

MODEL FARM

Ecology Surveys Report



ECO00138 Model Farm
Ecology Surveys
Report
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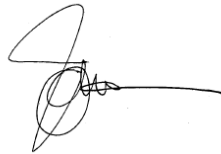
REPORT

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EXECUTIVE SUMMARY

RPS Consulting Services Ltd (RPS) were commissioned by Legal and General Strategic Land Ltd (the client) to undertake a series of Phase II protected species surveys, as recommended in the Preliminary Ecological Appraisal (PEA, RPS May 2018) and following a bat roost assessment of buildings and trees. Phase II protected species surveys were conducted for bats, otter, great crested newt, badger and breeding birds. The proposed development is located within the Vale of Glamorgan, north of Porthkerry and south of the A4226 and Port Road. The application site extends to approximately 45 ha with the total land ownership extending to 109 ha.

The application site predominately comprises pasture and arable fields intersected by hedgerows and areas of broadleaf woodland. The land ownership boundary includes three Sites Important to Nature Conservation (SINC) designated for supporting ancient semi-natural broadleaved woodland. The application site incorporates the northern half of one of these designated sites. The wider land ownership also includes two small watercourses; Whitelands Brook and Bullhouse Brook. The farmhouse and a complex of mainly large agricultural buildings used for livestock and the storage of machinery are located in the northern part of the site.

The majority of habitat loss associated with the development will be pasture and arable fields but also includes intersecting hedgerows and trees. In order to compensate for the loss, the compensatory planting of woodland, scrub and grassland areas will be provided, predominately within the south of the site. The retained habitat within the site will be protected from any direct or indirect impacts through the use of protective buffers. An environmentally sensitive lighting scheme will maintain N-S and E-W dark corridors alongside the development.

The suite of bat surveys found a number of species utilising the site for foraging and commuting as well as roosting. Bats species identified roosting within the site included both common and soprano pipistrelle and noctule. The barn complex and farmhouse supported day roosts used by small numbers of pipistrelle bats with peak counts of four and two respectively. Two of the mature trees within the site were found to support noctule roosts with peak counts of three and one respectively. A soprano pipistrelle was also recorded using a third tree within the site. A further tree roost was also identified adjacent to the site boundary with the presence of unidentified bat droppings within a cavity. The farmhouse and barn complex will be demolished and the three trees confirmed as bat day roosts will be felled. A European Protected Species Mitigation Licence for bats will be required for the development. The licence application will need to be supported by proposals for the provision of alternative roosts on the boundary of the development and a series of species protection measures to ensure that bats are not harmed.

No evidence of dormouse was identified during the 2019 surveys. However, due to the suitable habitat within the site boundary and the presence of a dormouse record in the wider local area, a precautionary dormouse mitigation strategy has been prepared for hedgerow removal and for enhancement of the future value of the wider landholding for dormouse.

No signs of otter activity were identified during surveys although the site supports potential habitat and as such pre-construction surveys of suitable habitat will be undertaken immediately prior to works in the vicinity of these habitats.

No badger setts were identified, but the site falls within an active territory of a badger social group with dung pits, paths, prints, and push-throughs recorded. There is potential for a new badger sett to be established within the site in the future, and as such a pre-construction survey should be undertaken immediately prior to construction phases.

Breeding bird surveys identified a number of species utilising the site for possible, probable or confirmed breeding. These consisted of a number of farmland specialists of conservation concern. In order to compensate for the loss of habitats associated with the development that are utilised by these specialist species a number of habitat compensation methods have been suggested.

No evidence of great crested newt was recorded during the 2019 survey with a negative eDNA result for the only waterbody within the application site and are considered to be absent.

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1 INTRODUCTION

1.1 Background to the study

- 1.1.1 RPS were commissioned by Legal and General Strategic Land Ltd (the client) to undertake Phase II protected species surveys, as recommended in the Preliminary Ecological Appraisal (PEA, RPS May 2018), at a site named 'Land at Rhoose aka. 'Model Farm' with a central grid reference of ST08026 67338.
- 1.1.2 An outline planning application has prepared by RPS for a proposed 45ha Business Park on land at Port Road, Rhoose on behalf of Legal & General (Strategic Land) Ltd, application proposes approximately 1.7 million sq ft Class B1, B2 and B8 floorspace, car parking, landscaping, drainage infrastructure and biodiversity enhancement and is located adjacent to Cardiff Airport (Appendix A).
- 1.1.3 Phase II surveys were conducted to inform the planning application. The surveys covered were bats (roosts and activity), breeding birds, dormouse, great crested newt, badger, and otter. Consideration was also given to other species, including reptiles. This report sets out the findings of the Phase II surveys and outlines proportionate mitigation and enhancements.

