and the HSE described lighting at crossing points as a “basic safety measure.”

OUR ASPIRATIONS FOR LIGHTING PROVISION

- Avoid provision of lighting as a first principle.
- Only apply or extent lighting where there is a clear safety case.
- We understand where there are clear biodiversity cases.
- To mitigate where a safety case interacts with a biodiversity case.
- Adhere to the mitigation hierarchy from BCT & ILP GN08.
 - o Reduce column heights.
 - o Add louvres & shields to light sources to deflect away from vegetation
 - o Reduce lighting levels.
 - o Reduce blue light content.
- Overall, to be responsible with lighting provision.

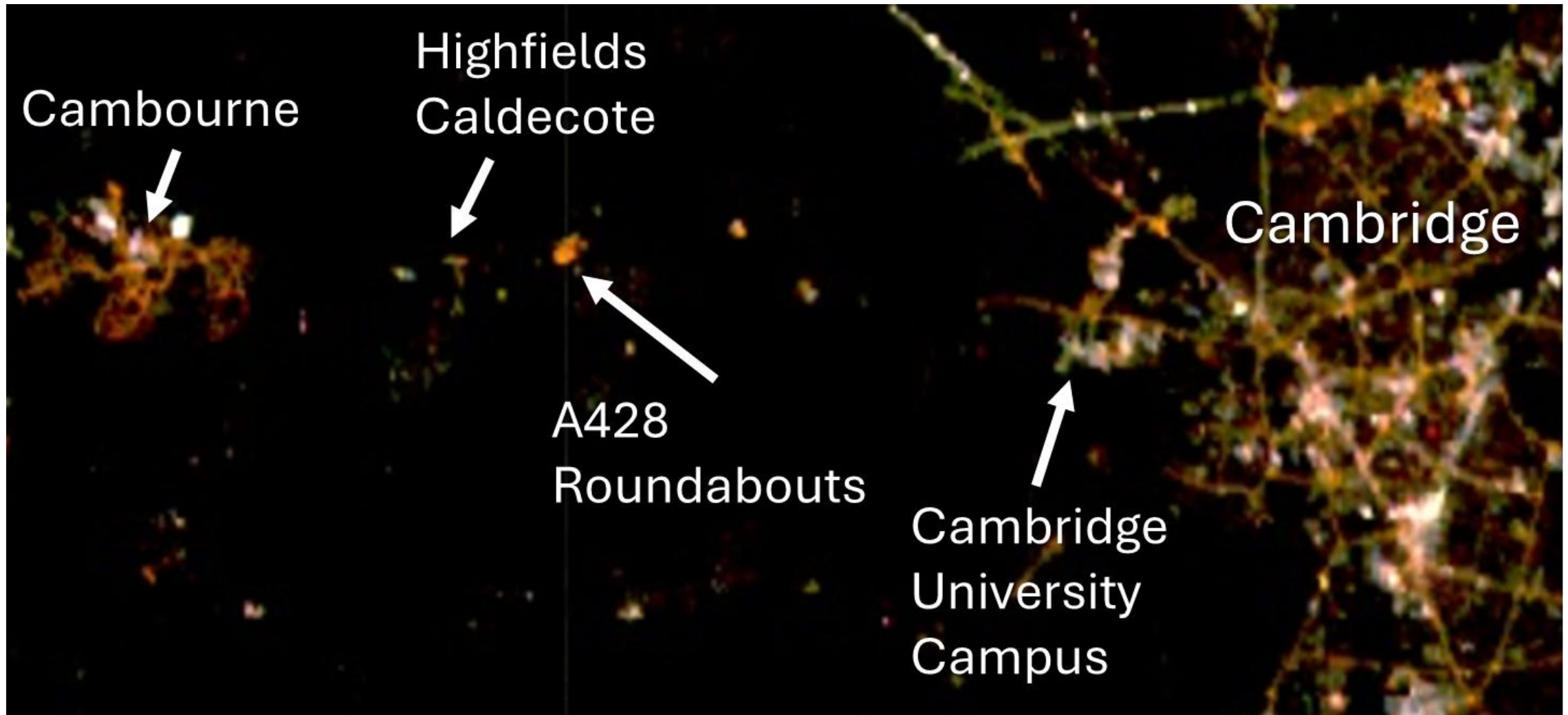
Existing Lighting Baseline

- Areas of darkness but also significant localised areas of bright illumination.
- Mix of asset types SON to Fluorescent and LED.
- Fluorescent lighting present in Highfields which has UV content!
- CCC currently upgrading to LED, CCT is White but varies on location.
- Lights are dimmed to 60% of output from 22:00 hours



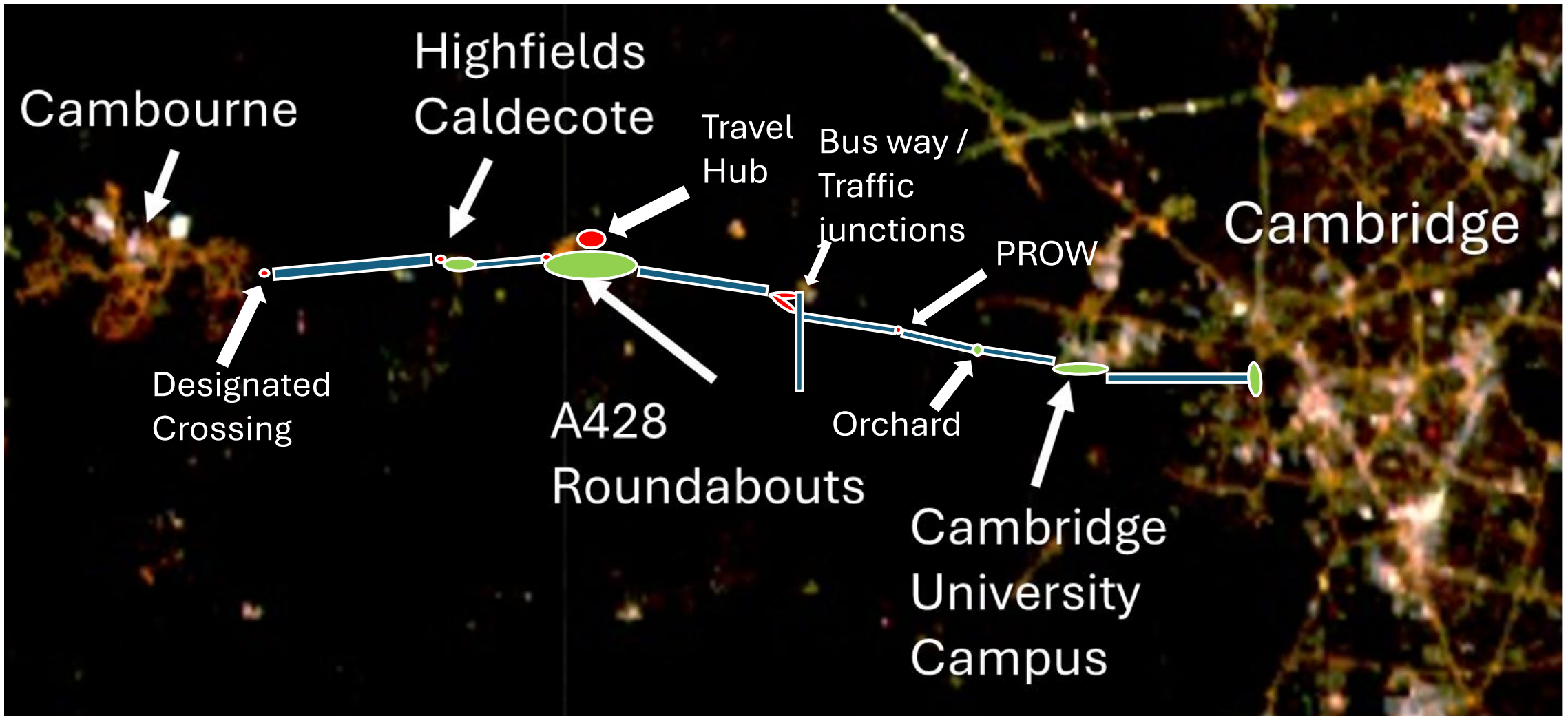
Plan-B Project, Satellite imagery between Cambourne and Cambridge

Proposed Lighting Baseline - Focus



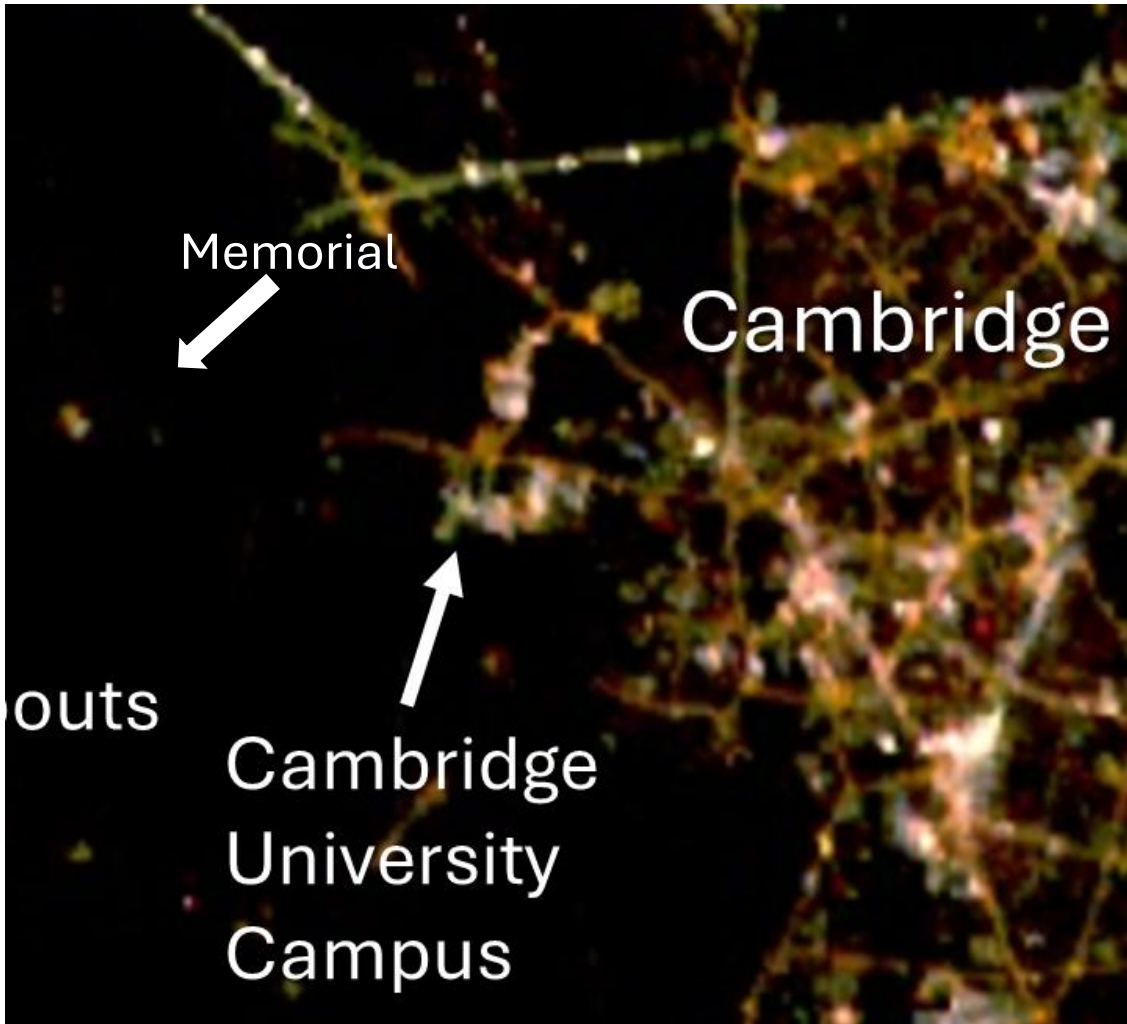
Plan-B Project, Satellite imagery between Cambourne and Cambridge

