A358 Taunton to Southfields Dualling Scheme

Ecological Baseline Report - Bat Trapping and Radio Tracking

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Table of contents

Table of Figures

Table of Tables

Executive summary

The A358 Taunton to Southfields Dualling scheme would provide a dual carriageway along the length of the A358 between Taunton and Ilminster in Somerset, connecting the M5 motorway to the A303.

Bat trapping and radio tracking surveys were part of the suite of habitat and protected species surveys commissioned in relation to the scheme. This report presents the results of the bat trapping and radio tracking surveys undertaken throughout 2021 and aims to inform the ecology baseline for the scheme.

The objectives of this report are to present the results of the bat trapping and radio tracking surveys and inform appropriate mitigation and enhancement as required.

All bat species are afforded full protection under the Conservation of Habitats and Species Regulations 2017 and the Wildlife and Countryside Act 1981. Bechstein's bat, barbastelle, noctule, soprano pipistrelle, brown long-eared bat, greater horseshoe bat and lesser horseshoe bat are also listed as a Species of Principal Importance (SPI) in accordance with Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006.

The desk study identified four European Special Areas of Conservation designated for bats located within 30 kilometres of the scheme (Hestercombe House SAC, Exmoor and Quantock Oakwood SAC, Bracket's Coppice SAC and Beer Quarry and Caves SAC), as well as three designated sites of national importance (Thurlbear Woods and Quarrylands SSSI, Barrington Hill Meadows SSSI and Barrington Hill NNR) and 46 non-statutory sites (all of which were Local Wildlife Sites) within 2 kilometres of the scheme.

Data search information provided by the Somerset Environmental Records Centre (SERC) returned a significant number of bat records (from the last ten years) from within 10 kilometres of the scheme, with at least 15 species of bats recorded, including all four Annex II species. A review of desk study information also found that six Bechstein's bat roosts had been located through radio tracking surveys in 2018 and 2020, identifying roosts in Huish Wood and Bickenhall Wood and a barbastelle roost was located in Bickenhall Wood. Species found to be present within the study area included Natterer's bat, small Myotis (possibly whiskered bat/Brandt's bat or alcathoe bat), serotine, Bechstein's bat, common pipistrelle, soprano pipistrelle, barbastelle, noctule and brown long-eared bat

The 2021 trapping surveys consisted of 18 trapping surveys resulting in the capture of 338 individuals. Fourteen species were caught, including all four Annex II species. The 2021 trapping surveys had an average capture rate of 18.7 bats per night, indicating that the study area supported a wide range of bat species and larger bat populations than previously recorded.

Three colonies of Bechstein's bats were found within woodlands across the study area and likely two colonies of barbastelle bats located adjacent to the scheme. Radio tracking of Bechstein's bat, barbastelle, brown long-eared bat, Natterer's bat, noctule and Leisler's bat in 2021 identified a total of 51 roosts, with nine roosts present within, or in close proximity to, the scheme footprint. A number of key bat crossing points of the scheme (offline section and existing A358) were also recorded, as well as areas of high foraging activity adjacent to the scheme and associated foraging passes over the existing A358. This information would be used to assess the impacts of the scheme and inform the mitigation strategy.

There were a number of limitations to the 2021 surveys, notably due to the unsuitable weather conditions (mainly in spring), which had notable effect on bat behaviour and breeding success nationally, but also limited or delayed access to some parts of the study area. Due to these limitations, a need for further trapping and radio tagging surveys, to be completed in 2022, has been identified.

Further trapping and tagging of Bechstein's bats is required in 2022 to gather sufficient data on a suitable representative proportion of each colony's behaviour to better determine population size and range, locations of roosts, foraging habitat, important habitats for flight lines (foraging and commuting) and crossing points. This information is required to appropriately assess the impacts of the scheme on Bechstein's bats and to inform suitable mitigation.

Additional trapping, radio tracking and roost monitoring of the barbastelle population is also required to gather sufficient data on a suitable representative proportion of each colony's behaviour to better determine population size and range, locations of roosts, foraging habitat, important habitats for flight lines (foraging and commuting) and crossing points. This additional data is also required to fully ascertain the status of the population within the study area and characterise colony structures. This information is required to appropriately assess the impacts of the scheme on barbastelles and to inform suitable mitigation.

1 Introduction

1.1 Purpose and scope of this document

1.1.1 The A358 Taunton to Southfields Dualling scheme (hereafter referred to as 'the scheme') would provide a dual carriageway along the length of the A358 between Taunton and Ilminster in Somerset, connecting the M5 motorway to the A303 at Ilminster to the south. Bat trapping and radio tracking surveys were part of the suite of habitat and protected species surveys commissioned in relation to the scheme.

1.1.2 This report presents the results of the bat trapping and radio tracking surveys and aims to inform the ecology baseline for the scheme.

1.1.3 The objectives of this report are to:

- investigate the status of barbastelle and Bechstein's bats as well as other tree-roosting bats within the Zone of Influence (ZoI) of the proposed scheme, with an emphasis on woodland habitat and treelines
- radio track key individuals using the site to locate maternity roosts of barbastelle and Bechstein's and other tree-roosting bat species (where appropriate) to determine activity patterns and habitat use
- identify key flight lines, crossing points across the scheme, individual core foraging areas, main roosts and colony range for all tagged bats
- provide information to inform ecological mitigation and enhancement measures where appropriate

1.2 Scheme overview

1.2.1 The scheme is part of a programme of improvements planned along the A303/A358 corridor aimed at improving connectivity between London, the south-east and the south-west. The A303, alongside the A30, forms part of the strategic road network (SRN) and together with the A358, provides the link between London, the south-east and the south-west.

1.2.2 The programme of improvements, as set out in the Government's *Road Investment Strategy* [1] made a commitment to, *"…upgrade all remaining sections of the A303 between the M3 and the A358 to dual carriageway standard, together with creating a dual carriageway link from M5 at Taunton to the A303"*.

1.2.3 The scheme directly addresses this long-term commitment and would provide a new rural all-purpose dual carriageway link from the M5 at Taunton to the A303 at Southfields roundabout. The new dual carriageway would comprise new and upgraded stretches of the existing A358 road. Full details of the scheme will be provided in Chapter 2 *The Project* of the Environmental Statement (ES). Please refer to Figure 1-1 for the scheme plan.

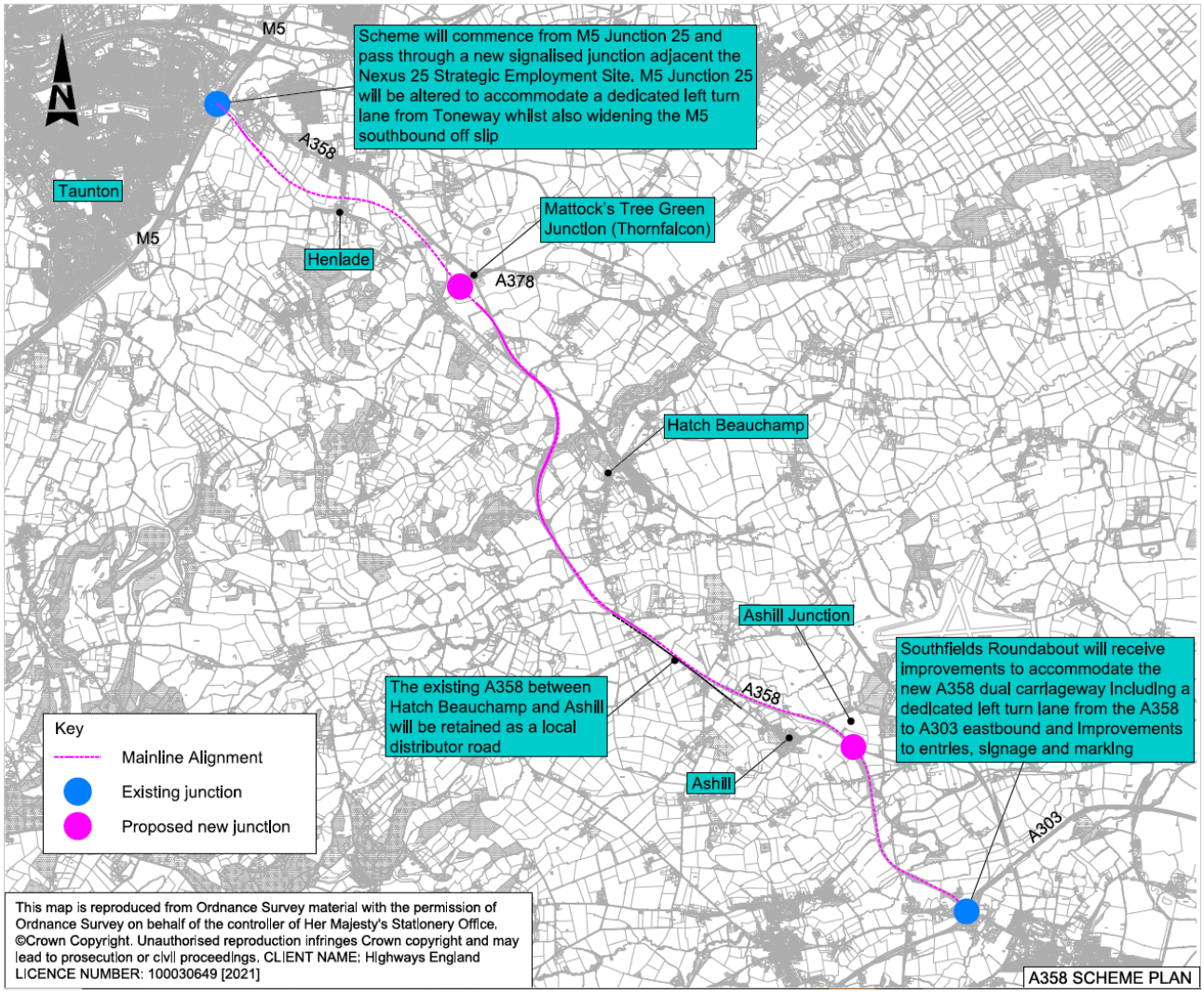

Figure 1-1 Scheme plan

1.3 Study area and zone of influence

1.3.1 The Chartered Institute for Ecology and Environmental Management (CIEEM) *Guidelines for Ecological Impact Assessment* [2] recommend that all potentially important ecological features that occur within the ZoI for a scheme are investigated. The ZoI includes:

- areas to be directly within the land take for the scheme
- areas that would be temporarily affected during construction
- areas where there is a risk of light and noise disturbance during construction and/or operation

1.3.2 The ZoI depends on the ecological features concerned and specific consideration of mobile species that could make regular movements to, from or across the scheme is required. With regard to the bat populations likely to be affected by the scheme, the ZoI varies by individual species' ecology such as differing habitat requirements and home ranges. Therefore, the ZoI can be considered to extend up to 30 kilometres from the defined ecology survey zone, which comprises the footprint of the scheme and associated site clearance area. For the purposes of the trapping and radiotracking surveys the ZoI is defined as woodland and tree-dominated habitat within or adjacent to the ecology survey zone and this ZoI is hereafter referred to as the study area.

1.4 Legislation

1.4.1 A framework of international, European, national and local legislation and planning policy guidance exists to protect and conserve wildlife and habitats. This legislation will be listed in full within Chapter 8 *Biodiversity* of the ES. Legislation relevant to and discussed within this report are:

- The Conservation of Habitats and Species Regulations 2017.
- Wildlife and Countryside Act 1981.
- Natural Environment and Rural Communities (NERC) Act 2006.

1.5 Status of bats at national level

1.5.1 There are 18 species of bat within the UK, 17 of which are known to be breeding. Bat populations are known to have decreased significantly over the last century, with this largely attributed to threats associated with development. These threats include direct impacts on roosts from building and development work requiring tree removal and the demolition of buildings and other structures, in addition to severance of important commuting corridors by roads, other linear infrastructure and vegetation removal.

1.5.2 Habitat loss has also resulted in the loss and degradation of important foraging grounds for bat populations. Increased disturbance from light and noise associated with development both through construction and operation, and the installation of wind turbines are also thought to have contributed to the decline in the numbers of bats.

1.5.3 Bechstein's bat (*Myotis bechsteinii*) and barbastelle (*Barbastelle barbastellus*), which are the main target species of the trapping and radio tracking surveys, are two of the UK's rarest mammals with both species listed on Annex II of the EC Habitats and Species Directive [3] and listed as Species of Principal Importance in England in accordance with Section 41 of the NERC Act 2006. Bechstein's bat is also listed as "near threatened", and barbastelle as "vulnerable" on the IUCN global red list [4].

1.6 Status of bats at county level

1.6.1 A total of 16 bat species have been recorded in the county. Somerset Bat Group [5] provides the following information on the distribution and status of bat species within the county:

Common species

- Common pipistrelle (*Pipistrellus pipistrellus*): A common species in Somerset, as it is elsewhere in the UK, recorded across the county and commonly recorded roosting in modern houses.
- Soprano pipistrelle (*Pipistrellus pygmaeus*): A common species in Somerset, as it is elsewhere in the UK. However, the soprano pipistrelle is not as frequently recorded as the common pipistrelle. It is frequently found in damp Somerset woodland, or near water.
- Brown long-eared bat (*Plecotus auritus*): This is a widespread and relatively common species in Somerset. Brown long-eared bats feed mainly in woodland and often roost in buildings, such as open lofts in older buildings and barns.
- Daubenton's bat (*Myotis daubentonii*): This species is common throughout Somerset particularly in wet woodlands or near water, with noted sites

including Bishops Palace moat, Chard Reservoir and the River Tone. There are three known maternity roost sites in Somerset.

- Noctule (*Nyctalus Noctula*): This species is common throughout Somerset, found roosting in hollow trees or bat boxes.

Uncommon species

- Serotine (*Eptesicus serotinus):* This species is declining in abundance within Somerset and is now recorded less frequently. Within Somerset this species is noted as roosting in Victorian houses with clay tile roofs and deep barge boards.
- Natterer's bat (*Myotis nattereri*): This species is locally common in the Mendips, Somerset, but is uncommon elsewhere across the county. It has been recorded in the bat group's bat boxes and bat houses.
- Lesser horseshoe bat (*Rhinolophus hipposideros*): This species is locally common in the Mendips, Somerset, but is uncommon elsewhere across the county. It has been recorded roosing in older buildings and stone outbuildings.
- Greater horseshoe bat (*Rhinolophus ferrumequinum):* This species is nationally endangered. Around 12% of the national breeding colony are breeding in the Mendips and hibernating in local caves. This species is uncommon elsewhere across the county.
- Whiskered bat (*Myotis mystacinus*): Whiskered bat, Brandt's bat (*Myotis brandtii*) and the rare Alcathoe bat (*Myotis alcathoe*) bat can only reliably be distinguished by close examination or DNA testing, so are likely to be under-recorded. There is little information on Somerset roosts of these species available. However, whiskered bat is noted as widespread but not frequent in Somerset.

Rare species

- Nathusius' pipistrelle (*Pipistrellus nathusii*): This species is rare across Somerset. A few individuals have been recorded in flight, but little information is available on their breeding status across Somerset. However, this species has been found breeding north of the Mendips.
- Barbastelle: This species is rare across Somerset however it is confirmed as breeding within Somerset's ancient woodland. A breeding colony of over 100 individuals has been recorded at Holnicote, and another in Corfe.
- Grey long-eared bat (*Plecotus austriacus*): This species is currently noted as rare in Somerset, with three known roost sites in the county. It is speculated that Somerset may be a hotspot for them, however there is currently insufficient data to support this theory.
- Brandt's bat: Whiskered bat, Brandt's bat and the rare Alcathoe bat can only reliably be distinguished by close examination or DNA testing, so are likely to be under-recorded. Brandt's bat has been recorded in Somerset, but there is limited knowledge of their breeding status.
- Bechstein's bat: This species is a rare species across the UK, including within Somerset where there are very few records. This species has been recorded within Somerset with possible breeding colonies present towards the Dorset border.
- Leisler's bat (*Nyctalus leisleri*): This species is rare across Somerset, with very little information on roosts within the country. However, a roost was recently discovered in the centre of Taunton.

1.7 Species-specific ecology

1.7.1 All bat species in the UK are nocturnal, emerging from their roosts at dusk, or shortly after. Bats have been found to roost in a number of places, including trees, barns, buildings (within lofts, basements and cavity walls), caves and bridges. Their preferred roosting location depends on a number of factors, species, gender, time of year. Bats require different conditions when hibernating compared to summer roosts.

1.7.2 Bats utilise an array of habitats as foraging grounds, including riparian habitats, woodland and grassland, feeding on a variety of insect species. Foraging grounds and insect prey differ between each species of bat, with different species adapted for hunting in a variety of ways. Many bat species are also known to use multiple different habitat types to forage, highlighting the importance of landscape scale assessment to ensure the persistence of a mosaic of habitats across important foraging areas.

1.7.3 In order to navigate between their roosts and foraging grounds, bats use linear features as commuting corridors. These are most commonly seen to be hedgerow and treelines, in addition to small patches of woodland, rivers and streams. Where these features are comprised of diverse plant assemblages, suitable to support insect populations, they may be used during opportunistic foraging, with bats feeding on the way to their main foraging grounds.

1.7.4 Relevant background information on species specific ecology has been used to inform surveys and assessments, including their distribution, range, suitable habitats, life cycle and threats. For example, the core zone of influence of a species refers to the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost. This has influenced the area in which surveys are conducted, and scale at which impacts will be considered in the future.

1.7.5 Details on the species-specific ecology of the two target species, barbastelle and Bechstein's bat are provided below.

Barbastelle

1.7.6 The barbastelle bat is one of the UK's rarest bat species, heavily associated with woodland for both roosts and foraging and are commonly found to forage some distance from roost locations which are often spread over a wide range, commonly a couple of kilometres. Colonies of barbastelle often fragment into a number of smaller roosts with a fission-fusion behaviour, with individuals separating and coming together to roost.

1.7.7 Barbastelle bats typically roost in cracks and crevices within trees and are therefore often found in ancient woodlands due to the higher standing deadwood resource and high proportion of oak. This species is very sensitive to disturbance, together with the loss of roost-sites and food resources [6].

Bechstein's bat

1.7.8 In the UK Bechstein's bat is restricted to parts of southern England and south Wales, which comprises the north-western edge of its European range. Bechstein's bats are predominantly associated with ancient broadleaf woodlands

[7] and previous studies have shown a strong association with oak and ash woodland [8] while woodlands including conifer are considered unsuitable.

1.7.9 Research undertaken by Hill and Greenaway in 2006 [8] as part of the Bechstein's bat survey pilot study identified an 'ideal' woodland model for likely presence of Bechstein's bats. Ideal Bechstein's bat woodland was found to comprise the following features:

- Size – woodlands over 25ha in size were considered. This was either 25ha of continuous woodland, in a single block, or in nearby/connected woodland blocks.
- Canopy Cover – Ideally high canopy with at least 75% cover.
- Canopy Composition – Predominantly native broadleaved woodland, preferably oak (or ash), or mixed including a high proportion of old oak.
- Understorey Cover – Ideally well developed with at least 50% cover.
- Understorey Composition – Native species, preferably hazel.

1.7.10 Other positive considerations increasing the probability of Bechstein's bat being present included the following:

- Presence of streams or ponds within woodland that retains water in summer.
- South-facing woodlands, these receive higher sunlight and have higher average temperatures, and come into leaf earlier in spring.
- Lower elevations, these are warmer with higher average temperatures than higher woodlands.
- Stands of mixed age that include stands/trees greater than 100 years, these provide evidence of historical continued canopy cover.
- Occurrence and connectivity of other suitable woodlands.

1.7.11 Negative considerations that could reduce the probability of Bechstein's bat being present included the following:

- Evidence of more recent management to clear understorey, coppicing and remove older trees.
- High proportion of conifer and non-native species.

1.7.12 The use of the ideal Bechstein's bat woodland model above has been highly successful in targeting woodlands for surveying Bechstein's bats. However, there are numerous examples of Bechstein's bat being found in scenarios that don't fit the model, which could be for a range of reasons, including localised variations and failing colonies still present in non-ideal, or non-model habitats [9].

1.7.13 Bechstein's bats forage over a relatively small area in comparison to other species, therefore the presence of suitable habitat within close proximity to their roost sites is important for the success of the colony, with loss of habitat having a likely significant negative impact upon the favourable conservation status of the species [10].

2 Methodology

2.1 Desk study

2.1.1 A detailed biological records search was requested from Somerset Environmental Records Centre (SERC) in January 2021, for records of bats within a 10 kilometre buffer of the scheme. Records over ten years were omitted as they might not accurately represent the current status of bat populations in the area. However, significant records over ten years old, such as hibernation and maternity roosts, were included given their significance to the local bat population and scheme.

2.1.2 A detailed desk study exercise was undertaken in January 2021 in order to determine the presence of statutory and non-statutory designated sites up to 2 kilometres from the scheme, which was extended out to 30 kilometres for Special Areas of Conservation (SACs) with bat species listed as a qualifying feature. The sites were identified using sources that included Multi-Agency Geographic Information for the Countryside (MAGIC) [11] and the Joint Nature Conservation Committee (JNCC) [12] websites. Details of statutory and non-statutory designated sites within the respective study areas are summarised within the results and will be reported in full within Chapter 8 *Biodiversity* of the ES and Habitat Regulations Assessment (HRA) Report.

2.1.3 The *A358 Taunton to Southfields Dualling Bat Trapping and Radio Tracking Technical Report (June 2021)* [13] was also reviewed for records of bats from surveys relating to the scheme undertaken in 2017, 2018 and 2020.

2.2 Field study

2.2.1 All surveys were led by experienced bat ecologists, Daniel Whitby and Annika Binet.

2.2.2 Daniel Whitby is a full member of CIEEM and is an experienced ecologist who has specialised in bats for over 20 years. During his career he has specialised in bat work specifically on the rarest UK species and advanced survey techniques, notably trapping, use of ultrasonic lures and radio tracking with extensive experience in use of night vision equipment for surveys.

2.2.3 Daniel holds Natural England Bat class licences 3 and 4 and has held numerous Natural England scientific project licenses which have involved radio-tracking, ringing and research into all 17 UK breeding species, including all Annex II species, namely barbastelle, Bechstein's bat, greater horseshoe bat and lesser horseshoe bat. He has worked extensively with the common and rare species both in surveying, conservation and mitigation projects and research and has been selected as an assessor for Natural England's new Earned Recognition Scheme.

2.2.4 Annika Binet is a full member of CIEEM and is an experienced ecologist who has worked on bats for over 10 years. She has experience with all UK species, including all Annex II species, namely barbastelle, Bechstein's bat, greater horseshoe bat and lesser horseshoe bat. During her career she has specialised in bat work and advanced survey techniques, notably trapping, use of ultrasonic lures and radio tracking and additionally has extensive experience in use of night vision equipment for surveys.

2.2.5 Annika holds Natural England Bat class 3 and 4 licences and has held a number of EPS mitigation licenses or equivalent during the last 8 years. She has previously held a survey licence and numerous project licences covering disturbance during all seasons, handling, capture using hand nets, mist nets and harp traps, use of acoustic lures, marking by fur clipping and ringing and radio tagging and has also been an accredited agent on project licences in England and Wales for advanced bat surveys including rare species-specific research projects, commercial projects and radiotracking a range of species.

2.2.6 All surveys were carried out under a project licence issued by Natural England (licence number 2021-52521-SCI-SCI) to include all trapping and radio tagging of all species and followed best practice guidance [14] [15].

2.2.7 The following survey methods were used to gather data to ascertain the use of the study area by bats. All surveys conducted during 2021 followed a precautionary approach, based on advice from IUCN [16], Eurobats [17], CIEEM [18] and BCT [19], to minimise the potential for transmission of Covid-19 to UK bat species during the pandemic. The precautionary approach included disinfecting all equipment to be used, wearing of suitable PPE including face masks, regularly cleaning and hand sanitising and minimising handling and processing of all bats.

Trapping surveys

2.2.8 To accurately identify what potential impacts a proposed development may have on any bats, or population/colony present locally, it is important to identify the sex and breeding status of individuals to inform on the presence, or potential presence, of a breeding population using a site as well as the presence, or proximity, of a local maternity colony that could be impacted.

2.2.9 Trapping surveys were undertaken to identify the species present, as well as the sex and breeding status of individual bats.

2.2.10 Trapping surveys were conducted across a range of habitats and locations along the length of the proposed scheme in 2021, with a total of 18 nights' trapping conducted. Trapping was conducted between May and September avoiding the more sensitive late pregnancy period and early birth period when bats can carry dependant young. Exact trapping locations were dependant on the species being targeted, ground and weather conditions as well as specific suitable trapping locations available within the study area, as identified from the desk study information. These included habitats or features considered likely to be important to the target species, and to have potential to be used by a range of bat species, including Bechstein's bat and barbastelle.

2.2.11 Trapping surveys were conducted using several Harp traps (Austbat two bank and three bank) and Mist nets (Ecotone) to trap bats. Where suitable this was accompanied with a sonic lure (Sussex Autobat or Binary Acoustic Technology AT100) to attract any bats foraging in the area using a range of bat species' social calls. This can increase the detection rate of quiet whispering species, such as Bechstein's bat, barbastelle, myotis (*Myotis sp.)* and long-eared bats (*Plecotus sp.),* which can be under-recorded on detector surveys.

2.2.12 A range of lure calls were played to maximise capture rates during trapping sessions. This included playing a range of calls to catch a full suite of species

present, as well as a number of more species-specific calls to target certain species of interest, such as Bechstein's bat and barbastelle calls.

2.2.13 Trapping was generally conducted from dusk until the early hours of the morning with a minimum trapping period of five hours. All traps were checked regularly to ensure no bats were trapped for extended periods. All bats caught were identified to species level, sexed, aged and reproductive status ascertained. All bats were released at the capture site shortly after capture. Target bat species were ringed where suitable and licensed with a Porzana bat ring. All trapping surveys were undertaken in accordance with chapter 9 of the *Bat Surveys for Professional Ecologists: Good Practice Guidelines* [14] and capture and marking of bats was undertaken in accordance with Natural England's *Guidance on the capture and marking of bats under the authority of a Natural England licence* [20].

Ringing

2.2.14 Target bat species, primarily barbastelle and Bechstein's bats, in addition to other species of interest, were ringed to potentially provide additional information on movements of individuals throughout the study area, in addition to ensuring that the same bat was not tagged twice.

2.2.15 Ringing of bats, can provide information on both movements of bats throughout the scheme and local landscape where they are re-caught at other locations, and can help indicate the geographical spread and land use by a colony/population.

2.2.16 All bats were ringed with Porzana alloy bat rings using sizes 2.9mm to 4.2mm as suitable for the species being ringed. Rings were closed manually until <1mm remained between the lipped ends of the ring. Before release each bat and ring were checked so that it did not stick on the wrist, it moved freely along the forearm and the 5th finger did not stick inside the ring.

Radio tracking surveys

2.2.17 Individual bats were radio tagged to enable radio tracking surveys. Radio tags (Biotrack - UK and Holohil - Canada) were fixed to a bat using a latex-based adhesive (Torbot bonding cement) and carefully attached between the shoulder blades (the most suitable centre of gravity) of the bat.

2.2.18 Bats were radio tagged following a 5% rule where the combined radio tag and glue weight was not more than 5% of the bat's weight. A range of radio tag weights were used as suitable for the species being tagged [14].

2.2.19 After fitting the radio tag, the tag aerial was carefully cleaned, and the bat kept for 5-10 minutes to be thoroughly checked before being released. Bats were monitored intermittently upon release, however radio tracking data was not always collected on the night a bat was fitted with a tag, as behaviour could be affected/skewed by the tagging experience. Where bat activity was monitored on the night the bat was tagged this information was used to inform locations for subsequent nights' tracking.

2.2.20 Bats were radio tracked using Biotrack Sika receivers and different Yagi aerials using a range of radio tracking methods depending on activity, bat location and commuting distances.

2.2.21 High fixed masts were erected on the site using large 1.8m rigid Yagi aerials to gain the maximum range and accuracy, and flexible two and three element Yagi

aerials were used for mobile surveyors to follow bats on foot where required. Bat positions or fixes were, when possible, triangulated from bearings taken from multiple surveyor locations as the most accurate recording method, and the close approach method used when only one surveyor had a bearing or signal from a bat.

2.2.22 Radio tracking surveys were undertaken in accordance with Section 9.3 of the *Bat Surveys for Professional Ecologists: Good Practice Guidelines* [14] and *A Manual for Wildlife Radio Tagging* [21].

Emergence surveys

2.2.23 Emergence surveys were carried out on accessible day roosts, which were identified using radio tracking data. Emergence surveys were conducted to enable accurate roost counts of visible roosts to indicate colony size and roost characterisation.

2.2.24 The evening emergence surveys were conducted between May and September during the radio tracking period when the tagged bats were known to be present within the roost.

2.2.25 The emergence surveys began approximately 15 minutes before sunset and finished one and a half hours after sunset on each survey. The species and number of bats exiting the roost were recorded.

2.2.26 Batlogger M bat detectors were used for taking time-expanded recordings of any bats emerging from the buildings or trees. These recordings were analysed on Elekon Bat Explorer analysis software that facilitates species identification.

2.2.27 Professional night vision infra-red or thermal imaging video cameras were used to film areas of the buildings or trees, with the assistance of an external infra-red lamp, to accurately identify and record bats emerging. All footage was analysed using VLC player to confirm the location of roost features and obtain a roost count.

2.3 Analysis of results

Radio tracking analysis

2.3.1 The radio tracking fixes obtained for each bat were imported into R Studio, which was then used to produce visual representations of the estimated ranging areas using statistical algorithms included within the AdeHabitat HR package.

2.3.2 The home range of an individual animal is typically constructed from a set of fixes that had been collected over a period of time, identifying the position in space of an individual at many points in time. The 100% Minimum Convex Polygon (MCP) was used to estimate the foraging ranges of each of the radio tracked bats. The MCP simply connects the outermost points on the scatter of mapped locations such that the sum of linkage distances between edge points is minimised. However, MCPs are very sensitive to outliers and require large data sets for accurate estimations of home range size [22]. Furthermore, they give no information about how the animal is using its home range [23].

2.3.3 Probabilistic approaches to home range estimators have also been developed whereby the density of fixes is estimated throughout the area used by the animal. Kernel Density Estimation (KDE) [24] [25] [26] is a nonparametric technique that

describes home ranges by means of hierarchical probabilities for the intensity of habitat utilisation, termed isopleths. Series of isopleths can be plotted around the smallest area where the cumulative probability reaches a particular value. For example, the 95% isopleth encompasses the area where the probability of finding an animal is 95%.

2.3.4 Studies on various species' home ranges show that, for a number of environment-related reasons, certain portions within the home range are visited more frequently than other [27] [28]. The centre(s) of activity can be defined as the area within the home range in which the most fixes occurred during the radio tracking period and can give an indication of which part(s) of the range the bat(s) used more intensively. Areas of more intensive use have been termed as the 'core area of the home range' of the animal and may be related to the greater availability of food resources and refuges [29].

2.3.5 Core areas can be a useful concept when describing patterns of behaviour or identifying particular resources [23] [22]. The 50% isopleth (median value) was adopted as an indicator of core area use.

Impact analysis

2.3.6 Core Sustenance zones (CSZs) were used to help assess the likelihood of significant impact upon maternity colonies present within the survey area.

2.3.7 CSZs, when applied to bats, refer to the area surrounding maternity roosts within which the habitat availability and quality has significant influence upon the resilience and favourable conservation status of the colony using the roost. They were determined via meta-analysis of data describing foraging radii following a literature review of reported results from radio tracking studies where bats were tracked whilst foraging within the UK and Europe [30] [31].

2.3.8 The review identified three metrics of bat foraging radii that are commonly reported in the literature [30]:

- Maximum foraging radius – this is the maximum straight-line distance from the roost occupied during the previous day to the furthest foraging area, or in some cases the furthest point travelled, by any bat during the study.
- Mean-maximum foraging radius – this is the average maximum foraging radius (see above) of all bats in the study. In most cases this is the maximum distance travelled by each bat across all nights of the study, averaged across all bats, however in a small number of cases the maximum distance travelled each night by each bat, averaged across all nights, is used.
- Mean foraging radius - the average straight-line distance between the roost occupied during the previous day and each core foraging area used by the bats tracked during the study.

2.3.9 CSZ sizes for UK bat species are detailed in Table 2-1 below.

Table 2-1 Core Sustenance Zone sizes calculated for UK bat species [31]

Species	CSZ radius (km)
Greater horseshoe bat *(Rhinolophus ferrumequinum*)	3
Lesser horseshoe bat (*Rhinolophus hipposideros*)	2
Barbastelle	6

Species	CSZ radius (km)
Brown long-eared bat (*Plecotus auritus*)	3
Grey long-eared bat (*Plecotus austriacus*)	3
Daubenton's bat (*Myotis daubentonii*)	2
Natterer's bat (*Myotis nattereri*)	4
Whiskered/Brandt's/Alcathoe bat (*Myotis mystacinus/brandtii/alcathoe*)	1
Bechstein's bat	3**
Common pipistrelle (*Pipistrellus pipistrellus*)	2
Soprano pipistrelle (*Pipistrellus pygmaeus*)	3
Nathusius pipistrelle (*Pipistrellus nathusii*)	3
Noctule (*Nyctalus noctula*)	4
Leisler's bat (*Nyctalus leisleri*)	3
Serotine (*Eptesicus serotinus*)	4

** Note: There may be justification with Annex II and other rare species to increase the CSZ to reflect use of the landscape by all bats in a population. We suggest increasing the CSZ of Bechstein's bat to at least 3km, reflecting its very specific habitat requirements.

2.4 Assumptions and limitations

2.4.1 Many species have very similar echolocation calls making accurate species identification from acoustic surveys difficult, especially for cryptic groups like myotis bats. Different amplitude of species' calls dramatically under or over identify the presence of some species, resulting in a very biased survey technique and commonly misidentifying presence of some species, notably long-eared bats.

2.4.2 By their nature, rare species are difficult to catch, especially ones that have large, wide-ranging foraging areas. Trapping can be improved via use of an ultrasonic lure to target specific species; however, no surveys can be used as confirmation of absence, but rather an increased improbability of presence.

2.4.3 Trapping of the target species such as Bechstein's bat is specifically conducted using an ultrasonic lure which incites a territorial response in bats defending their territory from what they perceive is the presence of another bat. When bats are not breeding, they don't form the territories in the same way, as they don't have the need to feed as much, and hence defend their food resource. It is notable that in very poor breeding years, capture rates drop substantially as bats do not respond to defend their territory.

2.4.4 Roost switching behaviour is observed in most bat species and is particularly prevalent with tree-roosting bats, therefore woodlands containing confirmed maternity colonies should be considered a roost as a whole woodland rather than as roosts in individual trees, as all trees with features have a high chance of being used at different times of year and over the life of the colony as features change suitability over time and in different climatic conditions. Woodlands with maternity roosts are also likely to contain hibernation roosts within a range of trees.

2.4.5 Trapping surveys can improve data gathering by confirming species identification, sex and breeding status, however, trapping is more difficult and specialist, and trapping success can vary depending on trap suitability in different areas and access to suitable trapping positions. Bats are difficult to locate in foraging habitat and difficult to catch, especially in large, exposed open areas. Different species

may also forage in different habitats throughout the year according to the availability of their preferred prey and in particular weather conditions; for example, more sheltered areas can be more highly used during periods of colder weather, wind or light rain than more open, exposed areas. Bats moving over large areas also become increasingly difficult to find and/or follow and to obtain fixes for. Bats can move out of range, have signals blocked by local topography or enter underground sites where signals are lost.

2.4.6 The most pertinent data to the scheme is where, when and how bats are interacting with habitats within or near the study area. As some bats will forage over wide areas, they could spend notable amounts of time well away from the study area. Radio tracking surveys concentrated on bat activity within the study area, notably where bats may cross the scheme. In cases where bats were foraging away from the study area, continuous contact with the bat was not maintained, with surveyors concentrating on the bats where they forage near to the scheme and where they cross over the scheme. As a result, the constraints identified with bats moving out of range were not considered to be significant.

2.4.7 Spring 2021 was particularly poor, with prolonged wet weather conditions and lower than average temperatures (including night-time temperatures) well into May. A number of trapping surveys, notably in May, commenced due to good forecast conditions, but on-site weather conditions were recorded as suboptimal/unsuitable for survey. Trapping surveys affected by poor weather conditions included 17 May (Ashill Wood/Every's Copse), 18 May (Jordan's Park), 19 May and 27 July (Bickenhall Wood), 22 May and 9 August (Stoke Wood) and 24 May 2021 (Henlade Wood). These surveys were completed but conditions were considered to be sub-optimal. A trapping survey in Huish Wood on 24 May 2021 was terminated early due to unsuitable weather conditions. These surveys are not considered representative of the bat activity levels for the study area.

2.4.8 A lower number of fixes were obtained for some bats as they were recorded to be foraging a long way from the site and not on, or near the road scheme and as the surveys were concentrating on identifying the crossing point positions and not on identifying foraging habitats when not near the road scheme the bats were not followed during these periods but were scanned for frequently. Additionally, during the periods of sub-optimal conditions bats were recorded to return to and remain in their roosts for extended periods again reducing the number of fixes obtained for these bats, however they were scanned for frequently during these periods. Not enough fixes were obtained to be sufficient to plot the KDEs for three out of the 31 radio tagged bats (bat 1 and bat 2, both of which were Bechstein's bats, and bat 27 a Leisler's bat) to a suitable level of accuracy therefore only MCPs have been plotted for these bats, which represent their range within the impact zone of the scheme but not their overall range which will extend further. MCPs and KDEs have been plotted for all other radio tagged bats.

2.4.9 Bat activity was notably lower than expected during the pre-parturition period and the number of grounded bats nationally due to poor weather was high. These prolonged weather conditions would have affected bat behaviour, not only foraging in poor conditions, but likely roost behaviour, with many colonies forming roosts late and reduced breeding success. Poor weather conditions also reduced the number of individuals leaving roosts. Poor weather conditions were considered to be a significant factor in reduced activity levels recorded for six radio tagged bats (bat 5 Natterer's bat; bat 7 barbastelle; bat 8 noctule; bat 9 brown long-eared bat; bat 10 barbastelle and bat 11 Bechstein's bat). Bats were

recorded as having shorter foraging bouts and returning more regularly to night roosts. Access constraints also resulted in a reduced number of fixes recorded for bat 9 brown long-eared bat.

2.4.10 Access was not available to all areas throughout the survey season, with access to the Hatch Park Estate and Line Wood delayed until the post parturition period. Access to some roosts on private land and property was not available and not all areas of the site were accessible throughout the survey season to enable emergence surveys to be carried out.

2.4.11 Emergence surveys were carried out on identified roosts where practicable and accessible. However, not all features were visible, or bats seen emerge, in order to enable roost counts. Studies have shown that significant numbers of potential roost features in trees are not visible from ground level during the summer months due to them being obscured by canopy cover and due to the angle of the sun and the reduction in light penetration due to the density of foliage [32]. A radio tracking study carried out by S. Murphy et. al. in 2012 [33] showed that 25% of brown long-eared bat roosts identified from radio tagged bats could not be identified from the ground even when a tagged bat was present in the roost. Winter checks and aerial surveys of trees may enable identification of features which weren't visible during the summer survey period.

2.4.12 Due to international issues with supply and manufacturing the supply of radio tags ceased in July 2021 leading to a shortage of tags and inability to complete all of the radio tagging planned for the project in late summer. Radio tagging was therefore concentrated on gathering data from the newly discovered Bechstein's bat colonies, and larger identified existing colony as a priority, as agreed with Natural England, over the tagging non-Annex II species.

2.4.13 The survey results presented in this study represent a snapshot in time, and so should not be extrapolated to predict how bats are likely to use the study area at different times of year or at the same time in different years but should be used as averages and as a guide to behaviours. Where colony radio tracking was conducted, this only provided information on habitat use by a portion of the colony, as not every individual was tracked. The higher the proportion of a colony tracked, the greater the proportion of data on the colony is collected, and the more representative the radio tracking data is for that colony.

3 Results

3.1 Desk study

3.1.1 The following section provides a summary of the desk study search results. However, full details on designated sites will be provided within Chapter 8 Biodiversity of the ES and HRA Report and bat records detailed in Appendix A of the Bat Roost Report Technical Appendix (which will form Appendix 8.8 of the ES).

European designated sites

3.1.2 There are four European Special Areas of Conservation (SACs) designated for bats which were located within 30 kilometres of the scheme. These comprise:

- **Hestercombe House SAC** –located 3.77 kilometres from the scheme and designated as a maternity roost for lesser horseshoe bats with a hibernation colony also present.
- **Exmoor and Quantock Oakwood SAC** – located 15.97 kilometres from the scheme and designated for supporting barbastelle and Bechstein's bat maternity roosts.
- **Bracket's Coppice SAC** – located 18.21 kilometres from the scheme and designated for supporting a maternity roost of Bechstein's bats.
- **Beer Quarry and Caves SAC** – located 28.42 kilometres from the scheme and designated as a hibernation roost for eight species of bat, including lesser horseshoe bat, greater horseshoe bat and Bechstein's bats.

Nationally designated sites

3.1.3 There are three designated sites of national importance within 2 kilometres of the scheme. These are Thurlbear Woods and Quarrylands Site of Special Scientific Interest (SSSI), Barrington Hill Meadows SSSI and Barrington Hill National Nature Reserve (NNR). A further 13 nationally designated sites of national importance were located over 2 kilometres from the scheme but fell within 200 metres of the ARN. These sites have the potential to provide suitable foraging and roosting habitat for bat species.

Regionally designated sites

3.1.4 There are 46 non-statutory sites within 2 kilometres of the scheme, all of which are Local Wildlife Sites (LWSs). There is a single LWS identified as supporting bats within the data search area; Crimson Hill Tunnel LWS, situated 1.6 kilometres east of the scheme, recorded as supporting a winter roost of at least five horseshoe bats.

Bat records

3.1.5 A significant number of recent (within the last 10 years) bat records were returned from SERC within 10 kilometres of the scheme, a summary of which is provided in Table 3-1. At least 15 species of bats have been recorded within 10 kilometres of the scheme.

Table 3-1 Desk study (SERC) records of bats within 10 kilometres of the scheme

Species	Records within 10km	Significant records
Chiroptera (unidentified)	981	-
Common pipistrelle	791	Including 1 maternity roost 3.81km east of the scheme.
Pipistrelle sp.	697	Including 1 maternity roost 2.77km south-east of the scheme.
Soprano pipistrelle	338	-
Lesser horseshoe bat	385	Including records of 27 roosts, the closest of which is 240m south-west of the scheme (at Ilminster). There is 1 record of a maternity roost 6.90km west of the scheme at Blagdon Hill.
Serotine	232	-
Noctule	179	Includes 1 records of a maternity roost.
Myotis sp.	147	
Brown long-eared bat	188	Including 3 records of maternity roosts. The closest of which is 3.83km west of the scheme.
Plecotus sp.	70	Including 1 record of a maternity roost (species not confirmed) 2.77km south-east of the scheme.
Natterer's bat	81	Including 1 record of a maternity roost 2.77km south-east of the scheme.
Greater horseshoe bat	59	Including records of roosts from 3 different sites, the closest of which is 5.16km east of the scheme.
Barbastelle	59	-
Daubenton's bat	70	-
Leisler's bat	24	-
Nyctalus sp.	18	-
Nathusius' pipistrelle	17	-
Nyctalus/Eptesicus sp.	11	-
Whiskered bat	14	-
Whiskered/Brandt's bat	22	-
Bechstein's bat	7	-
Brandt's bat	3	-

3.1.6 Of the four Annex II species recorded, only lesser horseshoe bat and greater horseshoe bat were confirmed to be roosting within 10 kilometres of the scheme.

Barbastelle and Bechstein's bat records only pertained to ultrasonic recordings and flight records.

3.1.7 Twenty-seven confirmed lesser horseshoe bat roosts were recorded within 10 kilometres of the scheme. Roost types included: day, night, maternity, indeterminate (droppings only) and transitional roosts. The closest lesser horseshoe bat roosts were located 233 metres west of the scheme, north of Bickenhall. There were four records of roosts within 1 kilometre of the scheme, with three at the northern end of the scheme, and one to the south of the scheme. All other roost records were located over 3 kilometres from the scheme and were primarily located to the north and south of Taunton.

