

# LONDON- WEST MIDLANDS ENVIRONMENTAL STATEMENT

## Volume 5 | Technical Appendices

CFA12-13 | Waddesdon to Chetwode

**Bat trapping/radio tracking study - Bernwood Forest  
(EC-006-002)**

Ecology

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Department  
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**Volume 5: Bat trapping/radio  
tracking study - Bernwood Forest  
Appendix EC-006-002  
Ecological baseline data**

# 1 Summary

- 1.1.1 A detailed bat survey comprising activity transects, emergence surveys, paired sampling of linear habitat features, automated static recording, trapping and radio-tracking was carried out over two seasons in an area of the Bernwood Forest between Calvert and Quainton in close proximity to the land required for the construction and operation of the Proposed Scheme. This area is known to be significant for its bat assemblage.
- 1.1.2 Radio-tracking and activity surveys indicated several sites important for foraging and commuting including Sheepphouse Wood Site of Special Scientific Interest (SSSI), between Grendon Junction and the Akeman Disused Railway, north and south of the Benfields overbridge, along the Mega Ditch and the existing Aylesbury Link Railway. Several crossing points were identified at Grendon Junction, Benfields overbridge, and south of Sheepphouse Wood SSSI.
- 1.1.3 In addition to the foraging activity and commuting routes identified above, automated static detector surveys indicate that the habitat within the Aylesbury Link railway corridor is a commuting route used by bat species. The habitat that this railway corridor provides is therefore of significance for the bat assemblage present in this area. The area between Sheepphouse Wood (which contains known bat roosts) and riparian habitats at the Calvert Landfill Site and Muxwell Brook Diversion is of particular importance. . Broadly similar proportions of bats were recorded using linear features and open habitats during paired sampling surveys. Serotine were only recorded using open habitat during paired sampling surveys but in low numbers. Although evidence of bats using open habitat was recorded, radio-tracking data show that the majority of commuting routes in the Bernwood area follow linear habitat features. Myotis species and brown long-eared bats were predominantly recorded commuting along linear features. Commuting by all bat species was prevalent along linear features at Grendon Junction; along the hedgerow to Finemere Fishing Lakes; and along the edge of Sheepphouse Wood.
- 1.1.4 A total of 409 bats of 10 species were captured during the trapping surveys in 2012 and 2013, including Bechstein's, Brandt's, brown long-eared bat, common pipistrelle, Daubenton's, Leisler's, Natterer's, noctule, soprano pipistrelle, and whiskered bats. Between 21 August and 25 September 2012 a total of 101 bats were captured over 20 night's survey effort. On 38 nights between 6 May and 11 August 2013 a total of 308 bats were captured over 38 night's survey effort.
- 1.1.5 In 2012, a total of 17 female bats of nine species were fitted with radio-transmitters and subsequently radio-tracked to determine roosting and foraging locations and flightlines between roosts and foraging sites. This resulted in the identification of 31 roosting locations.
- 1.1.6 In 2013, a total of 52 bats of 10 species (including 14 female and three male Bechstein's bats) were fitted with radio-transmitters and subsequently radio-tracked to determine roosting and foraging locations and flightlines between roosts and foraging sites. In addition, data were obtained on roosting and foraging locations and flightlines from seven female bats (including two female and one male Bechstein's) radio-tagged by the North Bucks Bat Group (NBBG) and three

Bechstein's (two females and one male) radio-tagged by the Bernwood Forest Bechstein's Project. This resulted in the determination of 105 roosting locations from 66 individuals radio-tracked during the study period.

- 1.1.7 Flightlines alongside the Aylesbury Link Railway were identified for Bechstein's bat, Brandt's bat, whiskered bat, common and soprano pipistrelle, brown long-eared bat, Natterer's bat and Daubenton's bat.
- 1.1.8 Serotine bats were recorded during activity transect surveys and Nathusius' pipistrelle was recorded during the automated detector surveys.



## 2 Introduction

### 2.1 The context for the current survey

- 2.1.1 Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora, known as the Habitats Directive, was adopted in 1992. The main aim of the Habitats Directive is to promote the maintenance of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species listed on the Annexes to the Directive at a favourable conservation status, introducing robust protection for those habitats and species of European importance.
- 2.1.2 The Conservation of Habitats and Species Regulations 2010 (as amended) (referred to as the 'Habitats Regulations') implement the Habitats Directive into national legislation. Regulation 41 seeks to protect certain species (European Protected Species) and contains a range of prohibitions include deliberate capture or killing, deliberate disturbance and the deterioration or destruction of a breeding site or resting place of such an animal.
- 2.1.3 All species of bat are fully protected under the Habitats Regulation as European Protected Species through their inclusion on Schedule 2. In addition, certain species, including Bechstein's bat, are Annex II species listed under the Directive, for which specific protection through the establishment of Special Areas of Conservation (SAC) applies.

### 2.2 Site Context and Status

- 2.2.1 The Bernwood Forest area in north Buckinghamshire includes a series of ancient woodland compartments including Finemere Wood SSSI, Sheephouse Wood SSSI, Grendon and Doddershall woods SSSI and Ham Home-cum-Hamgreen woods SSSI and five woods designated as Local Wildlife Sites (LWS). The woodlands are located within 3 km each side of the Proposed Scheme.
- 2.2.2 This area is known to be significant for its bat assemblage. Of the ten species recorded in the survey area Bechstein's bat *Myotis bechsteinii*, noctule *Nyctalus noctula*, soprano pipistrelle *Pipistrellus pygmaeus* and brown long-eared bat *Plecotus auritus* are species of principal importance in England as identified in Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006)<sup>1</sup>. Other woodland bat species, including whiskered bat *Myotis mystacinus*, Brandt's bat *Myotis brandtii* and Natterer's bat *Myotis nattereri*, are also present.
- 2.2.3 Bechstein's bat has been described as one of Britain's rarest mammals<sup>2</sup> and as being very uncommon throughout its range<sup>3</sup>. In recognition of its rarity, Bechstein's bat is listed on Annex II of the EC Habitats Directive as a species to be protected by the establishment of SAC. However, the elusive nature of Bechstein's bat had previously made any kind of systematic survey impractical and, therefore, there are

<sup>1</sup> Natural Environment and Rural Communities Act 2006 (Chapter 16). London. Her Majesty's Stationery Office.

<sup>2</sup> Battersby, J., (2005), UK Mammals: Species Status and Population Trends, JNCC/Tracking Mammals Partnership.

<sup>3</sup> Macdonald, D.W. & Barrett, P., (1993). Mammals of Britain and Europe (Collins Field Guide). Collins, London.

currently no reliable estimates of national population size of this species and, for most regions, information on its distribution is poor. This situation has changed since a technique was developed that makes it possible to make systematic surveys for woodland bats, including Bechstein's bat<sup>45</sup>. The technique involves using an ultrasonic lure (the Sussex Autobat) to attract bats into a net or trap. This technique has been adopted by the Bat Conservation Trust National Bat Monitoring Programme (NBMP) to carry out a national survey of Bechstein's bat, with participating bat groups across the UK, with the aim of providing information about the Bechstein's bat's distribution range and habitat preferences.

- 2.2.4 The North Bucks Bat Group and the Bernwood Forest Bechstein's Project have carried out extensive voluntary bat surveys (initiated by the Bat Conservation Trust's Bechstein's Bat Project) in north Buckinghamshire. These surveys confirmed the presence of Bechstein's bats in 2010 and a subsequent radio-tracking project by the Bernwood Forest Bechstein's Project identified a breeding colony in Doddershall Wood SSSI. There is concern that the construction and operation of the Proposed Scheme through their current range may have a potential impact on their use of the habitats in the wider landscape.
- 2.2.5 Thus, detailed survey work was required to provide more information on roosting, commuting and foraging behaviour of Bechstein's bats and other bat species in those areas adjacent to the Proposed Scheme in order to better understand any potential adverse impacts, and if relevant to inform the design of mitigation.

## 2.3 Project aims and approach

- 2.3.1 The project was designed to obtain robust baseline data on bat species using habitats along the Proposed Scheme and surrounding areas, in proximity to the Bernwood Forest areas.
- 2.3.2 The project was designed to obtain robust baseline data on bat species using habitats along the Proposed Scheme and surrounding areas, in proximity to the Bernwood Forest areas, where records received from the North Bucks Bat Group indicate an important assemblage of woodland bats, including Bechstein's, is present.
- 2.3.3 This was achieved by a review of existing data provided by the North Bucks Bat Group and the Buckinghamshire and Milton Keynes Environmental Records Centre (BMERC) and the completion of field surveys.
- 2.3.4 Field surveys were undertaken in 2012 and 2013 to obtain information on bat movement corridors, foraging sites, and roosts in the vicinity of the Proposed Scheme. The surveys included activity transects, paired sampling of habitat features, automated detectors, and the trapping and radio-tracking of bats. All trapping was carried under two site specific annexes to Dr Stephanie Murphy's licences (ref number: 20122797 and 20130639).
- 2.3.5 The survey area was primarily the existing Aylesbury Link Railway, to which HS2 will be adjacent, and areas between the woodlands where access was permitted.

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<sup>4</sup> Hill, D A & Greenaway, F. (2005). Effectiveness of an acoustic lure for surveying bats in British woodlands. *Mammal Review* 35(1):116-122

<sup>5</sup> Hill, D.A. & Greenaway, F. (2008). Conservation of bats in British woodlands. *British Wildlife*, 19(3): 161-169.

- 2.3.6 The survey aimed to provide information on all bats including their species and sex, breeding status, condition, numbers and behaviour.
- 2.3.7 This data has been used to inform the Environmental Statement and the associated mitigation and compensation measures.

## 3 Methodology

### 3.1 Data Search

3.1.1 A data search of bat records in the area was carried out and roosts and foraging/movement records were mapped to build an initial picture of how bats are using the landscape. North Bucks Bat Group records obtained from sightings, detector surveys, trapping and tree and building inspections were compiled and analysed. The results of the data search were summarised to highlight salient records, provide their proximity to the route and conservation importance.

### 3.2 Survey Area

3.2.1 The survey area for both trapping and automated recording runs along the existing railway line corridor from a point south of the Edgcott Road (SP71972 20795) to one north of Calvert village (SP68732 24897) and is approximately 5km in length.

3.2.2 The bat transect route follows the existing bridleway from Calvert village (approximate Grid Reference SP68885, 24486) to the west of Finemere Wood SSSI (approximate grid reference SP70955, 22970). It is approximately 3.2km long.

3.2.3 The survey area for radio tracking encompasses the wider landscape surrounding the route including the disused railway line to the west of Woodlands Farm. Finemere Wood SSSI, Sheephouse Wood SSSI, and the five woods designated as a LWS to the north-east of the route (Romer Wood LWS, Greatsea Wood LWS, Balmore Wood LWS, Runts Wood LWS and Decoypond Wood LWS). The Grendon and Doddershall woods SSSI and the Ham Home-cum-Hamgreen woods SSSI are south-east of the route. The north of the survey area includes Calvert Jubilee Nature Reserve LWS, the adjacent Grebe Lake LWS and Calvert Railway Station LWS. All tracking in the survey area was undertaken from land parcels where access had been granted or from suitable roads and Public Rights of Way (PRoW).

### 3.3 Automated Surveys 2012

3.3.1 Aerial photograph and Ordnance Survey (OS) map analysis was conducted to assess the landscape, habitat connectivity and determine where to automated static monitoring surveys. These automated surveys focused specifically on:

- the Aylesbury Link Railway; and
- habitat corridors that may enable Bechstein's bats to cross the route, such as hedgerows and tree lines which link woodland blocks (where access allows).

3.3.2 Ten locations were chosen to place out automated static monitoring recorder units along the route (see Figure 2). The locations were identified as likely 'hotspots' of bat activity based on the analysis of aerial photographs and OS maps. The recording dates for each unit are detailed in Table 1. Each recorder was set up to record for 2 hours 30 minutes commencing recording 15 minutes prior to sunset and for 2 hours 30 minutes immediately after sunrise.

3.3.3 Analysis was undertaken using Analook V3.5 to the appropriate level for each species group. Myotis bats were not identified to species level using Analook.

Table 1: Static recording dates for August and September 2012

Static recorder number	August Recording Dates	September Recording Dates
1	1 – 3	5 – 11
3	22 – 29	5 – 11
2	23 – 25	5 – 11
7	23 – 27	5 – 11
8	23 – 27	5 – 11
9	23 – 27	Unit stolen in Sept
11	23 – 29	5 – 11
12	23 – 29	5 – 11
13	23 – 29	5 – 11
14	23 – 29	5 – 11

### Automated Surveys 2013

3.3.4 The new methodology used in 2013 consisted of arrays comprised of three static monitoring detectors each with two microphones set out in a line, perpendicular to the existing Aylesbury Link Railway Line at six locations. The arrays bisected the railway and encompassed habitats adjacent to it (such as tall ruderal and scrub vegetation on the western side of the railway and the habitat within the Mega Ditch on the eastern side of the railway). The array methodology allowed ratios of activity to be recorded at confirmed and potential crossing points in order to identify which features bats are predominately using for commuting and/or foraging. This information also reinforced data collected from radio-tracking surveys which allowed precise flight paths to be established for the width of existing crossing points. Data gathered in this manner enables potential impacts of the Proposed Scheme to be fully considered, and inform appropriate mitigation to address these impacts.

3.3.5 Six array locations were placed along the railway were selected from preliminary evidence of crossing points gathered in 2012. At each location, an array comprising up to three automated static recorders were rotated around four fixed static monitoring points and two floating array locations. Rotations took place every week between 29 May 2013 and 7 August 2013. Each Automated Static recorder, recorded via two microphones on 50m cables, set at predetermined distances apart from each other to ensure consistency and coverage of the survey area. The four array locations, selected on the basis of data from desk studies and prior knowledge of the area, were as follows:

- array 1: south of Sheephouse Wood (a potential bat roosting site) and east of Calvert Landfill Site. A section of habitat that links potential roosts to the

Mega Ditch<sup>6</sup> (suitable bat foraging habitat) and the railway (suitable bat commuting route);

- array 2: bridge at Greatmoor Farm;
- array 3: between Greatmoor Farm and Oak Tree Farm; and
- array 4: south of Finemere fishing lakes.

3.3.6 Within the array, static recorder unit 1 was typically positioned to the west of the rail corridor and in the vicinity of the Mega Ditch; unit 2 was typically positioned in the centre of the rail corridor; and unit 3 was typically positioned to the east of the rail corridor.

3.3.7 Each recorder was set up to record for 8 hours overnight, from sunset. Analysis was undertaken using Analook V3.5 to the appropriate level for each species group.

3.3.8 The high numbers of records in 2013 necessitated the need to build filters (auto-identification of calls based on selected call parameters) for calls of four genus of bat species. All data were analysed with each of the four filters. The filters were built for common pipistrelle calls with 89% confidence limit, soprano pipistrelle calls (88% confidence limit), *Myotis* calls (85% confidence limit), *Nyctalus* calls (93% confidence limit) and barbastelle calls (79% confidence limit). The barbastelle filter was run separately.

3.3.9 Time expansion analysis was undertaken on WAV recordings to confirm the species identified from zero crossed ZC analysis. All calls identified from scans as barbastelle species were further analysed using WAV file. Furthermore, as it was not possible to build a filter for brown long-eared bat species due to the call characteristics allowing a confidence limit of 50% on the filter, WAV file analysis was also undertaken to identify brown long-eared bat calls on a proportion of the files.

3.3.10 *Myotis* bats were not identified to species level using Analook due to the chance of error in using ZC files to draw conclusions regarding these species.

3.3.11 Refer to Figures 1-5 for maps of the array and microphone locations. Figures 6-9 represent the nightly average passes per microphone with larger plotted locations indicating higher numbers of passes.

## 3.4 Bat Activity Transect Surveys 2012 and 2013

3.4.1 Bat activity transect surveys were undertaken throughout the Calvert area using a predefined 3.2km long route (see Figure 1), which was designed to pass habitat features that are likely to be used by bats. All surveys were undertaken from sunset for approximately 2 hours 30 minutes. The transect was repeated on eight occasions between June 2012 and August 2013. Surveyors used SM2 Bat+ recorders in conjunction with Bat Box Duet detectors connected to Edirol digital recorders.

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<sup>6</sup> Deepened and widened diversion of the Muxwell Brook close to Sheephouse Wood and adjacent to parts of the Bridleway GUN/25, containing scattered scrub and wetland vegetation.

## 3.5 Paired Sampling 2013

- 3.5.1 Given the importance of understanding where and when bats are crossing the existing railway or moving along the rail corridor paired sampling points were deployed. The first point (surveyor) was situated on one of the known crossing points (identified in the 2012 survey) where a linear habitat feature (such as a tree line or hedgerow) is perpendicular to the railway and the second point (surveyor) was situated adjacent to the existing railway in more open habitat (such as an arable field) approximately 100m away from the first surveyor. The surveyors used automated bat detectors to record all bat activity and all bat flight paths, directions of flight, where seen, and time of bat pass were recorded in order to map bat flightlines.
- 3.5.2 The paired sampling surveys commenced 15 minutes before sunset and continued until after civil twilight. The dawn surveys commenced before dawn and continued until sunrise. Five locations were identified within the corridor between land to the south of Sheephouse Wood and Finemere Wood, as shown in Figure 3, and the relative level of activity was compared to investigate whether bats significantly followed linear habitat features to cross the existing line, as indicated by the radio-tracking study in 2012, as opposed to crossing in more open habitats.

## 3.6 Trapping surveys 2012 and 2013

- 3.6.1 The trapping surveys were carried out at ten locations, where access was permitted along the Aylesbury link Railway and adjoining habitat corridors that Bechstein's and other bat species may follow to cross it, where access was permitted. The trapping locations are shown in Figure 4 (2012 locations) and Figure 5 (2013 locations). These locations were selected on the basis of aerial photographs, OS map analysis and preliminary automated surveys.
- 3.6.2 At each of the 10 trapping locations, two harp traps and one mist net were set approximately 150-200 metres apart. Each trap was fitted with an acoustic lure to increase the likelihood of catching bats close to the Proposed Scheme. The acoustic lure works by producing simulations of a variety of bat social calls. The majority of calls that were used during the survey period were those that are most effective for catching Bechstein's bats. Simulations of barbastelle bat, Natterer's bat, Daubenton's bat, brown long-eared bat and small Myotis spp. were also used.
- 3.6.3 Each of the 10 locations, shown in Figures 4 and 5, was surveyed for two non-consecutive nights during the study period (a total effort of 20 nights trapping in 2012 and 38 nights in 2013). This comprised of 10 nights surveying in August 2012, 10 nights surveying in September 2012, eight nights surveying in May 2013, 10 nights in June 2013, 10 nights in July 2013 and 10 nights in August 2013.
- 3.6.4 The bats captured in the harp traps and mist nets were removed from the traps by a suitably experienced and licensed ecologist (or under the direction of licensed ecologist) and transferred to a clean cloth bag. At the end of each trapping sessions biometric information was obtained from all bats captured. Each bat was sexed, weighed using a light line spring scale (Pesola), forearm measured using digital callipers (Sealey So707), reproductive status ascertained and any other general health observations noted. Any bats that were selected for radio-tagging were

retained to have a radio-transmitter attached and all other bats were released immediately in close proximity to the site of capture during the hours of darkness. Droppings were collected from captured individuals for future DNA analysis.

- 3.6.5 Each bat captured that was considered to be appropriate for ringing had a metal ring fitted to its forearm which had a unique serial number and the inscription 'London Zoo' (London Zoo has an arrangement with BCT to notify it of any ring or number sent in). Two sizes of ring was be used, 2.9mm and 4.2mm. The 4.2mm rings were fitted to noctule *Nyctalus noctula*, Leisler's *Nyctalus leisleri* and serotine *Eptesicus serotinus* bats have not been recorded in this area. The 2.9mm rings were fitted to all other UK bat species captured in this area. Ringing bats will allow for on-going monitoring as there are a number of bat box monitoring schemes operational in local area. This information will also be useful for future monitoring in relation to the Proposed Scheme.

### 3.7 Radio-tracking study

- 3.7.1 Bats for radio-tagging were selected on the basis of their existing health. No underweight bats were selected for radio-tagging and the weight of the radio-tag was always less than 5% of the animal's weight. Female bats were selected (and in particular reproductive females) for radio-tagging as a preference to male bats, as this enabled the identification of important breeding colonies but male Bechstein's bats were also selected for radio-tagging in 2013.
- 3.7.2 Transmitters were attached with Skin-Bond® (Pfizer Inc.) to the area between the shoulder blades from which fur had been clipped. Recapture data indicates that the tags usually fall off the animals after 5 - 12 days. All animals were caught and handled under licence from Natural England. The animals that were fitted with radio-transmitters were released on the same night of capture in close proximity to the capture site.
- 3.7.3 To subsequently determine the position of radio-tagged bats during the day (daytime roost locations) and night (commuting and foraging locations) the animals were radio-tracked on foot and by car by a minimum of two surveyors using a Biotrack 'Sika' receiver and a Yagi 3-element antenna on a height-adjustable and portable mast. Each radio-tagged bats position was determined by taking paired bearings sequentially from various known locations around the foraging area. Time, compass bearing, GPS reading and weather were recorded on to data sheets in the field. The radio-tracking teams followed the bats from sunset for a maximum of eight hours. If the focal animal returned to the roost early then tracking of this animal was terminated after no further activity was recorded for one hour. The estimates of roosting locations were obtained by taking multiple bearings from different locations in the vicinity of where the signal was emitted. At least two radio-tracking teams were deployed on the existing rail corridor to ascertain the approximate location where an animal crossed the Proposed Scheme.
- 3.7.4 Each animal was radio-tracked for between two and 10 days (depending on how long contact with each radio-tagged animal was maintained) to obtain estimates of home range. Bats were radio-tracked concurrently whereby the radio-tracking teams would switch between radio-tag frequencies in order to obtain estimates of locations for different animals. Data from each night of radio-tracking was added



to a cumulative database and for each individual this was used to estimate the bat's ranging area (see below).

- 3.7.5 Where access was available, emergence of the bats from their roosts was monitored around dusk by direct observation. Where lack of access was a constraint on the survey, measures described in the constraints section below were implemented. Counts of emerging bats were used to give a measure of minimum colony size. In most cases it was possible to estimate the position of the radio-tagged female at intervals after the bat left the roost, and in this way to establish the flight lines used between the roosts and foraging areas. Where roosting locations were identified on land where access was prohibited, this was addressed by using the radio-tacking techniques described above.

## 3.8 Home range analysis

- 3.8.1 Pairs of compass bearings, and the locations they were taken from, were used to estimate the bat's position (fix) by triangulation with the software package LOAS (version 2.12, Ecological Software Solutions, 1998 – 2003). The fixes obtained from LOAS were imported into Ranges 7 (version 1.8, Anatrack Ltd, 2006) and ArcGIS 9 (version 9.2, ESRI 2006) which were used to produce visual representations of the estimated ranging areas.
- 3.8.2 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 location of an individual at many points in time.
- 3.8.3 Two range estimators were used to calculate total range estimates for each individual: 100% Minimum Convex Polygon (100% MCP) and 95% Kernel Density Estimator (95%KDE and 50%KDE). 100% 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, MCP are very sensitive to outliers and require large data sets for accurate estimations of home range size<sup>7</sup>. Furthermore, they give no information about how the animal is using its home range (Harris et al, 1990).
- 3.8.4 Probabilistic approaches to home ranges estimators have also been developed whereby the density of fixes is estimated throughout the area used by the animal. Kernel Density Estimation (KDE)<sup>8,9,10</sup> is a nonparametric estimator 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%.
- 3.8.5 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

<sup>7</sup> Powell, R. A. (2000). Animal home ranges and territories and home range estimators. In Research techniques in animal ecology: controversies and consequences. Boitani, L. & Fuller, T.K. (eds.) Columbia University Press, New York, USA, pp. 65-110.

<sup>8</sup> Silverman, B. W. (1986). Density estimation for statistics and data analysis. Chapman & Hall. London.

<sup>9</sup> Worton, B. J. (1987). A review of models of home range for animal movement. Ecological Modelling, 38, 277-298.

<sup>10</sup> Worton, B. J. (1989). Kernel methods for estimating the utilization distribution in home-range studies. Ecology, 70, 164-168.

than others<sup>1112</sup>. 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<sup>33</sup> (et alThompson et al., 2007).

3.8.6 Core areas can be a useful concept when describing patterns of behaviour or identifying particularly resources<sup>1415</sup>. The 50% isopleth (median value) was adopted as an indicator of core area use. The use of 50% KDE for bats radio-tracked in this study, would also make it comparable with other radio-tracking studies on woodland bats, for example, Bechstein's *Myotis bechsteinii*<sup>1617</sup> and brown long-eared *Plecotus auritus*<sup>18</sup>. The 50% isopleth was, therefore, adopted as an indicator of core bat foraging areas.

## 3.9 Constraints

3.9.1 Due to access restrictions not all automated static recorders placed out in the array were equipped with two microphones, so for instance some arrays had five microphones instead of six. This was the case for Array 3, where only two automated static recorders, each with two micro phones were utilised.

3.9.2 The analysis was undertaken using mostly filters and scans in Analook given the very large number of files to be analysed. However some of the files were subject to surveyor analysis and given the time constraints on analysis, a proportion of species may be under represented these include Nathusius' pipistrelle, barbastelle and brown long-eared bats. Brown long-eared bats in particular, are likely to be under represented as a filter was not built for this species. Furthermore, of the proportion of calls that were analysed, very low numbers of this species were identified. This is most likely due to the call characteristics of brown long-eared bats, the call of which is comparatively quiet. In order for the automated detectors to record calls they must fly within 3m of the microphone. The trapping surveys ensure that the presence of these species, which are difficult to detect through automated or activity surveys, could be confirmed and accounted for in the assessment of the bat assemblage. This is therefore not considered to represent a significant constraint.

3.9.3 The trapping commenced at sunset and lasted four to six hours on each survey night. Unsuitable weather (heavy rain) terminated a survey early on one occasion (which was re-scheduled) and trapping was terminated early twice as a result of low

<sup>11</sup> Adams, L. and Davis, S. D. (1967). Internal anatomy of home range. *Journal of Mammalogy*, 48, 529-536.

<sup>12</sup> Dixon, K. R. and Chapman, J. A. (1980). Harmonic mean measure of animal activity areas. *Ecology*, 61, 1040-1044.

<sup>13</sup> Samuel, M. D., Pierce, D. J. and Garton, E. O. (1985). Identifying areas of concentrated use within the home range. *Journal of Animal Ecology*, 54, 711-719.

<sup>14</sup> Harris, S., Cresswell, W. J., Forde, P. G., Trehwella, W. J., Woollard, T. and Wray, S. (1990). Home-range analysis using radio-tracking data - a review of problems and techniques particularly as applied to the study of mammals. *Mammal Review*, 20, 97-123.

<sup>15</sup> Powell, R. A. (2000). Animal home ranges and territories and home range estimators. In *Research techniques in animal ecology: controversies and consequences*. Boitani, L. & Fuller, T.K. (eds.) Columbia University Press, New York, USA, pp. 65-110.

<sup>16</sup> Dietz, M. and Pir, J. B. (2009). Distribution and habitat selection of *Myotis bechsteinii* in Luxembourg: implications for forest management and conservation. *Folia Zoologica*, 58, 327-340.

<sup>17</sup> Kerth, G. and Melber, M. (2009). Species-specific barrier effects of a motorway on the habitat use of two threatened forest-living bat species. *Biological Conservation*, 142, 270-279.

<sup>18</sup> Murphy, S. E., Greenaway F., and Hill, D.A (2012). Patterns of habitat use by female brown long-eared bats presage negative impacts of woodland conservation management. *Journal of Zoology* 288: 177-183.

temperatures (below 8°C) in 2012. Trapping was terminated after eight nights in May 2013 due to weather constraints and the condition of bats captured (mostly underweight) after the cold spring. Due to the number of subsequent surveys completed in optimal conditions, the surveys that were terminated are not likely to have affected the survey conclusions.

- 3.9.4 All of the radio-tracking was carried out from land where access was permitted, public roads and footpaths as access to habitats to the east of the existing railway line was restricted. Restricted access affected the accuracy of the bearings obtained during the study. Firstly, if the bat was roosting in an area of land where access was prohibited, it was not possible to ascertain the precise roosting location. Secondly, if the bat was foraging in an area of land where the strength of the signal was weak (as a consequence of the topography) and/or, had disappeared, then it was not possible to ascertain precisely where the bat was.
- 3.9.5 These constraints were addressed in two ways:
- if the bat was roosting in land where access was prohibited, multiple bearings were taken from a variety of different locations in a 3600 radius of the signal direction to get a better estimate of roosting locations; and
  - if the bat was foraging in an area of land where the signal strength was weak, then the radio-tracking surveyors would move to more elevated areas of land to get an omnidirectional on the bat being tracked and re-adjust their positions to achieve a clearer signal.

## 4 Results

### 4.1 Data Search

4.1.1 There are records for Bechstein's bats from most of the woodlands in Bernwood Forest. These include woodland to the east and west of the route at Shrubs Wood LWS, Decoypond Wood LWS, Sheephouse Wood SSSI, Finemere Wood SSSI, Grendon Wood and Lee Wood, Doddershall Wood, Ham Green and Ham Home Wood, Grove Wood and Mercers Wood. A maternity colony is present in Finemere Wood. Table 2 summarises the woods where Bechstein's bats are present in Bernwood Forest.

4.1.2 Eight further bat species are present in this area including species generally associated with woodland such as brown long-eared bat, Brandt's/whiskered bat and Natterer's bat. Common pipistrelle and soprano pipistrelle and noctule have been recorded in moderate to high numbers within the survey area. Leisler's bat and serotine have been recorded in low numbers at over 1km from the route.

Table 2: Woods where Bechstein's bat activity was recorded.

Wood	Location in relation to proposed route	Bechstein's bat recorded
Decoypond	Adjacent	Yes
Shrubs	544m NE	Yes
Home	1333m NE	Yes
Romer	470m NE	Yes
Greatsea	541m NE	Yes
Baltimore	1033m NE	Yes
Runts	1442m NE	Yes
Hewins	570m SW	Yes
Sheephouse	Adjacent	Yes (Bat box monitoring)
Finemere	214m NE	Yes Maternity colony (Bat box monitoring)
Grendon	822m SW	Yes
Doddershall	1484m SW	Yes
Ham Home	2864m SW	Yes
Ham Green	2536 Table 1: Static recording dates for August and September 2012m SW	Yes (Bat box monitoring)
Mercer's	3356m SW	Yes

### 4.2 Automated Surveys 2012

4.2.1 The locations for static monitoring undertaken during 2012 are provided in Figure 2a.

- 4.2.2 Locations numbers 1 and 3 recorded relatively high levels of *Myotis* passes. Location 13 located near Woodlands Farm, captured an average of 20 passes per night (ppn) in August, with relatively high proportion of *Myotis* calls accounting for 17.8% of all calls. Only 6 ppn in September were recorded accounting for less than 3% of all the calls. SM2 No: 7 situated near Decoypond Wood averaged 14.7 ppn during both August and September. Preliminary evidence suggests the habitat along, and directly adjacent to, the Aylesbury Link Railway is of particular importance for *Myotis* species for commuting and foraging.
- 4.2.3 The call numbers from SM2 No: 1, 3, 8, 9, 11, 12, 14, indicate lower but still significant *Myotis* activity, with average ppn ranging from 2.7-8.1.
- 4.2.4 SM2 No: 11, located north of Grendon Junction, recorded high activity of *Nyctalus* sp with 28.4% of the passes, 22.3 ppn, during August. Despite relatively high numbers of passes recorded during September there was still a notable decline in passes recorded with an average 13.33 passes per night. This accounted for 8.4% of the total passes throughout September for SM2 No: 11.
- 4.2.5 *Nyctalus/Eptesicus* activity levels were generally very low, but higher levels of activity were recorded by Location 11 at Grendon Junction Farm. During September, 3 ppn were recorded on average, accounting for a very low percentage of the total calls, at less than 2%. This figure was lower for August with an average of less than one ppn.
- 4.2.6 *Nyctalus/Eptesicus* activity was more consistent for both September and August at Finemere Wood. SM2 No: 12 recorded an average of 2 and 2.7 ppn for August and September. These figures showed lower levels of activity compared with other genera recorded. The other automated static monitoring recorders captured less than 1 ppn on average, or no passes at all, indicating negligible activity at these areas.
- 4.2.7 The other automated static monitoring recorders captured less than one ppn on average, or no passes at all, indicating negligible activity at these areas.
- 4.2.8 Very high activity for *Plecotus* species was recorded by Location 7 near Decoypond Wood. The activity accounted for 45% of the total activity in August which was an average of 84 ppn and 15.8 passes. This number was significantly reduced for September with less than 1% accounting for the total calls of SM2 No: 7.
- 4.2.9 Location 8 averaged 10 ppn in August only, with fewer passes in September.
- 4.2.10 High levels of *Pipistrellus* activity was captured at all the Locations, accounting for over 80% of all recorded calls at each static recorder unit except Location 7. Particularly high levels of activity were recorded on SM2 No: 9 with 296 and 286 ppn in August and September. SM2 No: 3 also had high levels of activity with 279 ppn in September and over 100 in August. SM2 No: 11, 12 and 13 all had high activity of over 100 ppn for both months as well. Initial evidence from the timing of the records indicate one possible soprano pipistrelle roost in the vicinity of Woodlands Farm (SM2 No: 9), and a common pipistrelle roost potentially located near Finemere Wood (SM2 No: 3).

## 4.3 Automated Surveys 2012

- 4.3.1 The locations for static monitoring undertaken during 2012 are provided in Figure 2a.
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- 4.3.3 The call numbers from SM2 No: 1, 3, 8, 9, 11, 12, 14, indicate lower but still significant *Myotis* activity, with average ppn ranging from 8.1-2.7.
- 4.3.4 SM2 No: 11, located north of Grendon Junction, recorded high activity of *Nyctalus* sp with 28.4% of the passes, 22.3 ppn, during August. Despite relatively high numbers of passes recorded during September there was still a notable decline in passes recorded with an average 13.33 passes per night. This accounted for 8.4% of the total passes throughout September for SM2 No: 11.
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- 4.3.6 *Nyctalus/Eptesicus* activity was more consistent for both September and August at Finemere Wood. SM2 No: 12 recorded an average of 2 and 2.7 ppn for August and September. These figures showed lower levels of activity compared with other genera recorded. The other automated static monitoring recorders captured less than 1 pass per night on average, or no passes at all, indicating negligible activity at these areas.
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- 4.3.10 High levels of *Pipistrellus* activity was captured at all the Locations, accounting for over 80% of all recorded calls at each static recorder unit except Location 7. Particularly high levels of activity were recorded on SM2 No: 9 with 296 and 286 ppn in August and September. SM2 No: 3 also had high levels of activity with 279 ppn in September and over 100 in August. SM2 No: 11, 12 and 13 all had high activity of over 100 ppn for both months as well. Initial evidence from the timing of

the records indicate one possible soprano pipistrelle roost in the vicinity of Woodlands Farm (SM2 No: 9), and a common pipistrelle roost potentially located near Finemere Wood (SM2 No: 3).

## 4.4 Automated Surveys 2013

### Array 1

- 4.4.1 At Array 1 (see Figure 2b), approximately 86,000 passes recorded over the whole season. The highest bat activity occurred in June, with the total of 24,092 passes recorded across the entire array. May and July recorded similarly high levels of activity with total number of passes recorded as 24,092 and 20,347 respectively. Activity in May was lower with a total 15,426 passes recorded across the entire array.
- 4.4.2 Unit 3, which was located to the east of the existing railway, recorded the greatest number of bat passes, with a peak of 15,674 ppn for the overall bat assemblage. Lowest bat activity was recorded at unit 1, to the west of the existing railway, with 1,388 ppn for the overall bat assemblage.
- 4.4.3 Common pipistrelle bats accounted for the majority of bat passes (total of 16,868 passes across the entire period). The highest occurrence of this species was recorded at unit 3, east of the existing railway compared with a peak 763 ppn at SM2 1
- 4.4.4 Soprano pipistrelle was recorded in moderate to high numbers, with peak counts in May of 857 ppn at unit 3. This static detector unit was located to the east of the rail corridor directly south of Sheephouse Wood. The lowest activity for soprano pipistrelle was recorded unit 1, with peaks of 9 ppn (for both microphones) in August and 12 ppn (left microphone) and 15 ppn (right microphone) in June. This static detector was located directly to the south of the lake at Calvert Landfill (north of the Mega Ditch).
- 4.4.5 Nathusius Pipistrelles were recorded at this location in moderate numbers with a peak count of 83 ppn and 104 ppn recorded at unit 2 (right microphone) and 3 (left microphone) respectively in July. No activity was recorded in May and low numbers were recorded in August with passes per night not exceeding 2 for this species.
- 4.4.6 The highest levels of common pipistrelle activity were recorded in June at unit 3 where peak counts of 1,245 ppn and 1,586 ppn were (left and right microphone respectively). Unit 3 consistently recorded high levels of common pipistrelle activity, from the right microphone located near to Sheephouse Wood; the left microphone (along the eastern edge south of Sheephouse Wood) recorded this species to a lesser extent across all months. As with soprano pipistrelle, activity was lowest in August at unit 1 for both microphones, with a peak of 76 ppn and 96 ppn (left and right microphone respectively) (Figure 2b).
- 4.4.7 Overall, greatest bat activity was recorded to the east of the existing railway and along the rail corridor.

## Array 2

- 4.4.8 At Array 2, an approximate total of 35,000 passes were recorded during May, June and July. Most activity occurred in June, with an average of 1,871 ppn recorded across the entire array.
- 4.4.9 Within array 2, unit 3, located to the east of the existing railway, recorded the greatest number of bat passes, with a total of 18,223 passes recorded for the entire season. Lowest bat activity was recorded at unit 1, to the west of the existing railway, which recorded a peak of 1,529 ppn for the overall assemblage.
- 4.4.10 Common pipistrelle accounted for the majority of bat passes (with an approximate total of 30,000 passes recorded for the entire array). The highest occurrence of which was recorded at unit 2, the unit nearest the railway where a peak count of 1,202 ppn was recorded on the left microphone in July, high numbers were also recorded in May at the same microphone location with a peak of 1,032 ppn. The numbers in June were lower with a peak of 752 ppn recorded on the left microphone of unit three and 215ppn and 688 ppn recorded on unit 2 (left and right microphones respectively). The left microphone of unit 2 on Array 2 was located nearest to the railway (see Figure 2b). Indicating common pipistrelles use this area for commuting and foraging.
- 4.4.11 Soprano pipistrelle was recorded in low numbers, with peak of 869 ppn recorded at unit 3 (right microphone) which is on the eastern edge of the rail corridor on a hedgerow which leads south from Sheephouse Wood. The lowest peak for this species was 1 ppn recorded at unit 1 (right microphone) to the west of the existing railway. Unit 1 consistently recorded low numbers of soprano pipistrelle throughout the season with the highest peak nightly count recorded in June with 8ppn. This indicates that soprano pipistrelle use the north eastern side of the railway preferentially to commute and forage within at this location.
- 4.4.12 Nathusius' pipistrelle was recorded in low numbers, with a peak of 49 ppn at unit 2 left microphone (located to the south of the Mega Ditch) in May and 15ppn at unit 1 in June.
- 4.4.13 *Myotis* species had a peaks of 56 ppn recorded in May at unit 2 (left microphone), the lowest activity of *Myotis* species was recorded was consistently recorded by unit 1 (left microphone with the lowest peak recorded as 2 ppn of *Myotis* species). Unit 1 was located in the westerly side of the railway furthest from the existing railway, Unit 2 was located along the Mega Ditch indicating this is the preferred area for *Myotis* species activity. The peak of *Nyctalus* was 42 ppn recorded in June on the right microphone of unit 1 (and unit 2 on the right microphone). Activity was consistently high in June for all three units, however *Nyctalus* species used the areas by unit 2 to a greater extent with slightly lower levels of activity recorded at units 1 and 3 throughout the season.
- 4.4.14 Overall, greatest bat activity was recorded to the east of the railway and along the rail corridor.



## 4.5 Array 3

- 4.5.1 At Array 3, a total 16,770 passes were recorded in May, June, July and August. Most bat activity occurred in August, with a total of 4,691 passes recorded for the whole array.
- 4.5.2 Unit 3, located to the north east of the rail corridor, recorded the greatest number of bat passes, with a total of 2,005 passes recorded in August. Lowest bat activity was recorded at unit 1 in May with a total of 351 passes recorded. Unit 1 consistently recorded the lowest levels of activity throughout the season while unit three consistently recorded the highest levels of activity.
- 4.5.3 The bat assemblage comprised low numbers of common pipistrelle bats with a peak of 343 ppn recorded in June at unit 3 (right microphone). The lowest occurrence of this species was recorded in July on unit 2 (right microphone). Consistently low numbers of common pipistrelle were recorded on unit 2 right microphone which was within the scrub on the railway corridor (records were all less than 50 ppn throughout the season). Conversely higher numbers of common pipistrelles were consistently recorded on unit 2's left microphone (over 200 ppn throughout the season), which was located on the west side of the railway within the scrub near Grendon Junction.
- 4.5.4 Soprano pipistrelle was recorded in low numbers for this species, with a peak of 35 ppn at unit 3 left microphone in July. Activity for this species did not exceed 50 ppn on any occasion throughout the season. Very low numbers of soprano pipistrelle were consistently recorded at unit 1 and unit 2's right microphone, indicating that this species restrict its activity around the Akeman Street Disused Railway (unit 1) and to the north east of the existing Aylesbury Link Railway.
- 4.5.5 Nathusius' pipistrelle was recorded in low numbers with a peak count of 17ppn recorded in July at unit 2 right microphone. The activity was relatively consistent throughout the season for this species with the highest number of passes recorded on unit 1 right microphone and unit 2 right microphone.
- 4.5.6 *Myotis* species were recorded in similar numbers to Array 2, with a peak count of 31 ppn recorded in July on unit 3, left microphone. However *Nyctalus* species activity was higher at this location than at Array 1 and 2 with a peak of 126 ppn. *Myotis* species were recorded in highest numbers to the west of the existing railway while *Nyctalus* were recorded in highest numbers within the rail corridor and the eastern side of the existing railway.
- 4.5.7 Overall, greatest bat activity was recorded along the rail corridor.

## 4.6 Array 4

- 4.6.1 At Array 4, a total of 116,897 passes were recorded during May, June and July. Most bat activity occurred in July, with a total of 63,034 passes recorded across the entire array. High levels of activity were also recorded in May and June with totals of 30,054 and 23,089 passes respectively
- 4.6.2 The bat assemblage was predominantly comprised of common pipistrelle bats with a peak of 1,727 ppn recorded at unit 1, left microphone in July. Conversely the right

microphone peak activity was lower with a peak count of 705 ppn recorded. Unit 1 was located with both microphones on either side of the railway corridor). This data indicates that common pipistrelles use the scrub to the west of the rail corridor to a greater extent than the eastern side of the railway corridor. High levels of activity were recorded over the fishing lakes as well for this species with peak counts for both May and June at units 2 and 3 recorded, of 1,300 ppn and 1,585 ppn respectively.

4.6.3 Soprano pipistrelle was recorded in moderate to high numbers at this location, with peak counts of 846 ppn recorded at unit 1 left microphone in July, within the rail corridor, and no bat passes recorded at unit 3 left microphone and unit 1 right microphone with 11 ppn. This indicates that soprano pipistrelles are not foraging to the same extent as other species over the fishing lakes and similar to common pipistrelles are not using the edge of the railway corridor as a flight line but prefer to use the scrub bordering the railway corridor. Overall, greatest bat activity was recorded within the rail corridor, with high levels away to the east of the rail corridor.

4.6.4 Nathusius' pipistrelle was recorded in moderate numbers with a peak count of 109 ppn recorded at unit 2 in July. Unit 3 recorded similar numbers with a peak of 83ppn recorded in June. Unit 1 recorded very low numbers of this species. This indicates the Nathusius' pipistrelle use the eastern side of the railway within the Fishing Lakes and the vegetation to a greater extent than the western side at this location.

4.6.5 *Myotis* species and *Nyctalus* species both had high levels of activity at this array with peak counts of 997 ppn and 388 ppn respectively. Both of which were recorded in July on unit 2 right microphone (scrub at the last of Finemere Fishing lakes). High levels of activity was consistently recorded along the eastern side of railway corridor as well as along the fishing lakes. The lowest total average for *Nyctalus* species of 92 ppn was at unit 2, immediately to the east of the rail corridor.

4.6.6 Overall, greatest bat activity was recorded within the rail corridor, with high levels away to the east of the rail corridor.

## 4.7 Floating Array Locations

- The following Floating Arrays locations were surveyed: the first Floating Array was between Array 1 (north of the Mega Ditch) and 2 (south of the Mega Ditch) and was surveyed in June and July; and
- the second Floating Array was between Arrays 3 and 4 (focussed solely on Benfield's Overbridge) and was surveyed in June.

4.7.1 An approximate total of 11,000 passes were recorded across the first Floating Array. The greatest number of bat passes were recorded at unit 3 in June, with a peak of 609 ppn of common pipistrelles. The lowest peak count was recorded at unit 2 in July with a peak of 93 ppn. Unit 2 was located to the east of the existing railway. Occasional passes of Nathusius' pipistrelles were recorded at unit 2 left microphone and unit 1 right microphone (these were located south of the lake at Calvert Landfil and within the Mega Ditch). Peak passes recorded were 1ppn at unit 2 and 5ppn at unit 1.

- 4.7.2 An approximate total of 16,000 passes were recorded across the second Floating Array, all passes were recorded in June. The greatest number of bats was recorded at unit 3 (located on the eastern side of the railway of the Benfields overbridge, south of Finemere wood) where a total of 6,912 bats passes were recorded. A common pipistrelle peak nightly count of 764 ppn (right microphone) and 349 ppn of soprano pipistrelle (left microphone) was recorded. *Nyctalus* species activity was consistently high at unit 1 (western side of Benfields overbridge) and at unit 3 (eastern side of the railway), however the peak count was recorded at unit 1 with peak counts occurring on the same night of 308 ppn and 305 ppn (left and right microphone respectively). Unit 2 which was placed closest to the railway recorded the fewest *Nyctalus* species. This indicates that *Nyctalus* species forage and commute predominantly on either side of the existing railway. A peak count of 3 ppn was recorded for barbastelle at unit 1 left microphone (located below Benfields overbridge between Akeman Street Disused Railway and the existing Railway). barbastelle were also recorded at unit 2. This indicates barbastelle use the scrub vegetation around Akeman Street Disused Railway and the existing Aylesbury Link Railway.

## 4.8 Transect Survey 2012 and 2013

- 4.8.1 A total of seven species were recorded and/or observed in flight during the activity transects. These are *Myotis* species, common and soprano pipistrelles, brown long-eared bat, Noctule, Leisler's bat and serotine. The amalgamated results of the transect surveys are summarised in Table 3. *Myotis* bats were recorded at several locations from Decoypond Wood through to the western hedgerow at Finemere Wood. A brown long-eared bat was observed crossing the existing railway line towards Decoypond Wood LWS, other brown long-eared bats were recorded at the south western edge of Finemere Wood. Noctules were recorded in several locations; foraging north of Finemere fishing lakes by the western hedgerow leading to Finemere Wood, close to Sheephouse Wood SSSI and to the north of Decoypond Wood. A single serotine was recorded to the south of Sheephouse Wood. Leisler's bats were recorded commuting along the bridle way adjacent to the Aylesbury Link Railway. Multiple records of common and soprano pipistrelles were recorded at several locations including crossing the railway near Benfields overbridge, foraging at Grendon Junction south of the Mega Ditch and near Finemere Fishing lakes.

## 4.9 Paired Sampling 2013

- 4.9.1 A total of six species were recorded in flight during paired sampling surveys; *Myotis* species, common and soprano pipistrelles, brown long-eared bats, serotines and *Nyctalus* species. The results for these surveys can be found in Table 4.
- 4.9.2 *Myotis* species were mostly recorded commuting along linear features with peak numbers of *Myotis* recorded using the scrub and hedgerow between Finemere Fishing Lakes and Finemere Wood. Activity of *Myotis sp* was also recorded foraging along linear features and crossing the Proposed Scheme at Grendon Junction and at the southern edge of Sheephouse Wood.

- 4.9.3 Serotine pipistrelle and *Nyctalus* species were more commonly recorded commuting over open habitat. With peak counts of pipistrelles using open vegetation in the arable field to the south of Sheephouse Wood in higher numbers.
- 4.9.4 *Nyctalus* species were mostly recorded foraging in open habitat over the arable land and Aylesbury Link Railway next to the north western hedgerow leading from Finemere wood (to the north of Finemere Lakes).
- 4.9.5 Myotis species and brown long-eared bats have mostly been recorded commuting along linear features. Use of linear features was prevalent at the following locations; Grendon Junction, along the hedgerow to Finemere Fishing Lakes and the edge of Sheephouse Wood.