1.2 Site Description

- 1.2.1 The site is located within the Vale of Glamorgan, north of Porthkerry and south of the A4226 and Port Road. The client's total land ownership extends to 109 ha, although the application site boundary extends to approximately 45 ha. The application site (henceforth referred to as the 'site') is predominately comprised of pasture and arable fields intersected by hedgerows and areas of broadleaf woodland. The land ownership boundary includes three Sites Important to Nature Conservation (SINC) designated for supporting ancient semi-natural broadleaved woodland. The application site incorporates the northern half of one of these sites, however the site will be protected during development. The greater area of land ownership also includes two small watercourses; Whitelands Brook and Bullhouse Brook. The farmhouse and a complex of mainly large agricultural buildings used for livestock and the storage of machinery is located in the northern part of the site.
- 1.2.2 The site lies to the west of Porthkerry Country Park, with the woodland block in the south east of the site connected the woodland within the wider park which is intersected by a railway viaduct.
- 1.2.3 The wider landscape supports further arable and pasture farmland with patches of broadleaf woodland, as well as Cardiff Airport to the west and Barry to the east.

1.3 Aims and Objectives

- 1.3.1 The aims of this report are to:
- Identify the presence of protected species (Phase II Protected Species Surveys) and the habitats utilised by any protected species on site;
 - Assess population sizes of protected species, if present, on site;
 - Provide an assessment of potential direct or indirect impacts of the development on the population status of any protected species present;
 - Provide outline details of mitigation required for protected species, as appropriate, in context with wildlife legislation; and
 - Provide recommendations for biodiversity enhancements in line with national and local planning policy.

2 METHODS

2.1 Bat Roost Assessment

Trees

- 2.1.1 A systematic inspection of all trees within the site or adjoining the boundary was conducted on 28th March 2019 by Kate Davies (GradCIEEM) and Laura White (GradCIEEM). The trees were assessed for their potential to support roosting bats and whether they would be impacted due to (1) their removal as part of the development plan or (2) retained but disturbed due to the proximity to the development plan. The assessment was completed from ground level using close focusing binoculars and a high-powered torch as necessary. To assess the potential bat roosting suitability, roosting features and evidence of bats were searched for as defined in Table 2.1. Trees were then assigned a category of potential suitability as a bat roost, defined in Table 2.2.
- 2.1.2 A second inspection to confirm whether trees previously noted for bat roost potential would be suitable for a climbing survey, was conducted on 2nd April 2019 by Mike Shewring (CEcol, licence No. 74460: OTH: CSAB:2016) and Kate Davies. All visits and subsequent assessments were conducted in accordance with Bat Surveys for Professional Ecologists: Good Practice Guidelines (BCT, 2016).

Buildings

- 2.1.3 Systematic external and internal inspections of buildings on-site were completed on 2nd April 2019 by Mike Shewring (CEcol, licence No. 74460: OTH: CSAB:2016) Kate Davies (accredited agent under Mike Shewring) and Laura White, from ground level using close focusing binoculars and a high-powered torch as necessary. The internal inspection of buildings was completed where safe access was available.
- 2.1.4 Structural features that may influence the suitability of a building to support roosting bats include the presence of a roof void, the presence of access points into the building (including gaps beneath barge boards, soffits and fascia boards, gaps under lead flashing, gaps within masonry and under loose tiles, gaps between mortise and tenon joints), the complexity and size of any roof voids and daytime light levels in the roof voids.
- 2.1.5 The surrounding habitat can influence roost potential and notes were made on the setting of the tree/ building, its proximity to significant linear habitat features (such as a watercourse, mature hedgerow, wooded lane or an area of woodland) and other factors including artificial lighting.
- 2.1.6 Taking account of the architectural and habitat features, the buildings were assigned a level of roost suitability (Table 2.2) based the criteria given in the Bat Conservation Trust's Bat Surveys: Good Practice Guidelines (Collins, 2016) and professional judgement. The primary objective of this exercise was to identify the need for further detailed bat survey later in the year, or alternatively to obtain sufficient information that would dismiss the need for further assessment.

Table 2-1 Potential bat roosting features and evidence searched for in trees.