3.1.8 Greater horseshoe bat records were largely located to the north and south of the scheme, with the majority located to the north of Taunton and to the west of the M5 motorway. Records of a greater horseshoe bat roosts (recorded annually from 2016 – 2019) were located 5.95 kilometres east of the scheme at Butcher's Hill, Fivehead (roost type unknown). Two further roosts were located approximately 6.2 kilometres and 9.39 kilometres to the north-east, respectively.

3.1.9 The majority of barbastelle records were located to the north of Taunton and the M5 motorway. Smaller clusters were recorded to the south and west of the scheme, with a cluster of records located adjacent to the Nexus 25 development and several off-site woodland blocks. The closest records of barbastelle were within the scheme boundary at the northern end of the scheme and to the south of the Taunton Park and Ride.

3.1.10 Bechstein's bat records were primarily located in association with large woodland blocks to the south and west of the scheme including Old Wood and Buckland Wood. The closest records pertained to an observation 1.7 kilometres west of the scheme boundary towards the southern end of the scheme at Broadway Pound.

3.1.11 Other common and more notable species, including common and soprano pipistrelle, serotine, brown long-eared bat, noctule, Natterer's bat, Daubenton's bat, and whiskered bat, were also recorded roosting within 10 kilometres of the scheme.

Other records

3.1.12 The SERC dataset contained notable historic records of hibernating bats identified in 1989 and 1990-1991 which were not included in the detailed analysis above.

3.1.13 Daubenton's bat, brown long-eared bat and lesser horseshoe bat were found hibernating in Quants Reserve in 1989, approximately 10 kilometres to the west of the scheme. Lesser horseshoe bats were also found hibernating within a large residential property 3.5 kilometres north of the scheme in Walford in 1990. Unidentified hibernating bats were recorded in Crimson Hill Tunnel, approximately 1.6 kilometre east of the scheme near Wrantage along a disused railway line.

3.1.14 A review of the *A358 Taunton to Southfields Dualling Bat Trapping and Radio Tracking Technical Report (June 2021)* [13] found that six Bechstein's bat roosts had been located through radio tracking surveys in 2018 and 2020, identifying roosts in Huish Wood and Bickenhall Wood. A single female barbastelle had also been radio tagged, and a roost of 11 individuals located in Bickenhall Wood. Trapping surveys carried out in 2017, 2018 and 2020 involved 31 trapping nights, during which a total of 108 bats of nine species were caught. Species caught

included Natterer's bat, small Myotis (possibly whiskered bat/Brandt's bat or alcathoe bat *Myotis alcathoe*), serotine, Bechstein's bat, common pipistrelle, soprano pipistrelle, barbastelle, noctule and brown long-eared bat. Breeding Bechstein's bat, barbastelle, Natterer's bat, common pipistrelle and brown long-eared bat were all confirmed in the survey/trapping areas.

3.2 Field study

Trapping and radio tagging

3.2.1 Trapping and radio tagging was conducted at ten survey locations in 2021, as shown in Appendix A. Eighteen trapping sessions were conducted between May and September 2021, resulting in a total of 338 captures of 14 species. The numbers of each species trapped at each survey location are presented in Table 3-2 below and full details of trapping results provided in Appendix B, Table B-1 with trap and capture locations divided by species illustrated on Figures B-1 to B-8. Species captured included:

- Common pipistrelle
- Soprano pipistrelle
- Brown long-eared bat
- Barbastelle
- Bechstein's bat
- Natterer's bat
- Daubenton's bat
- Whiskered bat
- Brandt's bat
- Noctule
- Leisler's bat
- Serotine
- Greater horseshoe bat
- Lesser horseshoe bat

3.2.2 Full details of the weather conditions during the trapping, radio tracking and emergence surveys are presented in Appendix D, Table D-1.

Table 3-2 Results of all trapping surveys

Site	Trapping nights	Total captures	*P.pip*	*P.pyg*	*P.aur*	*M.bech*	*M.nat*	*M.daub*	*M.bran*	*M.myst*	*B.barb*	*N.noc*	*N.Lei*	*E.ser*	*R.ferr*	*R.hipp*
Abbey Wood	1	32	12	6	0	1	5	0	0	3	2	2	0	1	0	0
Ashill Wood/ Every's Copse	2	55	4	8	12	13	5	1	0	5	0	3	0	4	0	0
Bickenhall Wood	2	51	14	1	9	6	5	0	0	13	0	2	0	0	0	1
Hatch Park Estate	2	26	2	8	4	1	2	1	0	0	4	2	1	0	0	1
Huish Wood	3	38	5	7	10	3	5	0	0	5	1	0	0	1	0	1

Site	Trapping nights	Total captures	*P.pip*	*P.pyg*	*P.aur*	*M.bech*	*M.nat*	*M.daub*	*M.bran*	*M.myst*	*B.barb*	*N.noc*	*N.Lei*	*E.ser*	*R.ferr*	*R.hipp*
Henlade Wood	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Line Wood	1	12	0	1	5	0	2	0	0	2	1	0	0	1	0	0
Jordan's Park	2	26	6	10	5	0	2	1	0	1	0	0	0	0	0	1
Stoke Wood	3	76	2	12	15	2	21	1	1	5	10	4	1	0	1	1
Hurford's Plantation	1	21	0	7	5	3	3	0	0	0	0	1	1	1	0	0
	18	**338**	**45**	**60**	**65**	**29**	**51**	**4**	**1**	**34**	**18**	**14**	**3**	**8**	**1**	**5**

Abbey Wood

3.2.3 A single trapping survey was conducted on 25 July 2021, with a total of six trap nights' worth of effort (the total number of traps set over the course of the surveys) conducted resulting in a total of 32 captures of seven species. Weather conditions were warm, still and dry and considered to be suitable during the survey.

3.2.4 The understorey within the woodland was extremely dense restricting placement of traps to the boundary features. Common pipistrelle was the most frequently caught species (n=12), followed by soprano pipistrelle (n=6) and Natterer's bat (n=5). An individual Bechstein's bat and two barbastelles were caught and one of each species radio tagged. Other species captured included Brandt's bat, noctule and serotine. A summary of the trapping survey results at Abbey Wood is provided in Table 3-3.

Table 3-3 Results summary for Abbey Wood surveys

Date	Weather summary	No. of traps	Total captures	*P.pip*	*P.pyg*	*P.aur*	*M.bec*	*M.nat*	*M.dau*	*M.bra*	*M.mys*	*B.barb*	*N.noc*	*N.lei*	*E.ser*	*R.ferr*	*R.hipp*
25/07/21	Good - Warm, still & clear	6	32	12	6	0	1	5	0	0	3	2	2	0	1	0	0

Ashill Wood/Every's Copse

3.2.5 Trapping surveys were conducted on 17 May and 19 July 2021, with a total of 17 trap nights' worth of effort conducted resulting in a total of 55 captures of nine species. Weather conditions were considered suitable on both nights; however, the May survey had been very wet during the day, cool and breezy and the temperature dropped during the survey creating sub-optimal conditions and reducing bat activity levels.

3.2.6 Bechstein's bat and brown long-eared bat (both n=12) were the most common species caught. The next most common species was soprano pipistrelle (n=8). In total nine bats were tagged from the two trapping sessions in Ashill Wood/Every's Copse: six Bechstein's bats, two Natterer's bats and one brown long-eared bat. Other species captured included common pipistrelle, Daubenton's bat, whiskered bat, noctule and serotine. A summary of the trapping survey results at Ashill Wood and Every's Copse is provided in Table 3-4.

Table 3-4 Trapping results summary for Ashill Wood/Every's Copse surveys

Date	Weather summary	No. of traps	Total captures	P.pip	P.pyg	P.aur	M.bech	M.nat	M.daub	M.bran	M.myst	B.barb	N.noc	N.lei	E.ser	R.ferr	R.hipp
17/05/21	Suboptimal - Very wet day. Dry, clear and still and cold evening	8	15	0	4	1	6	3	0	0	1	0	0	0	0	0	0
19/07/21	Good - Very warm day and warm, still evening	9	40	4	4	11	6	3	1	0	4	0	3	0	4	0	0
			55	4	8	12	12	6	1	0	5	0	3	0	4	0	0

Bickenhall Wood

3.2.7 Trapping surveys were conducted on 19 May and 27 July 2021, with a total of 13 trap nights' worth of effort conducted resulting in a total of 51 captures of eight species. Weather conditions were considered suitable on both nights.

3.2.8 Common pipistrelle was the most frequently caught species (n=14) closely followed by whiskered bat (n=13). Lower numbers of brown long-eared bat (n=9), Bechstein's bat (n=6) and Natterer's bat (n=5) were caught. Two Bechstein's bats were radio tagged from Bickenhall wood. Other species captured included soprano pipistrelle, noctule and lesser horseshoe bat. A summary of the trapping survey results at Bickenhall Wood is provided in Table 3-5.

Table 3-5 Trapping results summary for Bickenhall Wood surveys

Date	Weather summary	No. of traps	Total captures	*P.pip*	*P.pyg*	*P.aur*	*M.bech*	*M.nat*	*M.daub*	*M.bran*	*M.myst*	*B.barb*	*N.noc*	*N.lei*	*E.ser*	*R.ferr*	*R.hipp*
19/05/21	Good - cool, dry, clear sky	6	29	9	1	4	2	3	0	0	8	0	1	0	0	0	1
27/07/21	Good - Warm, still, overcast and humid	7	22	5	0	5	4	2	0	0	5	0	1	0	0	0	0
			51	14	1	9	6	5	0	0	13	0	2	0	0	0	1

Hatch Park Estate

3.2.9 Trapping surveys were conducted post-parturition, due to delayed access to this area, on 26 July and 24 August 2021. A total of 15 trap nights' worth of survey effort was conducted resulting in a total of 26 captures of 10 species. Weather conditions were suitable on both nights; warm and clear on the 26 July 2021, with cloud cover developing through the night and rain showers recorded after the completion of the survey, 24 August 2021 was warm, still and partly overcast.

3.2.10 Lower numbers of bats were caught in this woodland than expected with soprano pipistrelle the most frequently caught species (n=8), followed by barbastelle (n=4), with a single Bechstein's bat also captured during the surveys. Five bats were tagged: three barbastelle, one Natterer's bat and one Leisler's bat. Other species captured included common pipistrelle, brown long-eared bat, Daubenton's bat, noctule, Leisler's bat and lesser horseshoe bat. A summary of the trapping survey results at Hatch Park is provided in Table 3-6.

Table 3-6 Trapping results summary for Hatch Park surveys

Date	Weather summary	No. of traps	Total captures	*P.pip*	*P.pyg*	*P.aur*	*M.bech*	*M.nat*	*M.daub*	*M.bran*	*M.myst*	*B.barb*	*N.noc*	*N.lei*	*E.ser*	*R.ferr*	*R.hipp*
26/07/21	Good - Warm, still & clear	8	5	0	0	1	0	1	1	0	0	1	0	0	0	0	1
24/08/21	Good - Warm, still & partly overcast	7	21	2	8	3	1	1	0	0	0	3	2	1	0	0	0
			26	2	8	4	1	2	1	0	0	4	2	1	0	0	1

Huish Wood

3.2.11 Trapping surveys were conducted on 24 May, 7 June and 10 August 2021, with a total of 17 trap nights' worth of effort conducted resulting in a total of 38 captures of nine species. Weather conditions were suitable during the June and August surveys. Whilst conditions were initially suitable during the May survey, it became cold quickly and the survey was terminated early, for welfare reasons, prior to midnight.

3.2.12 Brown long-eared bat (n=10) was the most frequently caught species followed by soprano pipistrelle (n=7), common pipistrelle, Natterer's bat and whiskered bat (all n=5). Three Bechstein's bats and one barbastelle were also caught. None of the captured bats were fitted with a radio tag. Other species captured included brown long-eared bat, whiskered bat, serotine and lesser horseshoe bat. A summary of the trapping survey results at Huish Wood is provided in Table 3-7.

Table 3-7 Trapping results summary for Huish Wood surveys

Date	Weather summary	No. of traps	Total captures	*P.pip*	*P.pyg*	*P.aur*	*M.bech*	*M.nat*	*M.daub*	*M.bran*	*M.myst*	*B.barb*	*N.noc*	*N.lei*	*E.ser*	*R.ferr*	*R.hipp*
24/05/21	Unsuitable - Clear day and evening, became cold quickly.	6	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
07/06/21	Good - Warm overcast day. Still, warm &	6	14	2	3	4	0	2	0	0	1	1	0	0	0	0	1

Date	Weather summary	No. of traps	Total captures	*P.pip*	*P.pyg*	*P.aur*	*M.bech*	*M.nat*	*M.daub*	*M.bran*	*M.myst*	*B.barb*	*N.noc*	*N.lei*	*E.ser*	*R.ferr*	*R.hipp*
	clear evening																
10/08/21	Optimal - Warm, light breeze & mostly clear	5	23	2	4	6	3	3	0	0	4	0	0	0	1	0	0
			38	5	7	10	3	5	0	0	5	1	0	0	1	0	1

Hurford's Plantation

3.2.13 A single trapping survey was conducted on 25 August 2021, with a total of three trap nights' worth of effort conducted resulting in a total of 21 captures of seven species. Weather conditions were warm and still with partial cloud and considered suitable during the survey.

3.2.14 Soprano pipistrelle was the most frequently caught species (n=7) followed by brown long-eared bat (n=5). Three Bechstein's bats were caught during the survey. Three bats were radio tagged from this woodland: two Bechstein's bats and one brown long-eared bat. Other species captured included Natterer's bat, noctule, Leisler's bat and serotine. A summary of the trapping survey results at Hurford's Plantation is provided in Table 3-8.

Table 3-8 Trapping results summary for Hurford's Plantation surveys

Date	Weather summary	No. of traps	Total captures	*P.pip*	*P.pyg*	*P.aur*	*M.bech*	*M.nat*	*M.daub*	*M.bran*	*M.myst*	*B.barb*	*N.noc*	*N.lei*	*E.ser*	*R.ferr*	*R.hipp*
25/08/21	Optimal - Warm, still & partly overcast	3	21	0	7	5	3	3	0	0	0	0	1	1	1	0	0

Henlade Wood

3.2.15 A single trapping survey was conducted on 24 May 2021, with a total of six trap nights' worth of effort carried out resulting in the capture of a single Natterer's bat. This bat was not fitted with a radio tag. The temperature dropped rapidly during the survey with very low bat activity recorded on handheld detectors, conditions were considered unsuitable to conduct a survey and the survey terminated early for welfare reasons prior to midnight. A summary of the trapping survey results at Henlade Wood is provided in Table 3-9.

Table 3-9 Trapping results summary for Henlade Wood surveys

Date	Weather summary	No. of traps	Total captures	*P.pip*	*P.pyg*	*P.aur*	*M.bech*	*M.nat*	*M.daub*	*M.bran*	*M.myst*	*B.barb*	*N.noc*	*N.lei*	*E.ser*	*R.ferr*	*R.hipp*
24/05/21	Unsuitable - Clear day and evening,	6	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0

Date	Weather summary	No. of traps	Total captures	*P.pip*	*P.pyg*	*P.aur*	*M.bech*	*M.nat*	*M.daub*	*M.bran*	*M.myst*	*B.barb*	*N.noc*	*N.lei*	*E.ser*	*R.ferr*	*R.hipp*
	became cold quickly																

Line Wood

3.2.16 A single trapping survey was conducted on 1 August 2021 following delayed permission to access the site, with a total of seven trap nights' worth of effort conducted resulting in a total of 12 captures of six species. Weather conditions were warm with partial cloud and were considered to be suitable for the survey.

3.2.17 Brown long-eared bat (n=5) weas the most commonly caught species during the survey. A single barbastelle was caught during the survey. None of the captured bats were fitted with radio tags. Other species captured included soprano pipistrelle, Natterer's bat, whiskered bat and serotine. A summary of the trapping survey results at Line Wood is provided in Table 3-10.

Table 3-10 Trapping results summary for Line Wood surveys

Date	Weather summary	No. of traps	Total captures	*P.pip*	*P.pyg*	*P.aur*	*M.bech*	*M.nat*	*M.daub*	*M.bran*	*M.myst*	*B.barb*	*N.noc*	*N.lei*	*E.ser*	*R.ferr*	*R.hipp*
01/08/21	Suitable - Warm, light breeze & mostly clear	7	12	0	1	5	0	2	0	0	2	1	0	0	1	0	0

Jordan's Park

3.2.18 Trapping surveys were conducted on 18 May and 20 July 2021, with a total of nine trap nights' worth of effort conducted resulting in a total of 26 captures of seven species. Whilst conditions were initially suitable during the May survey, there were heavy showers during the evening it become cool quickly with a light breeze; due to the more open nature of the habitat being surveyed trapping was terminated early, for welfare reasons, prior to midnight. Weather on 20 July was warm and dry and considered to be suitable for the survey. Traps were set up within an area of parkland adjacent to the A358.

3.2.19 Soprano pipistrelle was the most frequently caught species (n=10) closely followed by common pipistrelle (n=6). None of the captured bats were fitted with radio tags. Other species captured included brown long-eared bat, Natterer's bat, Daubenton's bat, whiskered bat and lesser horseshoe bat. A summary of the trapping survey results at Jordan's Park is provided in Table 3-11.

Table 3-11 Trapping results summary for Jordan's Park surveys

Date	Weather summary	No. of traps	Total captures	*P.pip*	*P.pyg*	*P.aur*	*M.bech*	*M.nat*	*M.daub*	*M.bran*	*M.myst*	*B.barb*	*N.noc*	*N.lei*	*E.ser*	*R.ferr*	*R.hipp*
18/05/21	Unsuitable - Heavy showers, dry from about	3	2	0	1	0	0	0	1	0	0	0	0	0	0	0	0

Date	Weather summary	No. of traps	Total captures	*P.pip*	*P.pyg*	*P.aur*	*M.bech*	*M.nat*	*M.daub*	*M.bran*	*M.myst*	*B.barb*	*N.noc*	*N.lei*	*E.ser*	*R.ferr*	*R.hipp*
	20:00. Light breeze and overcast and feeling cool																
20/07/21	Good - Warm, still & clear	6	24	6	9	5	0	2	0	0	1	0	0	0	0	0	1
			26	6	10	5	0	2	1	0	1	0	0	0	0	0	1

Stoke Wood

3.2.20 Trapping surveys were conducted on 22 May, 6 June and 9 August 2021, with a total of 30 trap nights' worth of effort conducted resulting in a total of 76 captures of 13 species. The weather on 22 May started suitably but the temperatures dropped rapidly causing it to become unsuitably cold. Un-forecast rain was recorded on 9 August late in the evening making this survey slightly suboptimal. The weather on 6 June was warm and still and considered to be suitable.

3.2.21 Natterer's bat (n=21) was the most common species caught during the surveys followed by brown-long-eared bat (n=15), soprano pipistrelle (n=12) and barbastelle (n=10). Two Bechstein's bats were also caught during the surveys. A total of ten bats were radio tagged from this woodland, with four barbastelle, two Bechstein's bats, two brown long eared bats, one Natterer's bat and one noctule being fitted with radio tags. Other species captured included common pipistrelle, Daubenton's bat, whiskered bat, Leisler's bat, greater horseshoe bat and lesser horseshoe bat. A summary of the trapping survey results at Stoke Wood is provided in Table 3-12.

Table 3-12 Trapping results summary for Stoke Wood surveys

Date	Weather summary	No. of traps	Total captures	*P.pip*	*P.pyg*	*P.aur*	*M.bech*	*M.nat*	*M.daub*	*M.bran*	*M.myst*	*B.barb*	*N.noc*	*N.lei*	*E.ser*	*R.ferr*	*R.hipp*
22/05/21	Suboptimal - Clear with light breeze, temperature dropping rapidly after sunset	8	4	0	0	0	0	1	0	1	1	0	0	0	0	0	1
06/06/21	Optimal - Briefly rained in day, evening warm and clear	12	43	2	6	8	1	10	1	0	3	8	3	0	0	1	0
09/08/21	Good - Rain late evening during set	10	29	0	6	7	1	10	0	0	1	2	1	1	0	0	0

Date	Weather summary	No. of traps	Total captures	*P.pip*	*P.pyg*	*P.aur*	*M.bech*	*M.nat*	*M.daub*	*M.bran*	*M.myst*	*B.barb*	*N.noc*	*N.lei*	*E.ser*	*R.ferr*	*R.hipp*
	up, dry after 20:00																
			76	2	12	15	2	21	1	1	5	10	4	1	0	1	1

Roost Trapping

3.2.22 A roost trapping exercise was carried out at roost 29 in Hatch Park on 31 August 2021. This roost had been identified as a Bechstein's bat maternity roost through radio tracking. A total of 36 bats were captured out of the roost using a pole trap. The bats were aged, sexed and the breeding status was identified prior to ringing and release of the bats, as detailed in Table 3-13. Captures during this session included two ringed recaptures previously caught in May and July 2021.

Table 3-13 Summary results of the roost trapping exercise

Date	Weather summary	Location	Grid reference	Species	Sex	Age	Breeding status	Number of captures
31/07/21	warm and dry	Hatch Park	ST 29462 20265	M.bech	Female	Adult	Lactating	12
31/07/21	warm and dry	Hatch Park	ST 29462 20265	M.bech	Female	Adult	Parous, non-breeder	16
31/07/21	warm and dry	Hatch Park	ST 29462 20265	M.bech	Female	Adult	Nulliparous, non-breeder	6
31/07/21	warm and dry	Hatch Park	ST 29462 20265	M.bech	Female	Juv	N/A	2
								36

Ringing

3.2.23 Throughout the trapping surveys a total of 64 bats were marked by ringing. The majority were Bechstein's bats (n=49); with 34 ringed during the roost trapping exercise, barbastelle (n=14) and an individual Leisler's bat (n=1) were also ringed.

3.2.24 Three Bechstein's bats and one barbastelle were recaptured after ringing:

- Bat 29 (Bechstein's bat) was tracked after initial capture in Hurford's plantation and subsequently re-trapped during the roost capture exercise in Hatch Park
- One Bechstein's bat was captured during woodland trapping in Bickenhall and subsequently recaught during roost trapping in Hatch Park but not radio tracked.
- Bat 21 (Bechstein's bat) was captured during roost trapping in Hatch Park and subsequently recaptured in Bickenhall and radio tracked after recapture.
- Bat 24 (barbastelle) was captured twice during woodland trapping exercises within Stoke Wood.

Radio tracking

3.2.25 Radio tracking of 31 adult female bats was carried out between May and September 2021 as detailed in Table 3-14. The majority of the radio tracked bats

were Bechstein's bats (n=13) and barbastelle (n=8) (specifically targeted for identification of maternity roosts and colony range analysis), although brown long-eared bats (n=4), Natterer's bats (n=4), a Leisler's bat (n=1) and a noctule bat (n=1) were also tagged and radio tracked (primarily to identify roosts and key crossing points). A total of 51 roosts were identified throughout the tracking period.

Table 3-14 Radio tagged bats

Bat ID	Date	Species	Breeding status	Capture site	Grid reference of trap
1	17/05/21	M.bech	Parous	Ashill Wood/Every's Copse	ST33214 17994
2	17/05/21	M.bech	Parous	Ashill Wood/Every's Copse	ST33304 17946
3	17/05/21	M.bech	Parous	Ashill Wood/Every's Copse	ST33331 17573
4	17/05/21	M.nat	Parous	Ashill Wood/Every's Copse	ST33152 17737
5	22/05/21	M.nat	Parous	Stoke Wood	ST26628 22935
6	06/06/21	B.barb	Nulliparous	Stoke Wood	ST26584 22888
7	06/06/21	B.barb	Parous	Stoke Wood	ST26584 22888
8	06/06/21	N.noc	Parous	Stoke Wood	ST26734 22597
9	06/06/21	P.aur	Parous	Stoke Wood	ST26555 22966
10	06/06/21	B.barb	Parous	Stoke Wood	ST26674 22903
11	06/06/21	M.bech	Parous	Stoke Wood	ST26555 22966
12	19/07/21	M.bech	Parous	Ashill Wood/Every's Copse	ST33496 17529
13	19/07/21	M.bech	Lactating	Ashill Wood/Every's Copse	ST33496 17529
14	19/07/21	P.aur	Lactating	Ashill Wood/Every's Copse	ST33371 17704
15	19/07/21	M.nat	Lactating	Ashill Wood/Every's Copse	ST33236 17944
16	19/07/21	M.bech	Lactating	Ashill Wood/Every's Copse	ST33195 17999
17	25/07/21	M.bech	Parous	Abbey Wood	ST29098 20599
18	25/07/21	B.barb	Nulliparous	Abbey Wood	ST29098 20576
19	26/07/21	B.barb	Lactating	Hatch Park	ST29398 20752
20	26/07/21	M.nat	Lactating	Hatch Park	ST29402 20558
21	27/07/21	M.bech	Parous	Bickenhall Wood	ST28806 19985
22	27/07/21	M.bech	Lactating	Bickenhall Wood	ST29059 20048
23	09/08/21	M.bech	Nulliparous	Stoke Wood	ST26622 22710
24	09/08/21	B.barb	Nulliparous	Stoke Wood	ST26580 22802

Bat ID	Date	Species	Breeding status	Capture site	Grid reference of trap
25	09/08/21	P.aur	Lactating	Stoke Wood	ST 26504 22912
26	24/08/21	B.barb	Post lac	Hatch Park	ST29462 20769
27	24/08/21	N.lei	Parous	Hatch Park	ST29477 20757
28	24/08/21	B.barb	Post lac	Hatch Park	ST29462 20769
29	25/08/21	M.bech	Post lac	Hurford's Plantation	ST29415 21090
30	25/08/21	M.bech	Post lac	Hurford's Plantation	ST29381 20954
31	25/08/21	P.aur	Post lac	Hurford's Plantation	ST29415 21090

Bat 1 – Bechstein's bat (adult female, parous)

3.2.26 Tagged on 17 May 2021 following capture in Ashill Wood – ST 33214 17994, one roost identified (refer to information provided for bats 2 and 3 in paragraphs 3.2.28 and 3.2.30 for details of the roost).

Bat 2 – Bechstein's bat (adult female, parous)

3.2.27 Tagged on 17 May 2021 following capture in Ashill Wood/Every's Copse – ST 33304 17946, one roost identified.

3.2.28 A low number of fixes were obtained for bats 1 and 2 as they predominantly foraged north of Ashill within areas where surveyors did not have access and topography was blocking signals. The bats were frequently scanned for throughout the tracking period and fixes were recorded whenever they returned towards Ashill and were in range of the surveyors. The bats were not recorded approaching the scheme during the radio tracking period, therefore bats 1 and 2 were confirmed as not being on or near the scheme. See Figure D-1 and Figure D-2 in Appendix D for details on roost, capture and fix locations.

Bat 3 – Bechstein's bat (adult female, parous)

3.2.29 Tagged on 17 May 2021 following capture in Ashill Wood/Every's Copse – ST 33331 17573, two roosts identified.

3.2.30 A daytime search on the 18 May 2021 identified bats 1, 2 and 3 roosting within a woodpecker hole in an oak tree within Ashill Wood/Every's Copse (roost 1). An emergence count on 18 May was carried out which identified 25 bats emerging from this roost. Bats 1 and 2 returned to this roost throughout the tracking period whereas bat 3 was found night roosting within a low split in a different oak tree (roost 4) on the night of 19 May 2021 and subsequently day roosting within roost 4 on 21 and 22 May 2021.

3.2.31 Bat 3 predominantly foraged within Ashill Wood/Every's Copse and on the eastern existing A358 verge during the early part of the nights with only two road crossings observed with the bat moving to foraging areas to the south-west of the existing A358. Later in the night when road traffic had decreased, and therefore there was reduced disturbance from light and noise levels. Bat 3 was recorded foraging over the woodland strip which bordered the existing A358, with multiple passes over the A358 whilst foraging. See Figure D-3 in Appendix D for details on

roost, capture and fix locations and Figure D-37 for scheme sections identified with a large number of foraging bat crossings.

Bat 4 – Natterer's bat (adult female, parous)

3.2.32 Tagged on 17 May 2021 following capture in Ashill Wood/Every's Copse – ST 33152 17737, two roosts identified.

3.2.33 A daytime search on 18 May 2021 found bat 4 roosting a house in Southtown to the south of the scheme (roost 2), where a peak count of 31 bats was recorded. On the nights of 19 and 24 May 2021 bat 4 was recorded night roosting within a small copse adjacent to the A358 near Ashill (roost 3), although the exact tree could not be pinpointed as the bat moved prior to an on-foot tracker being able to pinpoint the exact roost location.

3.2.34 Bat 4 predominantly foraged on the eastern existing A358 verge during the early part of the nights, with only low numbers of road crossings observed. Bat 4 moved away from the roost to foraging areas located to the south-west of the scheme, and Ashill Wood/Every's Copse where she was captured. Later in the night, when road traffic had decreased and therefore reduced disturbance from light and noise, bat 4 was observed foraging over both the east and west woodland strips which bordered the A358 between Ashill and Southtown, with multiple foraging passes over the road See Figure D-4 in Appendix D for details on roost, capture and fix locations and Figure D-37 for scheme sections identified with a large number of foraging bat crossings.

Bat 5 – Natterer's bat (adult female, parous)

3.2.35 Tagged 22 May 2021 following capture in Stoke Wood – ST 26628 22935, two roosts identified.

3.2.36 A daytime search on 23 May 2021 found bat 5 roosting within an oak tree in Stoke Wood (roost 5). An emergence count was undertaken on 25 May 2021 with a count of 25 bats emerging. Bat 5 remained roosting in this tree throughout the tracking period, other than during the day of 26 May 2021 when bat 5 was recorded within a small group of ash trees in Stoke Wood (roost 6). The exact tree and emergence point could not be pinpointed due to signal bounce.

3.2.37 Bat 5 was captured within Stoke Wood and was also found to use Stoke Wood for roosting. However, the predominant foraging areas, identified during the tracking period, were to the north of the scheme around the Henlade Tarmac works (where the signal frequently became blocked reducing the number of fixes gained for this bat) and along the River Tone and surrounding habitat. Bat 5 was predominantly recorded to cross the scheme to the east of Stoke Road, commuting along hedgerows and crossing the existing A358 at the Tarmac works site. See Figure D-5 in Appendix D for details on roost, capture and fix locations and Figure D-37 for scheme sections identified with a large number of foraging bat crossings.

Bat 6 – barbastelle (adult female, nulliparous)

3.2.38 Tagged on 6 June 2021 following capture in Stoke Wood – ST 26584 22888, four roosts identified (see roost details provided for bat 10 in paragraphs 3.2.50 - 3.2.53 below).

3.2.39 Bat 6 was recorded to have two primary foraging areas: Stoke Wood, and a series of small un-named woodland blocks between Thornfalcon and Ham to the north of the scheme. Bat 6 was recorded crossing the existing A358 and the offline section of the scheme to the east of Stoke Road, following the route of Thornwater Stream. See Figure D-6 in Appendix D for details on roost, capture and fix locations and Figure D-32 for locations of scheme crossing points.

Bat 7 – barbastelle (adult female, parous)

3.2.40 Tagged on 6 June 2021 following capture in Stoke Wood – ST 26584 22888, two roosts identified.

3.2.41 A daytime search on 7 June 2021 found bat 7 roosting within an ash tree (roost 8) within Stoke Wood. An emergence survey was carried out on the night of 7 June 2021, but no bats were recorded to emerge from the tree, potentially due to visibility of the roost feature being obscured by foliage. Bat 7 subsequently moved to another roost on 8 June 2021 (roost 13), then returned to roost 8 on the night of 8 June 2021 prior to returning to roost 13 until the 11 of June. An emergence count of roost 13 on 11 June 2021 recorded six bats emerging in quick succession.

3.2.42 Bat 7 was predominantly recorded foraging within Stoke Wood and the adjacent copse to the south-east. Bat 7 was also recorded foraging within woodland adjacent to the M5 motorway and commuting along tree lines connecting this woodland to Stoke Wood. Bat 7 was recorded foraging and commuting within the scheme on a number of occasions. A lower than typical number of fixes were collected for bat 7 due to shorter foraging bouts and regular night roosts, likely due to colder than average temperatures. See Figure D-7 in Appendix D for details on roost, capture and fix locations.

Bat 8 – noctule (adult female, parous)

3.2.43 Tagged on 6 June 2021 following capture in Stoke Wood – ST 26734 22597, two roosts identified.

3.2.44 A daytime search on 7 June 2021 found bat 8 roosting within an ash tree (roost 9) within Stoke Wood. An emergence survey was carried out on the night of 7 June 2021 with 26 bats being recorded to emerge from a woodpecker hole within the main stem of the tree and bat 8 emerging from another unseen feature. Bat 8 moved to another roost on 8 June 2021 (roost 14) where it remained until 11 June 2021. An emergence count was carried out at roost 14 on 8 June 2021 during which 20 bats were recorded emerging from a woodpecker hole.

3.2.45 Bat 8 was recorded foraging within Stoke Wood and the surrounding habitat, with some movement recorded across and to the north of the scheme near Ruishton and Thornfalcon. Due to the speed and height at which bat 8 flew exact crossing points could not be identified, however flight paths at identified scheme crossing points were high above the carriageway. Lower numbers of fixes were collected for bat 8 due to shorter foraging sessions and higher level of night roosting, likely due to the colder than average temperatures, in addition to time spent foraging outside of the study area. See Figure D-8 in Appendix D for details on roost, capture and fix locations.

Bat 9 – brown long-eared bat (adult female, parous)

3.2.46 Tagged on 6 June 2021 following capture in Stoke Wood – ST 26555 22966, one roost identified.

3.2.47 A daytime search on 7 June 2021 found bat 9 roosting within the eastern gable of a house to the east of Stoke Wood (roost 10). Emergence surveys were carried out on the property on 7 June 2021, focusing on the eastern gable of the property, from which the tagged bat emerged, confirming a solitary roost in this location. On 9 June 2021 an emergence survey of the property was carried out which identified a single long-eared bat emerging from the eastern gable and eight long-eared bats emerging from the northern gable of the property.

3.2.48 Bat 9 was captured within Stoke Wood and was recorded foraging within this woodland However the predominant foraging locations were away from Stoke Wood, located along waterways, mature tree lines and small woodland blocks close to the scheme, as well as the Tarmac site at Henlade. The number of fixes for bat 9 was much lower than typical, due to bat 9 spending longer than normal periods night roosting, likely due to the unseasonal colder weather during this period, lack of access to the Tarmac site and blocking of signal by terrain and infrastructure present within the Tarmac works site. See Figure D-9 in Appendix D for details on roost, capture and fix locations.

Bat 10 – barbastelle (adult female, parous)

3.2.49 Tagged on 6 June 2021 following capture in Stoke Wood – ST 26674 22903, six roosts identified.

3.2.50 Following tagging bat 6 was tracked back to the roost at dawn where it was recorded roosting in fluting of a yew tree on the edge of Stoke Wood, with at least five other bats also visible (roost 7). Bat 10 was also recorded in roost 7 during daytime tracking on the 7 June, and an emergence count was undertaken with a count of eight bats emerging.

3.2.51 On 8 and 9 June 2021 bats 6 and 10 were found roosting in a spilt (hazard beam) in an oak tree in Stoke Wood (roost 12). An emergence count for roost 12 was undertaken on 8 June 2021 with six bats recorded to emerge. Bat 10 was tracked to two separate night roosts within Stoke Wood on the night of 8 June 2021 (roost 15 and roost 16).

3.2.52 Bats 6 and 10 moved to a third day roost on 10 June 2021, located within a low crack in a small hazel tree (roost 17), and emergence count recorded seven bats emerging. Both bat 6 and bat 10 were recorded night roosting within an oak tree in Stoke Wood on 10 June 2021 and subsequently found day roosting in the same location on 11 June 2021 (roost 18). Bat 10's tag remained active for a further week and further day roosts within Stoke Wood were identified on 14 and 16 June 2021 (roost 20 and roost 21 respectively).

3.2.53 Bat 10's foraging patterns were similar to that of bat 6, with crossings of the existing A358 and the offline section of the scheme around Thornfalcon. Bat 10 was also recorded to forage further south than bat 6 with a scheme crossing noted near Greenway Lane. Lower than typical number of fixes were collected for bat 10 due to only shorter foraging bouts and regular night roosts, likely as a consequence of colder than average temperatures. See Figure D-10 in Appendix D for details on roost, capture and fix locations and Figure D-32 for locations of scheme crossing points.

Bat 11 – Bechstein's bat (adult female, parous)

3.2.54 Tagged on 6 June 2021 following capture in Stoke Wood – ST 26555 22966, with two roosts identified.

3.2.55 A daytime search on 7 June 2021 found bat 11 roosting within an ash tree in Stoke Wood (roost 11). An emergence survey of the tree on 7 June 2021 recorded 14 bats, including bat 11, emerging from a woodpecker hole, with an additional three bats recorded emerging from a secondary feature higher up the tree. Bat 11 returned to roost 11 throughout the primary tracking period up to 11 June 2021. On 14 June 2021 the tag was tracked to another ash tree within Stoke Wood (roost 19), but an emergence survey did not record any bats emerging from this roost and the tag remained static, presumed having fallen off the bat.

3.2.56 Bat 11 was predominantly recorded within Stoke Wood, with a small number of forays to the waterways and Swingrite Golf Centre along Haydon Lane to the north of the wood. Lower numbers of fixes were collected for bat 11 due to shorter foraging sessions and higher level of night roosting, sometimes returning to the roost before midnight. This is likely due to the colder than typical weather conditions for this time of the year. See Figure D-11 in Appendix D for details on roost, capture and fix locations.

Bat 12 – Bechstein's bat (adult female, parous)

3.2.57 Tagged on 19 July 2021 following capture in Ashill Wood/Every's Copse – ST 33496 17529, with two roosts identified (refer to information provided for bat 3 in paragraphs 3.2.30-3.2.31 for details of the roost).

3.2.58 Bat 12 remained within Ashill Wood and the adjacent copse, with predominate use of the south-east section of Ashill for foraging. See Figure D-12 in Appendix D for details on roost, capture and fix locations.

Bat 13 – Bechstein's bat (adult female, lactating)

3.2.59 Tagged on 19 July 2021 following capture in Ashill Wood/Every's Copse – ST 33496 17529, one roost identified (refer to information provided for bat 3 in paragraphs 3.2.30-3.2.31 for details of the roost).

3.2.60 Bat 13 predominantly foraged within the south-east section of Ashill Wood/Every's Copse but was also recorded foraging for an extended period within a small woodland adjacent to the A358 close to Ashill village, crossing the scheme directly across from this woodland. See Figure D-13 in Appendix D for details on roost, capture and fix locations and Figure D-33 for locations of scheme crossing points.

Bat 14 – brown long-eared bat (adult female, lactating)

3.2.61 Tagged on 19 July 2021 following capture in Ashill Wood/Every's Copse – ST 33371 17704, two roosts identified.

3.2.62 A daytime search on 20 July 2021 found bat 14 roosting in a house adjacent to Ashill Wood/Every's Copse (roost 25). The property was identified as containing a maternity roost, but an emergence count could not be carried out as no access was granted. Bat 14 remained at the roost on 21 July 2021 prior to moving to an oak tree in Ashill Wood/Every's Copse (roost 27) on 22 July 2021; a minimum of 18 bats, including bat 14, were recorded in roost 27.

3.2.63 Bat 14 remained with Ashill Wood/Every's Copse throughout the tracking period, with a single foray following tree lines running to the north-west from Ashill Wood/Every's Copse, as well as some passes to the south-east along the tree line (also used by bat 16). Bat 14 was not recorded approaching the scheme during the tracking period. See Figure D-14 in Appendix D for details on roost, capture and fix locations.

Bat 15 – Natterer's bat (adult female, lactating)

3.2.64 Tagged on 19 July 2021 following capture in Ashill Wood/Every's Copse – ST 33371 17704, two roosts identified.

3.2.65 A daytime search on 20 July 2021 found bat 15 roosting within a tree in Ashill Wood/Every's Copse (roost 24) which it continued to use until 23 July 2021. An emergence survey of the tree showed only the tagged bat emerging. On 25 July 2021 bat 15 was recorded roosting within a small cluster of oaks in Ashill Wood/Every's Copse. The signal appeared to be coming from one of the oaks, but no bats were recorded to emerge and therefore the exact roost location could not be pinpointed.

3.2.66 Bat 15 predominately foraged within Ashill Wood/Every's Copse and along the narrow bands of woodland lining the A358 to the south-west of Ashill Wood/Every's Copse, with numerous foraging passes recorded crossing the A358 later in the night once traffic levels had reduced. Bat 15 was recorded commuting along the hedgerows between Every's Copse and the existing A358, where bat 15 was then recorded crossing the A385. See Figure D-15 in Appendix D for details on roost, capture and fix locations.

Bat 16 – Bechstein's bat (adult female, lactating)

3.2.67 Tagged on 19 July 2021 following capture in Ashill Wood/Every's Copse – ST 29398 20752, one roost identified.

3.2.68 A daytime search on 20 July 2021 identified bats 12, 13 and 16 roosting within an oak tree in a small copse to the west of Ashill Wood/Every's Copse (roost 22). The bats continued to use this roost on 21, 22 and 23 July 2021. An emergence survey of roost 22 was carried out which recorded 37 bats emerging from a woodpecker hole. Bat 12 was also recorded to use a night roost within Ashill Wood/Every's Copse on the night of 21 July 2021 (roost 26).

3.2.69 Bat 16 remained within Ashill and the surrounding habitat, often recorded foraging along a mature tree line connected to Ashill Wood/Every's Copse and extending to the south-east. Bat 16 was not recorded approaching the scheme during the tracking period. See Figure D-16 in Appendix D for details on roost, capture and fix locations.

Bat 17 – Bechstein's bat (adult female, parous)

3.2.70 Tagged 25 July 2021 following capture in Abbey Wood – ST 29098 205499, three roosts identified.

3.2.71 A daytime search on 26 July 2021 found bat 17 roosting within a north facing hole in an oak tree in Hatch Park (roost 29). Bat 17 used roost 29 between 26 and 28 July 2021 prior to moving to a large beech within Abbey Wood (roost 33) on 29 and 30 July 2021 before returning to roost 29 on 31 July 2021. Bat 17 then moved to an ash tree in Lady Anna's Wood within the Hatch Park Estate (roost 37) on 1

and 2 August 2021. Emergence surveys were carried out at roosts 29 and 33 on 26 July and 30 July 2021 respectively. Fifty-nine bats were observed emerging from roost 29 and one bat from roost 33.

3.2.72 Bat 17 was predominantly recorded foraging within Abbey Wood and the adjacent woodlands within the Hatch Park Estate on both the east and western side of the A358. Bat 17 was recorded crossing the A358 at the Griffin Lane underpass, travelling under the underpass earlier on in the night but more indiscriminately over or under the A358 later on in the night when the road was quieter. Bat 17 was also recorded making a number of foraging passes over the A358 between the woodland blocks south of Griffin Lane. See Figure D-17 in Appendix D for details on roost, capture and fix locations and Figure D-36 for locations of scheme crossing points.

Bat 18 – barbastelle (adult female, nulliparous)

3.2.73 Tagged on 25 July 2021 following capture in Abbey Wood – ST 2998 20576, two roosts identified.

3.2.74 A daytime search on 26 July 2021 found bat 18 roosting within an oak in Abbey Wood (roost 30) just 5 metres from where it was originally caught. Bat 18 continued to use this roost throughout the tracking period up to 2 August 2021. An emergence count confirmed its use as a solitary roost.

3.2.75 Bat 18 was recorded foraging across a wide area within the central section of the scheme, with fixes recorded within Huish Wood, Robert's Wood, Abbey Wood, woodland within the Hatch Park Estate and Bickenhall Wood. Whilst predominantly staying on the western side of the scheme, crossings were recorded just south of West Hatch Lane along Meare Stream and the mature tree line present here. See Figure D-18 in Appendix D for details on roost, capture and fix locations and Figure D-32 for locations of scheme crossing points.

Bat 19 – barbastelle (adult female, lactating)

3.2.76 Tagged on 26 July 2021 following capture in Lady Anna's Wood, within the Hatch Park Estate – ST 29398 20752, one roost identified.

3.2.77 A daytime search on 27 July 2021 identified the bat roosting within an oak in Abbey Wood (roost 31) within 10 metres of the roost used by bat 18. Bat 19 continued to use this roost throughout the tracking period up to 2 August 2021. An emergence count on 27 July 2021 confirmed the presence of 20 bats within a wound on the north-east aspect of the tree.