Table 3: Bat activity transect survey results - Quainton to Calvert Railway

Visit number and date	Total species passes recorded during transect survey									
	common pipistrelle	soprano pipistrelle	Nathusius' pipistrelle	pipistrelle species (species unknown)	Myotis species	brown long-eared bat	Barbastelle bat	noctule	Leisler's bat	serotine
Visit 1: June 2012	39	5	-	-	6	-	-	13	-	-
Visit 2: August 2012	19	1	-	2	8	-	-	-	2	1
Visit 3: September 2012	5	2	-	2	-	-	-	5	-	-
Visit 4: June 2013	157	5	-	-	7	3	-	1	-	-
Visit 5: June 2013 dawn	38	13	-	-	4	1	-	-	-	-
Visit 6: June 2013 dusk	28	12	-	-	1	-	-	17	-	-
Visit 7: June 2013	84	3	-	-	1	-	-	3	-	-
Visit 8: July 2013 dusk	126	26	-	-	5	-	-	26	-	-
Visit 9: July 2013 dawn	152	9	-	2	10	-	-	8	-	-
Visit 10: July 2013 dusk	205	6	-	-	4	-	-	46	-	-
Visit 11: July 2013 dawn	110	4	-	-	14	-	-	5	-	-

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Table 4: Results of paired sampling 2013

Location of paired sampling	P1 SP 7021 2288 (Surveyor 1), SP 7060 2272 (Surveyor 2)		P2 SP 7073 2224 (Surveyor 1), SP 7060 2272 (Surveyor 2)		P3 SP 7073 2224 (surveyor 1), SP 7088 2245 (Surveyor 2)		P4 SP 7115 2171 (Surveyor 1), SP 7141 2170 (Surveyor 2)		P5 SP 7179 2088 (Surveyor 1), SP 7184 2134 (Surveyor 2)	
Date	Activity type									
	Commuting open habitat	Commuting using linear features	Commuting open habitat	Commuting using linear features	Commuting open habitat	Commuting using linear features	Commuting open habitat	Commuting using linear features	Commuting open habitat	Commuting using linear features
May	5 (3 x pipistrelle species, 2 x <i>Nyctalus</i> )	2 x pipistrelle species			5 (2 x common pipistrelle, 3 soprano pipistrelle)	4 (3x <i>Myotis</i> species, 1 x unknown)			No data recorded	No data recorded
June			17 (3 x common pipistrelles, 14 x unknown species)	2 x soprano pipistrelles			21 (4 x soprano pipistrelle, 5 common pipistrelle, 3 brown long-eared bats, 9 x unknown, )	8 (3 x <i>Nyctalus</i> , recorded multiple times crossing the railway while foraging, 1 x common pipistrelle, 4 x <i>Myotis</i> species)		
July	5 x pipistrelle species	6 (3x <i>Myotis</i> 1 Brown long-eared bat, 2 x common pipistrelle )	10 (7x Pipistrelle species, 1 x common pipistrelle, 2 x <i>Nyctalus</i> species)	5 (1 <i>Myotis</i> species, 2x pipistrelle species, 2 x brown Long-eared bat commuting from Hewins Wood)	2(1x <i>Nyctalus</i> species, 1 x common pipistrelle)	4 (2 x pipistrelle species, 2 x <i>Nyctalus</i> species)	8 (1x <i>Myotis</i> species, 1 <i>Nyctalus</i> species, 3xcommon pipistrelle, 3 x serotine)	13 (2 x <i>Nyctalus</i> species, 1 <i>Myotis</i> species, 1 common pipistrelle, 9 x unknown, potential brown long-eared bats)	6 (5 x common pipistrelle species 1 x serotine)	3 (1 x <i>Myotis</i> species, 2 Daubenton's bats)
Aug	6 (5 x pipistrelle species, 1 x serotine)	9 x pipistrelle species			2 unknown species	3(1 x soprano pipistrelle travelling south along hedgerow. 2x common	3 (2 x common pipistrelles, 1 x serotine)	8 (4 x <i>Myotis</i> species, 2 x Natterers, 2 x pipistrelle	4 (2 x soprano pipistrelles, , 2 unknown species)	5 (1 x common pipistrelle, 3 x soprano pipistrelle, 1 x brown long-

Appendix EC-006-002

Location of paired sampling	P1 SP 7021 2288 (Surveyor 1), SP 7060 2272 (Surveyor 2)		P2 SP 7073 2224 (Surveyor 1), SP 7060 2272 (Surveyor 2)		P3 SP 7073 2224 (surveyor 1), SP 7088 2245 (Surveyor 2)		P4 SP 7115 2171 (Surveyor 1), SP 7141 2170 (Surveyor 2)		P5 SP 7179 2088 (Surveyor 1), SP 7184 2134 (Surveyor 2)	
						pipistrelle foraging under bridge)		species)		eared (suspected))
Species total	Commuting open habitat	Commuting using linear features	Commuting open habitat	Commuting using linear features	Commuting open habitat	Commuting using linear features	Commuting open habitat	Commuting using linear features	Commuting open habitat	Commuting using linear features
common pipistrelle total		2	4		5	1	10	2	5	1
Soprano pipistrelle total				2	3	2	4		2	3
Pipistrelle species total	13	11	7	2		2	3	2		
brown long-eared total		1		2						1
Myotis species total		3		1		4	1	11		3
Nyctalus species total	2		2		1	2	1	5		
Serotine Total	1						3		1	
Unknown species			14		2	1	10	9	2	

Appendix EC-006-002

Location of paired sampling	P1 SP 7021 2288 (Surveyor 1), SP 7060 2272 (Surveyor 2)		P2 SP 7073 2224 (Surveyor 1), SP 7060 2272 (Surveyor 2)		P3 SP 7073 2224 (surveyor 1), SP 7088 2245 (Surveyor 2)		P4 SP 7115 2171 (Surveyor 1), SP 7141 2170 (Surveyor 2)		P5 SP 7179 2088 (Surveyor 1), SP 7184 2134 (Surveyor 2)	
total										
Total of all bats species	16	17	27	7	11	12	32	29	10	8



## 4.10 Trapping 2012

- 4.10.1 Over 20 nights between 21 August and 25 September 2012, a total of 101 bats were captured. The biometric data for all bats caught are detailed in Table 9 (see Annexes 1 and 3 of this report).
- 4.10.2 A total of ten species were captured during trapping; Bechstein's bat, Brandt's bat, brown long-eared bat, common pipistrelle, Daubenton's bat, Leisler's bat, Natterer's bat, noctule, soprano pipistrelle and whiskered bat.
- 4.10.3 Figure 6 shows the number of captures along the Aylesbury Link Railway and capture locations adjacent to the Proposed Scheme in 2012, per survey session. The capture rate was given an index, where 0-5 bat captures is classified as low, 6-10 bat captures is classified as moderate and more than 10 bats captured per night at each location is classified as high.

## 4.11 Trapping 2013

- 4.11.1 Over 38 nights between 6 May and 11 August 2013, a total of 308 bats were captured. The biometric data of the bats captured are detailed in Table 10 (see Annexes 2 and 3 of this report).
- 4.11.2 A total of ten species were captured during the trapping study including barbastelle bat, Bechstein's bat, Brandt's bat, brown long-eared bat, common pipistrelle, Daubenton's bat, Natterer's bat, noctule, soprano pipistrelle and whiskered bat.
- 4.11.3 Figure 7 shows the relative number of captures along the Aylesbury Link Railway and captures locations adjacent to the Proposed Scheme in 2013, per survey session. The capture rate was given an index, where 0-5 bat captures is classified as low, 6-10 bat captures is classified as moderate and more than 10 bats captured per night at each location is classified as high.

## 4.12 Radio-tracking 2012

- 4.12.1 A total of 17 female bats of nine species were fitted with radio-transmitters and subsequently radio-tracked to determine roosting locations, foraging locations and flightlines between roosts and foraging sites.
- 4.12.2 A total of 31 roosting locations were determined from 16 individuals radio-tracked during the study period as summarised in Table 5. These roosts are detailed in Figures 8 - 17. One bat, a Leisler's bat (number 9), was not located in its roost after tagging. Leisler's bats can forage up to 10km from their roost and this bat was picked up on the receiver only once after radio-tagging as it flew north along the existing railway line approximately 2.5 hours after sunset. A 10km radius was searched by car during the daytime on two occasions but the daytime roost location was not found. Therefore, this bat was excluded from the analysis. The roosts located for each species are discussed further below.

## 4.13 Radio-tracking 2013

- 4.13.1 A total of 52 female bats of 10 species (including 14 female and three male Bechstein's bats) were fitted with radio-transmitters. These bats were subsequently radio-tracked to determine roosting and foraging locations and

flightlines between roosts and foraging sites in 2013. In addition, data were obtained on roosting locations, foraging locations and flightlines for seven female bats (including two female and one male Bechstein's) radio-tagged by the North Bucks Bat Group and three Bechstein's (two females and one male) radio-tagged by the Bernwood Forest Bechstein's Project.

- 4.13.2 A total of 105 roosting locations from 66 individuals radio-tracked during the 2013 study period are summarised in Table 6. These roosts are detailed in Figures 8-17. One bat, Bechstein's bat number 11, was not located in its roost or during the next seven nights of radio-tracking. Therefore, it was considered likely that the radio-tag had failed.

Table 5: The number of roosts located and number of nights radio-tracked for each bat in 2012

Bat	Species	Date Capture	No of roosts used in tracking period.	No of nights radio-tracked
1	Daubenton's	21.8.12	1	7
2	Brown long-eared	23.8.12	3	5
3	Brandt's	24.8.12	1	4
4	Natterer's	28.8.12	2	7
5	Whiskered	28.8.12	1	2
6	Soprano pipistrelle	28.8.12	1	5
7	Bechstein's	1.9.12	3	5
8	Natterer's	1.9.12	4	7
9	Leislars	9.9.12	n/a	1
10	Whiskered	12.9.12	1	4
11	Bechstein's	13.9.12	3	5
12	Brown long-eared	13.9.12	2	5
13	Brown long-eared	13.9.12	3	5
14	Brown long-eared	20.9.12	1	4
15	Daubenton's	20.9.12	1	4
16	Bechstein's	20.9.12	2	4
17	Common pipistrelle	22.9.12	2	3

Table 6: The number of roosts located and number of nights radio-tracked for each bat in 2013

Bat	Species	Date Capture	No of roosts used in tracking period	No. of nights radio-tracked
1	Whiskered	6.5.13	2	4
2	Barbastelle	6.5.13	1	2
3	Bechstein's	10.5.13	1	6
4	Brown Long-eared	10.5.13	1	5

Bat	Species	Date Capture	No of roosts used in tracking period	No. of nights radio-tracked
5	Natterer's	12.5.13	1	4
6	Daubenton's	12.5.13	2	4
7	Natterer's	7.6.13	1	3
8	Brown Long-eared	8.6.13	6	6
9	Whiskered	8.6.13	2	6
10	Natterer's	8.6.13	4	2
11	Bechstein's	8.6.13	n/a	n/a
12	Soprano Pipistrelle	9.6.13	2	5
13	Whiskered	9.6.13	2	3
14	Daubenton's	10.6.13	1	3
15	Brandt's	13.6.13	1	5
16	Bechstein's	16.6.13	2	4
17	Bechstein's	16.6.13	2	4
18	Bechstein's	16.6.13	3	4
19	Bechstein's	16.6.13	2	4
20	Bechstein's	16.6.13	2	4
21	Bechstein's	13.7.13	1	4
22	Natterer's	13.7.13	1	3
23	Whiskered	13.7.13	1	3
24	Brown Long-eared	13.7.13	2	4
25	Brandt's	13.7.13	1	4
26	Whiskered	13.7.13	1	3
27	Brandt's	14.7.13	1	1
28	Daubenton's	14.7.12	1	3
29	Daubenton's	14.7.12	2	4
30	Common Pipistrelle	14.7.12	1	1
31	Whiskered	14.7.12	2	4
32	Brown Long-eared	14.7.12	1	4
33	Bechstein's	16.7.13	1	7
34	Bechstein's	17.7.13	1	6
35	Natterer's	17.7.13	1	6
36	Bechstein's	19.7.13	1	4
37	Bechstein's	19.7.13	1	4

Bat	Species	Date Capture	No of roosts used in tracking period	No. of nights radio-tracked
38	Bechstein's	19.7.13	2	4
39	Bechstein's	19.7.13	1	4
40	Bechstein's	19.7.13	1	4
41	Bechstein's	19.7.13	1	4
42	Daubenton's	20.7.13	2	3
43	Brown Long-eared	1.8.13	2	5
44	Brown Long-eared	1.8.13	1	1
45	Bechstein's	2.8.13	1	2
46	Brandt's	2.8.13	1	4
47	Daubenton's	2.8.13	4	5
48	Brown Long-eared	2.8.13	2	5
49	Whiskered	2.8.13	2	5
50	Soprano Pipistrelle	2.8.13	2	5
51	Brandt's	3.8.13	2	3
52	Brandt's	3.8.13	1	4
53	Daubenton's	3.8.13	1	3
54	Brown Long-eared	3.8.13	2	4
55	Brown Long-eared	3.8.13	1	4
56	Daubenton's	4.8.13	2	4
57	Daubenton's	6.8.13	1	1
58	Common Pipistrelle	6.8.13	1	2
59	Bechstein's	7.8.13	3	4
60	Bechstein's	7.8.13	1	6
61	Noctule	8.8.13	1	2
62	Bechstein's	8.8.13	2	6
63	Brown Long-eared	10.8.13	1	1
63	Bechstein's	10.8.13	2	4
65	Bechstein's	10.8.13	2	4
66	Bechstein's	10.8.13	2	4

4.13.3 Flightlines alongside the existing railway route and crossing the Proposed Scheme between roost sites and foraging sites were identified in both 2012 and 2013 for a number of radio-tracked individuals. These flightlines are detailed in Figure 18 - 27 and discussed further for each species below.

## Barbastelle radio-tracking data

### Barbastelle roost and flightlines 2012

- 4.13.4 No barbastelle bats were caught in 2012.

### Barbastelle roost and flightlines 2013

- 4.13.5 In 2013, one female barbastelle bat was caught in May to the north of Grendon Junction, where the disused railway line joins the existing Aylesbury Link railway. One barbastelle roost was subsequently located in woodland blocks to the south of Waddesdon Manor. Access to the woodlands where the roosts are situated to obtain colony counts was not granted. The barbastelle was subsequently radio-tracked commuting along the Akeman Street disused railway line between the A41 and Grendon Junction. It flew to the north of the Sheephouse Wood area and was not subsequently recorded. The roost and flightline for this species are detailed in Figures 8 and 19.

## Bechstein's bat radio-tracking data

### Bechstein's bat roosts and flightlines 2012

- 4.13.6 In 2012 a total of three female Bechstein's bats were radio-tagged during the study and seven Bechstein's roosts were subsequently located. All of the roosts were located in woodland to the south-west of the proposed route, including at Doddershall Wood and Hamgreen Wood. It was not possible to access the woodlands where the roosts were situated to obtain colony counts. The estimates of roosting locations were obtained by taken multiple bearings from different locations in the vicinity where the signal was emitted.
- 4.13.7 Three Bechstein's flightlines were recorded from the three individuals. Two flightlines crossed the Proposed Scheme, one of which comprised the strip of vegetation alongside the existing Aylesbury Link Railway between Benfield's Overbridge and Sheephouse Wood. Bat number 7, which was captured on the railway to the south of Benfield's Overbridge on the 1 September 2012 roosted in Doddershall woods to the south-west of the Proposed Scheme. Each night after emergence this female bat foraged for approximately one to two hours in the woodland where it was roosting and in Grendon Wood to the north. It then left the woodland to the south of the Proposed Scheme and flew through the bridleway adjacent to Hewins Wood. It was recorded flying north along the railway line adjacent to the scrub along the west of the railway line from Benfield's Bridge before heading east just south of Sheephouse Wood. It was subsequently recorded foraging in the north-eastern block of Romer Wood where it remained before returning to its roost in Doddershall Wood using the same flightline along the Hewins Wood bridle path.
- 4.13.8 Bat number 11 in 2012 was captured on the railway to the south of Greatmoor Farm on the 13 September 2012. It was initially recorded on the 14th September 2012 roosting alone in a woodpecker hole in a tree on the 14 September 2012 in Hewin's Wood within 250m of its capture site. It was subsequently recorded roosting in Doddershall Wood and in Ham Green Wood to the south. This female was not recorded crossing the Proposed Scheme or foraging in proximity to its capture location after it had been radio-tagged.

- 4.13.9 The third female Bechstein's radio-tracked was also captured on the railway to the south of Benfield's Bridge on the 20 September where the bridle path meets the existing Aylesbury Link Railway. It was subsequently recorded roosting at two different locations to the north of Doddershall Wood during the radio-tracking period. This bat foraged in Grendon Wood after emerging from its roost and crossed the railway line at Greatmoor and flew in a north-easterly direction along a low hedgerow (c 1.5m) towards Romer and Greatsea woods. It was subsequently recorded foraging in Romer Wood where it remained before returning to roost in Doddershall Wood using the same flightline along the Hewins Wood bridle path.

### **Bechstein's bat roosts and flightlines 2013**

- 4.13.10 Roosts located in 2013 included the Grendon and Doddershall woods complex to the south-west of the Proposed Scheme, Finemere Wood, Romer Wood, Sheepphouse Wood, Decoypond Wood, and a maternity colony using an ash tree in a hedgerow just outside Finemere Wood to the north-east of the Proposed Scheme. The peak count for the colony pre-maternity was 33 bats (18 June 2013) and the peak count for the colony using the same tree roost post maternity was 52 bats (21 July 2013). The colony moved into an oak tree in Finemere Wood in August, approximately 250 metres from the Proposed Scheme, where the peak emergence count was 15 bats.
- 4.13.11 In May 2013, a female Bechstein's bat was captured and radio-tagged by the North Bucks Bat Group in Finemere Wood. This bat was subsequently recorded roosting in an oak tree to the north-east of Finemere Wood. It did not leave Finemere wood during the radio-tracking period.
- 4.13.12 In June 2013, six female Bechstein's were radio-tagged in Finemere Wood and six tree roosts used by five female Bechstein's were subsequently located in the same wood. The five females, bats 15-20, occasionally roosted together and frequently switched between the six tree roosts identified during the tracking period. The flightlines recorded between the roosting locations in Finemere Wood and the foraging locations in Sheepphouse, Romer, Greatsea and Balmore Wood used by three of the five females comprised of hedgerows and tree lines along the Bernwood Jubilee Way. The other two females did not leave Finemere Wood.
- 4.13.13 In July 2013, a female Bechstein's bat radio-tagged by the Bernwood Forest Bechstein's Project was identified roosting in a hedgerow tree to the west of Ham Home Wood.
- 4.13.14 A maternity colony of Bechstein's was identified using an ash tree in a hedgerow just outside Finemere Wood to the north-east of the Proposed Scheme. The peak count for this colony post maternity was 52 bats (21st July 2013). The colony moved into an oak tree in Finemere Wood in August, approximately 250 metres from the Proposed Scheme, where the peak emergence count was 15 bats. Four females and one male Bechstein's from this colony were radio-tracked and flightlines were recorded between the roost and the foraging locations in Finemere, Sheepphouse, Romer, Greatsea, Runts and Balmore woods. One of the females roosted in Romer Wood on one occasion but returned to the roost just outside Finemere Wood for the remainder of the radio-tracking period. Upon emergence the bats roosting in this tree crossed low over a short section of open habitat (<20m) between the roost

tree to access foraging habitats in Finemere Wood but all other flightlines followed hedgerows and tree lines (Figure 19).

- 4.13.15 In July 2013 two further female Bechstein's, bat 33 and 34, were radio-tagged at Grendon Junction in the area of scrub vegetation where the Akeman Street disused railway line meets the Aylesbury Link Railway. Both bats roosted in Grendon and Doddershall woods and used the same tree roost (confirmed by the Bernwood Forest Bechstein's Project). Bat 13 was subsequently recorded on the Hewins Wood bridle-path. Bat 14 crossed the Proposed Scheme nightly to access foraging habitat in Greatsea and Romer Wood. It foraged in Grendon Wood upon emergence and after approximately two to three hours travelled along the Hewin's Wood bridle-path, crossed the Proposed Scheme at Grendon Junction (where it had been captured) and commuted along the hedgerow that leads into the north-west of Finemere Wood (perpendicular to the existing Aylesbury Link Railway). It returned to roost in Grendon Wood using the same route as a flightline.
- 4.13.16 The Bernwood Forest Bechstein's Project radio-tagged one female Bechstein's bat, bat 40, and one male Bechstein's bat, bat 41, in Sheephouse Wood. The male Bechstein's was recorded on one occasion roosting to the east of Decoypond Wood. The female captured was roosting with the 'Finemere Colony' in the ash tree just outside the wood. Hedgerow and scrub habitat to the south of Greatsea and Romer Woods that links to Sheephouse Wood was used as a flightline.
- 4.13.17 In August 2013, five female Bechstein's (including one juvenile) and two male Bechstein's were radio-tagged and radio-tracked. Two further Bechstein's, bat 63 and 64, radio-tagged by the North Bucks Bat Group were also radio-tracked.
- 4.13.18 One female, bat 60, captured just south of Benfield's Bridge roosted in Doddershall and Grendon woods complex. Upon leaving the wood it flew along the Edgcott Road following a hedgerow and watercourses through Moor Farm to access foraging habitat in Sheephouse Wood. It was recorded crossing the land required for the Proposed Scheme to access Sheephouse Wood to the south of the Doddershall and Grendon woods complex and, also, crossed the Proposed Scheme approximately 150 metres from the south of Sheephouse Wood where it followed the existing railway line vegetation before moving into the woodland.
- 4.13.19 The six other Bechstein's bats that were radio-tracked in August roosted to the north-east of the Proposed Scheme in the ash tree near Finemere Wood. During the tracking period three of the radio-tracked bats changed roosts to an oak tree in Finemere Wood, 250 metres from the Proposed Scheme.
- 4.13.20 Flightlines that comprised of hedgerows and tree lines were identified along the Bernwood Jubilee Way. These flightlines provided access to the complex woodlands Romer, Greatsea, Balmore and Runts. One juvenile female Bechstein's bat radio-tracked followed vegetation to the north-east of Finemere fishing lakes to forage within scrub and immature woodland vegetation between the Akeman Street disused railway line and the Aylesbury Link Railway. It also spent time foraging up and down the bridle path adjacent to Hewins Wood. It was recorded commuting back to Finemere Wood along the hedgerow perpendicular to the Aylesbury Link Railway that links to north-west of Finemere Wood. Bat 66, a male Bechstein's, was recorded leaving Finemere Wood on a number of occasions and

commuting south along the Aylesbury Link Railway, crossing the Edgcott Road, presumably to access foraging habitat to the south.

### **Brandt's bat radio-tracking data**

#### **Brandt's roosts and flightlines 2012**

- 4.13.21 A female Brandt's bats was captured on the Aylesbury Link Railway to the south of Benfields overbridge. This female bat was radio-tagged and subsequently recorded roosting in Sheephouse Wood. The location of this roost is shown in Figure 9. It was not possible to access the woodlands where the roost was situated to obtain colony counts as access was restricted. The estimates of roosting locations were obtained by taken multiple bearings from different locations in the vicinity where the signal was emitted.
- 4.13.22 This bat was not subsequently recorded flying adjacent to the Aylesbury Link Railway.

#### **Brandt's bat roosts and flightlines 2013**

- 4.13.23 In 2013, six female Brandt's were radio-tagged (including one female by the North Bucks Bat Group) and six roosts were subsequently identified. Three tree roosts were identified in Sheephouse Wood, one in a house at Rectory Farm in Edgcott, one in house at Woodlands Farm, approximately 50 metres from the Proposed Scheme and a tree roost in Finemere Wood. Access to the roosting locations to obtain colony counts was restricted for all roosting locations apart from Finemere Wood. An emergence survey was undertaken on the tree roost located in the north of Finemere Wood. A number of Myotis bat passes were recorded at dusk but it was not possible to determine the roosting cavity as it was too high in the canopy and obscured by vegetation.
- 4.13.24 Brandt's bats roosts were confirmed in Finemere Wood and at Woodlands Farm, Brandt's bat were recorded foraging along the River Ray culvert and the disused Akeman Street Disused Railway line. The Brandt's bat roosting at Woodlands Farm, bat 46, was recorded using both of these habitat features as flight lines, but it also used the existing Aylesbury Link Railway for commuting to Finemere Wood. This female also used the hedgerow perpendicular to the Aylesbury Link Railway that links to the north-west of Finemere Wood.
- 4.13.25 Flightlines were also identified for the three Brandt's bats roosting in Sheephouse Wood. These three breeding females roosting in Sheephouse regularly crossed the Proposed Scheme to access foraging habitat around water bodies at the Calvert Landfill site and along the Mega Ditch. They also crossed the Proposed Scheme at the Costello underbridge to the south of Sheephouse Wood and at the Aylesbury Link railway.
- 4.13.26 A partial flightline was recorded for bat 51 that roosted at Edgcott. This female flew across open farmland to access foraging habitat in Sheephouse Wood. This bat followed hedgerows for part of its commuting route but it is likely that more open arable habitat was also used.



## Brown long-eared bat radio-tracking data

### Brown long-eared bat roosts and flightlines 2012

- 4.13.27 A total of four brown long-eared bats were captured and radio-tagged and nine roosts were subsequently located. There are detailed in Figure 11. These included roosts in trees and bat boxes in Finemere Wood to the north-east of the Proposed Scheme, a roost in a tree adjacent to the bridleway alongside Hewins Wood and in a house at Greatmoor Farm (this roost has subsequently been demolished under EPS licence as part of the Energy for waste (EfW) development).
- 4.13.28 Bat number 2 was captured on the 23 August 2012 on the railway line adjacent to Sheepphouse Wood. It was subsequently recorded roosting in two different trees to the north of Sheepphouse Wood and was also recorded roosting in a tree adjacent on the bridle path to the west of the existing Aylesbury Link Railway. Permission to access Sheepphouse Wood in order to obtain a colony count was not granted. The estimates of roosting locations were obtained by multiple bearings from different locations in the vicinity where the signal was emitted. An emergence survey of the tree adjacent to the bridle path to the west of the railway line found that the female was roosting alone (in a cavity that had been created by lightning) whilst using this tree. Upon emergence a distinct flightline was recorded whereby the bat flew south along the existing railway line prior to departing in a westerly direction to the south of the landfill site. The flightline is shown in Figure 21.
- 4.13.29 Bat 12 was captured on 13 September 2012 on the Benfield's Over-bridge railway crossing. It was recorded roosting alone both in a tree on the bridleway adjacent to Hewins Wood and in the cottage at Greatmoor Farm. The roosts are shown in Figure 11. No specific flightlines were identified for this bat as it foraged in close proximity to its roosts.
- 4.13.30 Bat 13 was captured in the same harp trap at the same time as Bat 12. It was recorded roosting in three different tree roosts in Greatsea Wood to the north-east of the Proposed Scheme. Permission to access the woodland where the roost was situated in order to obtain a colony count was not granted. The likely roosting locations are shown in Figure 11. The bat flew south from Greatsea Wood along the hedgerow perpendicular to the Aylesbury Link Railway that connects to the north-west of Finemere Wood. It crossed the railway line at Grendon Junction to access the bridleway adjacent to Hewins Wood for foraging. The flightline crossing the Proposed Scheme at Grendon Junction is shown in Figure 21.
- 4.13.31 Bat 14 radio-tracked during the study was captured on the bridleway to the south of Greatmoor Farm on the 20 September 2012. It was subsequently recorded roosting in purpose-built bat boxes within Finemere Wood, as shown in Figure 11. It used the same flightlines crossing the Proposed Scheme at Grendon Junction as Bat 13, shown in Figure 21.

### Brown Long-eared bat roosts and flightlines 2013

- 4.13.32 In 2013 a total of ten female brown long-eared bats were radio-tracked (including four brown long-eared bats radio-tagged by the North Bucks Bat Group) and 18 roosts were subsequently located. The roosts are shown in Figure 11. One of the roosts, used by Bat 32 (a breeding female), was in the same tree roost as that used

by Bat 2 in 2012 (the tree adjacent to the bridle path to the west of the railway line where the female was found roosting in a cavity that had been created by lightning). The location of this tree is detailed in Figure 21. The emergence survey recorded at least seven females emerging from the tree, indicating that a likely small maternity colony uses this tree for roosting.

- 4.13.33 In May 2013 one female brown long-eared bat was captured and radio-tagged at the Costello underpass to the south of Sheephouse Wood. This female roosted in Sheephouse Wood. The North Bucks Bat Group confirmed that this bat was roosting in one of the bat boxes in Sheephouse Wood during the radio-tracking period. In July and August, three further breeding female bats were captured and radio-tagged on the Aylesbury Link Railway Line at Decoypond Wood and Sheephouse Wood used four different roosts, two in Sheephouse Wood, one in Decoypond Wood and one in the mature woodland belt to the west of the Proposed Scheme, adjacent to the Calvert landfill site. No colony counts were obtained for these roosts due to restricted access.
- 4.13.34 The roosts used by the remaining six brown long-eared bats radio-tracked in 2013 (including four which were radio-tagged by the North Bucks Bat Group) were located in Finemere Wood. The roosts comprised of trees and bat boxes.
- 4.13.35 Flightlines in 2013 were identified for the brown long-eared roosting in Sheephouse Wood, to the west of the Proposed Scheme along the bridle path and in Decoypond Wood. These comprised short commuting routes across the Proposed Scheme between roosts and foraging areas in Sheephouse Wood and Decoypond Wood. Bat 4 radio-tracked in May 2013 was also recorded flying along the Mega Ditch and along hedgerows adjacent to Moor Farm. The flightlines are shown in Figure 21.

## Common pipistrelle radio-tracking data

### Common pipistrelle roosts and flightlines 2012

- 4.13.36 One common pipistrelle was radio-tagged in 2012. A roost was subsequently recorded in the structure of the Adams Underbridge and River Ray culvert, the location of which is detailed in Figure 12. An emergence survey observed 22 bats exiting the bridge roost on the 24 September 2012. Given that the female radio-tagged was post-lactating and 22 bats were present (including juveniles that were captured at this location during the trappings surveys), this structure is likely to be used as a maternity colony roost. The radio-tagged bat was subsequently recorded using an oak tree along the Aylesbury Link Railway as a day roost during the radio-tracking period, as shown in Figure 12.
- 4.13.37 Two distinct flightlines from the roost were recorded. The radio-tagged female flew north along the vegetated footpath to the east of the Proposed Scheme that leads to the fishing lake to the west of Finemere Wood. There was also evidence of bats using the existing Adams Underbridge and River Ray culvert as a flight line (that were not radio-tagged). On emergence these bats departed in either a westerly direction along the River Ray, or an easterly direction along the hedgerow towards Finemere Wood.

### **Common pipistrelle roosts and flightlines 2012**

- 4.13.38 A total of 21 female and 15 males were captured in 2013 but the majority of common pipistrelle bats were too light to have a radio-transmitter fitted (see Table 9 of Annex 1 of this report for bat biometrics). Only two females were considered suitable (6g or more) for radio-tagging.
- 4.13.39 One female common pipistrelle, bat 30, captured in 2013 at Sheephouse Wood, was subsequently found roosting in a house in Quainton, as shown in Figure 12. It was not possible to ascertain whether this was a maternity roost, due to access restrictions, but a number of common pipistrelle passes were detected in the vicinity of the roost at dusk.
- 4.13.40 Flightlines for bat 30 comprised of the existing Aylesbury Link Railway from Quainton to Sheephouse Wood, as shown in Figures 22a and 22b. This also comprised part of the same flightline used by the common pipistrelle radio-tracked in 2012
- 4.13.41 The second common pipistrelle, bat 58, captured on the 6 August 2013 at Calvert Jubilee, was subsequently found roosting in a small wooded block (unnamed) to the east of the Proposed Scheme approximately 250 metres south of School Hill Bridge, as shown in Figure 12.
- 4.13.42 A precise flightline was not confirmed for bat 58 but it was recorded moving between the woodland block and Calvert Jubilee Nature Reserve LWS. Nonetheless, given that nine common and soprano pipistrelle bats were captured at dusk on the 10 June 2013 along the Aylesbury Link Railway vegetation at Calvert, it is likely that this linear vegetation corridor is used by common pipistrelle for commuting to foraging locations.

### **Daubenton's bat radio-tracking data**

#### **Daubenton's bat roosts and flightlines 2012**

- 4.13.43 A total of two female Daubenton's bats were radio-tagged in 2012. Bat number 1 was captured on the Aylesbury Link Railway to the south of Calvert and a roost was subsequently located to the south-west of Sheephouse Wood, as shown in Figure 13. Permission to access the woodlands in order to obtain a colony count was not granted. Bat 2 was captured on the bridleway adjacent to Hewin's Wood in September 2012 and was subsequently recorded roosting in the same location as bat 1.
- 4.13.44 Bat 1 consistently commuted along the Aylesbury Link Railway after emergence from Sheephouse Wood to access the Calvert Jubilee nature reserve LWS. This flightline is shown in Figure 23.
- 4.13.45 A flightline between Sheephouse Wood and the water bodies at the Calvert landfill site, where bat 15 crossed the Proposed Scheme was also identified. The flightline is shown in Figure 23.

### Daubenton's bat roosts and flightlines 2013

- 4.13.46 Nine female Daubenton's bat were radio-tagged in 2013 (including one Daubenton's radio-tagged by the North Bucks Bat Group) and 16 roosts were subsequently located. The roosts are shown in Figure 13.
- 4.13.47 Two Daubenton's bats, bat 14 and bat 57, were captured at Calvert Jubilee nature reserve LWS in June and August 2013 respectively. Roosts were subsequently located at Church Copse to the north of Chetwode, approximately 7km north-west of Calvert. Flightlines were identified along the disused railway line, comprising linear vegetation, to the south of Chetwode towards Tywford. Bat 57 was subsequently recorded roosting and foraging at Addington and did not return to Calvert Jubilee during the foraging period. No flightlines were identified for this bat. The roosts for bats 14 and 57 are shown in Figure 13
- 4.13.48 In May 2013 Daubenton's bat 6 was recorded roosting in both Finemere Wood and Doddershall Wood. The bat roost switched between Finemere Wood and Doddershall Wood in the daytime on the May 14 2013. The disused Akeman Street Railway was identified as a flightline, as shown in Figure 23 for this bat commuting from Doddershall Wood to foraging habitat around a large pond located to the north of Benfields Overbridge. The bat was also recorded crossing the bridge over the disused Akeman Street railway commuting to Finemere Wood and flying underneath the bridge in a southerly direction.
- 4.13.49 Four female Daubenton's bats (including one juvenile) were captured and radio-tagged at Sheephouse Wood during the July and August 2013. These four bats used six roosts, three in Sheephouse Wood and three in Decoypond Wood during the radio-tracking period. The locations of the roosts are shown in Figure 13 No colony counts were obtained for these roosts due to restricted access.
- 4.13.50 The Daubenton's bats roosting in Sheephouse Wood in 2013 crossed the Proposed Scheme to access the water bodies at the Calvert landfill site. At least three different crossing points were identified during the radio-tracking period. This behaviour was similar to that of Daubenton's bat 15 radio-tracked in 2012.
- 4.13.51 The Daubenton's bats roosting in Decoypond Wood in 2013 used the Aylesbury Link Railway to commute to foraging habitat at Calvert Jubilee and also Grebe Lake. This also comprised part of the same flightline used by the Daubenton's bat 1 radio-tracked in 2012. Bat 42 was recorded crossing the road between the two water bodies.
- 4.13.52 The Daubenton's bat captured at the Finemere Lakes in July 2013 was recorded roosting in both Grendon Wood and in Finemere Wood. An emergence survey of the tree roost in Finemere Wood recorded only two bats emerging (including the radio-tagged bat) but a high number of *Myotis* passes were recorded at dusk. This female was recorded commuting along the bridle-path adjacent to Hewin's Wood commuting to foraging habitat around the Finemere Fishing Lakes, and crossing the Proposed Scheme at Grendon Junction. It was also recorded along the Aylesbury Link Railway commuting to foraging habitat around water bodies at the Calvert landfill site.

- 4.13.53 The Daubenton's bat radio-tagged by the North Bucks Bat Group in August 2013 roosted in Finemere Wood and Grendon Wood. The bat was subsequently recorded crossing the Proposed Scheme at Grendon Junction. It was also recorded along the Aylesbury Link Railway commuting to foraging habitat around water bodies at the Calvert landfill site.

### **Natterer's radio-tracking data**

#### **Natterer's bat roosts and flightlines 2012 and 2013**

- 4.13.54 Two female Natterer's bats were captured and radio-tagged in 2012 and five roosts were subsequently located. Five of these roosts were located in bat boxes within Finemere Wood and one was located in a tree within the bridleway adjacent to Hewins Wood.
- 4.13.55 Bat 4 captured was captured on Aylesbury Link Railway, adjacent to the hedgerow perpendicular to the railway that links to the north-west of Finemere Wood. The bat was subsequently recorded roosting in purpose-built bat boxes within the wood. Emergence surveys or bat box checks were not carried out at this location as permission for access to undertake monitoring was not granted. The roosting locations are detailed in Figure 14.
- 4.13.56 Subsequent radio-tracking revealed that the bat was captured on a flightline which connects its roosting area in Finemere Wood to foraging locations to the west of the Proposed Scheme. The flightline is shown in Figure 24.
- 4.13.57 The second Natterer's bat was captured in September 2012 adjacent to the bridle path next to Hewin's Wood. It was subsequently recorded roosting in purpose-built bat boxes within the woodland and, also, in a tree adjacent to the bridleway, but the precise roosting location within the tree could not be ascertained as the foliage in the canopy was obscuring the roost entrance. It used the same flightline at bat 4 but was also recorded on the existing railway line between Grendon Junction and Benfields Overbridge Bridge, which crosses the disused Akeman Street railway. The flightline is shown in Figure 24.

#### **Natterer's roost and flightlines 2013**

- 4.13.58 Four Natterer's bats were radio-tagged in 2013 and eight Natterer's roosts were subsequently located as shown in Figure 14.
- 4.13.59 In May 2013 a female Natterer's was captured at Finemere Lakes and was subsequently recorded roosting in an oak tree in Finemere Wood. It was recorded commuting to Finemere Fishing Lake for foraging on one occasion but predominately remained in the woodland.
- 4.13.60 In 2013 two Natterer's were captured and radio-tracked between Benfields overbridge and Finemere Lakes. One female roosted in Grendon Wood and was recorded commuting along the disused Akeman Street Railway to foraging sites along the Mega Ditch and hedgerows within the vicinity of Moor Farm to the west of the Proposed Scheme. It was also recorded flying east along the Edgcott Road.
- 4.13.61 The second Natterer's radio-tracked in June 2013 roosted alone in an oak tree along the disused Akeman Street Railway, and then in an oak tree on a field margin to the north-west of Finemere, before moving to Middle Farm approximately 4km to the

east of the Proposed Scheme. No emergence survey data was available for the farm due to restricted access but a high number of confirmed Natterer's bat passes were recorded along the hedgerow to the north of the building complex where there was public access.

4.13.62 The flightlines identified between roosting sites and foraging sites for the three Natterer's radio-tracked in May and June 2013 are detailed in Figure 24.

4.13.63 The Natterer's radio-tracked in July 2013 roosted and foraged in Finemere Wood and no discernible flightlines were identified.

### **Noctule radio-tracking data**

#### **Noctule roost and flightlines 2013**

4.13.64 One female noctule bat was captured at Grendon Junction in August 2013 and radio-tagged. This female was subsequently recorded roosting in Doddershall Wood, as detailed in Figure 15. Upon emergence from the wood the bat flew in a north-easterly direction across the Proposed Scheme, once in a north-westerly direction towards Sheephouse Wood and, on the subsequent evening, in an easterly direction toward Finemere Wood. The bat was flying high and did not appear to be following linear features. The flightlines recorded are detailed in Figure 25.

### **Soprano pipistrelle radio-tracking data**

#### **Soprano Pipistrelle roosts and flightlines 2012**

4.13.65 One soprano pipistrelle was radio-tagged in August 2012. The bat roosted in a building within the Woodlands Farm complex as shown in Figure 16. The radio-tagged soprano pipistrelle foraged in the field to the rear of Woodlands Farm and commuted north along the disused Akeman Street Railway. On one occasion it flew south on emergence, underneath the Adams Underbridge River Ray culvert, prior to commuting along the Aylesbury Link Railway. The flightlines identified for this bat are shown in Figure 26.

#### **Soprano Pipistrelle roosts and flightlines 2013**

4.13.66 A total of 31 female and 25 males were captured in 2013 but the majority of soprano pipistrelle bats were too light to have a radio-transmitter fitted (see Table 10 of Annex 2 of this report for bat biometrics). Only two females were considered suitable (6g or more) for radio-tagging.

4.13.67 The first soprano pipistrelle, bat 12 radio-tracked in June 2013, was captured at Grendon Junction and subsequently found roosting at Woodlands Farm. This was the same roost used by soprano pipistrelle radio-tracked in 2012. This bat was also recorded roosting during the night in a tree adjacent to the River Ray. The second soprano pipistrelle, bat 50, radio-tracked in August 2013, captured at Benfield's Over Bridge was recorded roosting in buildings at Benfields Overbridge and in Finemere Wood. It roosted alone along in Finemere Wood on the first night after radio-tagging and then moved to the buildings at Oak Tree Farm for the remainder of the tracking period.

4.13.68 Flightlines for bat 12 comprised of the Aylesbury Link Railway line, and this also comprised part of the same flightline used by the soprano pipistrelle radio-tracked

in 2012. Flightlines for bat 50 comprised of the bridleway between Oak Tree Farm and Finemere Wood. The flightlines for both soprano pipistrelle bats radio-tracked in 2013 is shown in Figure 26.

### **Whiskered bat radio-tracking data**

#### **Whiskered bat roosts and flightlines 2012**

- 4.13.69 Two whiskered bats were radio-tracked in 2012 and roosting locations were subsequently recorded.
- 4.13.70 Bat 1 was captured on the railway line at Grendon Junction in August 2012. It was subsequently recorded roosting in a building at Woodlands Farm. An emergence survey of this property on the 31 August 2012 identified at least fifteen whiskered bats emerging from the building in addition to four Common Pipistrelle bats. The location of this roost is shown in Figure 17. A flightline was identified for this bat when it flew south from the roost and crossed the Aylesbury Link Railway at Adam's Underbridge River Ray culvert. It then flew north along the strip of vegetation adjacent to the Aylesbury Link Railway beside the access track to the Finemere Fishing Lake to access foraging habitat north of the lake. The flightlines identified in 2012 are detailed in Figure 27.
- 4.13.71 Bat 10 captured at Grendon Junction in September 2012 was subsequently recorded roosting to the north of Sheepphouse Wood. The location of this roost is shown in Figure 17. It was not possible to access Sheepphouse Wood to obtain an emergence count as access to this wood was restricted. No discernible flightlines were identified for this bat as it foraged in Sheepphouse Wood but it is presumed that it must have left the woodland on occasion as it was captured to the south at Grendon Junction.

#### **Whiskered bat roosts and flightlines 2013**

- 4.13.72 Seven whiskered bats were radio-tracked in 2013 (including one whiskered bat radio-tagged in 2013 by the North Bucks Bat Group) and ten whiskered roosts were subsequently located. The locations of the roosts recorded in 2013 are shown in Figure 17.
- 4.13.73 One whiskered bat was captured at Benfields Overbridge in May and was subsequently recorded roosting in an oak tree in Finemere wood. It was recorded crossing the Proposed Scheme at Grendon Junction to commute to foraging habitat alongside the Muxwell Brook. It was also recorded commuting along the hedgerow that is perpendicular to the Aylesbury Link Railway and connects to the north-west of Finemere Wood.
- 4.13.74 Two whiskered bats were radio-tracked in June 2013. The first female was captured along the hedgerow that links the north-west of Finemere Wood to the Aylesbury Link Railway Line. It roosted in buildings at Woodlands Farm for one night before moving to Doddershall Woods. After emergence from Woodlands Farm it was recorded commuting along the disused Akeman Street Railway between Doddershall Wood and the hedgerow where it was captured. The second female whiskered radio-tracked in June 2013 was captured at Grendon Junction and was subsequently recorded roosting at two locations to the south of Doddershall Wood. No further discernible flightlines were recorded for this bat after it was radio-

tagged as it tended to remain in Doddershall Woods, but it was presumed that it was using the disused Akeman Street Railway or Aylesbury Link Railway, given that it was captured at Grendon Junction.

- 4.13.75 Three whiskered bats were captured in July 2013. Bat 23 was captured along the hedgerow that links the north-west of Finemere Wood to the Aylesbury Link Railway Line, and was subsequently recorded roosting in Greatsea Wood. Permission to access Greatsea Wood in order to obtain a colony count was not granted. This bat foraged briefly in the wood after emergence and commuted to Finemere Wood to forage via Balmore Wood and hedgerows along the Bernwood Jubilee Way.
- 4.13.76 Bat 26 and 31 were captured adjacent to Sheepphouse Wood in July 2013. Bat 26 was subsequently recorded roosting at Rectory Farm in Edgcott and bat 31 was subsequently recorded roosting at Dunsty Hill Farm and at Lawn Hill Farm in Edgcott. It was not possible to obtain emergence counts at these locations as access permission was not granted. For the whiskered bat roosting at Dunsty Hill Farm and Lawn Hill Farm flightlines were recorded that followed hedgerows and watercourses to the south of the landfill site to access foraging habitat in Sheepphouse Wood. No discernible flightlines were recorded for bat 26 roosting at Rectory Farm but it was recorded crossing the Proposed Scheme at Sheepphouse Wood to access water bodies for foraging at the Calvert landfill site.
- 4.13.77 In August 2013 one whiskered bat was radio-tagged by the North Bucks Bat Group. It was subsequently recorded roosting in Quainton and after emergence flew directly north to Hill End Farm where it foraged briefly in a copse. It then commuted in a westerly direction to forage in Runts Wood and then flew south into Finemere Wood. The dawn flightline for when this bat returned to its roost was more direct back to Quainton and it was likely to have commuted along the Bernwood Jubilee Way.

## 4.14 Foraging areas

- 4.14.1 Descriptions of foraging areas are provided below in individual species accounts. These are based on the 100%MCP and 95%KDE analysis as described in the methodology. Table 7 and Table 8 summarise the MCP, and KDE data for each bat radio-tracked bat in 2012 & 2013 respectively.

Table 7: Number of bats tracked, tracking period and corresponding range size obtained for each bat during the 2012 study.

Bat	Species	Date Capture	No of nights radio-tracked	100%, MCP(ha)	95%, KDE (ha)	50%, KDE (ha)
1	Daubenton's	21.8.12	7	610.00	252.54	20.85
2	Brown long-eared	23.8.12	5	115.44	156.40	17.61
3	Brandt's	24.8.12	4	18.86	17.52	0.77
4	Natterer's	28.8.12	7	53.75	37.22	3.45
5	Whiskered	28.8.12	2	50.38	12.28	0.79
6	Soprano pipistrelle	28.8.12	5	40.09	30.76	3.32



Bat	Species	Date Capture	No of nights radio-tracked	100%, MCP(ha)	95%, KDE (ha)	50%, KDE (ha)
7	Bechstein's	1.9.12	5	412.90	421.50	70.50
8	Natterer's	1.9.12	7	40.15	67.02	10.72
9	Leislars	9.9.12	1	n/a	n/a	n/a
10	Whiskered	12.9.12	4	33.10	21.85	2.22
11	Bechstein's	13.9.12	5	139.00	78.00	2.40
12	Brown long-eared	13.9.12	5	16.70	16.24	1.45
13	Brown long-eared	13.9.12	5	24.20	32.43	4.82
14	Brown long-eared	20.9.12	4	25.98	59.38	13.99
15	Daubenton's	20.9.12	4	115.10	140.54	16.20
16	Bechstein's	20.9.12	4	185.10	327.35	39.40
17	Common pipistrelle	22.9.12	3	24.82	3.69	0.29

Table 8: Number of bats tracked, tracking period and corresponding range size obtained for each bat during the 2013 study.

Bat	Species	Date Capture	No of nights radio-tracked	100%, MCP(ha)	95%, KDE (ha)	50%, KDE (ha)
1	Whiskered	6.5.13	4	76.54	73.25	15.32
2	Barbastelle	6.5.13	2	708.21	n/a	n/a
3	Bechstein's	10.5.13	6	2.58	2.73	0.30
4	Brown Long-eared	10.5.13	5	26.54	19.96	8.93
5	Natterers	12.5.13	4	71.77	71.77	22.76
6	Daubenton's	12.5.13	4	169.30	151.38	68.04
7	Natterers	7.6.13	3	259.79	164.31	8.67
8	Brown Long-eared	8.6.13	6	12.84	13.85	6.48
9	Whiskered	8.6.13	6	60.21	52.96	17.42
10	Natterers	8.6.13	2	95.08	n/a	n/a
11	Bechstein's	8.6.13	0	n/a	n/a	n/a
12	Soprano Pipistrelle	9.6.13	5	98.01	106.53	17.89
13	Whiskered	9.6.13	3	19.25	19.25	5.29
14	Daubenton's	10.6.13	3	505.65	n/a	n/a

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15	Brandt's	13.6.13	5	204.73	314.52	72.12
16	Bechstein's	16.6.13	4	96.14	204.73	16.78
17	Bechstein's	16.6.13	4	78.11	31.06	4.28
18	Bechstein's	16.6.13	4	80.49	46.12	11.63
19	Bechstein's	16.6.13	4	30.30	28.66	10.91
20	Bechstein's	16.6.13	4	39.37	6.65	0.81
21	Bechstein's	13.7.13	4	21.23	11.57	1.32
22	Natterers	13.7.13	3	41.96	52.42	9.95
23	Whiskered	13.7.13	3	15.27	7.33	0.85
24	Brown Long-eared	13.7.13	4	3.47	4.67	0.85
25	Brandt's	13.7.13	4	39.98	35.40	11.07
26	Whiskered	13.7.13	3	39.98	39.98	3.88
27	Brandt's	14.7.13	1	33.08	n/a	n/a
28	Daubenton's	14.7.12	3	184.64	164.58	66.54
29	Daubenton's	14.7.12	4	67.05	43.81	12.26
30	Common Pipistrelle	14.7.12	1	n/a	n/a	n/a
31	Whiskered	14.7.12	4	207.91	234.96	48.82
32	Brown Long-eared	14.7.12	4	7.18	6.71	4.14
33	Bechstein's	16.7.13	7	112.34	79.94	14.73
34	Bechstein's	17.7.13	6	177.33	110.99	34.65
35	Natterers	17.7.13	6	137.17	134.95	31.33
36	Bechstein's	19.7.13	4	37.28	13.17	6.14
37	Bechstein's	19.7.13	4	105.20	43.22	22.92
38	Bechstein's	19.7.13	4	45.22	35.48	3.70
39	Bechstein's	19.7.13	4	95.81	26.84	5.35
40	Bechstein's	19.7.13	4	78.60	26.63	4.65
41	Bechstein's	19.7.13	4	55.36	19.93	6.72
42	Daubenton's	20.7.13	3	109.86	25.17	3.37
43	Brown Long-eared	1.8.13	5	639.04	150.43	12.35
44	Brown Long-eared	1.8.13	1	n/a	n/a	n/a
45	Bechstein's	2.8.13	2	n/a	n/a	n/a

46	Brandt's	2.8.13	4	71.65	27.46	9.88
47	Daubenton's	2.8.13	5	311.13	310.68	9.88
48	Brown Long-eared	2.8.13	5	124.39	143.61	61.64
49	Whiskered	2.8.13	5	298.79	289.90	67.46
50	Soprano Pipistrelle	2.8.13	5	2465.28	381.88	66.38
51	Brandt's	3.8.13	3	258.62	189.01	30.24
52	Brandt's	3.8.13	4	353.28	429.85	122.68
53	Daubenton's	3.8.13	3	190.02	117.39	46.87
54	Brown Long-eared	3.8.13	4	36.41	21.07	9.49
55	Brown Long-eared	3.8.13	4	132.13	123.01	38.94
56	Daubenton's	4.8.13	4	67.67	17.67	1.15
57	Daubenton's	6.8.13	n/a	n/a	n/a	n/a
58	Common Pipistrelle	6.8.13	2	16.69	12.12	5.58
59	Bechstein's	7.8.13	4	243.52	31.06	11.30
60	Bechstein's	7.8.13	6	687.27	98.90	4.20
61	Noctule	8.8.13	2	264.10	n/a	n/a
62	Bechstein's	8.8.13	6	284.46	71.62	6.10
63	Brown Long-eared	10.8.13	n/a	n/a	n/a	n/a
64	Bechstein's	10.8.13	4	78.39	95.22	34.69
65	Bechstein's	10.8.13	4	102.98	89.34	19.76
66	Bechstein's	10.8.13	4	154.04	128.33	17.27

### Barbastelle 2013 foraging

- 4.14.2 The barbastelle radio-tracked in May 2013 was only encountered briefly during the radio-tracking period. It was recorded flying fast, presumably commuting, along the disused Akeman Street Railway between the A41 and Grendon Junction. It was also recorded flying north towards Sheeppouse Wood.

### Bechstein's 2012 foraging

- 4.14.3 Figure 28 details the 100%MCP, 95%KDE and 50%KDE respectively for the three Bechstein's bats radio-tracked during the study. Two Bechstein's bats had a similar pattern of behaviour. Both of these females tended to fly quickly along the bridleway adjacent to Hewins Wood, which suggests they were commuting as opposed to foraging. There was evidence that Bat 7 may have foraged briefly in the

scrub vegetation alongside the Mega Ditch adjacent to the existing railway line, as this bat was recorded for approximately 10 minutes at this location. Both of these females were subsequently recorded in Romer and Greatsea woods where they remained foraging during the tracking period. The other Bechstein's radio-tracked in 2012, bat 11, foraged in Hewin's Wood on the first night after capture. On subsequent nights foraging activity shifted further to the south and it was recorded in Doddershall Wood and foraging along mature hedges that link Doddershall Wood to Ham Green Wood to the south. This bat did not forage within woodland to the north-east of the Proposed Scheme but was recorded foraging in Hewins Wood which is 500 metres to the south-west of the proposed route.