Potential Bat Roosting Features	Signs Indicating Possible Use by Bats
Natural holes	Live, dead or skeletons of bats
Woodpecker holes	Bat droppings in the roof void (particularly below ridge beam and apex)
Cracks/splits in major limbs	Feeding remains e.g. insect wings
Loose bark	Tiny scratches around entry point
Hollows/cavities	Urine staining around entry point
Dense epicormic growth	Bat droppings in, around or below entry points
Bird and bat boxes	Audible squeaking at dusk or in warm weather
	Flies around entry point
	Distinctive smell of bats
	Smoothing of surfaces around a cavity

Table 2-2 Categories for bat roosting potential.

Category	Criteria
Negligible Potential	No evidence, no suitable Potential Roost Features (PRFs)
Low Potential	No evidence of use, one or two features suitable for low numbers of bats, with very limited roosting potential. Limited connectivity to wider landscape with other bat habitats.
Moderate Potential	No evidence of use, several suitable features, but unlikely to support a roost type of high conservation status, connected to wider landscape with good foraging habitat.
High Potential	No evidence of use, but many suitable features for use by larger numbers of bats on a more regular basis and potentially for longer periods. Well connected to good foraging habitat and known roosts nearby.
Confirmed Roost	PRFs with evidence of use present, observation or previous records of bats confirmed to be roosting in the feature/building/tree.

2.2 Endoscope Inspections

- 2.2.1 In place of emergence surveys, climbing inspections and endoscope examinations of trees were completed by qualified and licensed ecologists from Soltys Brewster Ecology Limited. Ground level inspections of trees were conducted by Mike Shewring (CEcol, licence No. 74460: OTH: CSAB:2016) and Kate Davies.
- 2.2.2 All the surveys were conducted in accordance with Bat Surveys for Professional Ecologists: Good Practice Guidelines (BCT, 2016) and completed in the main activity period (May – September inclusive) to avoid potential disturbance to hibernating bats, details provided in Appendix B.
- 2.2.3 Trees with moderate or high potential to support roosting bats were inspected / climbed on a minimum of two or three survey visits respectively to take into account the fact that roosts may be used intermittently.
- 2.2.4 Potential roost features were inspected physically using a torch and an endoscope to search for live bats or any evidence of use by bats such as droppings, claw marks, staining and polishing. Around each feature searches were made for evidence of use by bats such as staining below a hole, smoothing of bark and bat droppings. Notes were made on:
- Type of feature/enclosure of space
 - Dimensions and cavity depth
 - Height above ground level
 - Orientation /aspect
 - Evidence of bat activity
 - Additional information affecting likelihood of use by bats

2.3 Bat Emergence/Re-entry Surveys

- 2.3.1 RPS bat emergence/re-entry surveys for trees and buildings were carried out in accordance with good practice guidelines as outlined by the Bat Conservation Trust (BCT, 2016). Dusk emergence surveys commenced 15 minutes prior to sunset and continued until 90 minutes after. Re-entry surveys commenced 90-120 minutes prior to sunrise and continued until 15 minutes after. For all the trees and buildings with high potential, one of the three survey visits was a dawn survey.

Trees

- 2.3.2 Trees with moderate or high potential to support roosting bats were subject to a minimum of two or three surveys respectively. For trees with moderate potential, if evidence of use by bats was recorded, an additional third survey visit would be undertaken (BCT, 2016).
- 2.3.3 Each survey was carried out by team of surveyors to cover the PRFs of individual trees. An infra-red camera, acting as an additional “surveyor”, was used to focus on an individual PRF on a tree (or building). Surveys were conducted in suitable weather conditions as prescribed in the good practice guidelines (see Table 2.4).

Table 2-3 Bat tree emergence/re-entry survey dates, weather conditions and surveyors.

Date	Tree No.	Surveyors*	Weather Conditions	Sunset/ Sunrise	Start Time	End Time
08/08/2019	1	GK, SD	Dry, 11-13°C, light breeze B2	05:47	04:17	06:02
03/09/2019		KD, LW	Dry, 12-15°C, moderate breeze B4/5	19:55	19:40	21:25
16/09/2019		KD, LW	Dry at start, rain during the latter half of the survey, 12-15°C, moderate breeze B4	19:26	19:11	20:56
12/08/2019	678	LW, TO	Dry, 16-18°C, gentle breeze B3	20:40	20:25	22:10
19/09/2019		TO	Dry, 17-19 °C, light air B1	19:19	19:04	20:49
08/08/2019	12	LW	Dry, 11-13°C, light breeze B2	05:47	04:17	06:02
04/09/2019		KD, LW	Dry, 12-14°C, moderate breeze B4	19:53	19:38	21:23
17/09/2019		LW	Dry, 10-12°C, light breeze B2	06:50	05:20	07:05
17/09/2019	13	KD	Dry, 10-12°C, light breeze B2	06:50	05:20	07:05
24/07/2019	19	GK, LW	Dry, 18-20°C, light air B1	21:15	21:00	22:45
19/09/2019	10	LW, KD	Dry, 17-19 °C, light air B1	19:19	19:04	20:49
25/07/2019	22	GK, PO, VR	Dry, 20-22°C, light breeze B2	21:13	20:55	23:00
12/09/2019		KD, LW	Dry, 16-18°C, gentle breeze B3	19:35	19:20	21:05
20/09/2019		KD, LW	Dry, 12 °C clear, light breeze B2	06:55	05:25	07:10