3.2.78 Bat 19 had a slightly smaller foraging range than bat 18 as it did not go as far north as Huish Wood but was recorded predominantly within the same areas of Bickenhall Wood, Abbey Wood, Robert's Wood and woodland within the Hatch Park Estate with scheme crossings recorded at Griffin Lane underpass. See Figure D-19 in Appendix D for details on roost, capture and fix locations and Figure D-32 for locations of scheme crossing points.

Bat 20 – Natterer's bat (adult female, lactating)

3.2.79 Tagged on 26 July 2021 following capture in woodland to the east of the A358 within the Hatch Park Estate – ST 29402 20558, two roosts identified.

3.2.80 A daytime search on 27 July 2021 found bat 20 roosting within an area of Hatch Park (roost 32) (precise roost location could not be pinpoint due to access restrictions). The signal remained consistent during daytime checks on 28 and 29 July 2021. The signal was picked up further south, still within Hatch Park, on 30 and 31 July 2021 (roost 36) before returning to the direction and strength for roost 32 on 1 August 2021. On 2 August 2021 the signal was in the direction of roost 32, but weaker and it could not be accessed to determine if bat 20 was in the same roost with the tag insulated, or in a different roost further away in the same direction.

3.2.81 Bat 20 was the widest ranging of the Natterer's bats tagged, with foraging recorded predominantly around Hatch Wood, but also ranging as far west as Wych Lodge Lake. Numerous scheme crossings were recorded for this bat, with the majority at Griffin Lane underpass, but also up along Meare Stream adjacent to West Hatch Lane, which was also used by bat 18. Later at night, bat 20 was also observed foraging in woodlands within the Hatch Park Estate on both the east and west of the scheme near Griffin Lane with multiple foraging passes over the A358. See Figure D-20 in Appendix D for details on roost, capture and fix locations.

Bat 21 – Bechstein's bat (adult female, parous)

3.2.82 Tagged on 27 July 2021 following capture in Bickenhall Wood – ST 28806 19985, three roosts identified (refer to information provided for bat 22 in paragraphs 3.2.85-3.2.86 for details of the roost).

3.2.83 Bat 21 was recorded predominantly within Bickenhall Wood with some use of woodlands within the Hatch Park Estate, in which it was also found roosting. Scheme crossings were recorded but an exact location could not be pinpointed. Bat 21 was identified crossing near the Hatch Park cattle creep; however, as this was not recorded to be used during the crossing point surveys undertaken between May and September 2021 (further details on the results of the crossing point surveys are provided in the Bat Activity Report (which will form Appendix 8.8 of the ES), it is assumed that bat 21 crossed over the A358 where the woodland abuts the existing A358 and would be the closest wooded corridor between Bickenhall Wood and roost 29, within Little Oakley Plantation, and this behaviour matches with the fixes for bat 21. See Figure D-21 in Appendix D for details on roost, capture and fix locations.

Bat 22 – Bechstein's bat (adult female, lactating)

3.2.84 Tagged on 27 July 2021 following capture in Bickenhall Wood – ST 29059 20048, one roost identified.

3.2.85 A daytime search on 28 July 2021 identified bats 21 and 22 roosting within an oak in Hatch Park previously used by bat 17 (roost 29). Bat 21 used roost 29 on 28 and 29 July 2021 prior to moving to an immature beech within Bickenhall Wood (roost 34) on 30 July 2021 before returning to roost 29 on 31 July 2021. Bat 21 then moved to an ash tree within Lady Anna's Wood within the Hatch Park Estate with bat 17 (roost 37) on 1 and 2 August 2021, while bat 22 used roost 29 throughout the tracking period up to 2 August 2021.

3.2.86 Bat 22 foraged predominantly in Bickenhall Wood and woodlands within the Hatch Park Estate, in which it also roosted, with some wider ranging passes up to Abbey Wood and Hatch Park. Bat 22 was recorded crossing the existing A358

adjacent to crossing point 12 where Bickenhall Wood meets the A358, at Griffin Lane underpass, as well as to making foraging passes over the road whilst foraging in woodlands within the Hatch Park Estate, which border the A358. See Figure D-22 in Appendix D for details on roost, capture and fix locations.

Bat 23 – Bechstein's bat (adult female, nulliparous)

3.2.87 Tagged on 9 August 2021 following capture in Stoke Wood – ST 26622 22710, one roost identified.

3.2.88 A daytime search on 10 August 2021 found bat 23 roosting within an oak tree (roost 40) in a parkland near Stoke Wood to which it returned on 11 August 2021. No signal could be found for bat 23 during daytime searching on 12 August 2021 and bat 23 did not reappear on subsequent nights which may indicate that the tag stopped functioning early, or the bat had left the study area and did not return.

3.2.89 Bat 23 foraged over a relatively wide range during the period in which the tag was functioning, with fixes recorded within Stoke Wood but also west towards the M5 with confirmed fixes on the western side of the M5 in an area where both verges were lined with narrow woodland belts. Bat 23 was recorded crossing the scheme at Stoke Road. See Figure D-23 in Appendix D for details on roost, capture and fix locations.

Bat 24 – barbastelle (adult female, nulliparous)

3.2.90 Tagged on 9 August 2021 following capture in Stoke Wood – ST 26580 22802, one roost identified.

3.2.91 A daytime search on 10 August 2021 identified bat 24 roosting within an oak tree within Stoke Wood previously used by bat 7 (roost 13). An emergence count was carried on 10 August 2021 during which 16 bats emerged, a subsequent count was carried out on 11 August 2021 during which 17 bats recorded to emerge from a large crack in a limb. Bat 24 continued to use this roost throughout the tracking period until 13 August 2021.

3.2.92 Bat 24 was predominantly recorded foraging within the northern part of Stoke Wood and surrounding habitats but ranged as far south as Thurlbear Woods. Whilst bat 24 predominately remained outside of the scheme footprint, a single scheme crossing was recorded at Stoke Road. See Figure D-24 in Appendix D for details on roost, capture and fix locations.

Bat 25 – brown long-eared bat (adult female, lactating)

3.2.93 Tagged on 9 August 2021 following capture in Stoke Wood – ST 26504 22912, two roosts identified.

3.2.94 A daytime search on 10 August 2021 found bat 25 roosting within a cherry tree within Stoke Wood (roost 38). An emergence count was carried out on 10 August 2021 with 27 bats recorded to emerge from roost 38. Bat 25 continued to use roost 38 as a day roost but was also recorded to use another tree in Stoke wood (roost 40) as a night roost on the night of 12 August 2021.

3.2.95 Bat 25 remained within Stoke wood for the majority of the tracking period with some forays north towards Henlade and crossings of the scheme were recorded close to Stoke Road. See Figure D-25 in Appendix D for details on roost, capture and fix locations.

Bat 26 and bat 28 – barbastelle (adult females, post-lactating)

3.2.96 Tagged on 24 August 2021 following capture in Lady Anna's Wood within the Hatch Park Estate – ST 29462 20769, two roosts identified.

3.2.97 A daytime search on 25 August 2021 found bats 26 and 28 roosting within a large split in an oak tree in Bickenhall Wood (roost 41). An emergence count was carried out on 25 August 2021 during which 22 bats were recorded emerging from the roost. Both bats were recorded to use the roost between 24 and 29 August 2021 prior to moving to another oak in Bickenhall Wood (roost 49) on 30 August 2021 and remaining there on 31 August and 1 September 2021.

3.2.98 Bats 26 and 28 were both caught within the same trap in Lady Anna's Wood and were predominantly recorded foraging in the woodlands within the Hatch Park Estate adjacent to the scheme, as well as within Bickenhall Wood, where they were also recorded roosting. They were both recorded crossing the scheme on multiple occasions, using the Griffin Lane underpass as well as crossing over the A358 within the vicinity of the underpass later at night. Bat 26 was also recorded to the east of the study area near Isle Abbots, and bat 28 was recorded commuting to Line Wood and foraging in this area. See Figure D-26 and Figure D-28 in Appendix D for details on roost, capture and fix locations.

3.2.99 The lower number of fixes recorded for bat 26 was due to the bat foraging a long way to the east of the study area and not on, or near the scheme.

Bat 27 – Leisler's bat (adult female, parous)

3.2.100 Tagged on 24 August 2021 following capture in Lady Anna's Wood, which the Hatch Park Estate – ST 29477 20757, two roosts identified.

3.2.101 A daytime search on 25 August 2021 found bat 27 roosting within a building in North Curry (roost 45) to which it returned on 26 to 31 August and 1 September 2021 before moving to another building in North Curry (roost 51) on 2 August 2021. No emergence survey could be carried out due to a lack of access.

3.2.102 Bat 27 was caught close to the scheme but was found to be roosting some distance away and was rarely picked up during radio tracking, however surveyors frequently scanned for the tag signal throughout the tracking period confirming that bat 27 did not return to the study area and daily roost checks were carried out to confirm that the tag was still active. See Figure D-27 in Appendix D for details on roost, capture and fix locations.

Bat 29 – Bechstein's bat (adult female, post-lactating)

3.2.103 Tagged on 25 August 2021 following capture in Hurford's Plantation – ST 29415 21090, three roosts identified. See paragraph 3.2.45 below for roost details.

3.2.104 Bat 29 was caught within Hurford's Plantation and was recorded foraging in this area throughout the course of the survey, as well as roosting within this woodland. Bat 29 was also recorded undertaking foraging loops along the hedgerow from Hurford's Plantation to Griffin Lane, crossing the A358, foraging along Griffin Lane, then foraging along a mature tree line towards West Hatch Lane where it was recorded crossing back across the A358 following Meare Stream, which was also used by bats 18 and 20, before looping up into Robert's Wood and back to Hurford's Plantation. This pattern was noted repeatedly

throughout the tracking period. See Figure D-29 in Appendix D for details on roost, capture and fix locations.

Bat 30 – Bechstein's bat (adult female, post-lactating)

3.2.105 Tagged on 25 August 2021 following capture in Hurford's Plantation – ST 29381 20954, three roosts identified.

3.2.106 During post-release tracking on 25 August 2021 bat 29 was located within a night roost within a tree in Hurford's Plantation (roost 43). Bat 29 returned to this roost at night on 26 and 27 August 2021. Bat 30 was located within a night roost within a tree in Bickenhall Wood (roost 42) on 25, 26 and 27 August 2021. A daytime search on 26 August 2021 identified bats 29 and 30 roosting within an ash tree within Hurford's Plantation (roost 43). An emergence count was carried out on 26 August 2021 which recorded 54 bats emerging from a callus roll. Both bats returned to roost 43 on 27, 28 and 29 August 2021 before moving to a tree within Hatch Park on 30 August 2021 (roost 50) which could not be pinpointed as no access was available. Bats 29 and 30 remained in this roost on 31 August and 1 September 2021.

3.2.107 Bat 30 was recorded using an extended area adjacent to the A358 between Hurford's Plantation and a small copse near Hatch Green. A road crossing was recorded at Griffin Lane underpass as well as some foraging passes across the A358 later in the night. However, bat 30 remained on the western side of the scheme for the majority of the tracking period foraging within the A358 boundary features. See Figure D-30 in Appendix D for details on roost, capture and fix locations.

Bat 31 – brown long-eared bat (adult female, post-lactating)

3.2.108 Tagged on 25 August 2021 following capture in Hurford's Plantation – ST 29415 21090, three roosts identified.

3.2.109 A daytime search on 26 August 2021 found bat 31 roosting within an ash tree within Hurford's Plantation (roost 46). During the night of 26 August 2021 bat 31 was recorded night roosting within another ash tree (roost 47) within the same woodland prior to returning to roost 46 on 27 August 2021. During the night of 27 August 2021 bat 31 moved to a beech tree within the same woodland (roost 48) and subsequently day roosted within this tree on 28 August 2021 before returning to roost 46 on 30 and 31 August and 1 and 2 September 2021. An emergence survey was carried out on roost 46 on 27 August 2021 which recorded at least three bats emerging.

3.2.110 Bat 31 predominantly remained within Hurford's Plantation and the surrounding habitats throughout the tracking period with frequent forays onto Griffin Lane, Lady Anna's Wood on the western side of the A358 and Hatch Park on the eastern side of the A358. A small number of fixes were recorded within Abbey Wood and Bickenhall Wood. See Figure D-31 in Appendix D for details on roost, capture and fix locations.

Roosts

3.2.111 The tagging and radio tracking of 31 bats of six species was used to identify a total of 51 roosts, consisting of 41 day roosts and ten night roosts. Roosts identified included 16 barbastelle roosts, 15 Bechstein's bat roosts, eight Natterer's bat roosts, eight brown long-eared bat roosts, two noctule roosts and

two Leisler's bat roosts. The locations of identified roosts are shown on Figure C-1 (northern section), Figure C-2 (central section) and Figure C-3 (southern section) in Appendix C. Emergence surveys were conducted on 34 roosts, and one roost was endoscoped, to obtain information on the number of bats using each roost. Counts for 27 roosts were obtained. Full details of roost features, roost location, roost type, species and number of bats using the roost, and dates when roosts were occupied are presented in Table C-1 with photographs provided in Table C-2 in Appendix C.

Other observations during trapping and radio tracking

3.2.112 A noctule maternity roost (roost 23) was identified through audible calls noted during the daytime search of Ashill Copse on 22 July 2021 whilst radio tracking bats 12, 13 and 16. An emergence count was carried out on 20 July 2021, which recorded 11 bats emerging from a woodpecker hole.

4 Evaluation

4.1 Desk study

4.1.1 The review of the *A358 Taunton to Southfields Dualling Bat Trapping and Radio Tracking Technical Report (June 2021)* [13] as part of the desk study found that a total of 31 trapping surveys (carried out in 2017, 2018 and 2020) resulted in the capture of 108 bats of nine species, representing an average of 3.48 bats per night. Notably no horseshoe bat species were caught in 2017, 2018 or 2020.

4.1.2 In 2018 a total of seven Bechstein's bats and one male barbastelle was radio tracked. In addition, three Bechstein's bats, one female barbastelle and one female Natterer's bat were radio tracked in 2020. Trapping and radio tracking was used to identify the presence of ten Bechstein's bat roosts (located within the central section of the scheme, with a peak count of 21 bats in 2018), two barbastelle roosts (one solitary male roost and a maternity roost of 11 individuals).

4.2 Field study

4.2.1 Temperatures in spring 2021 were colder than the average for the time of year, and bat activity was notably lower, with reduced breeding success noted throughout the UK. Despite this, the 2021 trapping surveys consisted of 18 trapping surveys resulting in the capture of 338 individuals of 14 species, including all four Annex II species (Bechstein's bat, barbastelle, greater horseshoe bat and lesser horseshoe bat). This represents an average capture rate of 18.7 bats per night, approximately five times higher than the 2017, 2018 and 2019 surveys (suggesting weather conditions were not a significant limitation to the 2021 surveys) and over 50% more species identified present, indicating that the study area supports a diverse bat fauna and larger bat populations than previous recorded.

4.2.2 The trapping and radio tracking surveys (also informed by targeted emergence surveys) identified the presence of 51 bat roosts within the study area:

- Barbastelle: 15 roosts
- Bechstein's bat: 15 roosts
- Brown long-eared bat: 8 roosts
- Leisler's bat: 2 roosts
- Natterer's bat: 8 roosts
- Noctule: 3 roosts

4.2.3 During the radio tracking surveys, 28 of the 31 tagged bats were recorded commuting across the scheme on 138 occasions, with between 1 and 15 commuting crossings per bat. Where woodland was present on both sides of the A358, bats were recorded foraging across the A358 between the woodland blocks, particularly later in the night when traffic levels were lower.

4.2.4 Griffin Lane was noted to be of particular importance for a number of bat species and colonies present within the central section of the scheme, with the lane and underpass being used for commuting between roosting and foraging areas. Within the southern section of the scheme, the hedgerow networks linking Ashill Wood/Every's Copse to the scheme were identified as important commuting routes to foraging habitats close to the scheme.

4.2.5 Radio tracking surveys have shown the importance of the mature tree and hedgerows bordering the existing A358 for commuting and foraging bats, as well as the importance of hedgerows connecting the scheme to the nearby woodlands, particularly for the large Bechstein's bat population.

4.2.6 Detailed summaries for each species recorded within the study area are provided below.

Barbastelle

4.2.7 A total of 18 barbastelle bats were caught in 2021, with captures predominantly within Stoke Wood, but also within Huish Wood, Abbey Wood, Line Wood and the Hatch Park Estate. No barbastelles were caught at any trapping sites within the southern section of the study area. Just over half (n=10) of the captures were within the post-parturition period and twice as many females (n=12) were caught as males (n=6). No juveniles were captured which may be due poor breeding success or later breeding.

4.2.8 Eight female barbastelles were fitted with radio tags; four captured in Stoke Wood (northern section of the study area), and four captured in Lady Anna's Wood/Abbey Wood (central section of the study area). Capture and roost locations for all tagged barbastelle bats are shown on Figure D-38 and their associated MCPs shown on Figure D-39.

4.2.9 Data from the bats tagged in Stoke Wood identified a fragmented colony comprising a number of roosts, with clusters of bats using different roosts at the same time. The minimum count in June was 14 bats and in August it was 17 bats. However, given the highly fragmented nature of barbastelle colonies (which can comprise satellite roosts) it is possible that there were additional, unidentified roosts, therefore the barbastelle population within the northern section of the study area has potential to be larger than currently estimated.

4.2.10 Data from the four bats tagged in Lady Anna's Wood/Abbey Wood identified a roost in Abbey Wood of 20 individuals in late July and early August and a roost in Bickenhall Wood of 22 individuals. Survey data from 2020 [13] recorded this roost containing 11 bats, including a radio tagged bat (id 246). It is likely that records of bats using the roosts in Abbey Wood and Bickenhall are of the same individuals moving between different roosts. However, it is possible that there could be other satellite roosts in the local area and so this is considered a minimum population estimate.

4.2.11 The bats tagged and radio tracked within the central region of the study area were found to be crossing the existing A358 on a number of occasions with two key crossing points identified, one at Griffin Lane and one just south of West Hatch Lane as shown on Figure D-32. However, the use of these crossings was predominantly in the early part of the night and crossings became less restricted later at night when traffic levels were reduced, with bats noted to be making foraging passes over the existing A358 anywhere it was wooded on both sides.

4.2.12 Barbastelles tagged and radio tracked within the northern section of the study area were found to be both commuting and foraging over the scheme. While most of the foraging was identified within Stoke Wood, this was to be expected given the colder than average conditions when bats will forage in denser and warmer woodland areas (as opposed to foraging in more open habitats later in the

warmer summer periods). However, bats were still found to be crossing the scheme.

4.2.13 Barbastelle colonies commonly fragment into a number of smaller roosts demonstrating a fission fusion behaviour, with individuals separating and coming together to roost. Tagging individuals can be less successful in accurately identifying the colony size for this reason compared to other species. As individuals from these fragmented roosts can commonly forage in different areas, it is often difficult to catch individuals close to roosts and therefore may not identify the total population size of the whole colony. However, the radio tracking in 2021 clearly identified a maternity population and cluster of roosts in both the northern and central areas of the study area.

4.2.14 Barbastelle colonies can have roosts spread out over a large area, commonly a couple of kilometres. The maximum distance between roosts within the study area was recorded at over 3.5km, which is likely too far to be just one colony. No overlap or movement between any individuals from the northern Stoke Wood population or central area was recorded. As only a low number of bats were tagged it is possible that this was one larger spread-out population; however, the lack of overlap suggests these were two separate smaller colonies in closer proximity to each other.

4.2.15 The northern population comprised a minimum of 17 individuals and the central population comprised a minimum of 22 individuals. with a number of roosts within the study area and individuals from both the northern and central population recorded crossing the scheme. The barbastelle population has a high number of roosts locally and is considered to be of national significance.

4.2.16 All tagged barbastelles were found to cross the scheme or forage within the scheme footprint. Barbastelles commonly forage some distance from roost locations, which can be spread out over a wide range, and can have large foraging areas. It is anticipated that the highest potential impacts of the scheme would be at crossing points with bats being at risk of collisions with vehicles. Loss of foraging for this species is less likely to be a notable impact due to the large foraging areas and continued availability of other foraging habitats commonly used by this species.

4.2.17 The eight bats radio tagged therefore represented approximately 20% of the total population within the study area. Best practice guidelines recommend 25% of a colony be tagged and radio tracked to get sufficient representation of the colony and understanding of the colony range, behaviour and habitat use. Radio tracking should ideally look to track the minimum number of bats needed to identify the necessary information for ethical and welfare reasons. In this case it was considered that as there was limited previous research on the colony, and the limited trapping and tracking of eight individuals did not provide suitable representation of the colony, sufficient data was not gathered to determine whether a single colony with divided territory ranges, or two separate colonies in close proximity were present within the study area.

4.2.18 Further trapping, ringing and radio tracking surveys are therefore required during 2022 to gather additional information on the barbastelle population with the aims of confirming the colony structure, locating any more existing maternity roosts and getting an accurate representation of bat scheme crossing points in order to inform appropriate mitigation.

Bechstein's bat

4.2.19 Trapping and radio tracking surveys identified the presence of three Bechstein's bat maternity colonies within the study area:

- A maternity colony in Stoke Wood (northern section of the study area, with a minimum count of 17 bats) for which three roosts were identified.
- A maternity colony within the Hatch Park Estate (central section of study area, minimum count of 59 bats) for which nine roosts were identified including five close to, and one within, the scheme footprint.
- A maternity colony in Ashill Wood/Every's Copse (southern section of the study area, with a minimum count of 37 bats) for which four roosts were identified, including one very close to the scheme footprint.

4.2.20 A total of 28 Bechstein's bats were caught in 2021, with captures in all but three of the trapping sites (Henlade Wood, Line Wood and Jordan's Park) showing a good distribution of this species throughout the study area.

4.2.21 Trapping caught a much higher proportion of females (n=21) to males (n=4) and low numbers of juveniles (n=3) were caught, likely due to the poor weather in spring resulting in notably lower and later breeding. Bechstein's bats are known to sexually segregate with females utilising the optimum core foraging areas and few males being caught in maternity colony areas. The high number of females at survey locations along the scheme therefore indicates that the habitats on the site are of high suitability for this species.

4.2.22 Thirteen female Bechstein's bats were fitted with radio tags; two captured in Stoke Wood, five captured in within the Hatch Park Estate and six captured in Ashill Wood/Every's Copse. Capture and roost locations for all tagged Bechstein's bats are shown on Figure D-40 and their associated MCPs shown on Figure D-41.

4.2.23 Data from the two bats tagged in Stoke Wood was variable. The adult female tagged in June predominantly foraged in Stoke Wood, while the non-breeding female was recorded roosting within an oak tree to the east of Stoke Wood and foraged over a wider area outside the woodland to the north and north-west of Stoke Wood and towards the M5. Commuting and foraging activity was also recorded within, or close to the scheme and confirmed scheme crossings at Stoke Road were recorded on two occasions.

4.2.24 The minimum colony count at Stoke Wood was 17 individuals, which is considered low for a Bechstein's bat colony, with the two radio tagged bats representing approximately 12% of the colony. However, a colony roost was not located in late summer, meaning a later season count was not possible. Many counts in early May were lower than expected due to colder than average weather conditions during this time. Therefore, this colony has the potential to be larger than the estimated size which was based on the single count in May. As only two individuals were tagged and tracked from Stoke Wood, and one bat used habitats around the scheme, further trapping and radio tracking surveys are required in order to obtain a suitable representation of the colony and identify the potential impacts of the scheme on the Stoke Wood Bechstein's bat population.

4.2.25 The central population in the Hatch Park Estate was much larger than previously identified in 2020 [13]. The minimum colony count was 59 individuals, which is larger than average, therefore the five tagged bats represented approximately

8.5% of the colony. Roost trapping surveys in Little Oakley Plantation, located on the east side of the A358, caught 36 individuals but only two were juveniles and only around one-third of the adult females were found to be breeding.

4.2.26 The combination of the 2018 and 2020 survey data [13] and the 2021 surveys show this colony to be using a wide area and a number of smaller nearby connected woodlands including Bickenhall Wood, Abbey Wood, Lady Anna's Wood, Little Oakley Plantation, Hurford's Plantation and Huish Wood. Radio tracking and roost counts also showed that this colony was commonly fragmenting into smaller satellite roosts spread throughout a number of these foraging woodlands. The connectivity between these woodlands is therefore highly important and must be retained.

4.2.27 Bats were regularly recorded crossing the existing A358 to access these woodland foraging areas. Crossing points included Griffin Lane underpass as well as crossing points over the existing A358, as shown on Figure D-33. Surveyors were positioned at the key crossing areas identified to confirm the crossing points and routes used. It was identified that some individuals would use the underpass for the first part of the night, and later use more direct crossing points over the existing A358 once traffic levels had reduced. However, the radio tracking did not identify the scheme crossing points and core foraging areas of all the bats tagged, and as such, there was not sufficient information gathered to accurately inform on the behaviour of individuals from this colony and to identify the potential impacts of the scheme on the Hatch Park Estate Bechstein's bat population. Therefore, additional radio tracking surveys are required in order to obtain a suitable representation of the colony. Given the size of this colony and data collected to date and preference to radio tag as minimum number of bats as possible it is recommended at least 15% of the colony is tracked.

4.2.28 The Bechstein's bat colony in Ashill Wood/Every's Copse had a minimum count of 37 individuals in July, before juveniles were active. The six tagged bats therefore represented approximately 16% of the colony. Bats were recorded predominantly foraging in the main woodland, but also along the disused railway line to the north-east of the woodlands, which provided more sheltered foraging during a period of poor weather. Two bats, representing one-third of the bats tagged in this area, were identified crossing the A358 to forage in small copses adjacent to the existing A358. Bats tended to remain within the Ashill Wood/Every's Copse for the first part of the night, with bats commuting to cross the A358 to access other foraging areas later in the night when traffic levels had reduced.

4.2.29 Where there is a rare species, and the potential for impacts is considered to be high, it is recommended that 25% of the colony is tagged and radio tracked in order to get a representation of the colony and understanding of the colony range, behaviour and habitat use. The 2021 radio tracking surveys gathered important data on the behaviour and habitat use of this colony, identifying Ashill Wood/Every's Copse as a core area, and recording two radio tagged bats crossing the existing A358 to small discrete foraging areas that would be impacted by the scheme. Given the lack of woodland to the south of the scheme, it is highly unlikely that a higher proportion of bats from this colony would be found to use these areas. The need for additional radio tracking surveys in 2022 has been identified in order to maximise roosts identified and gather population data in a typical breeding year. However, given the pertinent data collected to date, the number of bats tagged could be reduced from 25% to minimise welfare impacts on bats.

4.2.30 The presence of three maternity colonies and a combined population of well over 100 individuals within the study area makes this population of national significance. The scheme would fall within the CSZ for the three identified maternity colonies, with individual Bechstein's bats from all three colonies found to be using habitats within the scheme footprint; most notably the central Hatch Park Estate colony, where the entire colony was moving between roosts located on either side of the scheme. Potential impacts on the Bechstein's population are considered to be high from direct and indirect impacts including collision risks, noise and light impacts.

4.2.31 Road traffic noise has been found to reduce bat activity where it is believed that noise interferes with echolocation and foraging success, particularly with quieter whispering species [34], and woodland habitats adjacent to the scheme may have reduced suitability for bat foraging for this reason. While bats were found to forage in areas adjacent to the existing A358, these were commonly identified to be used much later in the night when traffic levels were reduced and impacts lower. In addition, the trapping surveys at the Hatch Park Estate, conducted in woodland adjacent to the existing A358, caught fewer Bechstein's bats than would be expected for the population in this area, indicating that fewer bats were foraging in these areas. It is possible that this reduced trap rate for Bechstein's bats, and other species, may be down to the reduced suitability of this woodland for foraging with the traffic levels. It is therefore recommended that, to maximise the suitability of foraging woodland, any compensatory woodland planting/management is located away from the scheme where practicable to ensure it is as suitable as possible for foraging bats.

Brandt's bat

4.2.32 Only one adult female Brandt's bat was caught within the study area, with this bat being captured in Stoke Wood during the pre-parturition period. Brandt's bat is found throughout the UK but is less common and widespread than whiskered bat, with the majority of large colonies found within the more northern areas of the UK but some colonies known to be present within south-west England. The bat was not fitted with a radio tag as it was found to be underweight, likely due to the poor weather conditions experienced in spring. The capture of only one single individual early in the survey season suggested the study area did not support a large local population and the presence of a maternity colony on or near the study area was considered unlikely.

Brown long-eared bat

4.2.33 A total of 65 brown long-eared bats were caught in 2021, making it the most frequently caught species, with captures in all trapping locations with the exception of Henlade Wood.

4.2.34 This is a common widespread species across the UK which, due to its quiet nature, is commonly under recorded on acoustic surveys. This is a woodland species predominantly foraging in a range of woodland habitats but also using tree lines, hedges and scrubby habitats. These bats roost in trees but are also commonly found roosting within buildings. The higher number of this species caught is expected as this is a common species and a woodland species with most of the surveys concentrated in woodland habitats. This species also responds well to the lure calls including some other species calls such as Bechstein's calls.

4.2.35 Trapping caught a slightly higher number of males (n=38) to females (n=24), but a very low number of juveniles, with only three caught. This is likely a result of colder than average spring temperatures affecting breeding.

4.2.36 Four female brown long-eared bats were tagged and radio tracked; two from Stoke Wood, one from Abbey Wood and one from Ashill Wood/Every's Copse, identifying three maternity colonies and eight roosts for this species. Within the central section of the study area, two roosts were recorded very close to, and one within, the scheme footprint. Capture and roost locations for all tagged brown long-eared bats are shown on Figure D-42.

4.2.37 A total of three of the four bats radio tracked were recorded crossing the scheme (including individuals from two maternity colonies), with crossing points illustrated on Figure D-34. Given the proximity of the roosts to the scheme, it is considered likely that individuals from all colonies may cross the scheme at some point.

4.2.38 Brown long-eared bats are considered common and widespread within the study area and there is potential for a number of maternity colonies and roosts to be present in both trees and buildings along the scheme, as well as potential for other colonies in unsurveyed woodlands. Given that the scheme would fall within the CSZ for the three identified maternity colonies, and individuals were found to be readily commuting throughout the landscape, appropriate mitigation would be required and will be fully detailed within Chapter 8 Biodiversity of the ES.

Common pipistrelle

4.2.39 A total of 45 common pipistrelle bats were caught in 2021, with captures in all but two of the survey locations; Henlade Wood and Line Wood, where only single surveys were carried out and poor weather conditions were experienced at the former.

4.2.40 Trapping caught slightly higher numbers of males (n=21) to females (n=15) and nine juveniles but not individuals were fitted with radio tags. Common pipistrelle is a common widespread species across the UK which is associated with a wide range of habitats and was present throughout the study area, with numerous roosts in buildings and trees identified during the emergence surveys carried out as part of the wider suite of surveys, including a maternity roost present on Stoke Road (please refer to the Ecological Baseline Report – Bat Roosts [which will form Appendix 8.8 of the ES] for further information).

Daubenton's bat

4.2.41 A total of four Daubenton's bats were caught in 2021 within the study area, with only individual bats caught at any one trapping site. Daubenton's bats are considered common and widespread across the UK and are known to be heavily associated with open water.

4.2.42 All Daubenton's bats caught were identified as adult males. This was likely due to the habitat present throughout the study area not being considered suitable for supporting a maternity colony with no large, open waterbodies present and few open rivers to provide suitable foraging habitat. Male Daubenton's bats, however, are known to use sub-optimal habitats some distance from waterbodies. As no females or juveniles were caught within the study area, it is considered unlikely that there is a maternity colony within or near the study area, and potential impacts of the scheme on this species are considered to be low.

Greater horseshoe bat

4.2.43 Only one adult male greater horseshoe bat was caught within the study area. This bat was caught in Stoke Wood and was not fitted with a radio tag. No roosts were identified within the study area. Greater horseshoe bats were recorded infrequently during acoustic surveys (please refer to the Ecological Baseline Report – Bat Activity [which will form Appendix 8.9 of the ES] for further information) and therefore the presence of a significant maternity population within or near the study area is considered unlikely. As a result, potential impacts of the scheme on this species are considered low.

Leisler's bat

4.2.44 A total of three Leisler's bats (two males and one female) were caught with captures in Lady Anna's Wood, Stoke Wood and Hurford's Plantation. This species is found widespread throughout Britain, but populations are highly variable with the species absent in many areas and it is considered relatively rare within the South-west.

4.2.45 A female Leisler's bat caught in Lady Anna's Wood was tagged and radio tracked to identify two roosts approximately 5 kilometres to the north-east of the scheme and confirmed roost counts could not be carried out due to access restrictions. Capture and roost locations for all tagged Nyctalus bats are shown on Figure D-44.

4.2.46 Tracking data showed that the female only entered the study area to forage on a small number of occasions, therefore it was concluded that the study area did not represent the core foraging area for this individual.

4.2.47 The low capture rates and the tracking results for this species suggest that Leisler's bat is a rare visitor to the study area, and it is considered unlikely that a significant maternity population is present within the study area. This species responds well to lures, and it would therefore be anticipated that higher numbers would have been caught if significant populations were present within the study area. Due to the low population present, and the behaviour of the species, potential impacts of the scheme on this species are considered to be low.

Lesser horseshoe bat

4.2.48 A total of five lesser horseshoe bats were caught in 2021 with captures in Bickenhall Wood, Lady Anna's Wood, Huish Wood, Jordan's Park and Stoke Wood.

4.2.49 Slightly more females (n=3) than males (n=2) were caught, and no juveniles were caught, although this may have been due to late breeding of this species in 2021. Bat roost surveys confirmed the presence of a lesser horseshoe bat maternity roost at Griffin Lane with a minimum of 24 bats counted in late August when juveniles were likely to be present (please refer to the Ecological Baseline Report – Bat Roosts [which will form Appendix 8.8 of the ES] for further information). Lesser horseshoe bats were regularly observed commuting along Griffin Lane during radio tracking and activity surveys.

4.2.50 Lesser horseshoe bats may be adversely affected by highway schemes, due to a higher risk of impact with moving vehicles and being sensitive to light and noise disturbance. Given the close proximity of the lesser horseshoe bat maternity roost to Griffin Lane and the number of lesser horseshoe bats that were observed using

the Griffin Lane underpass to cross the scheme, it was not considered necessary to conduct colony radio tracking of this species. It is expected that most lesser horseshoe bats will continue using this underpass to cross the scheme during periods of traffic flow.

Natterer's bat

4.2.51 A total of 52 Natterer's bats were caught in 2021, with captures at all trapping locations. Slightly higher numbers of females (n=26) than males (n=21) were caught, and five juveniles were also caught.

4.2.52 This is a common widespread species across the UK often associated with woodlands but also forages in open meadows, hedges and livestock areas. This bat commonly roosts in trees but can also be found roosting within voids in buildings.

4.2.53 Capture rates were largely consistent throughout the trapping sites, but with a notably increased rate within Stoke Wood, particularly for females (n=12) and juveniles (n=3). More females (n=14) than males (n=6) were captured during the pre-parturition period.

4.2.54 Four females were radio tagged, two from Ashill/Every's Copse, one from the Hatch Park Estate and one from Stoke Wood, identifying three maternity colonies and eight roosts in trees and buildings on both sides of the A358, with one of the southern roosts located within the scheme footprint. Capture and roost locations for all tagged Natterer's bats are shown on Figure D-43.

4.2.55 Individual Natterer's bats from the central and southern colonies were recorded crossing the scheme, and individuals from the northern colony were recorded foraging within the scheme footprint, but with no frequently used crossing points identified. Confirmed and unconfirmed crossing points used by Natterer's bat are illustrated on Figure D-35.Three of the four radio tracked bats were recorded foraging within woodland adjacent to the existing A358, predominantly later at night when traffic levels had notably reduced and vehicle passing was infrequent. During later parts of the night bats were found to cross the scheme regularly and at multiple locations, where earlier in the night any crossings were recorded at pinch points.

4.2.56 Given that the scheme would fall within the CSZ for the three identified maternity colonies, and individuals, and potentially whole colonies, would readily commute throughout the landscape and cross the scheme, appropriate mitigation would be required and will be fully detailed within Chapter 8 *Biodiversity* of the ES.

Noctule

4.2.57 A total of 14 noctules were caught in 2021 with captures in Ashill Wood/Every's Copse, Bickenhall Wood, Gore Langton, Stoke Wood, Abbey Wood and Hurford's Plantation, with equal numbers of males and females caught (n=7 each) and no juveniles caught.

4.2.58 This is a common widespread species which is easily caught using lures but was not specifically targeted during trapping surveys as a wide-ranging, high-flying species which is easily identified using other survey types. A number of roosts of this species were confirmed present by both radio tracking and hearing roosts of these bats during other surveys. This species is known to move roost regularly,

and individuals are known to move some notable distance between roosts, commonly a few kilometres.

4.2.59 A single female noctule was tagged and radio tracked, identifying two roosts and confirming the presence of a maternity colony within Stoke Wood, as shown on Figure D-44. Two maternity roosts were also identified by surveyors hearing the social calls within roosts during trapping and radio tracking surveys. Therefore, a total of three maternity colonies and four roosts were identified within the study area. These roosts were located in Stoke Wood (one maternity colony, two roosts, minimum 26 bats counted), Ashill Wood/Every's Copse (maternity roost, minimum 11 bats counted) and woodlands within the Hatch Park Estate (maternity colony, three roosts, minimum 32 bats counted).

4.2.60 Whilst the scheme would fall within the CSZ for all three identified maternity colonies, potential impacts of the scheme on this species are considered to be lower as they are a high-flying species (foraging over large areas) and were frequently observed crossing the scheme at heights well outside the range of collision with vehicles or impacts from light and noise. As a loud echolocating species, it is believed that the impact of road noise is lower on this species. Significant impacts on this species would be through loss of roosts, which would be addressed through appropriate mitigation fully detailed within Chapter 8 *Biodiversity* of the ES.

Serotine

4.2.61 A total of eight serotines were caught in 2021, with captures in Ashill Wood/Every's Copse, Huish Wood, Line Wood, Abbey Wood and Hurford's Plantation. More females (n=6) were caught than males (n=2) and no juveniles were caught.

4.2.62 Serotine can forage opportunistically, with a seasonal shift to take advantage of insect hatches, so populations may only be present in certain areas periodically. Serotine have also been known to move maternity roosts over more than 1 kilometre. All captures were from the post-parturition period which may indicate seasonal variation or could be due to the late spring and the reduced response to the acoustic lures; however, as this was not a target species for the trapping surveys it may be under recorded. No bats were radio tracked to identify roost locations.

4.2.63 It is considered likely that there was a maternity colony within the study area, but it was not considered to be in close proximity to the scheme. Although serotines are larger bats, they commonly forage and commute lower to the ground and will readily cross open spaces and roads within the height of traffic and could therefore be at risk of collision with vehicles. Any appropriate mitigation required would be fully detailed within Chapter 8 *Biodiversity* of the ES.

Soprano pipistrelle

4.2.64 A total of 60 soprano pipistrelles were caught in 2021, with captures in all but Henlade Wood, where the single night's survey was terminated early due to unsuitable weather conditions. This is a common and widespread species across the UK, which is found using a wide range of habitats, however it is mostly associated with water, especially larger open waterbodies and larger rivers.

4.2.65 The trapping results identified a high sexual bias in individuals caught with adult males (n=43) more common caught than females (n=9) and only eight juveniles caught. This may be due to habitat present within the study area being less suitable for a maternity colony with no large, open waterbodies present and few open rivers. Male soprano pipistrelles are known to use sub-optimal habitats, and this may explain the higher number of males are recorded. There was no evidence to indicate the presence of a large maternity roost within the study area, and no significant soprano pipistrelle roosts were identified during emergence surveys carried out within the study area, with only low numbers of bats present in the roosts found in trees and buildings (please refer to the Ecological Baseline Report – Bat Roosts [which will form Appendix 8.8 of the ES] for further information).

4.2.66 As soprano pipistrelles are associated with water features, such as rivers and streams, the retention of underpasses crossing the scheme is likely to retain habitat connectivity for soprano pipistrelles. The study area was considered unlikely to form part of the CSZ for this species and the population within the area was considered to be of local importance only.

Whiskered bat

4.2.67 A total of 34 whiskered bats were caught with captures in all but Henlade Wood, where the single night's survey was stopped early due to poor weather conditions. This is a common widespread species largely associated with woodlands and scrub habitat.

4.2.68 Trapping caught slightly higher numbers of females (n=18) to males (n=11) and five juveniles, the majority of which were caught within the central section of the scheme in Huish Wood, Bickenhall Wood and Abbey Wood, indicating the likely presence of a maternity colony within this section of the scheme. Notably fewer individuals were caught within other sections of the study area. No whiskered bats were radio tagged therefore the exact location of roosts and likely population size/extent has not been identified. However, given the numbers of bats caught it is considered likely that the scheme would fall within the CSZ for the colony in the central section.

5 Recommendations

5.1.1 The surveys undertaken during 2021 have provided a more accurate representation of the bat species present across the scheme than identified by previous surveys. However, there have been a number of limitations, notably due to the unsuitable weather conditions in May 2021 which were identified as having a notable effect on bat behaviour and breeding success nationally, but also restrictions to the areas surveyed and limited or delayed access to some areas of the site. Due to access restrictions and unsuitable weather conditions, some areas of the scheme were not subject to complete surveys in 2021. Therefore, it is recommended that further surveys are undertaken in 2022 to include pre-parturition surveys across the whole scheme and more targeted post parturition surveys, particularly in the central section of the scheme, to ensure a sufficient sample of each colony is achieved.

5.1.2 Recommendations for further surveys comprise:

- Conduct trapping surveys where necessary of the remaining woodlands to achieve a minimum of three surveys per woodland.
- Conduct additional trapping surveys along the scheme where necessary, notably on potential flight lines bisecting the offline section of the scheme.
- Conduct additional radio tracking of barbastelle to more accurately characterise the colony structures and populations and ensure the correct proportions of the colonies are radio tracked to fully inform on behaviour and habitat use.
- Conduct additional radio tracking of the Bechstein's bat colonies so a suitable proportion of each colony is radio tracked to inform fully on that colony's population and habitat use.
- Conduct radio tagging of additional species to identify key maternity roosts and scheme crossing points.

Abbreviations List

Please refer to ES Report Chapter 17 Abbreviations.

Glossary

Please refer to ES Report Chapter 18 Glossary.