### **Bechstein's 2013 foraging**

- 4.14.4 Figure 36 details the 100%MCP, 95%KDE and 50%KDE for all 20 Bechstein's radio-tracked (where adequate foraging data were obtained). Core foraging areas (denoted by 50%KDE) dominated by woodland habitat were identified in Finemere Wood and the woodland complex to the north-east of the Proposed Scheme that comprises Greatsea, Romer, Runts and Balmore woods. Total range areas (100%MCP) and peripheral foraging areas (denoted by the 95%KDE) comprised predominately of woodland, but habitat features such as water bodies, watercourses, scrub, hedgerows and vegetation alongside existing railway lines were also used.
- 4.14.5 The Finemere maternity colony of Bechstein's bats predominately use Finemere Wood and the network of woodlands to the north-west of the scheme. Two female Bechstein's and one male Bechstein's radio-tracked in 2013 from the Finemere colony used Sheephouse Wood for foraging, which is adjacent to the Proposed Scheme.
- 4.14.6 In August 2013 one male Bechstein's bat from the Finemere colony was recorded foraging along the existing Aylesbury Link Railway and commuting to woodland copses to the south of the Edgcott Road. One juvenile female Bechstein's bat was also recorded in August 2013 foraging in the scrub and immature woodland vegetation between the disused Akeman Street Railway and the existing Aylesbury Link Railway and along the Hewin's Wood Bridle path.
- 4.14.7 Three female Bechstein's bats that roosted in Grendon and Doddershall woods to the south-west of the Proposed Scheme, regularly crossed the Proposed Scheme to access foraging habitat in Greatsea and Romer Wood and, also, in Sheephouse Wood.

### **Brandt's 2012 foraging**

- 4.14.8 The female Brandt's bat radio-tracked during the study spent the majority of its time foraging in Sheephouse Wood, to the south and also along the Muxwell Brook, a vegetated stream that runs along the southern boundary of the wood. Figure 29 details the 100%MCP, 95%KDE and 50%KDE foraging range representation.

### **Brandt's 2013 foraging**

- 4.14.9 Figure 37 details the 100%MCP, 95%KDE and 50%KDE for all five Brandt's radio-tracked in 2013 (where adequate foraging data were obtained). Core foraging areas

(denoted by 50%KDE) dominated by woodland habitat were identified in Sheephouse, Finemere and Romer woods but there was evidence that the scrub vegetation and water bodies to the west of the Proposed Scheme were also used.

- 4.14.10 The three female Brandt's roosting in Sheephouse Wood regularly crossed the Proposed Scheme spending the majority of their foraging time around the water bodies at the Calvert landfill site foraging up and down the Mega Ditch. The breeding female roosting in Edgcott foraged predominately in Sheephouse Wood.
- 4.14.11 The Brandt's roosting in Woodlands Farm to the west of the Proposed Scheme foraged in Finemere Wood and around Finemere fishing lakes. The Brandt's roosting in Finemere Wood foraged in the wood but also made use of the woodland complex, including Greatsea and Romer Woods, to the north-east of the Proposed Scheme.

### **Brown Long-eared 2012 foraging**

- 4.14.12 Figure 30 details the 100%MCP, 95%KDE and 50%KDE respectively for the four brown long-eared bats radio-tracked in 2012. Bat 2 foraged in Sheephouse Wood for approximately two to three hours after emergence. It was recorded once flying directly south along the railway line prior to flying west. It was recorded on three evenings foraging along the hedgerows in and around Grendon HM Young Offenders Institute and in woodland copses to the south of the landfill site. Bat 12 remained in the vicinity of the bridleway adjacent to Hewin's Wood foraging back and forth along the bridleway and in Hewins Wood. Bat 13 foraged in Greatsea Wood and along the hedgerows to the south of Greatsea Wood and along the mature hedgerows that connect Finemere Wood to the Aylesbury Link Railway. Bat 14, foraged in Finemere Wood after emergence and crossed the railway line numerous times while foraging. It also foraged along the mature hedgerow that is perpendicular to the Aylesbury Link Line, along the bridle path adjacent to the mature hedge that connects Finemere Wood to the existing railway line, and along the bridleway south of Greatmoor Farm.

### **Brown long-eared 2013 foraging**

- 4.14.13 Figure 38 details the 100%MCP, 95%KDE and 50%KDE for nine brown long-eared bats. Sufficient foraging data were not obtained from one of the brown long-eared bat, bat 63, radio-tagged by the North Bucks Bat Group in August due to the fact that the HS2 radio-tracking team focussed radio-tracking activity on other bats crossing the Proposed Scheme.
- 4.14.14 Core foraging areas (denoted by 50%KDE), dominated by woodland habitat, were identified in Sheephouse Wood and Finemere Wood. Bats occasionally used habitats to the west of the Proposed Scheme (as indicated by the 95%KDE and 100%MCP) and, in particular, bat 4 left Sheephouse Wood to forage within the Mega Ditch and along hedgerow adjacent to Moor Farm.

### **Common Pipistrelle 2012 foraging**

- 4.14.15 The common pipistrelle female radio-tracked during the study spent the majority of her time flying back and forth in a linear manner alongside the existing railway vegetation in both directions and to the west of the railway. Figure 31 details the 100%MCP, 95%KDE and 50%KDE foraging range representation.

### Common Pipistrelle 2013 foraging

- 4.14.16 Bat 30 roosting at Quanton was subsequently recorded foraging 5km to the south-west of the Proposed Scheme. It flew along the railway line to Sheephouse Wood on one occasion after radio-tagging but predominately spent foraging time away from the Proposed Scheme. The HS2 radio-tracking team were positioned alongside the Proposed Scheme to focus on bats using habitats within this area and, as a result detailed foraging data was recorded for this female (but the tracking team checked its radio-tag frequency every 15-20 minutes to ascertain if it had returned to the area of capture near to the Proposed Scheme).
- 4.14.17 Bat 58 captured at Calvert Jubilee foraged predominately near to the woodland block where it roosted. It was recorded foraging back and forth underneath Calvert Bridge and over the area of Network Rail land comprising of scrub vegetation to the east of the Proposed Scheme. It was also detected foraging around Calvert Jubilee Nature Reserve.

### Daubenton's 2012 foraging

- 4.14.18 Figure 32 details the 100%MCP, 95%KDE and 50%KDE respectively for the two Daubenton's radio-tracked during the study. Both females foraged in Sheephouse Wood for between one and two hours after emergence. The first, Daubenton's Bat 1, flew north alongside the Aylesbury Link Railway to reach the Calvert Jubilee Nature Reserve LWS and adjacent fishing lakes where it spent a number of hours foraging over the water. On two occasions it flew east and foraged around the water-bodies at Claydon House Estate. It subsequently returned to Sheephouse Wood to forage prior to returning to its roost. The second female, Bat 15 (Daubenton's Bat 2) had two distinct foraging areas, one within Sheephouse Wood and the second around the water bodies in the landfill site to the west of the Aylesbury Link Railway. This bat disappeared from range numerous times flying south and was not detected so its range is likely to be under-represented.

### Daubenton's 2013 foraging

- 4.14.19 Figure 40 details the 100%MCP, 95%KDE and 50%KDE for seven Daubenton's (sufficient foraging data were not obtained from two bats due to restricted access issues) radio-tracked in 2013.
- 4.14.20 Core foraging areas (denoted by 50%KDE) were dominated by woodland and water bodies. Key woodland areas used by the bats captured adjacent to the Proposed Scheme included Doddershall Finemere and Sheephouse woods. Key foraging water bodies included Calvert Jubilee nature reserve LWS, Grebe Lake, Finemere fishing lakes, the water bodies at the Calvert landfill site and a large pond to the north of Oak Tree Farm, just south-west of the disused Akeman Street Railway.

### Natterer's 2012 foraging

- 4.14.21 Figure 33 details the 100%MCP, 95%KDE and 50%KDE respectively for the two Natterer's bats radio-tracked during the study. Both females foraged in Finemere Wood predominately but also utilised the fields and bridle path adjacent to Hewins Wood. Bat 4 foraged in Finemere Wood each night for between two and three hours after emergence prior to moving out on to the fields and crossing the Aylesbury Link Railway at Grendon Junction. Bat 8 also foraged in Finemere Wood

but tended to move west for approximately one to two hours, foraging in the fields and watercourses to the west of the Proposed Scheme, south of Upper Greatmoor Farm.

### **Natterer's 2013 foraging**

- 4.14.22 Figure 41 details the 100% MCP, 95%KDE and 50%KDE for four Natterer's radio-tracked in 2013.
- 4.14.23 Core foraging areas (denoted by 50%KDE) were dominated by woodland and field margins surrounded by hedgerows and watercourses. Key woodland areas used by the bats captured within the footprint and adjacent to the Proposed Scheme included Grendon Wood, Finemere Wood and a woodland copse to the north of Grendon Wood, south of Prune Farm. Key hedgerow habitat includes the area around Prune Farm, the Mega Ditch and the hedgerow habitats alongside the disused Akeman Street Railway.
- 4.14.24 Habitats used within the wider landscape as part of their home range, denoted by the 95%KDE and 100%MCP, included woodland, arable fields and scrub vegetation.

### **Noctule 2013 foraging**

- 4.14.25 The noctule radio-tracked in August 2013 was only encountered briefly during the radio-tracking period after emergence on two occasions. Noctules were recorded flying in a north-easterly direction towards Sheephouse Wood and in an easterly direction towards Finemere Wood. The maternity roost was located in Grendon and Doddershall Wood. Figure 42 detailed the 100%MCP for this female

### **Soprano pipistrelle 2012 foraging**

- 4.14.26 The female soprano pipistrelle radio-tracked in 2012 foraged primarily in the field to the north of Woodlands Farm. It was radio-tracked foraging along the disused Akeman Street Railway and, also, within the scrub vegetation separating the disused railway and the Aylesbury Link Railway at Grendon Junction. This was also the location in which it was captured. It was also radio-tracked foraging in and around the buildings at Greatmoor Farm. Figure 34 details the 100%MCP, 95%KDE and 50%KDE foraging range representation.

### **Soprano pipistrelle 2013 foraging**

- 4.14.27 Figure 43 details the 100%MCP, 95%KDE and 50%KDE respectively for the two soprano pipistrelle bats radio-tracked in 2013. The bats core foraging habitat comprised of open habitats alongside the Aylesbury Link Railway, the disused Akeman Street railway, the bridle path at Benfields Overbridge, which crosses the Proposed Scheme, and in the field behind Woodlands Farm. These habitats are all characterised by linear features bound by mature hedgerows and scrub.
- 4.14.28 Habitats used within the wider landscape as part of their home range, denoted by the 95%KDE and 100%MCP, included woodland, arable fields, buildings and riparian habitats.

### Whiskered 2012 foraging

- 4.14.29 Figure 35 details the 100%MCP, 95%KDE and 50%KDE respectively for the two whiskered bats radio-tracked in 2012. Bat 5 roosting in Woodlands Farm foraged along the River Ray crossing and in the scrub vegetation alongside the existing railway line and in the fields to the north of Woodlands Farm. It was also recorded foraging in the scrub vegetation at Grendon Junction. The radio-tag signal was fairly intermittent for this female during the survey period so it was not possible to establish precise flightlines between roost and foraging areas. However, its two main foraging areas were Sheephouse Wood and the bridleway adjacent to Hewin's Wood.

### Whiskered 2013 foraging

- 4.14.30 Figure 44 details the 100%MCP, 95%KDE and 50%KDE for all seven whiskered bats radio-tracked in 2013 (where adequate foraging data were obtained). Core foraging areas (denoted by 50%KDE) is dominated by woodland habitat were identified in Sheephouse, Finemere, Greatsea, Romer, Balmore and Runts woods to the north-east of the Proposed Scheme and Doddershall Woods to the south-west. Core foraging areas were also recorded for this species around the water bodies at the Calvert landfill site and at the scrub habitat at Grendon Junction.
- 4.14.31 The whiskered bats roosting in Edgcott regularly crossed the Proposed Scheme spending the majority of their foraging time around the water bodies at the Calvert landfill. The breeding females roosting in Edgcott foraged predominately in Sheephouse Wood and the water bodies at the landfill site.
- 4.14.32 Habitats used within the wider landscape as part of their home range, denoted by the 95%KDE and 100%MCP, included woodland, arable fields, buildings and riparian habitats.

## 5 Discussion

### 5.1 Activity Transect Surveys 2012 and 2013

- 5.1.1 Areas where significant bat activity was recorded were the woodland surrounding the bridleway to the east of Calvert Village, Decoypond Wood, the western edge of Sheephouse Wood SSSI, the Mega Ditch and south of Sheephouse Wood.
- 5.1.2 Two potential crossing points for common pipistrelle and noctule bats were identified at Grendon Junction and Benfields overbridge. Line-side vegetation along the Aylesbury Link Railway adjacent to Greatmoor Farm (Mega Ditch) and north of Decoypond Wood was also shown to be used by commuting *Myotis* and common pipistrelle.
- 5.1.3 Areas of significant bat activity were recorded at several locations including; near Finemere fishing lakes, the existing eastern hedgerow leading from Finemere Wood to the Railway, Grendon Junction and Benfields overbridge.

### 5.2 Automated Recorder Surveys 2012 and 2013

- 5.2.1 Calls were analysed to genus level for purposes of data confidence; time expansion analysis was undertaken on a proportion of the data in order to add clarity and



confidence to calls analysed to species level (no *Myotis* species were identified to species level). Six genera were identified to be using the areas where the 10 static detectors were located in 2012 and the across the area which encompassed the static detector arrays in 2013. The genera' include *Nyctalus/Eptesicus*, *Nyctalus*, *Pipistrellus* species, *Myotis*, *Plecotus* species and *Barbastella* species.

### 5.3 Automated Recorder Surveys 2012

- 5.3.1 Similar peak counts of pipistrelles calls between the automated static monitors 9 and 7 static detector locations on the same months indicate the area along the hedgerows and railway where the detectors were located is an important foraging site for this species
- 5.3.2 Additionally, high numbers of common and soprano pipistrelles were recorded by Finemere fishing lakes (static detector 13). Foraging activity was particularly prevalent at the north and south of the Mega Ditch, along the Finemere Wood hedgerows to the east and west, at Finemere fishing lakes and at Benfield's over bridge.
- 5.3.3 Static recorder 9 recorded one pass of a serotine in September 2012. Leisler's bats were also recorded at Static detector 9. Indicating the area adjacent to the existing railway near Calvert Landfill site is used for commuting by Leisler's bats within this area. Recording calls in this area supports the evidence that Leisler's bats may use this area occasionally. Additionally activity of the large bats activity was different between the recording locations with at static recorder 7 recording much fewer larger bats, Static recorder 11 recording low numbers of ppn consistently throughout the season indicating this hedgerow is important for commuting *Nyctalus* species.
- 5.3.4 The data from all the locations indicated key crossing points near the south side of Sheephouse Wood, Grendon junction, the western hedgerow of Finemere Wood (near Benfield's overbridge) and at Finemere fishing lakes.

### 5.4 Automated Recorder Surveys 2013

- 5.4.1 A total of 316,704 bat passes were recorded across the collective array locations, between 29 May 2013 and 7 August 2013.
- 5.4.2 Overall, the highest bat activity was recorded at Array 4 south of Finemere fishing lakes, where a total of 117,489 passes were recorded. The lowest bat activity of all the array locations was recorded at Array 3 between Grendon Junction and Benfields overbridge (with total of 10,751 passes).
- 5.4.3 Common pipistrelle activity was highest at Array 2, the bridge at Greatmoor Farm (where a total of 30,004 passes were recorded) a peak of 5123 common pipistrelle ppn recorded, and lowest at the Floating Array (peak of 672 ppn).
- 5.4.4 *Myotis* and *Nyctalus* activity was highest at Array 1, near Sheephouse Wood, the Calvert landfill Site, the Mega Ditch and the railway, with a peak counts of 1,556 and 1,144 ppn respectively. Lowest activity for *Myotis* was recorded at the floating array locations, with a peak of 29 ppn. For *Nyctalus* sp lowest activity was recorded at Array 4 (total average of 92 ppn).

- 5.4.5 At Arrays 1, 2 and 4, highest bat activity was recorded to the east of the existing railway and along the rail corridor. At Array 3 and the floating array locations, highest bat activity was recorded along the rail corridor.
- 5.4.6 The data from all arrays sampled, indicate the habitat within the railway corridor is a key commuting route, used by all genera of bats surveyed. The link that this rail corridor provides is, therefore, of significance for the overall bat assemblage in this area. The habitat at Array 1 provides links between Sheephouse Wood (a potential bat roosting site), the Calvert landfill Site, the Mega Ditch (suitable bat foraging habitat) and the railway (suitable bat commuting route). The particularly high numbers of *Myotis* and *Nyctalus* bats recorded at this location are likely to reflect the suitable foraging and roosting habitats in the immediate vicinity of this array. It is interesting to note that both these genera were recorded in their highest numbers at Array 1, within the rail corridor rather than the peripheral habitats.
- 5.4.7 These collective habitats are of importance to the bat assemblage of the area in enabling their use of the wider landscape.

## 5.5 Paired Sampling

- 5.5.1 The data from paired sampling surveys indicate that open habitat and linear features are used by in similar proportions by different species.
- 5.5.2 Areas where significant bat activity along linear features was recorded were at Grendon Junction, along the hedgerow to Finemere Fishing Lakes and the edge of Sheephouse Wood.
- 5.5.3 Areas where significant bat activity in open vegetation was recorded was between Sheephouse Wood SSSI and the western hedge leading from Finemere Wood and the area between the Aylesbury Link Railway and Akeman Street Disused Railway.
- 5.5.4 *Myotis* species and brown long-eared bats were almost exclusively recorded along linear features, pipistrelle and *Nyctalus* species were also recorded using these features but were also recorded using open vegetation for foraging and commuting.
- 5.5.5 Pipistrelle species, and *Nyctalus* species were recorded in broadly similar levels commuting over open habitat compared with their recorded use of linear commuting features.
- 5.5.6 Serotine bats were only recorded using open habitats in comparison to linear features, although only in low numbers. This species often flies over open habitat where it is also easier to detect.
- 5.5.7 The surveys also identified several crossing points for *Myotis* species, common pipistrelle and noctule bats at Grendon Junction and Benfields overbridge leading from the western hedge at Finemere Wood.
- 5.5.8 Several *Myotis* and common pipistrelle bat flightlines were identified using the line-side vegetation is being utilised for commuting adjacent to Greatmoor farm (Mega Ditch) and north of Decoypond Wood.

## 5.6 Trapping Assessment and Radio Tracking Surveys 2012 and 2013

- 5.6.1 The trapping surveys conducted over two seasons, in August and September 2012 and from May through to August 2013, captured a total of 409 bats of eleven species. Between 21 August and 25 September 2012 a total of 101 bats were captured over 20 night's survey effort. On 38 nights between 6 May and 11 August 2013 a total of 308 bats were captured over 38 night's survey effort.
- 5.6.2 The capture rate was moderate, but the trapping was focused predominately on existing Aylesbury Link Railway as opposed to the surrounding woodlands, which resulted in a reduced number of bats being captured. The objectives of the survey were to maximise the capture of bats that use the Aylesbury link Railway and habitats directly adjacent to the Proposed Scheme for commuting or foraging. Consequently the survey identified important flightlines between roosts and foraging sites for a number of different bat species including barbastelle, Bechstein's, Brandt's, brown long-eared, common pipistrelle, Daubenton's, Natterer's, noctule, soprano pipistrelle and whiskered bats.
- 5.6.3 The locations with the highest capture rates for bats along the Aylesbury Link Railway and adjacent habitat features, were at Calvert, Costello underpass to the south of Sheephouse Wood, Benfield's Overbridge, Grendon Junction and Benfields Overbridge Bridleway Bridge (that crosses the disused Akeman Street Railway Line) and the hedgerow perpendicular to the Aylesbury Link Railway that connects to the north west of Finemere Wood.
- 5.6.4 Radio-tracking surveys identified the following Bechstein's flightlines; alongside the existing Aylesbury Link railway north of Benfield's overbridge; (location 2 shown in Figure 45); along the southern edge of Sheephouse Wood, (location 2a shown in Figure 45); between Grendon Junction and the disused Akeman Street railway line (locations 3 and 4 in Figure 45); along the connecting the hedgerow perpendicular to the Aylesbury Link Railway; and from the north-west of Finemere Wood to the Hewin's Wood bridlepath. The habitat features at these locations were also used as a commuting route by eight other bat species including barbastelle, brown long-eared, Brandt's, common pipistrelle, Daubenton's, Natterer's, soprano pipistrelle and whiskered bats. The bridge over the disused Akeman Street Railway at Oak Tree Farm was also used by six species including brown long-eared, common pipistrelle, Daubenton's, Natterer's, soprano pipistrelle and whiskered bats.
- 5.6.5 The Bechstein's roosts identified in 2012 were all located to the south-west of the Proposed Scheme in Grendon and Doddershall woods. In 2013 the presence of a maternity colony was located in a hedgerow tree on Finemere Hill just outside Finemere Wood. One female from this colony roosted in Romer Wood on one occasion. Male Bechstein's were recorded roosting in Sheephouse Wood and Decoypond Wood. In 2013 Bechstein's roosts were identified to the south-west of the Proposed Scheme at Grendon and Doddershall woods. Eighteen Bechstein's bats (including three male Bechstein's) were radio-tracked from the Finemere colony and the majority of the bats either foraged within Finemere Wood or the complex of woodlands to the north-east of the Proposed Scheme comprising

Sheephouse, Greatsea, Romer, Balmore and Runts woods. In August a juvenile female Bechstein's from the Finemere colony was recorded foraging at Grendon Junction and an adult male Bechstein's, that also roosted in the same tree as the maternity colony, was recorded commuting south along the Aylesbury Link Railway to access woodlands copses to the south of the Edgcott Road. Two females from the Grendon and Doddershall wood colonies were recorded crossing the Proposed Scheme at Grendon Junction and a third female was recorded using watercourses along the Muxwell Brook to commute to Sheephouse Wood.

5.6.6 The data obtained infers that the females from the colonies present in Grendon and Doddershall woods frequently cross the Proposed Scheme, to access woodland habitat to the north-east.

5.6.7 All of the Bechstein's bats radio-tracked in this study foraged predominately within broadleaved woodland, scrub, hedgerows and riparian habitats. The foraging ranges for the females radio-tracked that crossed the Proposed Scheme from the Doddershall colony (n=6) are larger (mean range size 124.10 ha 100% MCP, 95% KDE 57.25 ha, 50% KDE 11.34 ha) by comparison to the published data on range size for this species. The mean range size (100%MCP) for eight radio-tracked female Bechstein's in Sussex and Dorset woodlands, and woodlands in Germany, vary from 11.4 ha to 21.9 ha (Fitzsimons et al 2001 Schofield & Morris 2000 and Kerth et al., 2001) .

- The animals that cross the Proposed Scheme occupy a fragmented landscape and, therefore, have to travel further distances to find optimal foraging and roosting conditions;
- The time of year. All of the female bats that crossed the Proposed Scheme from the Grendon and Doddershall woods were post lactating and non-breeding. Schofield & Morris (2000) recorded the smallest ranges during late pregnancy and early lactation. Bats start to disperse further to swarming sites for mating prior to hibernation once the maternity colonies begin to disband, and possibly the large range size may be explained as a consequence of exploratory behaviour or
- The females radio-tracked may be sub-ordinate colony members. Radio-tracking studies have suggested that female Bechstein's have very little overlap in foraging range and it could be that more dominant females occupy better foraging habitat in close proximity to the roost. This may be supported by the number of pregnant and lactating females recorded foraging close to their roosts in Finemere, Greatsea and Runts woods.

5.6.8 The locations with the highest number of captures also concurred with the flightlines crossing the Proposed Scheme identified by the radio-tracked bats. These key crossing points are shown in aerial map with photograph inserts of the key crossing locations, Figure 45. Common pipistrelle, soprano pipistrelle and Daubenton's bats were identified crossing the Proposed Scheme at Calvert Bridge, location number 6 in Figure 45, but also used the existing Aylesbury Link Railway as a commuting route to access Calvert Jubilee and Grebe Lake.

- 5.6.9 There was evidence of bats crossing the Proposed Scheme at Costello underpass, location 1 shown in Figure 45, including Brandt's, brown long-eared, common pipistrelle, soprano pipistrelle and whiskered bats. These five species were captured in the underpass and brown long-eared and Brandt's were radio-tracked commuting through the underpass. However, there was also evidence of Bechstein's, brown long-eared, Brandt's, Daubenton's and whiskered bats crossing the Proposed Scheme in both directions along the Sheephouse Wood section of the proposed route.
- 5.6.10 Adams underpass and the River Ray were identified as a flightline used by common pipistrelle, soprano pipistrelle and whiskered bats crossing land required for the Proposed Scheme to commute to foraging habitats in Finemere Wood to the east and along the disused Akeman Street Railway to the west. Benfields overbridge and the Edgcott Road were also used as flightlines.
- 5.6.11 A roost and flightline used by a non-breeding barbastelle bat in May 2013 was identified. This was the only barbastelle captured during 58 nights of trapping in 2012 and 2013. The North Buckinghamshire Bat Group and the Bernwood Forest Bechstein's Project have carried out numerous trapping assessments in the Bernwood Forest area and have not identified a breeding roost for this species in close proximity to the survey area. The static monitoring data revealed barbastelle passes, but the number recorded was not indicative of an important flightline or roosting area in close proximity to the Proposed Scheme. It is concluded that barbastelle bats are present in the local area but occur at low density.
- 5.6.12 et al. Fourteen brown long-eared bats were radio-tracked during the two years and from data collected it appears that there is at least one breeding colony in the Sheephouse Wood area and a colony in Finemere Wood. The colony in Sheephouse Wood uses a number of different roosts in close proximity to the Proposed Scheme including Decoypond Wood and the woodland belt to the west of the Proposed Scheme. The colony in Finemere Wood uses a number of different tree and bat box roosts.
- 5.6.13 The brown long-eared bat is essentially a woodland species<sup>19,20,21</sup>, although it also uses other habitats such as orchards, parkland and conifer plantations<sup>22,23</sup>. There is evidence that hedgerows are used for foraging more frequently later in the season compared to earlier in the summer months<sup>24</sup> et al. The brown long-eared bats roosting and foraging in Sheephouse Wood also regularly foraged along the hedgerows to the west of the Proposed Scheme and over the vegetation within the

<sup>19</sup> Swift, S. M., Racey, P. A., 1983. Resource partitioning in two species of Vespertilionid bats (Chiroptera) occupying the same roost. *Journal of Zoology* 200: 249-259.

<sup>20</sup> Fuhrmann, M., Seitz, A., 1992. Nocturnal activity of the brown long-eared bat (*Plecotus auritus* L.1758): data from radiotracking in the Lenneburg forest near Mainz (Germany). In: *Wildlife telemetry. Remote monitoring and tracking of animals* (Priede, I.G., Swift, S.M., eds). 538 - 548.

<sup>21</sup> Entwistle, A. C., Racey, P. A., Speakman, J. R., 1996. Habitat exploitation by a gleaner bat, *Plecotus auritus*. *Philosophical Transactions of the Royal Society, London, Series B-Biol Sci* 351(1342): 921-931.

<sup>22</sup> Swift, S. M., Racey, P. A., 1983. Resource partitioning in two species of Vespertilionid bats (Chiroptera) occupying the same roost. *Journal of Zoology* 200: 249-259.

<sup>23</sup> Fuhrmann, M., Seitz, A., 1992. Nocturnal activity of the brown long-eared bat (*Plecotus auritus* L.1758): data from radiotracking in the Lenneburg forest near Mainz (Germany). In: *Wildlife telemetry. Remote monitoring and tracking of animals* (Priede, I.G., Swift, S.M., eds). 538 - 548.

<sup>24</sup> Murphy, S. E., Greenaway F., and Hill, D.A (2012). Patterns of habitat use by female brown long-eared bats presage negative impacts of woodland conservation management. *Journal of Zoology* 288: 177-183.

Mega Ditch. The mature hedgerow leading from the north-east of Finemere Wood that connects to the Aylesbury Link Railway was used both as a commuting route and for foraging. This habitat connectivity enables the bats from the colonies in Finemere Wood to access the foraging sites to the south-west of the Proposed Scheme.

- 5.6.14 Brandt's bats are typically associated with woodland habitat<sup>25</sup> et al and the female radio-tracked in 2012 roosted and foraged predominately in Sheephouse Wood and along the Muxwell Brook. In 2013 three Brandt's bats were also recorded roosting in Sheephouse Wood. These bats foraged in the woodland but also crossed the Proposed Scheme to access riparian habitats for foraging around the water bodies at the Calvert landfill site.
- 5.6.15 The Brandt's (confirmed by DNA analysis) recorded roosting in the complex of buildings at Woodlands Farm roosted in the same complex of buildings that was used by a maternity colony of whiskered bats in 2012. The Adams underpass and River Ray culvert was used as a flightline to commute between Finemere Wood and the roost site. Flightlines along the existing Aylesbury Link Railway were also identified.
- 5.6.16 Common pipistrelle bats are flexible in their habitat requirements occurring in a variety of habitat types in both urban and rural landscapes<sup>26</sup>. The common pipistrelle radio-tracked in 2012 roosted in the railway bridge structure at the River Ray crossing and foraged alongside the Aylesbury Link Railway, and adjacent field margins and scrub. The common pipistrelles radio-tracked in 2013 used the existing Aylesbury Link Railway for both commuting and foraging.
- 5.6.17 Daubenton's' roosts of breeding females (including a juvenile) were recorded at Decoypond Wood and Sheephouse Wood. Roosts were also recorded in Finemere Wood and Doddershall Wood.
- 5.6.18 The radio-tracking data revealed that the Daubenton's Bats roosting in Sheephouse Wood use the Aylesbury Link Railway to navigate to water bodies, including those on the landfill site to the west and Calvert Jubilee nature reserve LWS to the north. Between the 21 and 26 August, eight Daubenton's bats were captured on the railway line between Sheephouse Wood and Calvert Jubilee Nature Reserve LWS, approximately one to two hours after emergence which supports the assumption that the Aylesbury Link Railway is utilised as a flightline for this species.
- 5.6.19 Daubenton's were also recorded crossing the Proposed Scheme at Sheephouse Wood to access the water bodies at the Calvert landfill site, and at Grendon Junction to access foraging habitat to the east at the fishing lake and to the west over water bodies at Benfields Overbridge.
- 5.6.20 Natterer's' bats were recorded roosting in Grendon and Doddershall Wood and females from this colony used the bridle path adjacent to Hewin's Wood to access

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<sup>25</sup> Dietz, M. and Pir, J. B. (2009). Distribution and habitat selection of *Myotis bechsteinii* in Luxembourg: implications for forest management and conservation. *Folia Zoologica*, 58, 327-340.

<sup>26</sup> Nicholls, B. and Racey, P. A. (2006). Contrasting home-range size and spatial partitioning in cryptic and sympatric pipistrelle bats. *Behavioral Ecology and Sociobiology*, 61, 131-142.

foraging habitat along the Mega Ditch and hedgerows to the west of the Proposed Scheme. Natterer's rooting in the colony at Finemere Wood (peak count of 53 bats were recorded by the North Bucks Bat Group at a tree roost in Finemere Wood in May 2013). The radio-tracked bats used Finemere Wood for foraging but also used the hedgerows and fields adjacent to Finemere Wood. They crossed the railway line at Grendon Junction and used the Muxwell Brook for foraging. The disused Akeman Street Railway is also an important flightline for this species. Natterer's bats favour foraging in broad-leaved woodland and over river corridors.

- 5.6.21 Noctule bats roosting in Doddershall Wood did not follow any particular flightlines. Noctule bats fly fast and high above the ground when commuting and foraging. Broadleaved woodland and pasture are the foraging habitats consistently preferred by noctule bats<sup>27</sup> and the fragmentation of habitats is unlikely to impact this species.
- 5.6.22 Soprano pipistrelle bats are more closely associated with riparian habitat than common pipistrelle bats<sup>28</sup>. The soprano pipistrelle radio-tracked in 2012 and 2013 used the existing Aylesbury Link Railway and also commuted along the Adams underpass River Ray crossing. Whiskered roosts were recorded in Sheephouse, Greatsea, Finemere, and Doddershall woods, and in Edgcott. A maternity roost was identified in 2012 at Woodlands Farm. Both females used the vegetation along the existing railway line for foraging.
- 5.6.23 The whiskered bats roosting in Edgcott and Sheephouse Wood regularly crossed the Proposed Scheme spending the majority of their foraging time around the water bodies at the Calvert landfill site. The breeding females roosting in Edgcott foraged predominately in Sheephouse Wood and the water bodies at the landfill site.
- 5.6.24 Streams and woodlands are frequently used as foraging habitats<sup>29</sup> et al. The patchy wooded landscape with associated riparian habitat provide optimum foraging The whiskered bats roosting in Edgcott regularly crossed the Proposed Scheme spending the majority of their foraging time around the water bodies at the Calvert Land Fill. Streams and woodlands are frequently used as foraging habitats<sup>30</sup> et al. The patchy wooded landscape with associated riparian habitat provide optimum foraging
- 5.6.25 The whiskered bats roosting in Edgcott regularly crossed the Proposed Scheme spending the majority of their foraging time around the water bodies at the Calvert Land Fill. The breeding females roosting in Edgcott foraged predominately in Sheephouse Wood and the water bodies at the landfill site.

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<sup>27</sup> Mackie I.J and Racey, P.A. (2007) Habitat use varies with reproductive state in noctule bats (*Nyctalus noctula*): Implications for conservation. *Journal of Zoology* 140: 70-77.

<sup>28</sup> Davidson-Watts, I. and Jones, G. (2006) Differential in foraging behaviour between Common pipistrelle and Soprano pipistrelle. *Journal of Zoology* 268: 55-62.

<sup>29</sup> Dietz, M. and Pir, J. B. (2009). Distribution and habitat selection of *Myotis bechsteinii* in Luxembourg: implications for forest management and conservation. *Folia Zoologica*, 58, 327-340.

<sup>30</sup> Dietz, M. and Pir, J. B. (2009). Distribution and habitat selection of *Myotis bechsteinii* in Luxembourg: implications for forest management and conservation. *Folia Zoologica*, 58, 327-340.

# ANNEXES



# Annex 1

Table 9: Biometric data 2012

Date	Bat no.	Location	Grid ref	Grid ref	Species	Sex	Repro status	Weight (g)	Forearm (mm)
21.8.12	1	1	469011	224496	<i>M. daubentonii</i>	M	adult	7.5	38.74
21.8.12	2	1	469011	224496	<i>P. Pipistrellus</i>	F	juvenile	5	31.44
21.8.12	3	1	469011	224496	<i>M. daubentonii</i>	F	adult post-lactating	8	38.2
22.8.12	4	2	469388	223945	<i>P. Pipistrellus</i>	M	juvenile	4.5	32.63
22.8.12	5	2	469388	223945	<i>M. daubentonii</i>	M	adult (mature)	7.5	39.27
22.8.12	6	2	469388	223945	<i>M. daubentonii</i>	M	adult	7.25	37.97
22.8.12	7	2	469388	223945	<i>P. Pipistrellus</i>	M	adult	5	32.05
22.8.12	8	2	469388	223945	<i>M. daubentonii</i>	F	adult post-lactating	7.25	37.84
22.8.12	9	2	469388	223945	<i>P. pygmaeus</i>	M	juvenile	4	30.94
22.8.12	10	2	469388	223945	<i>M. daubentonii</i>	M	adult (mature)	8.75	38.92
22.8.12	11	2	469388	223945	<i>M. mystacinus</i>	F	adult non-breeding	4.75	33.67
22.8.12	12	2	469388	223945	<i>M. daubentonii</i>	F	female (post-lactating)	7.75	39.47
23.8.12	13	3	469991	223109	<i>P. auritus</i>	M	juvenile	6	35.54
23.8.12	14	3	469991	223109	<i>P. auritus</i>	F	adult post-lactating	10.25	37.76

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Date	Bat no.	Location	Grid ref	Grid ref	Species	Sex	Repro status	Weight (g)	Forearm (mm)
23.8.12	15	3	469991	223109	<i>P. auritus</i>	F	adult post-lactating	8.5	38.86
24.8.12	16	5	470689	222328	<i>M. brandtii</i>	F	adult non-breeding	8	39.27
26.8.12	17	4	470343	222717	<i>P. auritus</i>	F	adult non-breeding	7	40.2
26.8.12	18	4	470343	222717	<i>M. daubentonii</i>	M	juvenile	7	37.45
26.8.12	19	4	470343	222717	<i>M. brandtii</i>	M	adult	6	38.95
28.8.12	20	7	471058	221867	<i>P. Pipistrellus</i>	F	juvenile	4.25	31.93
28.8.12	21	7	471058	221867	<i>P. Pipistrellus</i>	F	juvenile	4	31.93
28.8.12	22	7	471058	221867	<i>P. Pipistrellus</i>	M	adult	4.5	31.59
28.8.12	23	7	471058	221867	<i>P. pygmaeus</i>	M	adult	5	32.35
28.8.12	24	7	471058	221867	<i>M. nattereri</i>	F	adult post-lactating	9.5	40.48
28.8.12	25	7	471058	221867	<i>M. mystacinus</i>	F	adult post-lactating	8.5	36.05
28.8.12	26	7	471058	221867	<i>M. mystacinus</i>	F	adult non-breeding	7	35.82
29.8.12	27	10	471840	220967	<i>P. Pipistrellus</i>	F	adult non-breeding	6	32.06
29.8.12	28	10	471840	220967	<i>P. Pipistrellus</i>	F	juvenile	5	31.86
29.8.12	29	10	471840	220967	<i>P. Pipistrellus</i>	M	juvenile	4.5	31.54
29.8.12	30	10	471840	220967	<i>P. Pipistrellus</i>	F	juvenile	5	31.98
29.8.12	31	10	471840	220967	<i>P. Pipistrellus</i>	M	juvenile	4.5	31.6
31.8.12	32	9	471634	221219	<i>M. mystacinus</i>	F	adult non-breeding	6	35.46
31.8.12	33	9	471634	221219	<i>M. mystacinus</i>	F	juvenile	4.5	34.88

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Date	Bat no.	Location	Grid ref	Grid ref	Species	Sex	Repro status	Weight (g)	Forearm (mm)
31.8.12	34	9	471634	221219	<i>P. pygmaeus</i>	M	adult	4.5	30.64
31.8.12	35	9	471634	221219	<i>P. Pipistrellus</i>	M	adult	5	31.19
31.8.12	36	9	471634	221219	<i>P. Pipistrellus</i>	F	adult post-lactating	6.5	32.39
31.8.12	37	9	471634	221219	<i>P. Pipistrellus</i>	M	juvenile	4.5	32.38
31.8.12	38	9	471634	221219	<i>P. Pipistrellus</i>	M	juvenile	4.5	31.04
31.8.12	39	9	471634	221219	<i>P. Pipistrellus</i>	F	adult non-breeding	4.5	31.93
31.8.12	40	9	471634	221219	<i>P. Pipistrellus</i>	M	adult - mature	5	32.16
31.8.12	41	9	471634	221219	<i>P. Pipistrellus</i>	M	adult - mature	4.75	31.71
1.9.12	42	6	470665	222161	<i>P. pygmaeus</i>	F	adult post-lactating	6	32.23
1.9.12	43	6	470665	222161	<i>M. bechsteini</i>	F	adult non-breeding	8.5	40.04
1.9.12	44	6	470665	222161	<i>M. nattereri</i>	F	adult post-lactating	8.25	40.64
1.9.12	45	6	470665	222161	<i>M. daubentonii</i>	M	adult	7.5	39.37
1.9.12	46	6	470665	222161	<i>P. pygmaeus</i>	F	adult post-lactating	5.5	31.06
1.9.12	47	6	470665	222161	<i>P. pygmaeus</i>	M	adult	5.25	31.66
1.9.12	48	6	470665	222161	<i>P. Pipistrellus</i>	M	adult	5	30.87
1.9.12	49	6	470665	222161	<i>P. pygmaeus</i>	M	juvenile	4.5	30.45
1.9.12	50	6	470665	222161	<i>P. auritus</i>	M	adult	7.5	37.22
1.9.12	51	6	470665	222161	<i>P. auritus</i>	M	juvenile	7	36.1
1.9.12	52	6	470665	222161	<i>P. auritus</i>	M	adult	8	37.55

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Date	Bat no.	Location	Grid ref	Grid ref	Species	Sex	Repro status	Weight (g)	Forearm (mm)
1.9.12	53	6	470665	222161	<i>M. nattereri</i>	M	adult	8.5	39.44
1.9.12	54	6	470665	222161	<i>P. Pipistrellus</i>	F	juvenile	5	30.71
1.9.12	55	6	470665	222161	<i>P. Pipistrellus</i>	M	juvenile	4.5	31.34
1.9.12	56	6	470665	222161	<i>P. pygmaeus</i>	M	juvenile	5	30.98
9.9.12	57	1	469011	224496	<i>P. Pipistrellus</i>	F	adult non-breeding	5	32.05
9.9.12	58	1	469011	224496	<i>P. Pipistrellus</i>	F	adult post-lactating	7.5	33.03
9.9.12	59	1	469011	224496	<i>N. leisleri</i>	F	adult non-breeding	14.5	43.22
11.9.12	60	3	469991	223109	<i>P. pygmaeus</i>	F	juvenile	5.25	31.42
12.9.12	61	7	471058	221867	<i>M. mystacinus</i>	F	adult post-lactating	8.25	37.92
12.9.12	62	7	471058	221867	<i>P. pygmaeus</i>	M	juvenile	4.5	31.76
13.9.12	63	5	470689	222328	<i>P. pygmaeus</i>	F	juvenile	4	32.48
13.9.12	64	5	470689	222328	<i>N. noctula</i>	M	adult	19.5	49.54
13.9.12	65	5	470689	222328	<i>P. auritus</i>	M	adult	7	35.54
13.9.12	66	5	470689	222328	<i>P. auritus</i>	M	adult	8	36.34
13.9.12	67	5	470689	222328	<i>P. auritus</i>	F	adult non-breeding	7.5	37.32
13.9.12	68	5	470689	222328	<i>P. auritus</i>	F	adult post-lactating	8	37.17
13.9.12	69	5	470689	222328	<i>P. auritus</i>	F	adult post-lactating	9	29.12
13.9.12	70	5	470689	222328	<i>P. auritus</i>	F	juvenile	6.75	35.87
13.9.12	71	5	470689	222328	<i>M. bechsteinii</i>	F	adult post-lactating	12	42.95

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Date	Bat no.	Location	Grid ref	Grid ref	Species	Sex	Repro status	Weight (g)	Forearm (mm)
20.9.12	72	6	470665	222161	<i>P. auritus</i>	M	adult	6.8	39.32
20.9.12	73	6	470665	222161	<i>P. auritus</i>	M	adult	7.5	35.61
20.9.12	74	6	470665	222161	<i>P. auritus</i>	F	adult	8	40.4
20.9.12	75	6	470665	222161	<i>M. mystacinus</i>	F	juvenile	6	32.15
20.9.12	76	6	470665	222161	<i>P. auritus</i>	M	adult	6.5	36.19
20.9.12	77	6	470665	222161	<i>M. daubentonii</i>	F	adult post-lactating	8.5	36.58
20.9.12	78	6	470665	222161	<i>M. bechsteinii</i>	F	adult non-breeding	9	42.67
21.9.12	79	8	471356	221574	<i>P. Pipistrellus</i>	M	adult	4.25	31.25
21.9.12	80	8	471356	221574	<i>P. Pipistrellus</i>	M	adult	4.5	31.95
21.9.12	81	8	471356	221574	<i>P. Pipistrellus</i>	M	adult	4	32.45
21.9.12	82	8	471356	221574	<i>P. Pipistrellus</i>	M	adult	4.5	31.9
22.9.12	83	7	471058	221867	<i>P. Pipistrellus</i>	F	post-lactating	5.5	31.75
22.9.12	84	7	471058	221867	<i>P. Pipistrellus</i>	F	adult post-lactating	5.5	31.4
22.9.12	85	7	471058	221867	<i>P. auritus</i>	F	adult post-lactating	9	40.22
22.9.12	86	7	471058	221867	<i>P. Pipistrellus</i>	M	adult	5	32.44
22.9.12	87	7	471058	221867	<i>P. Pipistrellus</i>	M	adult	4.75	31.47
22.9.12	88	7	471058	221867	<i>P. Pipistrellus</i>	F	adult post-lactating	5.5	32.82
22.9.12	89	7	471058	221867	<i>P. pygmaeus</i>	M	adult	5	30.21
24.9.12	90	10	471840	220967	<i>P. Pipistrellus</i>	M	adult	5	31.29

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Date	Bat no.	Location	Grid ref	Grid ref	Species	Sex	Repro status	Weight (g)	Forearm (mm)
24.9.12	91	10	471840	220967	<i>P. pygmaeus</i>	M	juvenile	4.5	31.98
24.9.12	92	10	471840	220967	<i>P. pygmaeus</i>	M	juvenile	4.5	32.4
25.9.12	93	9	471634	221219	<i>P. Pipistrellus</i>	M	adult	5	32.65
25.9.12	94	9	471634	221219	<i>P. Pipistrellus</i>	M	adult	5.5	31.89
25.9.12	95	9	471634	221219	<i>P. Pipistrellus</i>	M	juvenile	4.5	30.99
25.9.12	96	9	471634	221219	<i>P. Pipistrellus</i>	M	adult	5	32.4
25.9.12	97	9	471634	221219	<i>P. Pipistrellus</i>	M	juvenile	4.5	30.65
25.9.12	98	9	471634	221219	<i>P. Pipistrellus</i>	F	adult post-lactating	6	33.45
25.9.12	99	9	471634	221219	<i>P. Pipistrellus</i>	F	adult post-lactating	5.5	32.61
25.9.12	100	9	471634	221219	<i>P. pygmaeus</i>	F	adult non-breeding	5	31.87
25.9.12	101	9	471634	221219	<i>M. mystacinus</i>	M	juvenile	5.5	34.67

## Annex 2

Table 10: Biometric data 2013

Date	Bat number	Capture location	Letter prefix	OS Grid Ref.	OS Grid Ref.	Species	Sex	Reproductive Status	Weight (g)	Forearm (mm)	Ringed at time of capture	Ringed	Notes
6.5.13	1	5	SP	70623	22344	<i>M. mystacinus</i>	F	Nulliparous	5.5	35.86	No	H2751	
6.5.13	2	5	SP	70623	22344	<i>M. mystacinus</i>	F	Parous	6	35.42	No	H2800	Radio-tagged 173.8575; Session 1 Bat 1
6.5.13	3	5	SP	70623	22344	<i>M. mystacinus</i>	F	Nulliparous	5	35.28	No	H2752	
6.5.13	4	5	SP	70623	22344	<i>P. pygmaeus</i>	M	Adult	4	32.7	No	No	
6.5.13	5	5	SP	70623	22344	<i>B. barbastellus</i>	F	Nulliparous	6.5	38.06	No	H2799	Radio-tagged 173.8986; Session 1 Bat 2; 0.29g tag
10.5.13	6	4	SP	70205	22908	<i>P. Pipistrellus</i>	M	Adult	n/a	n/a	No	No	Captured as taking down harp trap in heavy rain, released immediately to avoid stress
10.5.13	7	4	SP	70205	22908	<i>P. auritus</i>	F	Adult	7.5	38.52	A5293	n/a	Radio-tagged 173.8400; Session 1 Bat 4; Captured at Costello's underpass south Sheephouse
11.5.13	8	6	SP	71024	21859	<i>P. Pipistrellus</i>	M	Adult	4.5	32.09	No	No	
11.5.13	9	6	SP	71024	21859	<i>P. Pipistrellus</i>	M	Adult	4.25	31.74	No	No	

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12.5.13	10	7	SP	71201	22009	<i>M. nattereri</i>	F	Nulliparous	6.75	38.25	Z2503	n/a	Radio-tagged 173.8690; Session 1 Bat 5; 0.29g tag
12.5.13	11	7	SP	71201	22009	<i>M. daubentonii</i>	F	Parous	8	39.49	No	H2798	Radio-tagged 173.7250; Session 1 Bat 6. Injury above right eye but has healed well.
13.5.13	12	9	SP	71636	21219	<i>P. pygmaeus</i>	F	Nulliparous	4	33.54	No	No	
13.5.13	13	9	SP	71636	21219	<i>P. pygmaeus</i>	M	Adult	4	31.97	No	No	
13.5.13	14	8	SP	71493	21702	<i>M. nattereri</i>	F	Parous	7	39.67	Z2385	n/a	
7.6.13	15	5	SP	70623	22344	<i>M. daubentonii</i>	F	Pregnant	11.75	38.36	No	n/a	Distended abdomen - too far into pregnancy to radio-tag
7.6.13	16	5	SP	70623	22344	<i>P. auritus</i>	F	Nulliparous	7	38.89	No	H2755	Too light to radio-tag
7.6.13	17	5	SP	70623	22344	<i>P. pygmaeus</i>	M	Adult	4	28.41	No	No	
7.6.13	18	5	SP	70623	22344	<i>P. pygmaeus</i>	F	Pregnant	5	33.14	No	No	Did not radio-tag to avoid undue stress as bat was light and pregnant
7.6.13	19	5	SP	70623	22344	<i>M. nattereri</i>	F	Pregnant	9.5	40.16	No	H2797	Pregnant but not imminently due; Radiotagged 173.7152; Session 2 Bat 1
7.6.13	20	5	SP	70623	22344	<i>P. pygmaeus</i>	F	Pregnant	5.25	33.55	No	No	Did not radio-tag to avoid undue stress as bat was light and pregnant
7.6.13	21	5	SP	70623	22344	<i>P. pygmaeus</i>	M	Adult	4	31.09	No	No	
7.6.13	22	5	SP	70623	22344	<i>M. brandtii</i>	M	Adult	5.5	35.47	No	H2754	



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8.6.13	23	7	SP	71201	22009	<i>M. nattereri</i>	F	Pregnant	9.75	39.58	Z2587	n/a	Did not radio-tag to avoid undue stress was advanced in pregnancy
8.6.13	24	7	SP	71201	22009	<i>P. auritus</i>	M	Adult	7	36.27	Z2551	n/a	Bat appeared in poor condition bald patches and light given time of year
8.6.13	25	7	SP	71201	22009	<i>M. nattereri</i>	F	Nulliparous	6.75	38.22	No	H2791	Too light to radio-tag.
8.6.13	26	7	SP	71201	22009	<i>P. Pipistrellus</i>	F	Pregnant	5.5	31.97	No	No	Did not radio-tag to avoid undue stress as bat was light and pregnant
8.6.13	27	7	SP	71201	22009	<i>M. mystacinus</i>	F	Pregnant	6.5	35.84	No	H2792	Radio-tagged 173.8840; Session 2 Bat 3
8.6.13	28	7	SP	71201	22009	<i>M. nattereri</i>	F	Non-breeding	6.75	38.74	A8154	n/a	
8.6.13	29	7	SP	71201	22009	<i>M. brandtii</i>	M	Adult	5	35.05	No	H2794	Too light to radio-tag.
8.6.13	30	7	SP	71201	22009	<i>M. nattereri</i>	F	Non-breeding	7	38.89	A8165	n/a	Too light to radio-tag.
8.6.13	31	7	SP	71201	22009	<i>M. nattereri</i>	F	Pregnant	8.75	40.23	Z2396	n/a	Radio-tagged 173.7750; Session 2 Bat 4
8.6.13	32	7	SP	71201	22009	<i>P. auritus</i>	F	Pregnant	8.25	38.12	No	H2755	Radio-tagged 173.7450; Session 2 Bat 2; used 0.29g radio-tag to minimise stress to animal.
8.6.13	33	7	SP	71201	22009	<i>M. daubentonii</i>	M	Adult	8	36.75	No	H2796	
8.6.13	34	7	SP	71201	22009	<i>M. daubentonii</i>	M	Adult	8.5	36.79	No	H2795	
8.6.13	35	7	SP	71201	22009	<i>P. auritus</i>	F	Nulliparous	7.5	40.51	No	H2788	
9.6.13	36	6	SP	71024	21859	<i>M. mystacinus</i>	F	Pregnant	5.75	33.75	No	No	Did not radio-tag to avoid undue stress as bat was light and pregnant.
9.6.13	37	6	SP	71024	21859	<i>P. auritus</i>	F	Non-breeding	6	38.79	A5184	n/a	