*GK=Georgia Kelly; SD=Steve Devereaux; KD=Kate Davies; LW=Laura White; PT=Paul Turner; TO=Tim Oliver; VR=Violet Ross; JD=Jack Blackburn; SW=Sophie Watson and NT=Nia Thomas

Buildings

- 2.3.4 The farmhouse and barn complex were each subject to two emergence surveys and one re-entry survey. The surveys were carried out by teams of four surveyors for the farmhouse and five surveyors for the barn complex with all surveys completed in suitable weather conditions as prescribed in the good practice guidelines (Table 2.5).

Table 2-4 Bat building emergence/re-entry survey dates, weather conditions and surveyors.

Date	Building	Surveyors	Weather Conditions	Sunset/ Sunrise	Start Time	End Time
24/07/2019	Farm House	KD, PO, SD, TO	Dry, 19°C, gentle breeze B3	21:15	21:00	23:00
15/08/2019		KD, JB, LW, SD	Dry, 16-18°C, light breeze B2	20:36	20:21	22:06
13/09/2019		GK, KD, LW	Dry, 14-16°C, light breeze B2	06:44	05:13	06:59

Date	Building	Surveyors	Weather Conditions	Sunset/ Sunrise	Start Time	End Time
22/07/2019	Barn Complex	KD, GK, LW, SD, VR	Dry, 19-21°C, light air B1	21:16	21:01	22:45
14/08/2019		KD, LW, NT, SD, SW	Intermittent drizzle, 16-18°C, gentle breeze B3	20:38	20:23	22:10
12/09/2019		GK, KD, LW, SD	Drizzle/light rain, 16-17°C, gentle breeze B3	06:43	05:14	06:58

2.4 Bat Activity

Activity Transect Survey

- 2.4.1 Bat activity surveys were carried out in line with good practice guidelines as outlined by the Bat Conservation Trust (BCT). Transect surveys covering the application site was carried out in October 2018, and from April to September in 2019, excluding June due to access constraints.
- 2.4.2 The defined transect route provided coverage of the whole of the site, encompassing the hedgerows or groups of individual trees and areas of woodland immediately to the south of the boundary. The start and finish locations were alternated for each survey. In some months the defined transect route had to be varied where there were access limitations (as detailed below in Section 3).
- 2.4.3 Surveys were conducted in suitable weather conditions as prescribed in the good practice guidelines (BCT) (see Table 2.6). They commenced at sunset (or within a suitable time period before/after) with the route walked at a steady pace recording any bats encountered, as well as numbers and behaviour where possible. In addition, a number of point counts were also carried out along the route during which the surveyor remained stationary for five minutes to record any bat activity encountered. These point counts consisted of the following locations:
- Point Count 1: ST 07435 67283 - West side of site near a group of ash trees (referred to as Tree 1 and located on the Tree Location Plan)
 - Point Count 2: ST 07734 67422 - Northern end of woodland block near Tree 12
 - Point Count 3: ST 07929 67511 - Middle of application boundary along hedgerow (near Tree 19)
 - Point Count 4: ST 08282 67684 – East side of site in the centre of a field south of Tree 22
- 2.4.4 Each survey was carried out using a Bat Logger M, recording constantly throughout the survey. This also recorded metadata such as GPS, temperature, date and time. The data was then analysed using Anabat Insight and the auto ID function using the Bat Classify plugin.

Table 2-5 Bat activity transect survey dates, weather conditions and surveyors.