Proposed Lighting Baseline – Mark up



Plan-B Project, Satellite imagery between Cambourne and Cambridge

The importance of visiting site



Plan-B Project, Satellite imagery of War Memorial



WSP Site Visits showing lighting of War Memorial

Site surveys

A night time photometric survey was conducted on the evenings of 2nd and 3rd July 2025.

Both evenings were warm and clear with the moon phase for 2nd July being first quarter moon and waxing gibbous for 3rd July. The survey commenced at approximately 23.00 upon astronomical darkness and concluded at 02.00 prior to astronomical twilight.

The survey was undertaken to establish and understand the current baseline levels of illumination and ambient lighting at existing installations that will be either:

- in direct proximity to the proposed busway;
- will be modified as a result of the proposed route of the busway; or
- are areas of no current lighting that the busway crosses and where it is deemed lighting will be required due to either trafficked vehicle conflict or areas where crossing points for NMUs are being provided as part of the scheme.

Measurements of illuminance (Lux) were taken using a Minolta T-10 illuminance meter, which at the time of the survey was within its annual calibration certification.

PAUSE FOR QUESTIONS

Natural England's Representation on Lighting

1. Barbastelles are one of the most light-averse bats, with light pollution considered to be a limiting factor for the species. There is evidence that barbastelles are territorial, with individuals returning to the same feeding locations year after year, with hunting grounds overlapping only minimally with those of other colony members.
2. Even low levels of light could therefore have significant impacts as individuals may be prevented from using or getting to their existing foraging areas and have to find new hunting grounds or encroach onto others' territories. This additional searching and defence of resources would increase energy expenditure and impact the health and breeding success of the colony. See Edition 1 Definition of favourable conservation status for barbastelle bat - RP2974 for further information.
3. Natural England therefore requests that we see and approve detailed lighting plans and strategies for both the Construction and Operation phases before agreeing to this scheme.
4. This should include details of the current Pre-Construction lux levels in areas of ecological sensitivity, in addition to the modelled lux level changes for the subsequent phases.

Key Areas of Ecological Sensitivity

Key Areas of Ecological Sensitivity:

- Highfields - Caldecot /Hardwick
- Madingley SSSI and Bat (Landscape Treatments for commuting bats)

Also of consideration:

- Coton Orchard
- Bats are moving across the scheme.

REDACTED FIGURE

- 
- Barbastelles are recorded in the western parts of Cambridge (SACO, CE 2019).
 - Edge of City - Interspersed with green open spaces and waterbodies, mostly managed for people and wildlife.

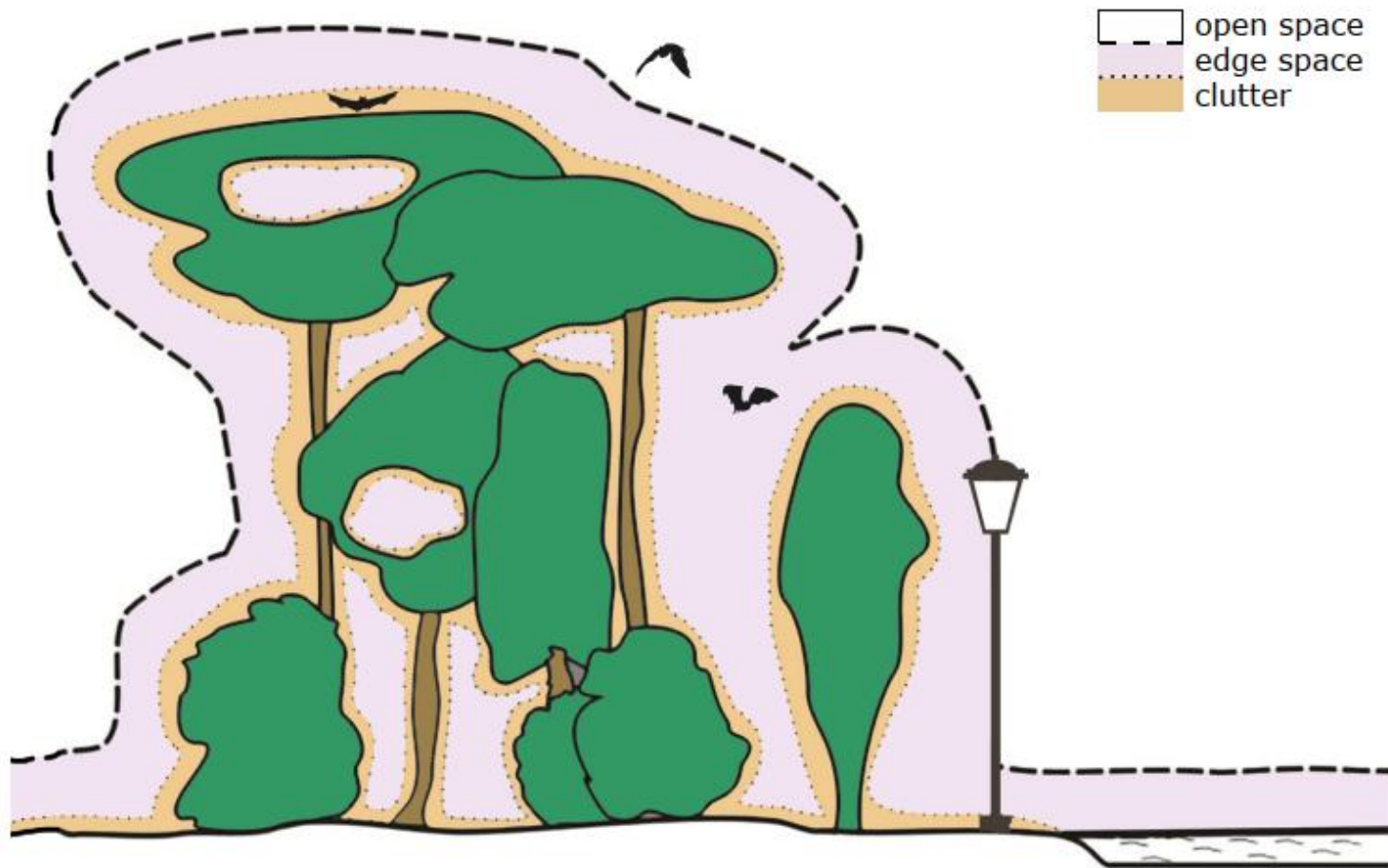


Figure 1. Bat species' foraging behaviour.



Hardwick

1. Proposed Operational Lighting Drawing
2. Summary of impact



Hardwick, BP Garage Day and Night-time Photos



1. EXISTING LIGHTING LEVEL CALCULATIONS UNDERTAKEN ON A FLAT PLANE 1.5M ABOVE GROUND. NOTE: PLEASE BE AWARE THAT CALCULATIONS DO NOT ALLOW FOR ANY SHADOWING CAUSED BY OBSTACLES, TREES.
2. LIGHTING CONTROLS ARE PROVIDED IN LINE WITH I.P. GUIDANCE NOT ON SITES AND ARTIFICIAL LIGHTING.
3. LIGHT OUTPUT USED IS RESPECTIVE OF DAY 1 OF LAMP CHANGES ON LAMPING INSTALLS ETC.
4. LIGHT LEVELS AND LIGHTING SPECIFICATION TO BE VERIFIED DURING SITE VISITS.
5. EXISTING HIGHWAY LIGHTING HAS BEEN INCLUDED AND IS BASED ON DATA PROVIDED FROM I.P. DATE: 19/03/2020.
6. EXISTING LIGHTING HAS BEEN INCLUDED AND IS BASED ON DATA PROVIDED FROM I.P. DATE: 19/03/2020.
7. EXISTING LIGHTING HAS BEEN INCLUDED AND IS BASED ON DATA PROVIDED FROM I.P. DATE: 19/03/2020.
8. EXISTING LIGHTING HAS BEEN INCLUDED AND IS BASED ON DATA PROVIDED FROM I.P. DATE: 19/03/2020.
9. EXISTING LIGHTING HAS BEEN INCLUDED AND IS BASED ON DATA PROVIDED FROM I.P. DATE: 19/03/2020.
10. EXISTING LIGHTING HAS BEEN INCLUDED AND IS BASED ON DATA PROVIDED FROM I.P. DATE: 19/03/2020.