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9.6.13	38	6	SP	71024	21859	<i>P. auritus</i>	M	Adult	6.5	37.87	Z2490	n/a	Wing was badly damaged and infected so removed the ring and applied approved veterinary disinfection.
9.6.13	39	6	SP	71024	21859	<i>P. auritus</i>	F	Non-breeding	7	39.4	A8202	n/a	Too light to radio-tag.
9.6.13	40	6	SP	71024	21859	<i>P. auritus</i>	M	Adult	6.5	38.36	No	H2785	
9.6.13	41	6	SP	71024	21859	<i>M. mystacinus</i>	F	Pregnant	5.5	35.13	No	H2756	
9.6.13	42	6	SP	71024	21859	<i>M. mystacinus</i>	F	Pregnant	6	35.5	No	H2789	Radio-tagged 173.8109; Session 2 Bat 7
9.6.13	43	6	SP	71024	21859	<i>M. mystacinus</i>	F	Nulliparous	5.5	34.63	No	H2757	
9.6.13	44	6	SP	71024	21859	<i>M. mystacinus</i>	F	Nulliparous	4.5	35.1	No	H2758	
9.6.13	45	6	SP	71024	21859	<i>P. pygmaeus</i>	F	Nulliparous	5	33.01	No	No	
9.6.13	46	6	SP	71024	21859	<i>P. pygmaeus</i>	F	Nulliparous	4.5	34.75	No	No	
9.6.13	47	6	SP	71024	21859	<i>P. pygmaeus</i>	F	Pregnant	6.5	34.67	No	Lo2156	Radio-tagged 173.7950; Session 2 Bat 6
9.6.13	48	6	SP	71024	21859	<i>M. bechsteinii</i>	F	Pregnant	8.75	40.63	No	H2790	Radio-tagged 173.7950; Session 2 Bat 5
10.6.13	49	1	SP	68766.5	24830	<i>P. pygmaeus</i>	F	Pregnant	5.75	31.14	No	No	All Pipistrelle bats captured just before sunset and after sunset indicating roost nearby; too light to radio-tag

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10.6.13	50	1	SP	68766.5	24830	<i>P. pygmaeus</i>	F	Pregnant	6	32.01	No	No	
10.6.13	51	1	SP	68766.5	24830	<i>P. pygmaeus</i>	F	Pregnant	5.5	32.98	No	No	
10.6.13	52	1	SP	68766.5	24830	<i>P. pygmaeus</i>	F	Pregnant	5.5	32.39	No	No	
10.6.13	53	1	SP	68766.5	24830	<i>P. pygmaeus</i>	F	Pregnant	4.75	32.67	No	No	
10.6.13	54	1	SP	68766.5	24830	<i>P. Pipistrellus</i>	F	Pregnant	5.25	33.72	No	No	
10.6.13	55	1	SP	68766.5	24830	<i>P. pygmaeus</i>	F	Pregnant	5.5	32.48	No	No	
10.6.13	56	1	SP	68766.5	24830	<i>P. auritus</i>	F	Nulliparous	7.5	40.2	No	H2759	
10.6.13	57	1	SP	68766.5	24830	<i>P. pygmaeus</i>	F	Pregnant	5.75	31.77	No	No	
10.6.13	58	1	SP	68766.5	24830	<i>P. Pipistrellus</i>	M	Adult	3.75	30.34	No	No	Bat extremely light and in poor condition
10.6.13	59	1	SP	68766.5	24830	<i>P. auritus</i>	F	Nulliparous	7.75	39.09	No	H2760	
10.6.13	60	1	SP	68766.5	24830	<i>M. daubentonii</i>	F	Pregnant	8.25	37.72	No	H2761	
10.6.13	61	1	SP	68766.5	24830	<i>M. mystacinus</i>	F	Nulliparous	5.25	34.65	No	H2762	
10.6.13	62	1	SP	68766.5	24830	<i>M. daubentonii</i>	F	Pregnant	8.75	38.77	No	H2767	Radio-tagged 173.2158; Session 2 Bat 8
10.6.13	63	1	SP	68766.5	24830	<i>P. pygmaeus</i>	M	Adult	4.5	31.97	No	No	

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11.6.13	64	2	SP	69389	23930	<i>M. mystacinus</i>	F	Pregnant	5	35.47	No	H2763	
11.6.13	65	2	SP	69389	23930	<i>M. mystacinus</i>	F	Nulliparous	4.5	35.17	No	H2764	
11.6.13	66	2	SP	69389	23930	<i>P. pygmaeus</i>	M	Adult	4.5	31.98	No	No	
13.6.13	67	4	SP	70205	22908	<i>M. mystacinus</i>	F	Pregnant	5.5	34.15	No	No	
13.6.13	68	4	SP	70205	22908	<i>P. Pipistrellus</i>	F	Pregnant	4.25	32.71	No	No	
13.6.13	69	4	SP	70205	22908	<i>P. pygmaeus</i>	F	Pregnant	5.5	32.93	No	No	
13.6.13	70	4	SP	70205	22908	<i>P. pygmaeus</i>	F	Pregnant	6	32.54	No	No	
13.6.13	71	4	SP	70205	22908	<i>P. pygmaeus</i>	F	Pregnant	5.25	31.24	No	No	Distended abdomen - too far into pregnancy to radio-tag
13.6.13	72	4	SP	70205	22908	<i>P. pygmaeus</i>	M	Adult	4.75	31.87	No	No	
13.6.13	73	4	SP	70205	22908	<i>P. pygmaeus</i>	F	Pregnant	7	31.54	No	No	Distended abdomen - too far into pregnancy to radio-tag
13.6.13	74	4	SP	70205	22908	<i>M. mystacinus</i>	M	Adult	4.75	35.55	No	No	
13.6.13	75	4	SP	70205	22908	<i>M. mystacinus</i>	F	Nulliparous	4.75	34.59	No	No	
13.6.13	76	4	SP	70205	22908	<i>M. brandtii</i>	F	Pregnant	6.5	36.54	No	H2765	Radio-tagged 173.8220; Session 2 Bat 9

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13.6.13	77	4	SP	70205	22908	<i>P. auritus</i>	F	Pregnant	9.5	39.51	A5172	n/a	Distended abdomen - too far into pregnancy to radio-tag
13.6.13	78	4	SP	70205	22908	<i>M. nattereri</i>	F	Pregnant	8.25	36.61	A5176	n/a	Bat was going torpid despite warm temperatures so decided not to radio-tag for animal welfare considerations
13.6.13	79	4	SP	70205	22908	<i>P. auritus</i>	M	Adult	8	37.13	A8168	n/a	
13.6.13	80	4	SP	70205	22908	<i>M. nattereri</i>	F	Nulliparous	7.5	39.74	No	H2766	Too light to radio-tag.
13.6.13	81	4	SP	70205	22908	<i>M. nattereri</i>	M	Adult	6	38.57	A8212	n/a	
13.6.13	82	4	SP	70205	22908	<i>P. auritus</i>	M	Adult	7.5	37.06	Z2458	n/a	
13.6.13	83	4	SP	70205	22908	<i>M. nattereri</i>	F	Non-breeding	8.25	38.58	Z2504	n/a	Ring may be number Z3504 - was very rusty
13.6.13	84	4	SP	70205	22908	<i>M. mystacinus</i>	F	Nulliparous	5	35.21	No	Z6451	
13.6.13	85	4	SP	70205	22908	<i>M. nattereri</i>	M	Adult	8.5	40.37	No	Z6452	
14.6.13	86	9	SP	71636	21219	<i>M. brandtii</i>	M	Adult	5.75	35.12	No	Z6453	
14.6.13	87	9	SP	71636	21219	<i>P. auritus</i>	M	Adult	7.5	36.97	No	Z6454	
14.6.13	88	9	SP	71636	21219	<i>M. mystacinus</i>	M	Adult	5.25	35.16	No	Z6455	
14.6.13	89	9	SP	71636	21219	<i>M. daubentonii</i>	M	Adult	7.5	38.75	A8216	n/a	Removed thorn from infected wing membrane adjacent to elbow
14.6.13	90	9	SP	71636	21219	<i>M. daubentonii</i>	M	Adult	8	39.15	No	Z6456	
14.6.13	91	9	SP	71636	21219	<i>P. pygmaeus</i>	F	Nulliparous	4.25	31.48	No	No	

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14.6.13	92	9	SP	71636	21219	<i>M. brandtii</i>	F	Pregnant	6.25	35.19	No	Z6457	Distended abdomen - too far into pregnancy to radio-tag
14.6.13	93	9	SP	71636	21219	<i>P. pygmaeus</i>	F	Nulliparous	4.75	30.95	No	No	
14.6.13	94	9	SP	71636	21219	<i>M. daubentonii</i>	M	Adult	8.25	40.92	No	Z6458	
15.6.13	95	3	SP	69727	23448	<i>M. mystacinus</i>	F	Pregnant	n/a	n/a	No	No	Released immediately and no biometrics taken as just about to give birth
16.6.13	96	8	SP	71493	21702	<i>M. bechsteinii</i>	F	Pregnant	8.25	42.05	No	Z6459	Radio-tagged 173.2780; Session 2 Bat 10
16.6.13	97	8	SP	71493	21702	<i>M. bechsteinii</i>	F	Pregnant	9.25	41.95	Z2646	n/a	Ring number does not indicate has been radio-tagged (North Bucks Bat Group / Bernwood Forest Bechstein's Project records) but because bat had bald patch on back (indicating may have been radio-tagged earlier in season) decided not to radio-tag as a precaution.
16.6.13	98	8	SP	71493	21702	<i>M. bechsteinii</i>	F	Pregnant	9.25	41.04	Z2647	n/a	Radio-tagged 173.2510; Session 2 Bat 11
16.6.13	99	8	SP	71493	21702	<i>M. bechsteinii</i>	F	Pregnant	8.5	40.89	No	Z6460	Radio-tagged 173.3220; Session 2 Bat 12
16.6.13	100	8	SP	71493	21702	<i>M. bechsteinii</i>	F	Non-breeding	8	40.97	No	Z6460	Radio-tagged 173.3080; Session 2 Bat 13
16.6.13	101	8	SP	71493	21702	<i>M. bechsteinii</i>	F	Pregnant	9.5	40.25	A5150	n/a	Radio-tagged 173.3340; Session 2 Bat 14

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16.6.13	102	8	SP	71493	21702	<i>P. pygmaeus</i>	F	Pregnant	5	31.09	No	No	Too light to radio-tag
16.6.13	103	8	SP	71493	21702	<i>M. nattereri</i>	F	Pregnant	9	40.02	Z2616	n/a	
12.7.13	104	9	SP	71636	21219	<i>P. pygmaeus</i>	M	Adult	5.5	32.03	No	No	
12.7.13	105	9	SP	71636	21219	<i>P. pygmaeus</i>	F	Nulliparous	4.25	31.96	No	No	Too light to radio-tag
12.7.13	106	9	SP	71636	21219	<i>P. Pipistrellus</i>	M	Adult	5	30.95	No	No	
12.7.13	107	9	SP	71636	21219	<i>P. Pipistrellus</i>	M	Adult	5	31.54	No	No	
12.7.13	108	9	SP	71636	21219	<i>M. mystacinus</i>	M	Adult	5.75	35.22	No	Z6363	
12.7.13	109	9	SP	71636	21219	<i>M. mystacinus</i>	F	Nulliparous	5.25	35.87	No	Z6464	Too light to radio-tag
12.7.13	110	9	SP	71636	21219	<i>M. mystacinus</i>	M	Adult	6	34.99	No	Z6465	
12.7.13	111	9	SP	71636	21219	<i>M. brandtii</i>	M	Adult	6.5	35.48	No	Z6466	
12.7.13	112	9	SP	71636	21219	<i>M. daubentonii</i>	M	Adult	7.5	38.23	No	Z6467	
13.7.13	113	4	SP	70205	22908	<i>P. auritus</i>	M	Adult	7.5	38.12	No	Z6468	
13.7.13	114	4	SP	70205	22908	<i>P. auritus</i>	M	Adult	7.5	38.94	H1071	n/a	Damaged wing as ring too tight - removed ring.
13.7.13	115	4	SP	70205	22908	<i>M. nattereri</i>	F	Non-breeding	8	40.12	Z2530	n/a	Radio-tagged 173.2715; Session 3; Bat 2

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13.7.13	116	4	SP	70205	22908	<i>M. mystacinus</i>	F	Lactating	6	n/a	n/a	n/a	Lactating and milk around nipples so released immediately
13.7.13	117	4	SP	70205	22908	<i>M. mystacinus</i>	F	Lactating	6	35.22	No	No	Milk around nipples
13.7.13	118	4	SP	70205	22908	<i>M. mystacinus</i>	F	Lactating	6	36.01	No	No	Milk around nipples
13.7.13	119	4	SP	70205	22908	<i>M. mystacinus</i>	F	Lactating	6	35.88	No	Z6469	Has bred this year but no milk around nipples; Radio-tagged 173.9930; Session 3; Bat 3
13.7.13	120	4	SP	70205	22908	<i>M. brandtii</i>	F	Lactating	7	36.31	No	No	Has bred this year but no milk around nipples
13.7.13	121	4	SP	70205	22908	<i>P. auritus</i>	M	Adult	7	38.22	A5191	n/a	
13.7.13	122	4	SP	70205	22908	<i>M. nattereri</i>	M	Adult	6.75	37.55	H1155	n/a	
13.7.13	123	4	SP	70205	22908	<i>M. mystacinus</i>	F	Nulliparous	5	35.13	No	Z6470	
13.7.13	124	4	SP	70205	22908	<i>P. pygmaeus</i>	M	Adult	5	31.22	No	No	
13.7.13	125	4	SP	70205	22908	<i>M. brandtii</i>	F	Lactating	7	n/a	No	No	Has recently given birth so released immediately
13.7.13	126	4	SP	70205	22908	<i>M. mystacinus</i>	F	Nulliparous	5	35.14	No	Z6471	
13.7.13	127	4	SP	70205	22908	<i>M. mystacinus</i>	F	Lactating	6.5	36.01	No	No	Has recently given birth so released immediately
13.7.13	128	7	SP	71201	22009	<i>P. auritus</i>	M	Adult	7.5	37.89	A8219	n/a	



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13.7.13	129	7	SP	71201	22009	<i>M. mystacinus</i>	F	Nulliparous	5	35.12	No	Z6473	
13.7.13	130	7	SP	71201	22009	<i>M. bechsteinii</i>	F	Lactating	9.5	40.23	No	Z6472	Bat has very pale fur. Radio-tagged 173.2480; Session 3; Bat 1
13.7.13	131	7	SP	71201	22009	<i>M. mystacinus</i>	F	Non-breeding	6.5	35.36	L02052	n/a	
13.7.13	132	7	SP	71201	22009	<i>M. mystacinus</i>	F	Lactating	6.5	35.92	No	No	
13.7.13	133	7	SP	71201	22009	<i>M. mystacinus</i>	F	Lactating	7	35.22	No	Z6474	Has bred this year but no milk around nipples ; Radio-tagged 173.9650; Session 3; Bat 6
13.7.13	134	7	SP	71201	22009	<i>M. mystacinus</i>	F	Lactating	6.5	35.35	No	No	
13.7.13	135	7	SP	71201	22009	<i>M. brandtii</i>	F	Lactating	8	36.09	No	Z6475	Has bred this year but no milk around nipples ; Radio-tagged 173.9790; Session 3; Bat 5
13.7.13	136	7	SP	71201	22009	<i>P. auritus</i>	F	Non-breeding	8	38.56	C1144	n/a	Radio-tagged 173.3800; Session 3; Bat 4
13.7.13	137	7	SP	71201	22009	<i>P. auritus</i>	F	Pregnant	11	38.48	No	No	In late stages of pregnancy - released immediately
13.7.13	138	7	SP	71201	22009	<i>P. auritus</i>	F	Pregnant	11	39.98	No	No	In late stages of pregnancy - released immediately
13.7.13	139	7	SP	71201	22009	<i>P. pygmaeus</i>	F	Lactating	6	31.78	No	No	
13.7.13	140	7	SP	71201	22009	<i>P. pygmaeus</i>	M	Adult	4	31.31	No	No	

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13.7.13	141	7	SP	71201	22009	<i>P. pygmaeus</i>	F	Lactating	7	31.89	No	No	
14.7.13	142	3	SP	69727	23448	<i>M. brandtii</i>	F	Lactating	6.75	36.12	No	Z6476	Has bred this year but no milk around nipples ; Radio-tagged 173.7370; Session 3; Bat 7
14.7.13	143	3	SP	69727	23448	<i>M. brandtii</i>	M	Adult	6.5	31.16	No	Z6477	
14.7.13	144	3	SP	69727	23448	<i>P. Pipistrellus</i>	F	Post-lactating	5.5	30.55	No	No	
14.7.13	145	3	SP	69727	23448	<i>M. daubentonii</i>	F	Post-lactating	9	39.02	No	Z6478	Radio-tagged 173.3170; Session 3; Bat 8
14.7.13	146	3	SP	69727	23448	<i>M. mystacinus</i>	F	Post-lactating	6	35.14	No	Z6479	
14.7.13	147	3	SP	69727	23448	<i>M. daubentonii</i>	F	Post-lactating	10	38.69	No	Z6480	Radio-tagged 173.3690; Session 3; Bat 9
14.7.13	148	3	SP	69727	23448	<i>P. Pipistrellus</i>	F	Post-lactating	6.5	31.22	No	Lo2154	Radio-tagged 173.8010; Session 3; Bat 10
14.7.13	149	3	SP	69727	23448	<i>M. mystacinus</i>	F	Post-lactating	6.5	36.01	No	Z6482	Radio-tagged 173.9210; Session 3; Bat 11
15.7.13	150	2	SP	69389	23930	<i>M. brandtii</i>	M	Adult	6.5	33.83	No	Z6483	
15.7.13	151	2	SP	69389	23930	<i>P. auritus</i>	M	Adult	7.5	38.67	No	No	
15.7.13	152	2	SP	69389	23930	<i>P. auritus</i>	F	Lactating	9	40.31	No	Z6462	Has bred this year but no milk around nipples ; Radio-tagged 173.2600; Session 3; Bat 12
15.7.13	153	2	SP	69389	23930	<i>M. daubentonii</i>	M	Adult	7	36.6	No	Z6463	

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15.7.13	154	2	SP	69389	23930	<i>P. auritus</i>	M	Adult	8	35.89	No	Z6464	
16.7.13	155	5	SP	70623	22344	<i>M. mystacinus</i>	F	Nulliparous	6	35.19	No	Z6465	
16.7.13	156	5	SP	70623	22344	<i>M. mystacinus</i>	F	Nulliparous	6.5	35.62	No	Z6466	
16.7.13	157	5	SP	70623	22344	<i>M. nattereri</i>	M	Adult	7.5	38.72	A5175	n/a	Frost bitten ears
16.7.13	158	5	SP	70623	22344	<i>P. auritus</i>	M	Adult	6	40.16	No	No	Underweight in poor condition
16.7.13	159	5	SP	70623	22344	<i>M. nattereri</i>	M	Adult	8	40.92	No	Z6467	
16.7.13	160	5	SP	70623	22344	<i>P. Pipistrellus</i>	M	Juvenile	3.5	30.16	No	No	
16.7.13	161	5	SP	70623	22344	<i>M. mystacinus</i>	F	Post-lactating	6	35.75	No	Z6468	
16.7.13	162	5	SP	70623	22344	<i>M. daubentonii</i>	M	Adult	8.5	38.16	No	Z6469	
16.7.13	163	5	SP	70623	22344	<i>M. mystacinus</i>	F	Post-lactating	6	35.94	No	Z6470	
16.7.13	164	5	SP	70623	22344	<i>P. pygmaeus</i>	F	Nulliparous	5	31.92	No	No	
16.7.13	165	5	SP	70623	22344	<i>P. auritus</i>	M	Adult	6.5	37.82	No	No	Underweight in poor condition
16.7.13	166	5	SP	70623	22344	<i>M. bechsteinii</i>	F	Non-breeding	9	40.95	No	Z6471	Radio-tagged 173.4260; Session 3; Bat 13
17.7.13	167	6	SP	71024	21859	<i>M. bechsteinii</i>	F	Post-lactating	9.5	41.22	No	Z6472	Radio-tagged 173.4556; Session 3; Bat 14
17.7.13	168	6	SP	71024	21859	<i>M. nattereri</i>	F	Post-lactating	8.5	40.96	No	Z6473	Radio-tagged 173.2935; Session 3; Bat 15

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17.7.13	169	6	SP	71024	21859	<i>P. pygmaeus</i>	M	Juvenile	4	31.01	No	No	
17.7.13	170	6	SP	71024	21859	<i>P. pygmaeus</i>	M	Juvenile	3.5	30.95	No	No	Recently Volant
17.7.13	171	6	SP	71024	21859	<i>P. Pipistrellus</i>	M	Juvenile	4	31.66	No	No	
17.7.13	172	6	SP	71024	21859	<i>P. auritus</i>	F	Nulliparous	7	38.06	No	No	
17.7.13	173	6	SP	71024	21859	<i>M. daubentonii</i>	M	Adult	8	38.66	No	No	
17.7.13	174	6	SP	71024	21859	<i>M. nattereri</i>	M	Adult	7.5	39.12	No	No	
17.7.13	175	6	SP	71024	21859	<i>P. auritus</i>	F	Nulliparous	7	38.22	No	No	
17.7.13	176	6	SP	71024	21859	<i>P. auritus</i>	F	Nulliparous	7.5	37.89	No	No	
18.7.13	177	1	SP	68766.5	24830	<i>P. pygmaeus</i>	M	Adult	5	30.99	No	No	
18.7.13	178	1	SP	68766.5	24830	<i>P. pygmaeus</i>	M	Adult	5.25	31.54	No	No	
18.7.13	179	1	SP	68766.5	24830	<i>P. Pipistrellus</i>	F	Juvenile	4	30.54	No	No	
18.7.13	180	1	SP	68766.5	24830	<i>P. Pipistrellus</i>	M	Adult	5.5	31.22	No	No	
18.7.13	181	1	SP	68766.5	24830	<i>M. daubentonii</i>	M	Adult	7.5	38.66	No	Z6474	
18.7.13	182	1	SP	68766.5	24830	<i>M. daubentonii</i>	M	Adult	8.5	38.69	No	Z6475	

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18.7.13	183	1	SP	68766.5	24830	<i>M. daubentonii</i>	M	Juvenile	6.5	36.35	No	No	
18.7.13	184	1	SP	68766.5	24830	<i>M. mystacinus</i>	M	Adult	5.5	35.22	No	Z6476	
18.7.13	185	1	SP	68766.5	24830	<i>P. pygmaeus</i>	F	Nulliparous	5.5	32.06	No	No	
18.7.13	186	1	SP	68766.5	24830	<i>P. pygmaeus</i>	M	Adult	5.5	31.09	No	No	
18.7.13	187	1	SP	68766.5	24830	<i>P. Pipistrellus</i>	M	Adult	6	31.44	No	No	
19.7.13	188	7	SP	71201	22009	<i>P. pygmaeus</i>	M	Adult	5	30.91	No	No	
19.7.13	189	7	SP	71201	22009	<i>M. bechsteinii</i>	F	Post-lactating	11	41.92	A8289	n/a	Radio-tagged 173.3370; Session 3; Bat 17
19.7.13	190	7	SP	71201	22009	<i>M. mystacinus</i>	F	Juvenile	4.5	34.92	No	No	Recently Volant
19.7.13	191	7	SP	71201	22009	<i>M. bechsteinii</i>	M	Adult	9.5	41.9	No	Z6477	Radio-tagged 173.3131; Session 3; Bat 19
19.7.13	192	7	SP	71201	22009	<i>M. bechsteinii</i>	F	Nulliparous	8.75	39.75	No	Z6478	Radio-tagged 173.4880; Session 3; Bat 18
19.7.13	193	7	SP	71201	22009	<i>M. bechsteinii</i>	F	Post-lactating	10	40.92	No	Z6479	Radio-tagged 173.2365; Session 3; Bat 16
19.7.13	194	7	SP	71201	22009	<i>M. mystacinus</i>	M	Juvenile	4.5	34.16	No	No	Recently Volant
19.7.13	195	7	SP	71201	22009	<i>M. mystacinus</i>	F	Juvenile	4.5	34.96	No	No	Recently Volant

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19.7.13	196	7	SP	71201	22009	<i>M. daubentonii</i>	M	Adult	8.5	38.75	A8216	n/a	
19.7.13	197	7	SP	71201	22009	<i>P. auritus</i>	F	Non-breeding	10	38.62	A8201	n/a	
19.7.13	198	7	SP	71201	22009	<i>M. mystacinus</i>	M	Adult	6	36.19	No	Z6480	
19.7.13	199	7	SP	71201	22009	<i>P. auritus</i>	F	Nulliparous	7.5	37.18	No	Z6481	
19.7.13	200	7	SP	71201	22009	<i>P. Pipistrellus</i>	F	Nulliparous	5.5	30.71	No	Z6482	
19.7.13	201	7	SP	71201	22009	<i>M. nattereri</i>	F	Lactating	10.5	36.92	No	No	Milk around nipples so decided not to radio-tag as likely to have recently given birth
19.7.13	202	7	SP	71201	22009	<i>M. daubentonii</i>	M	Adult	8	38.91	No	No	
20.7.13	203	10	SP	71886.3	20920	<i>M. daubentonii</i>	M	Adult	8.5	37.44	No	No	
20.7.13	204	10	SP	71886.3	20920	<i>M. nattereri</i>	F	Lactating	7.5	39	Z2404	n/a	Milk around nipples so decided not to radio-tag as likely to have recently given birth
20.7.13	205	10	SP	71886.3	20920	<i>P. auritus</i>	M	Adult	9	39.24	A8218	n/a	Slight damage at wing - adjusted ring slightly
20.7.13	206	10	SP	71886.3	20920	<i>P. auritus</i>	F	Nulliparous	8	38.31	No	No	
20.7.13	207	10	SP	71886.3	20920	<i>M. nattereri</i>	M	Juvenile	6	37.65	No	No	Recently Volant
20.7.13	208	8	SP	71493	21702	<i>P. Pipistrellus</i>	F	Post-lactating	4.25	30.92	No	No	

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20.7.13	209	8	SP	71493	21702	<i>P. Pipistrellus</i>	F	Juvenile	4.5	30.02	No	No	
20.7.13	210	8	SP	71493	21702	<i>M. bechsteinii</i>	F	Lactating	11	41.22	A8187	n/a	Lactating and recently given birth so did not radio-tag
20.7.13	211	8	SP	71493	21702	<i>M. bechsteinii</i>	F	Non-breeding	10.25	40.58	No	Z6483	Bat had bald patch on back between shoulder blades; but no ring - may have been radio-tagged earlier in season and lost ring. Decided not to tag as a precaution.
20.7.13	212	8	SP	71493	21702	<i>M. daubentonii</i>	F	Post-lactating	9.25	38.97	No	Z6484	Radio-tagged 173.3290; Session 3; Bat 22 (Bernwood Forest Bechstein's Project Bat 20 & 21)
20.7.13	213	8	SP	71493	21702	<i>P. auritus</i>	F	Nulliparous	7.5	37.18	No	No	
20.7.13	214	8	SP	71493	21702	<i>P. Pipistrellus</i>	F	Nulliparous	5.5	30.71	No	No	
20.7.13	215	8	SP	71493	21702	<i>M. nattereri</i>	F	Lactating	10.5	36.92	No	No	
20.7.13	216	8	SP	71493	21702	<i>M. nattereri</i>	F	Lactating	7.5	39	Z2404	n/a	
20.7.13	217	8	SP	71493	21702	<i>P. auritus</i>	M	Adult	9	39.22	No	No	
1.8.13	218	9	SP	71636	21219	<i>M. daubentonii</i>	M	Adult	8	38.12	No	No	
1.8.13	219	9	SP	71636	21219	<i>M. mystacinus</i>	M	Adult	5.5	35.16	No	No	
1.8.13	220	9	SP	71636	21219	<i>P. Pipistrellus</i>	F	Juvenile	4	30.96	No	No	
1.8.13	221	9	SP	71636	21219	<i>P. pygmaeus</i>	M	Adult	5	31.77	No	No	

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1.8.13	222	9	SP	71636	21219	<i>P. auritus</i>	M	Adult	7.5	38.16	No	No	
1.8.13	223	9	SP	71636	21219	<i>M. daubentonii</i>	M	Adult	7.5	37.84	No	No	
1.8.13	224	9	SP	71636	21219	<i>P. pygmaeus</i>	F	Juvenile	4.5	31.12	No	No	
2.8.13	225	5	SP	70623	22344	<i>M. mystacinus</i>	F	Juvenile	5	34.96	No	No	
2.8.13	226	5	SP	70623	22344	<i>P. Pipistrellus</i>	F	Juvenile	4.5	31.12	No	No	
2.8.13	227	5	SP	70623	22344	<i>P. pygmaeus</i>	F	Juvenile	4.5	31.12	No	No	
2.8.13	228	5	SP	70623	22344	<i>P. pygmaeus</i>	F	Post-lactating	6.5	31.94	No	Z6485	Radio-tagged 173.3420; Session 4; 8 (North Bucks Bat Group Bat 1 & 2; Bernwood Forest Bechstein's Project Bat 3; North Bucks Bat Group Bat 4, 5, 6, 7)
2.8.13	229	5	SP	70623	22344	<i>P. pygmaeus</i>	F	Juvenile	4.5	30.67	No	No	
2.8.13	230	5	SP	70623	22344	<i>P. Pipistrellus</i>	F	Juvenile	4.5	30.92	No	No	
2.8.13	231	5	SP	70623	22344	<i>P. Pipistrellus</i>	F	Nulliparous	4.75	31.02	No	No	
2.8.13	232	5	SP	70623	22344	<i>P. pygmaeus</i>	M	Adult	5.5	30.92	No	No	
3.8.13	233	4	SP	70205	22908	<i>P. Pipistrellus</i>	M	Adult	4.75	32.31	No	No	



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3.8.13	234	4	SP	70205	22908	<i>M. brandtii</i>	F	Adult	6.25	36.12	No	Z6486	Radio-tagged 173.9860; Session 4; Bat 9
3.8.13	235	4	SP	70205	22908	<i>M. brandtii</i>	M	Adult	5	36.07	No	No	
3.8.13	236	4	SP	70205	22908	<i>P. pygmaeus</i>	F	Nulliparous	5.75	32.22	No	No	
3.8.13	237	4	SP	70205	22908	<i>P. pygmaeus</i>	M	Adult	5.5	32.02	No	No	Swollen testes
3.8.13	238	4	SP	70205	22908	<i>P. Pipistrellus</i>	F	Juvenile	4	30.96	No	No	
3.8.13	239	4	SP	70205	22908	<i>P. auritus</i>	F	Juvenile	6	36.92	No	No	
3.8.13	240	4	SP	70205	22908	<i>P. auritus</i>	M	Adult	7.5	38.12	No	No	
3.8.13	241	4	SP	70205	22908	<i>M. daubentonii</i>	M	Adult	8.5	39.12	No	No	
3.8.13	242	4	SP	70205	22908	<i>M. daubentonii</i>	F	Juvenile	7	37.12	No	No	
3.8.13	243	4	SP	70205	22908	<i>M. daubentonii</i>	M	Adult	9.5	40.19	No	No	Swollen testes
3.8.13	244	4	SP	70205	22908	<i>P. pygmaeus</i>	M	Adult	5.5	31.67	No	No	
3.8.13	245	4	SP	70205	22908	<i>M. mystacinus</i>	F	Juvenile	4.5	35.47	No	No	
3.8.13	246	4	SP	70205	22908	<i>M. brandtii</i>	F	Post-lactating	6	36.41	No	Z6487	Radio-tagged 173.9680; Session 4; Bat 10
3.8.13	247	4	SP	70205	22908	<i>P. pygmaeus</i>	F	Post-lactating	5	31.92	No	No	

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3.8.13	248	4	SP	70205	22908	<i>P. Pipistrellus</i>	F	Juvenile	4.5	30.94	No	No	
3.8.13	249	4	SP	70205	22908	<i>P. pygmaeus</i>	F	Nulliparous	5.5	30.96	No	No	
3.8.13	250	4	SP	70205	22908	<i>M. mystacinus</i>	M	Adult	5	36.92	No	No	
3.8.13	251	4	SP	70205	22908	<i>P. Pipistrellus</i>	F	Nulliparous	5	31.67	No	No	
3.8.13	252	4	SP	70205	22908	<i>P. auritus</i>	F	Juvenile	7.5	36.88	No	No	
3.8.13	253	4	SP	70205	22908	<i>P. auritus</i>	F	Post-lactating	9	38.12	A5146	n/a	Radio-tagged 173.2640; Session 4; Bat 13
3.8.13	254	4	SP	70205	22908	<i>P. auritus</i>	F	Post-lactating	9	39.35	A5294	n/a	Radio-tagged 173.3364; Session 4; Bat 12
3.8.13	255	4	SP	70205	22908	<i>P. auritus</i>	M	Adult	8.5	37.26	No	No	Swollen testes
3.8.13	256	4	SP	70205	22908	<i>M. daubentonii</i>	F	Juvenile	7.5	37.98	No	No	
3.8.13	257	4	SP	70205	22908	<i>M. daubentonii</i>	F	Post-lactating	9	38.48	No	Z6488	Radio-tagged 173.3780; Session 4; Bat 14
3.8.13	258	4	SP	70205	22908	<i>M. daubentonii</i>	F	Juvenile	7.25	38.1	No	No	
3.8.13	259	4	SP	70205	22908	<i>M. daubentonii</i>	F	Juvenile	8.5	37.59	No	Z6489	Radio-tagged 173.3087; Session 4; Bat 11
3.8.13	260	4	SP	70205	22908	<i>M. daubentonii</i>	M	Juvenile	7.25	37.88	No	No	
4.8.13	261	3	SP	69727	23448	<i>P. auritus</i>	M	Adult	8.5	38.14	No	No	

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4.8.13	262	3	SP	69727	23448	<i>P. auritus</i>	M	Adult	7	37.98	n/a	n/a	Removed ring as wing damaged - check ring number.
4.8.13	263	3	SP	69727	23448	<i>M. mystacinus</i>	F	Nulliparous	6	35.63	No	No	
4.8.13	264	3	SP	69727	23448	<i>P. pygmaeus</i>	M	Juvenile	4.5	31.55	No	No	
5.8.13	265	2	SP	69389	23930	<i>M. nattereri</i>	M	Adult	8.5	38.97	No	No	
5.8.13	266	2	SP	69389	23930	<i>M. daubentonii</i>	M	Adult	9	39.11	No	No	
5.8.13	267	2	SP	69389	23930	<i>P. auritus</i>	F	Post-lactating	7.5	40.01	No	No	
6.8.13	268	1	SP	68766.5	24830	<i>P. pygmaeus</i>	M	Adult	5	31.01	No	No	
6.8.13	269	1	SP	68766.5	24830	<i>P. pygmaeus</i>	M	Adult	5.25	30.88	No	No	
6.8.13	270	1	SP	68766.5	24830	<i>P. Pipistrellus</i>	F	Juvenile	4.5	31.02	No	No	
6.8.13	271	1	SP	68766.5	24830	<i>P. Pipistrellus</i>	F	Juvenile	4.5	30.59	No	No	
6.8.13	272	1	SP	68766.5	24830	<i>M. daubentonii</i>	F	Post-lactating	9.5	39.17	Z6500	n/a	Radio-tagged 173.4480; Session 4; Bat 15
6.8.13	273	1	SP	68766.5	24830	<i>P. Pipistrellus</i>	F	Post-lactating	6	32.1	No	Lo2152	Radio-tagged 173.9400; Session 4; Bat 16
7.8.13	274	6	SP	71024	21859	<i>M. bechsteinii</i>	M	Adult	9	40.44	No	H2771	Radio-tagged 173.3675; Session 4; Bat 17
7.8.13	275	6	SP	71024	21859	<i>M. bechsteinii</i>	F	Post-lactating	8	40.14	No	H2780	Radio-tagged 173.2900; Session 4; Bat 18

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7.8.13	276	6	SP	71024	21859	<i>M. mystacinus</i>	F	Nulliparous	5.5	35.22	No	No	
7.8.13	277	6	SP	71024	21859	<i>P. Pipistrellus</i>	F	Juvenile	5	31.02	No	No	
7.8.13	278	6	SP	71024	21859	<i>M. mystacinus</i>	M	Adult	5.5	36.03	No	No	
7.8.13	279	6	SP	71024	21859	<i>P. auritus</i>	M	Adult	8	39.22	No	No	
7.8.13	280	6	SP	71024	21859	<i>P. auritus</i>	M	Adult	7.5	39.03	No	No	
7.8.13	281	6	SP	71024	21859	<i>P. pygmaeus</i>	M	Juvenile	4.5	30.87	No	No	
7.8.13	282	6	SP	71024	21859	<i>M. mystacinus</i>	M	Adult	6	35.87	No	No	
7.8.13	283	6	SP	71024	21859	<i>M. brandtii</i>	M	Adult	6.5	36.18	No	No	
8.8.13	284	7	SP	71201	22009	<i>N. noctula</i>	M	Adult	30	56.21	No	B2849	
8.8.13	285	7	SP	71201	22009	<i>P. auritus</i>	M	Adult	8	36.83	Z2600	n/a	
8.8.13	286	7	SP	71201	22009	<i>M. mystacinus</i>	F	Juvenile	5.5	33.22	No	No	
8.8.13	287	7	SP	71201	22009	<i>P. auritus</i>	F	Lactating	9	38.11	Z2371	n/a	
8.8.13	288	7	SP	71201	22009	<i>P. auritus</i>	M	Adult	8.5	39.07	A8218	n/a	
8.8.13	289	7	SP	71201	22009	<i>M. nattereri</i>	M	Juvenile	5.5	36.96	No	No	
8.8.13	290	7	SP	71201	22009	<i>M. mystacinus</i>	F	Juvenile	4.5	31.04	No	No	
8.8.13	291	7	SP	71201	22009	<i>M. nattereri</i>	M	Adult	7	36.93	A8227	n/a	

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8.8.13	292	7	SP	71201	22009	<i>M. nattereri</i>	F	Non-breeding	7	38.2	A8224	n/a	
8.8.13	293	7	SP	71201	22009	<i>P. auritus</i>	F	Non-breeding	7	39.56	A5172	n/a	
8.8.13	294	7	SP	71201	22009	<i>P. auritus</i>	F	Post-lactating	7.5	37.07	Z2452	n/a	
8.8.13	295	7	SP	71201	22009	<i>P. auritus</i>	M	Adult	7.5	40.25	A5190	n/a	Ring had pierced through wing and very badly damaged with scar tissue - removed.
8.8.13	296	7	SP	71201	22009	<i>M. bechsteinii</i>	F	Juvenile	8	40.26	No	H2768	Radio-tagged 173.3560; Session 4; Bat 20
8.8.13	297	7	SP	71201	22009	<i>M. mystacinus</i>	M	Juvenile	4.5	34.21	No	No	
8.8.13	298	7	SP	71201	22009	<i>N. noctula</i>	F	Adult	35	55.94	No	B2850	Radio-tagged 173.3240; Session 4; Bat 19
10.8.13	299	8	SP	71493	21702	<i>M. daubentonii</i>	M	Adult	7.5	38.44	No	No	
10.8.13	300	8	SP	71493	21702	<i>M. daubentonii</i>	M	Juvenile	7	36.59	No	No	
10.8.13	301	8	SP	71493	21702	<i>M. daubentonii</i>	M	Adult	7.5	37.37	A8227	n/a	
10.8.13	302	8	SP	71493	21702	<i>P. Pipistrellus</i>	M	Juvenile	4.5	30.94	A8224	n/a	
10.8.13	303	8	SP	71493	21702	<i>P. pygmaeus</i>	M	Juvenile	4	31.33	A5172	n/a	
10.8.13	304	8	SP	71493	21702	<i>M. mystacinus</i>	F	Nulliparous	5.25	35.02	Z2452	n/a	
10.8.13	305	8	SP	71493	21702	<i>M. mystacinus</i>	M	Juvenile	5	34.99	A5190	n/a	

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10.8.13	306	8	SP	71493	21702	<i>P. auritus</i>	F	Post-lactating	7.5	39.69	No	H2768	
10.8.13	307	8	SP	71493	21702	<i>M. bechsteinii</i>	M	Adult	8.5	39.54	No	H2769	Radio-tagged 173.7702; Session 4; Bat 24 (Bat 21 Bleb; 22 Bech; 23 Bech; North Bucks Bat Group)
10.8.13	308	8	SP	71493	21702	<i>M. bechsteinii</i>	M	Juvenile	7	38.12	A8236	n/a	Ringed by North Bucks Bat Group on 9.8.13 - released immediately as too light to tag

## Annex 3

Figure A: Species and sex of bats caught during trapping study in 2012

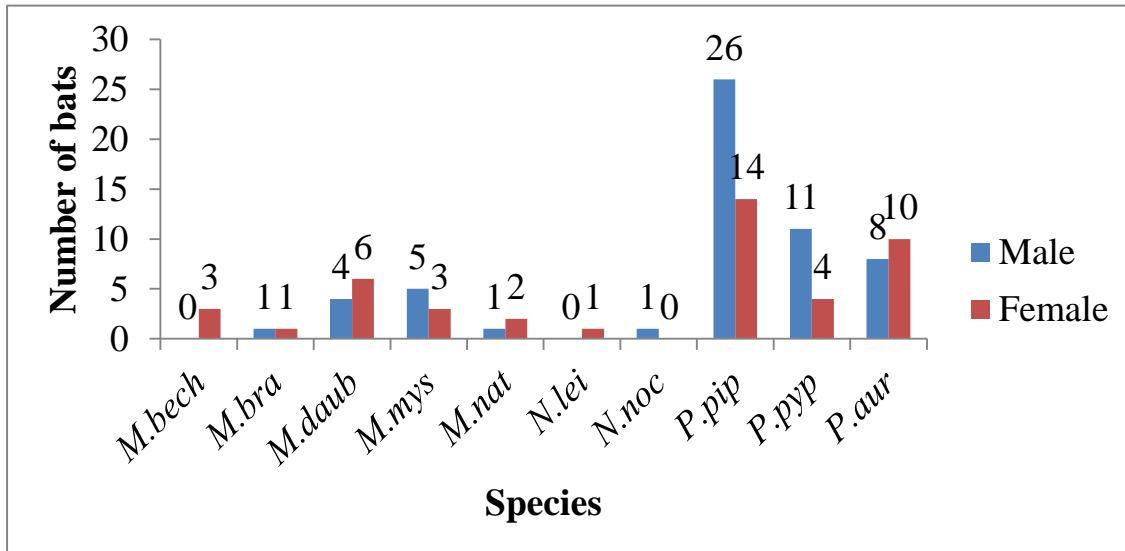
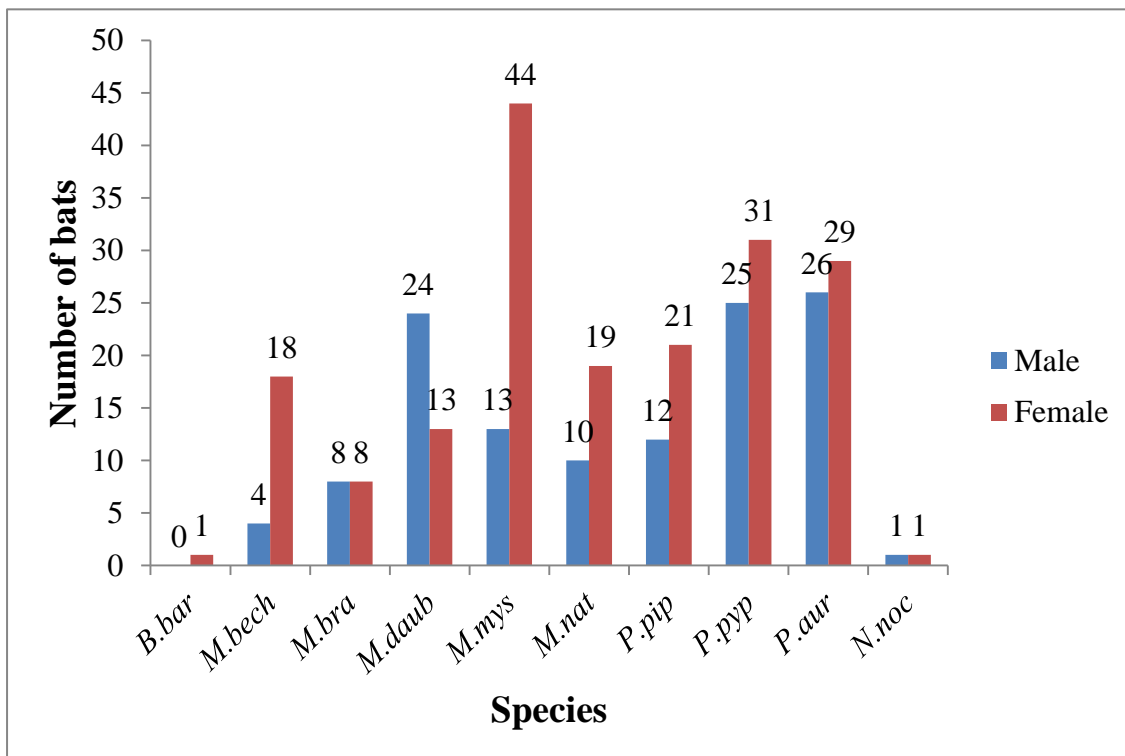


Figure B: Species and sex of bats caught during trapping study in 2013





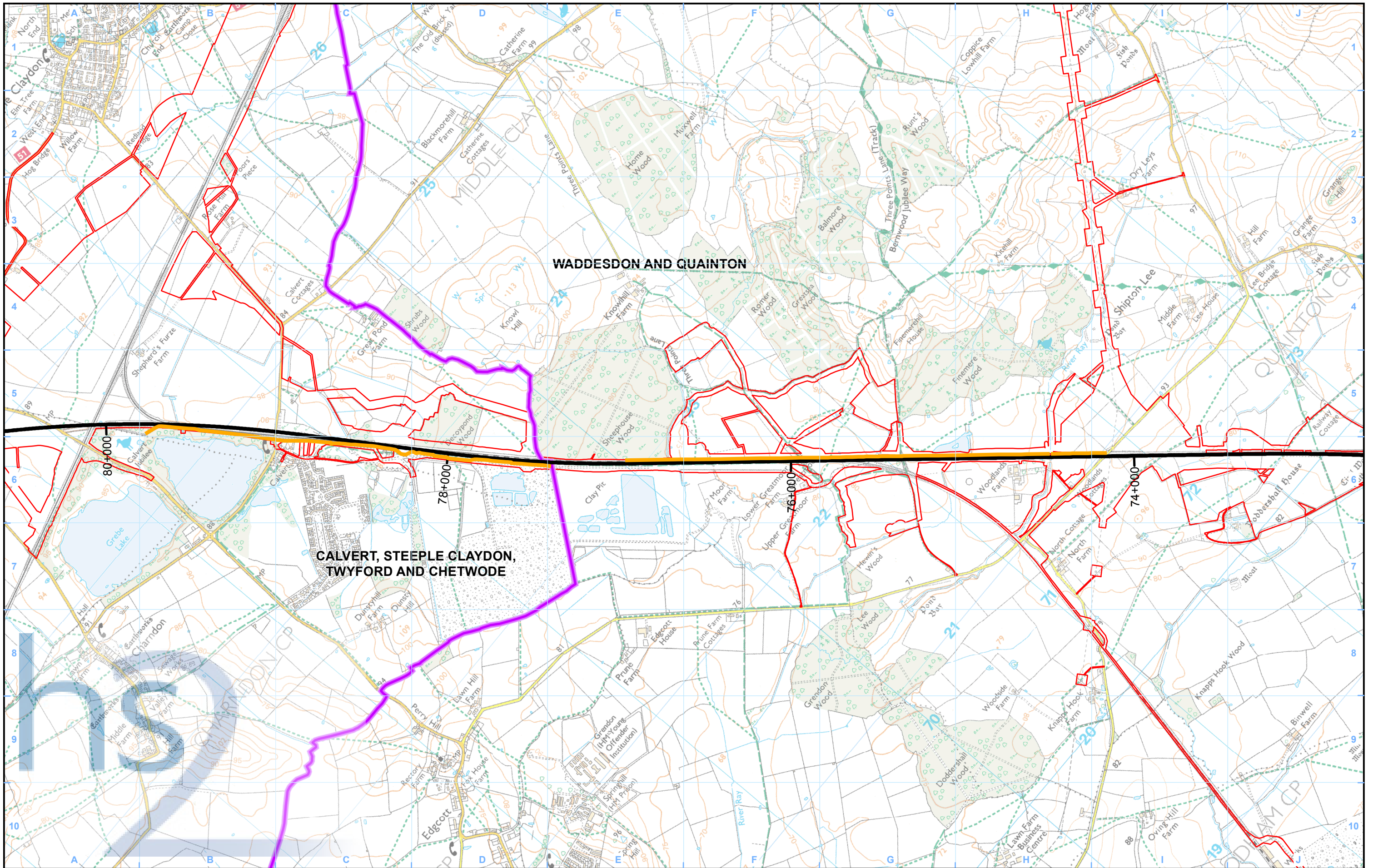


## 6 References

- Adams, L. and Davis, S. D. (1967). Internal anatomy of home range. *Journal of Mammalogy*, 48, 529-536.
- Battersby, J., (2005), UK Mammals: Species Status and Population Trends, JNCC/Tracking Mammals Partnership.
- Davidson-Watts, I. and Jones, G. (2006) Differential in foraging behaviour between Common pipistrelle and Soprano pipistrelle. *Journal of Zoology* 268: 55-62.
- Dietz, M. and Pir, J. B. (2009). Distribution and habitat selection of *Myotis bechsteinii* in Luxembourg: implications for forest management and conservation. *Folia Zoologica*, 58, 327-340.
- Dixon, K. R. and Chapman, J. A. (1980). Harmonic mean measure of animal activity areas. *Ecology*, 61, 1040-1044.
- Entwistle, A. C., Racey, P. A., Speakman, J. R., 1996. Habitat exploitation by a gleaning bat, *Plecotus auritus*. *Philosophical Transactions of the Royal Society, London, Series B-Biol Sci* 351(1342): 921-931.
- Fitzsimons, P, Hill D., Greenaway F (2001) Patterns of habitat use by female Bechstein's bats (*Myotis bechsteinii*) from a maternity colony in a British woodland. School of Biological Sciences. University of Sussex.
- Flavin D. A., Biggane S. S., Shiel C. B., Smiddy P. and Fairley J. S. 2001. Analysis of the diet of Daubenton's bat *Myotis daubentonii* in Ireland. *Acta Theriologica* (46) vol1: 46-52.
- Fuhrmann, M., Seitz, A., 1992. Nocturnal activity of the brown long-eared bat (*Plecotus auritus* L.1758): data from radiotracking in the Lenneburg forest near Mainz (Germany). In: *Wildlife telemetry. Remote monitoring and tracking of animals* (Priede, I.G., Swift, S.M., eds). 538 - 548.
- Harris, S., Cresswell, W. J., Forde, P. G., Trehwella, W. J., Woollard, T. and Wray, S. (1990). Home-range analysis using radio-tracking data - a review of problems and techniques particularly as applied to the study of mammals. *Mammal Review*, 20, 97-123.
- Hill, D A & Greenaway, F. (2005). Effectiveness of an acoustic lure for surveying bats in British woodlands. *Mammal Review* 35(1):116-122
- Hill, D.A. & Greenaway, F. (2008). Conservation of bats in British woodlands. *British Wildlife*, 19(3): 161-169.
- Kenward, R. E. (2001). A manual for wildlife radio tagging. Academic Press, London UK.
- Kerth, G., Wagner, M., König, B. (2001) Roosting together, foraging apart: information transfer about food is unlikely to explain sociality in female Bechstein's bats (*Myotis bechsteinii*) *Behavioral and Ecological Sociobiology* 50 (3): 283-291.