Date	Number	Surveyors	Weather Conditions	Sunset/ Sunrise	Start Time	End Time
04/10/2018	1	Kate Davies & Georgia Kelly	Dry, 13-15°C, gentle breeze B3	18:44	18:45	21:15
25/04/2019	2	Kate Davies & Laura White	Dry, 9-11°C, light breeze B2	20:25	20:15	22:45
16/05/2019	3	Kate Davies & Laura White	Dry, 15°C, moderate breeze B4	20:59	21:00	23:30
25/07/2019	4	Kate Davies & Laura White	Dry, 19-21°C, light air B1	21:12	21:10	23:40
27/08/2019	5	Kate Davies & Laura White	Dry, 17-18°C, drizzle at start, dry after 30 minutes, light breeze B2	20:11	20:10	22:40
25/09/2019	6	Kate Davies & Georgia Kelly	Dry, 13-15°C, gentle breeze B3	19:04	19:00	21:00

Static Detector Recording

- 2.4.5 A total of four automated detector locations were recorded at each month across the 2019 bat survey season (May-September) with the addition of two locations in April 2019 and four locations in October 2018. The locations are shown on Figure 1. The four locations per month were decided by assessing the most appropriate placements for detectors in relevance to bat flight paths and foraging areas.
- 2.4.6 The detectors were deployed for a minimum of five nights per location with recording commencing 30 minutes prior to sunset until 30 minutes after sunrise. Full details of detector locations and deployment times are given in Table 2.7.
- 2.4.7 The use of automated detectors allowed the collection of quantitative datasets which complements the more qualitative data collected during the activity transects outlined below. Analysis of five nights per location was carried out by Georgia Kelly using Analook Insight and Kaleidoscope software.

Table 2-6 Static detector locations and recording dates.

Location	Location Number	Month Deployed	Analysis Dates
ST 07737 67412	1	October	26/10/2018 – 31/10/2018
		November	04/11/2018 – 09/11/2018
ST 08407 67711	2	October	26/10/2018 – 31/10/2018
		November	04/11/2018 – 09/11/2018
ST 07733 67486	3	October	04/10/2018 – 09/10/2018
ST 08029 67670	4	October	04/10/2018 – 09/10/2018
ST 07582 67180	5	April	02/04/2019 – 07/04/2019
ST 08256 67595	6	April	02/04/2019 – 07/04/2019
ST 07966 67344	7	May	09/05/2019 - 14/05/2019
ST 07453 67284	8	May	17/05/2019 - 22/05/2019
ST 07717 67364	9	May	20/05/2019 – 25/05/2019
		June	02/06/2019 – 07/06/2019
ST 07956 67818	10	July	24/07/2019 – 29/07/2019
ST 07956 67818	11	August	03/08/2019 – 08/08/2019
ST 07879 67737	12	August	12/08/2019 – 17/08/2019
S T08100 67940	13	August	27/08/2019 – 01/09/2019
ST 07415 67283	14	August	27/08/2019
ST07561 67490	15	September	03/09/2019 – 08/09/2019
ST08326 67791	16	September	13/09/2019 – 18/09/2019
ST07389 67383	17	September	13/09/2019 – 18/09/2019

2.5 Hazel Dormouse Survey

- 2.5.1 A dormouse *muscardinus avellanarius* nest tube survey was initiated at the end of the 2018 active season was ongoing throughout the 2019 active season, following a methodology based on published best practice guidelines (Bright, Morris & Mitchell Jones 2006; Chanin & Woods 2003).
- 2.5.2 The dormouse is an arboreal species, spending the majority of its time during the active season in the canopy. The nest tubes provide shelter in which dormice nests can be constructed, enabling the presence of dormouse to be confirmed. Nest tubes can also be used by other mice species but differences in the structure of nests enables identification of features created by dormice.
- 2.5.3 The nest tubes consisted of stiff double walled black plastic (5 x 5cm in width and 25 cm long) with a plywood tray placed inside. These were suspended by wire onto the underside of horizontal tree branches. The nest tubes used were based on the standard design described in the published

guidelines and as recommended by the mammal society and were set following the methodology described by Chanin and Woods (2003).

2.5.4 The survey comprised the deployment of 100 nest tubes which were placed in all areas of suitable habitat within the site and in woodland habitat in the wider landholding (Figure 2).

2.5.5 Each nest tube was checked monthly at times when dormice will be active (excluding May 2019). Any signs of occupation or evidence of activity was recorded. All visits were carried out in suitable weather conditions. All survey visits, including tube deployment, were carried out by NRW dormouse license holder Georgia Kelly (S085812/1). Nest tubes were installed at the site on 4th October 2018 and inspected on the following dates:

- 25th October 2018
- 29th November 2018
- 26th April 2019
- 9th July 2019
- 31st July 2019
- 30th August 2019
- 2nd October 2019

Survey Effort

2.5.6 The dormouse survey guidelines provide recommendations on the minimum survey effort for presence / absence surveys. A method is outlined for quantifying survey effort based on the number of nest tubes used and the likelihood of encountering dormice during each month between April and November (when dormice are typically active).