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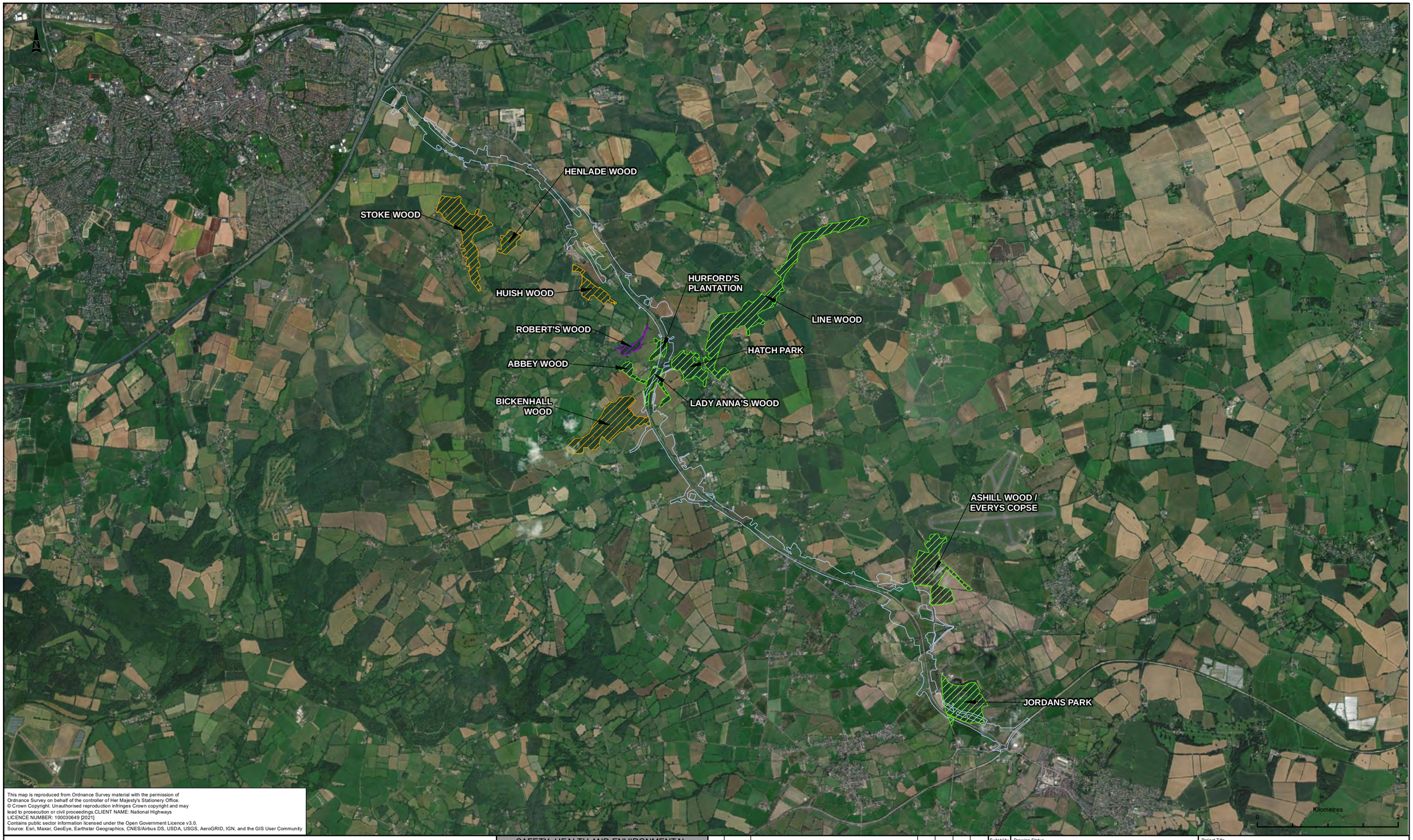
Appendices

Appendix A Trapping survey areas



LEGEND

- CAPTURE SITE 2017-2020 ONLY
- CAPTURE SITE 2017-2020 AND 2021
- CAPTURE SITE 2021 ONLY
- ECOLOGY SURVEY ZONE

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING SIGNIFICANT RESIDUAL RISKS (REFERENCE SHALL ALSO BE MADE IN THE DESIGN HAZARD LOG)

CONSTRUCTION
NONE

MAINTENANCE / CLEANING
NONE

USE
NONE

DECOMMISSIONING / DEMOLITION
NONE

Rev.	Date	Description	By	Chk'd	App'd	Auth'd
P02	06/05/22	ISSUE FOR INFORMATION	AC	MA	JS	SV

Suitability: S2 — Drawing Status: SUITABLE FOR INFORMATION

Client: national highways

Project Title: A358 TAUNTON TO SOUTHFIELDS DUALLING SCHEME

Drawing Title: TRAPPING SURVEY AREAS

Scale	By	Checked	Approved	Authorised
1:50,000	AC	MA	JS	SV
Original Size	**Date**	**Date**	**Date**	**Date**
A3	06/05/22	06/05/22	06/05/22	06/05/22

Drawing Number: HE551508 - ZZ - ARP - VES - DR - LE - 000302 (Location | Originator | Volume | Type | Role | Number)

Revision: P02

Appendix B 2021 trapping results

Table B-1 Trapping results

Date	Site name	Trap	Grid reference	Comment	Total no. bats	*P.pip*	*Ppyg*	*P.aur*	*M.bech*	*M.nat*	*M.daub*	*M.bran*	*M.myst*	*B.barb*	*N.noc*	*N.lei*	*E.ser*	*R.ferr*	*R.hipp*
17/05/21	Ashill/Every's Copse	1	ST33214 17994	3BHT Autobat	3		1		1	1									
17/05/21	Ashill/Every's Copse	2	ST33304 17946	3BHT Autobat	2				2										
17/05/21	Ashill/Every's Copse	3	ST33129 17842	6m MN no lure	2		1	1											
17/05/21	Ashill/Every's Copse	4	ST33152 17737	3BHT AT100	4		1		1	2									
17/05/21	Ashill/Every's Copse	5	ST33365 17773	3BHT Autobat	0														
17/05/21	Ashill/Every's Copse	6	ST33328 17651	9m MN no lure	0														
17/05/21	Ashill/Every's Copse	7	ST33331 17573	2BHT AT100	2		1		1										
17/05/21	Ashill/Every's Copse	8	ST33349 17470	3BHT Autobat	2				1				1						
18/05/21	Jordan's Park	1	ST33816 15894	3BHT Autobat	1						1								
18/05/21	Jordan's Park	2	ST33760 15720	3m MN no lure	1		1												
18/05/21	Jordan's Park	3	ST33743 15687	6m MN no lure	0														
19/05/21	Bickenhall Wood	1	ST28592 19880	3BHT Autobat	4			2					2						
19/05/21	Bickenhall Wood	2	ST28645 20006	3BHT AT100	2	1							1						
19/05/21	Bickenhall Wood	3	ST28778 20088	3BHT Autobat	2								1						1
19/05/21	Bickenhall Wood	4	ST28806 19985	3BHT Autobat	17	8	1	2	1	1			3		1				
19/05/21	Bickenhall Wood	5	ST28798 19927	6m MN no lure	1					1									

Date	Site name	Trap	Grid reference	Comment	Total no. bats	*P.pip*	*Ppyg*	*P.aur*	*M.bech*	*M.nat*	*M.daub*	*M.bran*	*M.myst*	*B.barb*	*N.noc*	*N.lei*	*E.ser*	*R.ferr*	*R.hipp*
19/05/21	Bickenhall Wood	6	ST28811 19891	3BHT Autobat	3				1	1			1						
22/05/21	Stoke Wood	1	ST26628 22935	3BHT Autobat	2					1			1						
22/05/21	Stoke Wood	2	ST26606 22891	3m MN no lure	0														
22/05/21	Stoke Wood	3	ST26647 22829	6m MN no lure	0														
22/05/21	Stoke Wood	4	ST26716 22864	3BHT Autobat	2							1							1
22/05/21	Stoke Wood	5	ST26766 22729	3BHT Autobat	0														
22/05/21	Stoke Wood	6	ST26834 22742	6m MN no lure	0														
22/05/21	Stoke Wood	7	ST26870 22782	6m MN no lure	0														
22/05/21	Stoke Wood	8	ST26861 22843	3BHT Autobat	0														
24/05/21	Huish Wood	1	ST28342 21753	3BHT Autobat	0														
24/05/21	Huish Wood	2	ST28330 21886	3BHT Autobat	0														
24/05/21	Huish Wood	3	ST28401 21805	3BHT Autobat	0														
24/05/21	Huish Wood	4	ST28532 21815	6m MN no lure	0														
24/05/21	Huish Wood	5	ST28534 21769	3BHT Autobat	1	1													
24/05/21	Huish Wood	6	ST28422 21911	6m MN no lure	0														
24/05/21	Henlade Wood	1	ST27129 22692	6m MN no lure	0														
24/05/21	Henlade Wood	2	ST27280 22639	2BHT Autobat	0														
24/05/21	Henlade Wood	3	ST27234 22560	3BHT Autobat	1					1									
24/05/21	Henlade Wood	4	ST27411 22593	3BHT AT100	0														
24/05/21	Henlade Wood	5	ST27309 22507	3BHT Autobat	0														
24/05/21	Henlade Wood	6	ST 27201 22396	3m MN no lure	0														
06/06/21	Stoke Wood	1	ST26555 22966	3BHT Autobat	4	1		2	1										
06/06/21	Stoke Wood	2	ST2659922924	6m MN no lure	1								1						
06/06/21	Stoke Wood	3	ST26584 22888	3mMN no lure	4					1				3					
06/06/21	Stoke Wood	4	ST26640 22844	3m MN no lure	3					1			1	1					
06/06/21	Stoke Wood	5	ST26674 22903	3BHT Autobat	5		2	1						1				1	

Date	Site name	Trap	Grid reference	Comment	Total no. bats	*P.pip*	*Ppyg*	*P.aur*	*M.bech*	*M.nat*	*M.daub*	*M.bran*	*M.myst*	*B.barb*	*N.noc*	*N.lei*	*E.ser*	*R.ferr*	*R.hipp*
06/06/21	Stoke Wood	6	ST26594 22801	3BHT Autobat	2					1				1					
06/06/21	Stoke Wood	7	ST26927 22829	3m MN no lure	2			1						1					
06/06/21	Stoke Wood	8	ST26825 22766	9m MN no lure	6		1	3		1				1					
06/06/21	Stoke Wood	9	ST26650 22720	3BHT Autobat	4		1	1		2									
06/06/21	Stoke Wood	10	ST26806 22712	3BHT Autobat	5	1				3			1						
06/06/21	Stoke Wood	11	ST26665 22600	3BHT Autobat	4		2			1	1								
06/06/21	Stoke Wood	12	ST26734 22597	6m MN no lure	3										3				
07/06/21	Huish Wood	1	ST 28281 21790	3m MN no lure	3	1	1			1									
07/06/21	Huish Wood	2	ST 28329 21874	3BHT Autobat	3			2		1									
07/06/21	Huish Wood	3	ST 28406 21882	3m MN no lure	1									1					
07/06/21	Huish Wood	4	ST 28348 21739	3BHT Autobat	2		1						1						
07/06/21	Huish Wood	5	ST 28386 21799	3BHT Autobat	4	1	1	1											1
07/06/21	Huish Wood	6	ST 28464 21820	3BHT Autobat	1			1											
19/07/21	Ashill/Every's Copse	1	ST 33322 18074	6m MN no lure	2					1	1								
19/07/21	Ashill/Every's Copse	2	ST 33195 17999	3BHT Autobat	10	1	2	4	2				1						
19/07/21	Ashill/Every's Copse	3	ST 33236 17944	3BHT Autobat	0														
19/07/21	Ashill/Every's Copse	4	ST 33127 17843	6m MN no lure	0														
19/07/21	Ashill/Every's Copse	5	ST 33140 17736	3BHT Autobat	6		2	1		1			1		1				
19/07/21	Ashill/Every's Copse	6	ST 33371 17704	3BHT Autobat	6			2		1							3		
19/07/21	Ashill/Every's Copse	7	ST 33358 17651	9m MN no lure	5	2		2									1		

Date	Site name	Trap	Grid reference	Comment	Total no. bats	*P.pip*	*Ppyg*	*P.aur*	*M.bech*	*M.nat*	*M.daub*	*M.bran*	*M.myst*	*B.barb*	*N.noc*	*N.lei*	*E.ser*	*R.ferr*	*R.hipp*
19/07/21	Ashill/Every's Copse	8	ST 33496 17529	3BHT Autobat	5				2				1		2				
19/07/21	Ashill/Every's Copse	9	ST 33319 17415	3BHT Autobat	6	1		2	2				1						
20/07/21	Jordan's Park	1	ST 34006 15864	3BHT AT100	5	1	4												
20/07/21	Jordan's Park	2	ST 33975 15953	3BHT Autobat	2			2											
20/07/21	Jordan's Park	3	ST 33841 15935	3BHT Autobat	8	2	2	3					1						
20/07/21	Jordan's Park	4	ST 33619 15787	3BHT Autobat	4	2	2												
20/07/21	Jordan's Park	5	ST 33813 15707	9m MN	2	1				1									
20/07/21	Jordan's Park	6	ST 33763 15716	3BHT Autobat	3		1			1									1
25/07/21	Abbey Wood	1	ST 29017 20794	3BHT AT100	10	6							1	1	2				
25/07/21	Abbey Wood	2	ST 29008 20623	3BHT Autobat	2					2									
25/07/21	Abbey Wood	3	ST 29099 20599	9m MN	8	5	1		1				1						
25/07/21	Abbey Wood	4	ST 29098 20576	3BHT Autobat	5	1	2			1				1					
25/07/21	Abbey Wood	5	ST 29026 20441	3m MN	0														
25/07/21	Abbey Wood	6	ST 29238 20528	3BHT Autobat	7		3			2			1				1		
26/07/21	Hatch Park	1	ST 29398 20752	3m MN no lure	1									1					
26/07/21	Hatch Park	2	ST 29361 20729	3BHT Autobat	0														
26/07/21	Hatch Park	3	ST 29286 20591	3BHT Autobat	0														
26/07/21	Hatch Park	4	ST 29248 20507	3BHT Autobat	1			1											
26/07/21	Hatch Park	5	ST 29238 20458	6m MN	1						1								
26/07/21	Hatch Park	6	ST 29499 20770	3BHT Autobat	0														
26/07/21	Hatch Park	7	ST 29402 20558	3BHT Autobat	2					1									1
26/07/21	Hatch Park	8	ST 29290 20395	3BHT Autobat	0														
27/07/21	Bickenhall Wood	1	ST 29235 19998	3BHT AT100	1					1									
27/07/21	Bickenhall Wood	2	ST 29059 20048	3BHT Autobat	4			1	2						1				

Date	Site name	Trap	Grid reference	Comment	Total no. bats	*P.pip*	*Ppyg*	*P.aur*	*M.bech*	*M.nat*	*M.daub*	*M.bran*	*M.myst*	*B.barb*	*N.noc*	*N.lei*	*E.ser*	*R.ferr*	*R.hipp*
27/07/21	Bickenhall Wood	3	ST 28862 19884	3BHT AT100	6	2							4						
27/07/21	Bickenhall Wood	4	ST 28799 19926	6m MN no lure	2	2													
27/07/21	Bickenhall Wood	5	ST 28806 19985	3BHT Autobat	2				1				1						
27/07/21	Bickenhall Wood	6	ST 28772 20095	3BHT Autobat	7	1		4	1	1									
27/07/21	Bickenhall Wood	7	ST 28532 19814	6m MN no lure	0														
01/08/21	Line Wood	1	ST 30387 21485	6m MN no lure	2			1		1									
01/08/21	Line Wood	2	ST 30448 21440	3 BHT AT100	3			1					1				1		
01/08/21	Line Wood	3	ST 30259 21391	6m MN no lure	1									1					
01/08/21	Line Wood	4	ST 30227 21349	3BHT Autobat	2			2											
01/08/21	Line Wood	5	ST 30171 21196	3BHT Autobat	2			1					1						
01/08/21	Line Wood	6	ST 30185 20962	3BHT Autobat	1					1									
01/08/21	Line Wood	7	ST 30119 21102	3BHT Autobat	1		1												
09/08/21	Stoke Wood	1	ST 26439 23018	3BHT Autobat	5			2		2						1			
09/08/21	Stoke Wood	2	ST 26504 22912	3BHT Autobat	6			4		1					1				
09/08/21	Stoke Wood	3	ST 26598 22877	6m MN no lure	2		1			1									
09/08/21	Stoke Wood	4	ST 26649 22838	9m MN no lure	0														
09/08/21	Stoke Wood	5	ST 26580 22802	3BHT Autobat	3		1			1				1					
09/08/21	Stoke Wood	6	ST 26591 22763	3BHT AT100	2		2												
09/08/21	Stoke Wood	7	ST 26622 22710	3BHT autobat	9		2		1	5			1						
09/08/21	Stoke Wood	8	ST 26769 22780	6m MN no lure	1									1					
09/08/21	Stoke Wood	9	ST 26790 22714	6m MN no lure	0														
09/08/21	Stoke Wood	10	ST 26828 22704	3BHT autobat	1			1											
10/08/21	Huish Wood	1	ST 28345 21880	3BHT AT100	2	1		1											
10/08/21	Huish Wood	2	ST 28380 21745	3BHT Autobat	4		2	1									1		
10/08/21	Huish Wood	3	ST 28464 21786	3BHT autobat	7	1	1	2		2			1						
10/08/21	Huish Wood	4	ST 28534 21871	3BHT autobat	8			2	2	1			3						

Date	Site name	Trap	Grid reference	Comment	Total no. bats	*P.pip*	*Ppyg*	*P.aur*	*M.bech*	*M.nat*	*M.daub*	*M.bran*	*M.myst*	*B.barb*	*N.noc*	*N.lei*	*E.ser*	*R.ferr*	*R.hipp*
10/08/21	Huish Wood	5	ST 28642 21720	3BHT autobat	2		1		1										
24/08/21	Hatch Park Estate	1	ST 29216 20358	3BHT AT100	8	2	4								2				
24/08/21	Hatch Park Estate	2	ST 29263 20521	3BHT autobat	2		2												
24/08/21	Hatch Park Estate	3	ST 29344 20715	3BHT Autobat	4		1	2	1										
24/08/21	Hatch Park Estate	4	ST 29406 20764	3m MN no lure	1									1					
24/08/21	Hatch Park Estate	5	ST 29462 20769	3m MN no lure	2									2					
24/08/21	Hatch Park Estate	6	ST 29477 20757	3BHT autobat	3			1		1						1			
24/08/21	Hatch Park Estate	7	ST 29387 20570	3BHT autobat	1		1												
25/08/21	Hurford's Plantation	1	ST 29415 21090	3BHT autobat	5			3	1	1									
25/08/21	Hurford's Plantation	2	ST 29443 21012	3BHT Autobat	1			1											
25/08/21	Hurford's Plantation	3	ST 29381 20954	3BHT Autobat	15		7	1	2	2					1	1	1		
				Totals	338	45	60	65	28	52	4	1	34	18	14	3	8	1	5

Figure B-1 Trap and capture locations - barbastelle

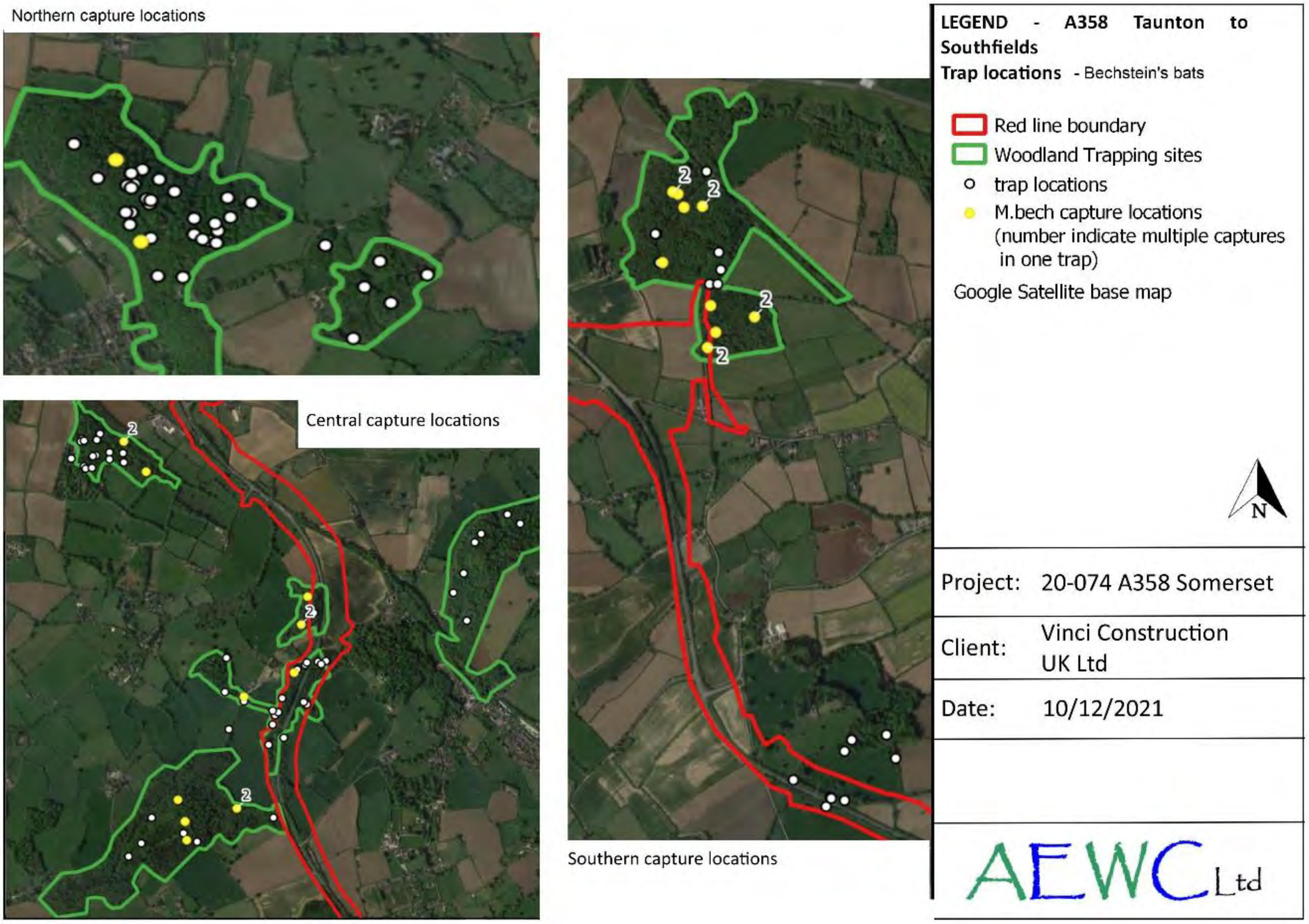


Figure B-2 Trap and capture locations – Bechstein's bat

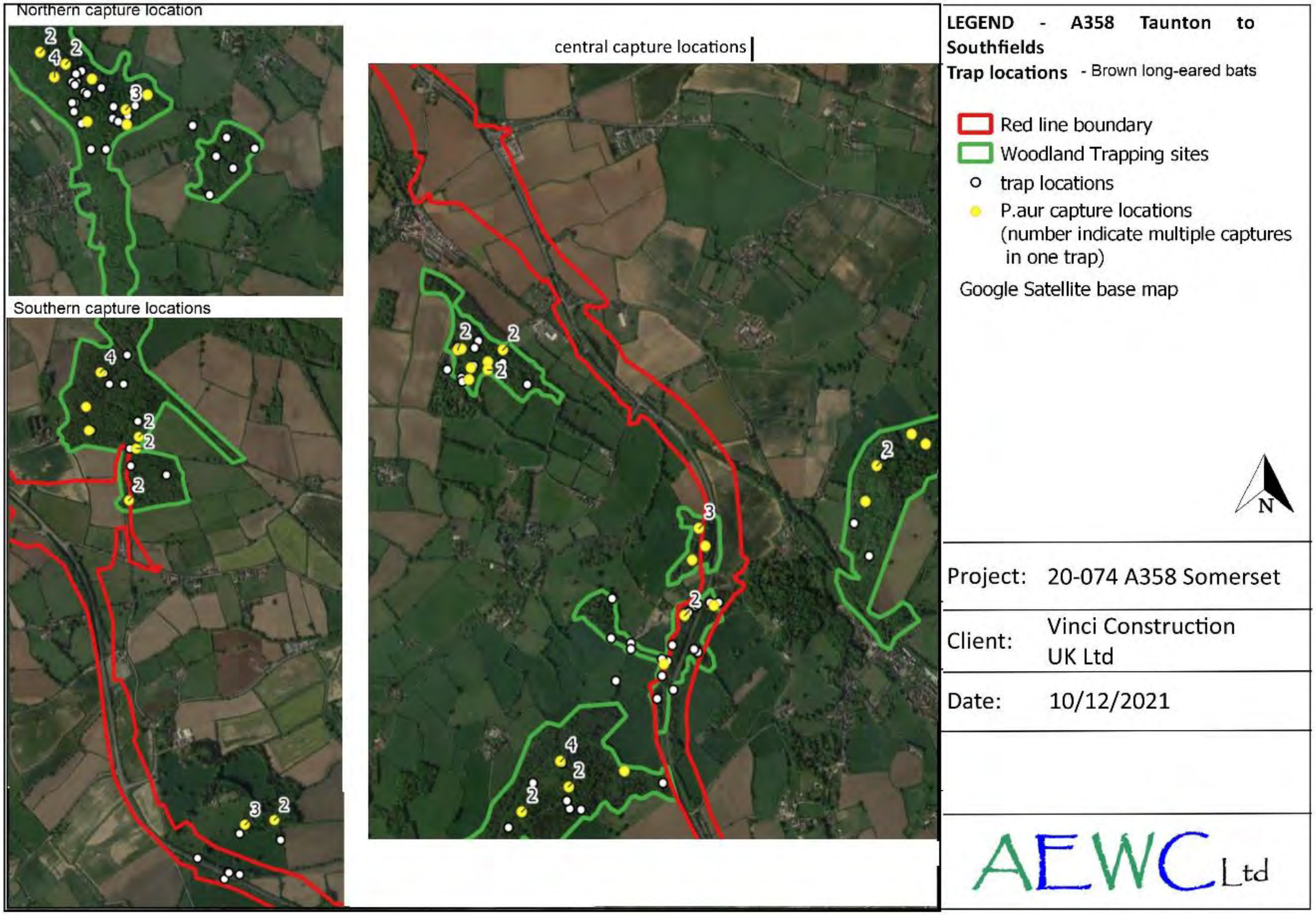


Figure B-3 Trap and capture locations – Brown long-eared bat

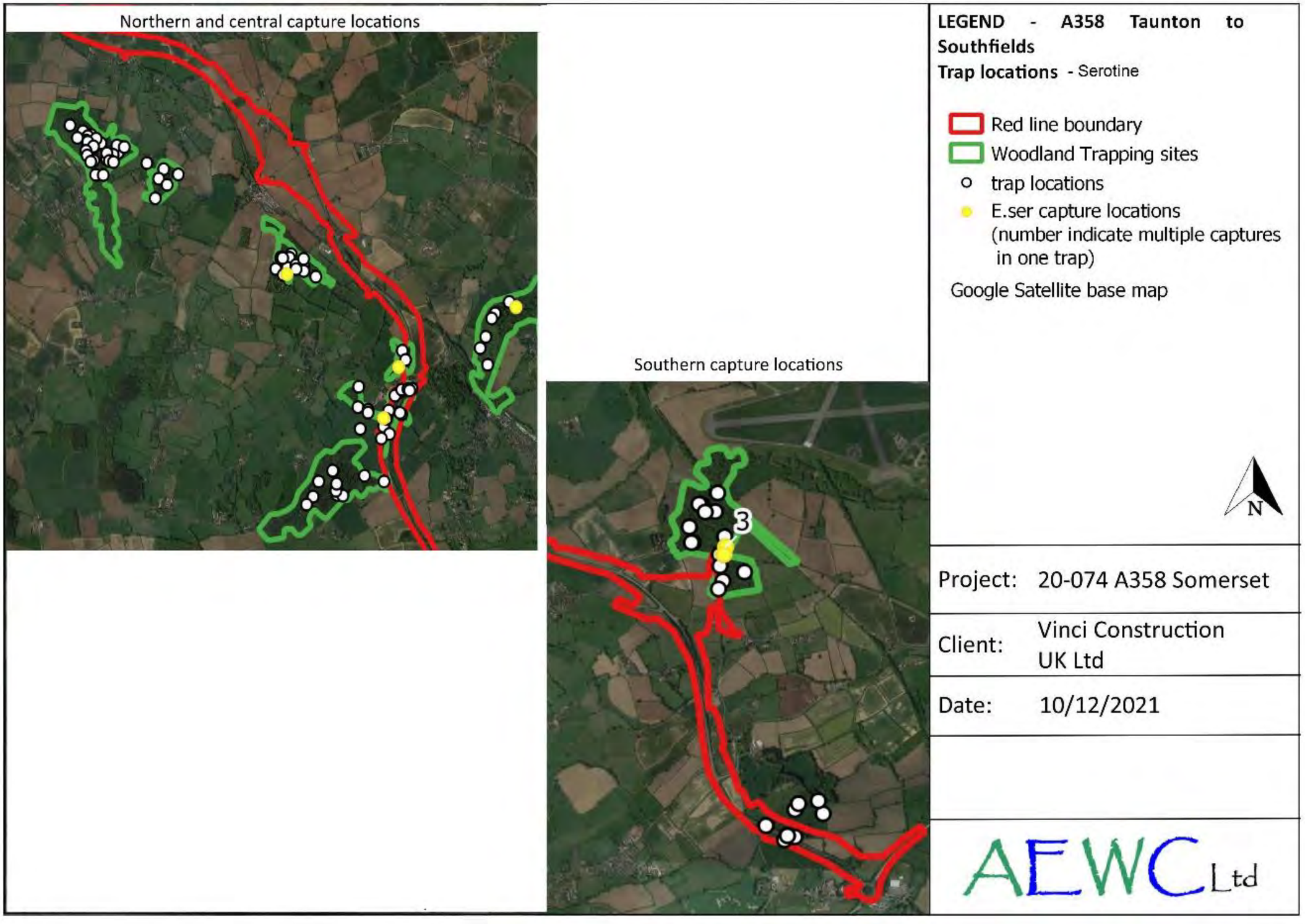


Figure B-4 Trap and capture locations – Serotine

Figure B-5 Trap and capture locations – Myotis sp. bats excluding Bechstein's bat

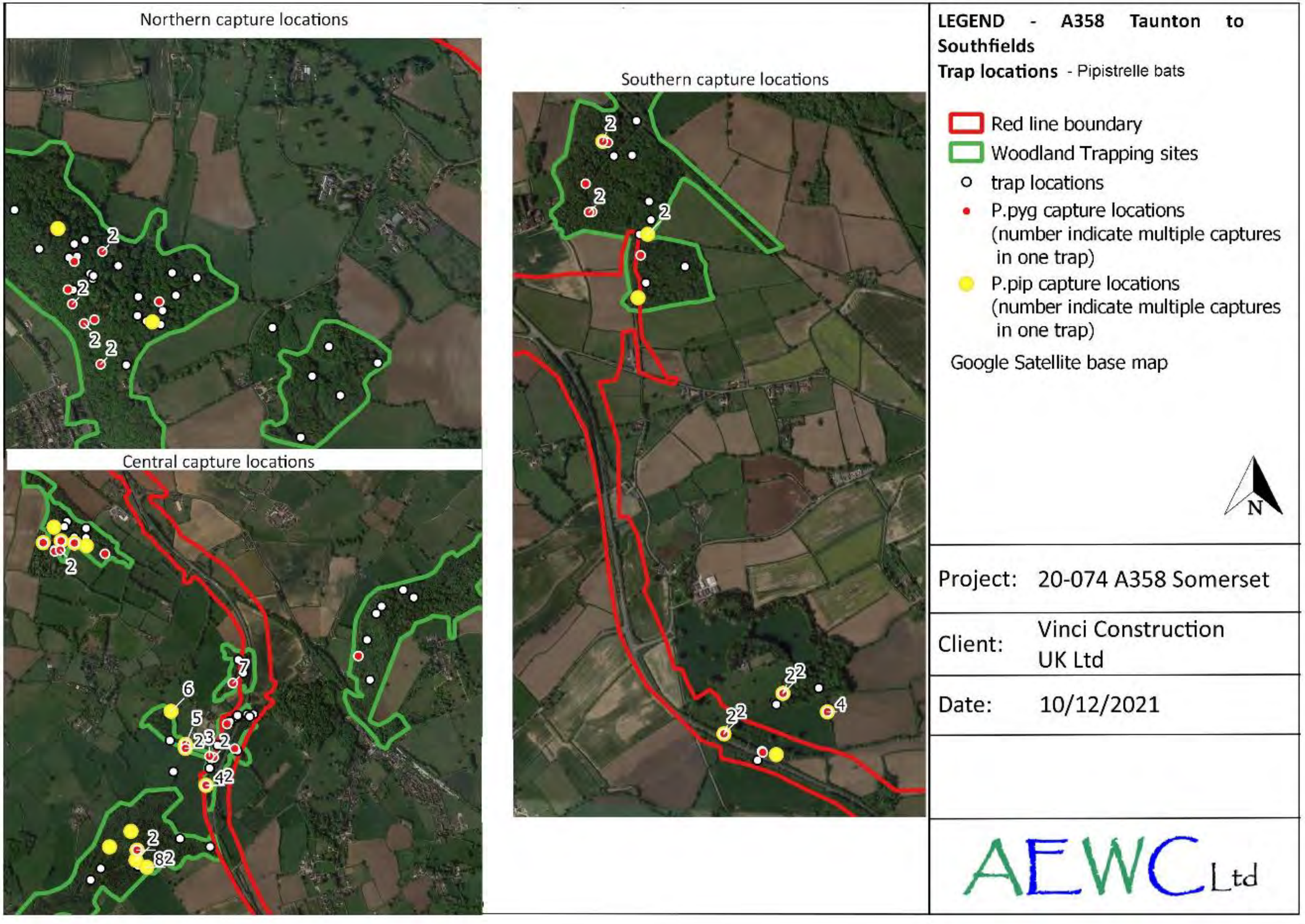


Figure B-6 Trap and capture locations – Pipistrelle sp.

Figure B-7 Trap and capture locations – Greater horseshoe bat and lesser horseshoe bat

Figure B-8 Trap and capture locations – Nyctalus sp.

Appendix C Roosts

Table C-1 Roosts identified through radio tracking

Roost no.	Roost type	Day roost category	Confirmed roost / feature	Location	Grid reference	Species	Bat no.	Dates used	Emergence	Max count
1	Day	Maternity	Obvious hole in oak tree	Ashill Wood	ST 33080 18017	M.bech	1, 2, 3	18/05, 19/05, 20/05, 21-22/05 (1&2 only), 23/05	Yes - 18/05	25
2	Day	Maternity	Fascia gap on house	Southtown Farm - house	ST 32143 16493	M.nat	4	18-23/05	Yes - 19/05	31
3	Night	N/a	N/a	Small copse near A358 Ashill	ST 32877 17460	M.nat	4	19/05, 24/05	No	N/a
4	Day	Solitary	Frost crack low on tree	Ashill	ST 33326 17573	M.bech	3	19/05 (night roost only), 21-22/05	No - feature endoscoped	1
5	Day	Maternity	Woodpecker hole in oak	Stoke Wood	ST 26535 22809	M.nat	5	25/05, 26/05 (night-roosting), 27/05 (most likely here)	Yes - 25/05	25
6	Day	Solitary	Ash tree	Stoke Wood	ST 26807 22829	M.nat	5	26/05	Yes - 26/05	1
7	Day	Satellite	Yes - fluting	Stoke Wood	ST26738 22507	B.barb	6, 10	07/06	Yes - 07/06	8
8	Day	Unknown	Ash tree, but roost feature unknown	Stoke Wood	ST26568 22725	B.barb	7	07/06, 08/06 (night roosting)	Yes - 07/06	No emergence seen; feature obscured
9	Day	Maternity	Main roost in woodpecker hole, tagged bat in another feature which wasn't visible	Stoke Wood	ST 26481 22992	N.noc	8	07/06	Yes - 07/06	26

Roost no.	Roost type	Day roost category	Confirmed roost / feature	Location	Grid reference	Species	Bat no.	Dates used	Emergence	Max count
10	Day	Solitary	Gap at E gable	Arundel Farm	ST 26571 23329	P.aur	9	07/06 - 10/06	Yes - 07/06, 08/06, 09/06	9
11	Day	Maternity	Woodpecker hole	Stoke Wood	ST 26330 22997	M.bech	11	07/06 - 11/06	Yes - 07/06, 08/06	17
12	Day	Satellite	Hazard beam in oak	Stoke Wood	ST 26754 22819	B.barb	6, 10	08/06, 09/06, 10/06 (night roosting)	Yes - 08/06	6
13	Day	Maternity	Large crack in branch of oak	South-east of Stoke Wood	ST 27126 21765	B.barb	7, 24	08/06 - 11/06. Bat 34 10/08, 11/08, 12/08, 13/08	Yes - 08/06, 10/08, 11/08	17
14	Day	Maternity	Woodpecker hole	Stoke Wood	ST 26807 22857	N.noc	8	08/06 - 11/06	Yes - 08/06	20
15	Night	N/a	N/a	Stoke Wood	ST 26374 23014	B.barb	10	08/06	No	N/a
16	Night	N/a	N/a	Stoke Wood	ST 26562 22962	B.barb	10	08/06	No	N/a
17	Day	Maternity	Low crack in small hazel	Stoke Wood	ST 26845 22873	B.barb	6, 10	10/06	Yes - 10/06	7
18	Day	Unknown	Oak - feature unknown	Stoke Wood	ST 26834 22860	B.barb	6, 10	10/06 (night roosting), 11/06	No	N/a
19	Unknown	Unknown	Ash tree	Stoke Wood	ST 26459 22937	M.bech	11	14/06	Yes - 14/06	No emergence seen – dropped tag
20	Day	Unknown	Tree	Stoke Wood	ST 26678 22586	B.barb	10	14/06	Yes - 14/06	No emergence seen; feature obscured
21	Day	Unknown	Tree	Stoke Wood	ST 26517 22817	B.barb	10	16/06	No	N/a

Roost no.	Roost type	Day roost category	Confirmed roost / feature	Location	Grid reference	Species	Bat no.	Dates used	Emergence	Max count
22	Day	Maternity	Tree	Ashill Copse	ST 32908 17977	M.bech	12, 13, 16	20/07, 21/07, 22/07, 23/07	Yes 20/07	37
23	Day	Maternity	Ash tree	Ashill Copse	ST 32948 17988	N.noc	identified whilst tracking bats 12, 13, 16	21/07	Yes 20/07	11
24	Day	Maternity	Tree	Ashill Wood	ST 33378 17912	M.nat	15	20/07, 21/07, 22/07, 23/07	Yes 21/07 and 22/07	1
25	Day	Maternity	Building roof void	Spekewood House	ST 33413 17996	P.aur	14	20/07, 21/07	Yes 21/07	20
26	Night	N/a	Tree	Ashill Wood	ST 33527 17571	M.bech	12	21/07	No	N/a
27	Day	Maternity	Hole on branch - east aspect	Ashill Wood	ST33368 17924	P.aur	14	22/07, 23/07	Yes 22/07	6
28	Day	Maternity	Tree, unknown feature	Ashill Wood	ST 33230 18212	M.nat	15	25/07, 26/07	Yes - 25/7	no emergence seen, but bats seen swarming at dawn, feature likely obscured
29	Day	Maternity	Ash tree with dead tree leaning against it, obvious N facing hole	Little Oakley Plantation (Hatch Park)	ST 29462 20265	M.bech	17, 21, 22	26-27/07 (20 only), 28-29/07 (20,24,25), 30/07 (25 only), 31/07 (20,24,25), 01-02/08 (25 only)	Yes - 26/07	59
30	Day	Solitary	Rot hole on oak	Abbey Wood	ST 29010 20789	B.barb	18	26/07 - 02/08	Yes - 26/07	1

Roost no.	Roost type	Day roost category	Confirmed roost / feature	Location	Grid reference	Species	Bat no.	Dates used	Emergence	Max count
31	Day	Maternity	Wound on NE aspect of oak	Abbey Wood	ST 29014 20786	B.barb	19	27/07 - 02/08	Yes - 27/07, 28/07, 30/07, 01/08	20
32	Day	Unknown	Tree	Hatch Park	ST 29858 20869	M.nat	20	28/07, 29/07, 01/08, 02/08	No	No Access
33	Day	Solitary	Large beech with obvious features	Abbey Wood	ST 28930 20778	M.bech	17	29/07 and 31/07 (night), 30/07 (day)	Yes - 30/07	1
34	Day	Unknown	Immature beech with single low slit	Bickenhall Wood	ST 28733 20024	M.bech	21	30/07	Yes - 30/07	2
35	Night	N/a	Oak - feature unknown	Lady Anna's Wood (Hatch Park)	ST 29355 20702	B.barb	18	30/07	No	N/a
36	Day	Unknown	Tree	Hatch Park	ST 29858 20750	M.nat	20	30/07, 31/07	No	No Access
37	Day	Unknown	Ash, possible high east-facing feature	Lady Anna's Wood (Hatch Park)	ST 29338 20619	M.bech	17, 21	01/08, 02/08	No	Unable to pinpoint exact tree due to signal bounce
38	Day	Maternity	Cherry tree	Stoke Wood	ST 26348 23021	P.aur	25	10/08, 11/08	Yes 10/08	27
39	Day	Unknown	Oak Tree	Parkland near Stoke Wood	ST 27303 23264	M.bech	23	10/08	Yes 10/08	No emergence seen; feature obscured
40	Night	N/a	Tree	Stoke Wood	ST 26649 22863	P.aur	25	12/08	No	N/a

Roost no.	Roost type	Day roost category	Confirmed roost / feature	Location	Grid reference	Species	Bat no.	Dates used	Emergence	Max count
41	Day	Maternity	Large vertical split in main trunk	Bickenhall Wood	ST 28461 19857	B.barb	26, 28	24/08, 25/08, 26/08, 27/08	Yes - 25/08	22
42	Night	N/a	Unconfirmed, woodpecker hole visible	Bickenhall Wood	ST 29110 20028	M.bech	30	25/08, 26/08, 27/08	No	N/a
43	Day	Maternity	Callus roll on ash	Hurford's Plantation	ST 29334 20902	M.bech	29, 30	25/08, 26/08, 27/08, 28/08	Yes - 27/08, 28/08	54
44	Night	N/a	Oak	Hurford's Plantation	ST 29363 20953	M.bech	29	25/08, 26/08, 27/08	No	N/a
45	Day	Unknown	House, exact feature unknown	North Curry	ST 32373 25027	N.lei	27	24/08, 25/08, 26/08, 27/08, 30/08, 31/08, 01/09	Yes - 28/08	No access
46	Day	Unknown	Ash tree woodpecker hole	Hurford's Plantation	ST 29342 20953	P.aur	31	25/08, 26/08, 27/08, 30/08, 31/08, 01/09, 02/09	Yes - 26/08, 27/08	Minimum 3 (roost obscured)
47	Night	N/a	N/a	Hurford's Plantation	ST 29440 21067	P.aur	31	25/08	No	N/a
48	Day	Unknown	Beech tree unknown feature	Hurford's Plantation	ST 29386 20999	P.aur	31	27/08 (night), 28/08	Yes - 28/08	No emergence seen; feature obscured
49	Day	Unknown	Oak unknown feature	Bickenhall Wood	ST 28822 20025	B.barb	26, 28	30/08, 31/08, 01/09	No	N/a
50	Day	Unknown	Unknown	Hatch Park	ST 29662 20725	M.bech	29, 30	30/08, 31/08, 01/09	No	No access
51	Day	Unknown	House, exact feature unknown	North Curry	ST 31802 25289	N.lei	27	02/09	No	No access

Table C-2 Photos of roosts identified through radio tracking

	
Photo 1: Roost 1	**Photo 2**: Roost 2

Photo 3: Roost 4

Photo 4: Roost 5

Photo 5: Roost 6

Photo 6: Roost 7

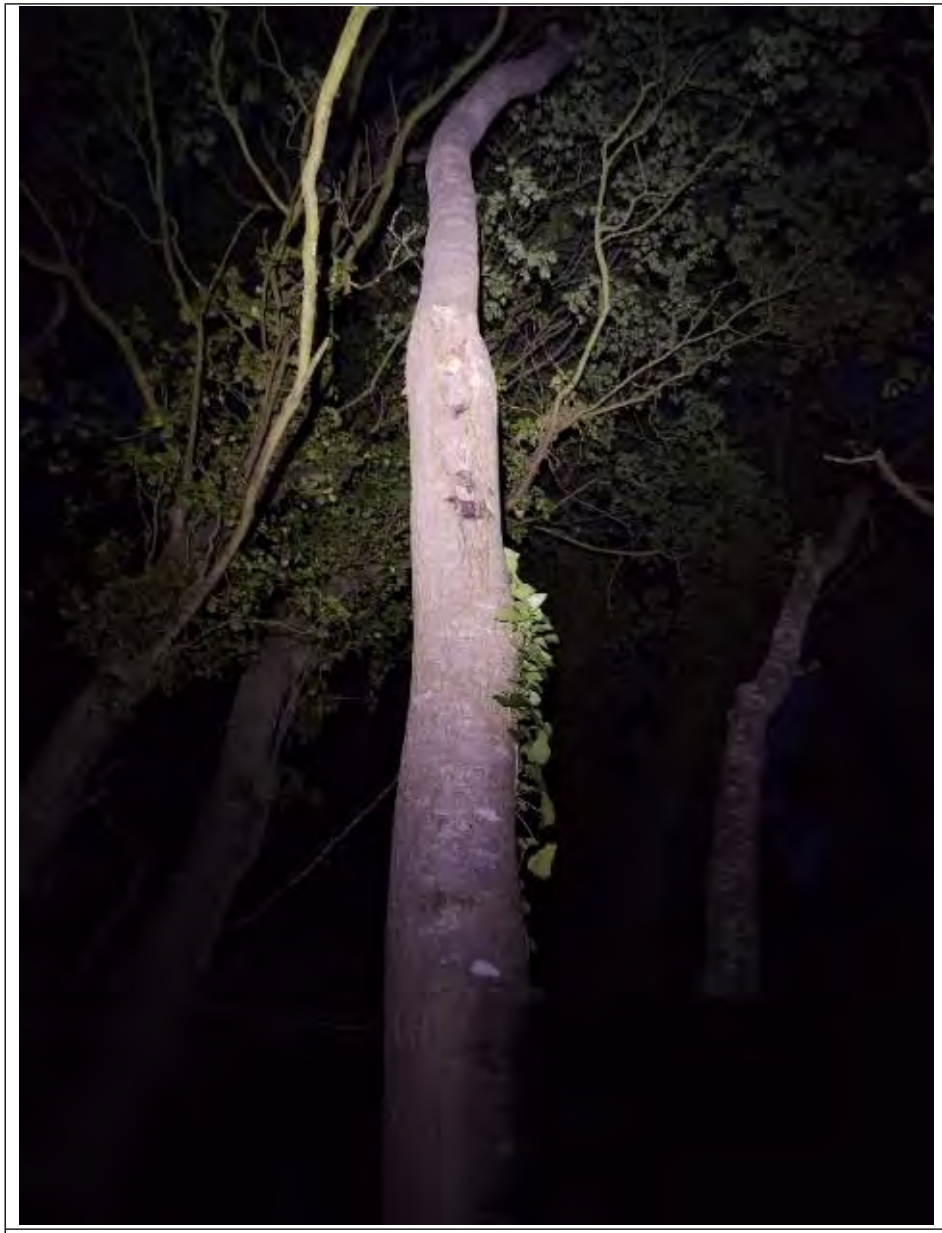


Photo 7: Roost 8

Photo 8: Roost 9

Photo 9: Roost 10

Photo 10: Roost 11 (Left)