DATE	BY	FOR	REVISION
19/03/2020	WSP	FOR EXISTING	001
19/03/2020	WSP	FOR EXISTING	002

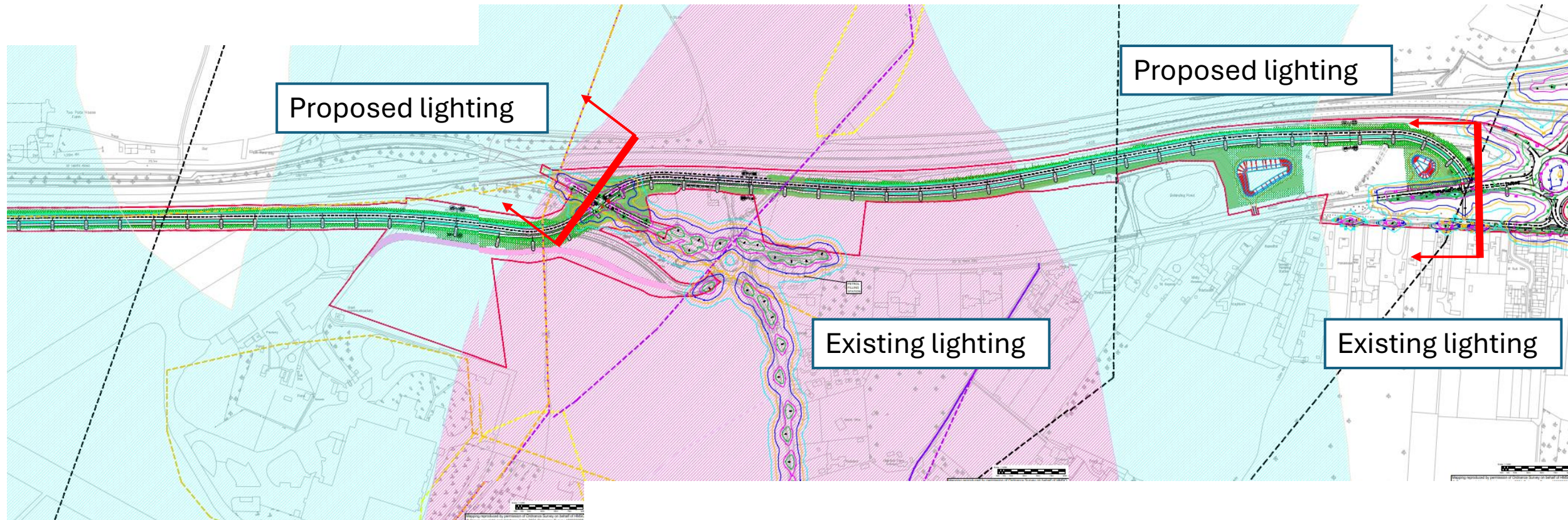
wsp
 62 RIVER ROAD, CAMBRIDGE CB2 3UJ, UK
 T: +44 (0) 1223 366 880 F: +44 (0) 1223 366 881
 www.wsp.co.uk

PROJECT	GREATER CAMBRIDGE PARTNERSHIP
CLIENT	CAMBRIDGESHIRE COUNTY COUNCIL
PROJECT	CAMBOURNE TO CAMBRIDGE TWO
PROJECT	LIGHTING ASSESSMENT COMBINED EXISTING AND PROPOSED LIGHTING CONTROL WITH BARBASTELLE RANGES AND FLIGHT PATHS (SHEET 4 OF 11)
SCALE	1:1000
DATE	19/03/2020
BY	WSP
FOR	WSP
PROJECT	70086660-WSP-HLD-XX-DX-LI-001304
DATE	19/03/2020

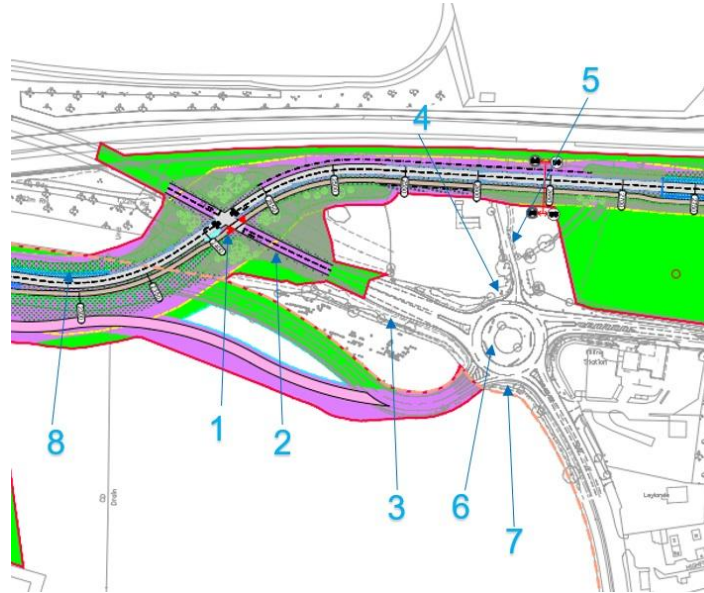
Proposed lighting

Existing lighting

Hardwick, Lighting in context



Location	Illuminance (Lux)			Comments
	Vertical @1.5m	Vertical @1.5m	Ground Level	
1	0.02	0.02	0.02	Levels recorded facing away from roundabout – beyond lighting installation
2	0.07	0.06	0.07	Levels recorded facing towards from roundabout – beyond lighting installation
3	7.09	6.69	11.74	Recorded in existing lit area on approach to roundabout
4	3.76	3.16	8.14	Levels recorded to approximately follow possible known bat flight line. LED on roundabout with SON/CPO on approaches
5	0.09	0.08	0.01	
6	0.48	0.37	0.95	
7	6.29	5.36	7.69	
8	0.01	0.01	0.00	Bourn Quarter Science park entrance. LED Solar studs located on left side of road. Science park is lit via columns but were off at the time of survey



Hardwick, Lighting Survey Notes

Night-time, light survey findings

Hardwick, Summary of Impact

Existing Lighting

- Existing lighting has been surveyed as achieving circa 10lux at 10pm which is C4 and provided by High Pressure Sodium and Fluorescent lights on Highfields Road. This suggests the existing lighting is baselined at C3 which would be in-line with lighting standards.

Construction Lighting

- it is expected that no construction lighting will be used during bat active seasons.

Proposed Operational lighting

- 120m lighting extension proposed in-line with ILP PLG02, the application of conflict areas on the highway.
- Lighting will only extend circa 30m on the busway itself to cover pedestrian access to bus stops and designated crossing points.

Proposed Mitigation

- Proposed lighting is risk assessed down to 7.5 C5 lux as per BS5489.
- Lighting will typically be dimmed to 4.5 lux between 10pm and 6am.
- LED is agreed with CCC as warm white 2,700K, shields and baffles to be added to reduce impact on local bats species in line with BCT & ILP GN08, Bats and Artificial Lighting at Night.

Residual Effects

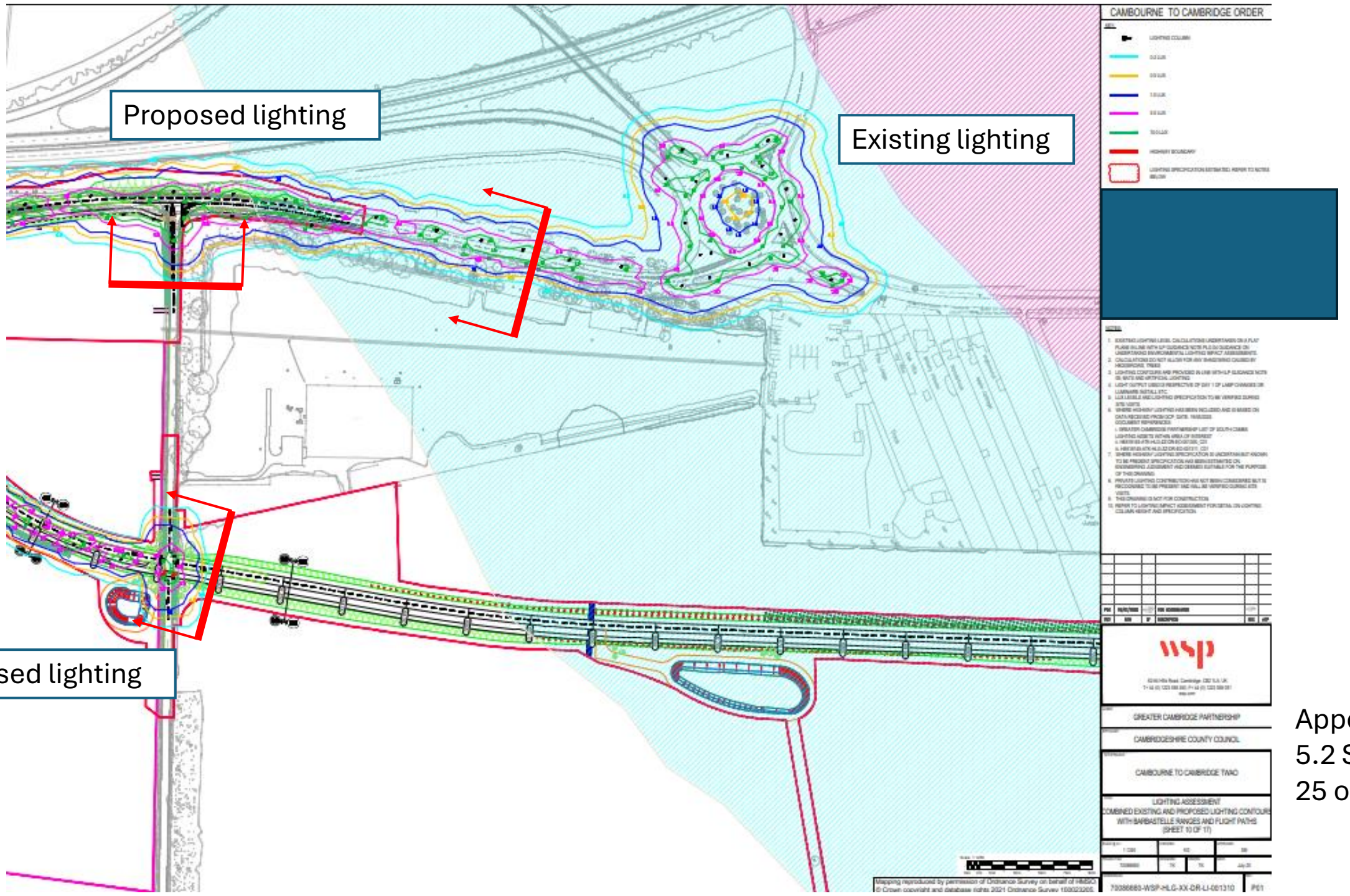
- Bats can continue to move through a wider dark permeable landscape