2.5.7 Using this method, the months April through November are each allotted a value referred to as an 'index of probability' score reflecting the relative likelihood of dormice being detected in nest tubes in that month. The 'index of probability' scores for each month are given in Table 2.8, the survey effort is calculated by totalling the index of probability scores for each month in which nest tubes are installed.

Table 2-7 Dormouse survey months and corresponding index of probability scores.

Month	Index of Probability (50 tubes)	Index of Probability (100 tubes)
April	1	2
June	2	4
July	2	4
August	5	10
September	7	14
October	2	4
November	2	4
Total Score for Site:		42

2.5.8 The survey visits covered October 2018 to September 2019. There was no survey check undertaken in May 2019 as access to the site was not possible. A total survey effort score of 20 is considered to be the minimum requirement to determine the presence / likely absence of dormouse. With 100 nest tubes placed within and around the site, the survey effort, covering October 2018 to September 2019 (excluding May), achieves an Index of Probability score of 42.

2.6 Great Crested Newt eDNA Survey

- 2.6.1 The waterbodies on site and within 250m and 500m of the application site boundary were reviewed as well as the connecting terrestrial habitat between them, to identify suitable waterbodies to survey for presence of great crested newt (GCN) *Triturus cristatus*.
- 2.6.2 One waterbody was identified on-site within the site with no other known waterbodies within 250m of the site boundary. The waterbody was sampled in suitable weather conditions on 15th April 2019 by NRW licence holder Laura White (S086255/1) and Kate Davies.
- 2.6.3 GCN release DNA into the ponds in which they live when they deposit; skin cells, faeces, mucus, sperm or eggs into the water. The DNA in this material can persist, and be detected, in the water for several weeks.
- 2.6.4 The eDNA detection method is considered more accurate than traditional survey methods due to the relatively low detection rates. Where GCN are present in a pond there is a higher likelihood of it being detected by sampling for DNA.
- 2.6.5 Water samples were collected at 20 points around the bank margin using the eDNA kit supplied by NatureMetrics. All the samples were collected from open water with no disturbance of sediment in the base of the pond to ensure that it represented the activity of the current season.
- 2.6.6 The samples were homogenized and fixed in six separate replicates. The analysis was conducted by NatureMetrics to confirm the presence/absence of GCN DNA in the samples. The NatureMetrics report confirmed the number of samples in which GCN DNA was found (if any), and additional results to confirm the validity of the samples (sample integrity check, degradation check and inhibition check).

2.7 Breeding Bird Survey

- 2.7.1 A breeding bird survey of habitats within the site was carried out following an adapted Common Birds Census (CBC) technique as outlined in Gilbert *et al.*, 1998. The survey visits were conducted during mild weather conditions, moderate wind (<5mph) and no heavy rain.
- 2.7.2 Survey visits were undertaken across the breeding bird season of 2019 with the individual visits on 22 March, 9 April and 20 May. The surveys were undertaken by experienced bird surveyors; Mike Shewring, Kate Davies and David Rees. Surveys commenced within an hour of sunrise and were completed within four hours during suitable weather conditions.

Territory Mapping

- 2.7.3 All the data from the different survey visits was combined and then analysed to assess the number of breeding territories for each species. Territories were estimated based on behavioural observations and on the separation distance between individuals of the same species, both on a single visit and between two different visits.
- 2.7.4 With the exception of skylark *Alauda arvensis* passerines displaying breeding behaviour in suitable habitat separated by less than 100 m during a single visit, or less than 200 m during different visits, were considered to be from the same pair. Birds separated by greater distances were considered to be from different pairs.
- 2.7.5 Skylark displaying breeding behaviour in suitable habitat separated by less than 200 m during a single visit, or 500 m during different visits, were considered to be from the same pair. Birds separated by greater distances were considered to be from different pairs.
- 2.7.6 Breeding behaviour was recorded and reviewed against the European Ornithological Atlas Committee (EOAC) criteria for categorising breeding status:

EOAC Breeding Status Categorisation

Possible Breeding

- Singing male(s) present (or breeding calls heard) in breeding season

Probable Breeding

- Pair observed in suitable nesting habitat in breeding season
- Permanent territory presumed through recordings on at least two different survey dates at the same place
- Courtship and display
- Visiting a probable nest site
- Agitated behaviour or anxiety calls from adults
- Nest building or excavating nest-hole