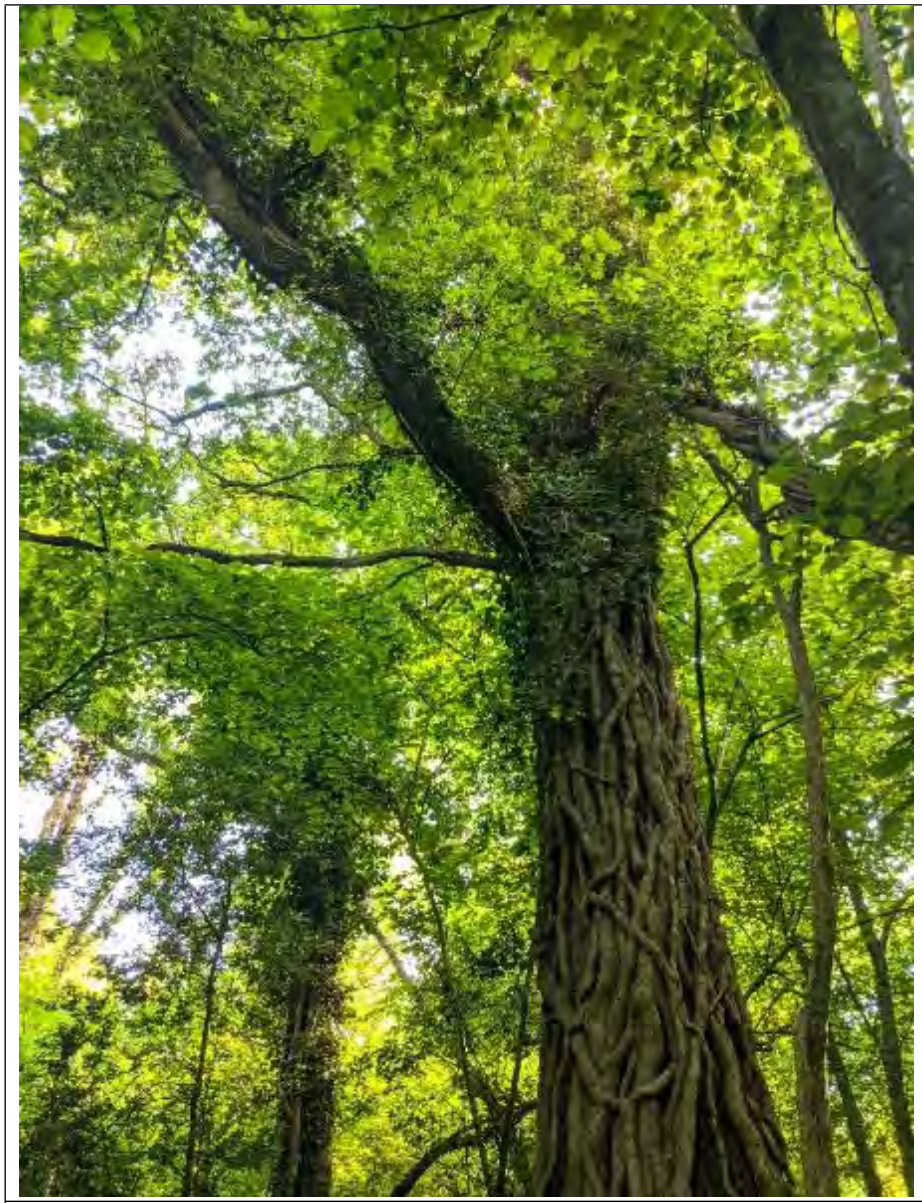


Photo 11: Roost 12

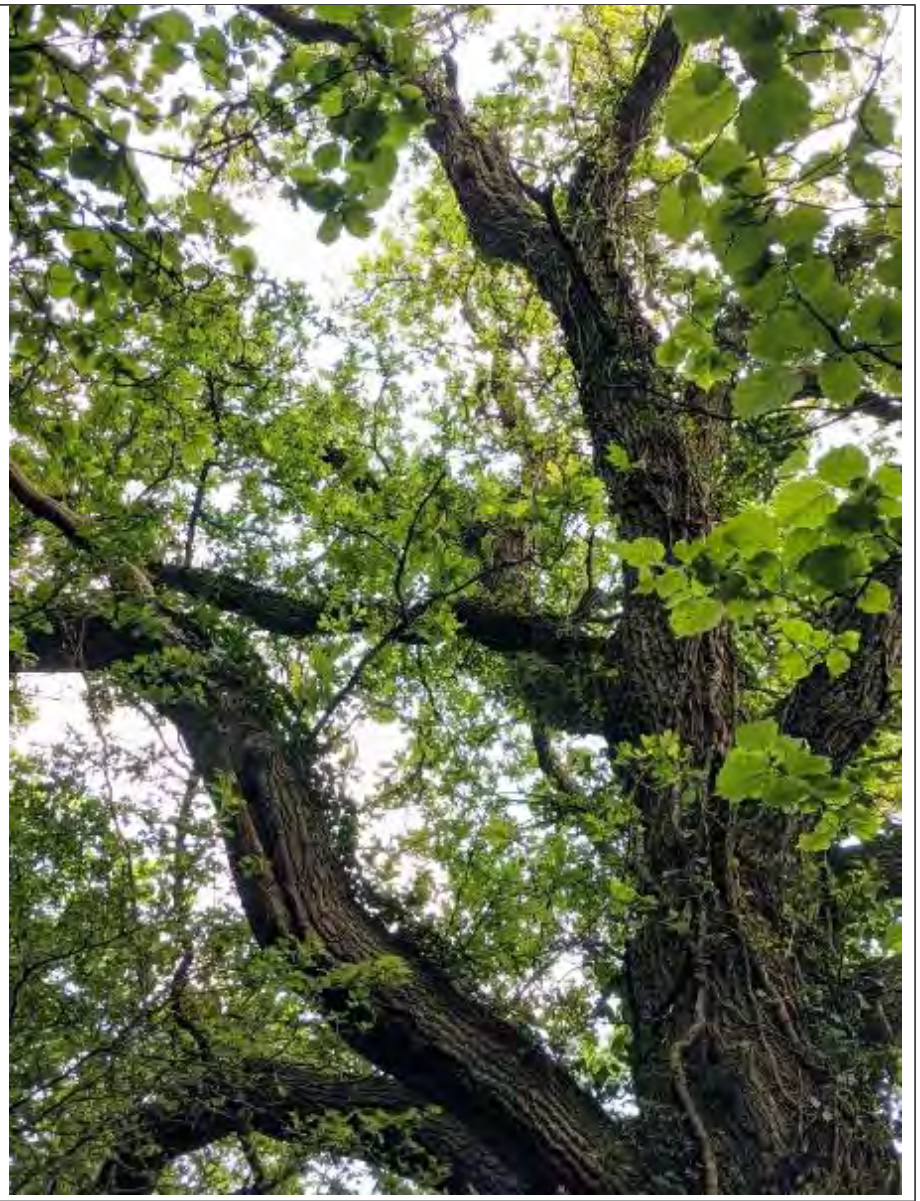


Photo 12: Roost 13

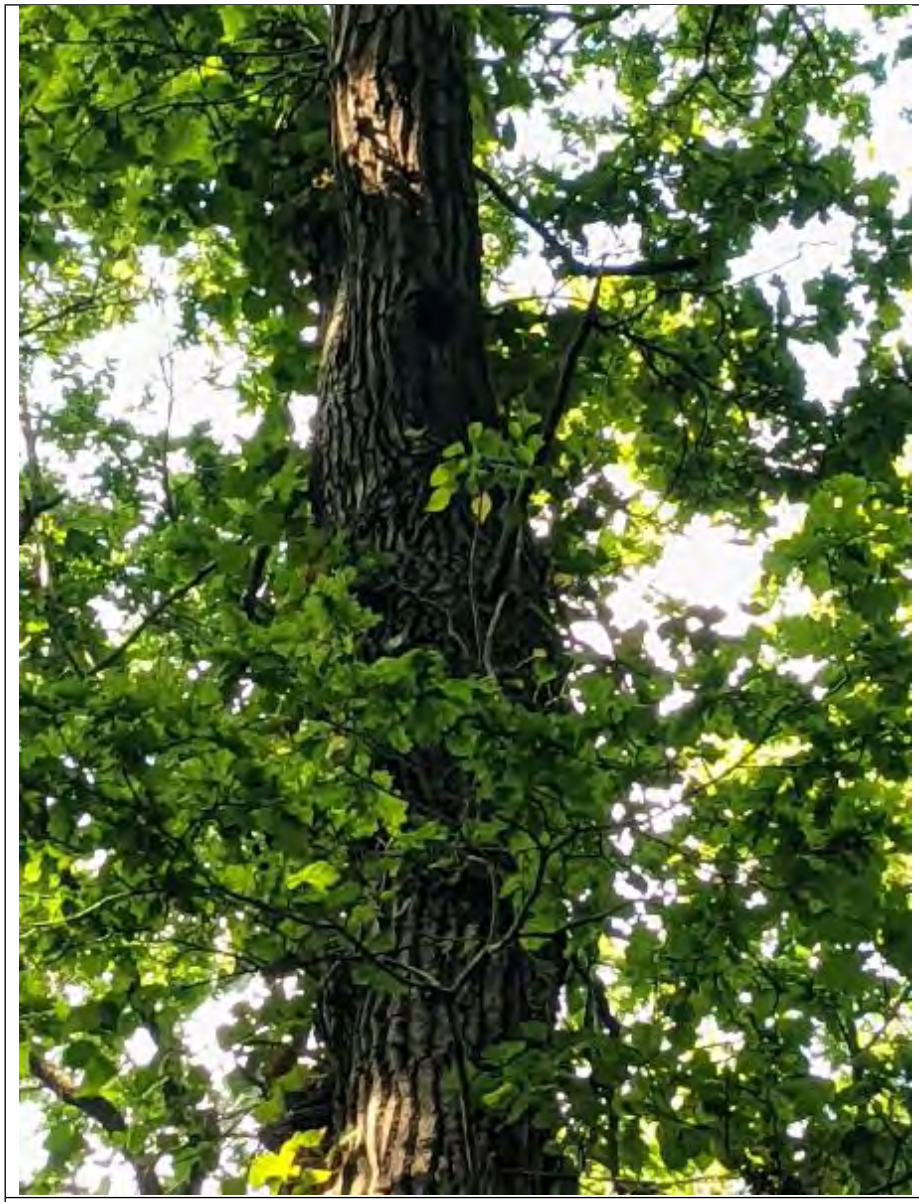


Photo 13: Roost 14

Photo 14: Roost 17

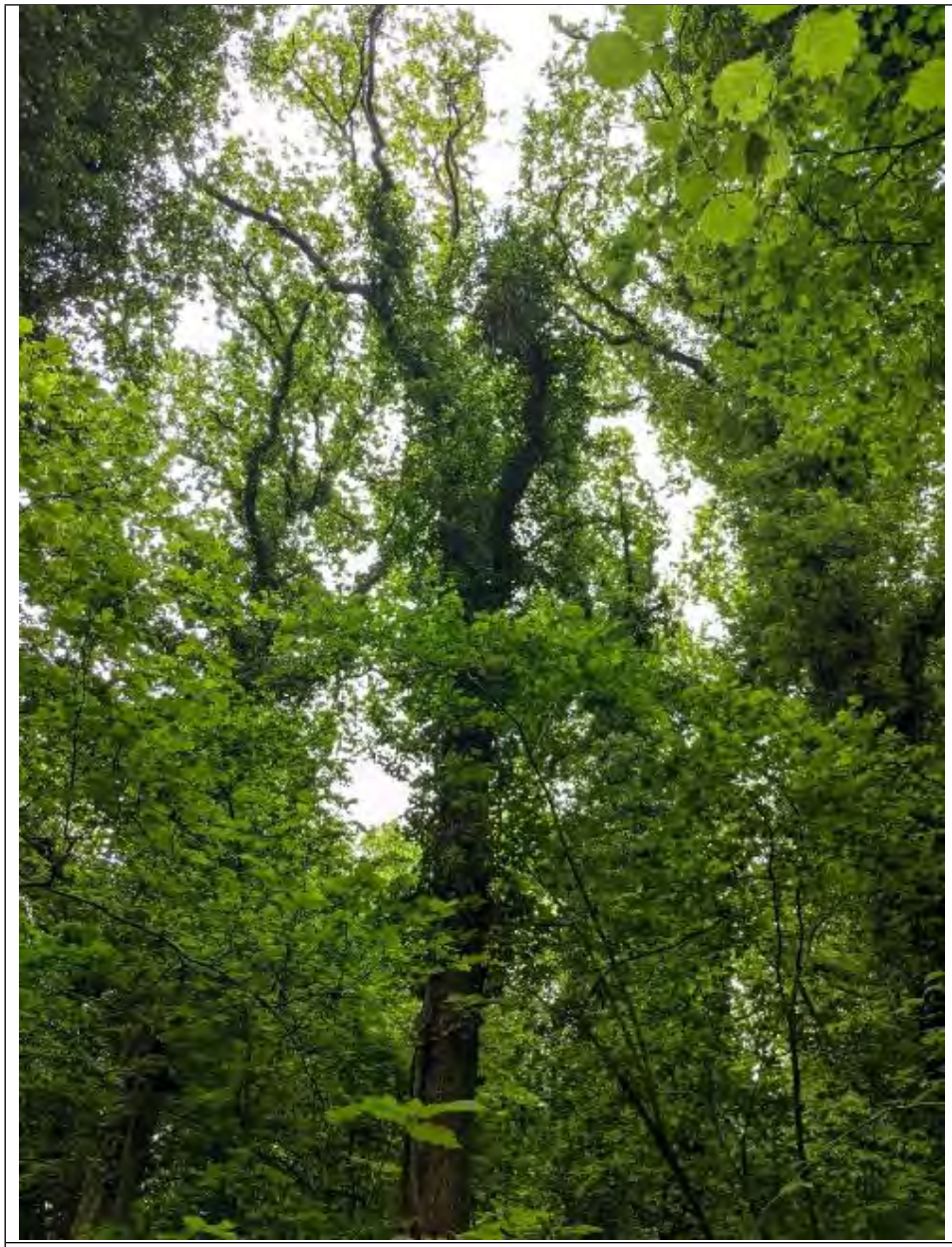


Photo 15: Roost 18

Photo 16: Roost 19

Photo 17: Roost 20

Photo 18: Roost 22

Photo 19: Roost 23

Photo 20: Roost 24

Photo 21: Roost 25

Photo 22: Roost 27

Photo 23: Roost 28

Photo 24: Roost 29

Photo 25: Roost 30

Photo 26: Roost 31

Photo 27: Roost 33

Photo 28: Roost 34

Photo 29: Roost 35

Photo 30: Roost 37

Photo 31: Roost 38

Photo 32: Roost 41

Photo 33: Roost 42

Photo 34: Roost 44

Photo 35: Roost 48

Photo 36: Roost 49

Figure C-1 Roosts identified within the northern section of the study area

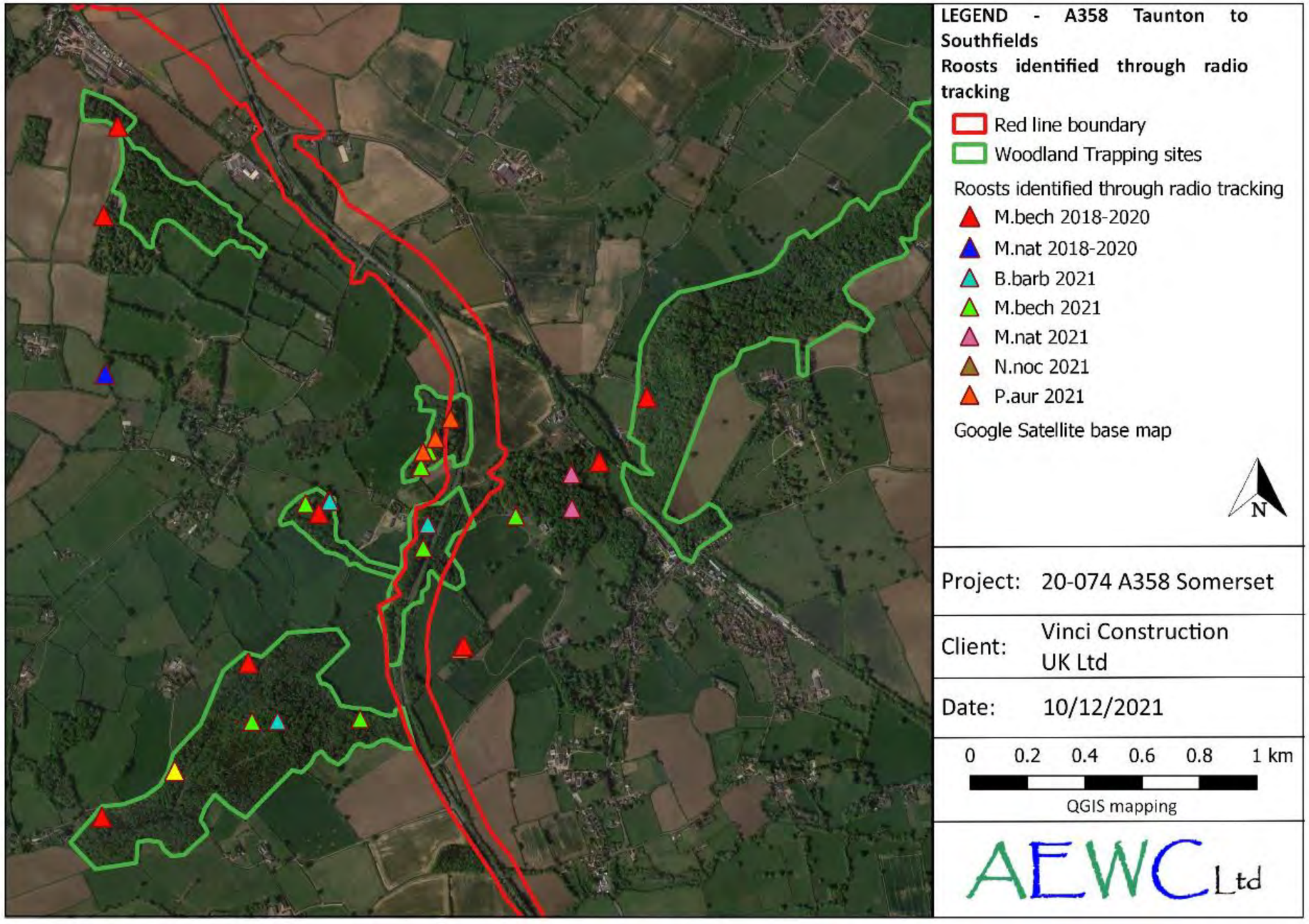


Figure C-2 Roosts identified within the central section of the study area

Figure C-3 Roosts identified within the southern section of the study area

Appendix D Radio tracking

Table D-1 Weather conditions during trapping, tracking and emergence surveys

Date	Trapping location	Tracking: bat no.	Emergence: bat no.	Weather description	Temperature (ºC)	
					High	Low
17/05/21	Ashill/Every's Copse	N/a	N/a	Very wet day. Dry, clear and still evening but temperature getting low over night	12.6	8.2
18/05/21	Jordan's Park	1, 2, 3	1, 2, 3	Very wet evening heavy showers, dry from about 20:00. Light breeze and overcast during survey and feeling cool	12.6	8.2
19/05/21	Bickenhall Wood	1, 2, 3, 4	4	Cool, dry, clear sky	13.7	8.7
20/05/21	-	1, 2, 3, 4	-	Rain showers in the afternoon, dry and cool over night	13.7	8.7
21/05/21	-	1, 2, 3, 4	-	Cool and dry	12.2	10.2
22/05/21	Stoke Wood	N/a	N/a	Clear evening with light breeze, temperature dropping rapidly after sunset	14.5	6.8
23/05/21	-	4	-	Heavy rain in the late evening, dry by 20:30 but temperature getting very low	13.5	5.6
24/05/21	Huish Wood	N/a	N/a	Clear day and evening became cold quickly. Survey stopped early due to cold	31.8	9
25/05/21	-	4, 5	5	Rain in the afternoon, dry and overcast with a light breeze in the evening, temperature dropping rapidly	13.7	8.6
26/05/21	-	5	5	Warm and dry to start but temperature dropping rapidly	17.5	7.9
27/05/21	-	5	-	Warm and dry to start but temperature dropping rapidly	19.8	7.5
28/05/21	-	5	-	Warm and dry to start but temperature dropping rapidly	20.5	10.2
06/06/21	Stoke Wood	N/a	N/a	Briefly rained in day, evening warm and clear	21.3	14.2
07/06/21	Huish Wood	6, 7, 8, 9, 10, 11	6, 7, 8, 9, 10, 11	Warm overcast day. Still, warm & clear evening	21	11.1
08/06/21	-	6, 7, 8, 9, 10, 11	6, 7, 8, 9, 10, 11	Warm clear day, still and clear evening	21.9	10.9
09/06/21	-	6, 7, 8, 9, 10, 11	9	Warm clear day, still and clear evening	23.3	11.9

Date	Trapping location	Tracking: bat no.	Emergence: bat no.	Weather description	Temperature (ºC)	
					High	Low
10/06/21	-	6, 7, 8, 9, 10, 11	6, 10	Overcast, warm, humid	22.5	16.8
11/06/21	-	6, 7, 8, 9, 10, 11	-	Overcast, warm, humid	21.6	16.7
14/06/21	-	-	10, 11	Warm clear day and clear evening	25.2	12.5
19/07/21	Ashill Wood/Every's Copse	N/a	N/a	Very warm day and warm still evening	31	15.9
20/07/21	Jordan's Park	12, 13, 14, 15, 16	12, 13, 16	Warm, still & clear	31.6	14.7
21/07/21	-	12, 13, 14, 15, 16	14, 15	Warm, still & clear	31.2	15.5
22/07/21	-	12, 13, 14, 15, 16	14, 15	Warm, still & clear	29.5	16.1
23/07/21	-	12, 13, 14, 15, 16	14, 15	Warm, still & clear	26.5	14.8
25/07/21	Abbey Wood	N/a	15	Warm, still & clear	22.4	16.9
26/07/21	Hatch Park Estate	17, 18	17, 18, 21, 22	Warm, still & clear, rain shower around 3.30am	26.6	13.4
27/07/21	Bickenhall Wood	17, 18, 19, 20	18, 19	Warm, still, overcast and humid, rain shower prior to sunset	22.4	19.1
28/07/21	-	17, 18, 19, 20, 21, 22	19	Overcast with some rain during the day, warm and still evening with clouds clearing	20.6	14.4
29/07/21	-	17, 18, 19, 20, 21, 22	-	Overcast and warm with rain showers throughout the night	21.3	13.1
30/07/21	-	17, 18, 19, 20, 21, 22	17, 19, 21	Warm and dry	19	14.1
31/07/21	-	17, 18, 19, 20, 21, 22	-	Warm and dry	18.5	15
01/08/21	Line Wood	17, 18, 19, 20, 21, 22	19	Warm, light breeze & mostly clear	20.6	13.4

Date	Trapping location	Tracking: bat no.	Emergence: bat no.	Weather description	Temperature (ºC)	
					High	Low
09/08/21	Stoke Wood	N/a	-	Rain in late evening during set up, dry after 20:00	20.9	14
10/08/21	Huish Wood	23, 24, 25	23, 24, 25	Warm, light breeze & mostly clear	22.8	13.8
11/08/21	-	23, 24, 25	24	Warm, light breeze & mostly clear	21.4	14
12/08/21	-	23, 24, 25	-	Warm, light breeze & mostly clear	21.6	12.8
13/08/21	-	23, 24, 25	-	Warm, light breeze & mostly clear	22	12.8
24/08/21	Hatch Park Estate	N/a	N/a	Warm, still & partly overcast	23.3	12.1
25/08/21	Hurford's Plantation	26, 27, 28, 29	26, 28	Warm, still & partly overcast	22.1	12.7
26/08/21	-	26, 27, 28, 29, 30, 31	31	Warm, still & partly overcast	23.1	12.5
27/08/21	-	26, 27, 28, 29, 30, 31	29, 30, 31	Warm and overcast during the day, sky clearing over night	18	10.5
28/08/21	-	28, 29, 30, 31	27, 29, 30, 31	Warm and overcast during the day, sky clearing over night	21.3	10.4
29/08/21	-	28, 29, 30, 31	-	Warm and overcast during the day, sky clearing over night	19.8	11.6