Madingley

1. Proposed Lighting Drawing
2. Summary of impact

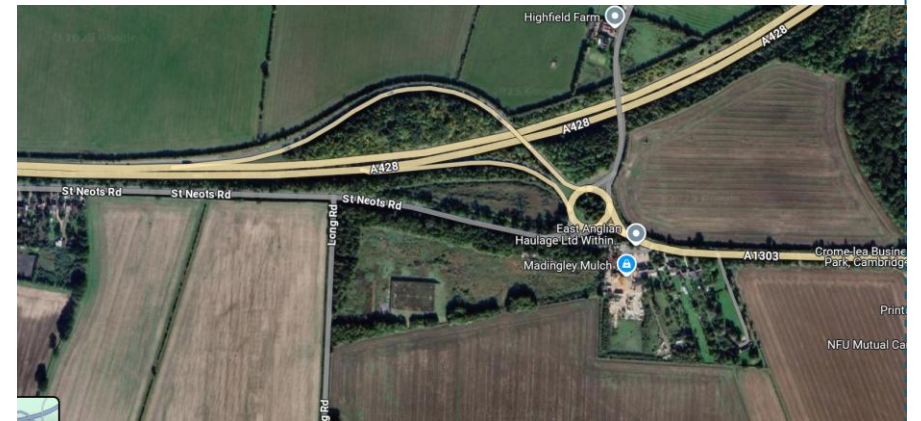


Long Road, St Neots junction, day-time photo

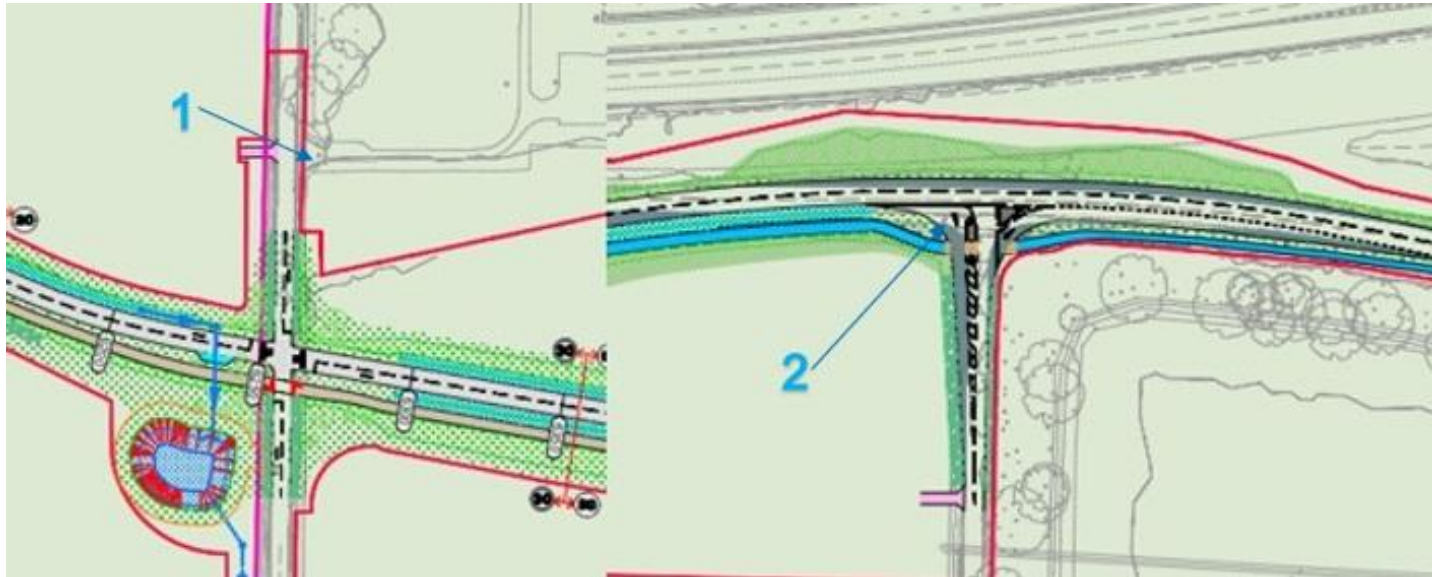


Madingley

- The lit area is outside of the home range and core foraging areas of the Madingley bats.
- A1303 has existing lighting but barbs are recorded along here (static 13, 21 & 22),
- Dark areas behind vegetation provide landscape permeability throughout the roundabout network.
- These mature trees and existing movements east west should be able to continue, with lighting contained south of this area



Madingley, Lighting Survey Notes



Location	Illuminance (Lux)			Comments
	Vertical @1.5m	Vertical @1.5m	Ground Level	
1	0.00	0.00	0.00	No lighting present
2	0.00	0.00	0.00	No lighting present

Night-time, light survey findings

Madingley, Summary of Impact

Existing Lighting,

- There is no existing lighting on Long Road. However, the existing lighting at the roundabout is similar to Hardwick, provided by high pressure sodium circa 15lux Av.

Construction Lighting,

- It is expected that no construction lighting will be used during bat active seasons.

Proposed operational lighting,

- The junction between long road and St Neots, will be illuminated in-line with ILP PLG02, the application of conflict areas on the highway and BS5489. The lighting will join up East with the existing roundabout lighting. Circa 300m. The lighting then extends West past the junction down onto the guided busway. This then connects with existing lighting on St Neots before looping back onto Long Road.

Mitigation

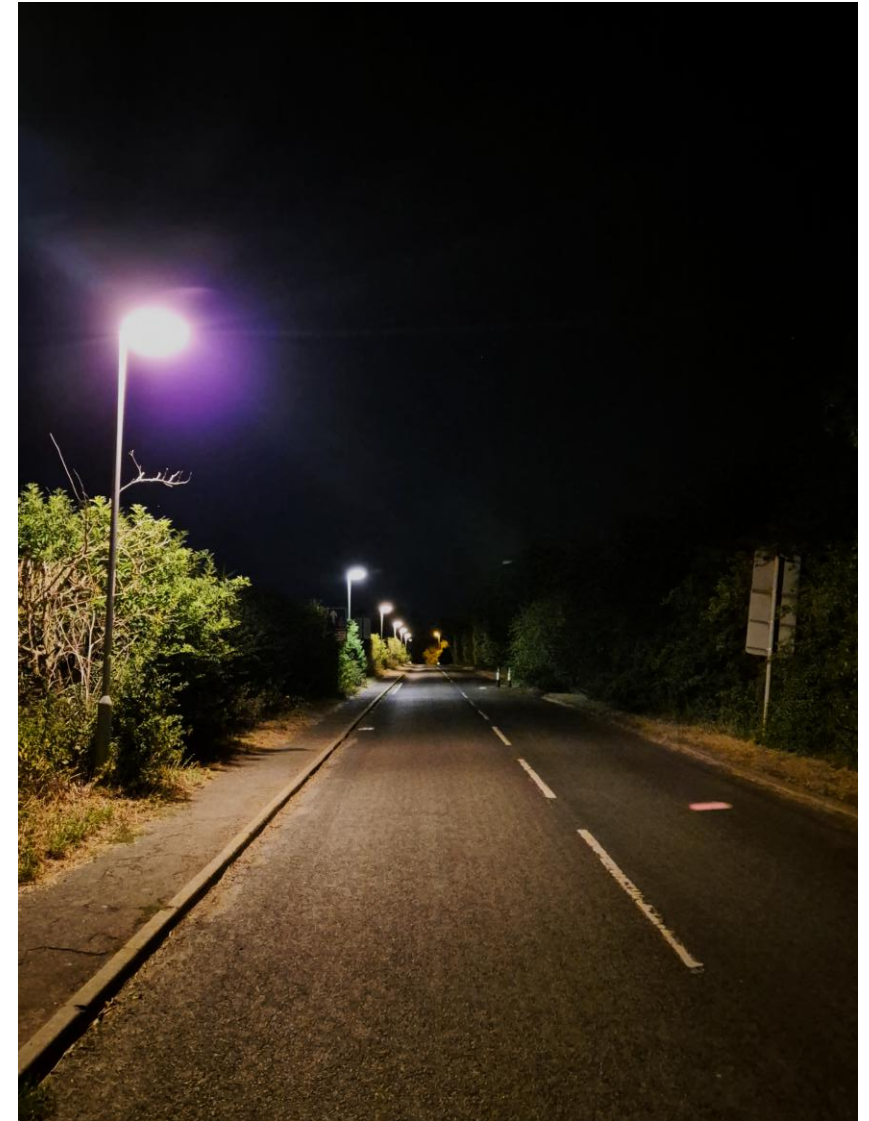
- There will be no lighting proposed on Long Road except at the junction.
- A departure will be sought with CCC for not lighting on Long Road.
- Proposed lighting is risk assessed down to 7.5 lux as per BS5489.
- Lighting will typically be dimmed to 4.5 lux between 10pm and 6am.
- LED is agreed with CCC as warm white 2,700K, shields and baffles to be added to reduce impact on local bat species in line with BCT & ILP GN08, Bats and Artificial Lighting at Night.
- Unlit Landscape treatments