Confirmed Breeding

- Distraction-display or injury feigning
- Used nest or eggshells found (occupied or laid within period of survey)
- Recently fledged young or downy young
- Adults entering or leaving nest-site in circumstances indicating occupied nest (including high nest or nest holes, the contents of which cannot be seen) or adult seen incubating
- Adult carrying faecal sac or food for young
- Nest containing eggs
- Nest with young seen or heard

2.8 Badger Scoping Survey

2.8.1 A scoping survey for badger *Meles meles* was conducted on the 2nd October 2019 by a suitably qualified ecologist, Kate Davies GradCIEEM. All habitats within the site and the connected wider habitat within the wider land ownership were searched for evidence of badger, following the methodology recommended by Harris et al. (1989), and the Forest Operations and Badger Setts's Guide 9 (Forestry Practice Division's, 1995).

2.8.2 Evidence searched for included:

- **Setts** – These are typically excavations into raised earth with entrances with a characteristic sideways 'D' shape. There are several types of badger sett which range in size from main setts which form the focal sett for a badger group to small, infrequently used outlier setts. Outside of the hibernation period, setts can be classified as active or inactive based on the signs of use at the sett entrances.
- **Prints** - Badger prints can be detected where badgers have crossed areas of bare ground and are easily distinguishable from other mammal prints.
- **Hair** - Badger guard hair has distinctive colouring and a square shaped profile that can be felt when rolled between the fingers. Badger hair can sometimes be collected along tracks and runs where they have pushed under barbed wire fences, or around sett entrances.
- **Dung Pits and Latrines** - Badgers defecate into a small scrape called a dung pit which is usually left uncovered. A latrine is a collective name for a series of dung pits within an area, used at certain times of the year by social groups to demarcate their territory.
- **Tracks / Runs** - A track is a main route frequently used by badgers. Tracks may be clearly visible over a considerable distance along flat, even ground. Runs are less frequently used routes, which may only be visible where they cross some obstacle, such as a bank, a hedge or a fence.

- **Push-throughs** – Where badgers have travelled beneath low sections of fencing, the fence may be pushed up. This can often be distinguished as a badger push-through by the broad and low shape of the pushed-up area and presence of badger hairs caught on the fencing.
- **Foraging Area / Snuffle Holes** - These often take the form of shallow excavated 'snuffle holes', rooting up of turf or ground cover, or overturning of dried cow manure in search of earthworms. Other foraging evidence may appear as holes left from digging out wasp or bee nests, and 'rolling' of cereal crops in arable areas.

2.8.3 Within the survey area, particular attention was given to field boundary features including hedgerows, areas of woodland and scrub and other features or habitats potentially suitable for the location of a sett.

2.9 Otter

2.9.1 A scoping survey for signs of otter *Lutra lutra* was conducted on the 2nd October 2019 by a suitably qualified ecologist; Kate Davies GradCIEEM. The survey comprised of a site walkover focusing on areas of suitable habitat within the application site boundary as well as extending connected habitat within the wider area of land ownership, this included two streams and surrounding woodland.

2.9.2 During the survey, all areas of potentially suitable otter habitat were inspected for field signs indicating the presence of the species, as well as features which may be used as resting sites (e.g. holts and couches). Otter field signs are described in Bang and Dahlstrøm (2001), and include resting sites, spraints, prints and feeding remains. Descriptions of these and other field signs are provided below.

- **Holts** - underground features used by otters to rest in during the day (otters forage at dawn and dusk), and potentially used as natal or breeding sites. Otters may use holts permanently or temporarily. Holts can include tunnels within banks of watercourses, underneath root-plates of trees or boulder piles, and man-made structures such as disused drains.
- **Couches / resting sites** – above-ground resting sites. Couches can be very difficult to identify, sometimes consisting of no more than an area of flattened grass or earth. A feature was classified as a confirmed otter couch / resting site where field signs such as spraints (varying in age from fresh to old), prints and/or claw marks were recorded in or around the feature.
- **Prints** - otters have characteristic footprints that can be found in soft ground and muddy areas.
- **Spraints** - otter faeces can be used to mark territories, often on in-stream boulders but also on fallen trees, vegetation tufts and other features that mark territorial boundaries. They can be present within or outside the entrances of holts and couches. Spraints have a characteristic smell and often contain fish remains.
- **Feeding signs** - the remains of prey items may be found at preferred feeding stations. Remains of fish, crabs or skinned amphibians can indicate the presence of otter.
- **Paths** - terrestrial routes that otters take when moving between couches or holts and foraging areas. When water-levels in watercourses are high, otters may travel along the banks of watercourses in preference to swimming.
- **Slides and play areas** - slides are typically worn areas on slopes where otters slide into the water on their bellies. They are often located between holt entrances/couches and adjacent watercourses.