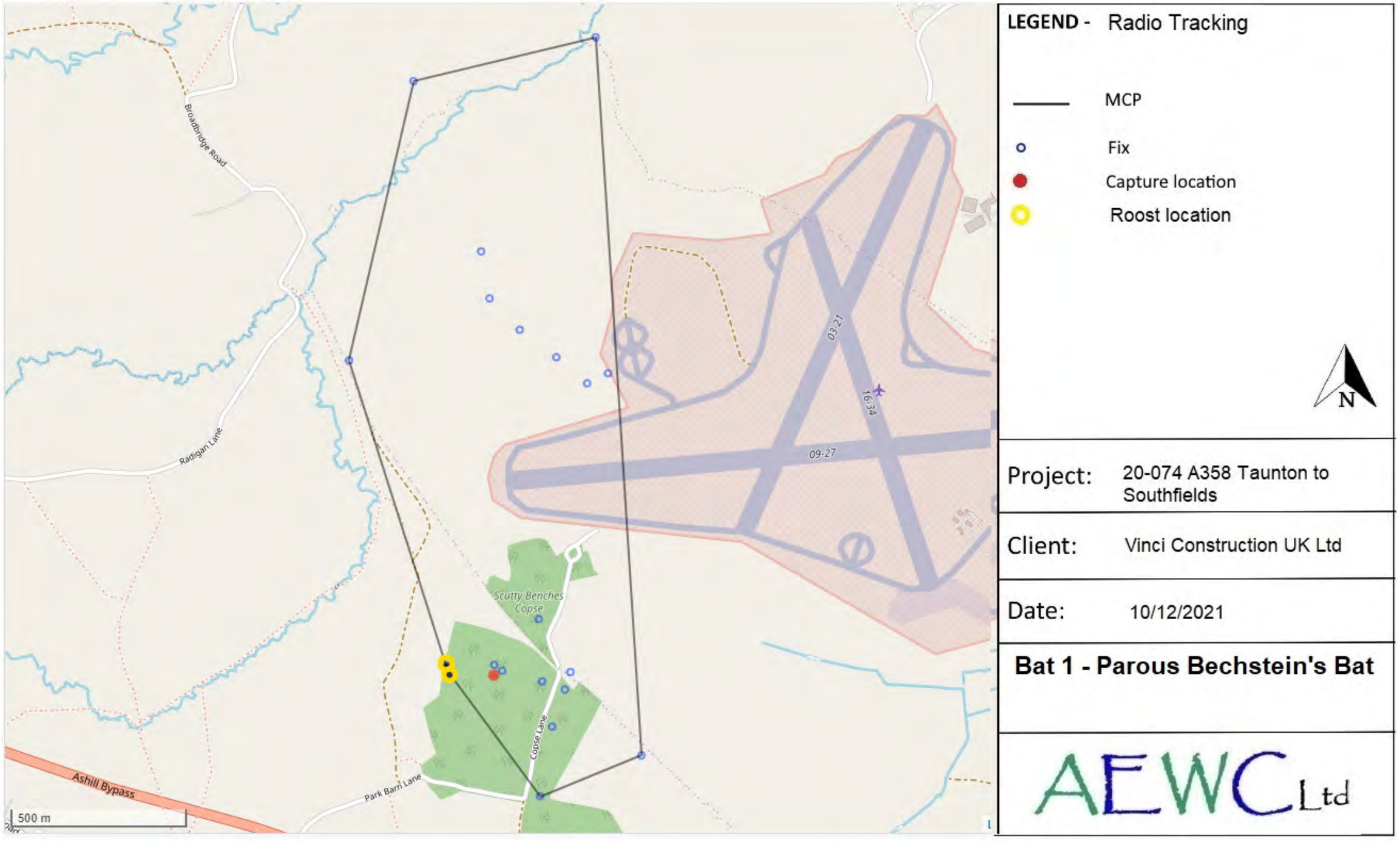


Figure D-1 Fixes and MCP for Bat 1

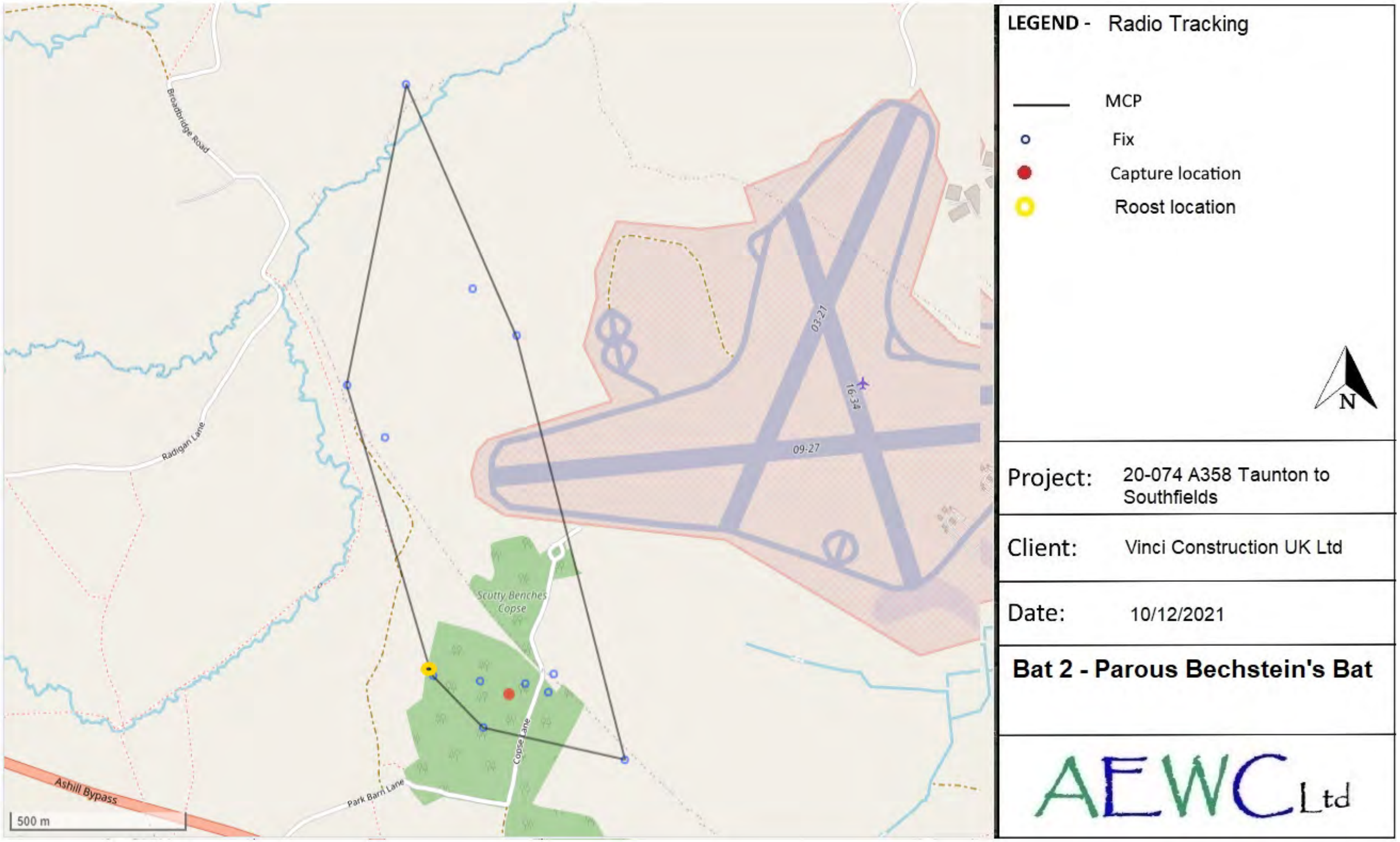


Figure D-2 Fixes and MCP for Bat 2

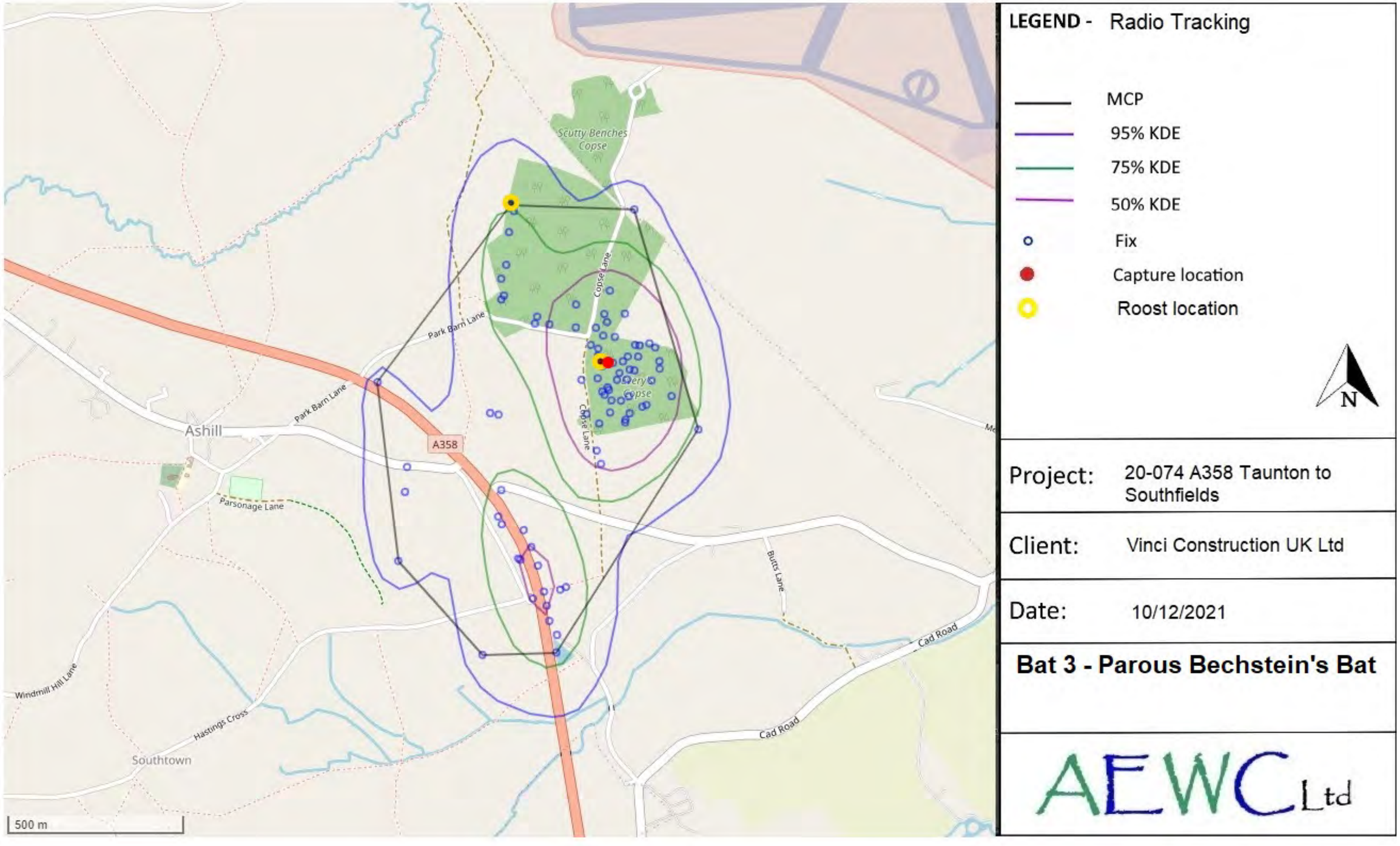


Figure D-3 Fixes, MCP and KDE for Bat 3

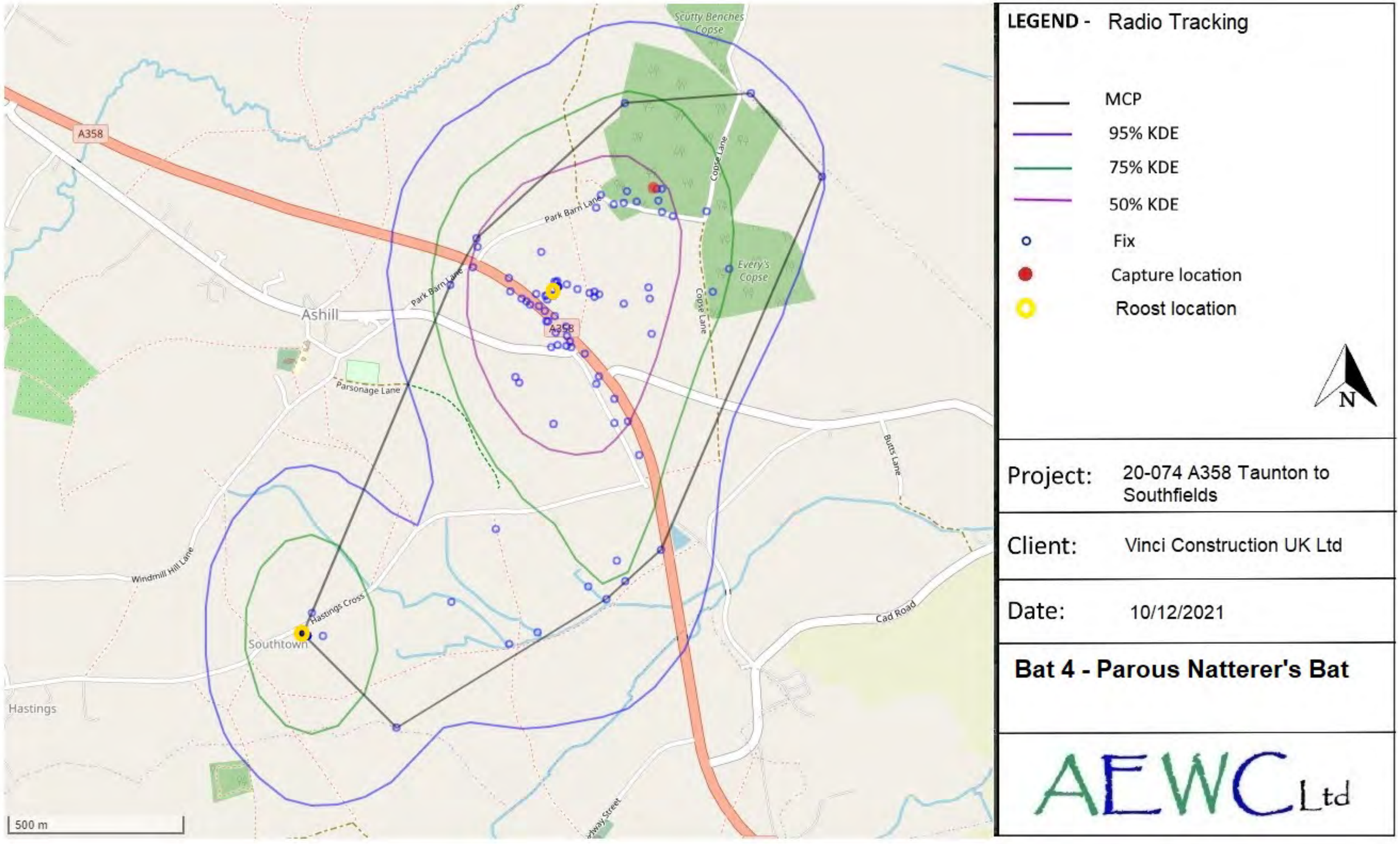


Figure D-4 Fixes, MCP and KDE for Bat 4

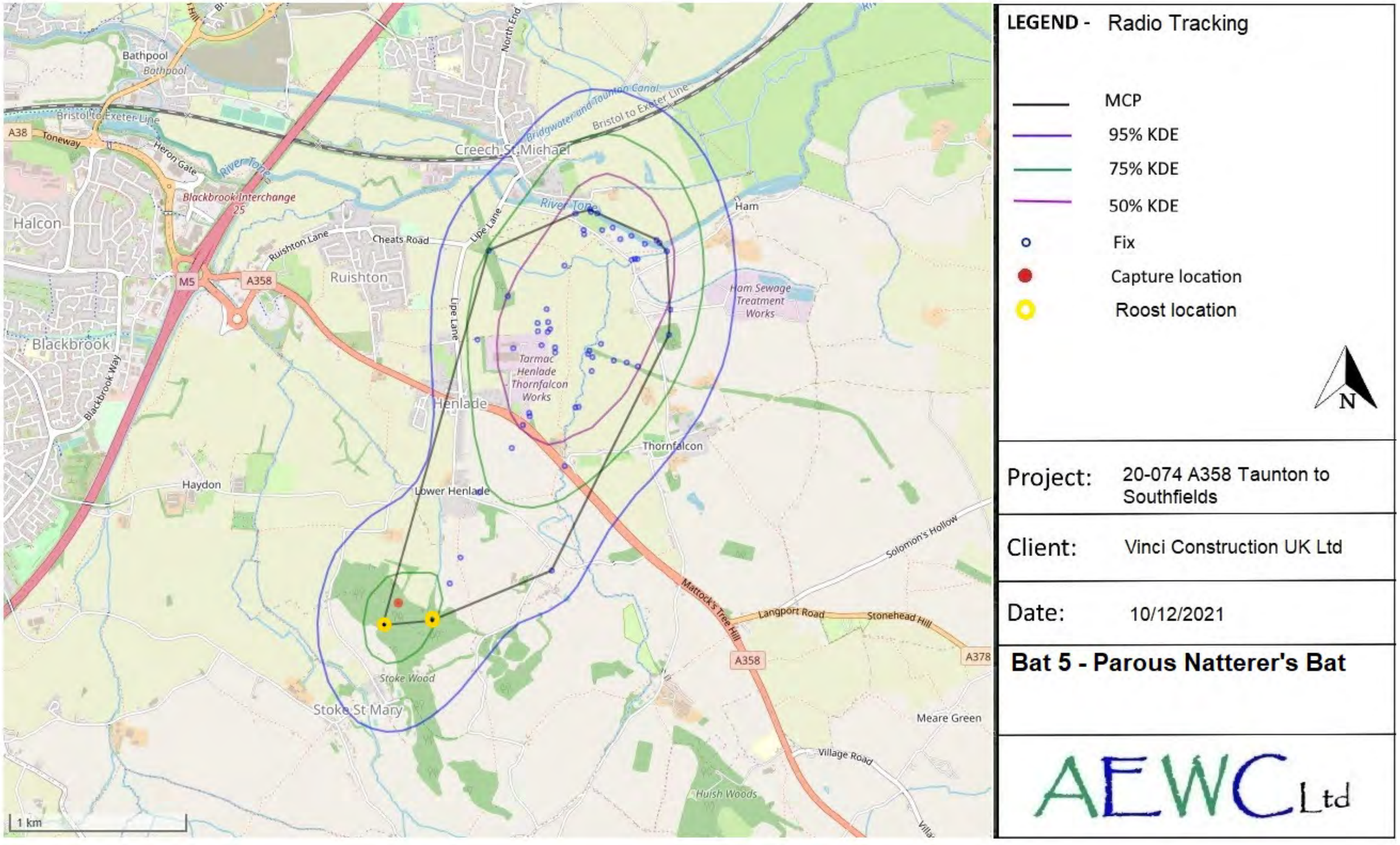


Figure D-5 Fixes, MCP and KDE for Bat 5

Figure D-6 Fixes, MCP and KDE for Bat 6

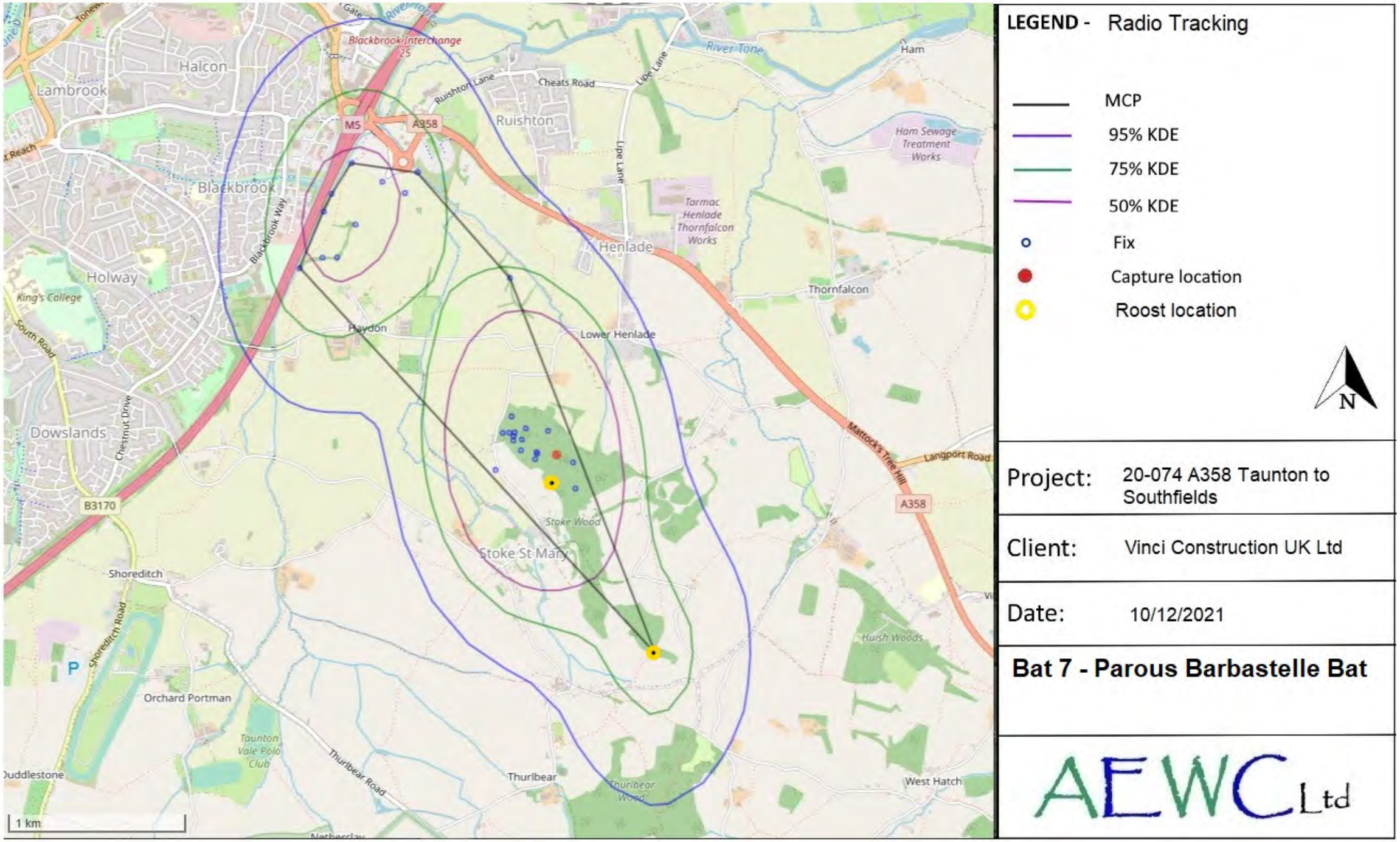


Figure D-7 Fixes, MCP and KDE for Bat 7

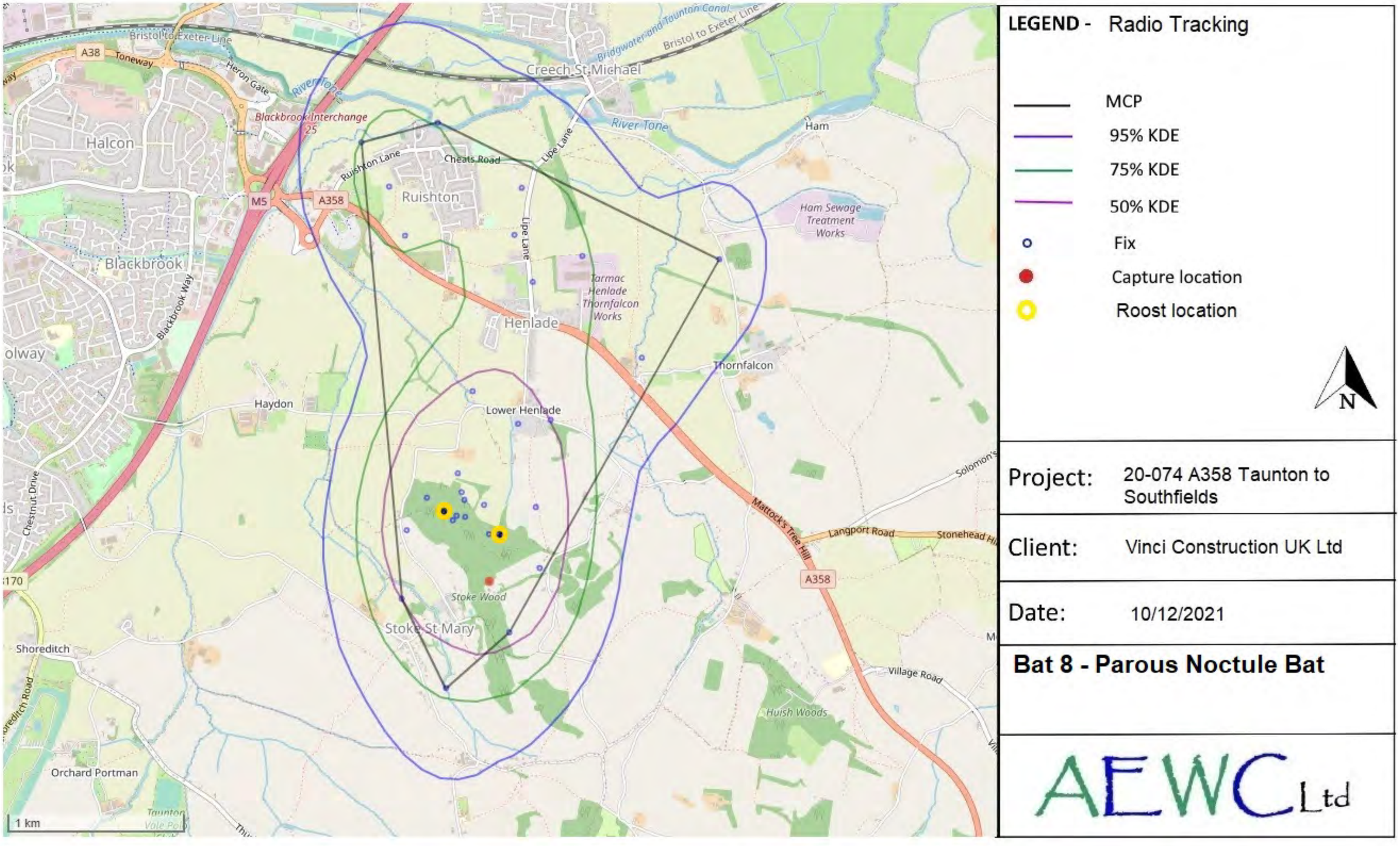


Figure D-8 Fixes, MCP and KDE for Bat 8

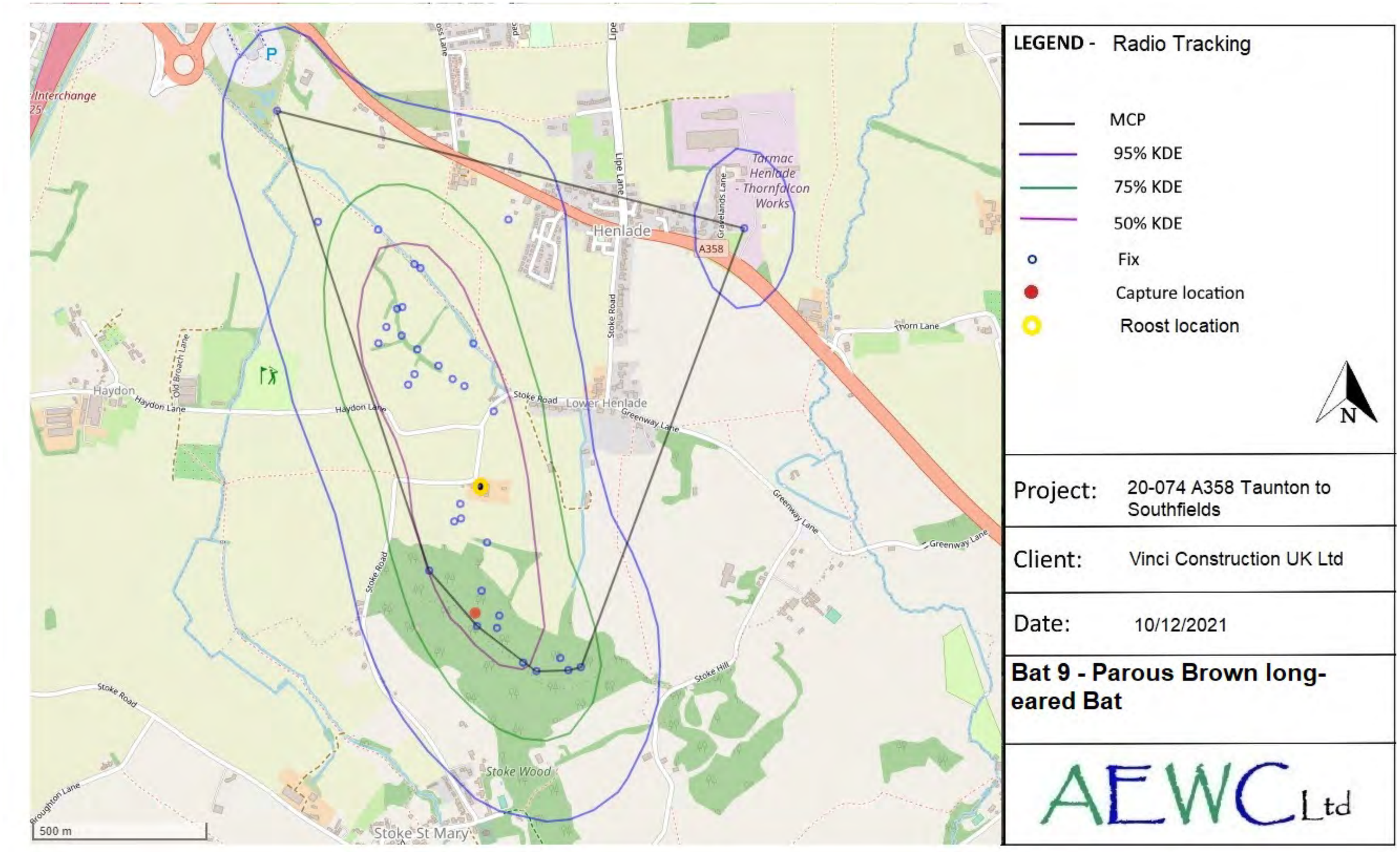
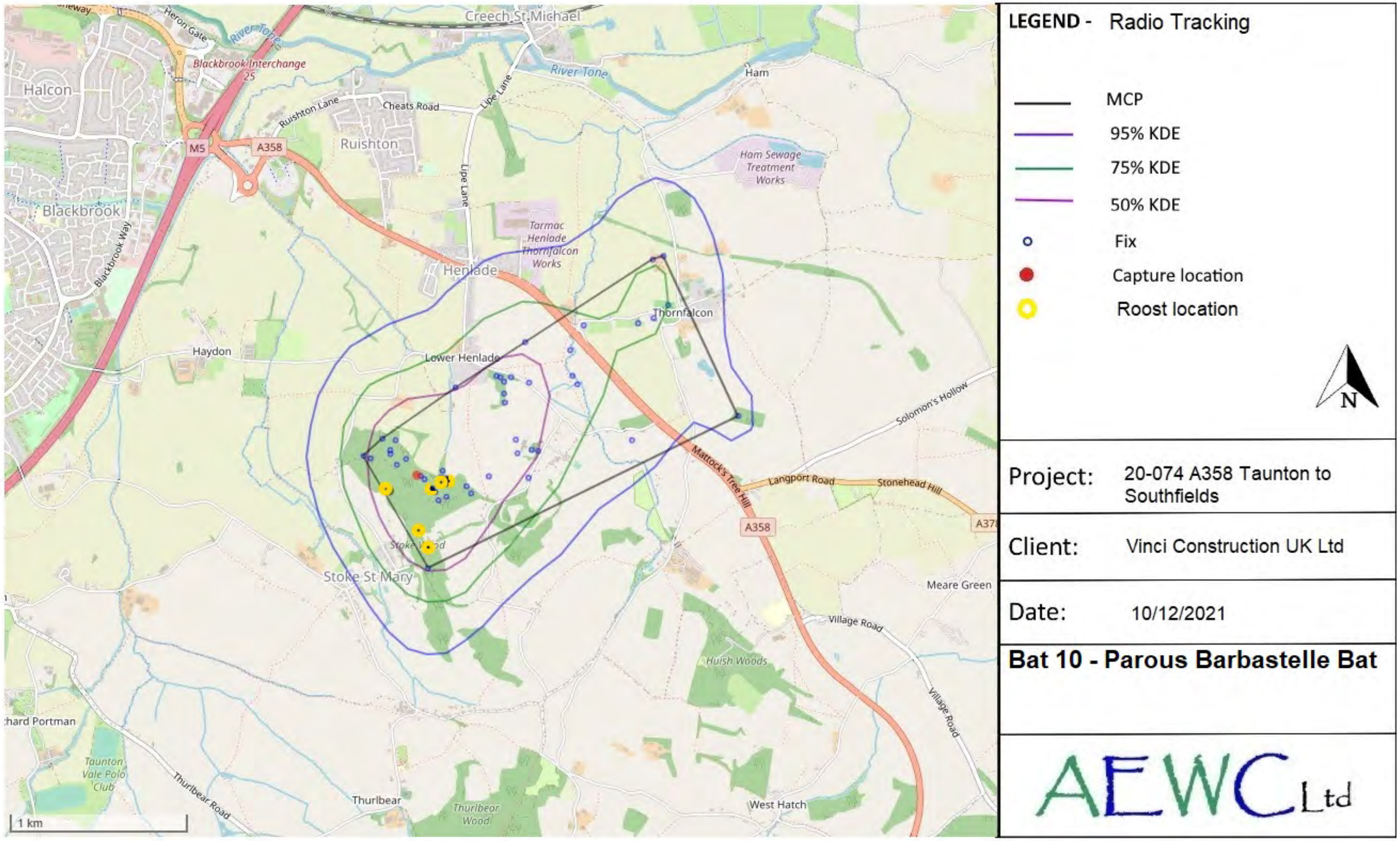


Figure D-9 Fixes, MCP and KDE for Bat 9



LEGEND - Radio Tracking

- MCP
- 95% KDE
- 75% KDE
- 50% KDE
- Fix
- Capture location
- Roost location

N

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Bat 10 - Parous Barbastelle Bat

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Figure D-10 Fixes, MCP and KDE for Bat 10

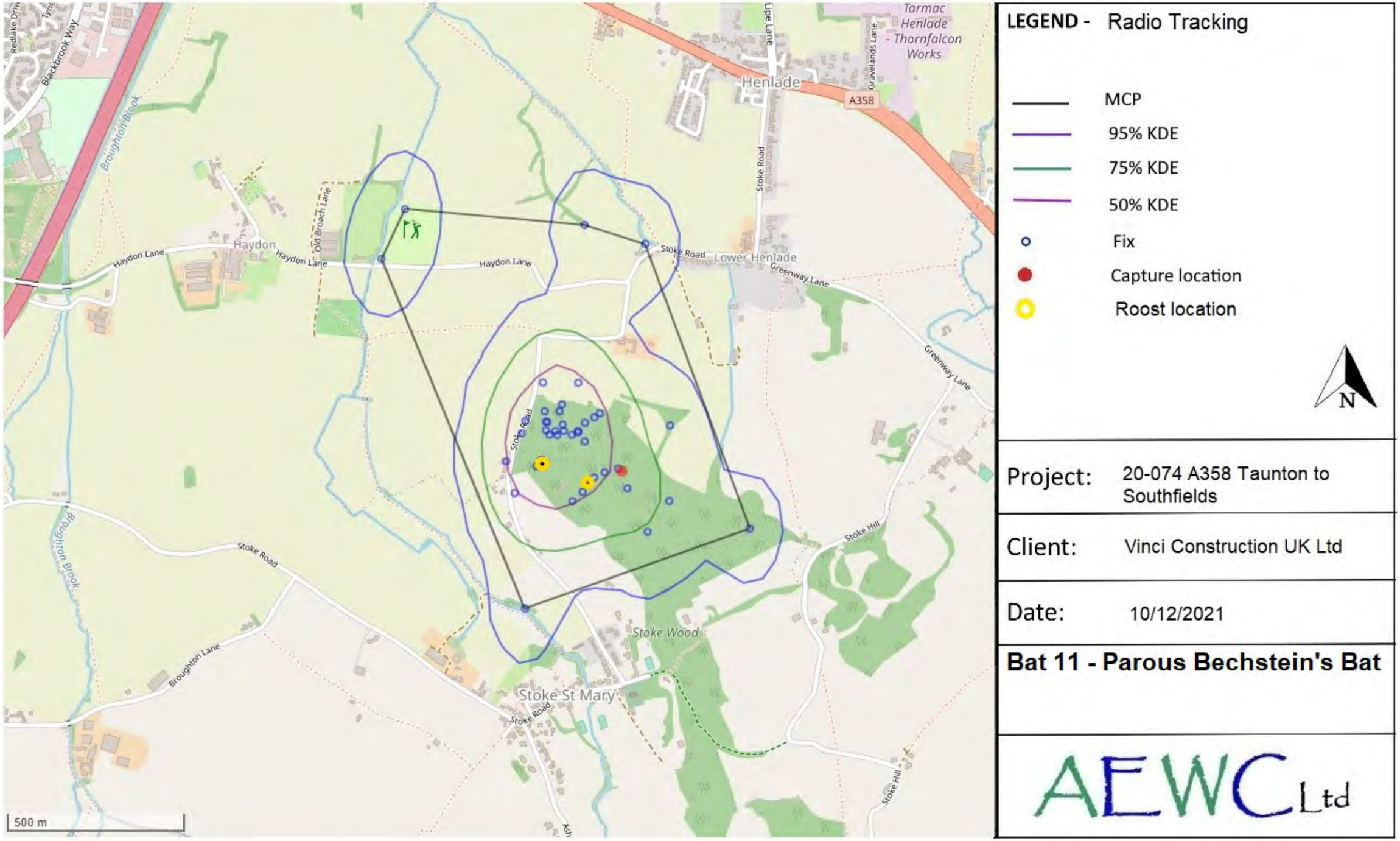


Figure D-11 Fixes, MCP and KDE for Bat 11

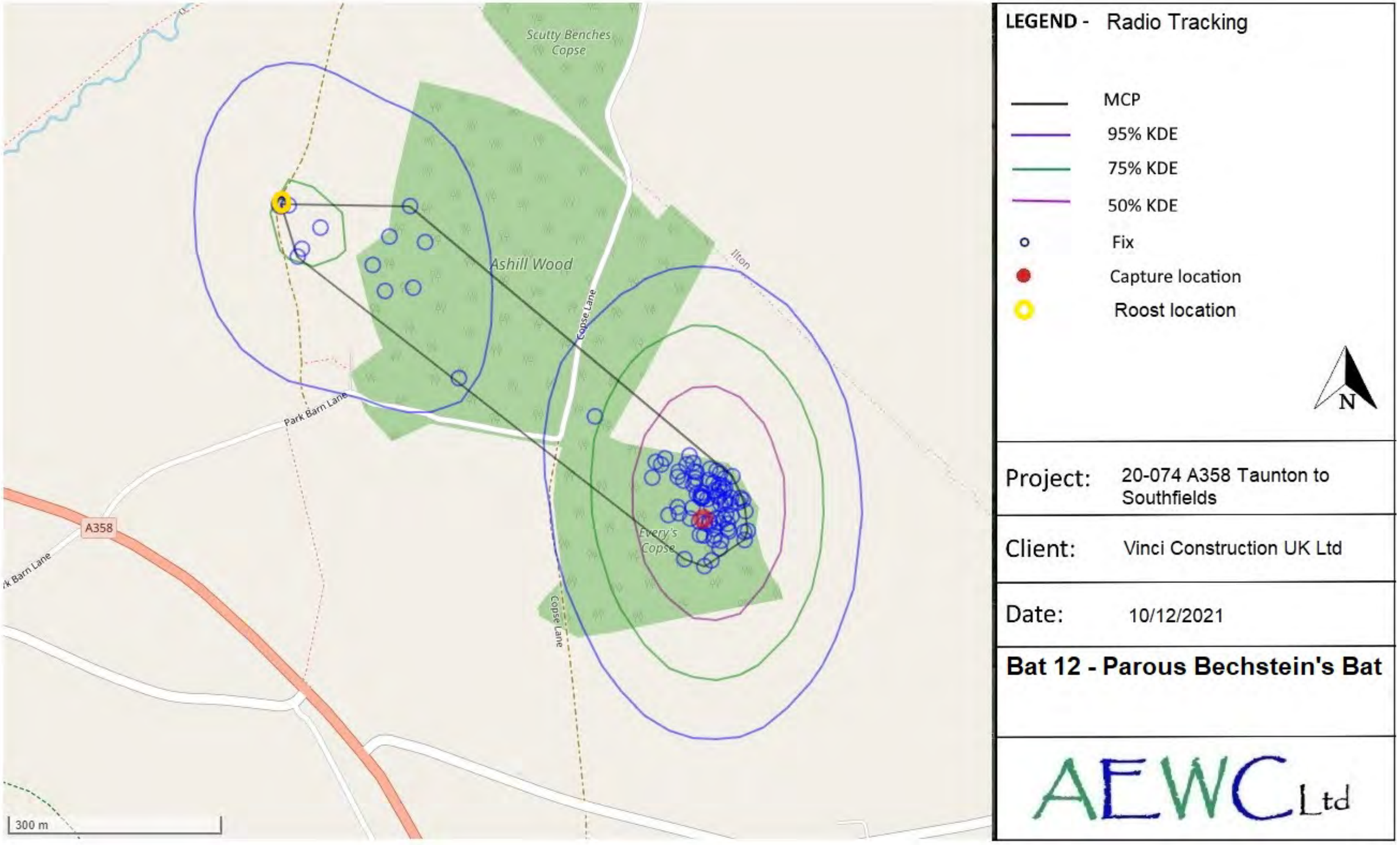


Figure D-12 Fixes, MCP and KDE for Bat 12

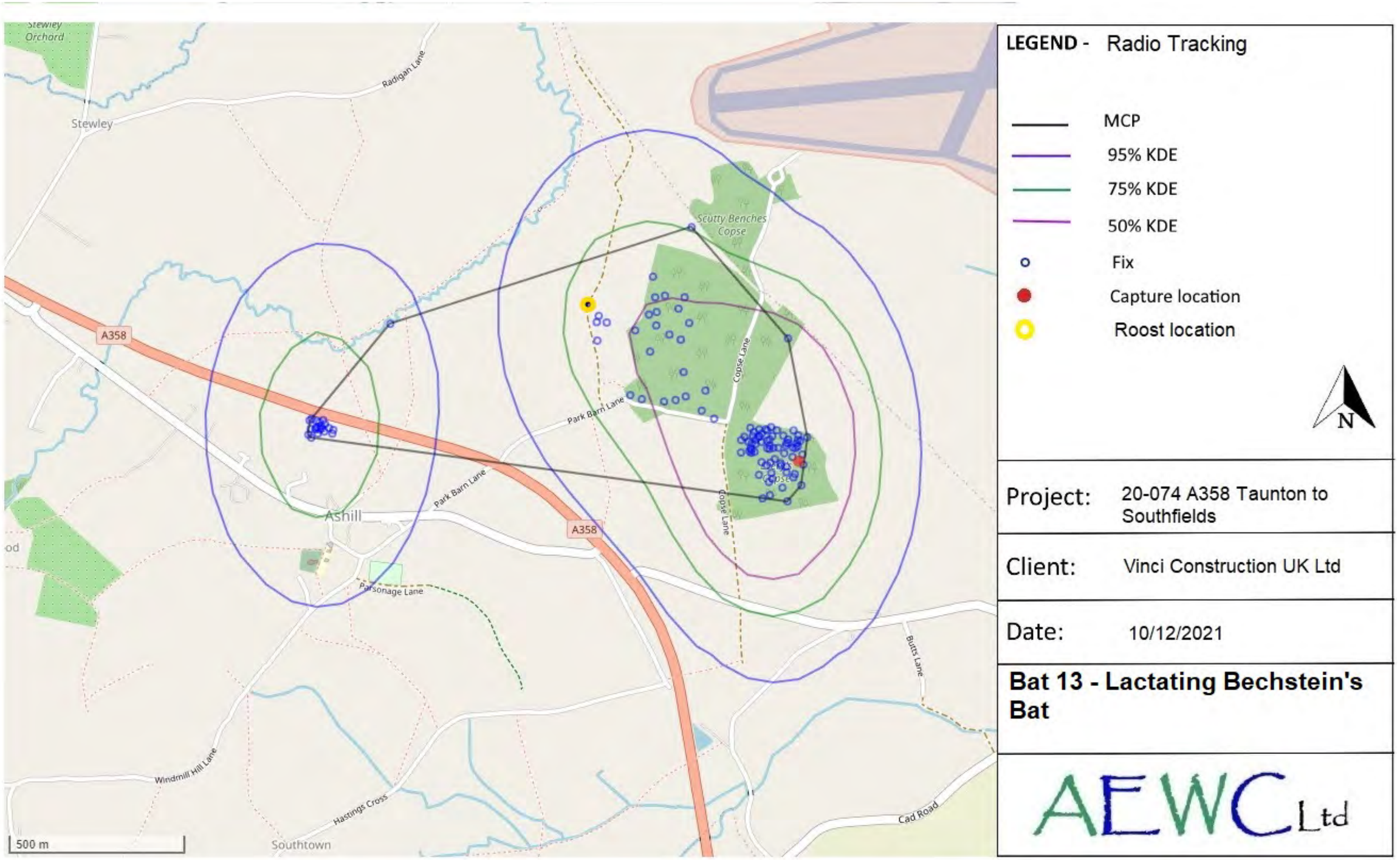


Figure D-13 Fixes, MCP and KDE for Bat 13

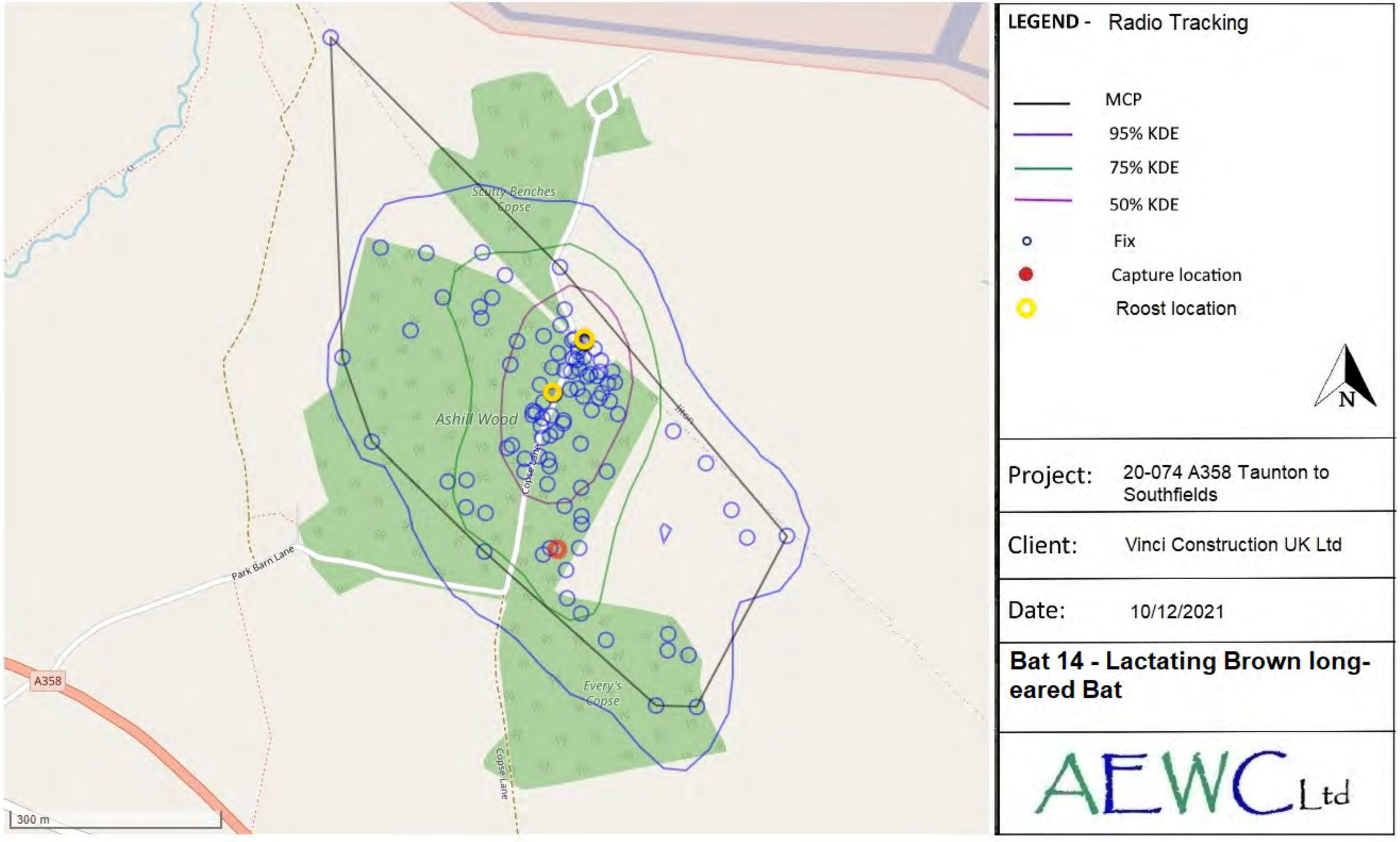


Figure D-14 Fixes, MCP and KDE for Bat 14

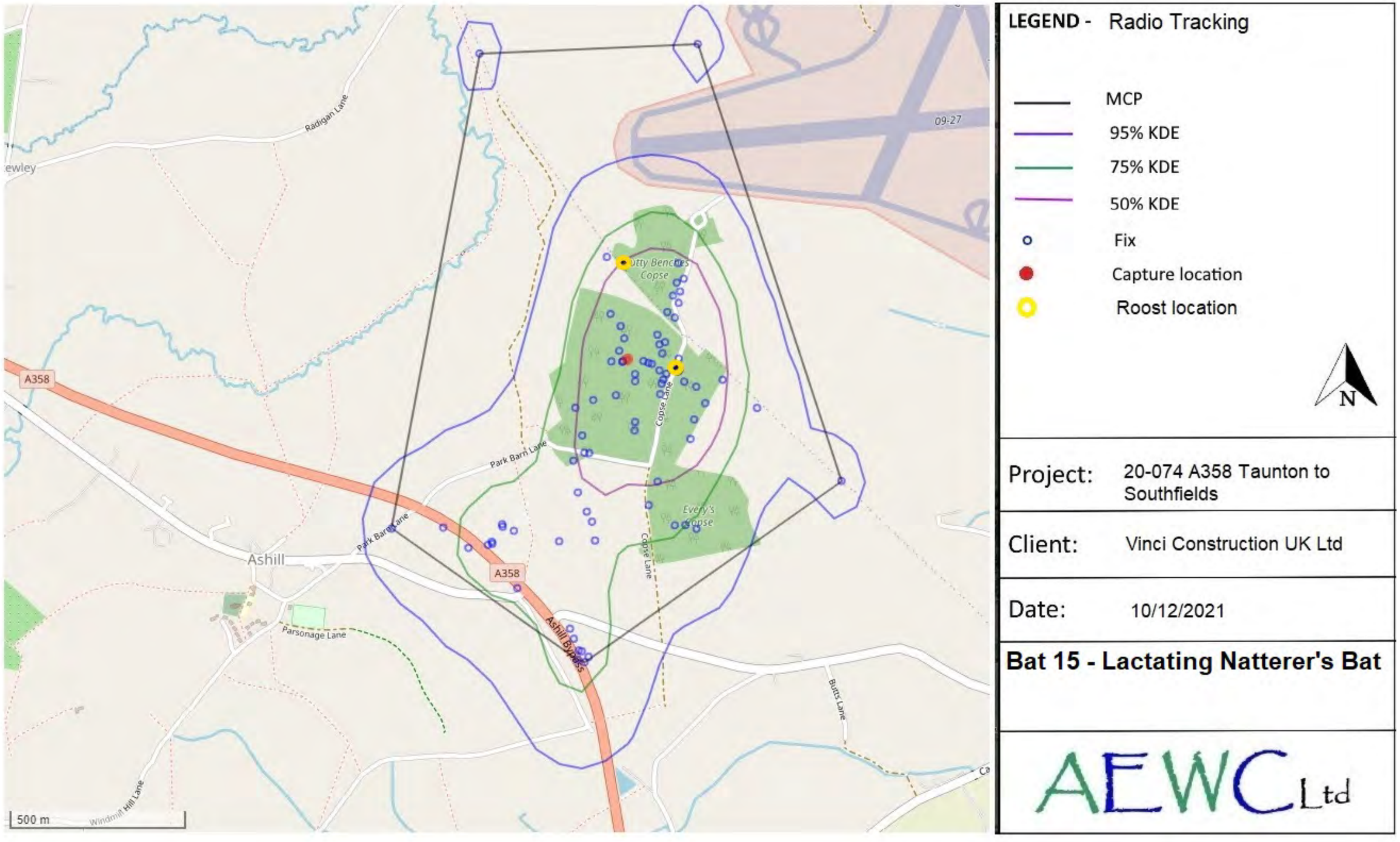


Figure D-15 Fixes, MCP and KDE for Bat 15

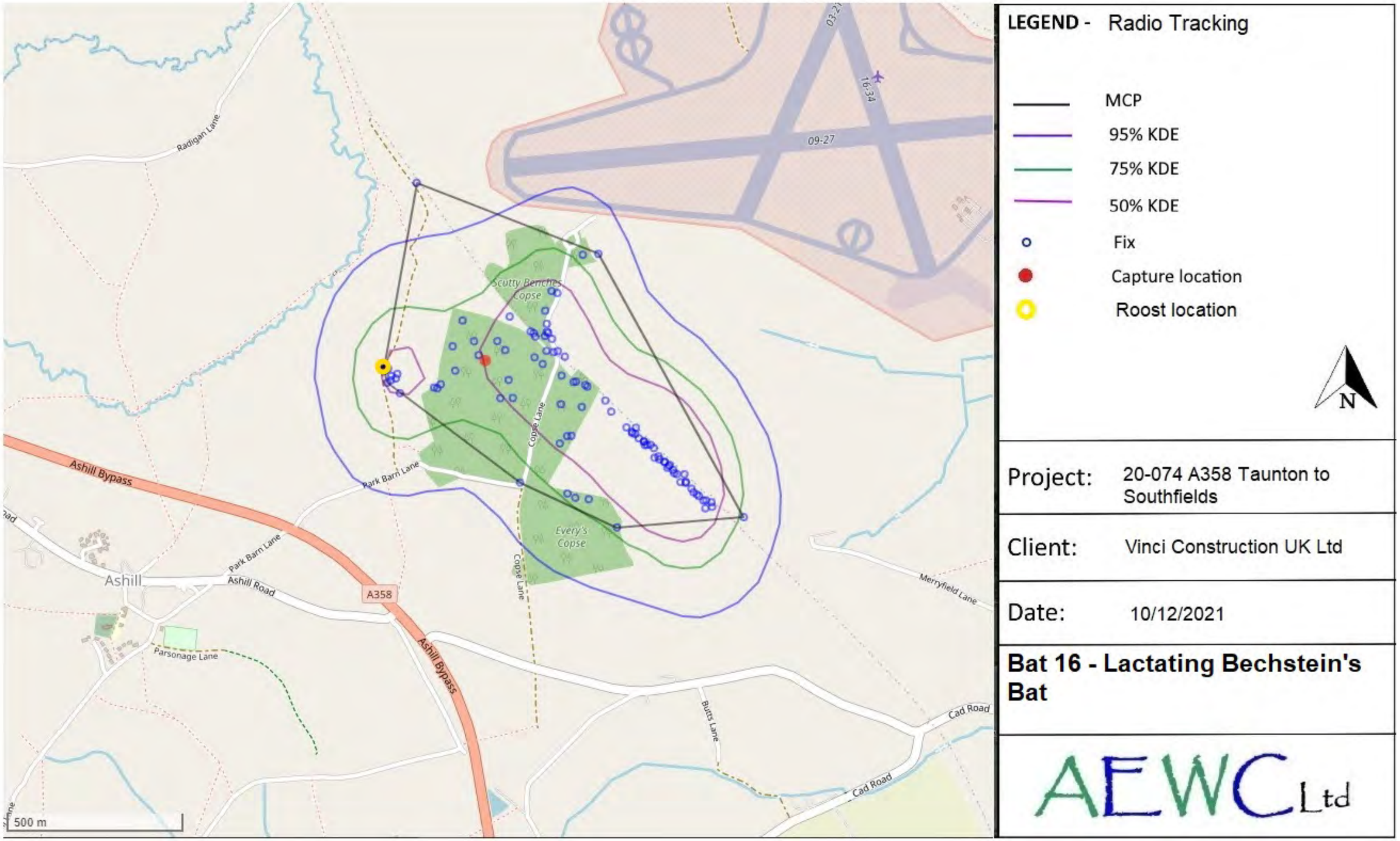


Figure D-16 Fixes, MCP and KDE for Bat 16

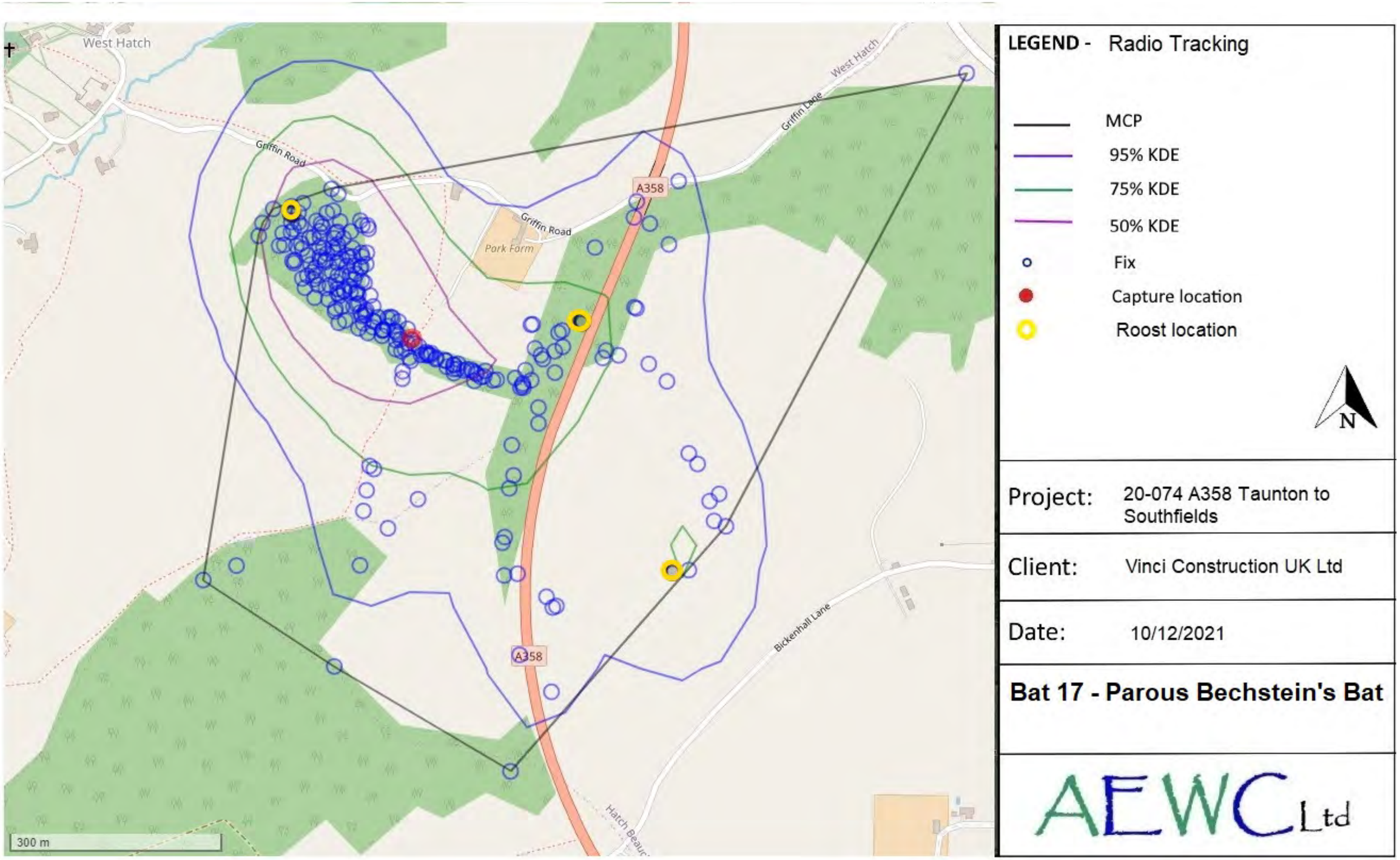


Figure D-17 Fixes, MCP and KDE for Bat 17

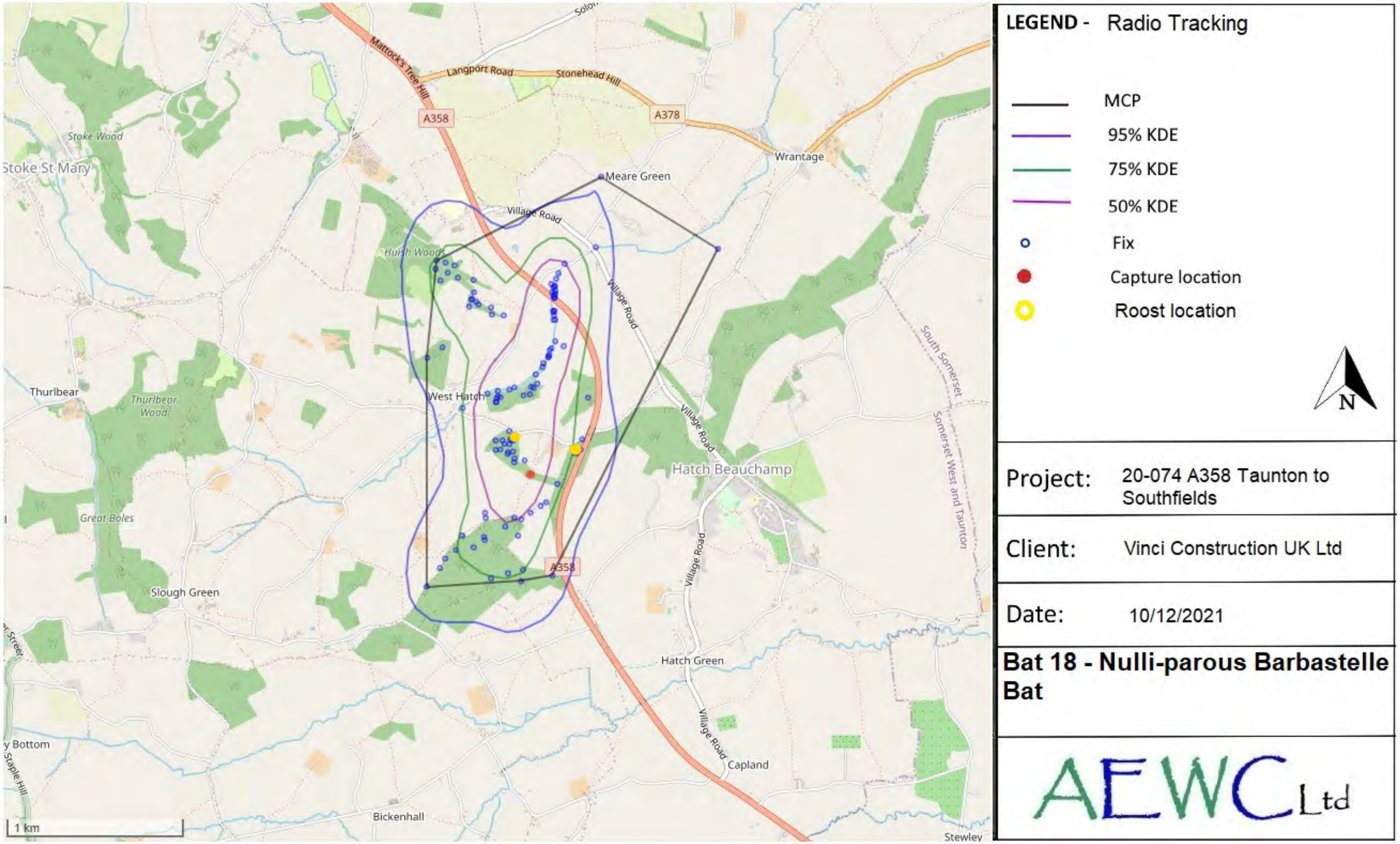
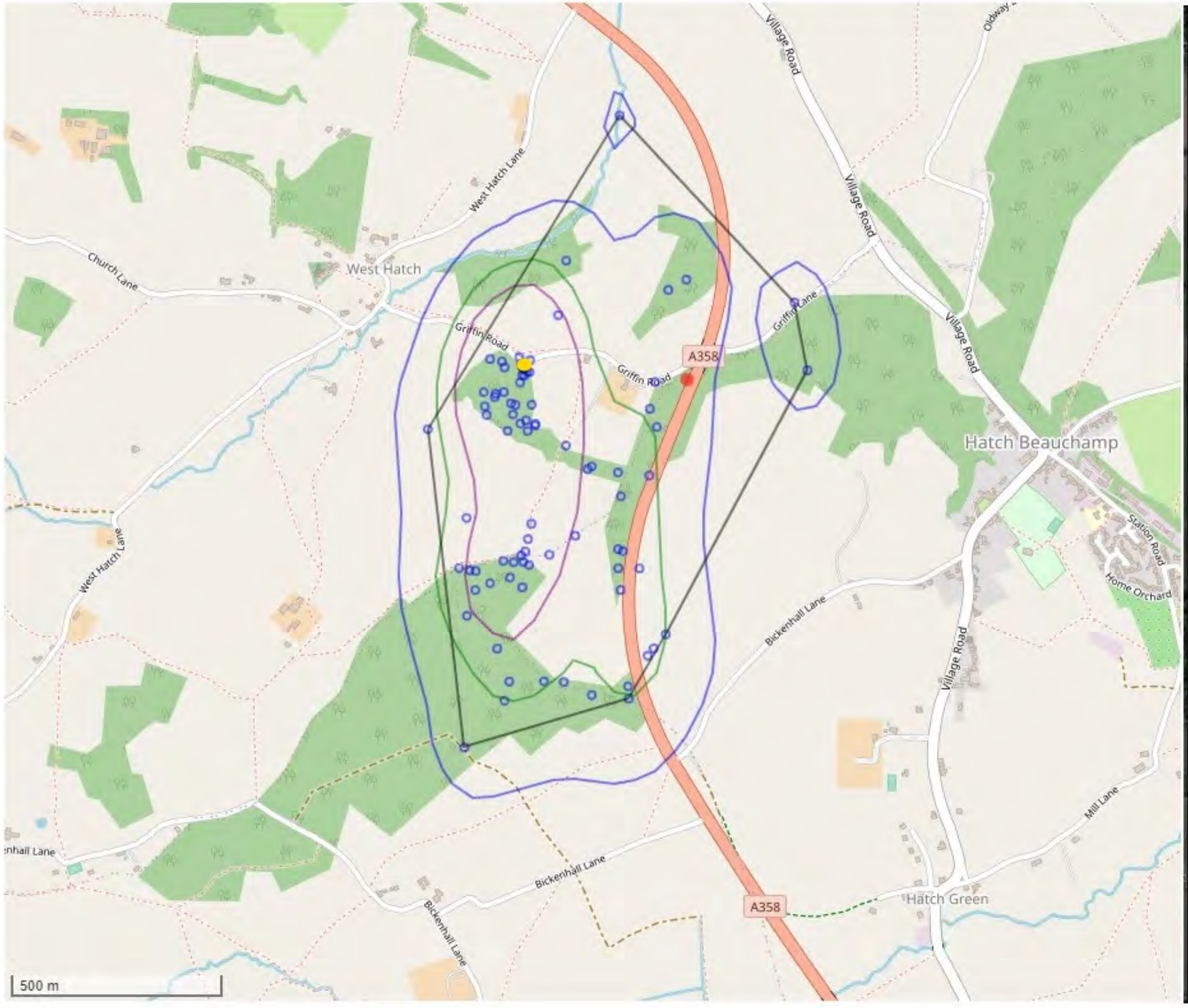