Residual effect

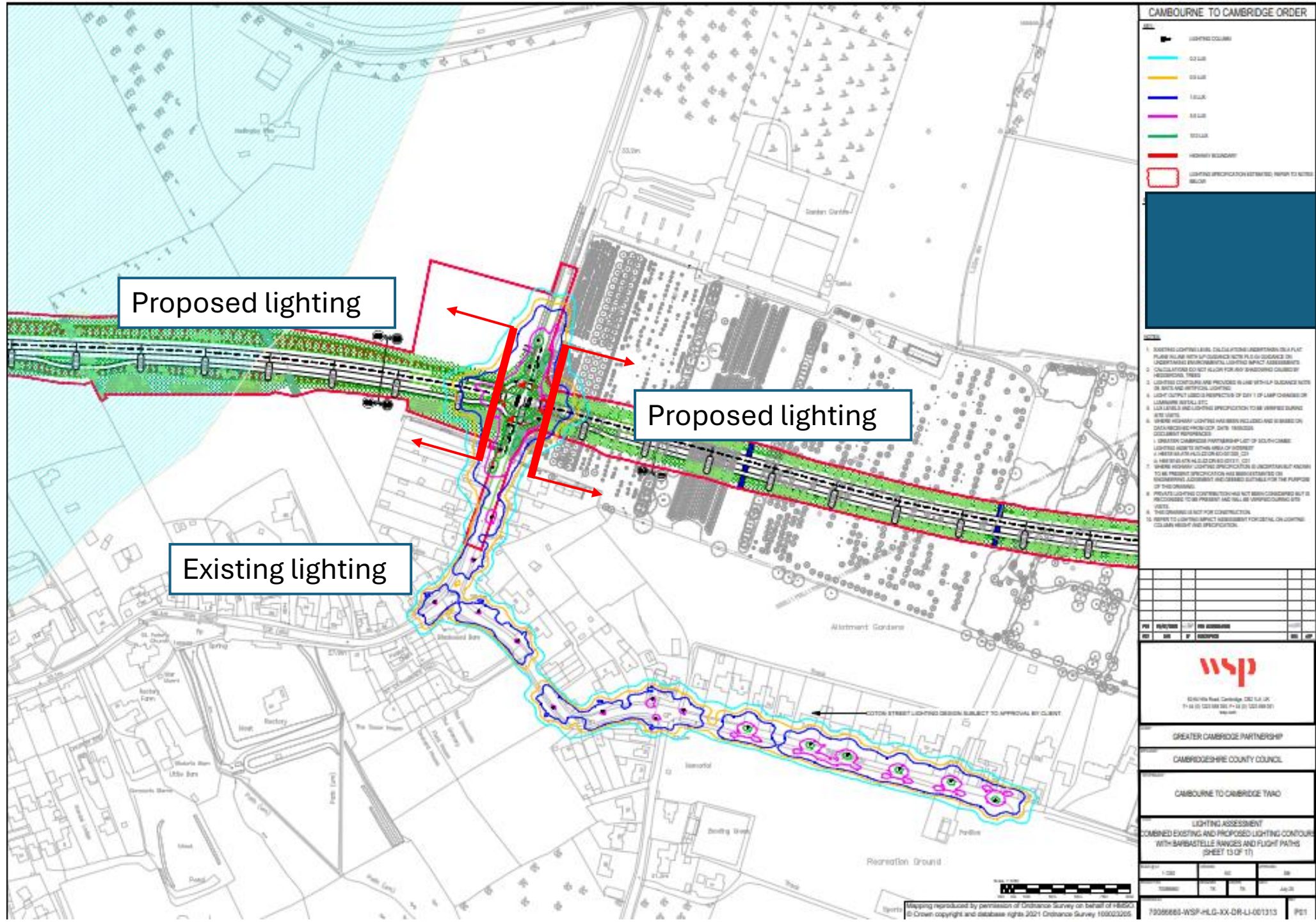
- Bats can continue to move through a permeable landscape

Coton

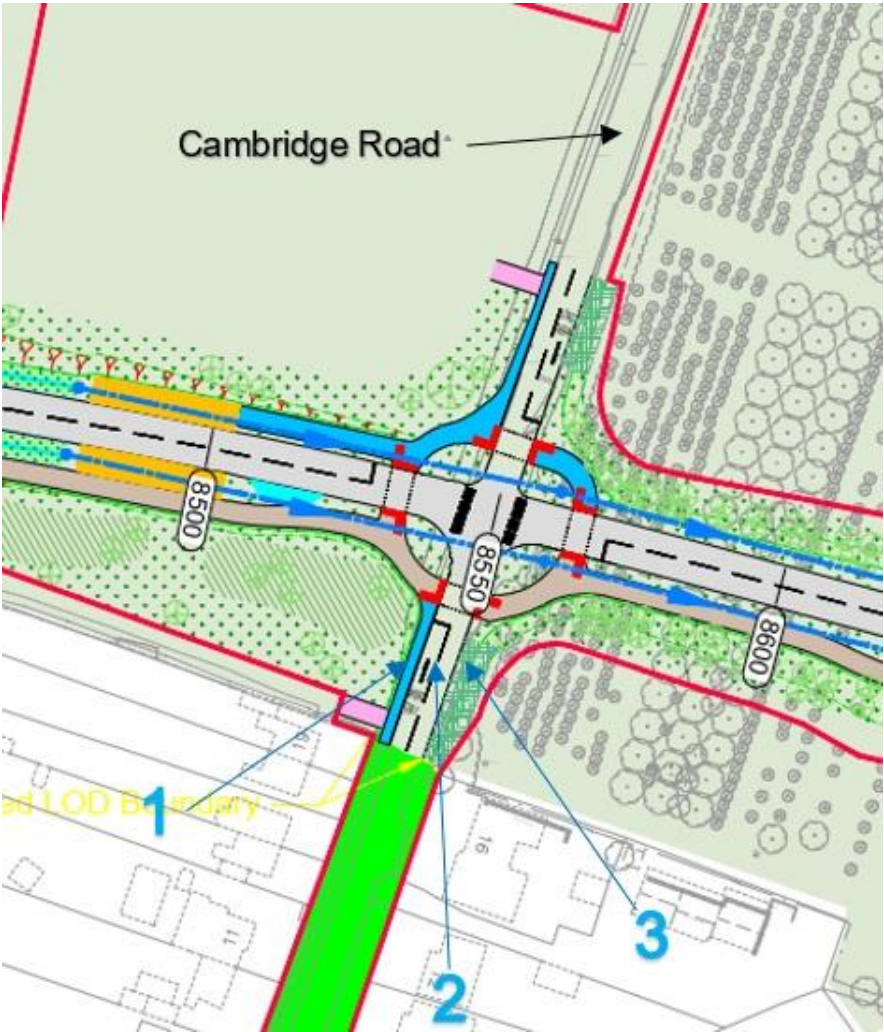
1. Proposed Lighting Drawing
2. Summary of impact



Coton, Day and Night-time Photos



Coton, Lighting Survey Notes



Location	Illuminance (Lux)			Comments
	Vertical @1.5m	Vertical @1.5m	Ground Level	
1	0.90	0.84	0.48	SON & PL light sources
2	0.69	0.40	0.50	SON & PL light sources
3	0.65	0.43	9.39	Directly below luminaire PL light source

Night-time, light survey findings



Coton, Summary of Impact

Existing Lighting,

- There is some existing lighting in Coton provided by high pressure sodium and fluorescent lamps (with UV content) providing up to 10 lux under the light sources.

Construction Lighting,

- It is expected that no construction lighting will be used during bat active seasons.

Proposed operational lighting,

- There is a slight extension of the existing to enable people to cross the road and get to the new bus stops at the junction.

Mitigation

- There will be no lighting proposed after bus stops on the bus way.
- Proposed lighting is risk assessed down to 7.5 lux as per BS5489.
- Lighting will typically be dimmed to 4.5 lux between 10pm and 6am.
- LED is agreed with CCC as warm white 2,700K, shields and baffles to be added to reduce impact on local bat species in line with BCT & ILP GN08, Bats and Artificial Lighting at Night.
- Unlit Landscape treatments
- **Residual effect**
- Bats can continue to move through a permeable landscape

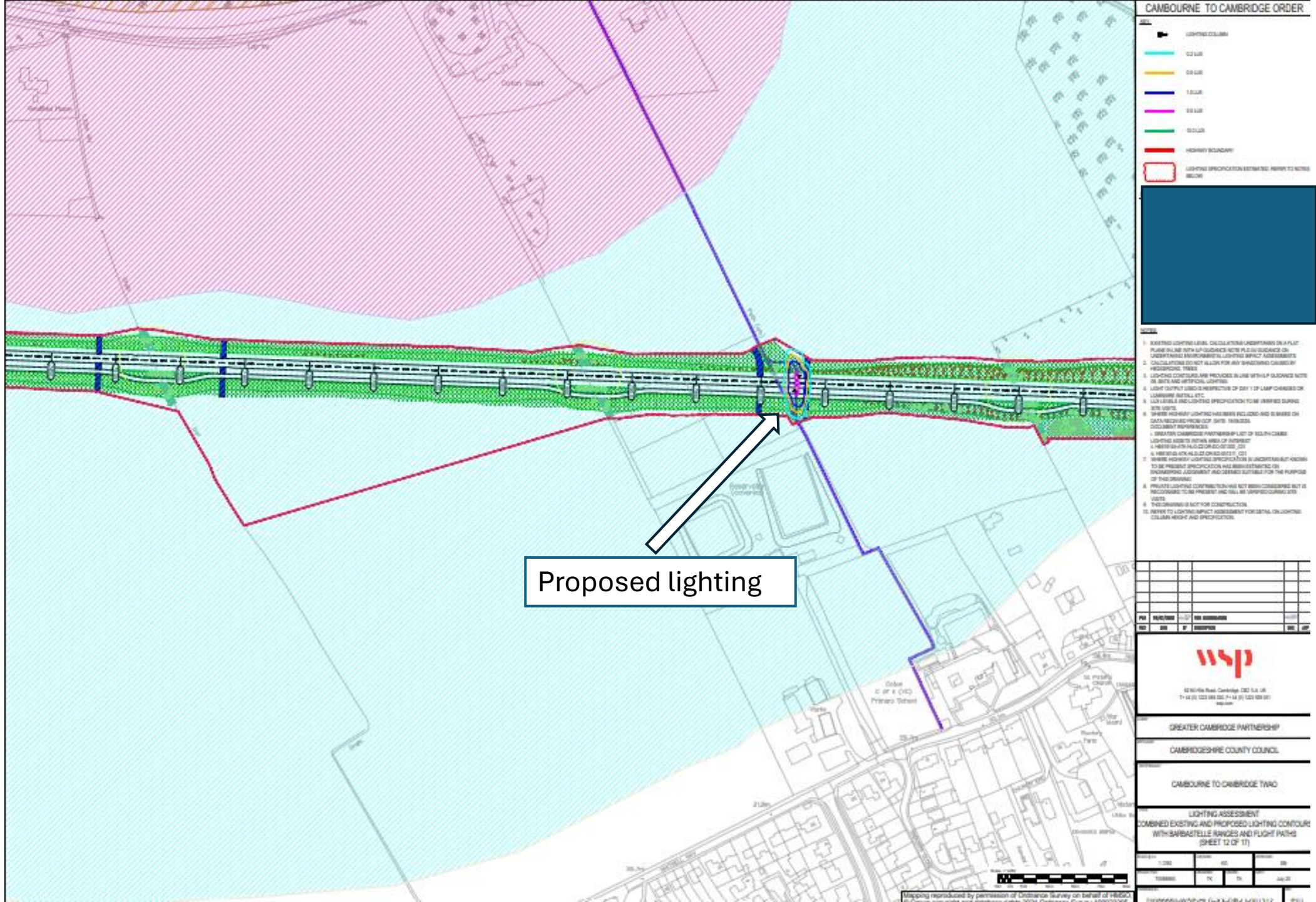
ISSUE	NATURAL ENGLAND'S POSITION	APPLICANTS POSITION	STATUS
1.	<p>Natural England therefore requests that we see and approve detailed lighting plans and strategies for both the Construction and Operation phases before agreeing to this scheme. This should include details of the current Pre-Construction lux levels in areas of ecological sensitivity, in addition to the modelled lux level changes for the subsequent phases.</p>	<p>The applicant has modelled:</p> <ul style="list-style-type: none"> - Pre-construction/existing lux levels (supported by night-time lux level readings) as presented. -lux level changes during operation. The scheme is predominantly unlit except for junctions and park and rides. <p>Bat ecologists have reviewed the lighting across the scheme including Ecologically sensitive areas.</p> <p>Significant localised lighting exists in the Hardwick and Madingley bat home ranges and core foraging areas (id'd from RT).</p> <p>The applicant will provide:</p> <ul style="list-style-type: none"> - a construction strategy of standard working hours of no lighting with the exception of temporary working at night for discrete areas of work. 	<p>TO BE DISCUSSED</p> <p>Appendix 5.2 Slide 34 of 57</p>