- Kerth, G. and Melber, M. (2009). Species-specific barrier effects of a motorway on the habitat use of two threatened forest-living bat species. *Biological Conservation*, 142, 270-279.
- Mackie I.J and Racey, P.A. (2007) Habitat use varies with reproductive state in noctule bats (*Nyctalus noctula*): Implications for conservation. *Journal of Zoology* 140: 70-77.
- Macdonald, D.W. & Barrett, P., (1993). *Mammals of Britain and Europe (Collins Field Guide)*. Collins, London.
- Murphy, S. E, Greenaway F, and Hill, D.A (2012). Patterns of habitat use by female brown long-eared bats presage negative impacts of woodland conservation management. *Journal of Zoology* 288: 177-183.
- Nicholls, B. and Racey, P. A. (2006). Contrasting home-range size and spatial partitioning in cryptic and sympatric pipistrelle bats. *Behavioral Ecology and Sociobiology*, 61, 131-142.
- Powell, R. A. (2000). Animal home ranges and territories and home range estimators. In *Research techniques in animal ecology: controversies and consequences*. Boitani, L. & Fuller, T.K. (eds.) Columbia University Press, New York, USA, pp. 65-110.
- Samuel, M. D., Pierce, D. J. and Garton, E. O. (1985). Identifying areas of concentrated use within the home range. *Journal of Animal Ecology*, 54, 711-719.
- Schofield, H., Morris, C. (2000) Ranging behaviour and habitat preferences of female Bechstein's bat, *Myotis bechsteinii* (Kuhl, 1818), in summer. Held by The Vincent Wildlife Trust.
- Silverman, B. W. (1986). *Density estimation for statistics and data analysis*. Chapman & Hall. London.
- Smith, P.G and Racey, P.A. (2008) Natterer's bats prefer foraging in broad-leaved woodlands and river corridors. *Journal of Zoology* 275: 314-322.
- Swift, S. M., Racey, P. A., 1983. Resource partitioning in two species of Vespertilionid bats (Chiroptera) occupying the same roost. *Journal of Zoology* 200: 249-259.
- White, G. C. and Garrott, R. A. (1990). *Analysis of wildlife radio-tracking data*. Academic Press. San Diego, USA.
- Worton, B. J. (1987). A review of models of home range for animal movement. *Ecological Modelling*, 38, 277-298.
- Worton, B. J. (1989). Kernel methods for estimating the utilization distribution in home-range studies. *Ecology*, 70, 164-168.

# 7 Figures



- Legend**
- Route in tunnel
  - Activity transect route
  - Route on surface
  - Community forum boundary
  - Land potentially required during construction

Map Number **Figure 1**

Map Name **Activity Transect Routes**

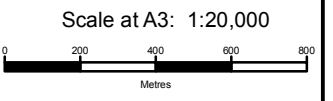
Community Forum Area:  
Waddesdon and Quanton



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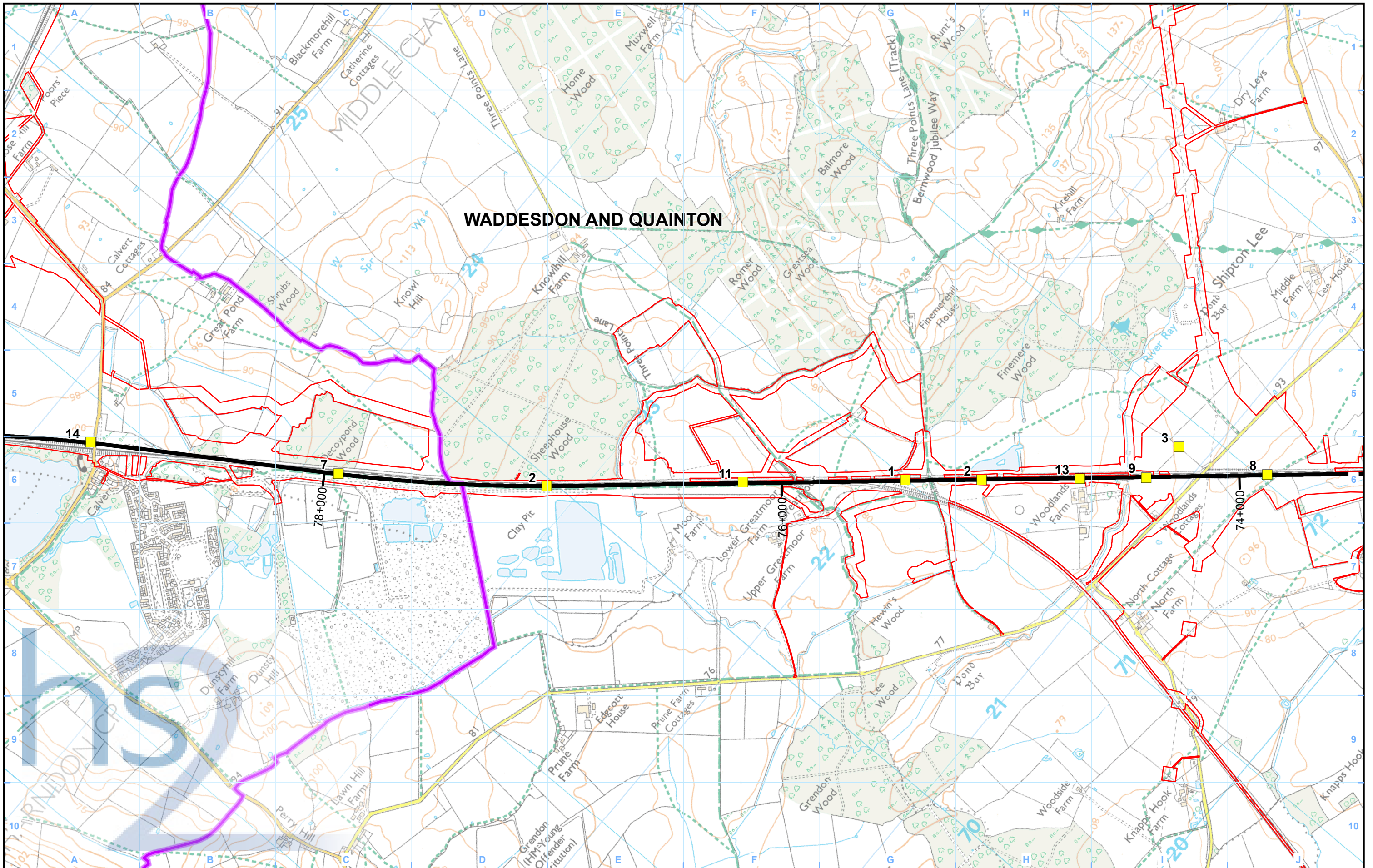
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**WADDESDON AND QUANTON**

- Legend**
- Route in tunnel
  - Route on surface
  - Community forum boundary
  - Land potentially required during construction
  - SM2 Static Recorder Location

Map Number **Figure 2a**

Map Name **SM2 Static Recorder Locations 2012**

Community Forum Area:  
Waddesdon and Quainton

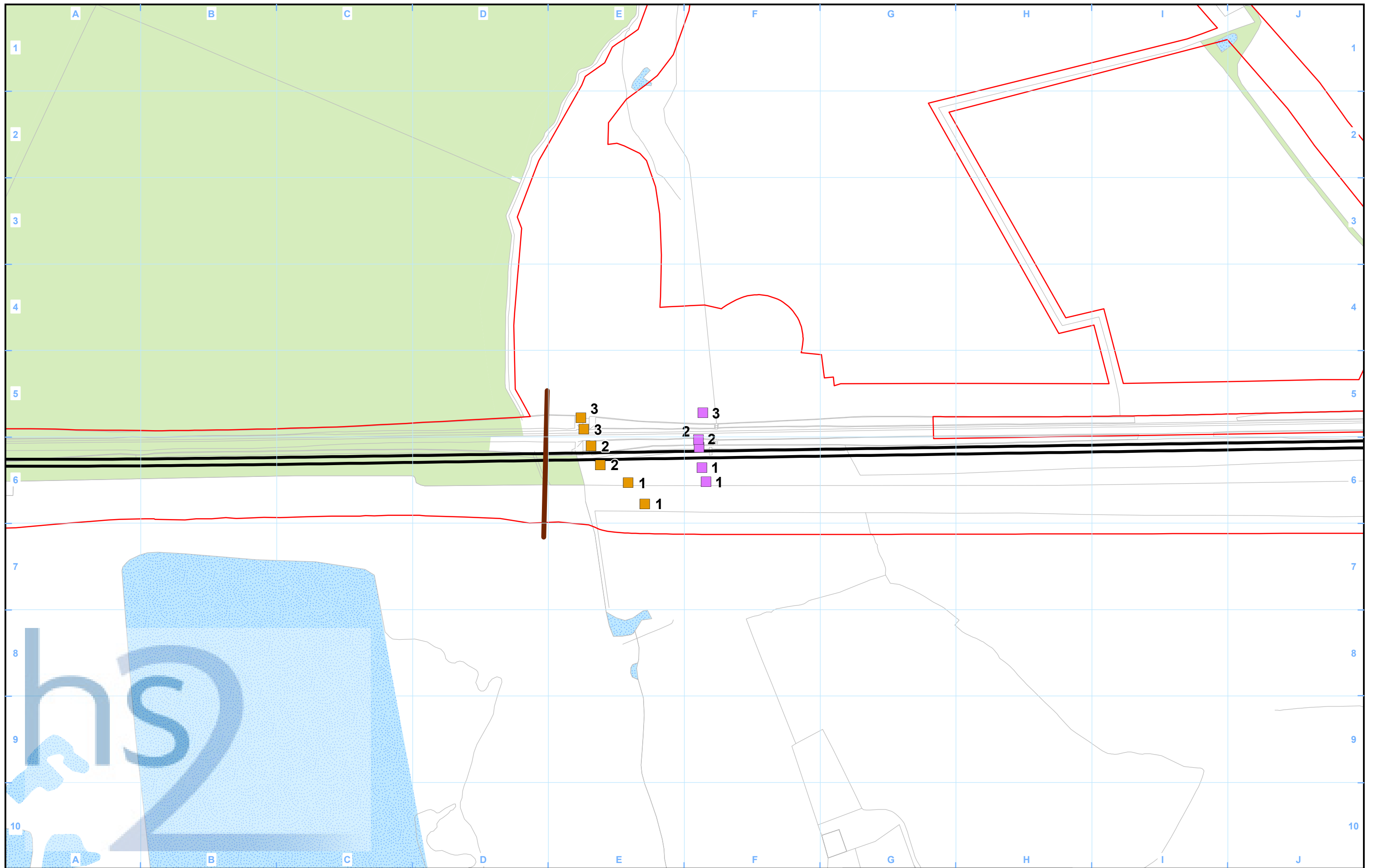
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**Legend**

- Route in tunnel
- Route on surface
- Community forum boundary
- Land potentially required during construction

**Mic Locations:**

- Array
- Array 1
- Floating between 1 and 2

Map Number: **Figure 2b**

Map Name: **SM2 Static Recorder Locations 2013**

Community Forum Area: **Waddesdon and Quanton**

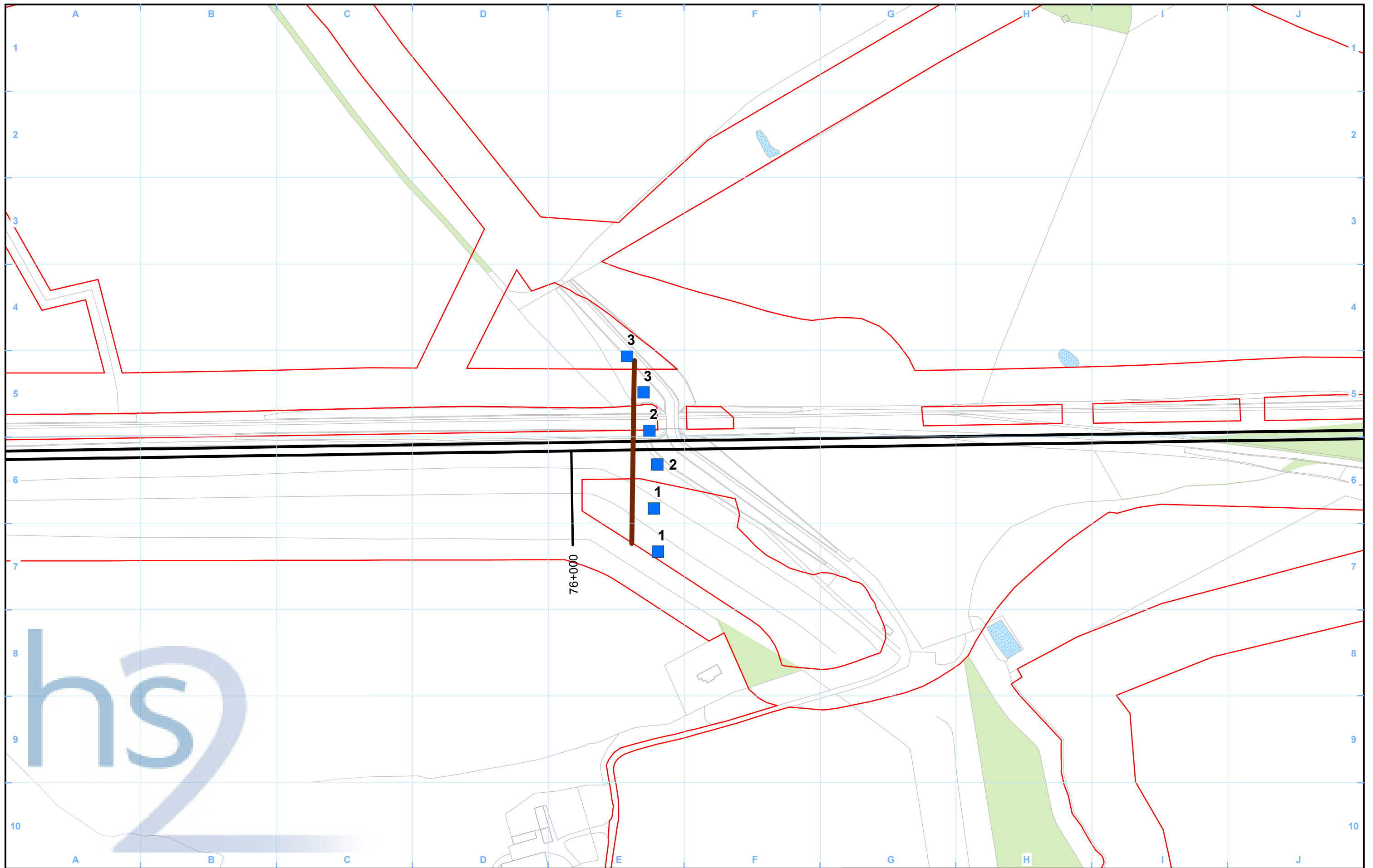
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**Legend**

- Route in tunnel
- Route on surface
- Community forum boundary
- Land potentially required during construction

**Mic Locations:**

- Array
- Array 2

Map Number **Figure 2c**

Map Name **SM2 Static Recorder Locations 2013**

Community Forum Area: **Waddesdon and Quanton**

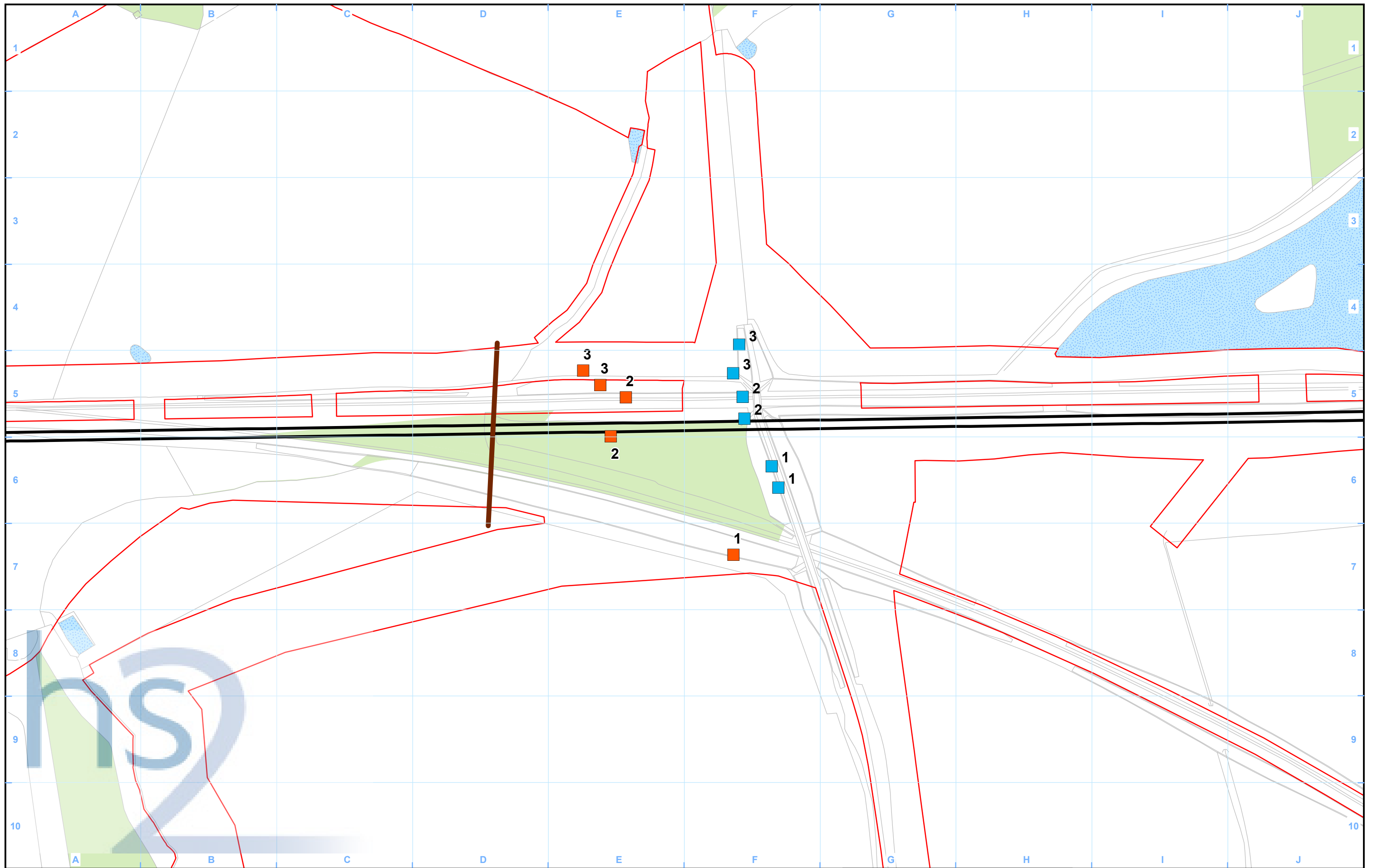
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**Legend**

- Route in tunnel
- Route on surface
- Community forum boundary
- Land potentially required during construction

**Mic Locations**

- Array
- Array 3
- Floating between 3 and 4

Map Number: **Figure 2d**

Map Name: **SM2 Static Recorder Locations 2013**

Community Forum Area: **Waddesdon and Quanton**

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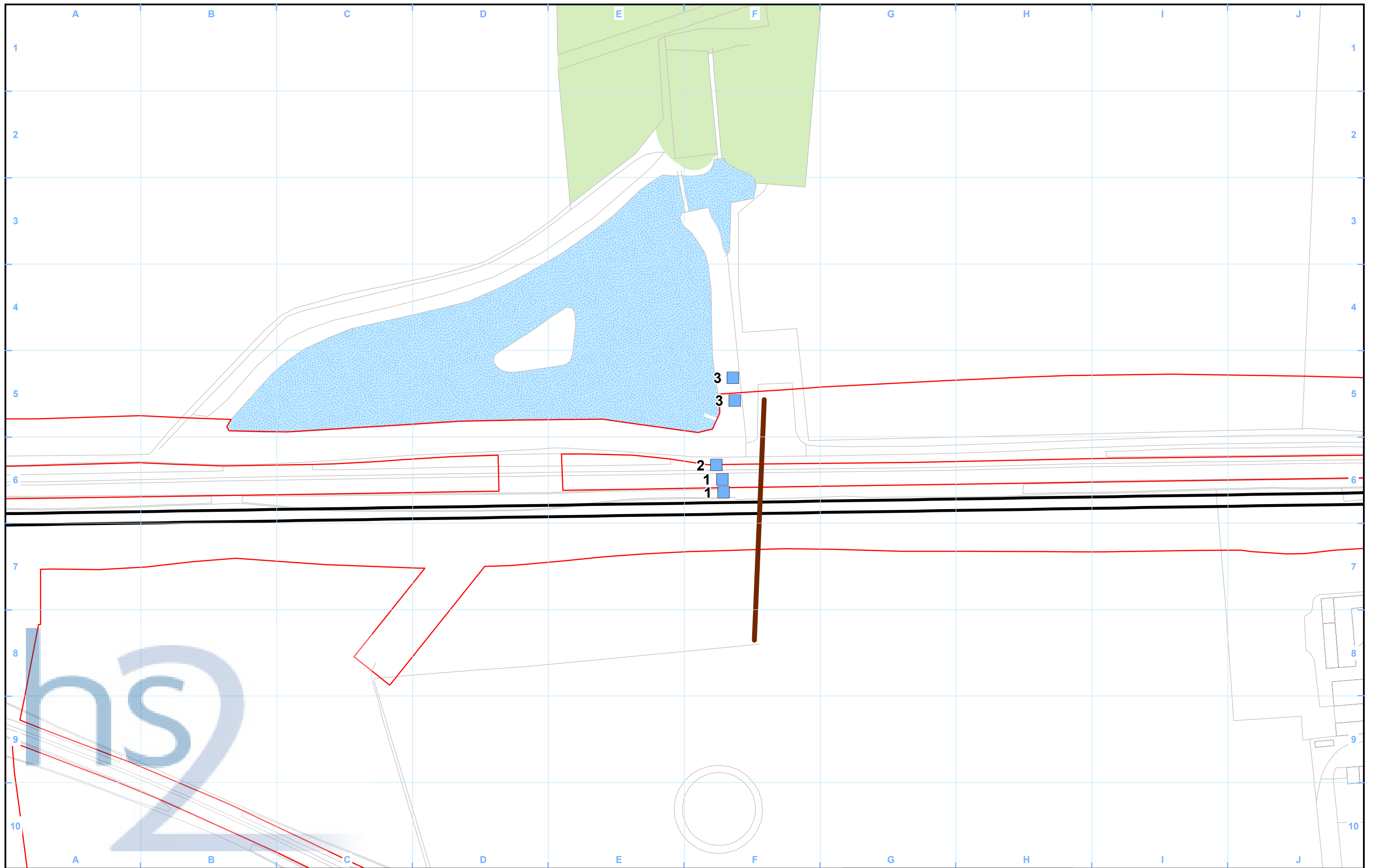
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Doc Number: **Figure 2d**      Date: **30/10/13**





**Legend**

- Route in tunnel
- Route on surface
- Community forum boundary
- Land potentially required during construction

**Mic Locations:**

- Array
- Array 4

Map Number: **Figure 2e**

Map Name: **SM2 Static Recorder Locations 2013**

Community Forum Area: **Waddesdon and Quanton**

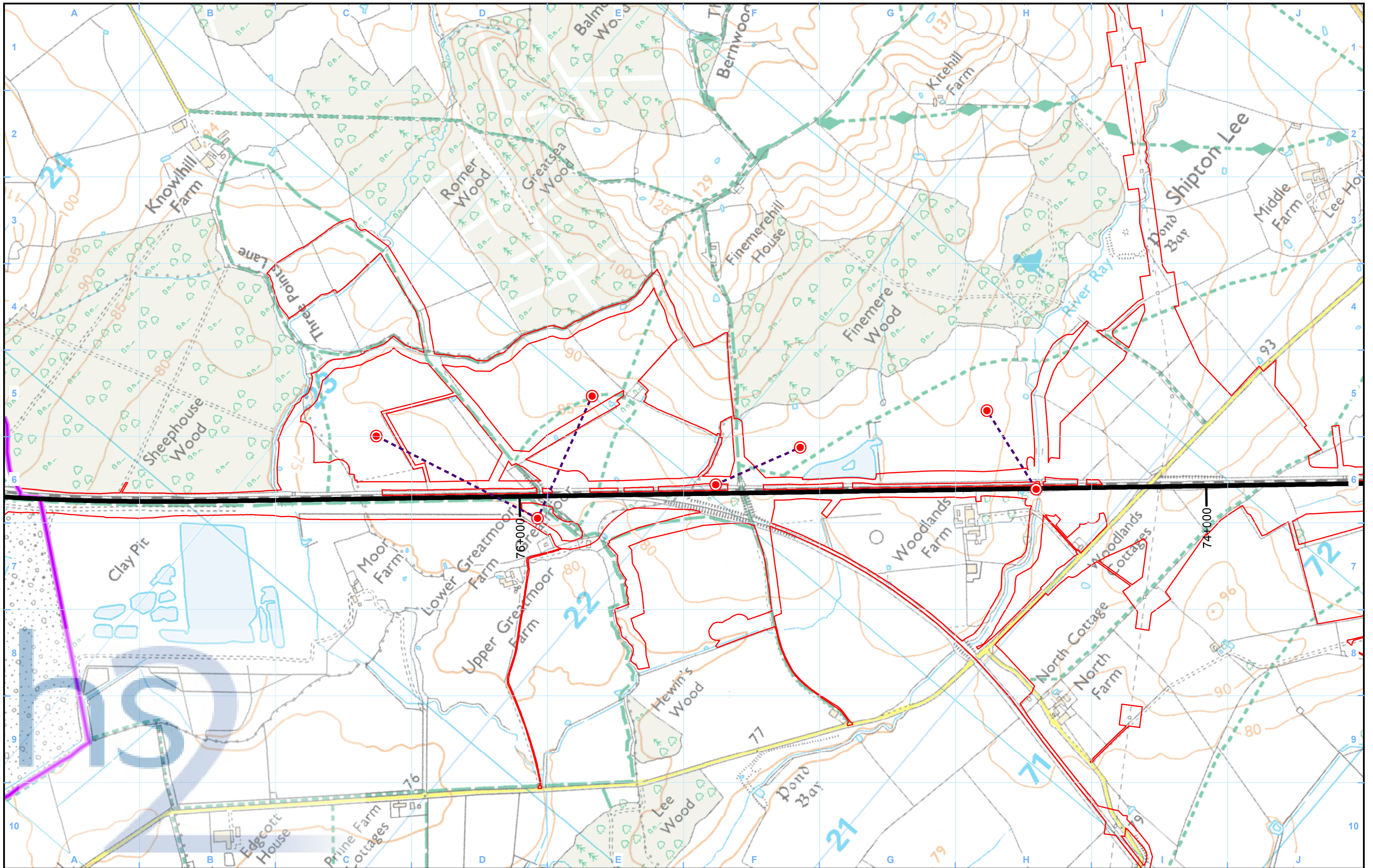
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- Legend**
- Route in tunnel
  - Route on surface
  - Community forum boundary
  - Land potentially required during construction
  - Paired sampling sites
  - Paired sampling routes

Map Number: **Figure 3**

Map Name: **Paired sampling sites**

Community Forum Area:  
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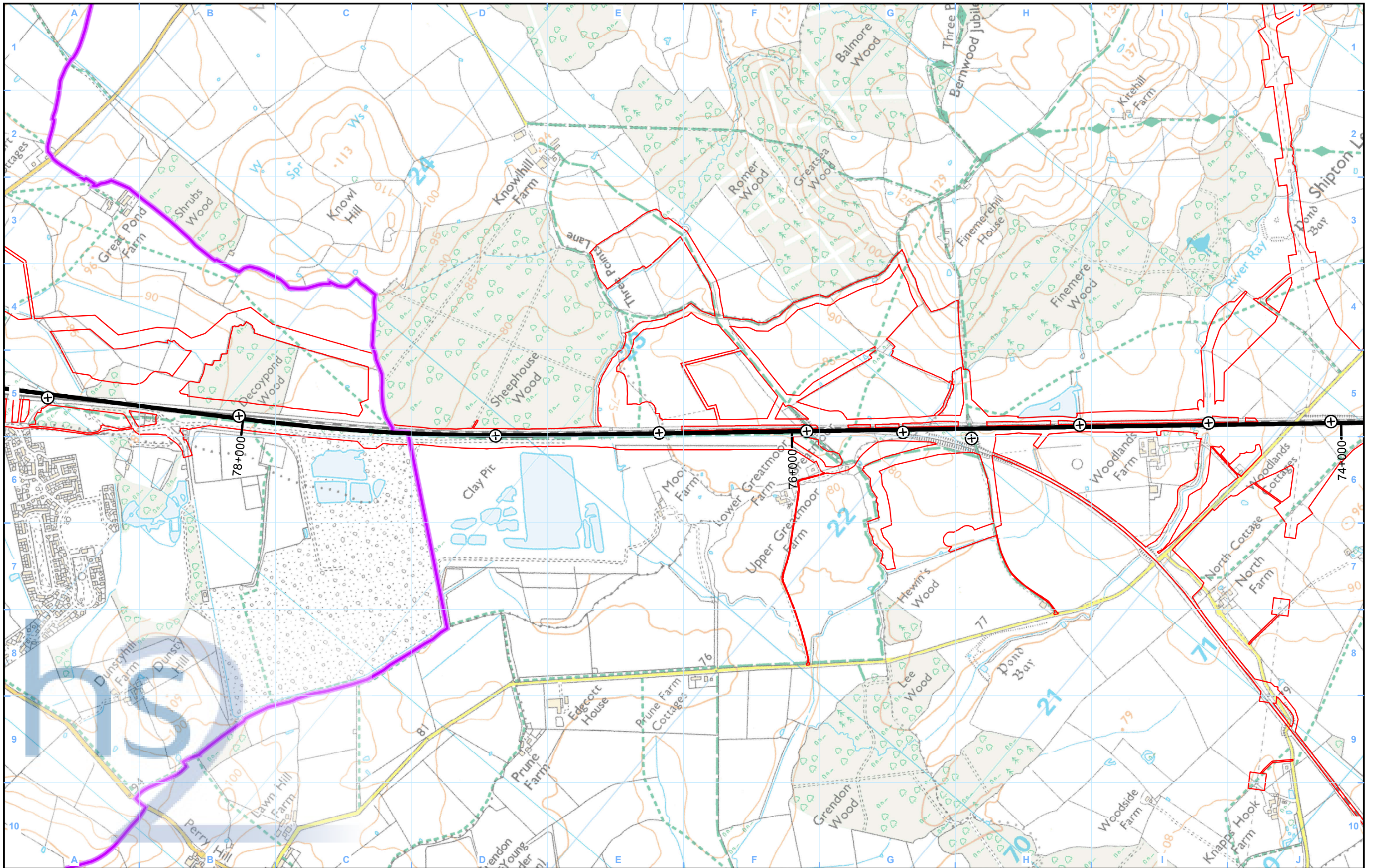


Scale at A3: 1:10,000



Metres

Date: 30/10/13




- Legend**
- Route in tunnel
  - Route on surface
  - Community forum boundary
  - Land potentially required during construction

X Trapping Locations 2012

Map Number **Figure 4**

Map Name **Trapping Locations 2012**

Community Forum Area:  
Waddesdon and Quanton




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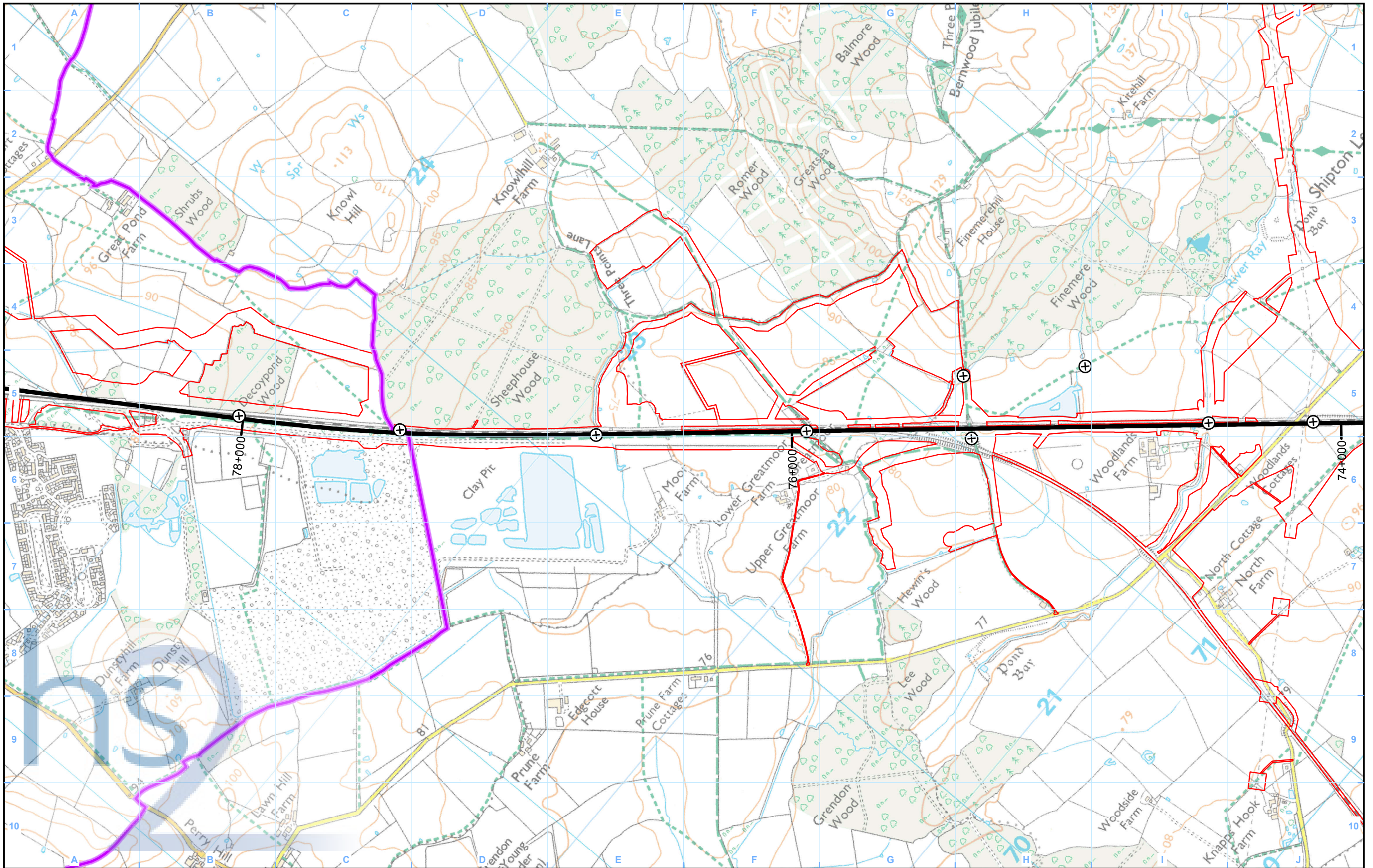


Scale at A3: 1:12,500



Metres

Date: 30/10/13



- Legend**
- Route in tunnel
  - Route on surface
  - Community forum boundary
  - Land potentially required during construction

Trapping locations 2013

Map Number **Figure 5**

Map Name **Trapping locations 2013**

Community Forum Area:  
Waddesden and Quanton

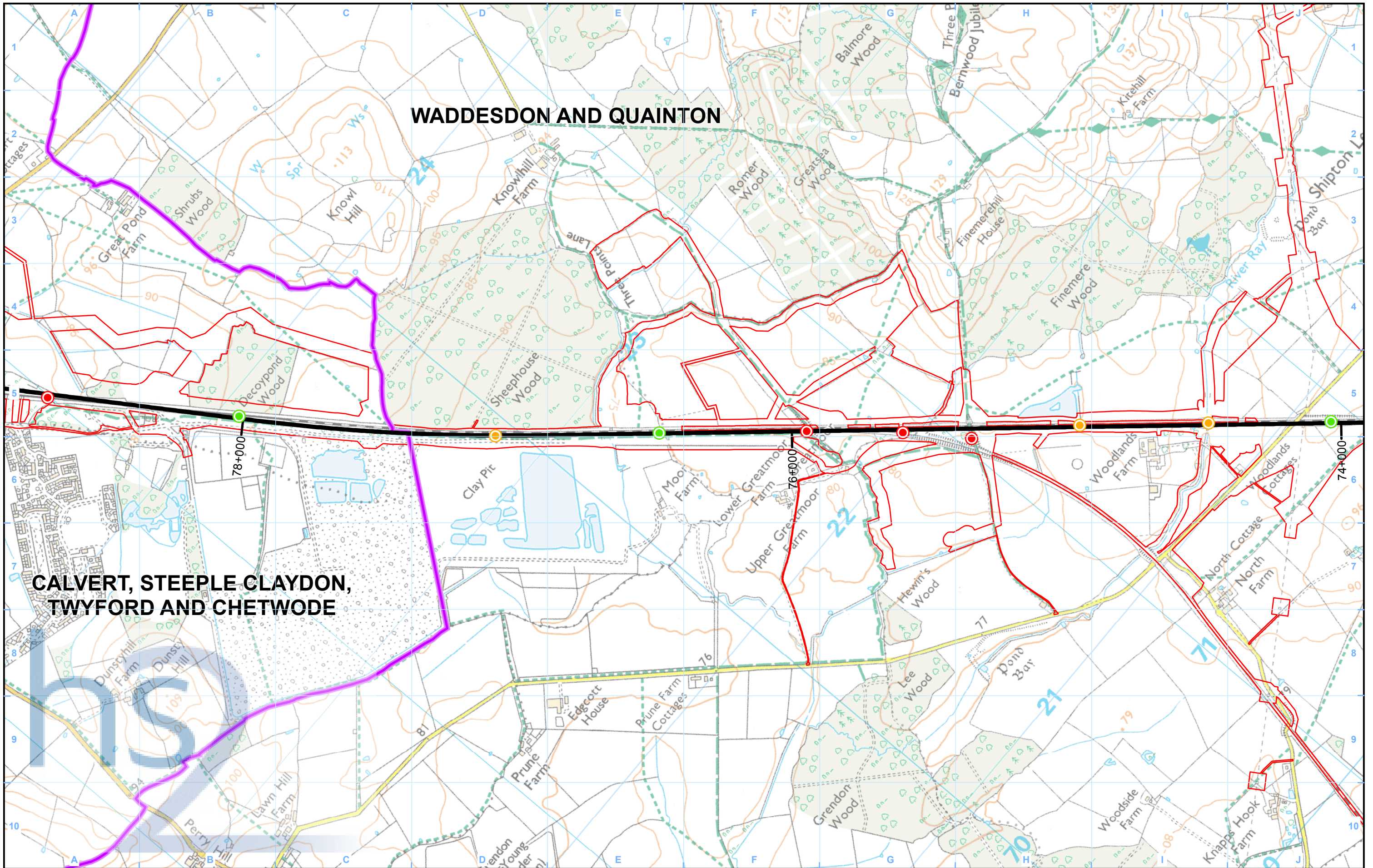
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**WADDESDON AND QUANTON**

**CALVERT, STEEPLE CLAYDON, TWYFORD AND CHETWODE**

- Legend**
- Route in tunnel
  - Route on surface
  - Community forum boundary
  - Land potentially required during construction
  - Low (0 - 5 individuals)
  - Medium (6 - 10 individuals)
  - High (greater than 10 individuals)

Map Number **Figure 6**

Map Name **Number of bats captured at different trapping areas 2012**

Community Forum Area: **Waddesdon and Quanton**

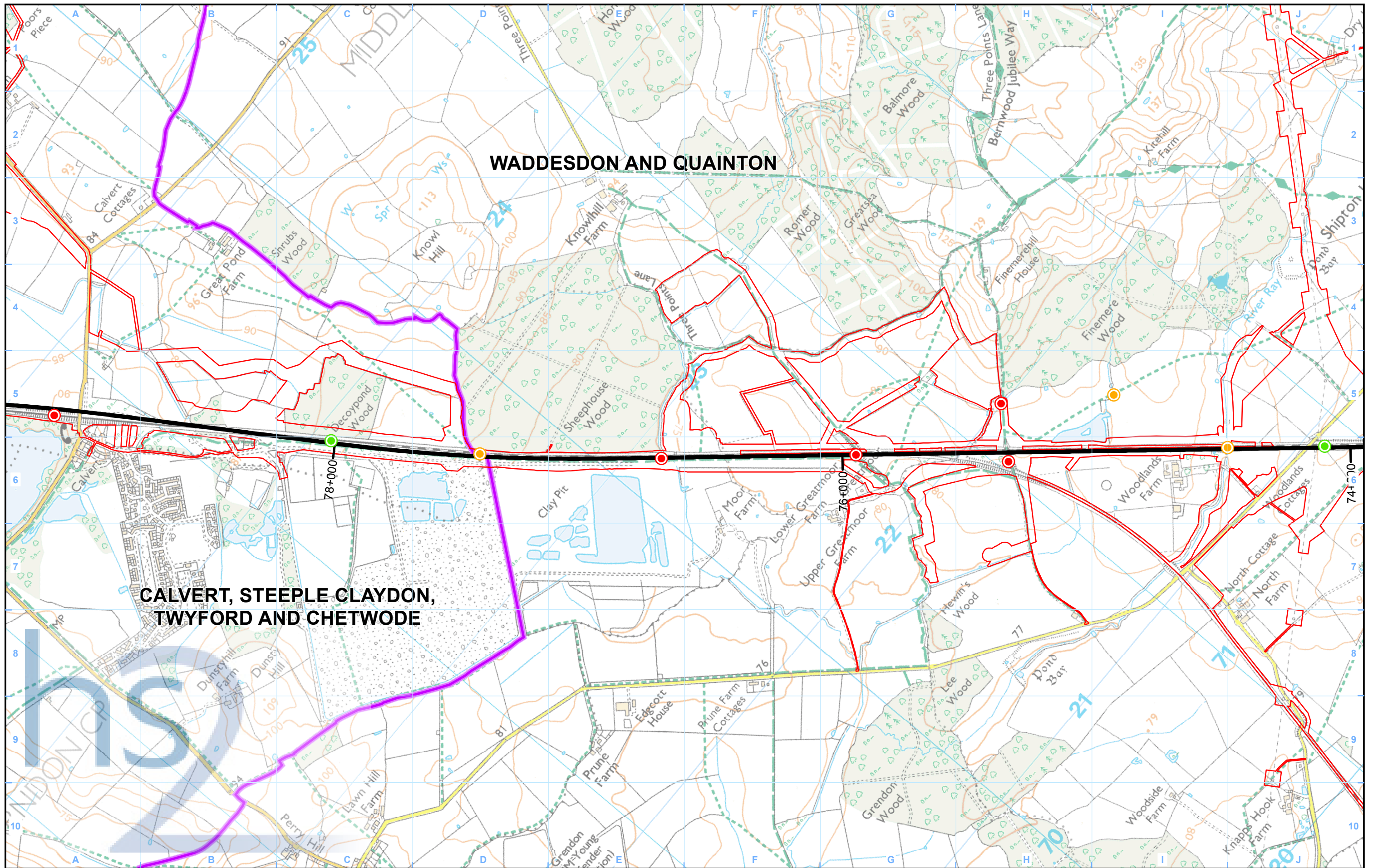
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**WADDESDON AND QUANTON**

**CALVERT, STEEPLE CLAYDON, TWYFORD AND CHETWODE**

**Legend**

- Route in tunnel
- Route on surface
- Land potentially required during construction
- Community forum boundary
- Low (0 - 5 individuals)
- Medium (6 - 10 individuals)
- High (greater than 10 individuals)

Map Number: **Figure 7**

Map Name: **Number of bats captured at different trapping areas 2013**

Community Forum Area: **Waddesdon and Quanton**

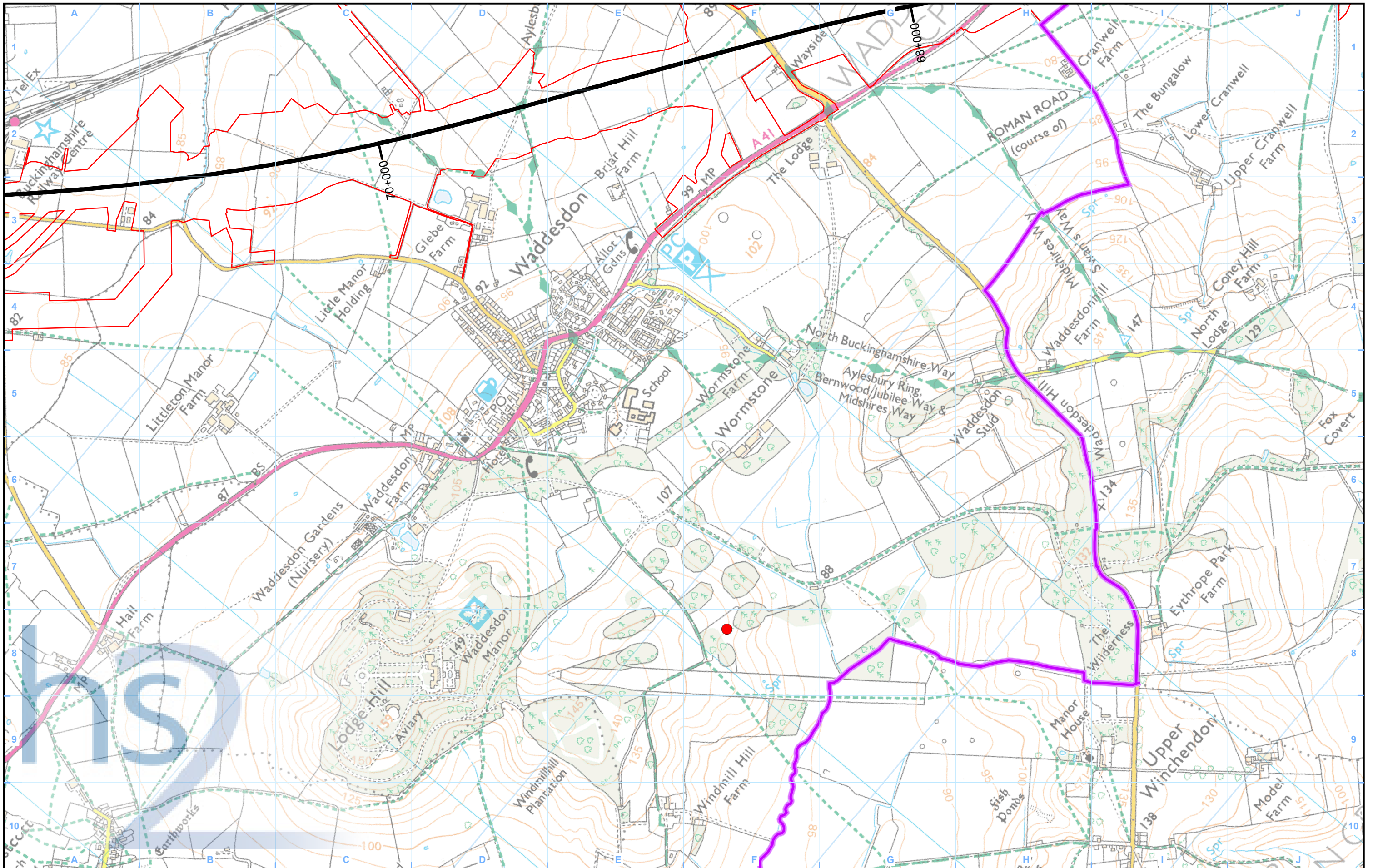
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- Legend**
- Route in tunnel
  - Route on surface
  - Community forum boundary
  - Land potentially required during construction
  - Barbastelle Roost Locations 2013

Map Number **Figure 8**

Map Name **Barbastelle roost locations identified in 2013**

Community Forum Area: **Waddesdon and Quainton**

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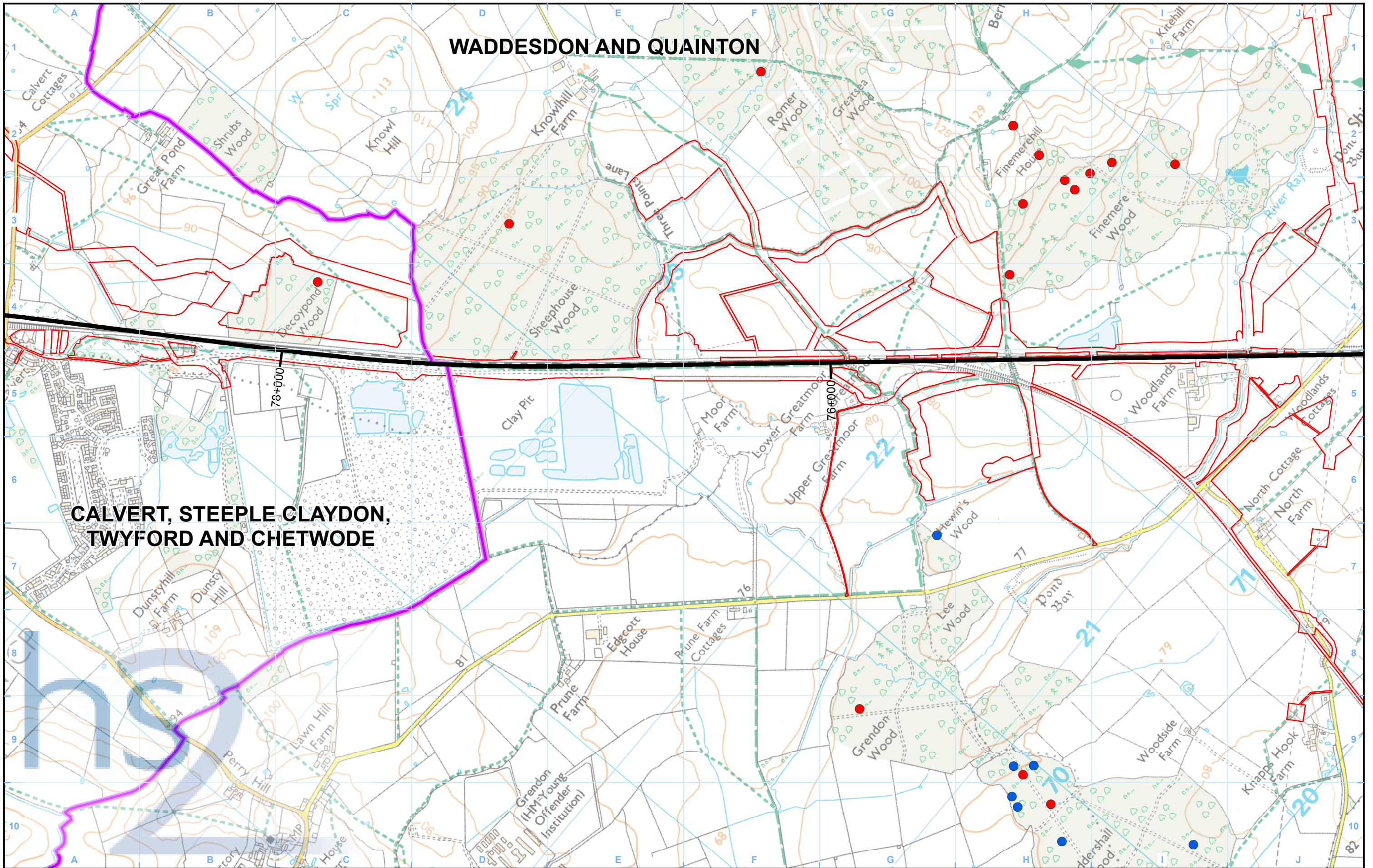
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Doc Number: **30/10/13**