Figure D-18 Fixes, MCP and KDE for Bat 18



LEGEND - Radio Tracking

- MCP
- 95% KDE
- 75% KDE
- 50% KDE
- Fix
- Capture location
- Roost location

N

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Bat 19 - Lactating Barbastelle Bat

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Figure D-19 Fixes, MCP and KDE for Bat 19

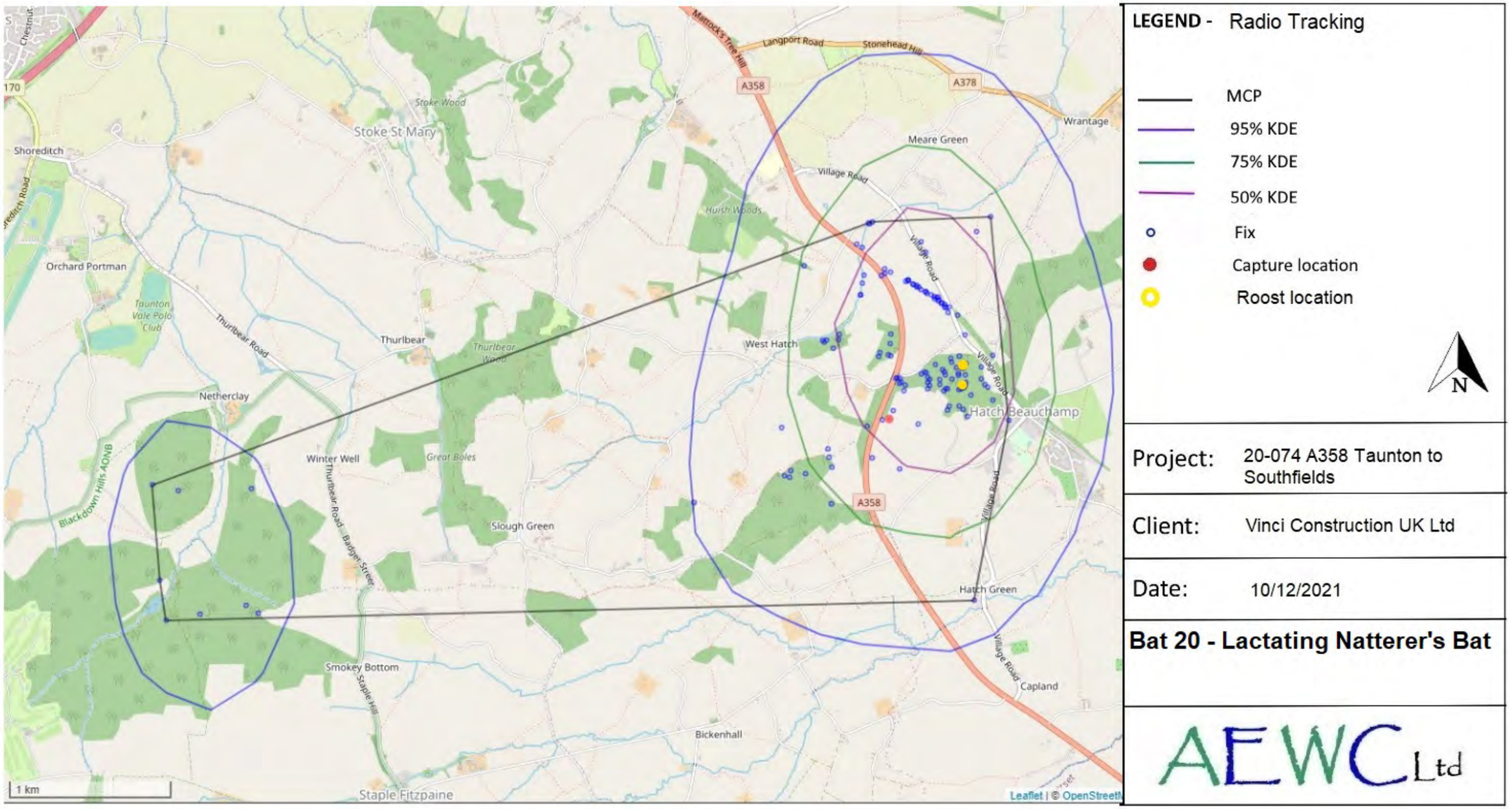

Figure D-20 Fixes, MCP and KDE for Bat 20

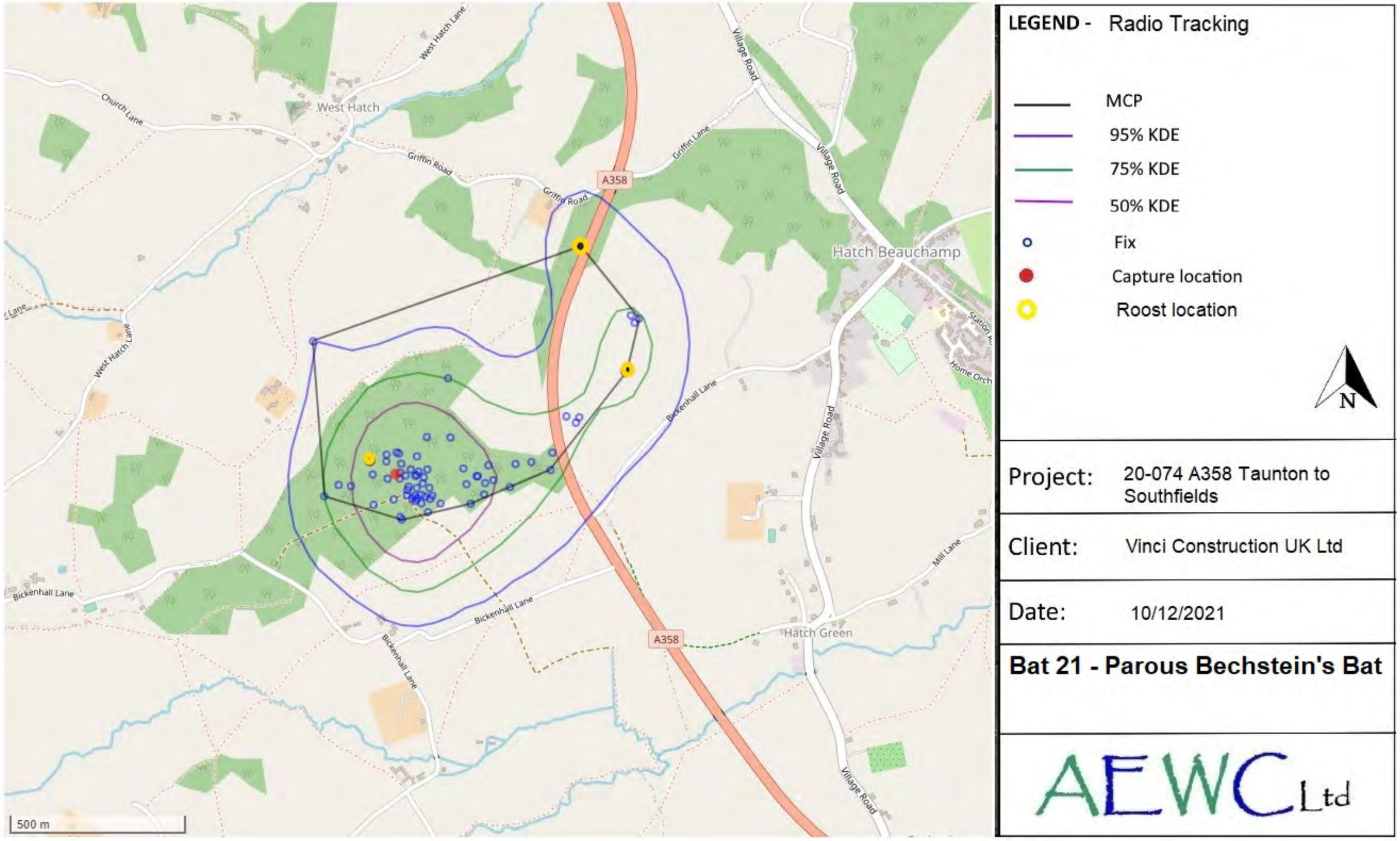

Figure D-21 Fixes, MCP and KDE for Bat 21

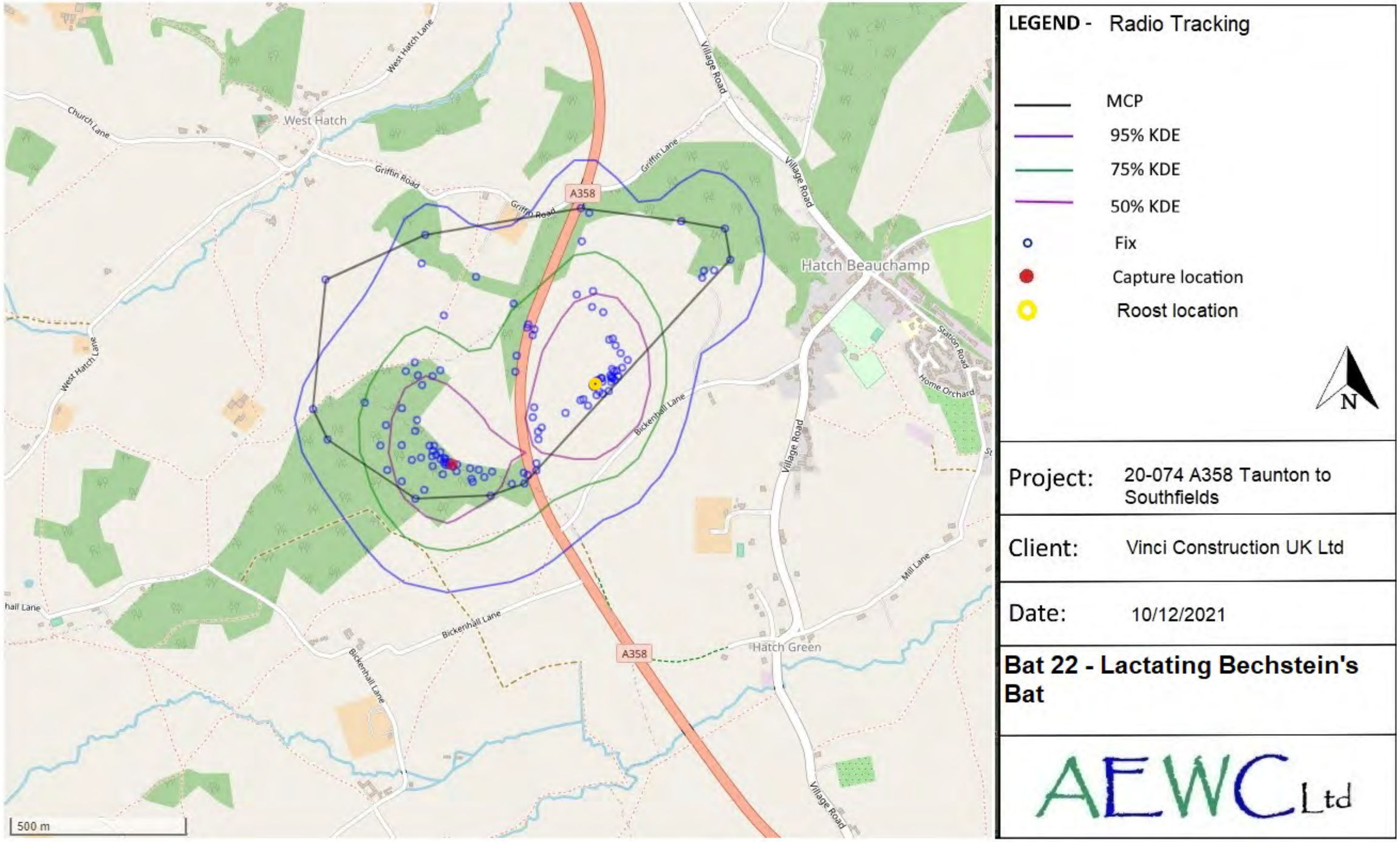

Figure D-22 Fixes, MCP and KDE for Bat 22

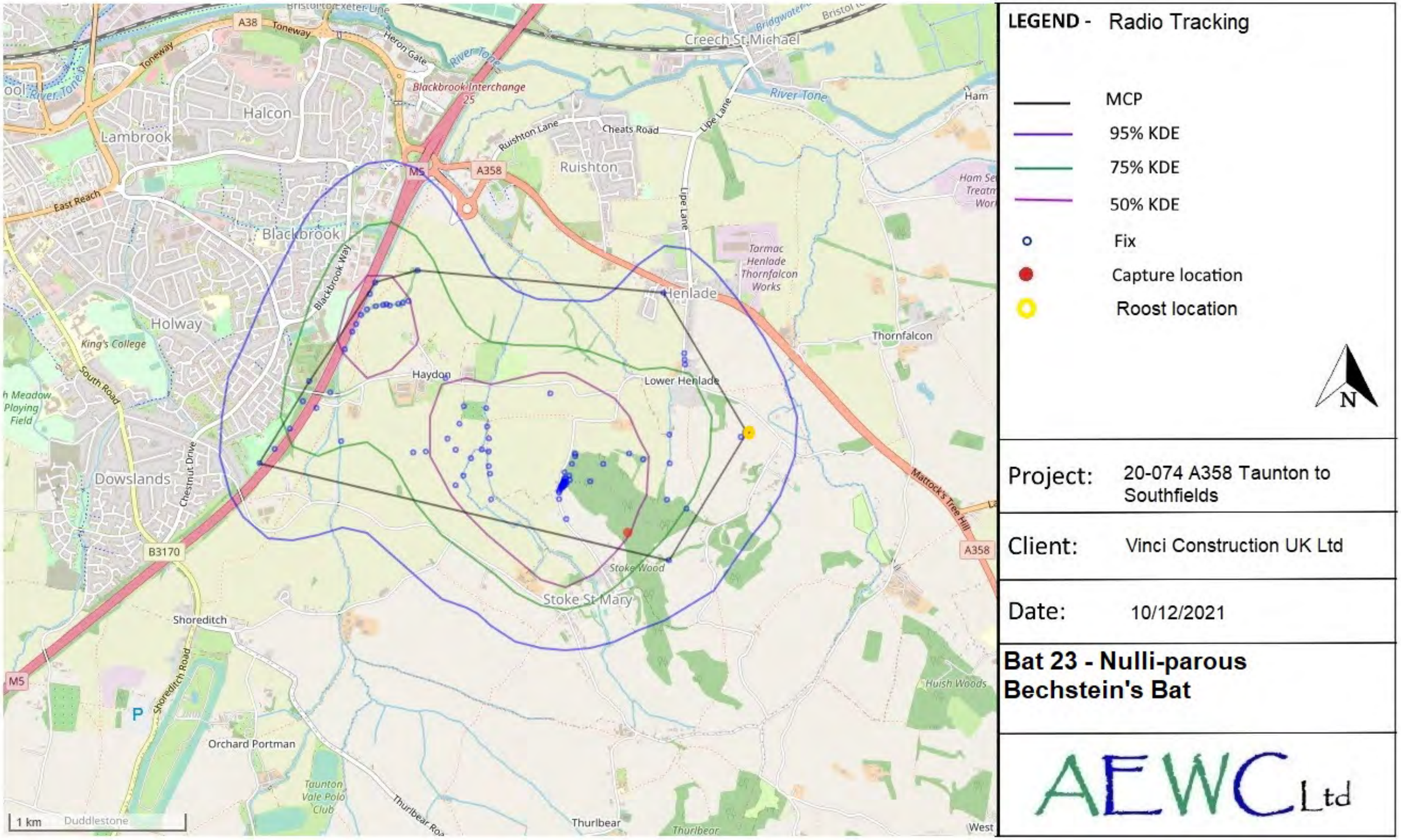

Figure D-23 Fixes, MCP and KDE for Bat 23

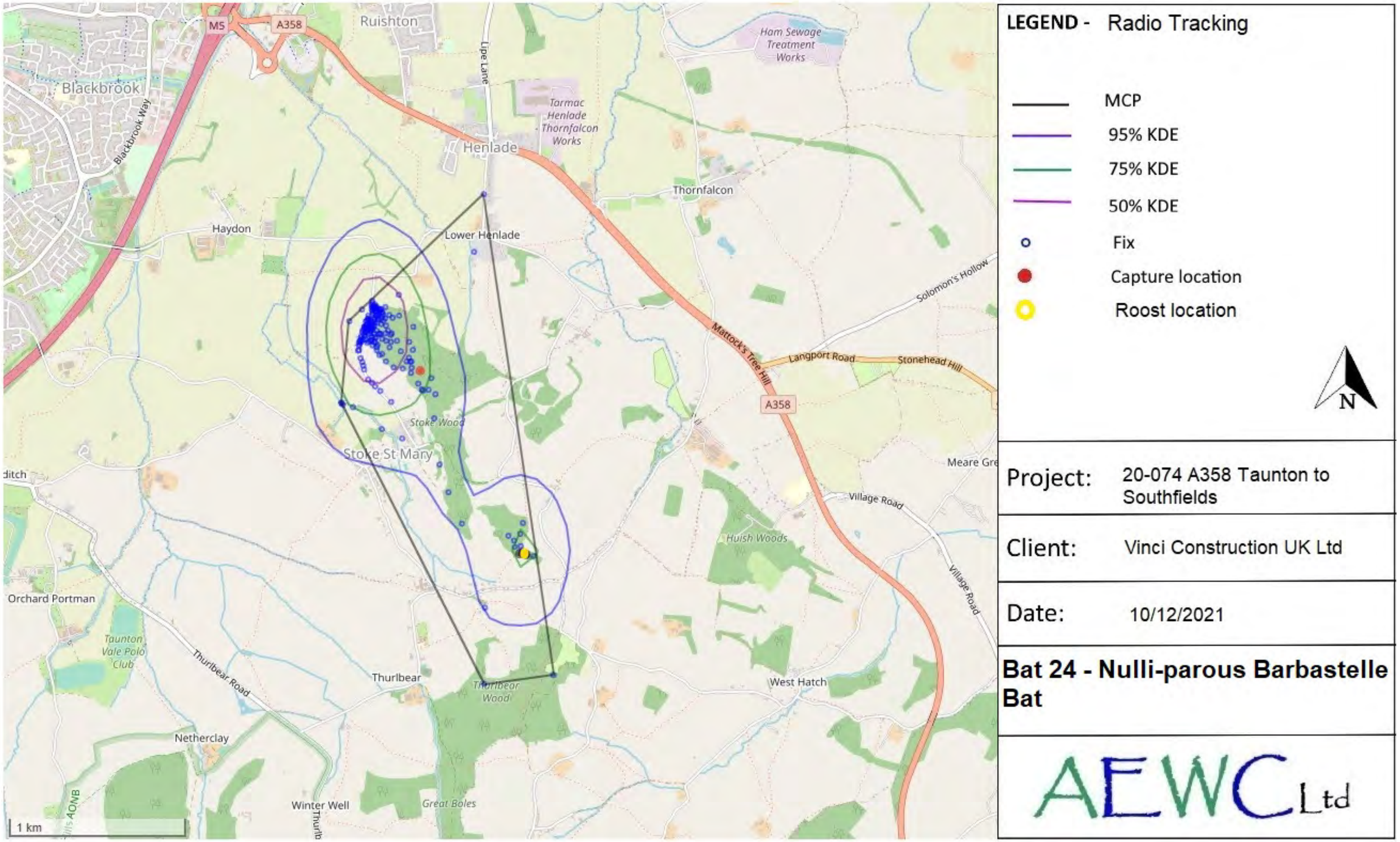

Figure D-24 Fixes, MCP and KDE for Bat 24

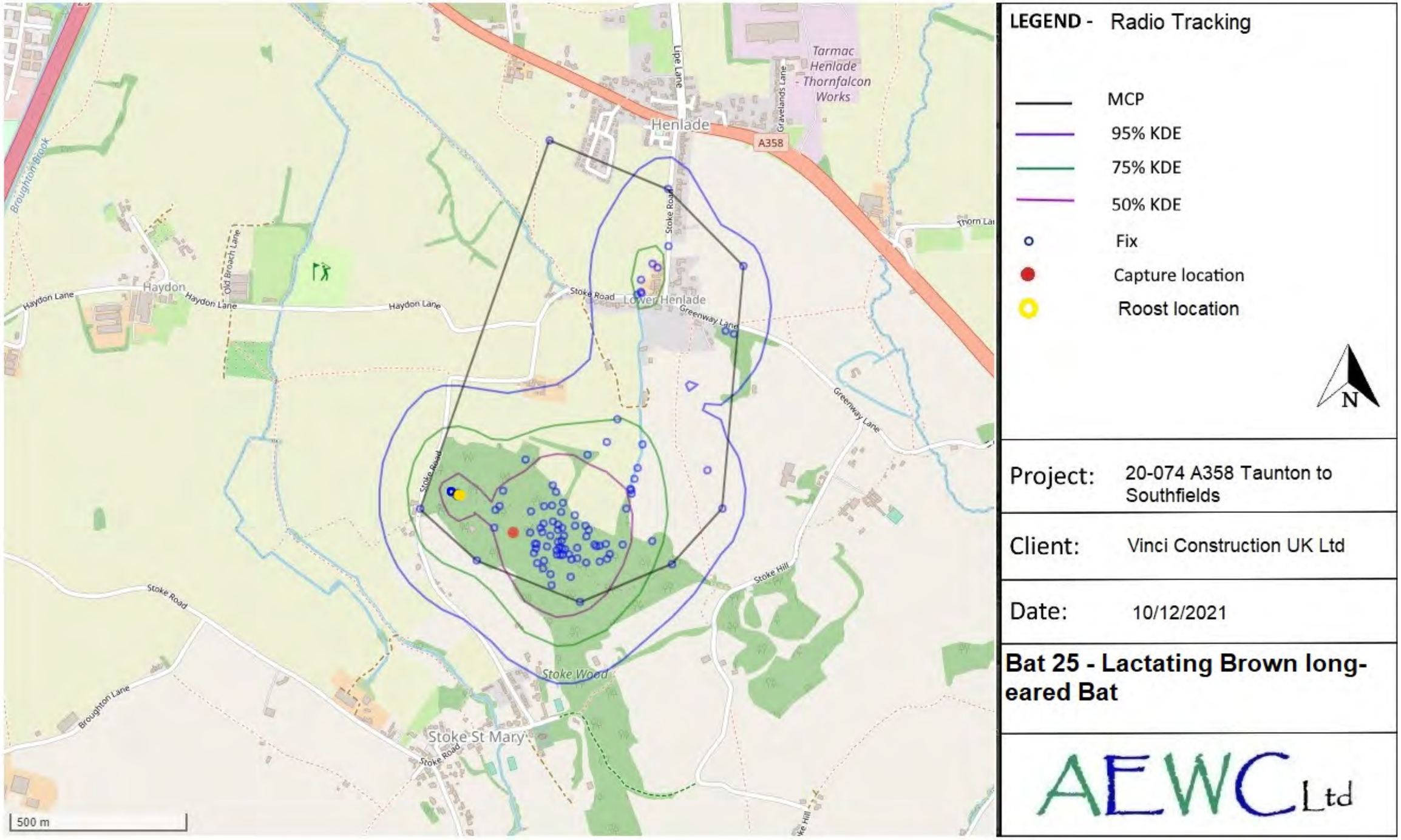

Figure D-25 Fixes, MCP and KDE for Bat 25

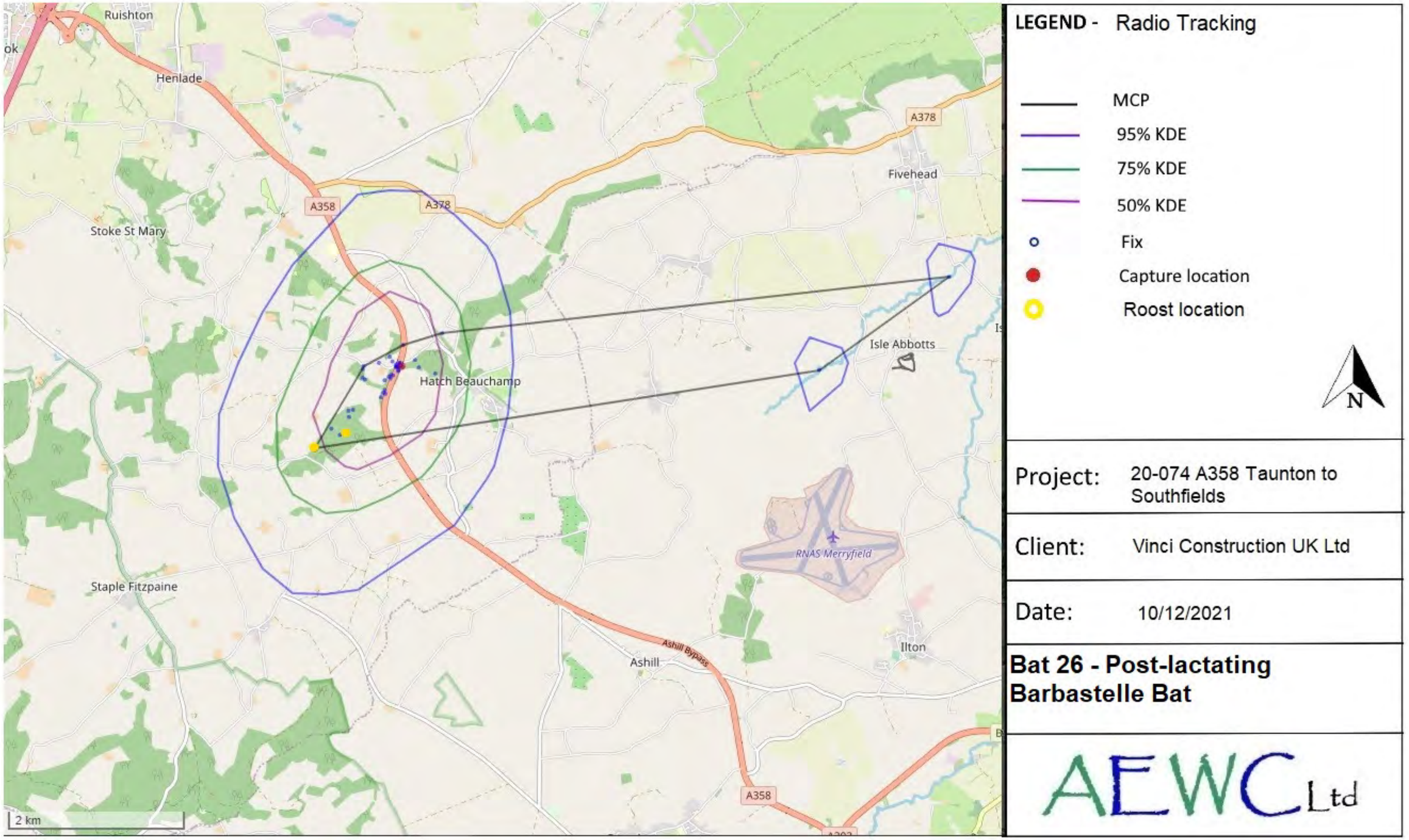

Figure D-26 Fixes, MCP and KDE for Bat 26

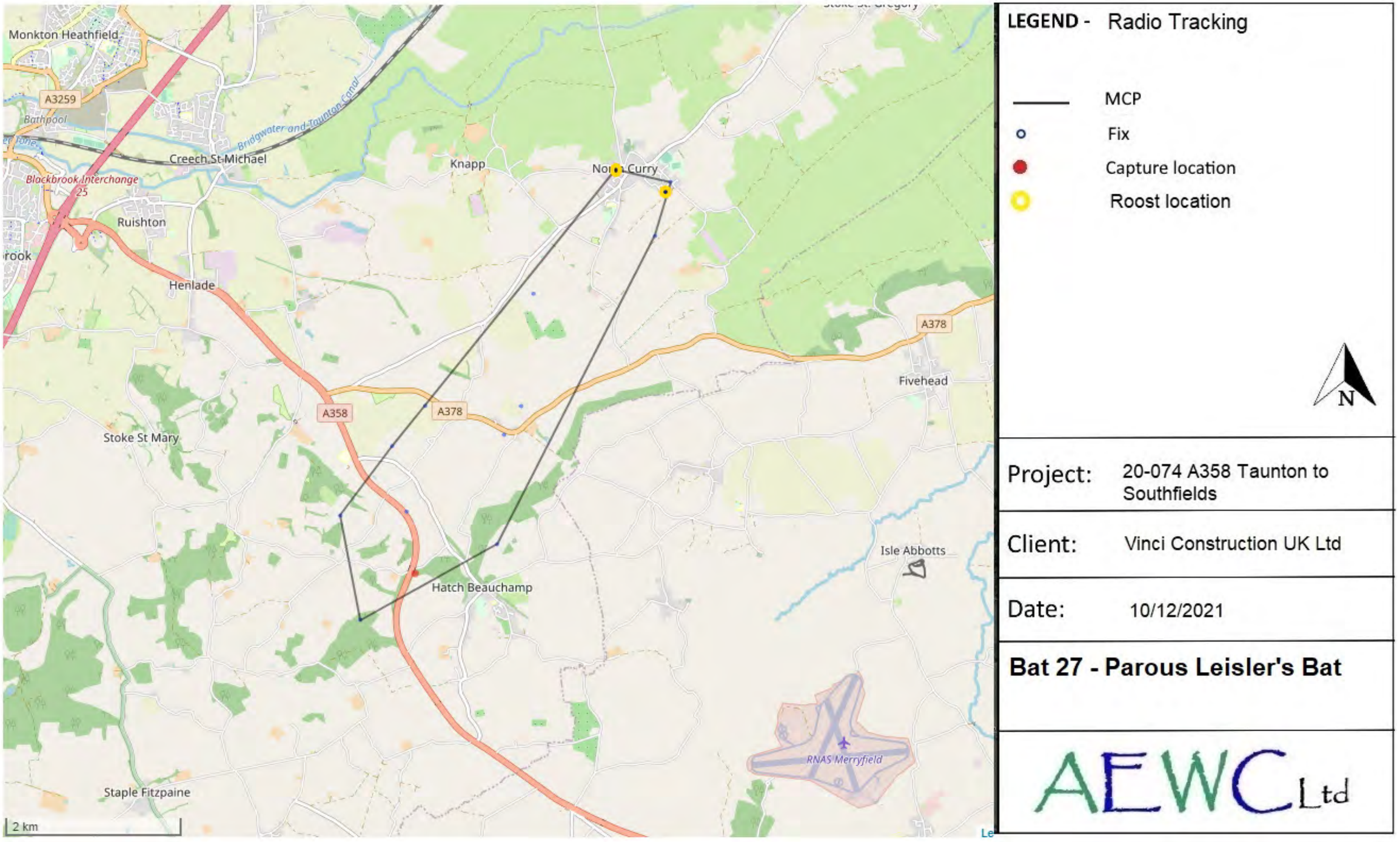

Figure D-27 Fixes and MCP for Bat 27

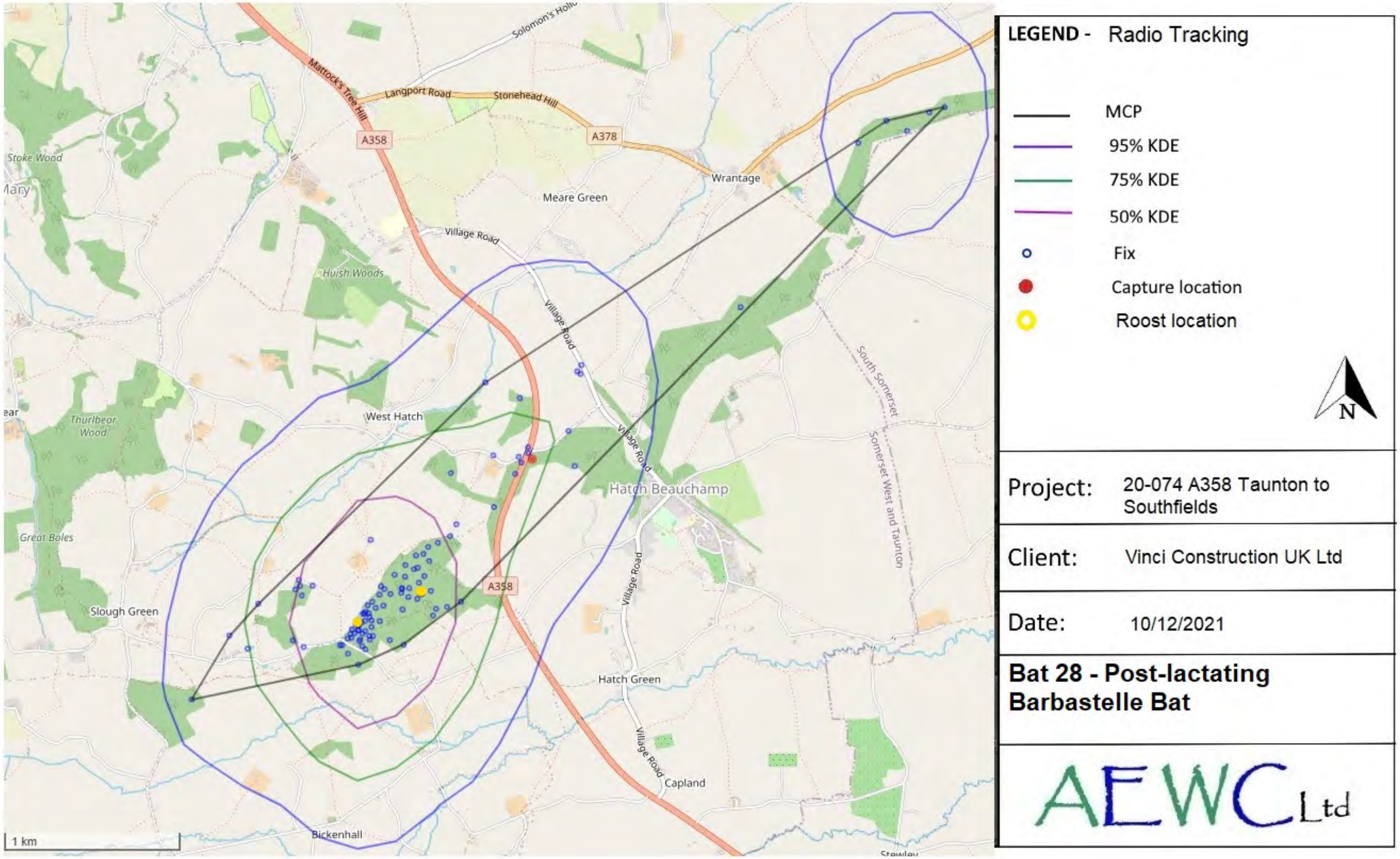

Figure D-28 Fixes, MCP and KDE for Bat 28

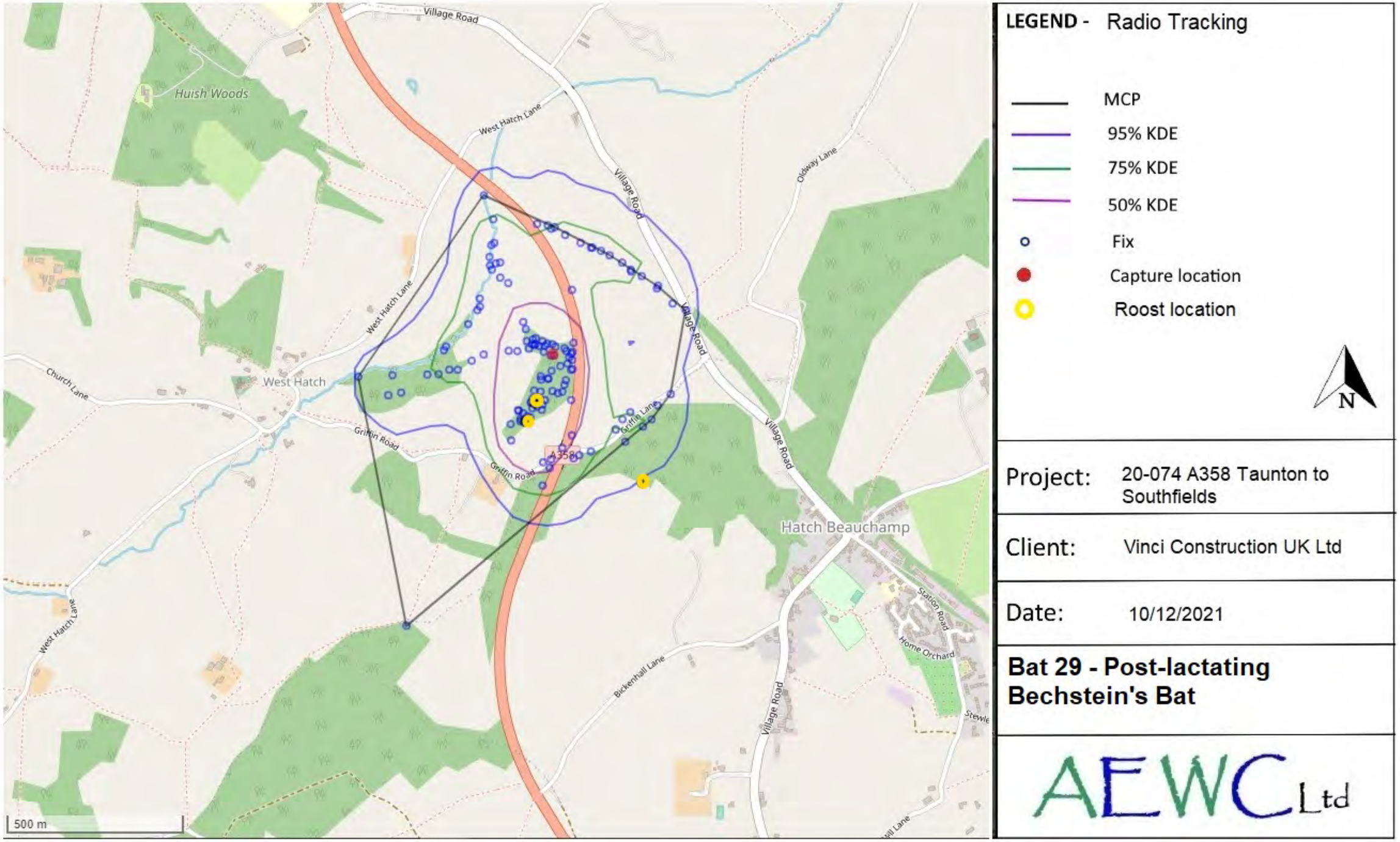

Figure D-29 Fixes, MCP and KDE for Bat 29

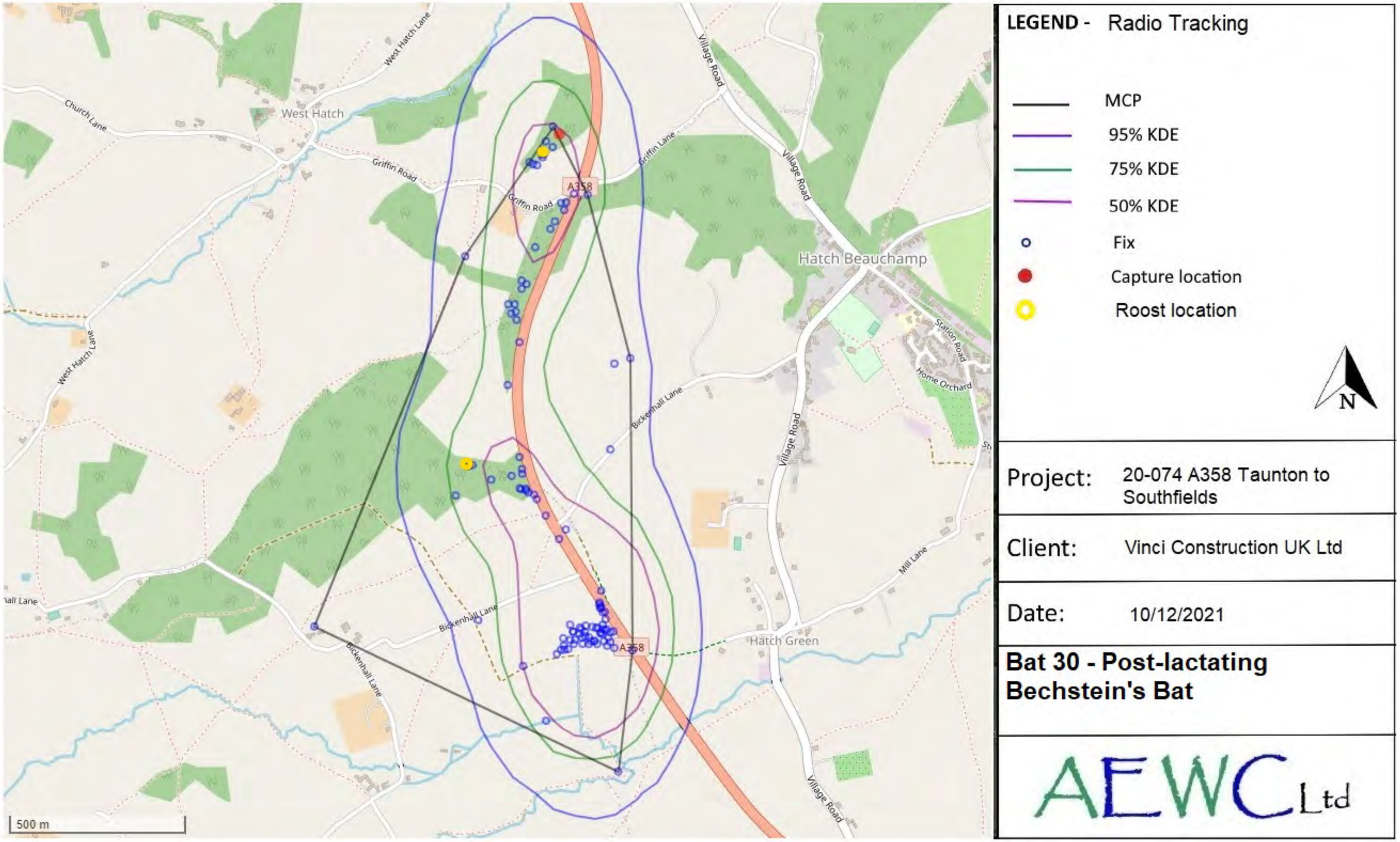

Figure D-30 Fixes, MCP and KDE for Bat 30

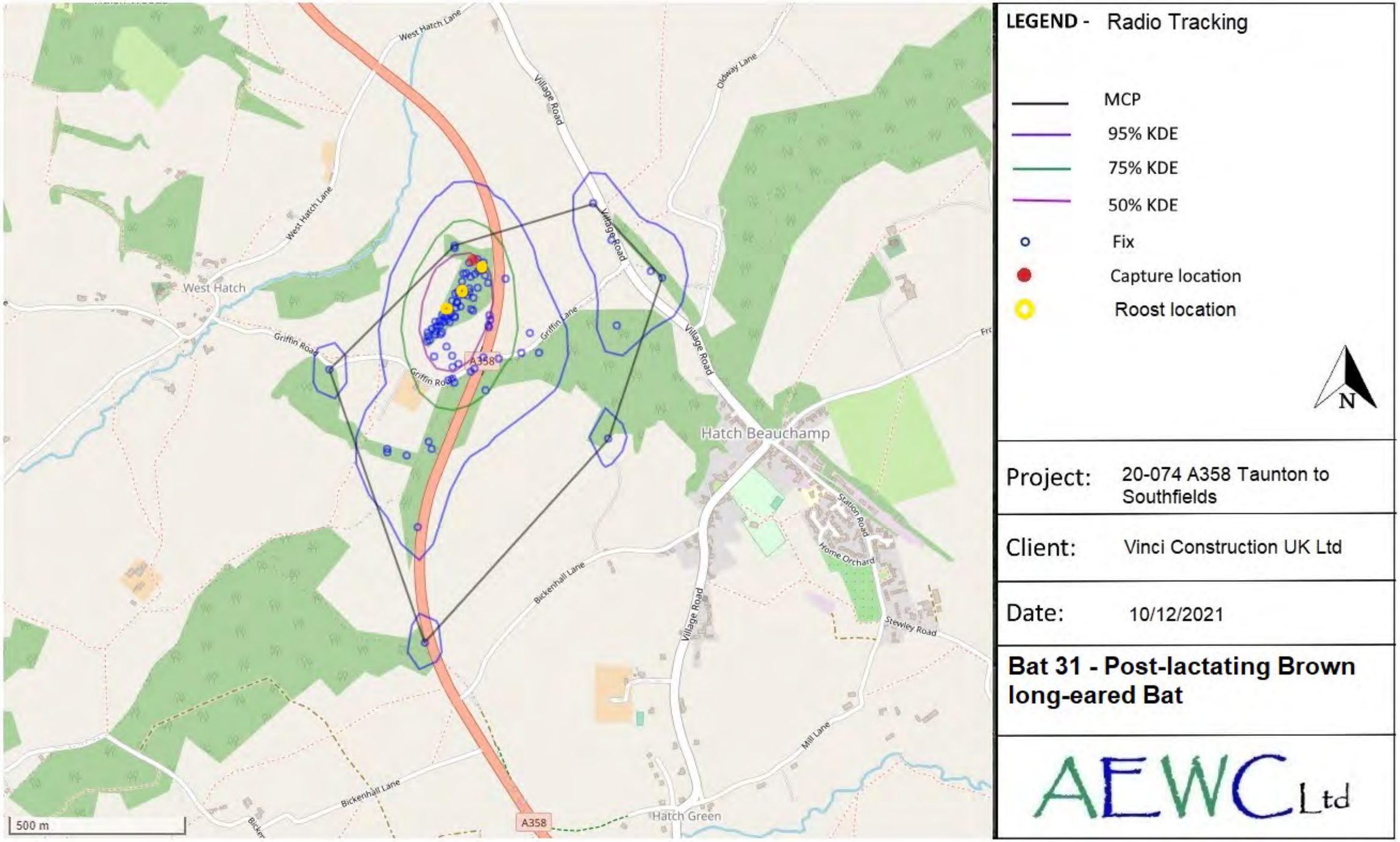

Figure D-31 Fixes, MCP and KDE for Bat 31

Table D-2 Details of bat recorded crossing the scheme

Bat No	Species	No. of recorded crossings	Notes
3	M.bech	10	10 crossings recorded, but lots of foraging and road hops whilst feeding later at night
4	M.nat	12	12 crossings recorded, but lots of foraging and road hops whilst feeding later at night
5	M.nat	5	Offline
6	B.barb	7	Offline
7	B.barb	1	Offline
8	N.noc	4	Offline – high above route
9	P.aur	8	Offline
10	B.barb	5	Offline
13	M.bech	2	Ashill
15	M.nat	3	Ashill
17	M.bech	13	Hatch Park Estate - underpass use, plus hopping over road from one woodland to another once dark
18	B.barb	6	Hatch Park Estate - underpass use, plus hopping over road from one woodland to another once dark
19	B.barb	6	Hatch Park Estate - underpass use, plus hopping over road from one woodland to another once dark
20	M.nat	13	Hatch Park Estate - underpass use, plus hopping over road from one woodland to another once dark