Natural England's Representation on Lighting

3. Crossing points should be shown to have no change from the baseline. There should not be just 'some' mitigation/buffering for increased levels of lighting, as is stated in paragraph 7.4.27 of the Technical Report 5 – Ecology [C2C-11-TR05-00] – the increased lighting should be completely mitigated for where it needs to be.

Proposed Bat Crossings

1. Proposed Lighting Drawing
2. Summary of impact



ISSUE	NATURAL ENGLAND'S POSITION	APPLICANTS POSITION	STATUS
	<p>3. Crossing points should be shown to have no change from the baseline. There should not be just ‘some’ mitigation/buffering for increased levels of lighting, as is stated in paragraph 7.4.27 of the Technical Report 5 – Ecology [C2C-11-TR05-00] – the increased lighting should be completely mitigated for where it needs to be.</p>	<p>Areas where there are landscape treatments where bat are currently unlit; will remain unlit; and will be maintained as such.</p>	<p>TO BE DISCUSSED</p>

Natural England's Representation on Lighting

4. Natural England requests to see the Ecology Site Management Plan to make sure lighting and illuminated compounds are sensibly located.

Construction Compounds



1. Access to compounds onto highway is restricted to minimise disruption

Construction Compounds:

01. Local area compounds are located at 50m intervals for welfare, food storage and plant

02. The main compound is located at the future park and ride site

03. Larger compounds are required at the following junction and M11 bridge locations

04. M11 bridge compounds for bridge construction, deck fabrication and storage

05. Compounds at side road crossings for welfare, site access, control offices and storage

06. Compounds located and include space storage for maintenance and placed to shield from nearby properties

07. Utility works contractors advise the compounds shown

Key:

ChC Order Limits

Construction Compounds

Site Access Points

NO	DATE	BY	FOR PLANNING	FOR	FOR
001	27/06/2020	MR	FOR PLANNING	FOR	FOR
002	24/06/2020	MR	FOR PLANNING	FOR	FOR
003	24/06/2020	MR	FOR PLANNING	FOR	FOR
004	24/06/2020	MR	FOR PLANNING	FOR	FOR
005	18/06/2020	MR	FOR PLANNING	FOR	FOR
006	18/06/2020	MR	FOR PLANNING	FOR	FOR
007	18/06/2020	MR	FOR PLANNING	FOR	FOR
008	18/06/2020	MR	FOR PLANNING	FOR	FOR
009	18/06/2020	MR	FOR PLANNING	FOR	FOR
010	18/06/2020	MR	FOR PLANNING	FOR	FOR
011	18/06/2020	MR	FOR PLANNING	FOR	FOR
012	18/06/2020	MR	FOR PLANNING	FOR	FOR
013	18/06/2020	MR	FOR PLANNING	FOR	FOR
014	18/06/2020	MR	FOR PLANNING	FOR	FOR
015	18/06/2020	MR	FOR PLANNING	FOR	FOR
016	18/06/2020	MR	FOR PLANNING	FOR	FOR
017	18/06/2020	MR	FOR PLANNING	FOR	FOR

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GREATER CAMBRIDGE PARTNERSHIP

CAMBRIDGESHIRE COUNTY COUNCIL

11/06/2021

ISSUE	NATURAL ENGLAND'S POSITION	APPLICANTS POSITION	STATUS
	<p>4. Natural England requests to see the Ecology Site Management Plan to make sure lighting and illuminated compounds are sensibly located.</p>	<p>The applicant will provide an Ecology Site Management Plan which will form a Planning Condition to be released prior to construction.</p> <p>All compounds are to be in areas are within the red line boundary.</p> <p>All compound areas will operate Standard working hours (except for occasional requirements)</p> <p>Security will be provided by patrols rather than lighting</p>	<p>TO BE DISCUSSED</p>

Natural England's Representation on Lighting

5. We advise that a '10m dark corridor', as specified in paragraph 7.4.30 is not wide enough, particularly if there are strong light sources nearby. More information is needed to back up paragraph 7.4.31, i.e. an explanation of how the dark corridors will be maintained and monitored, and exactly what the 'appropriate additional or remedial measures' would be..

ISSUE	NATURAL ENGLAND'S POSITION	APPLICANTS POSITION	STATUS
	<p>5. We advise that a ‘10m dark corridor’, as specified in paragraph 7.4.30 is not wide enough, particularly if there are strong light sources nearby. More information is needed to back up paragraph 7.4.31, i.e. an explanation of how the dark corridors will be maintained and monitored, and exactly what the ‘appropriate additional or remedial measures’ would be..</p>	<p>Notwithstanding that dark corridors are accepted within Local Authority Guidance as acceptable at a minimum of 10m.</p> <p>The scheme is predominantly unlit using online roads within a predominantly dark landscape tying in with west Cambridge.</p> <p>The scheme maintains a dark landscape and limits the lit areas to maintain landscape permeability.</p> <p>There are localised areas of lighting required for public H&S (drivers, pedestrians & cyclists) in line with HSE report at junctions & Travel Hubs.</p> <p>Where lighting is applied it is type and nature optimal for bats (minimum light specification – (eg 2700K warm light) whilst satisfying the lighting requirement to prevent fatalities.</p>	<p>TO BE DISCUSSED</p>

Natural England's Representation on Lighting

6. Barbastelles would not cross a 20m gap at height before complete darkness, they would instead cross close to the ground where it is more shaded – this therefore would encourage collisions with traffic rather than preventing it, particularly in locations close to roost sites.

ISSUE	NATURAL ENGLAND'S POSITION	APPLICANTS POSITION	STATUS
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6. Barbastelles would not cross a 20m gap at height before complete darkness, they would instead cross close to the ground where it is more shaded – this therefore would encourage collisions with traffic rather than preventing it, particularly in locations close to roost sites.

Our analysis of earliest emerging bats shows barbastelle are, on average, not active on the scheme until 2.6 hours after sunset. There are occasional early registrations but this is not the general trend.

The NE statement is not consistent with CEDR (2016) which describes barbastelles as ‘Bats with medium manoeuvrability with a more straight flight pattern They hunt and commute both in and away from vegetation and structures in a variety of flight heights. May occasionally fly but never hunt within vegetation. **Commuting over open stretches tend to occur at medium heights (2 – 10 m) with no clear tendency to lower flight.**’

We are conducting Existing Road Bat Crossing point surveys to understand how bats are moving in this unique setting.