# WADDESDON AND QUANTON

# CALVERT, STEEPLE CLAYDON, TWYFORD AND CHETWODE



- Legend**
- Route in tunnel
  - Route on surface
  - Community forum boundary
  - Land potentially required during construction

- Bechstein's Roost Locations 2012
- Bechstein's Roost Locations 2013

Map Number: **Figure 9**  
 Map Name: **Bechstein's roost locations identified in 2012 & 2013**  
 Community Forum Area: **Waddesdon and Quanton**

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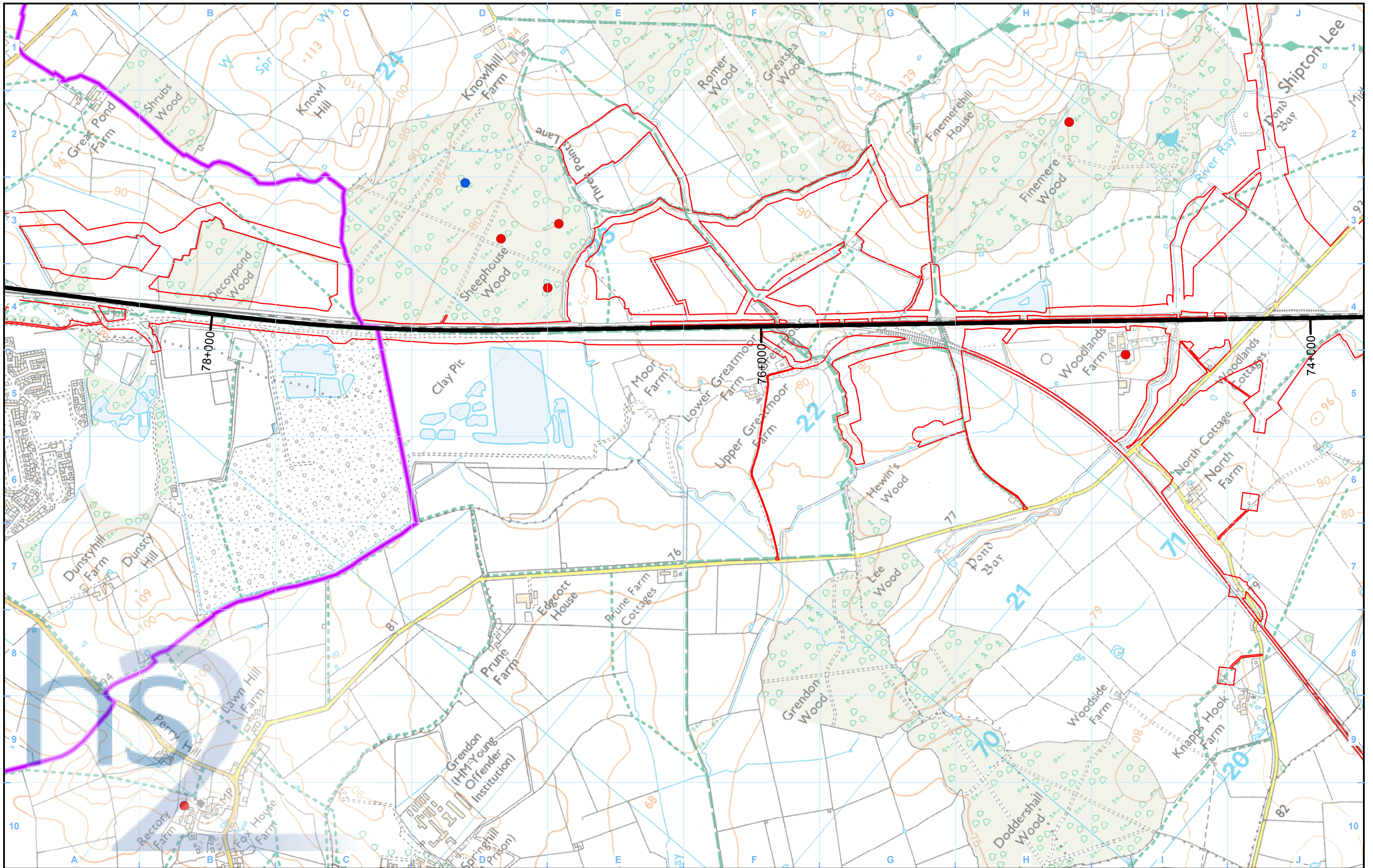
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- Legend**
-  Route in tunnel
  -  Route on surface
  -  Community forum boundary
  -  Land potentially required during construction
  -  Brandt's roost locations 2012
  -  Brandt's roost locations 2013

Map Number **Figure 10**

Map Name **Brandt's roost locations identified in 2012 & 2013**


Community Forum Area:  
Waddesdon and Quainton

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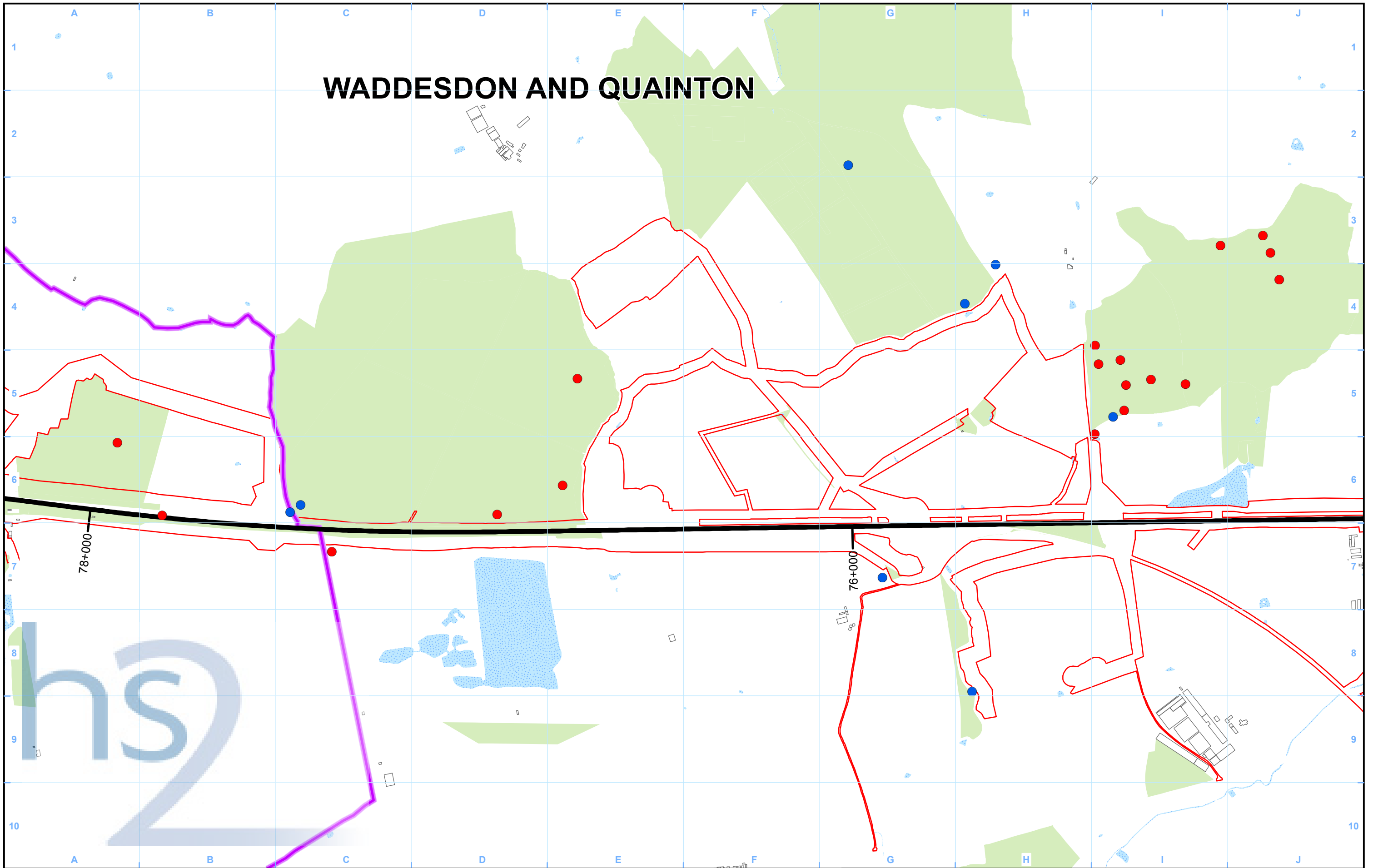
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Doc Number: Date: 31/10/13

# WADDESDON AND QUAYNTON



- Legend**
- Route in tunnel
  - Route on surface
  - Community forum boundary
  - Land potentially required during construction
  - Brown Long-eared Roost Locations 2012
  - Brown Long-eared Roost Locations 2013

Map Number: **Figure 11**

Map Name: **Brown Long-eared roost locations identified in 2012 & 2013**

Community Forum Area: **Waddesdon and Quainton**

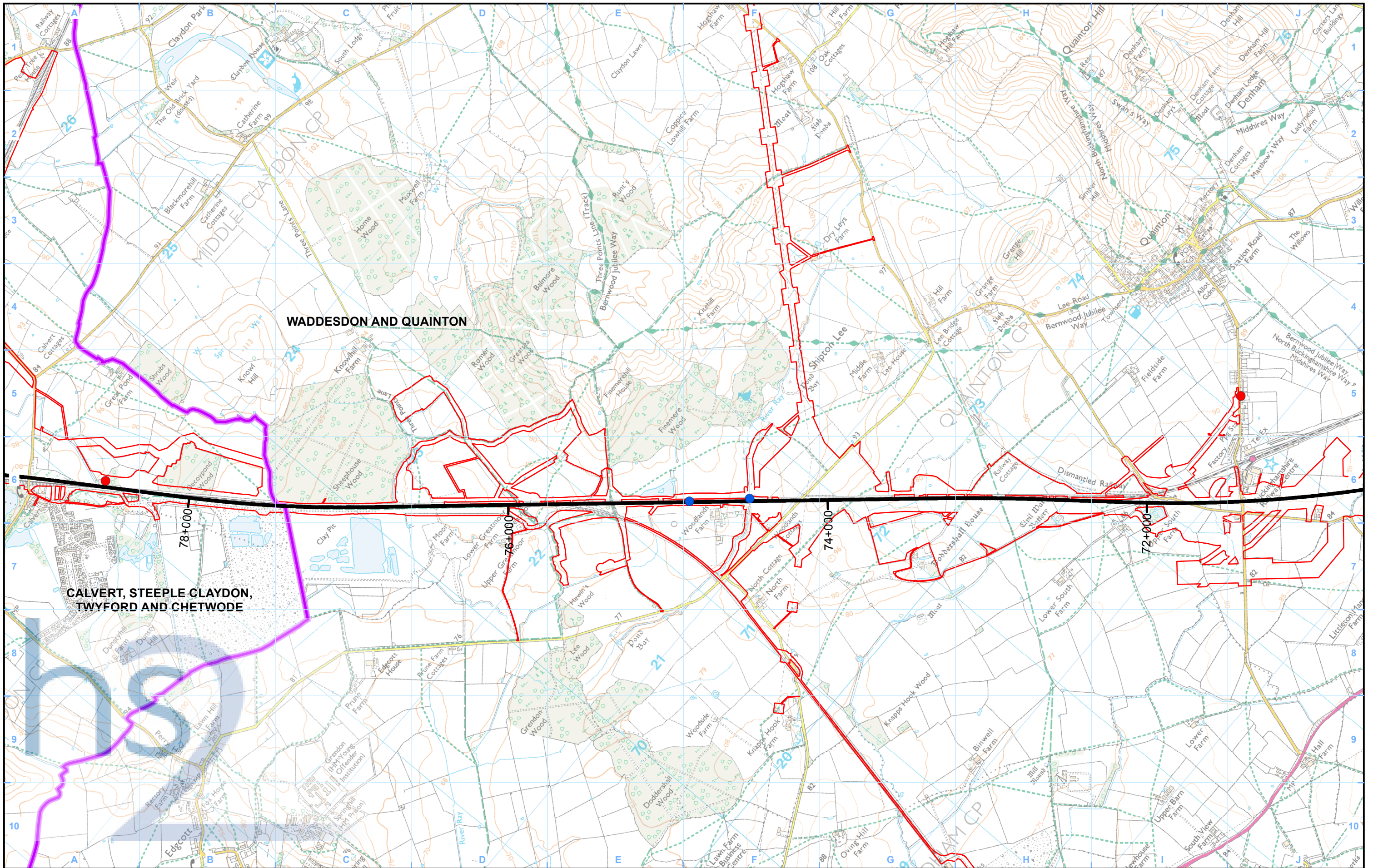
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Doc Number: **31/10/13**



**Legend**

- Route in tunnel
- Route on surface
- Community forum boundary
- Land potentially required during construction

- Common Pipistrelle Roost Locations 2012
- Common Pipistrelle Roost Locations 2013

Map Number **Figure 12**

Map Name  
**Common Pipistrelle roost locations identified in 2012 & 2013**

Community Forum Area:  
 Waddesdon and Quainton

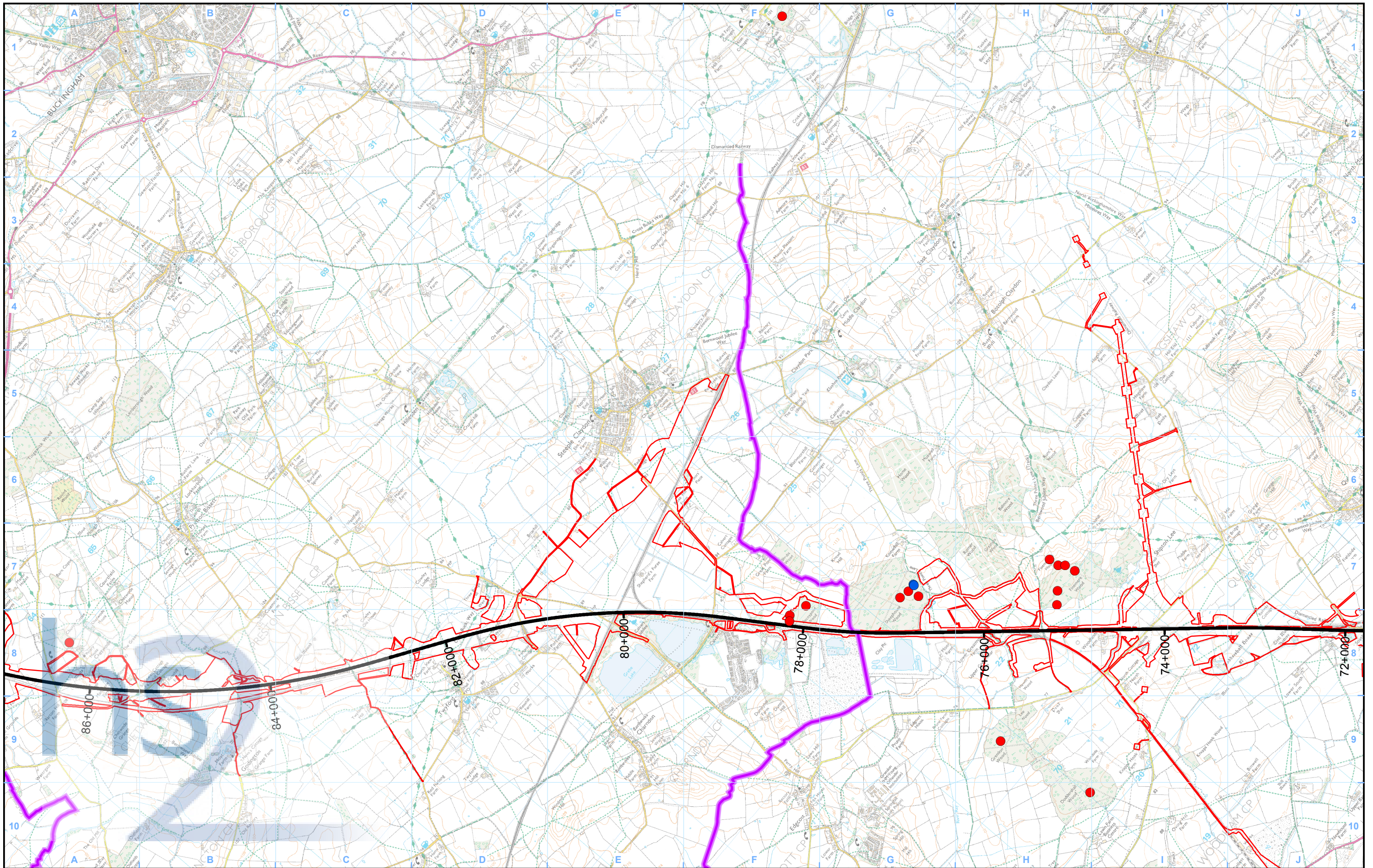
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Doc Number: Date: 30/10/13



- Legend**
- Route in tunnel
  - Route on surface
  - Community forum boundary
  - Land potentially required during construction

- Daubenton's Roost Locations 2012
- Daubenton's Roost Locations 2013

Map Number **Figure 13**

Map Name **Daubenton's roost locations identified in 2012 & 2013**

Community Forum Area:  
Waddesdon and Quainton

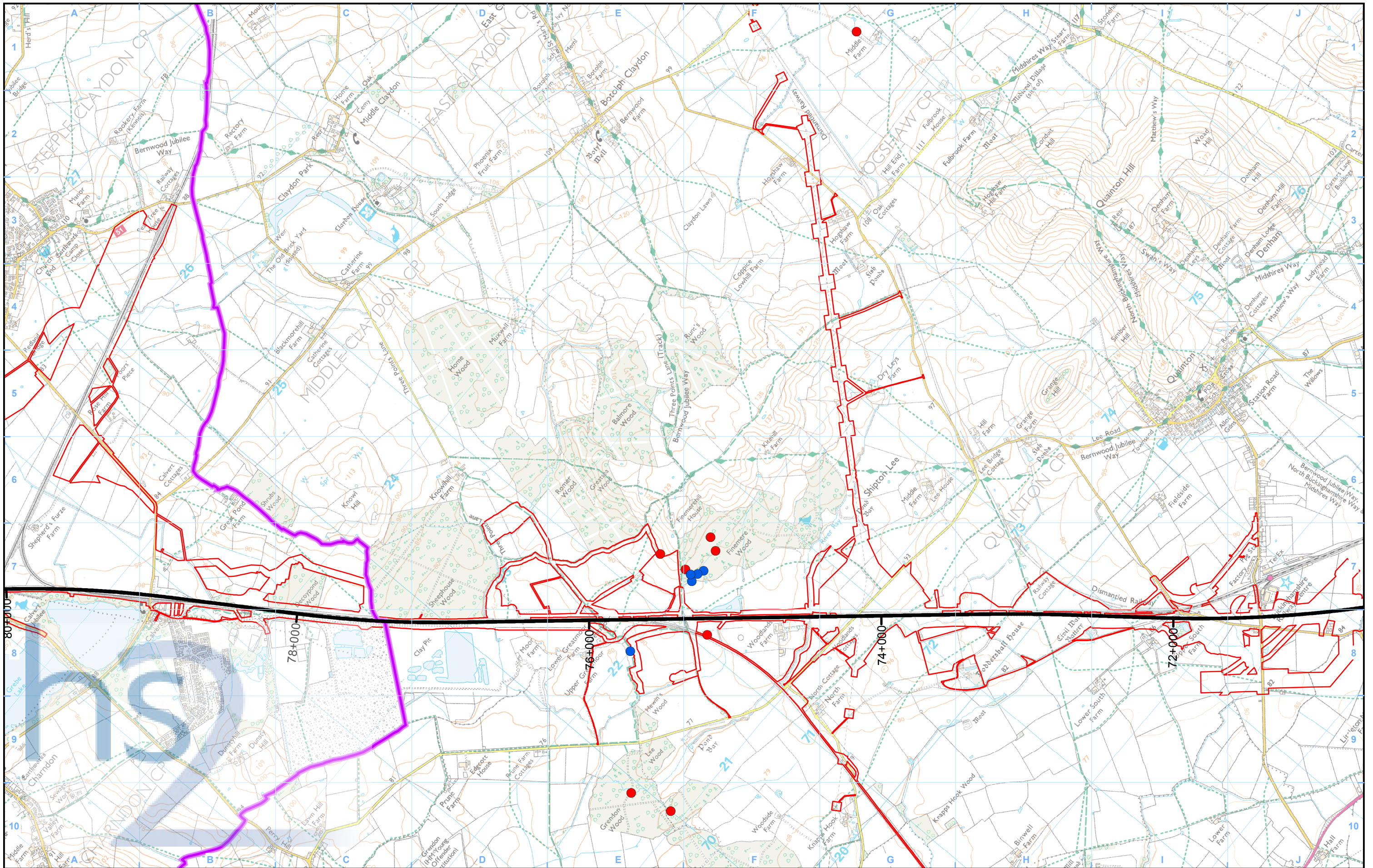
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- Legend**
- Route in tunnel
  - Route on surface
  - Community forum boundary
  - Land potentially required during construction
  - Natterer's Roost Locations 2012
  - Natterer's Roost Locations 2013

Map Number **Figure 14**

Map Name **Natterer's roost locations identified in 2012 & 2013**

Community Forum Area:  
Waddesdon & Quainton

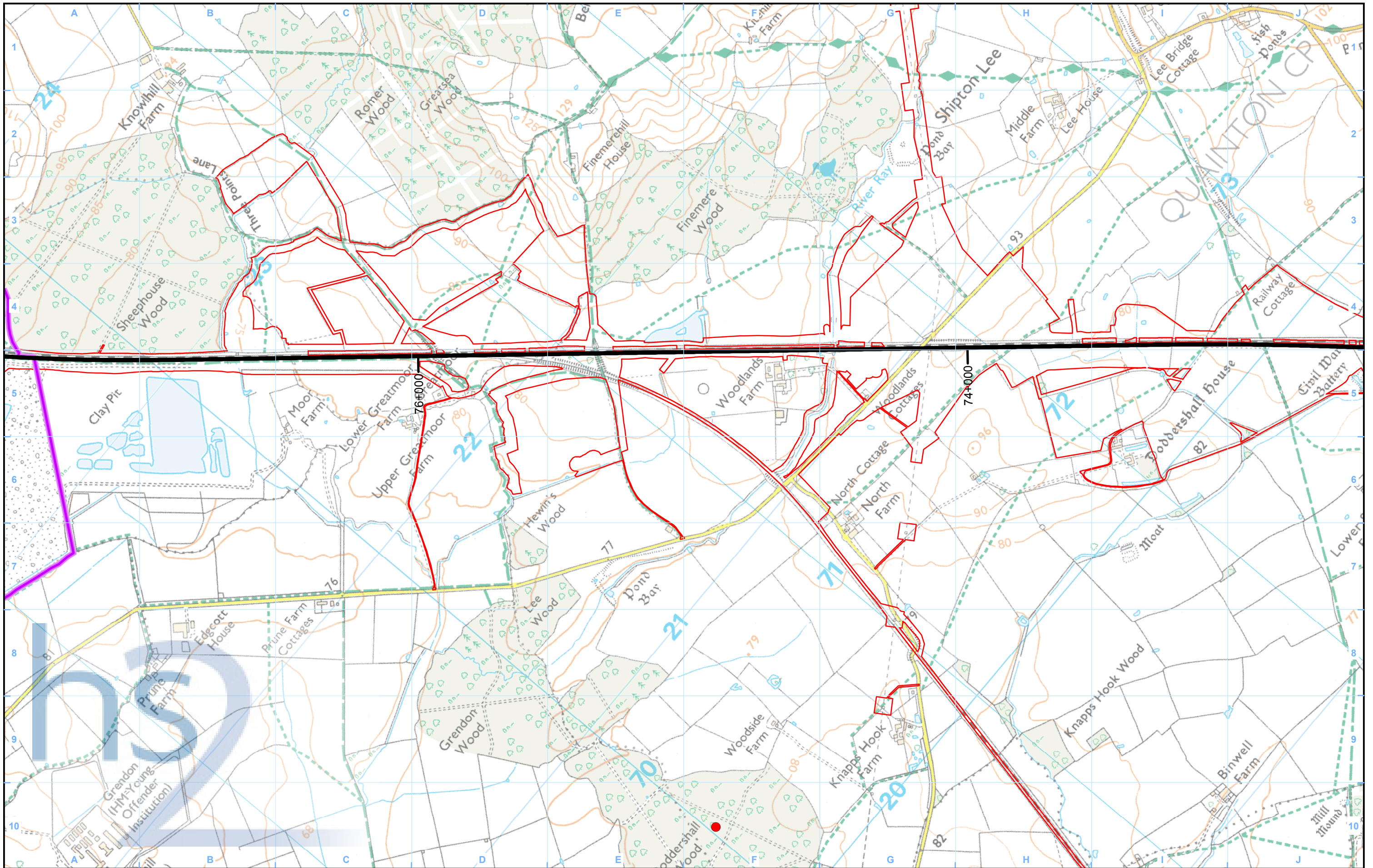
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- Legend**
- Route in tunnel
  - Route on surface
  - Community forum boundary
  - Land potentially required during construction
  - Noctule Roost Location 2013

Map Number **Figure 15**

Map Name  
**Noctule's roost locations identified in 2012 & 2013**

Community Forum Area:  
Waddesdon & Quainton

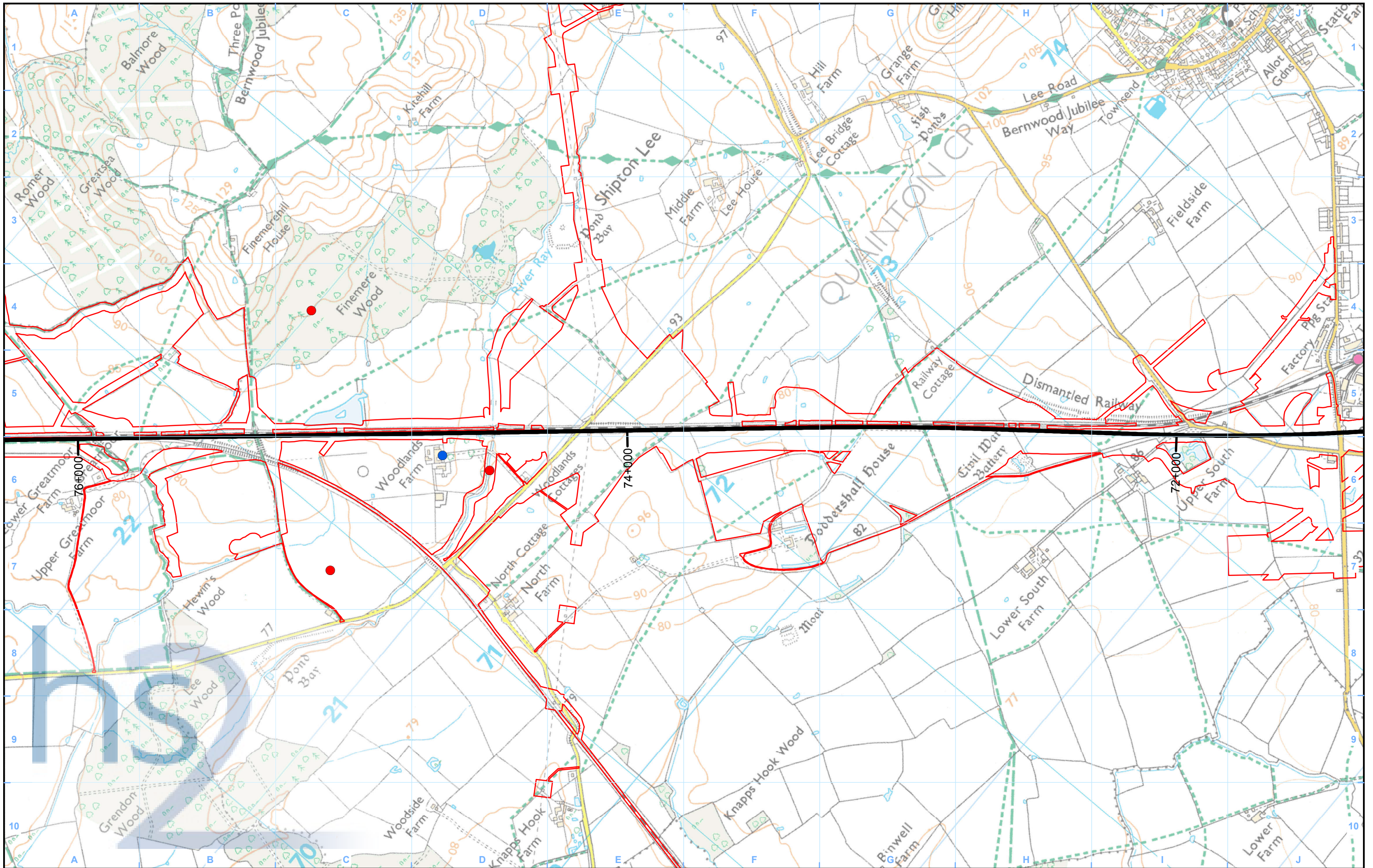
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- Legend**
- Route in tunnel
  - Route on surface
  - Community forum boundary
  - Land potentially required during construction
  - Soprano Pipistrelle Roost Locations 2012
  - Soprano Pipistrelle Roost Locations 2013

Map Number **Figure 16**

Map Name  
**Soprano roost locations identified in 2012 & 2013**

Community Forum Area:  
 Waddesdon & Quainton

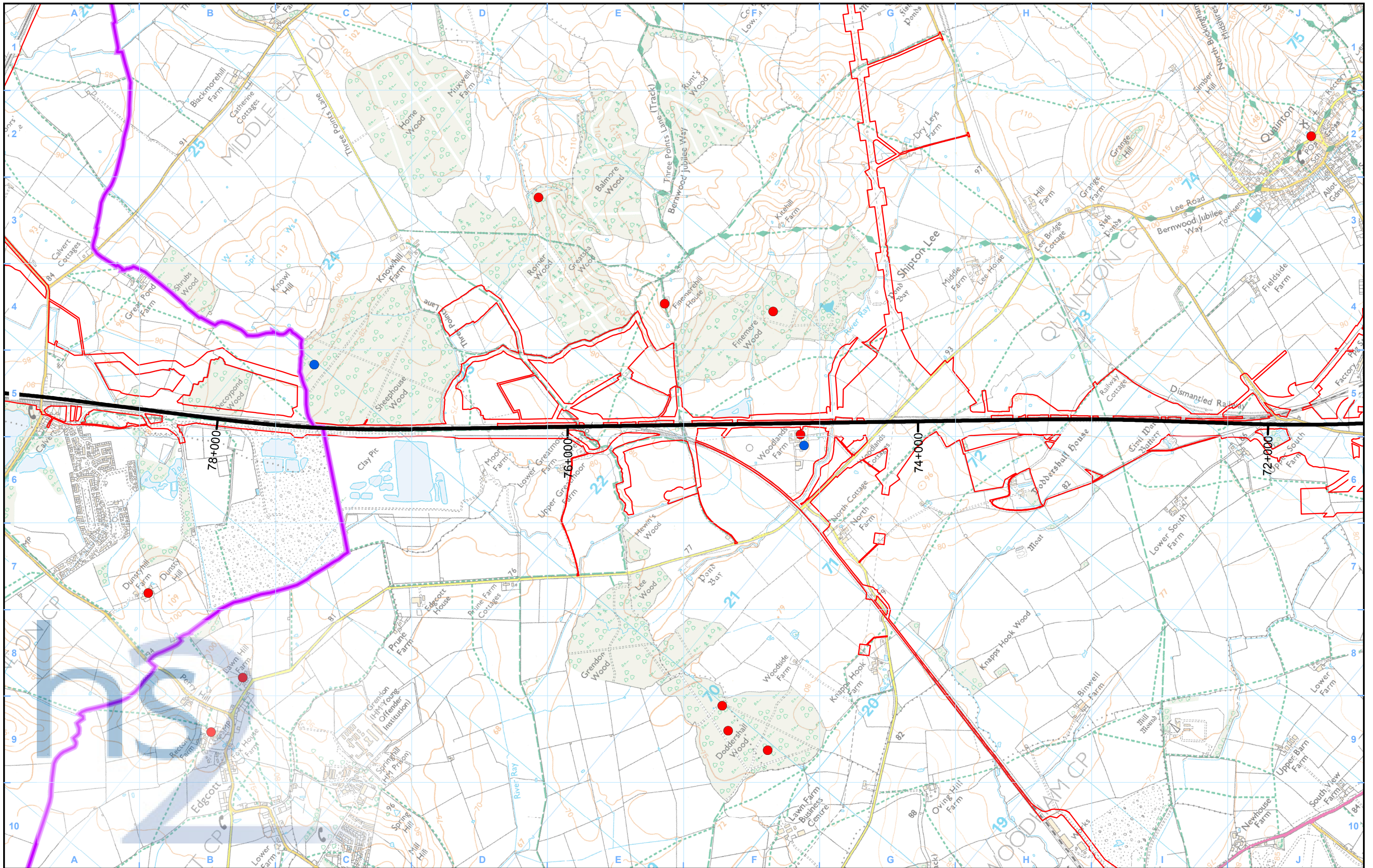
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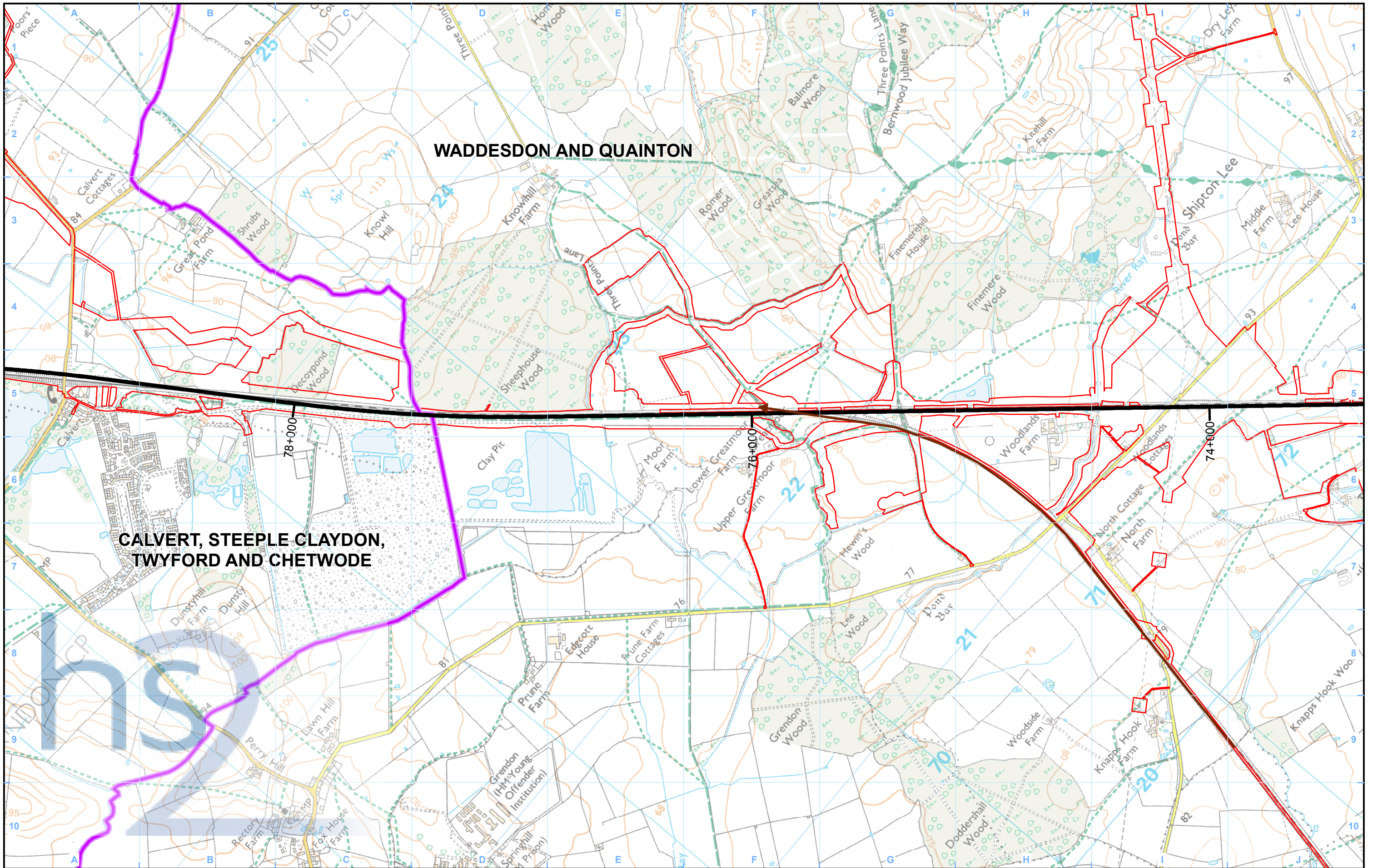
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<p><b>Legend</b></p> <ul style="list-style-type: none"> <li> Route in tunnel</li> <li> Route on surface</li> <li> Community forum boundary</li> <li> Land potentially required during construction</li> <li> Whiskered Roost Locations 2012</li> <li> Whiskered Roost Locations 2013</li> </ul>	<p>Map Number <b>Figure 17</b></p> <p>Map Name <b>Whiskered roost locations identified in 2012 &amp; 2013</b></p> <p><b>Community Forum Area</b> Waddesdon and Quanton</p>	<p></p> <p>Registered in England. Registration number 06791686. Registered office: Eland House, Bressenden Place, London SW1E 5DU.</p> <p>© Crown copyright and database rights 2013. Ordnance Survey Licence Number 100049190.</p> <p>Doc Number:</p>	<p>HS2 Ltd accept no responsibility for any circumstances, which arise from the reproduction of this map after alteration, amendment or abbreviation or if it is issued in part or issued incomplete in any way.</p> <p></p> <p>Scale at A3: 1:19,600</p> <p></p> <p>Metres</p> <p>Date: 30/10/13</p>
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**WADDESDON AND QUANTON**

**CALVERT, STEEPLE CLAYDON, TWYFORD AND CHETWODE**

- Legend**
- Route in tunnel
  - Route on surface
  - Community forum boundary
  - Land potentially required during construction

Barbastelle Flight Lines 2013

Map Number **Figure 18**

Map Name **Barbastelle Flightlines 2013**

Community Forum Area:  
Waddesdon and Quainton

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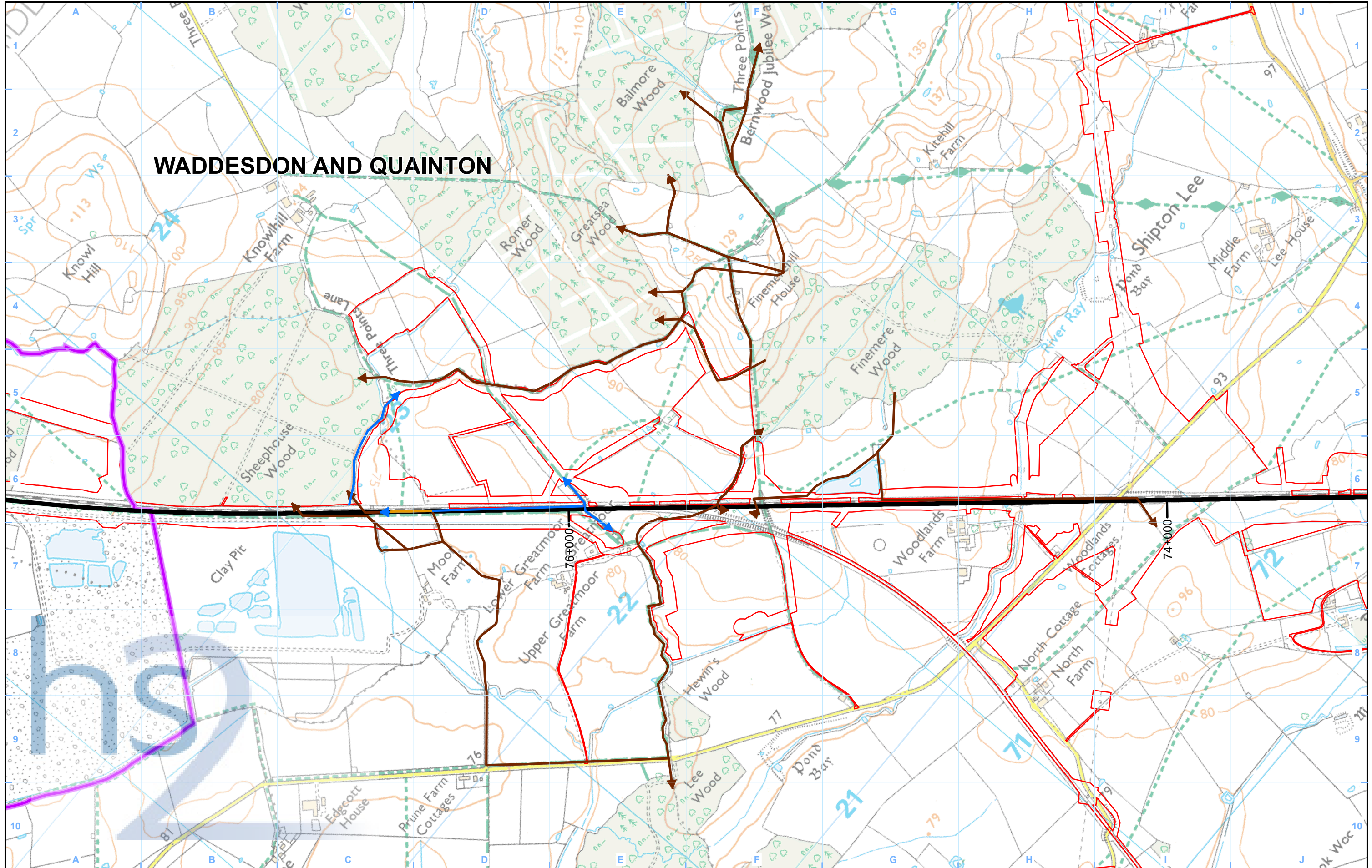
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# WADDESDON AND QUANTON



Legend	
	Route in tunnel
	Route on surface
	Community forum boundary
	Land potentially required during construction
	Bechstein's Flightlines 2012
	Bechstein's Flightlines 2013
	Bechstein's Flightlines 2012 & 2013

Map Number	Figure 19
Map Name	Bechstein's Flightlines 2012 & 2013
Community Forum Area: Waddesdon and Quanton	

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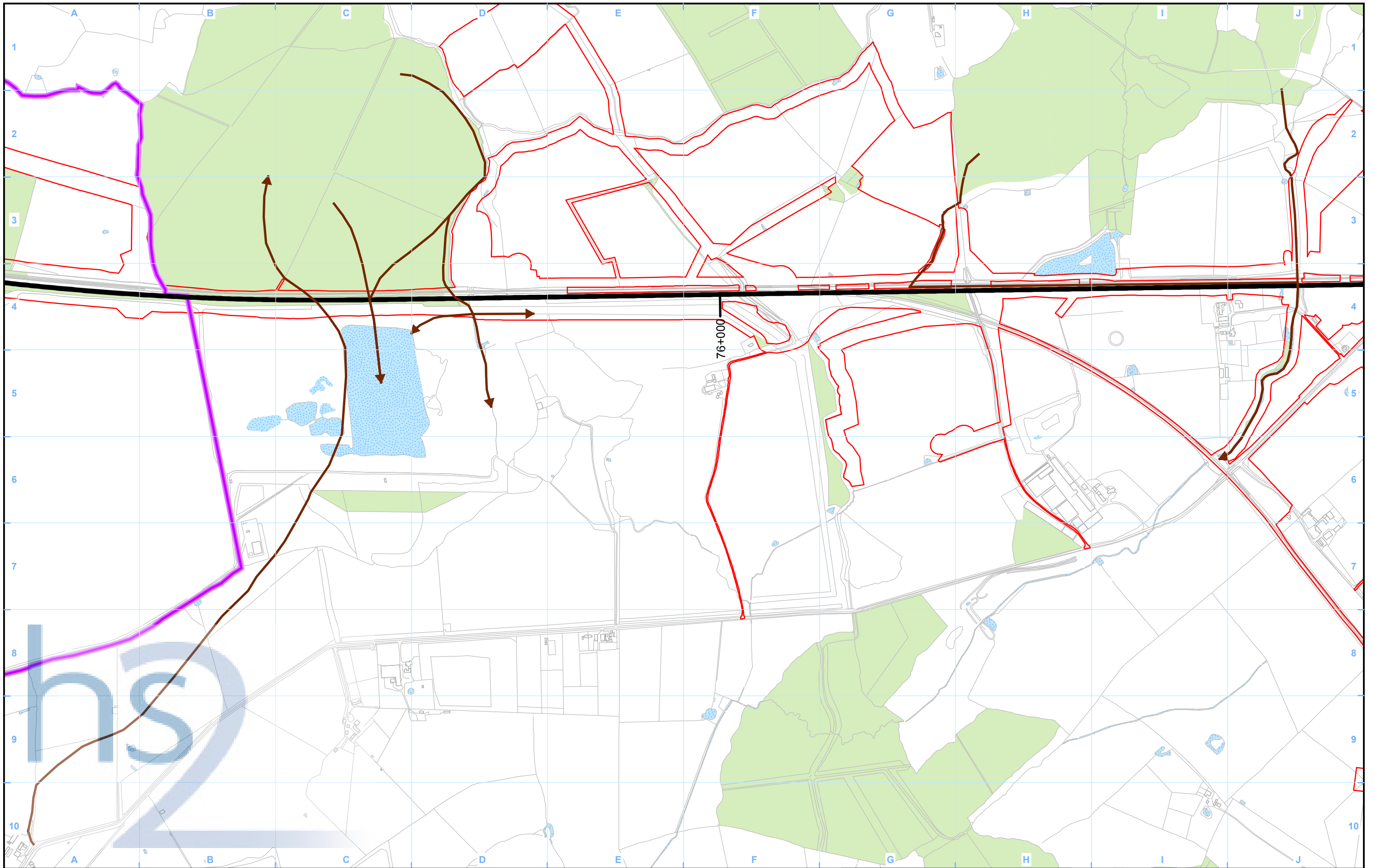
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**Legend**

- Route in tunnel
- Route on surface
- Community forum boundary
- Land potentially required during construction
- Brandt's Flightlines 2013

Map Number **Figure 20**

Map Name **Brandt's Flightlines 2013**

Community Forum Area:  
Waddesdon and Quanton

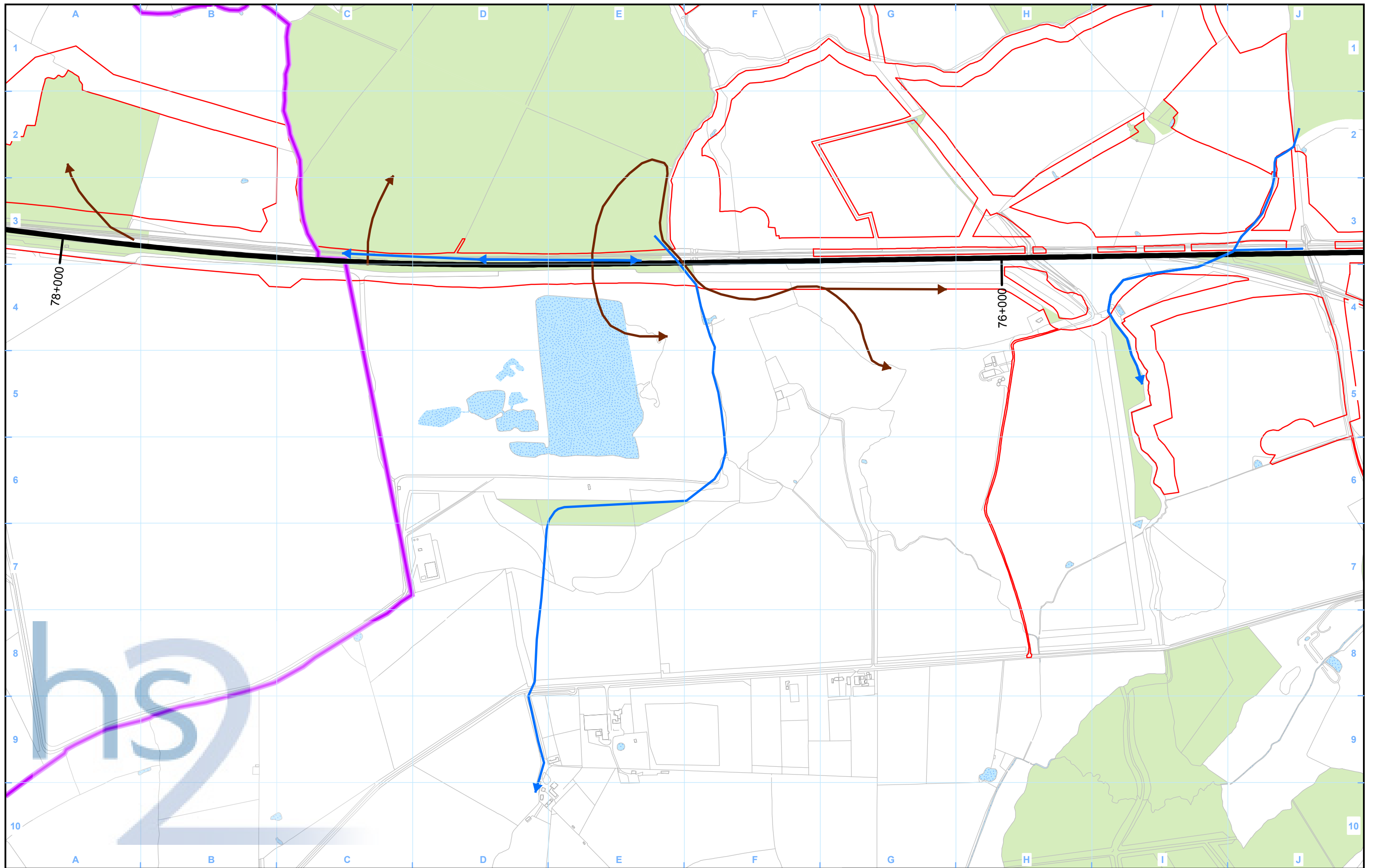
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- Legend**
- Route in tunnel
  - Route on surface
  - Community forum boundary
  - Land potentially required during construction