21	M.bech	3	Hatch Park Estate - mostly stayed west of the road, Griffin Lane for crossings
22	M.bech	15	Hatch Park Estate - underpass use, plus hopping over road from one woodland to another once dark
26	B.barb	4	Hatch Park Estate - underpass use, plus hopping over road from one woodland to another once dark
28	B.barb	5	Hatch Park Estate - underpass use, plus hopping over road from one woodland to another once dark
29	M.bech	8	Hatch Park Estate - underpass use, plus hopping over road from one woodland to another once dark
30	M.bech	5	Hatch Park Estate - underpass use, plus hopping over road from one woodland to another once dark
31	P.aur	3	Hatch Park Estate - underpass use, plus hopping over road from one woodland to another once dark

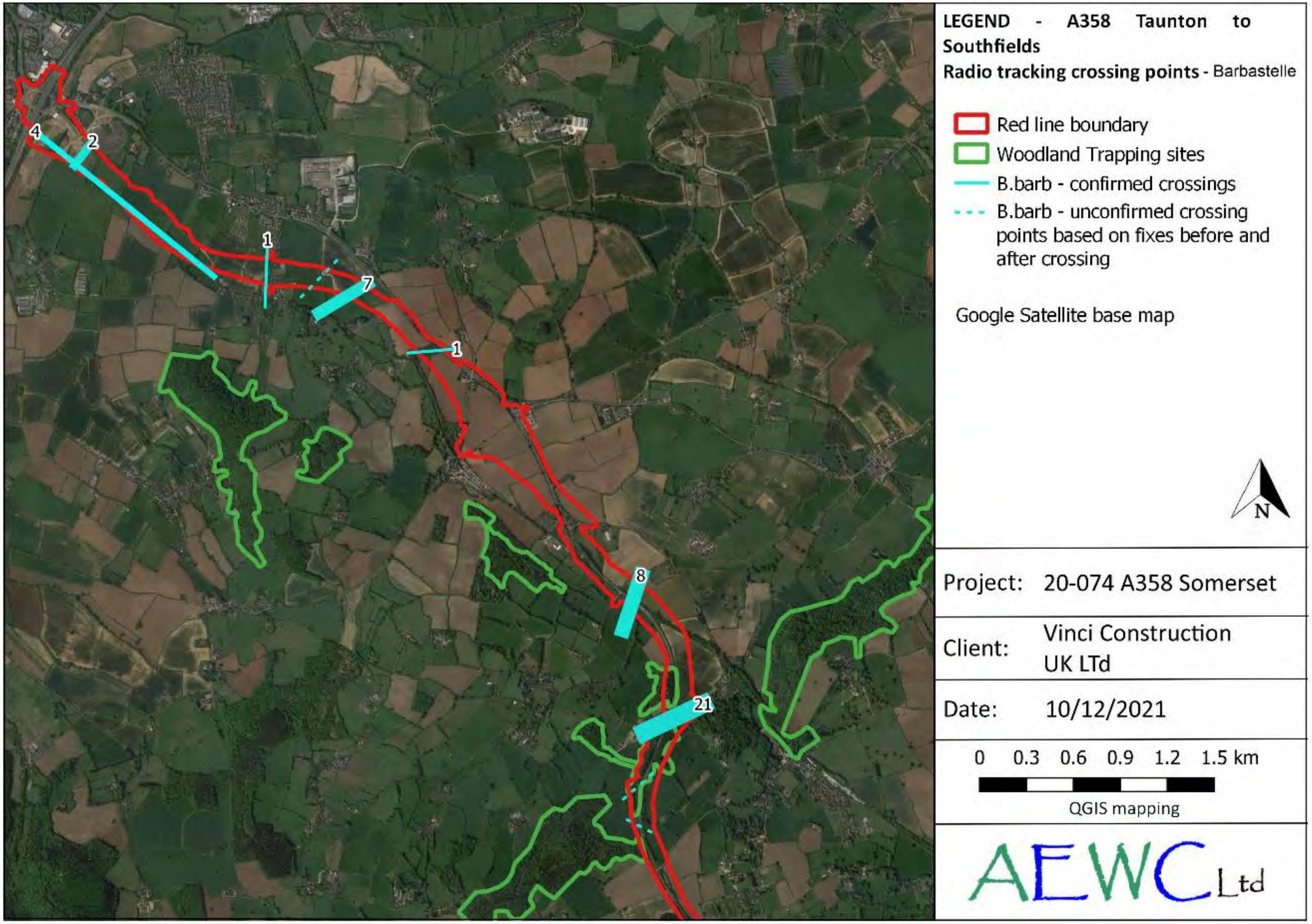

Figure D-32 Crossing points identified through radio tracking - barbastelle

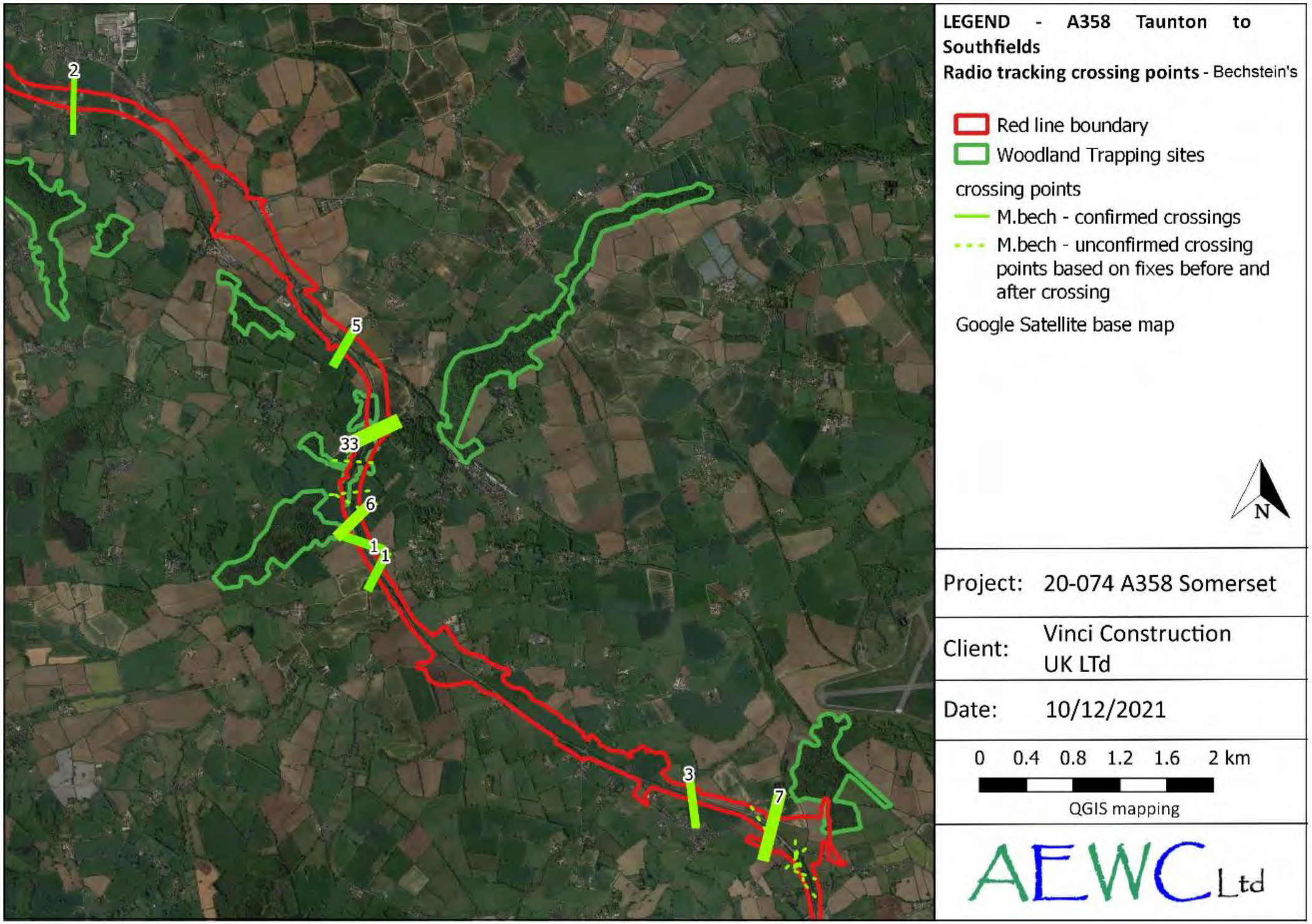

Figure D-33 Crossing points identified through radio tracking – Bechstein's bat

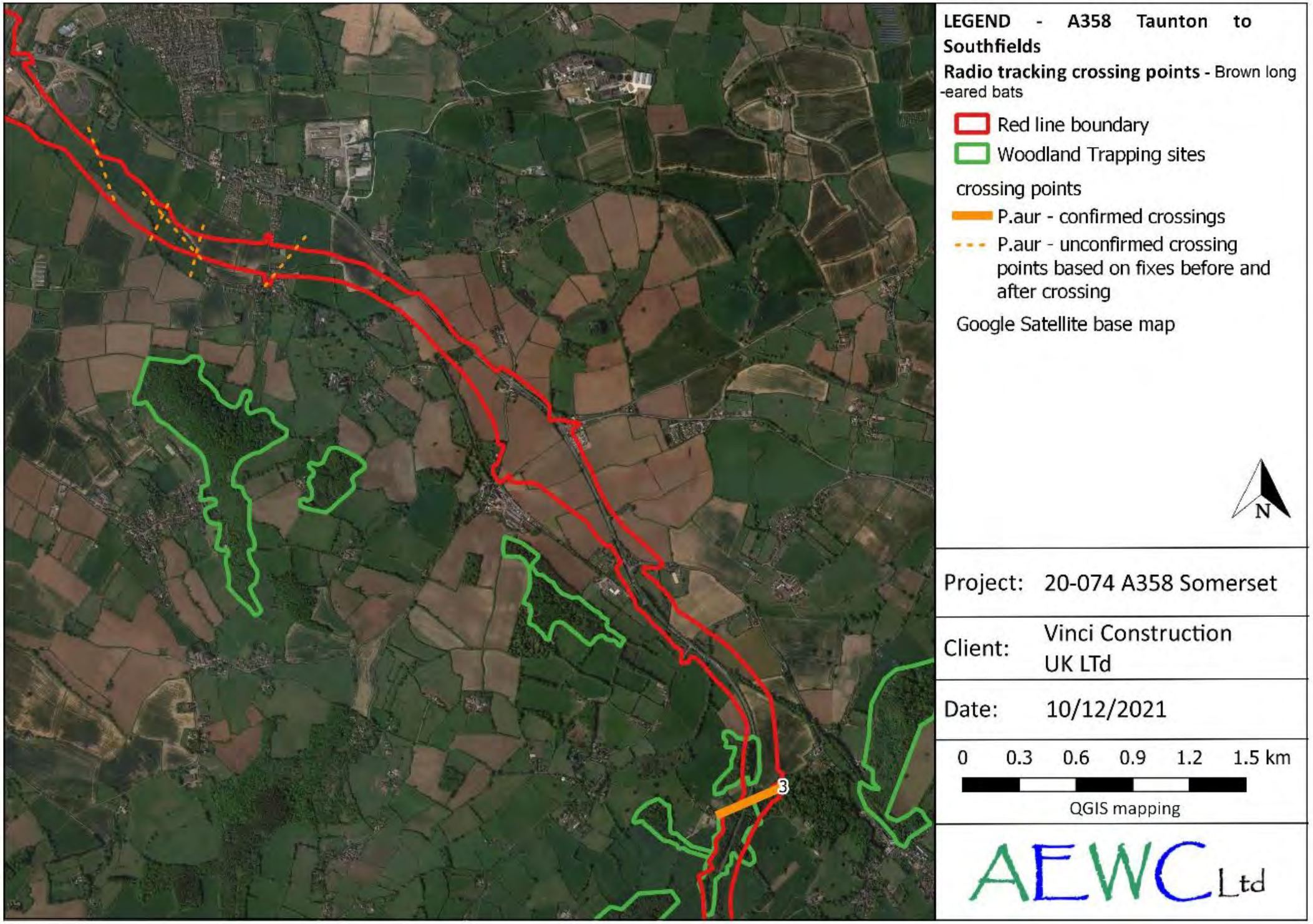

Figure D-34 Crossing points identified through radio tracking – brown long-eared bats

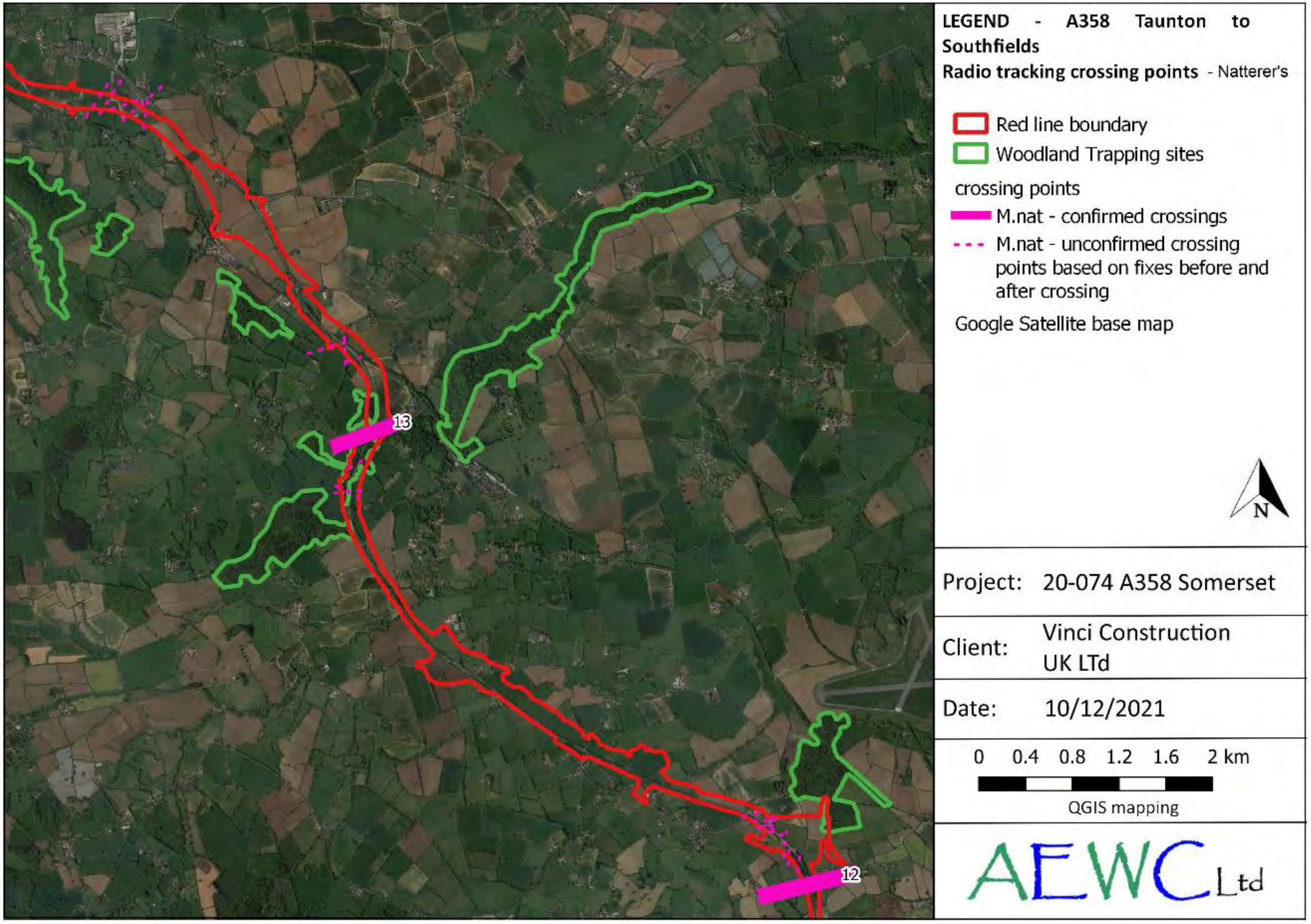

Figure D-35 Crossing points identified through radio tracking – Natterer's bats

Figure D-36 Crossing points identified through radio tracking - Griffin Lane detail

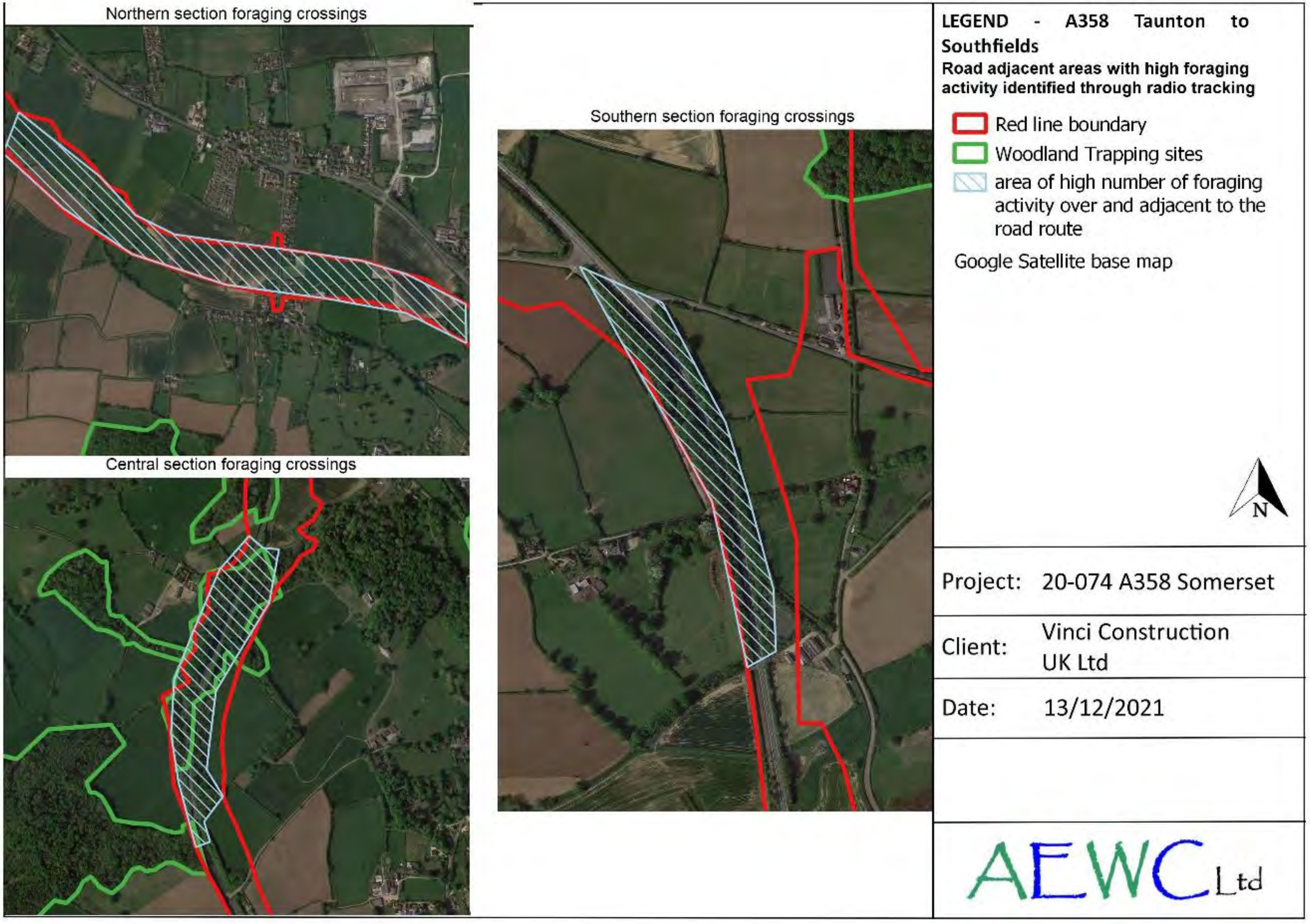

Figure D-37 Areas of high numbers of foraging crossings of the scheme

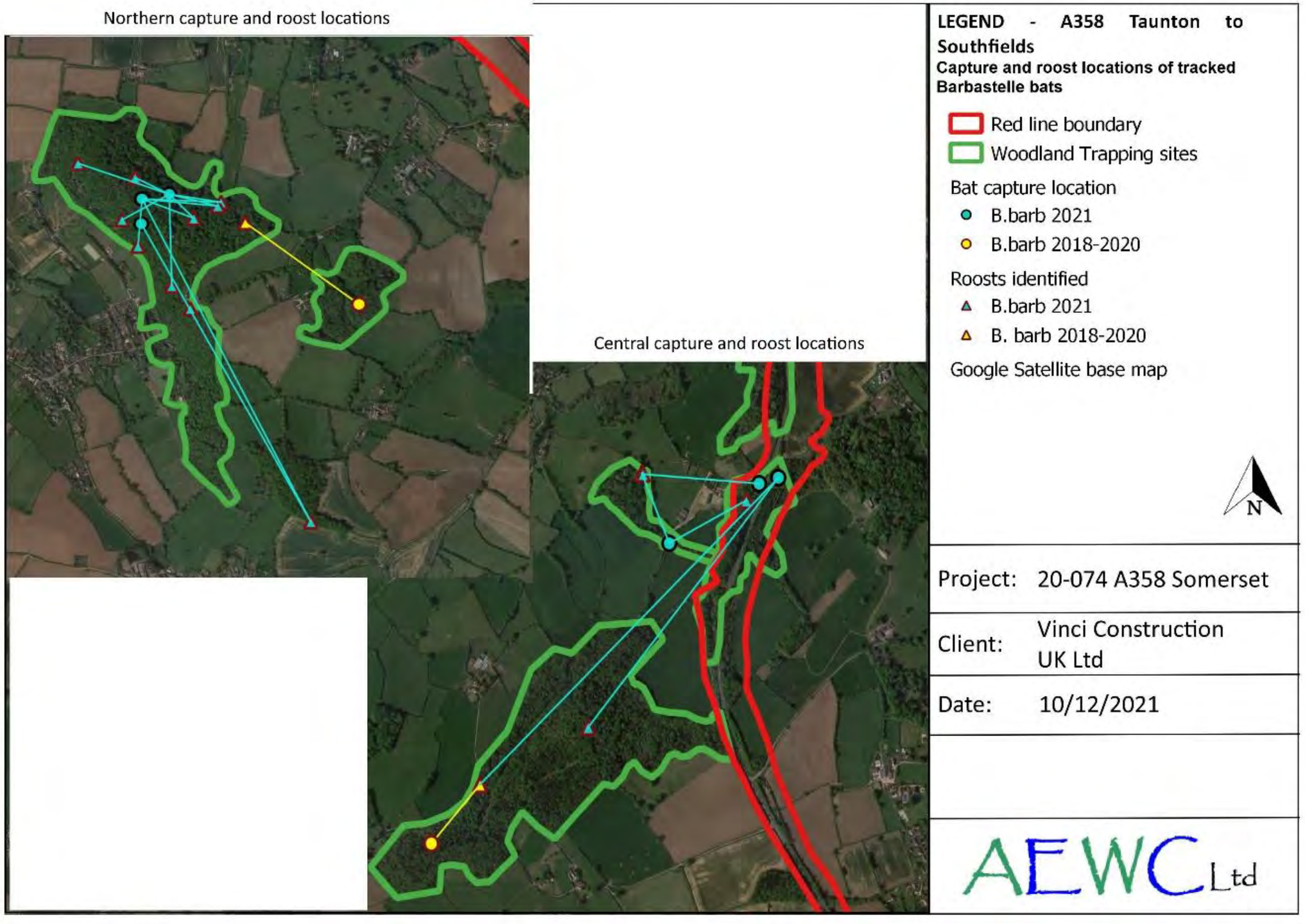

Figure D-38 Capture and corresponding roost locations for radio tagged barbastelle

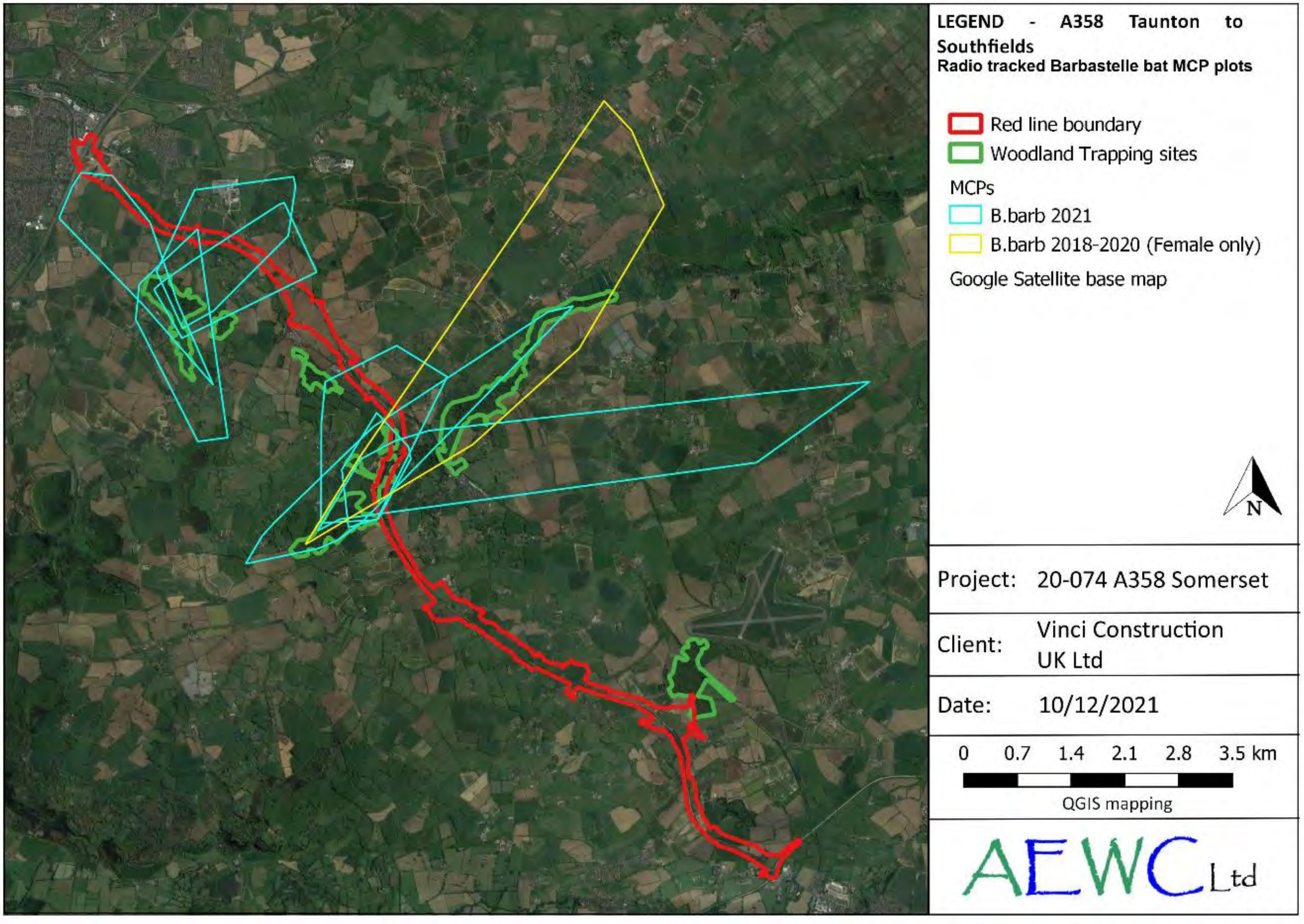

Figure D-39 MCPs for all radio tracked barbastelle bats

Figure D-40 Capture and corresponding roost locations for radio tagged Bechstein's bats

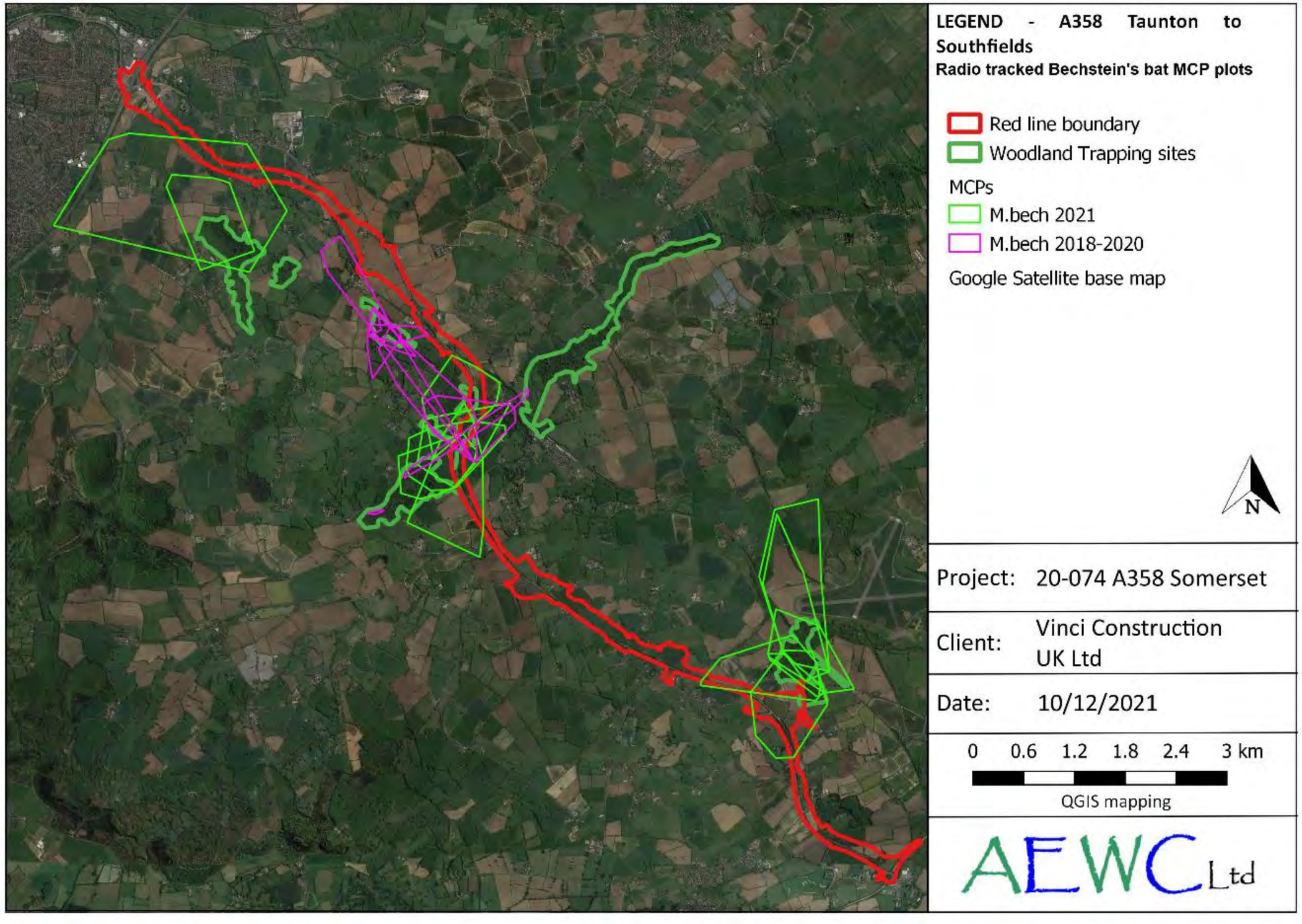

Figure D-41 MCPs for all radio tracked Bechstein's bats

Figure D-42 Capture and corresponding roost locations for radio tagged brown long-eared bats

Figure D-43 Capture and corresponding roost locations for radio tagged Natterer's bats

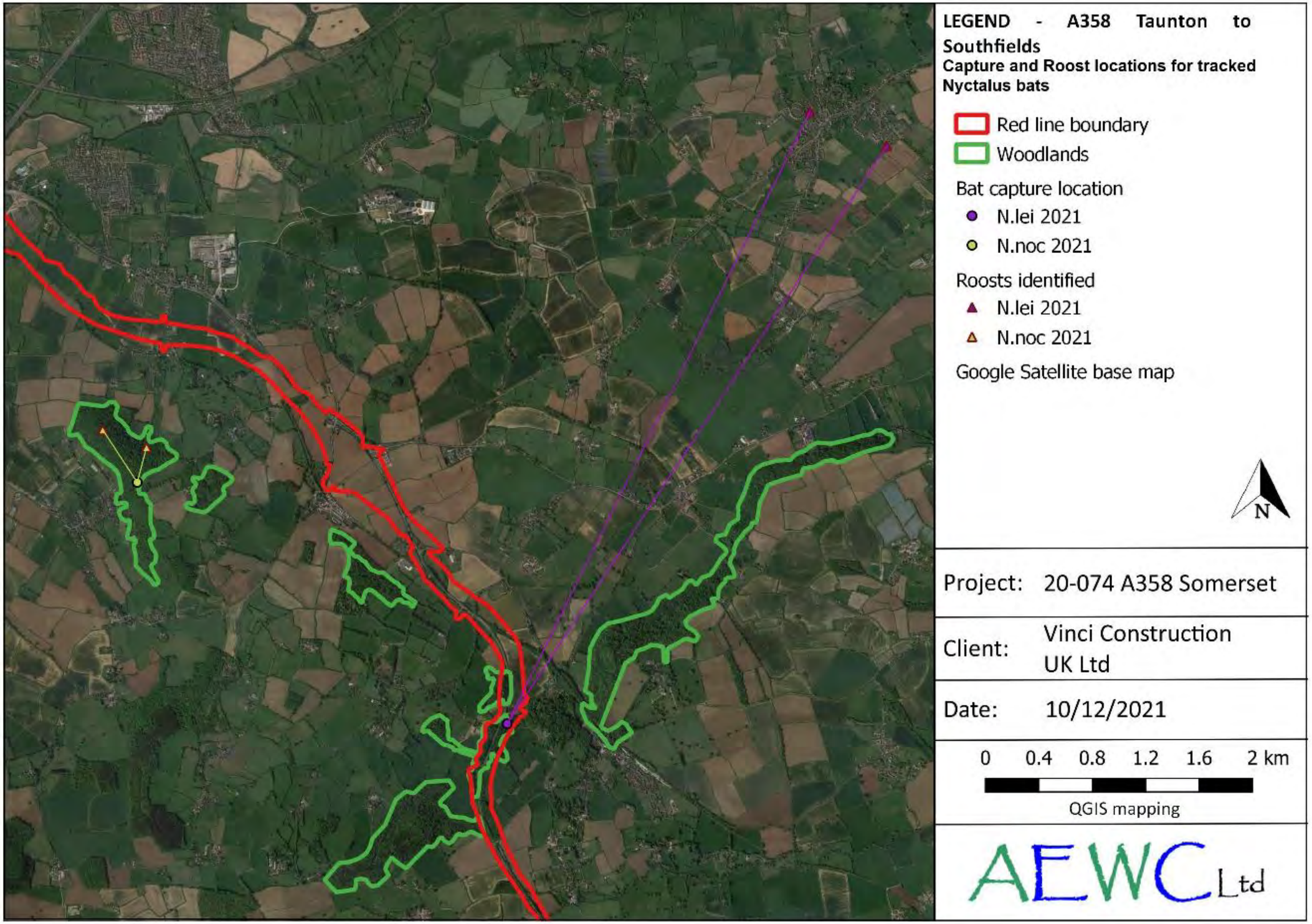

Figure D-44 Capture and corresponding roost locations for radio tagged Nyctalus sp. bats

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