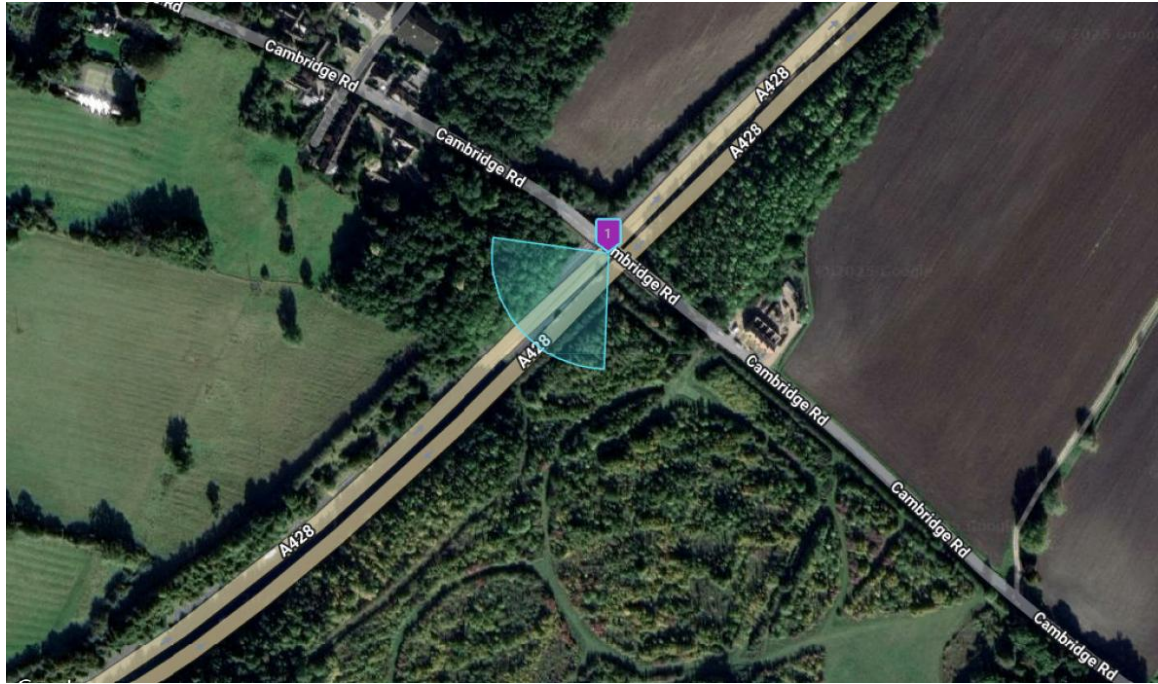
TO BE DISCUSSED

Appendix 5.2 Slide 45 of 57

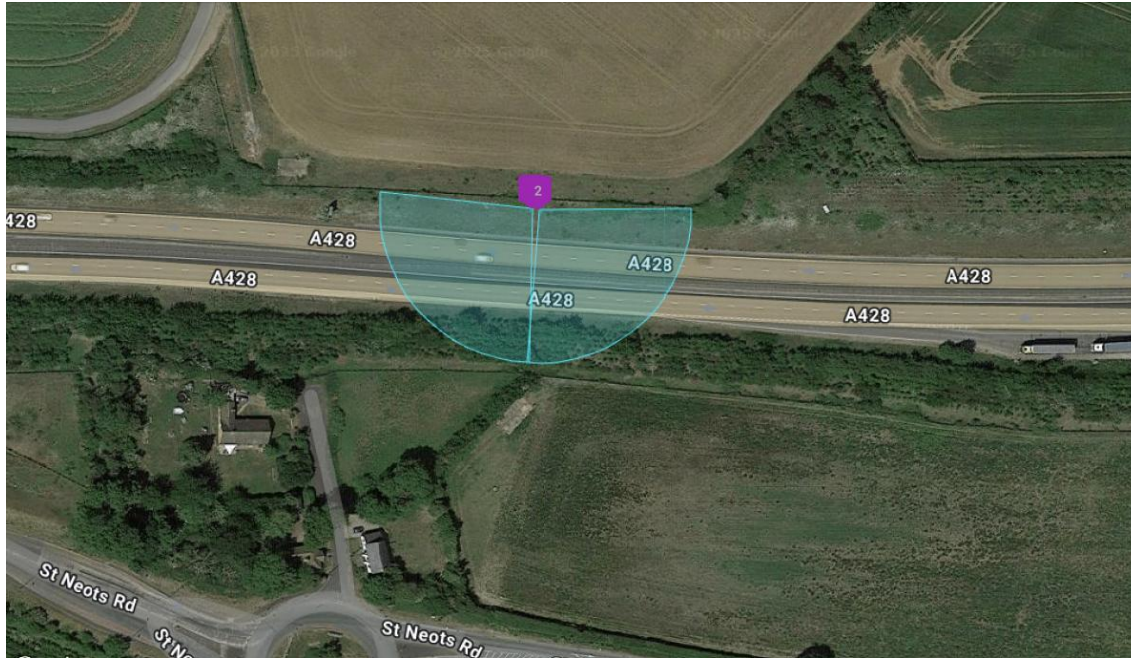


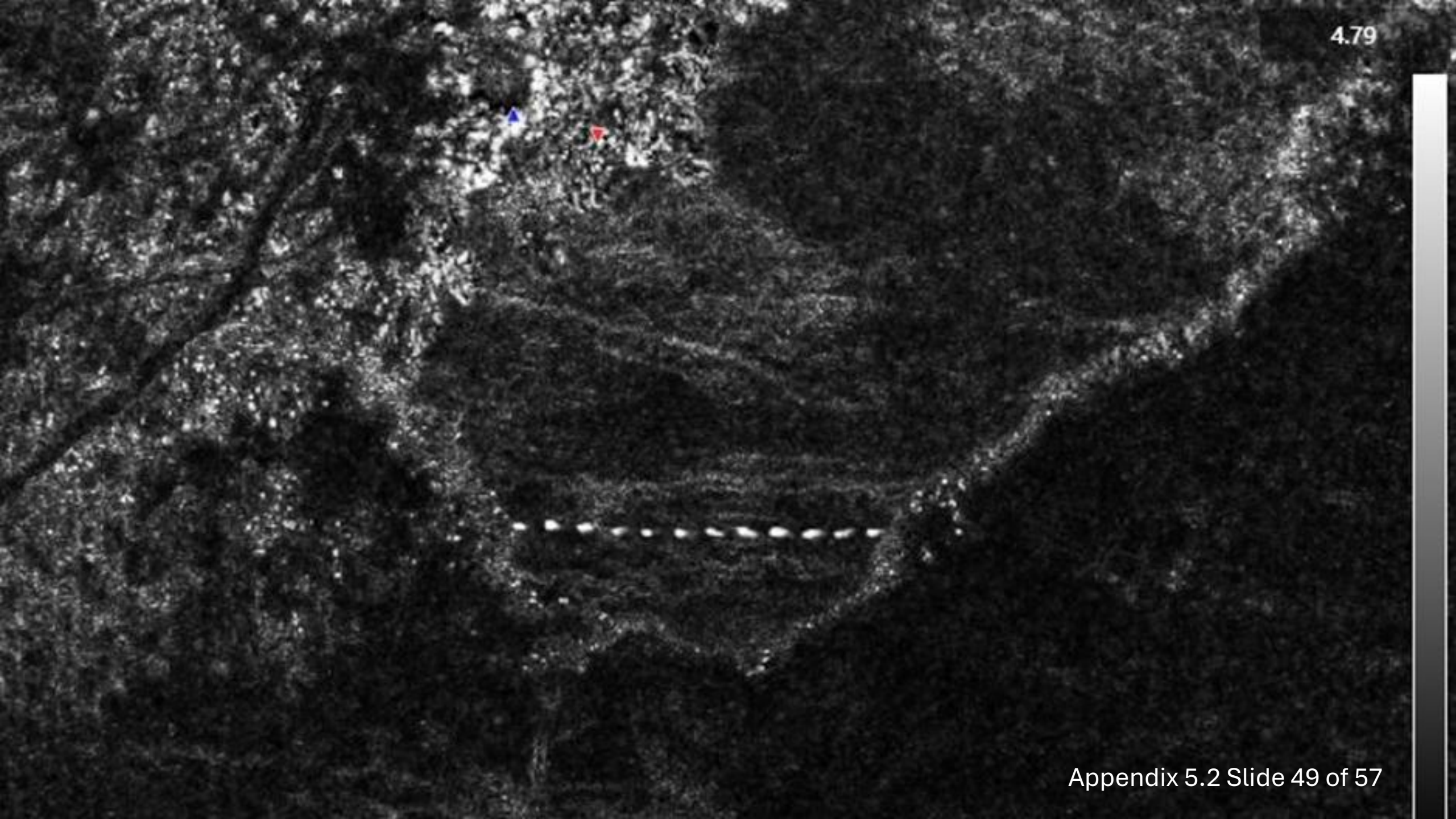
Existing Road Crossing Surveys -A1303

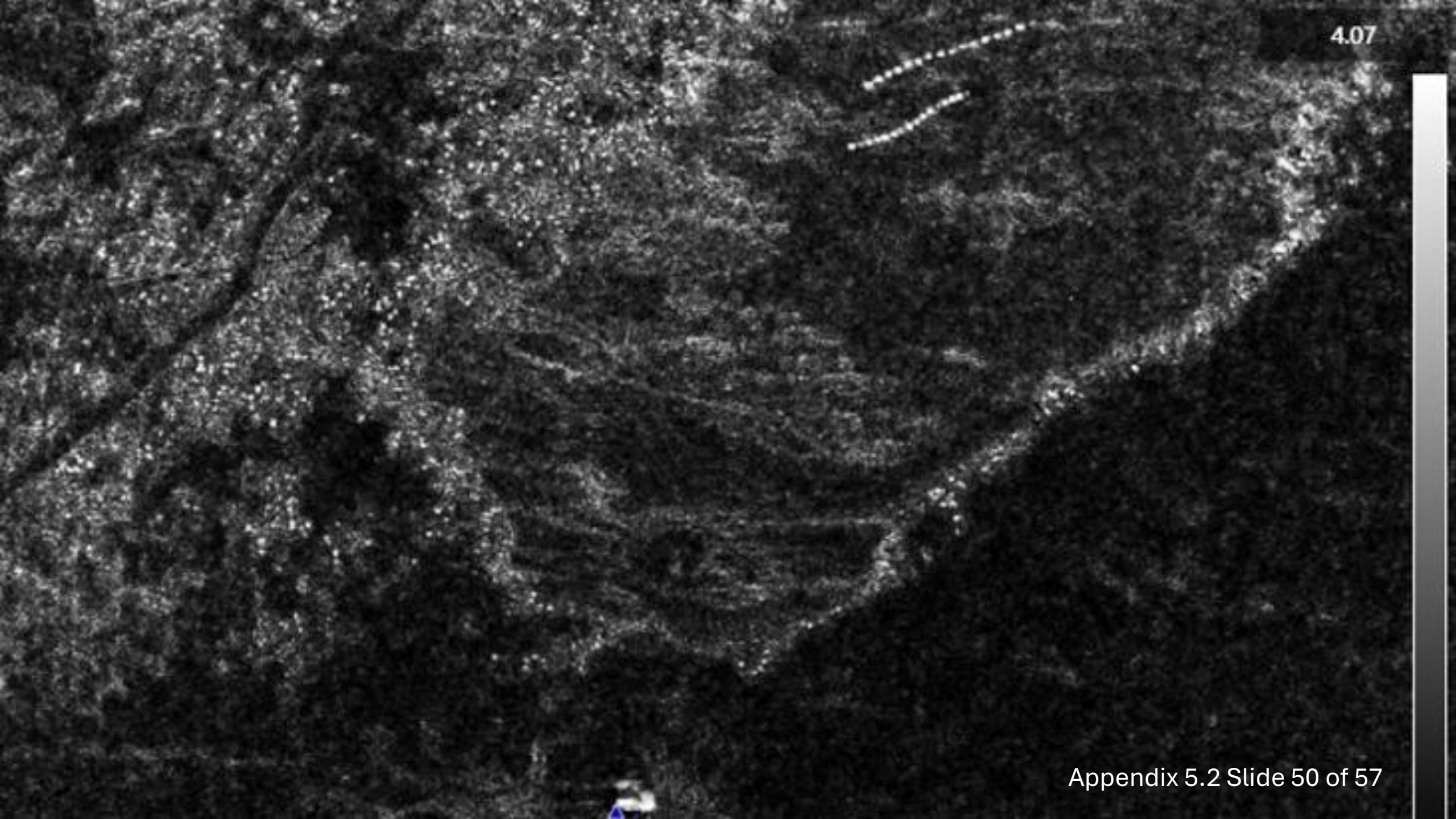
Existing Road Crossing Surveys –A428

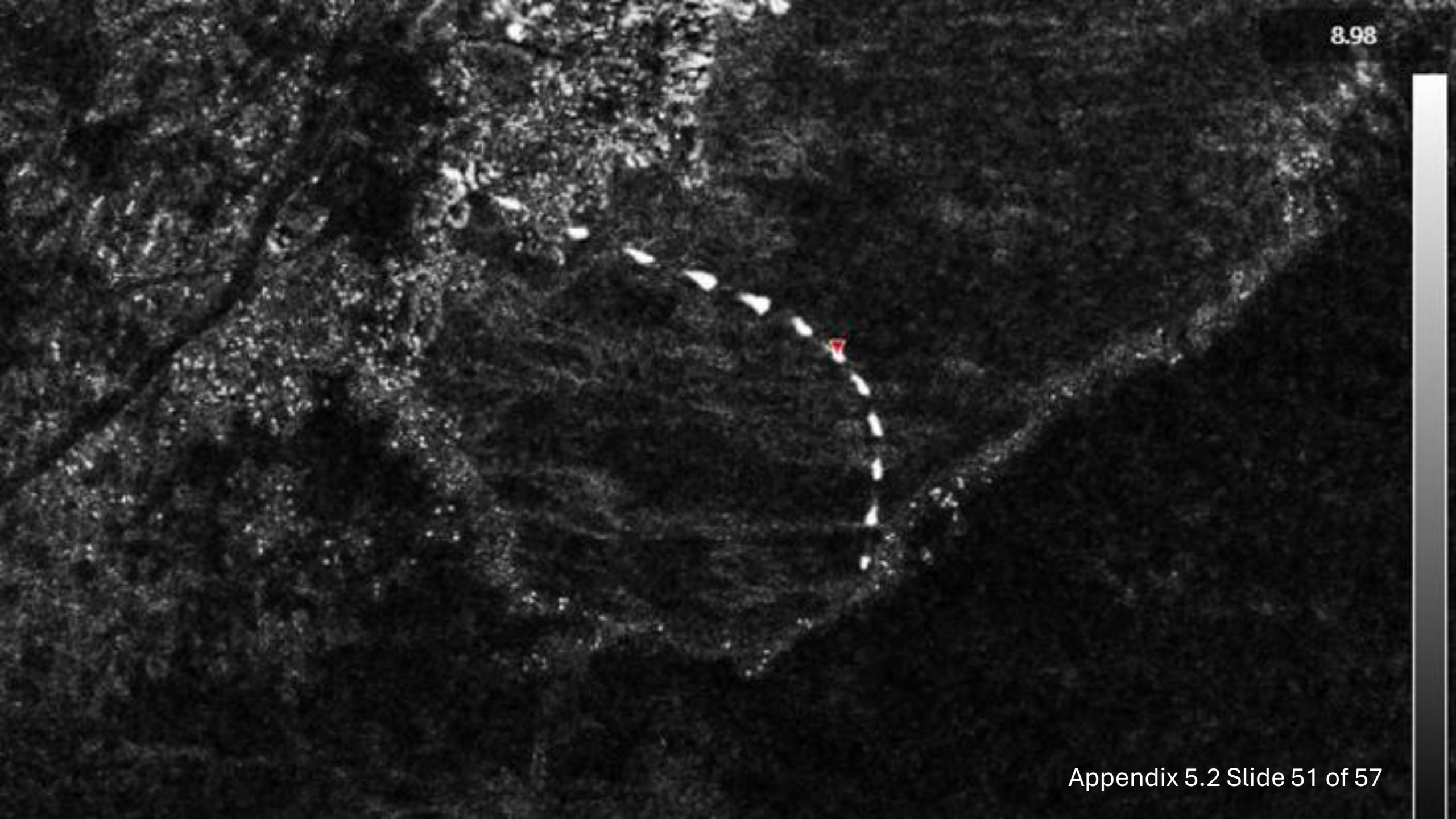


Existing Road Crossing Surveys –A428

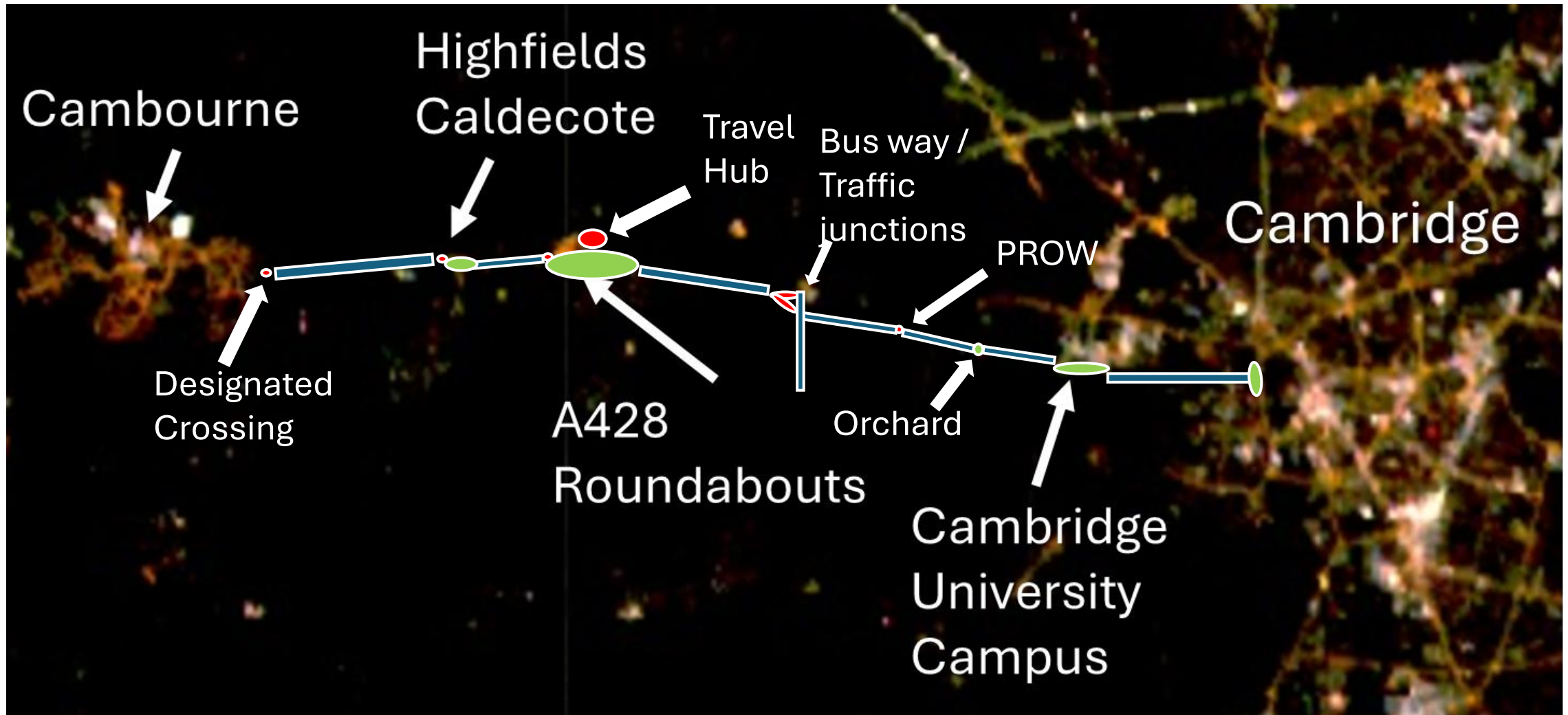








Proposed Lighting Baseline – Recap



Planning Conditions

21. Operational Lighting

No external lighting shall be provided or installed until an artificial lighting impact assessment and mitigation scheme has been submitted to and approved in writing by the relevant local planning authority. The assessment shall include the following:

- i) the method of lighting (including luminaire type / profiles, mounting location / height, aiming angles / orientation, angle of glare, operational controls, horizontal / vertical isolux contour light levels and calculated glare levels to receptors)
- ii) the extent/levels of illumination over the site and on adjacent land and predicted lighting levels at the nearest light sensitive receptors

All artificial lighting must meet the Obtrusive Light Limitations for Exterior Lighting Installations contained within the Institute of Lighting Professionals Guidance Notices for the Reduction of Obtrusive Light - GN01/20 (or as superseded).

The proposed mitigation scheme must be designed to an acceptable level in accordance with the Bat Conservation Trust and Institute of Lighting Professionals Guidance Note 08/23, and must address sensitive areas for barbastelle bats.

The lighting and mitigation scheme shall be carried out as approved and retained as such.

- Reason: In order to safeguard the Green Belt, and the amenity of all sensitive receptors, including biodiversity, in respect of possible adverse effects of lighting glare in accordance with policies S/4, HQ/1, SC/9, NH/4 and NH/8 of the South Cambridgeshire Local Plan (2018) and policies 4, 8, 34 and 70 of the Cambridge City Council Local Plan (2018).