- Brown Long-eared Flightlines 2012
- Brown Long-eared Flightlines 2013

Map Number **Figure 21**

Map Name **Brown Long-eared Flightlines 2012 & 2013**

Community Forum Area:  
Waddesdon and Quanton

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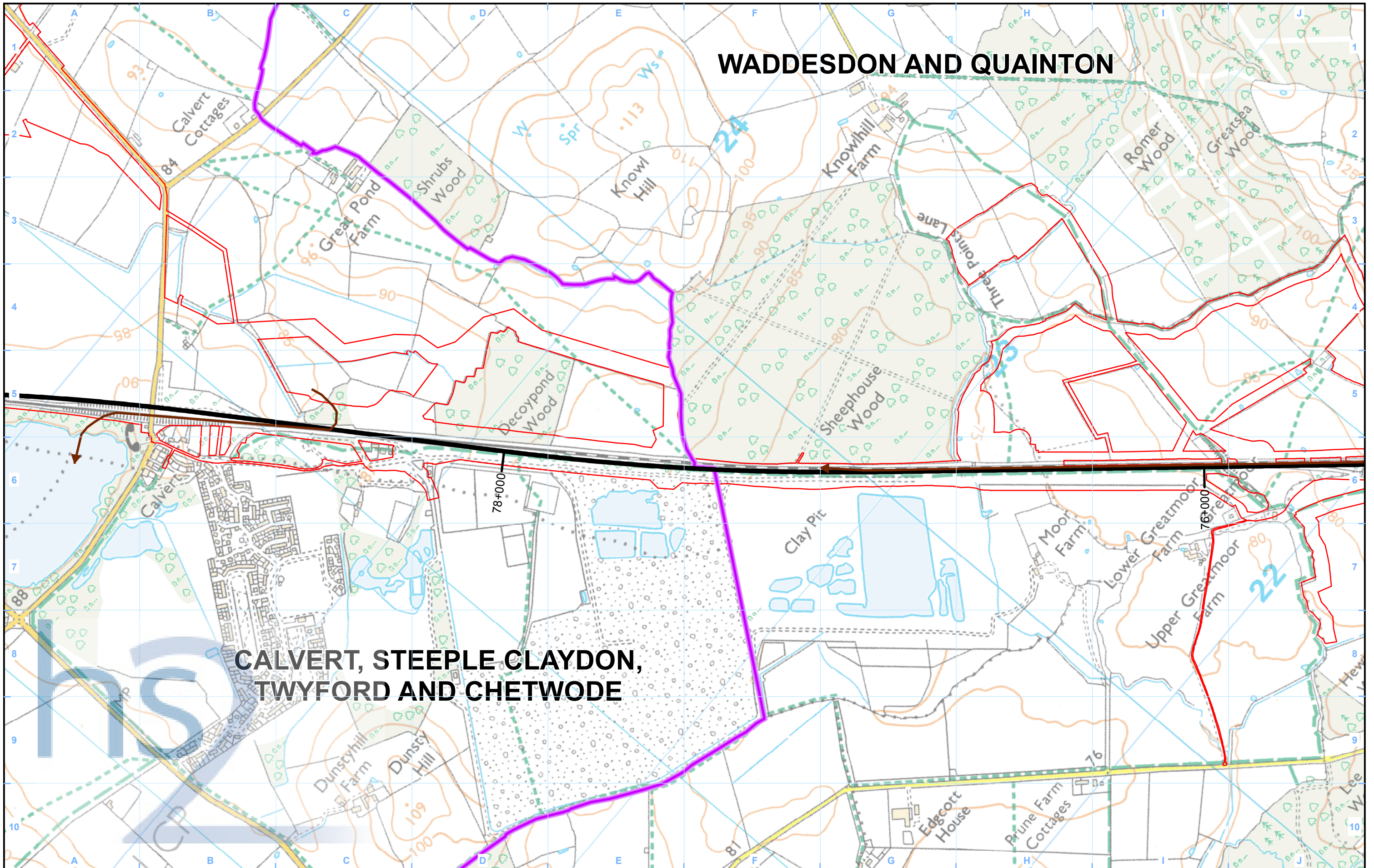
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Scale at A3: 1:7,300

Doc Number: Date: 30/10/13

# WADDESDON AND QUANTON

# CALVERT, STEEPLE CLAYDON, TWYFORD AND CHETWODE



- Legend**
- Route in tunnel
  - Route on surface
  - Community forum boundary
  - Land potentially required during construction
  - Common Pipistrelle Flightlines 2012
  - Common Pipistrelle Flightlines 2013
  - Common Pipistrelle Flightlines 2012 & 2013

Map Number: **Figure 22a**

Map Name: **Common Pipistrelle Flightlines 2012 & 2013**

Community Forum Area: **Waddesdon and Quanton**

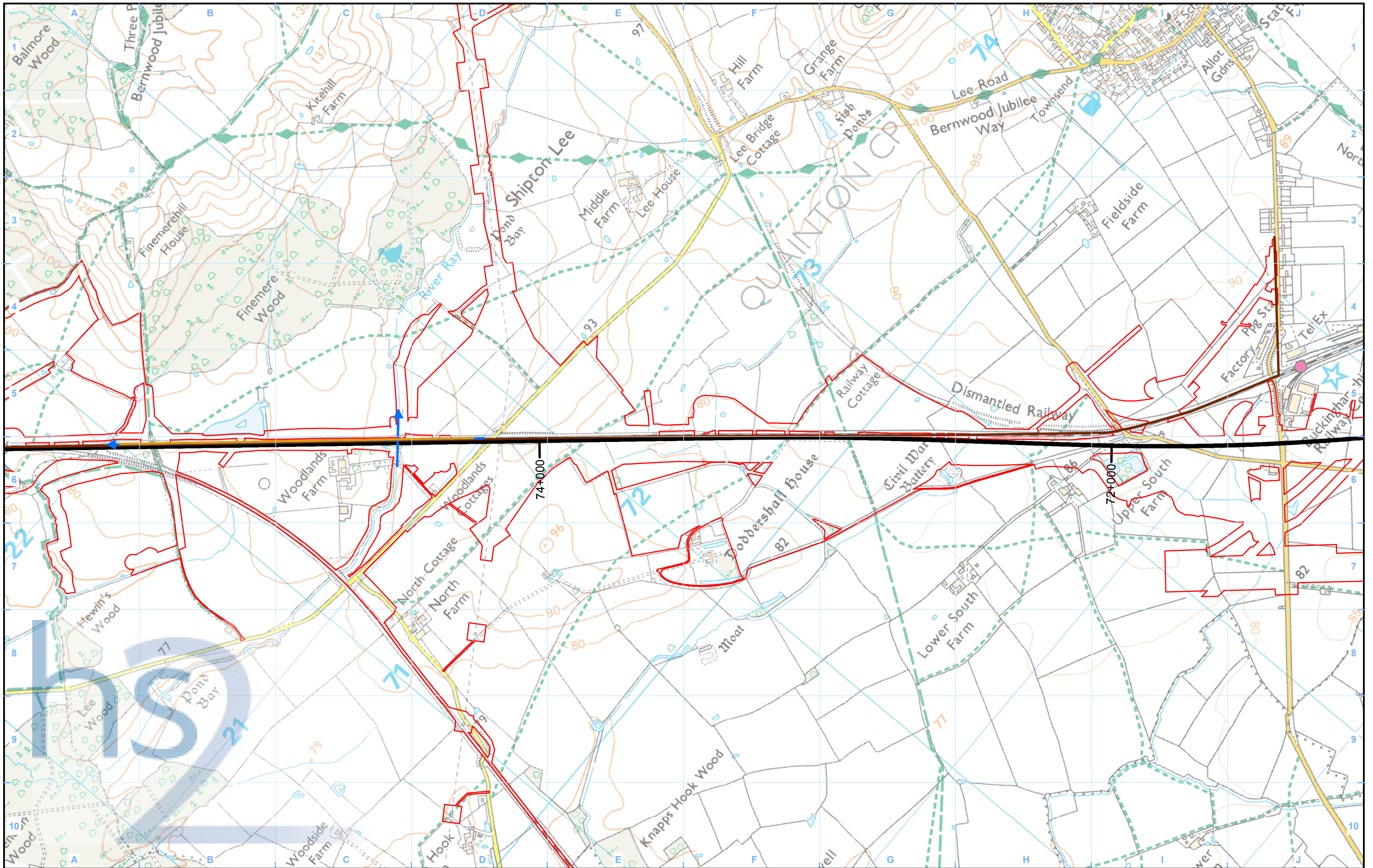
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Doc Number: **31/10/13**



**Legend**

- Route in tunnel
- Common Pipistrelle Flightlines 2012
- Common Pipistrelle Flightlines 2013
- Community forum boundary
- Common Pipistrelle Flightlines 2012 & 2013
- Land potentially required during construction

Map Number: **Figure 22b**

Map Name: **Common Pipistrelle Flightlines 2012 & 2013**

Community Forum Area:  
Waddesdon and Quanton

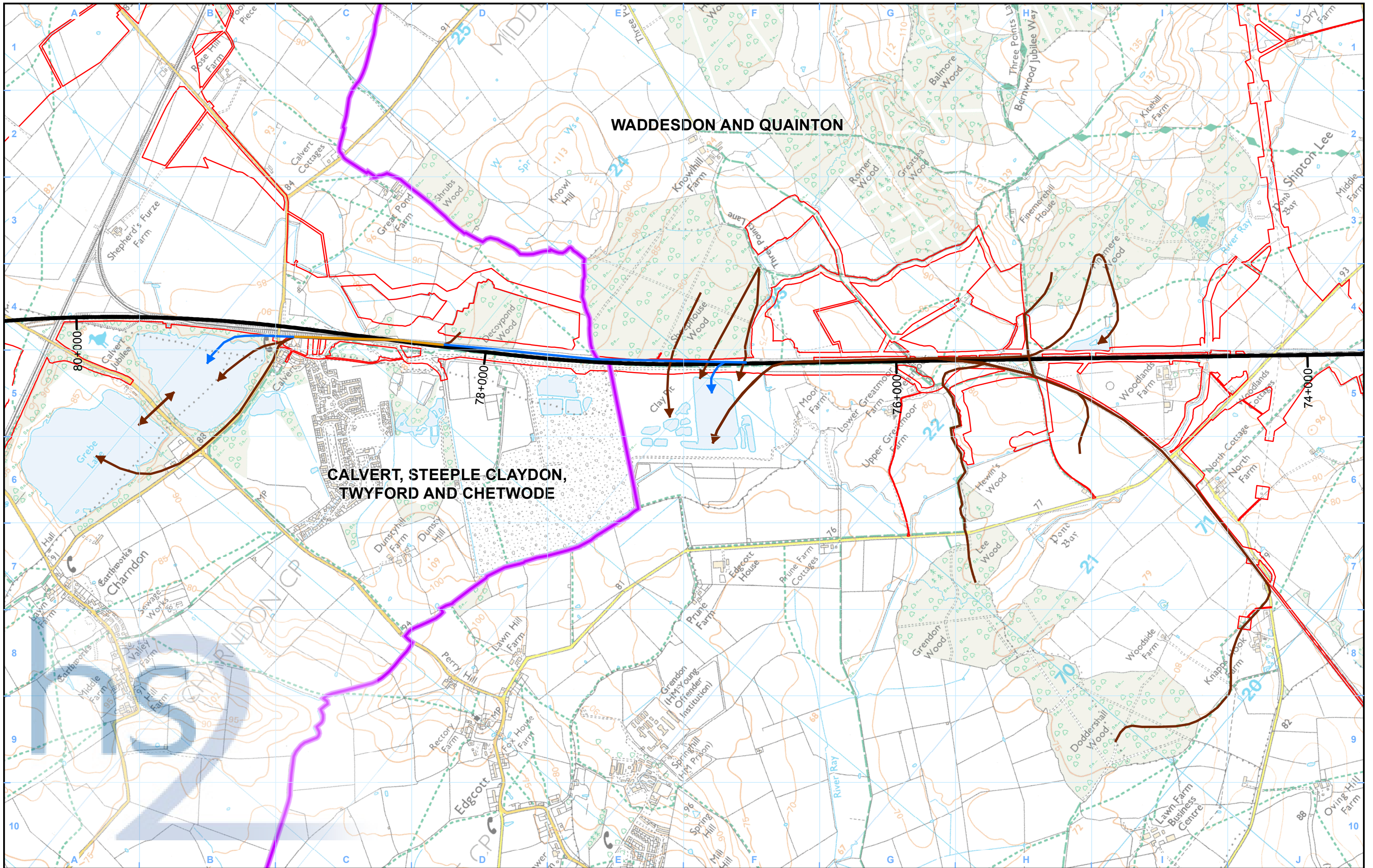
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Doc Number: **31/10/13**



- Legend**
- Route in tunnel
  - Route on surface
  - Community forum boundary
  - Land potentially required during construction
  - Daubenton's Flightlines 2012
  - Daubenton's Flightlines 2013
  - Daubenton's Flightlines 2012 & 2013

Map Number **Figure 23**

Map Name **Daubenton's Flightlines 2012 & 2013**

Community Forum Area:  
Waddesdon and Quainton

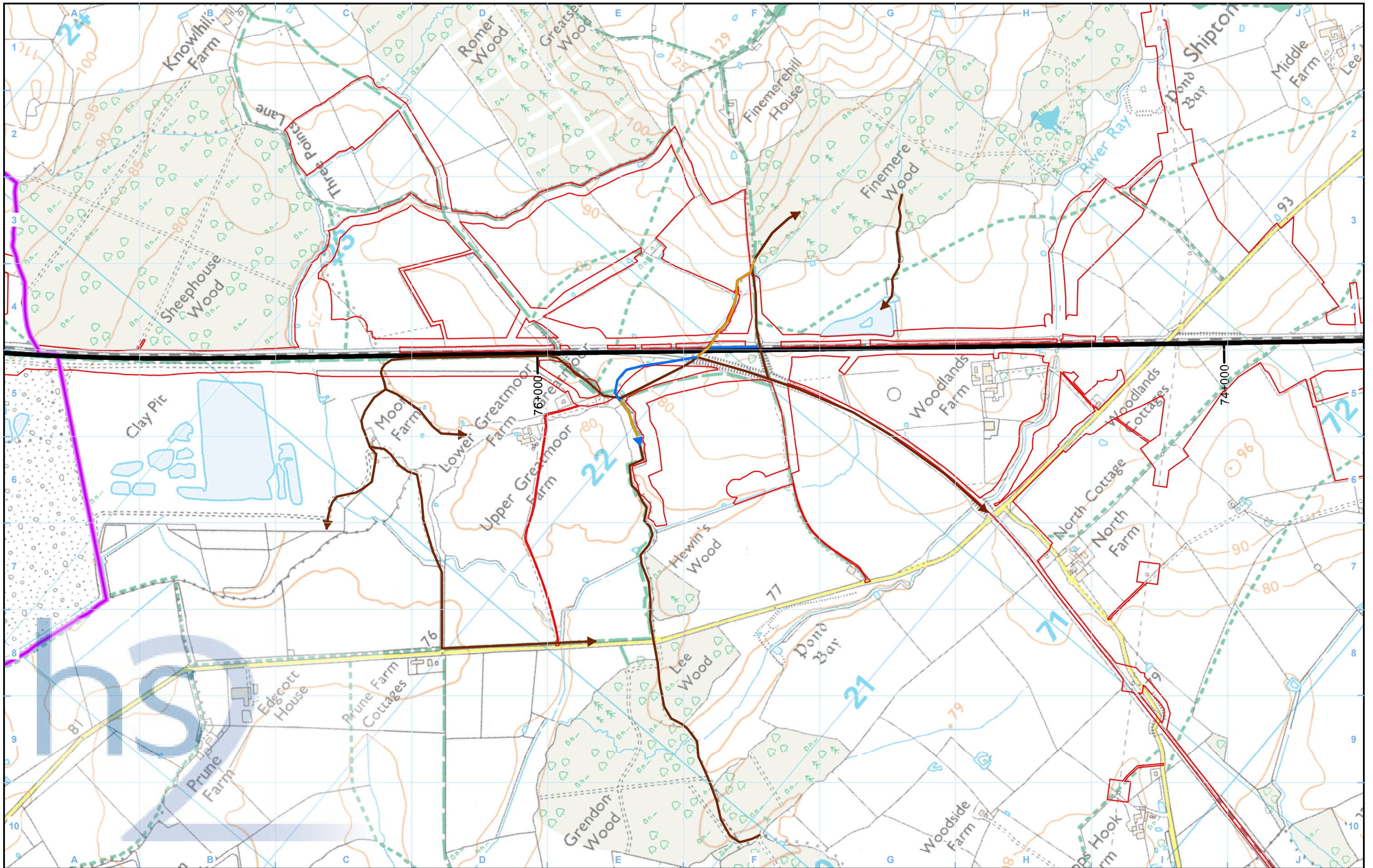
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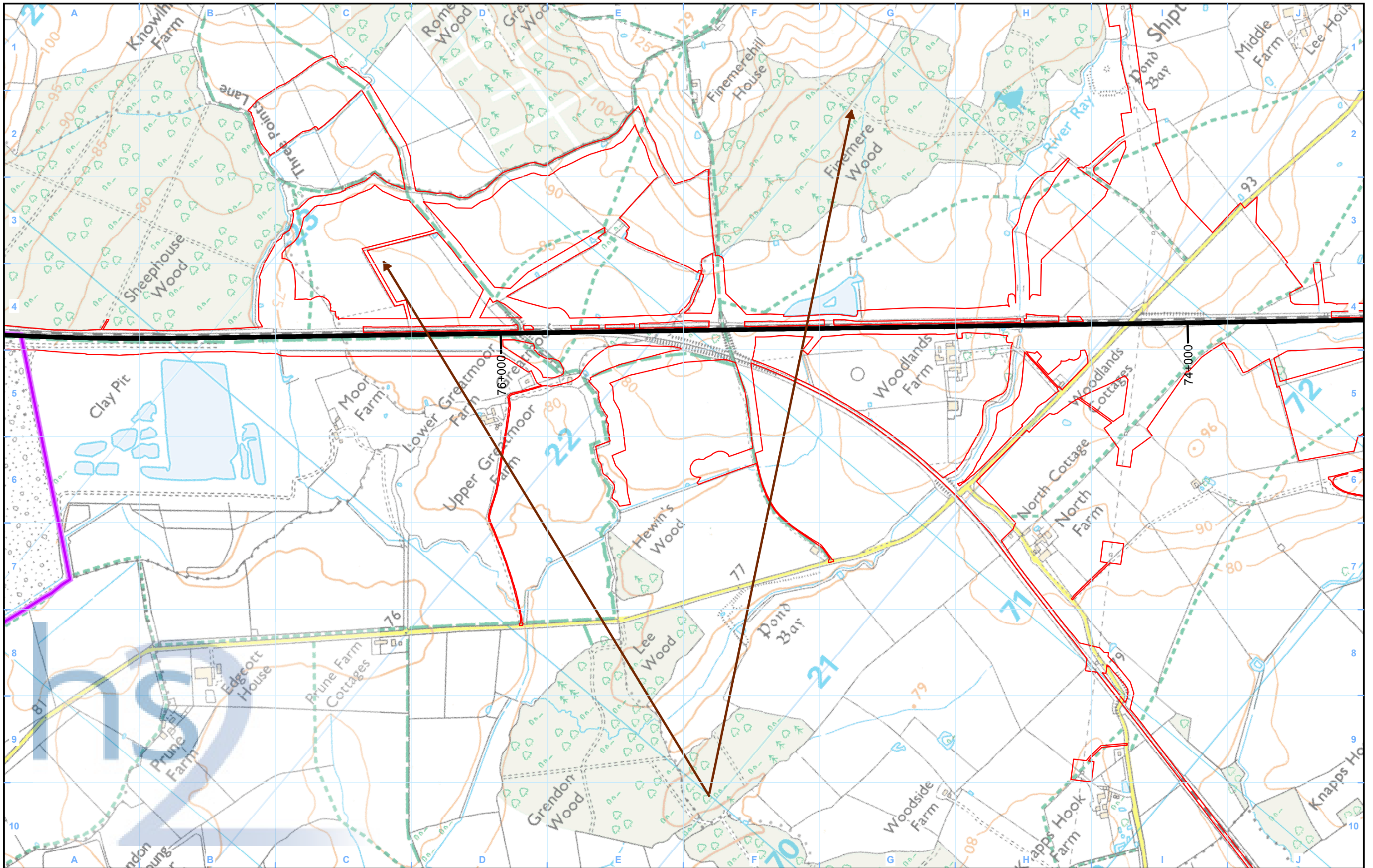
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Doc Number: Date: 30/10/13



<p><b>Legend</b></p> <ul style="list-style-type: none"> <li> Route in tunnel</li> <li> Route on surface</li> <li> Community forum boundary</li> <li> Land potentially required during construction</li> <li> Natterer's Flightlines 2012</li> <li> Natterer's Flightlines 2013</li> <li> Natterer's Flightlines 2012 &amp; 2013</li> </ul>	<p>Map Number: <b>Figure 24</b></p> <p>Map Name: <b>Natterer's Flightlines 2012 &amp; 2013</b></p> <p>Community Forum Area: <b>Waddesdon &amp; Quainton</b></p>	<p></p> <p>Registered in England. Registration number 06791686. Registered office: Eland House, Bressenden Place, London SW1E 5DU.</p> <p>Scale at A3: 1:10,000</p> <p></p> <p>© Crown copyright and database rights 2013. Ordnance Survey Licence Number 100049190.</p> <p>Doc Number: <b>Figure 24</b></p> <p>Date: <b>30/10/13</b></p>
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- Legend**
- Route in tunnel
  - Route on surface
  - Community forum boundary
  - Land potentially required during construction
  - Noctule Flightlines 2013

Map Number **Figure 25**

Map Name **Noctule's Flightlines 2013**

Community Forum Area: **Waddesdon & Quainton**

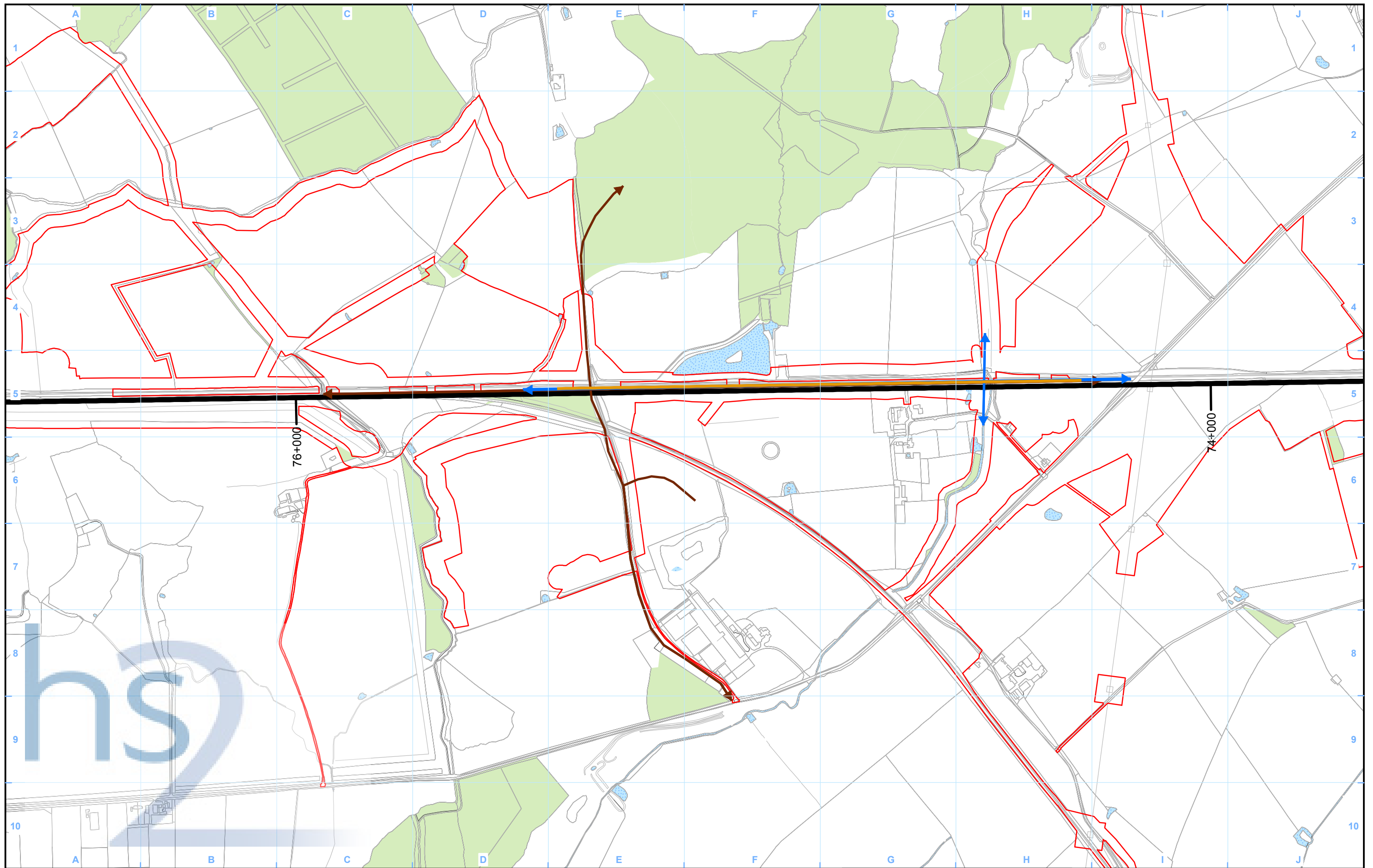
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- Legend**
- Route in tunnel
  - Route on surface
  - Community forum boundary
  - Land potentially required during construction
  - Soprano Pipistrelle Flightlines 2012
  - Soprano Pipistrelle Flightlines 2013
  - Soprano Pipistrelle Flightlines 2012 & 2013

Map Number **Figure 26**

Map Name **Soprano Pipistrelle Flightlines 2012 & 2013**

Community Forum Area: **Waddesdon & Quanton**

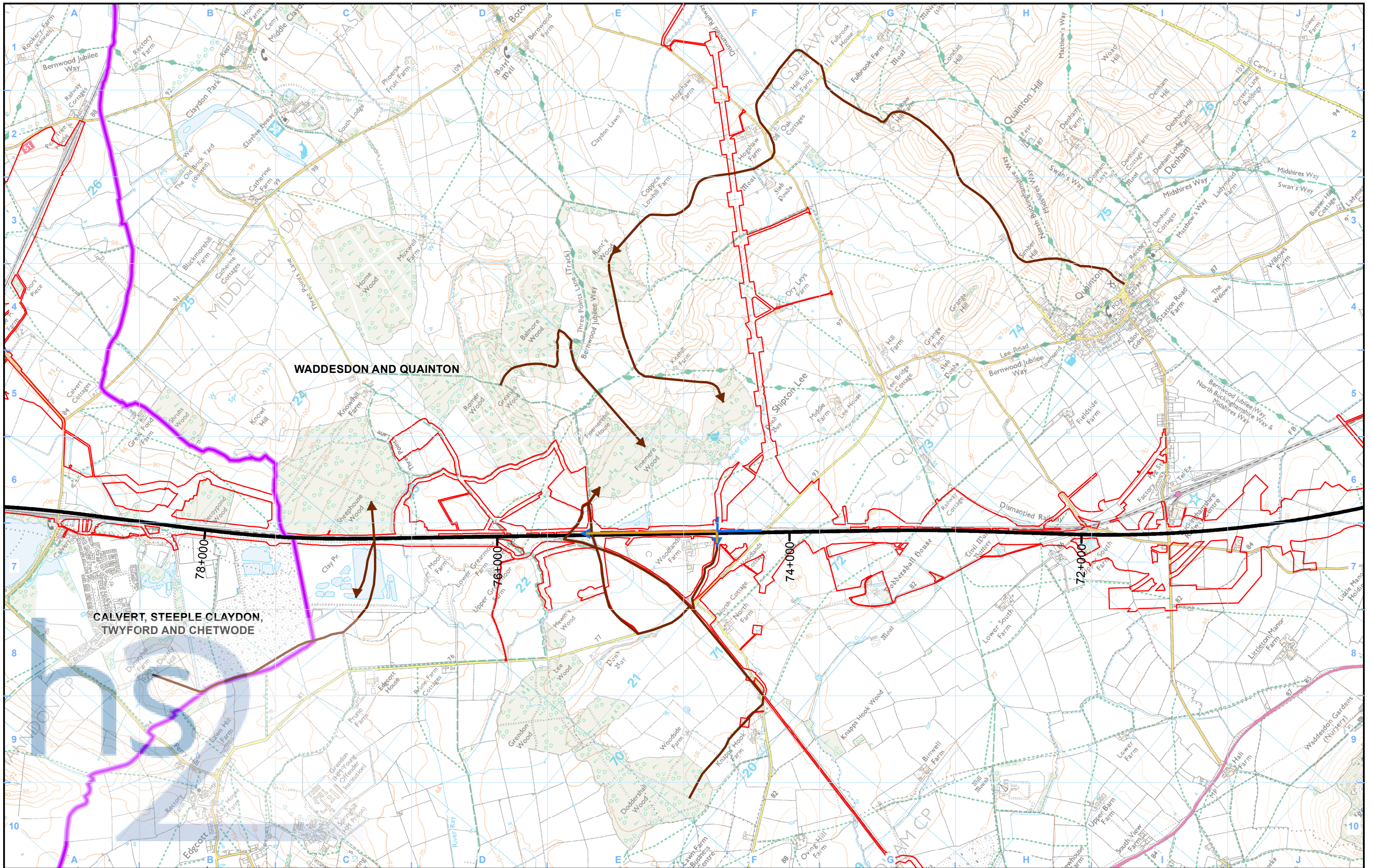
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**Legend**

- Route in tunnel
- Route on surface
- Community forum boundary
- Land potentially required during construction
- Whiskered Flightlines 2012
- Whiskered Flightlines 2013
- Whiskered Flightlines 2012 & 2013

Map Number **Figure 27**

Map Name **Whiskered Flightlines 2012 & 2013**

Community Forum Area:  
Waddesdon and Quanton

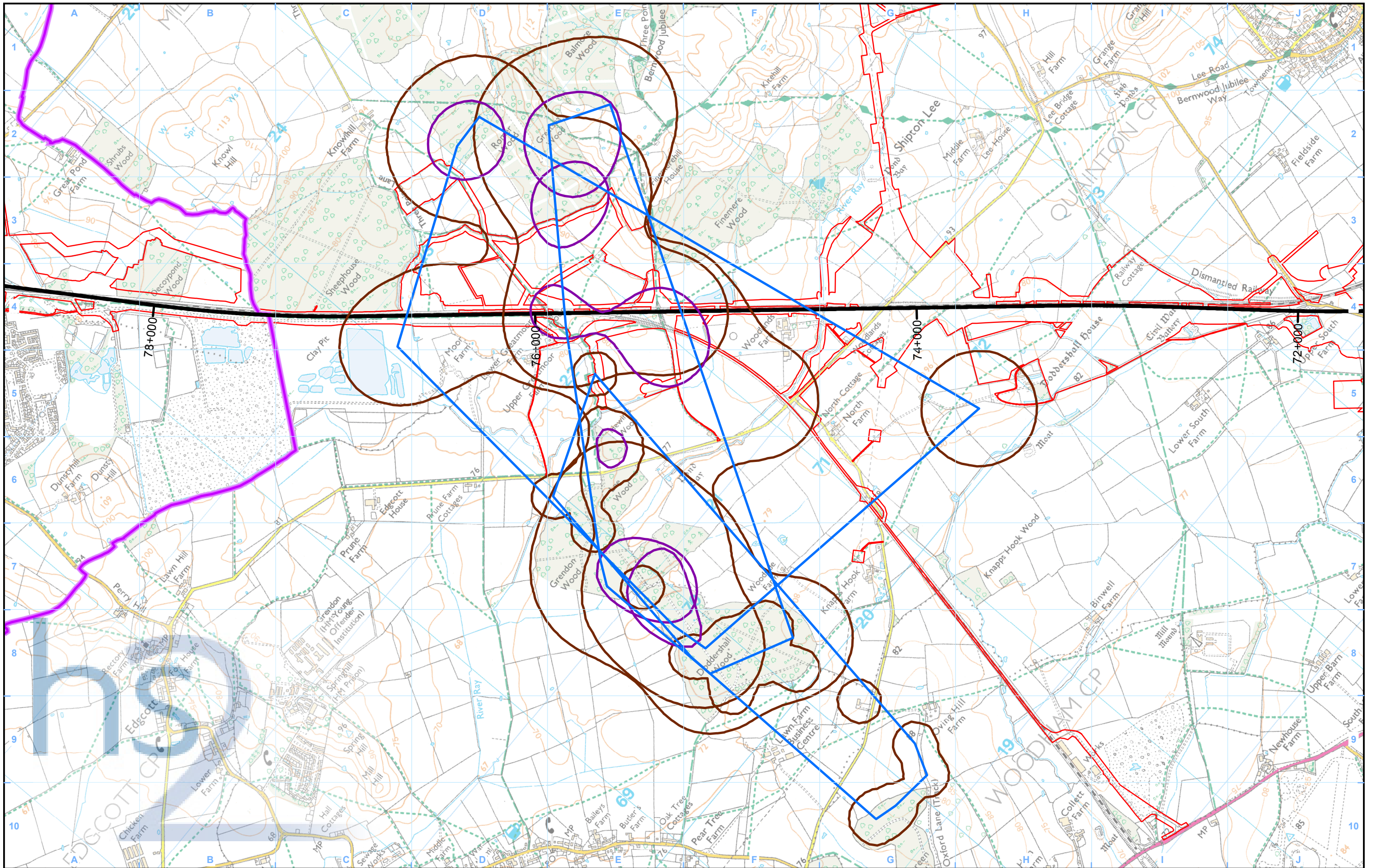
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- Legend**
- Route in tunnel
  - Route on surface
  - Community forum boundary
  - Land potentially required during construction
  - Bechsteins 2012 50% KDE
  - Bechsteins 2012 95% KDE
  - Bechsteins 2012 100% MCP

Map Number **Figure 28**

Map Name **Bechstein's all range foraging estimates 2012**

Community Forum Area:  
Waddesdon and Quanton




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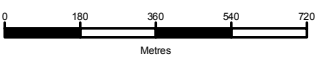
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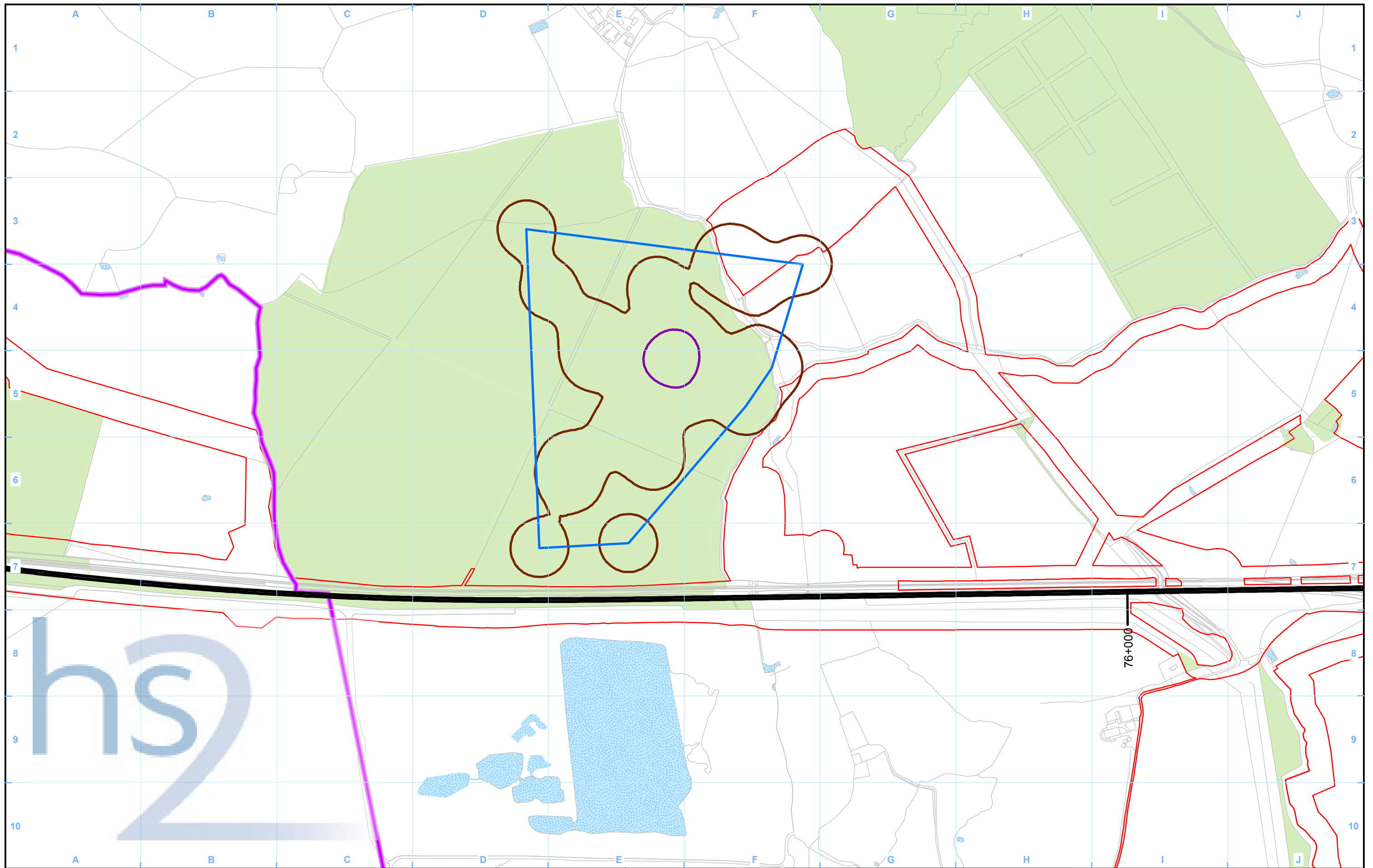


Scale at A3: 1:18,000



Metres

Date: 30/10/13



**Legend**

- Route in tunnel
- Route on surface
- Community forum boundary
- Land potentially required during construction
- BAT03\_BRANDTS BAT 1 FORAGING\_FIXES 50% KDE
- BAT03\_BRANDTS BAT 1 FORAGING\_FIXES 95% KDE
- BAT03\_BRANDTS BAT 1 FORAGING\_FIXES 100% MCP

Map Number **Figure 29**

Map Name **Brandt's all range Foraging estimates 2012**

Community Forum Area:  
Waddesdon and Quanton

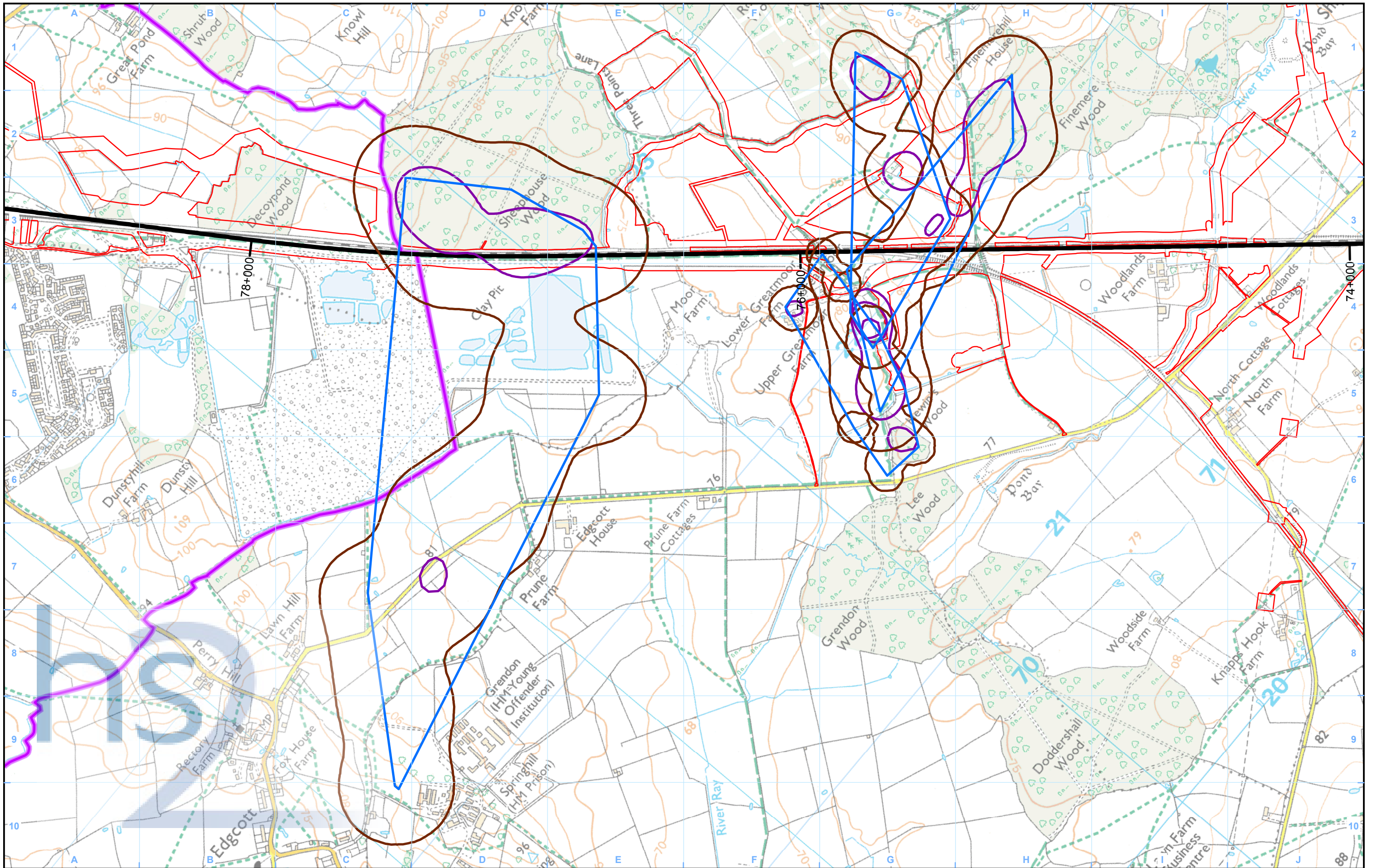
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Scale at A3: 1:6,000


Doc Number: Date: 31/10/13



Legend	
	Route in tunnel
	Route on surface
	Community forum boundary
	Land potentially required during construction
	Brown Long-eared 2012 50% KDE
	Brown Long-eared 2012 95% KDE
	Brown Long-eared 2012 100% MCP


Map Number: Figure 30  
 Map Name: Brown Long-eared all range foraging estimates 2012

Community Forum Area:  
 Waddesdon and Quanton


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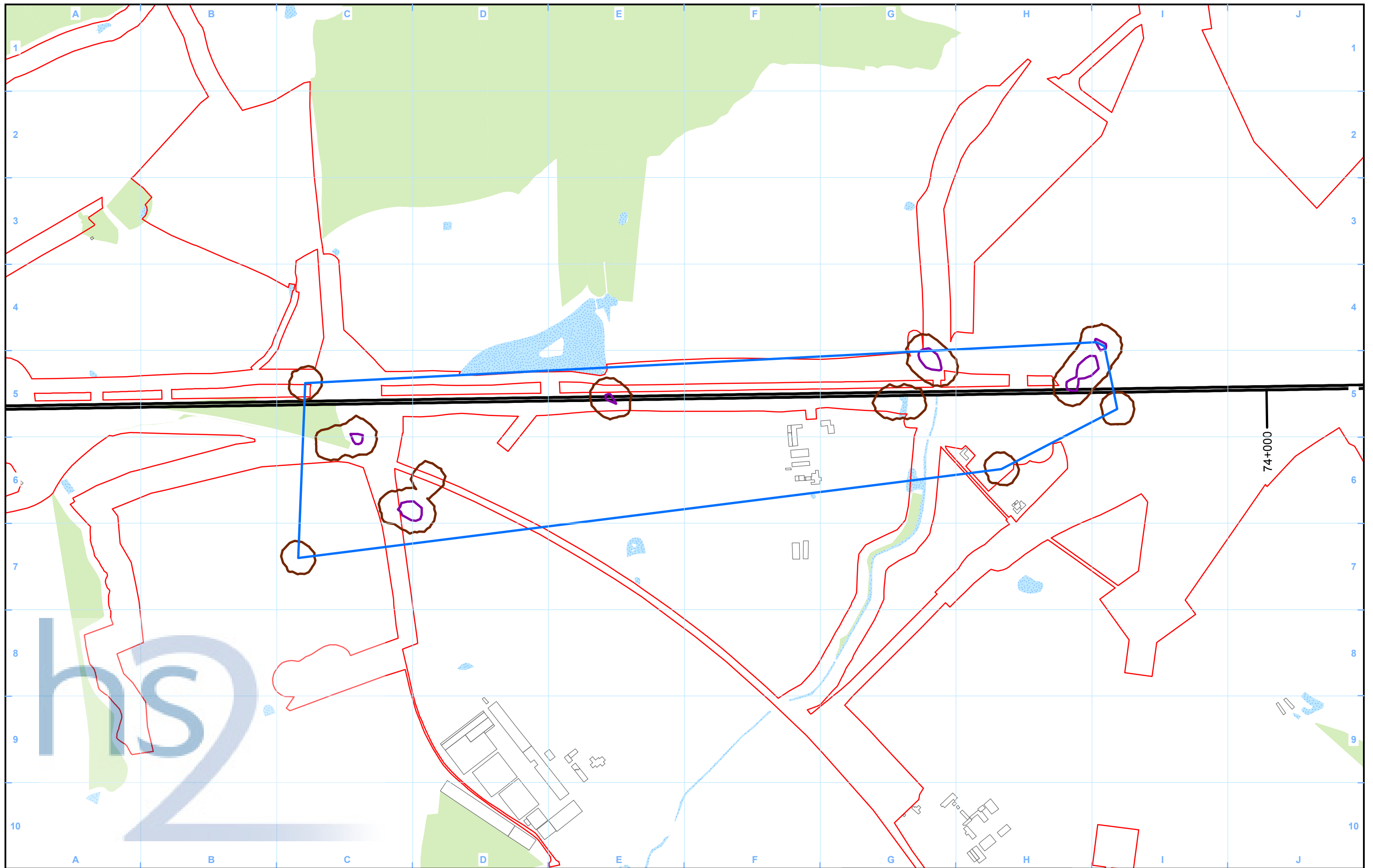
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 Metres

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Doc Number: Date: 30/10/13



**Legend**

- Route in tunnel
- Route on surface
- Community forum boundary
- Land potentially required during construction
- BAT17\_COMMON PIPISTRELLE FORAGING FIXES 50% KDE
- BAT17\_COMMON PIPISTRELLE FORAGING FIXES 95% KDE
- BAT17\_COMMON PIPISTRELLE FORAGING FIXES 100% MCP

Map Number **Figure 31**

Map Name  
**Common Pipistrelle all range foraging estimates 2012**

Community Forum Area:  
Waddesdon and Quainton

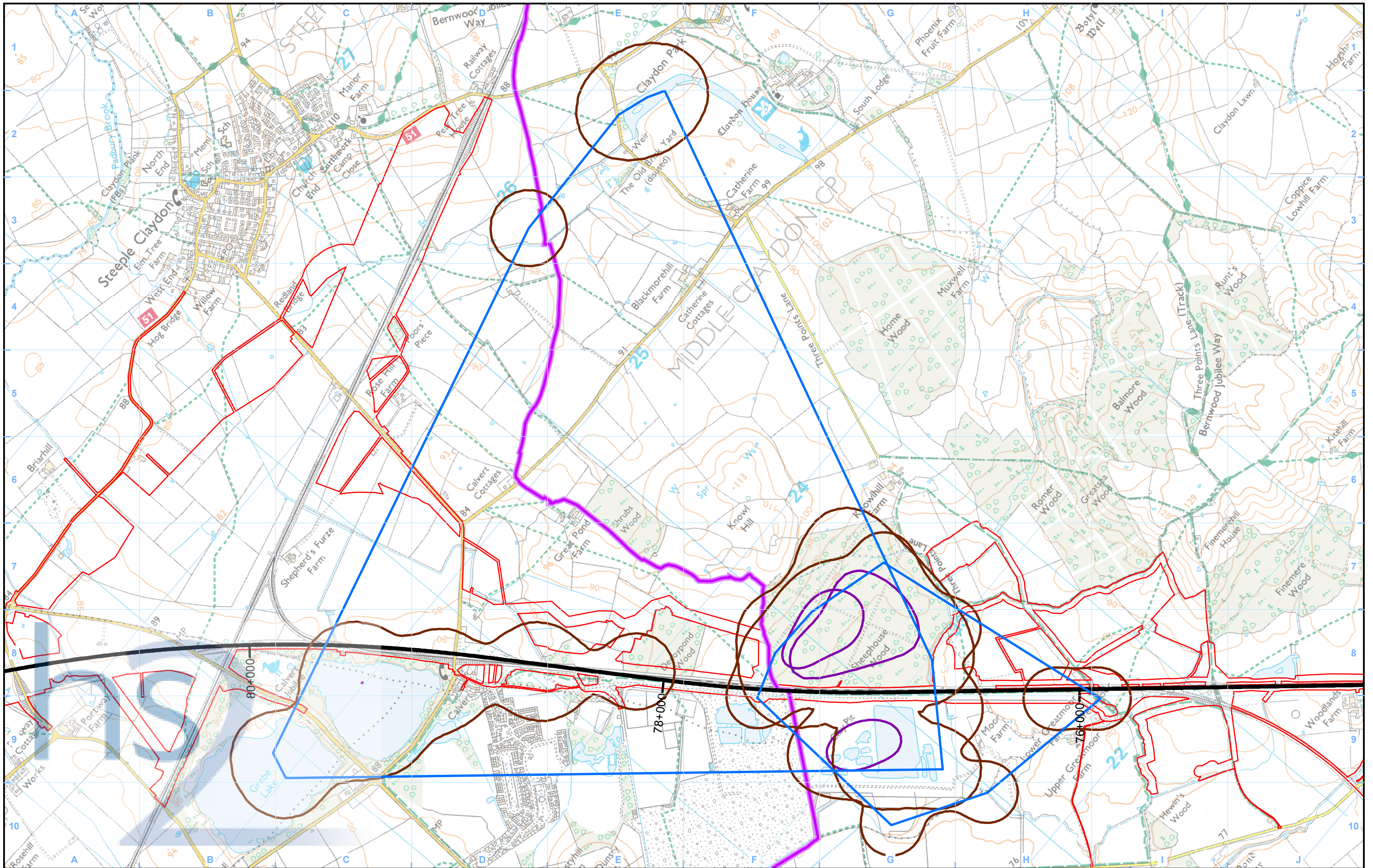
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Doc Number: Date: 30/10/13