Conclusions – Pre construction/Existing light levels

- Completed pre-construction lux level plans/ nighttime lux-level surveys & ecology team night-drive of scheme and wider area.
- West of Cambridge is predominantly a dark landscape (A428/A1303/M11 are predominantly unlit) with localised significant lighting existing in the Hardwick and Madingley barbastelle home ranges and core foraging areas (localised junctions).
- The existing localised lighting at are junctions/roundabouts which have significant mature and dense trees/shrubs lining roads. This is also seen within the West Cambridge area. This likely acts as screening, providing dark areas behind allowing movements for more sensitive to light bat species. (Light readings in the field – behind vegetation have low lux levels supporting this)

Conclusions – Construction

- Compounds will be unlit with security patrols, unless work requires them to be lit, which would be a rare occasion.
- CEMP - standard working hours of no lighting with the exception of temporary working at night for discrete areas of work.

Conclusions – Operation

- Ethos has been to avoid lighting except for areas with H&S requirement. Recent HSE ruling that unlit pedestrian crossings caused fatalities on bus routes in Cambridge.
- Bat Ecologists have reviewed the lighting across the scheme including Ecologically sensitive areas.
- All Landscape Treatments designed for commuting bats are unlit.
- Existing lighting in combination with the limited new lighting provision localised to interspersed junctions (driven/pedestrian and cycling) and Travel Hubs maintains wide ranging dark areas, avoiding fragmentation and ensuring landscape permeability to the bat populations ensuring no adverse effect on the integrity of the SAC.
- The new lighting provision will be subject to a Planning Condition



AOB / Questions