- Legend**
- Route in tunnel
  - Route on surface
  - Community forum boundary
  - Land potentially required during construction
  - Daubenton's 2012 50% KDE
  - Daubenton's 2012 95% KDE
  - Daubenton's 2012 100% MCP

Map Number: **Figure 32**

Map Name: **Daubenton's all range foraging estimates 2012**

Community Forum Area: **Waddesdon and Quainton**

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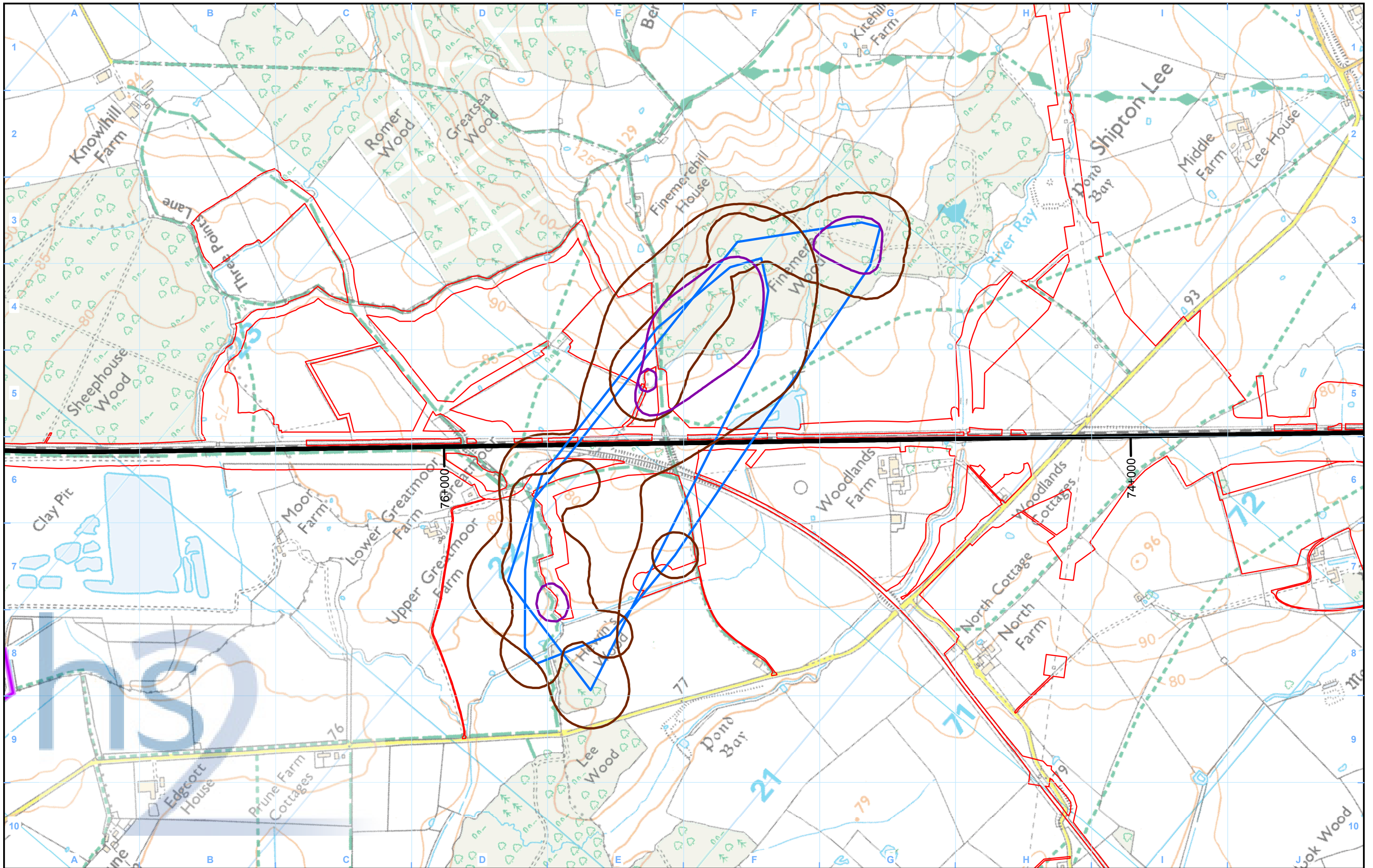
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Doc Number: **Figure 32** Date: 30/10/13





**Legend**

- Route in tunnel
- Route on surface
- Community forum boundary
- Land potentially required during construction
- Natterer's 2012 50% KDE
- Natterer's 2012 95% KDE
- Natterer's 2012 100% MCP

Map Number: **Figure 33**

Map Name: **Natterer's all range foraging estimates 2012**

Community Forum Area: **Waddesdon & Quainton**

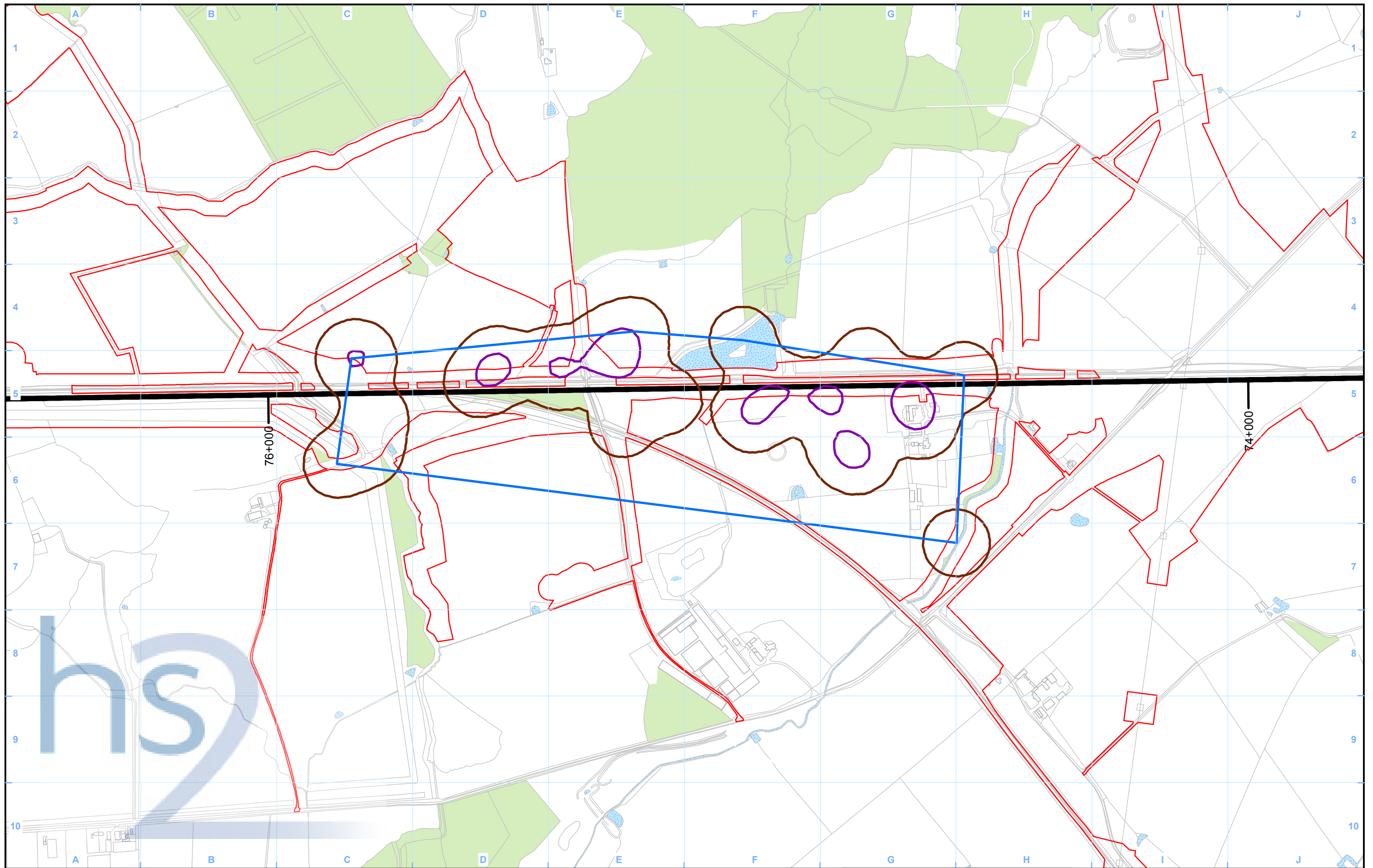
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Doc Number: **31/10/13**



**Legend**

- Route in tunnel
- Route on surface
- Community forum boundary
- Land potentially required during construction
- BAT6\_SOPRANO PIPISTRELLE BAT 1 FORAGING FIXES 50% KDE
- BAT6\_SOPRANO PIPISTRELLE BAT 1 FORAGING FIXES 95% KDE
- BAT6\_SOPRANO PIPISTRELLE BAT 1 FORAGING FIXES 100% MCP

Map Number **Figure 34**

Map Name  
**Soprano Pipistrelle all range foraging estimates 2012**

Community Forum Area:  
Waddesdon & Quainton

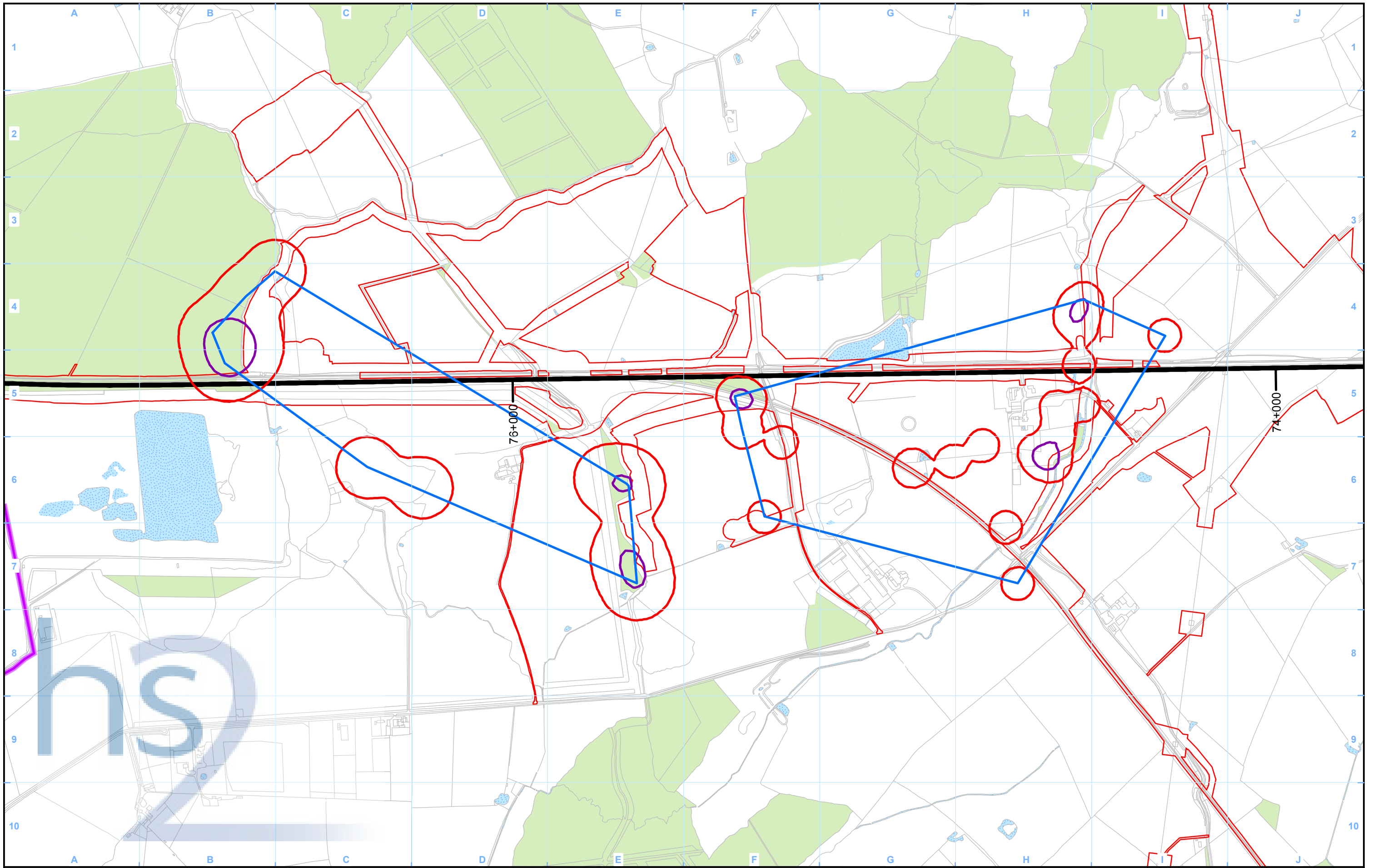
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- Legend**
-  Route in tunnel
  -  Route on surface
  -  Community forum boundary
  -  Land potentially required during construction
  -  Whiskered 2012 50% KDE
  -  Whiskered 2012 95% KDE
  -  Whiskered 2012 100% MCP

Map Number **Figure 35**

Map Name **Whiskered all range foraging estimates 2012**

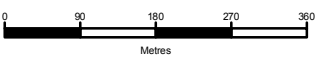
Community Forum Area: **Waddesdon and Quanton**

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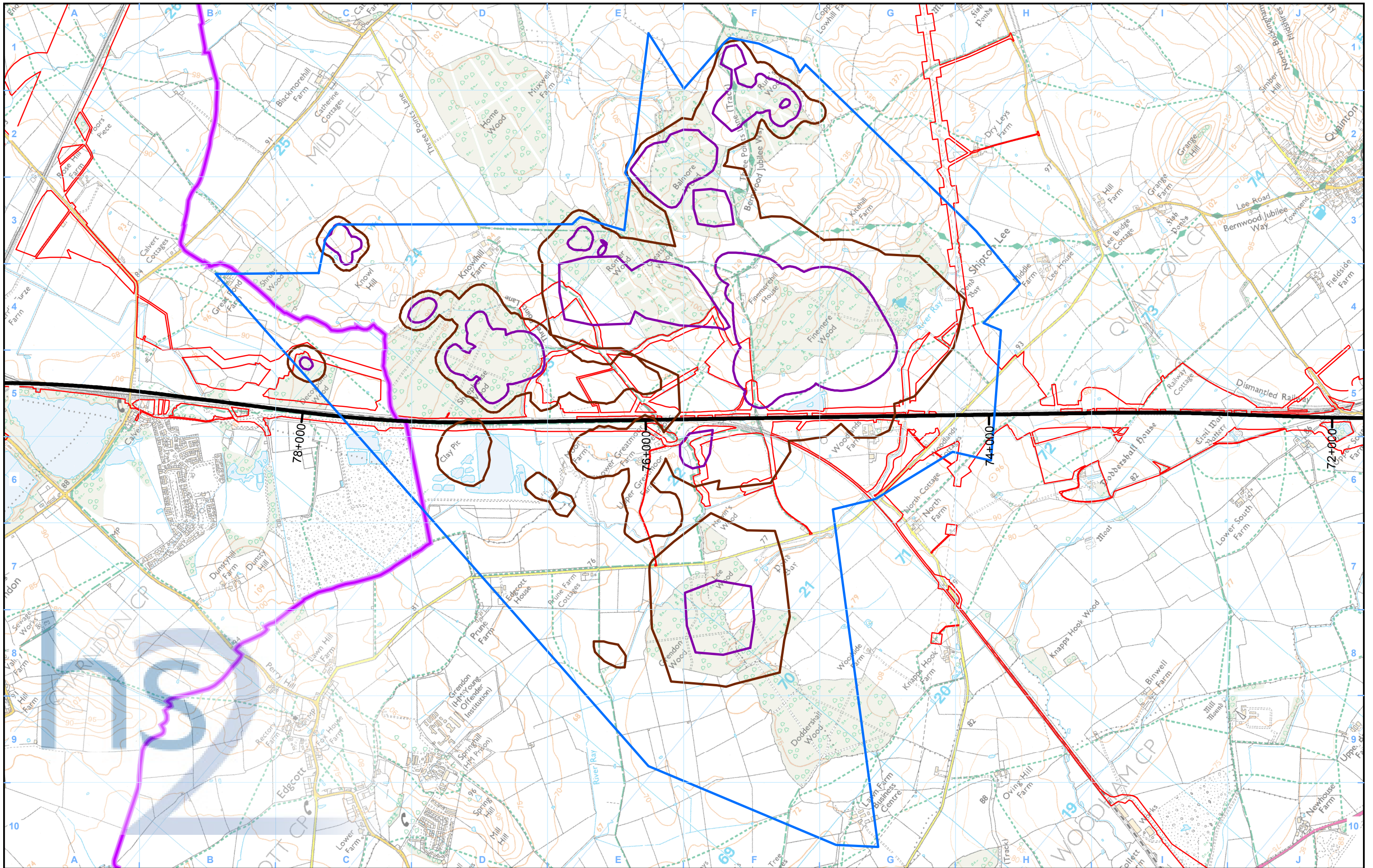
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Doc Number: Date: 30/10/13



**Legend**

- Route in tunnel
- Route on surface
- BECHSTEINS FORAGING 50% KDE
- BECHSTEINS FORAGING 95% KDE
- Community forum boundary
- BECHSTEINS FORAGING 100% MCP
- Land potentially required during construction

Map Number **Figure 36**

Map Name **Bechstein's all range foraging estimates 2013**

Community Forum Area:  
Waddesdon and Quanton

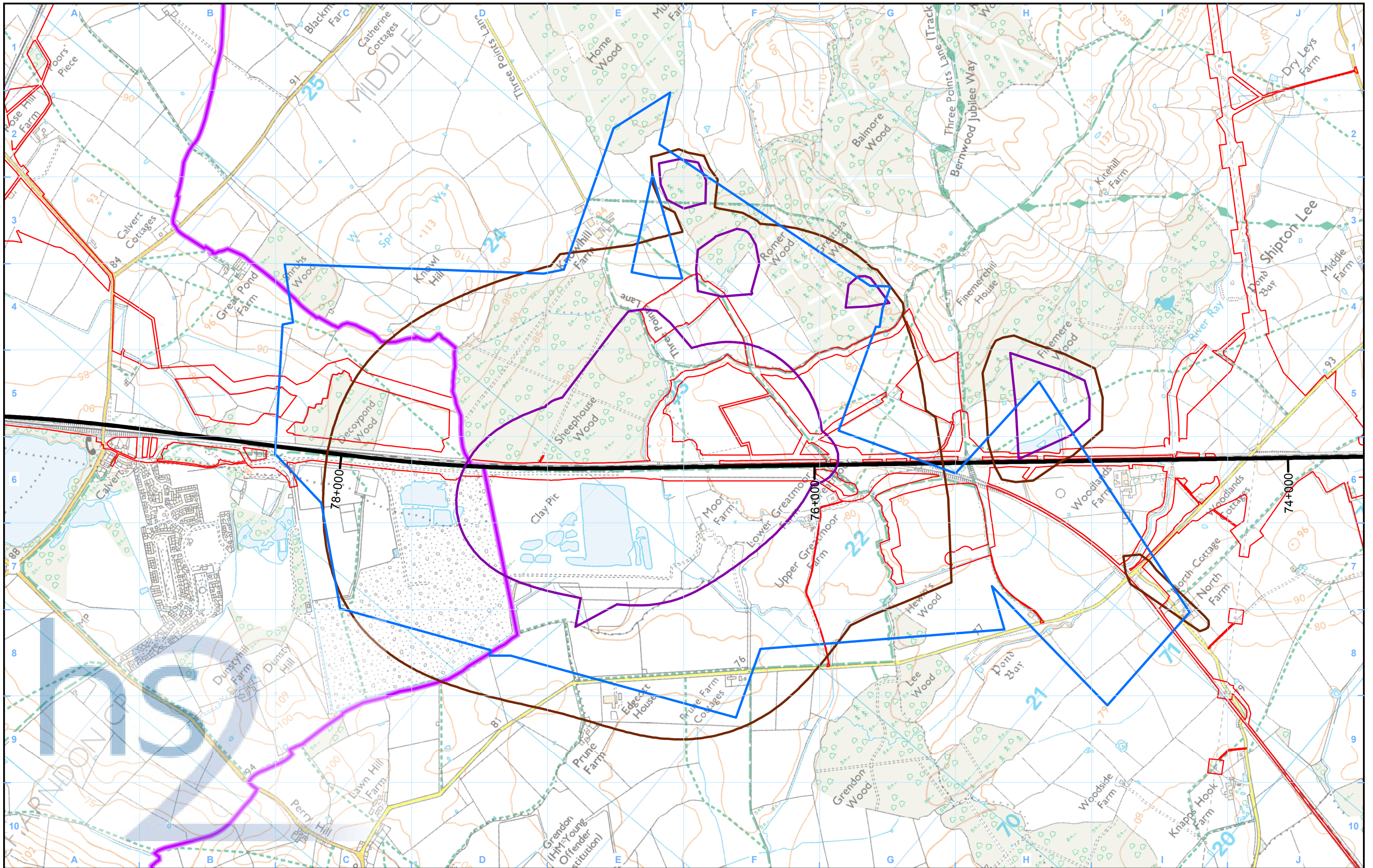
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Doc Number: Date: 30/10/13



**Legend**

- Route in tunnel
- Route on surface
- BRANDTS FORAGING 50% KDE
- BRANDTS FORAGING 95% KDE
- Community forum boundary
- BRANDTS FORAGING 100% MCP
- Land potentially required during construction

Map Number: **Figure 37**

Map Name: **Brandt's all range Foraging estimates 2013**

Community Forum Area: **Waddesdon and Quainton**

Map Number: **Figure 37**

Map Name: **Brandt's all range Foraging estimates 2013**

Community Forum Area: **Waddesdon and Quainton**

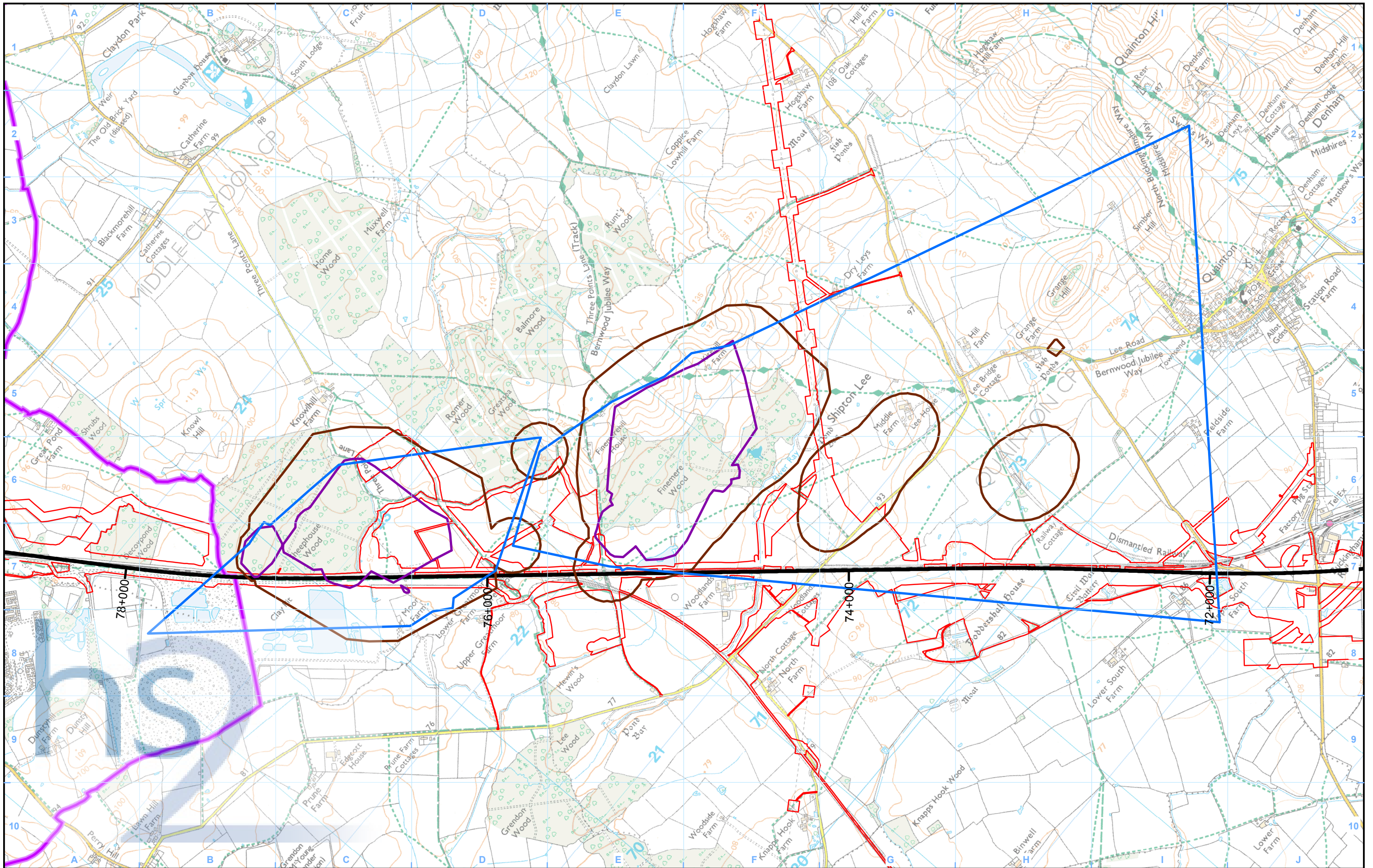
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Doc Number: **30/10/13**



- Legend**
- Route in tunnel
  - Route on surface
  - Community forum boundary
  - Land potentially required during construction
  - BROWN LONG-EARED FORAGING 50% KDE
  - BROWN LONG-EARED FORAGING 95% KDE
  - BROWN LONG-EARED FORAGING 100% MCP

Map Number **Figure 38**

Map Name **Brown Long-eared all range foraging estimates 2013**

Community Forum Area:  
Waddesdon and Quainton

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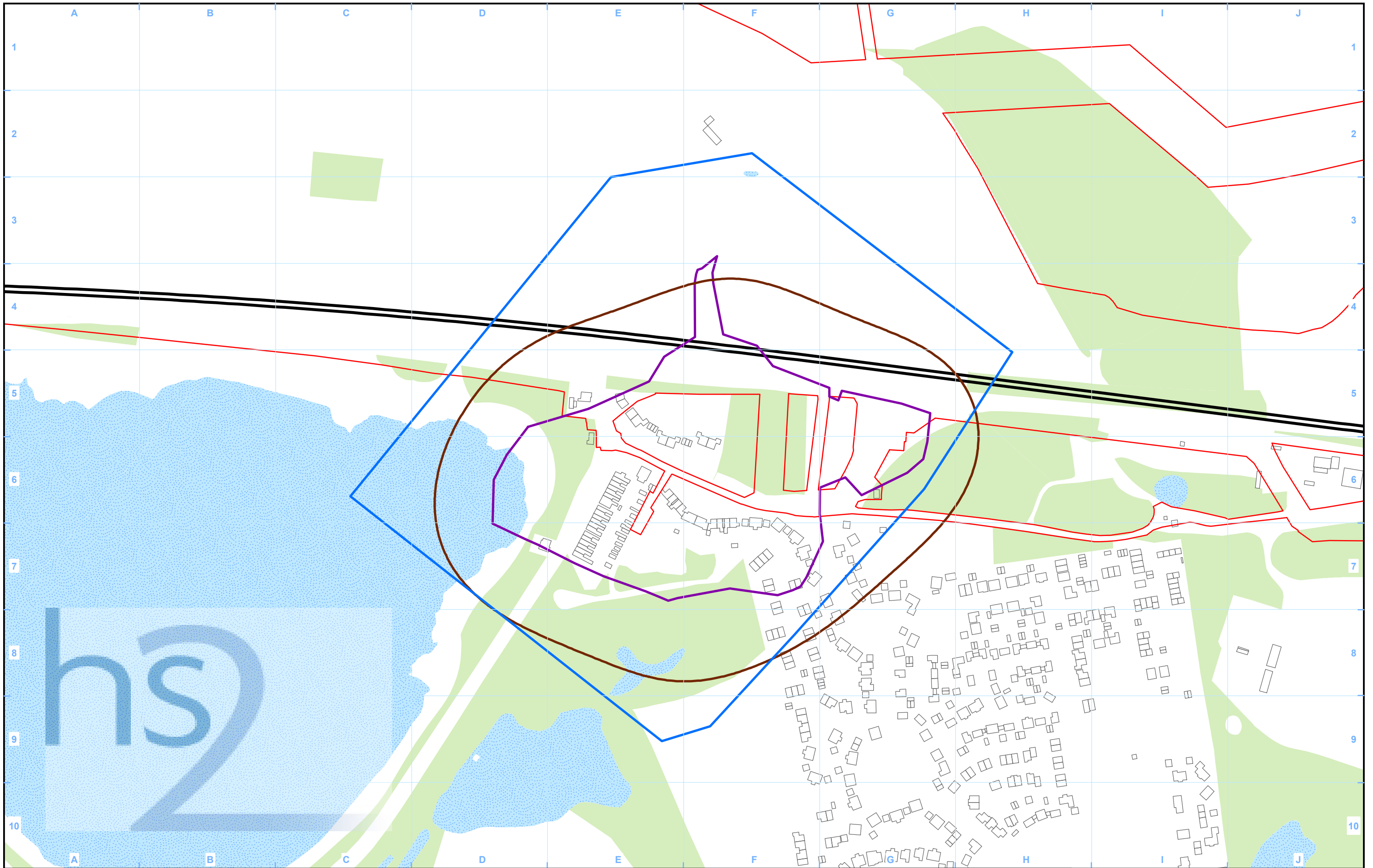
Metres

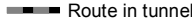
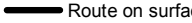





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Date: 31/10/13




- Legend**
-  Route in tunnel
  -  Route on surface
  -  Community forum boundary
  -  Land potentially required during construction
  -  COMMON PIPISTRELLE FORAGING 50% KDE
  -  COMMON PIPISTRELLE FORAGING 95% KDE
  -  COMMON PIPISTRELLE FORAGING 100% MCP

Map Number **Figure 39**

Map Name  
**Common Pipistrelle all range foraging estimates 2013**


Community Forum Area:  
 Waddesdon and Quanton

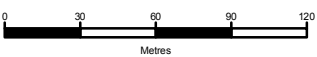
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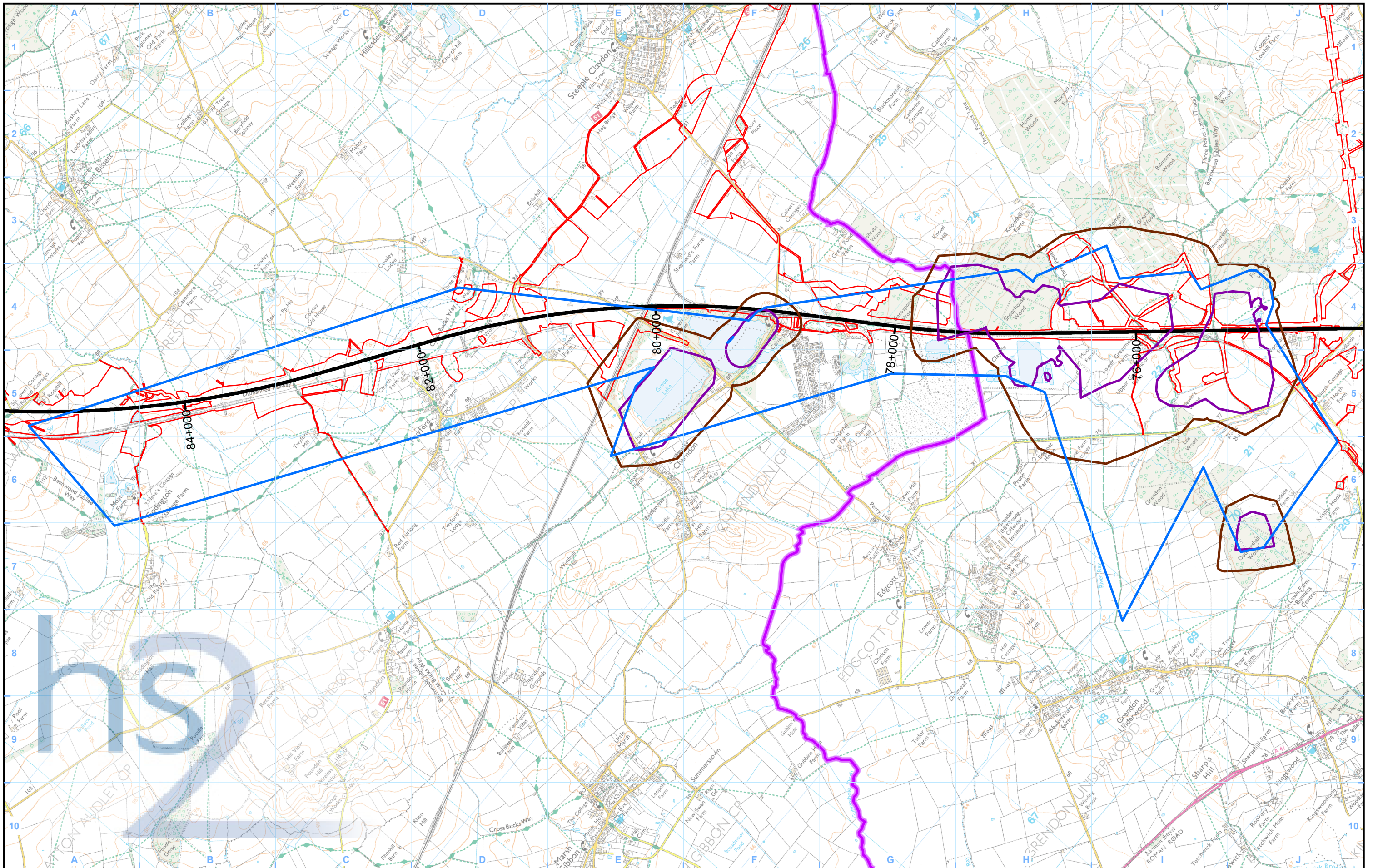
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Legend	
	Route in tunnel
	Route on surface
	Community forum boundary
	Land potentially required during construction
	DAUBENTONS FORAGING 50% KDE
	DAUBENTONS FORAGING 95% KDE
	DAUBENTONS FORAGING 100% MCP

Map Number **Figure 40**

Map Name **Daubenton's all range foraging estimates 2013**

Community Forum Area:  
Waddesdon and Quainton

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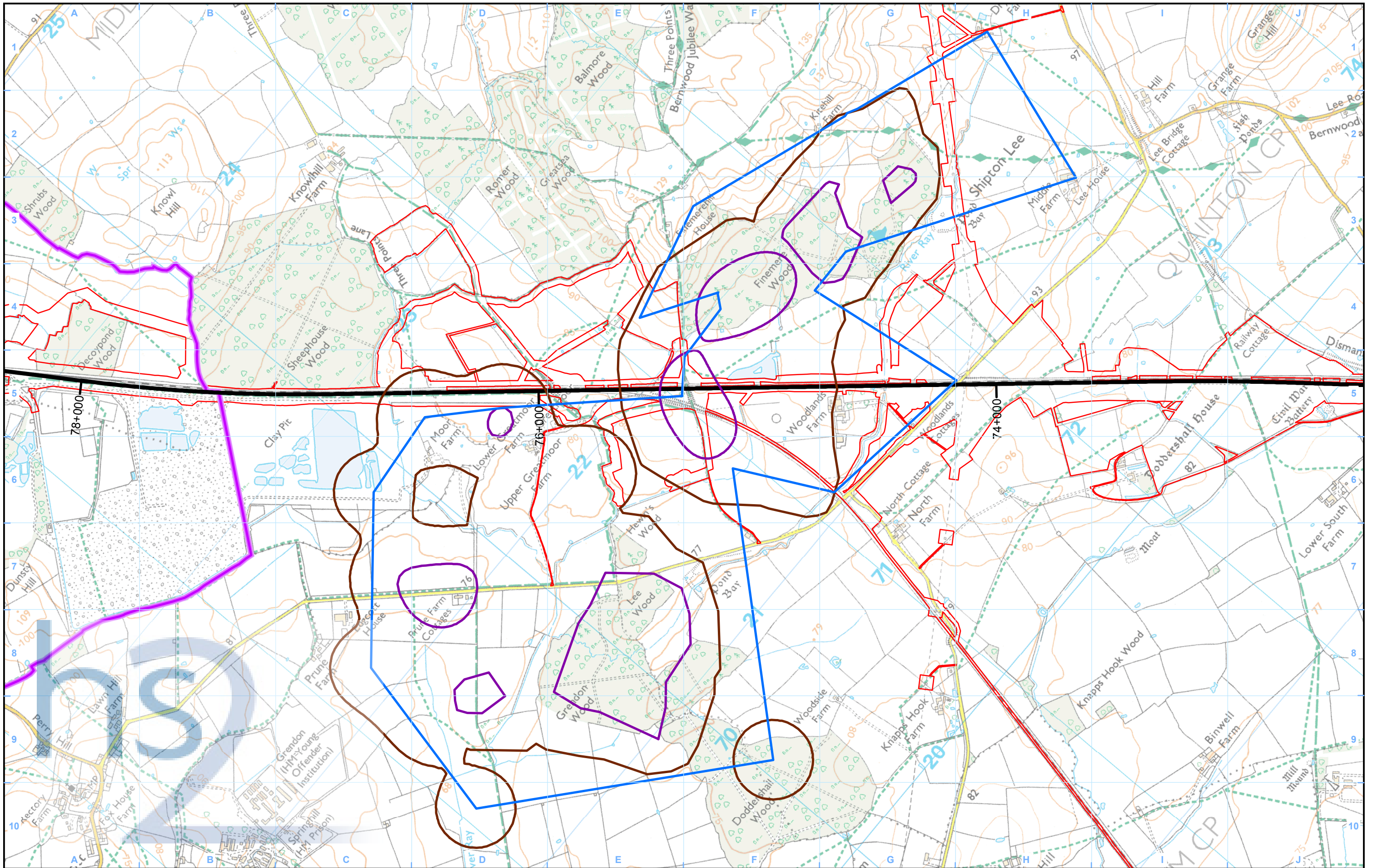
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- Legend**
- Route in tunnel
  - Route on surface
  - Community forum boundary
  - Land potentially required during construction
  - NATTERERS FORAGING 50% KDE
  - NATTERERS FORAGING 95% KDE
  - NATTERERS FORAGING 100% MCP

Map Number **Figure 41**

Map Name **Natterer's all range foraging estimates 2013**

Community Forum Area: **Waddesdon & Quainton**

**hs2**

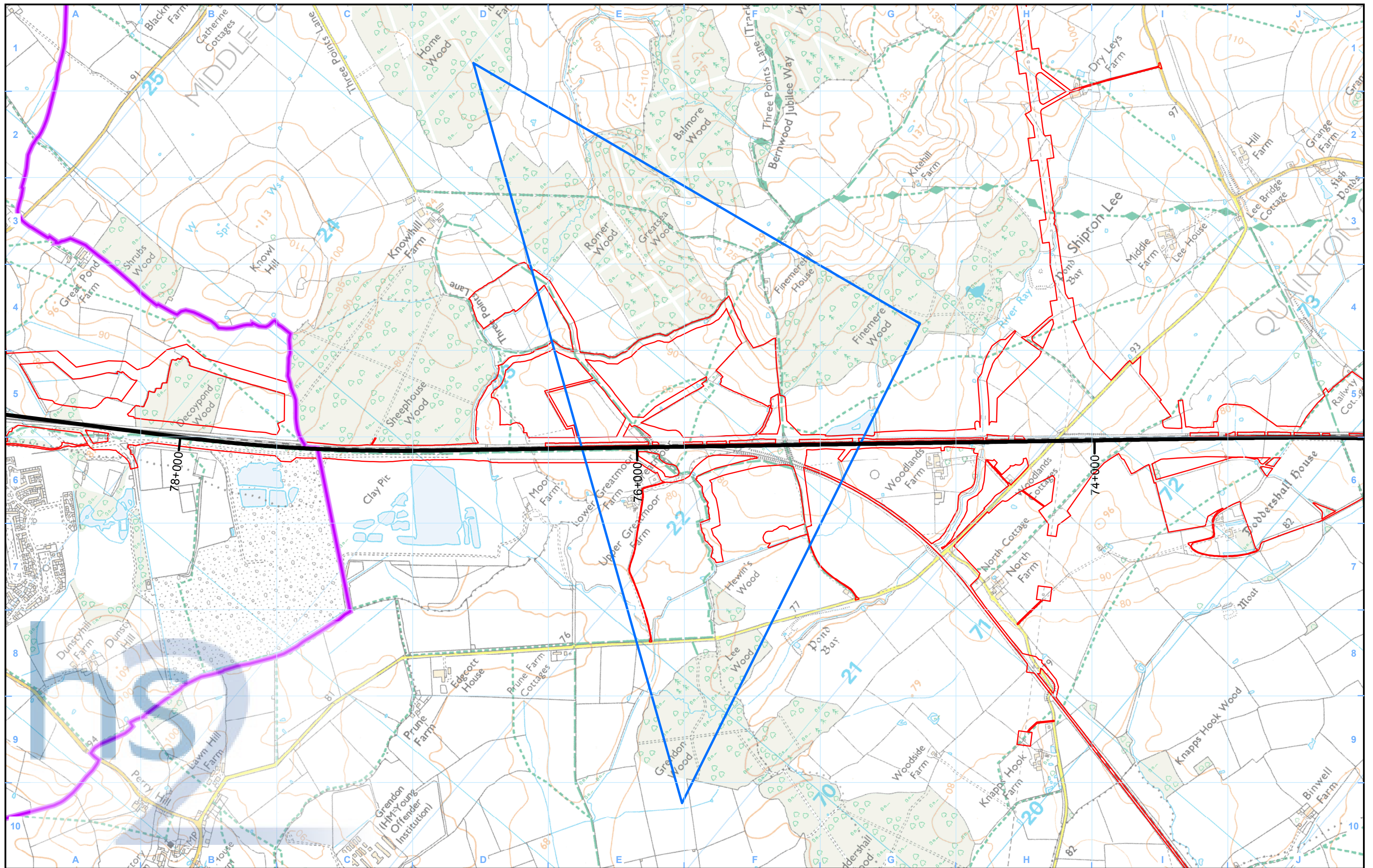
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150 300 450 600 Metres

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**Legend**

- Route in tunnel
- Route on surface
- Community forum boundary
- Land potentially required during construction
- NOCTULES FORAGING 100% MCP

Map Number **Figure 42**

Map Name  
**Noctule's all range foraging estimates 2013**

Community Forum Area:  
Waddesdon & Quainton

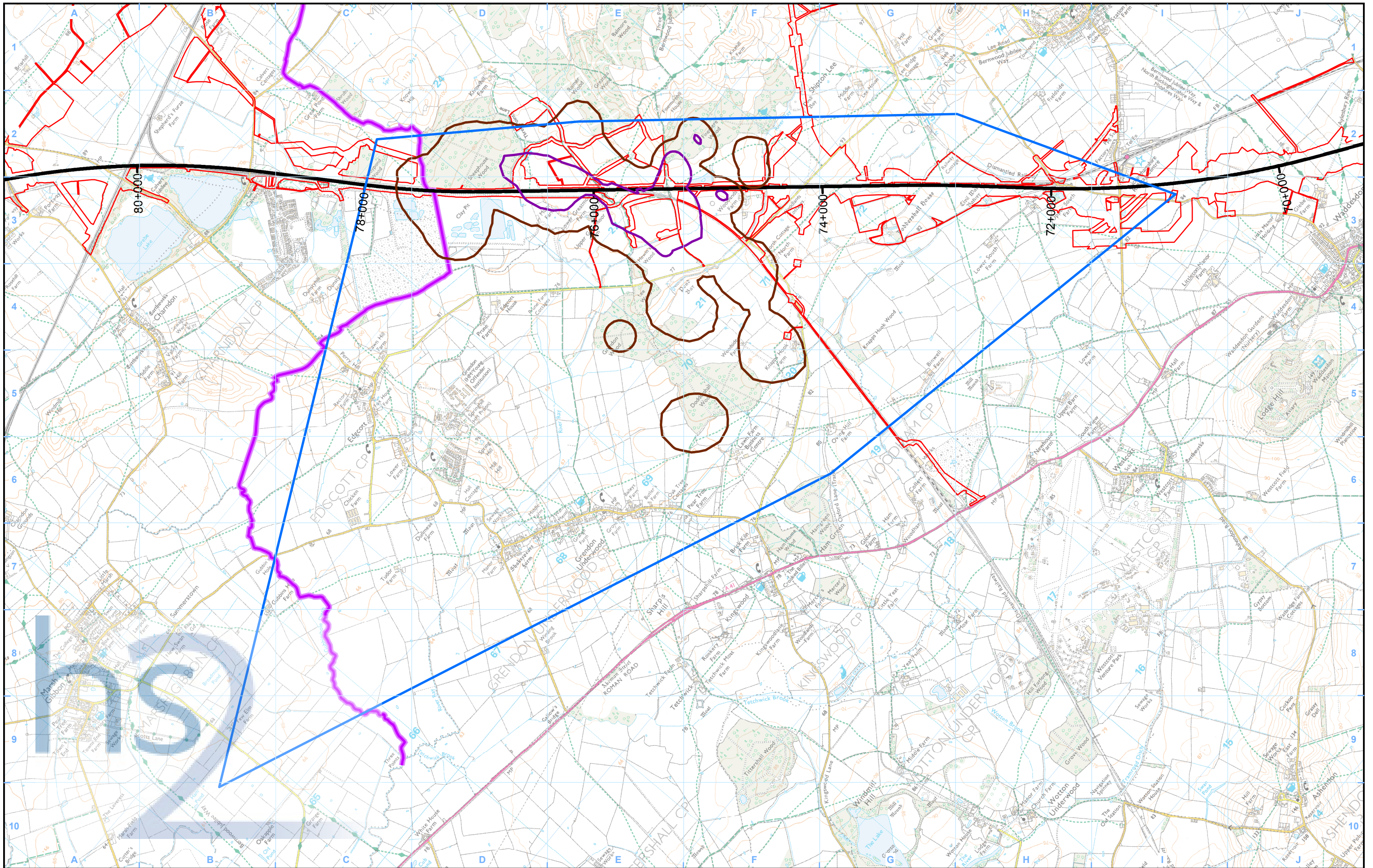
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**Legend**

- Route in tunnel
- Route on surface
- Community forum boundary
- Land potentially required during construction

- SOPRANO PIPISTRELLE FORAGING 50% KDE
- SOPRANO PIPISTRELLE FORAGING 95% KDE
- SOPRANO PIPISTRELLE FORAGING 100% MCP

Map Number **Figure 43**

Map Name  
**Soprano Pipistrelle all range foraging estimates 2013**

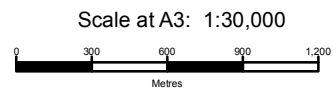
Community Forum Area:  
 Waddesdon & Quainton



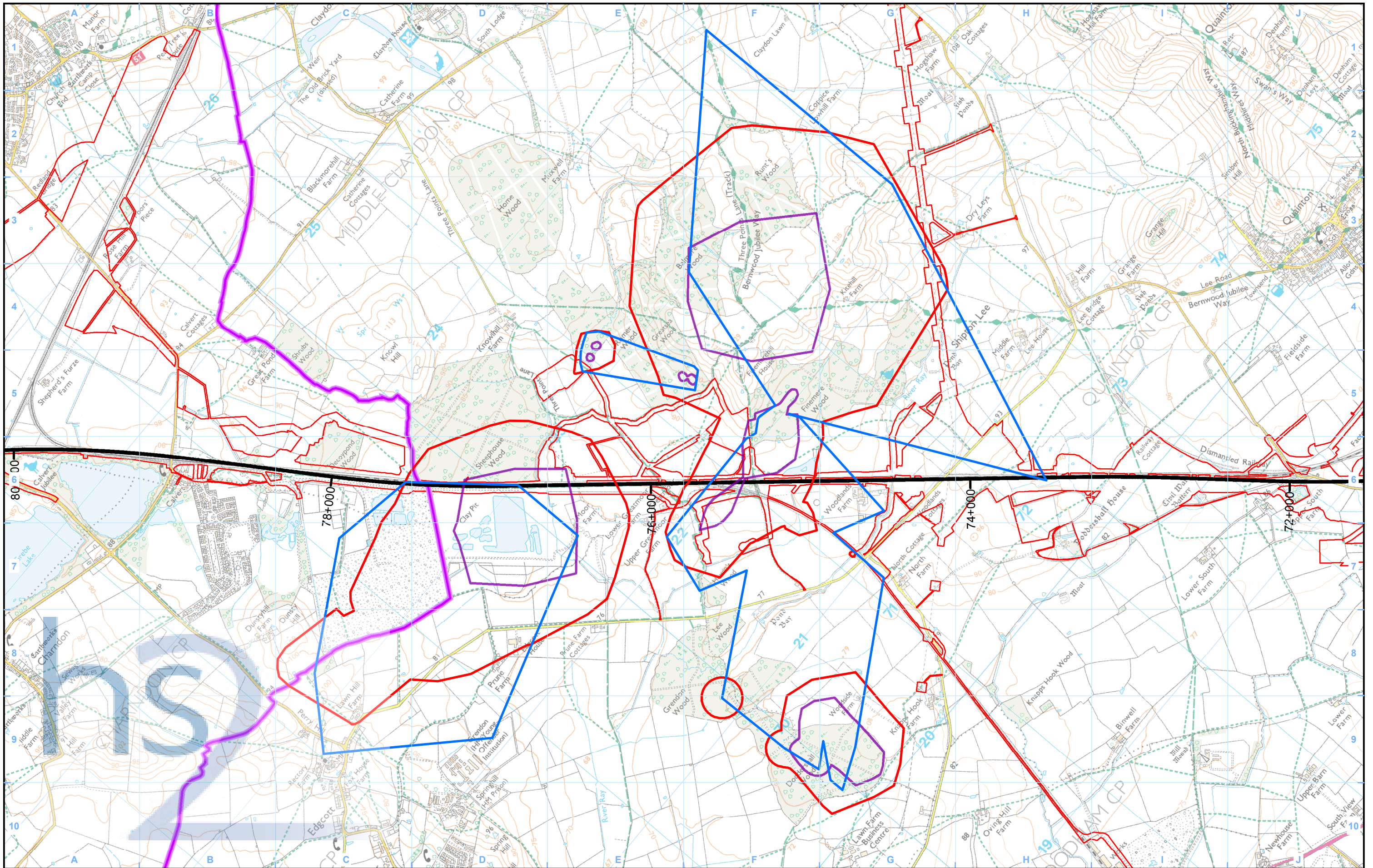
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**Legend**

- Route in tunnel
- Route on surface
- Community forum boundary
- Land potentially required during construction
- WHISKERED FORAGING 50% KDE
- WHISKERED FORAGING 95% KDE
- WHISKERED FORAGING 100% MCP

Map Number **Figure 44**

Map Name **Whiskered all range foraging estimates 2013**

Community Forum Area:  
Waddesdon and Quainton

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- Legend**
-  Route in tunnel
  -  Route on surface
  -  Key crossing location

Map Number **Figure 45**


Map Name **Key Crossing Locations**

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**Date: 31/10/13**