2.9.3 Any of the above field signs are diagnostic of the presence of otters, although spraints are the most reliably identifiable evidence of the species' presence. Field signs of interest were recorded with their location, using a hand-held GPS.

3 LIMITATIONS

- 3.1.1 Several Phase II surveys were affected impacted by access site restrictions during the summer survey season with very little permitted access in May, June and mid July 2019.

3.2 Bat Surveys

Bat Roost Assessment

- 3.2.1 Access into buildings within the barn complex was limited due to health and safety precautions. Several sections of the barn complex had unstable ceilings or roofs and due to this, the internal inspection was restricted to open hay/storage barns and one first floor location.

Bat Emergence Surveys

- 3.2.2 Due to site access restrictions in mid summer, all the emergence surveys were to be conducted between the end of July and end of September 2019.
- 3.2.3 Due to the presence of young bullocks and cows with calves, some of the night time emergence surveys for trees within those fields had to be postponed for health and safety reasons. On one occasion a tree emergence survey had to end early because of livestock, but this was over one hour after sunset and included the primary emerging period for bats (15 minutes before and 1 hour after sunset) and as such is not considered a significant limitation.

Bat Activity

- 3.2.4 Due to site access restrictions, the June transect survey could not be undertaken and only single locations were covered by static recorders in June and July.
- 3.2.5 The fixed route for activity survey transects was altered on a few occasions, when livestock (young bullocks or cows with calves) were present within fields previously walked through.
- 3.2.6 Location 14 for the static bat recording data only recorded for one night before the microphone was damaged and unable to supply further data.

3.3 Hazel Dormouse Survey

- 3.3.1 Due to restricted access, the month of May 2019 was not included in the survey visits for the active period. The end of month survey check for June 2019 was delayed until early July due to access restrictions. As dormouse nests comprise woven grass and leaves, they will typically remain intact within a nest tube for several months. As such the delay on the June survey visit is not considered a constraint.
- 3.3.2 The survey effort score of 42 significantly exceeding the minimum survey effort score of 20 and the access restriction has not affected the result.

3.4 GCN eDNA Survey

- 3.4.1 The waterbody sampled for GCN eDNA had access to the “bank” on only one side. The waterbody was a square artificial ‘pond’ used as a water source for cattle. Three of the four sides were lined with an unstable concrete wall covered in thick bramble. Consequently the sampling for the eDNA survey was restricted to only one side of the waterbody. Due to the small size of the waterbody, the restriction of sampling area is unlikely to have affected the overall result of the survey.

3.5 Breeding Birds

- 3.5.1 Three of the proposed four survey visits were undertaken due to access restrictions in June. Three surveys is generally the minimum survey effort required for territory mapping analysis it is not considered a significant limitation on the assessment of the breeding bird assemblage.

3.6 Badger

- 3.6.1 The majority of habitat within the site was accessible to inspect for signs of badger, however within the woodland blocks access was limited in places due to the dense understory. Where access was constrained the perimeter of the area was inspected for signs of badger such as pathways leading into the area. Where active setts are present in impenetrable vegetation, paths and other signs of activity will usually be visible. With no paths associated with these areas, there is no significant constraint on the survey.

3.7 Otter

- 3.7.1 The majority of Whiteland Brook and the woodland blocks were accessible to search for signs of otter, however access was limited in places due to the dense understory. Where access was constrained the perimeter of the area was inspected for signs of otter such as pathways leading into the area. This constraint was not considered to have a significant effect on the survey results.

4 RESULTS

4.1 Bat Roost Surveys

Trees

Climbing/Endoscope Inspections

- 4.1.1 Tree 1, located within a pasture field close to the western boundary had multiple cankers at various heights from around 1m above the ground and was classified as having high potential. Each canker was associated with several narrow 2-3cm wide gaps into large internal cavities. The endoscope survey was limited to cavities that were accessible from the ground. The subsequent dawn survey recorded a noctule bat re-entering one of the cavities higher up the tree.
- 4.1.2 Tree 13, located on the edge of the western woodland block, contained a large cavity at the base of the tree with significant heartwood rot. The entrance hole was approximately 35cm high with a width of around 15cm at widest point. The cavity reduced in size as it rose within the tree and rose to at least 1 m in height. The cavity has the potential to support high value roosts, however may be less favourable due to easy access from the ground to predators. No evidence of use by bats was identified during the endoscope inspection or subsequent dawn re-entry survey.
- 4.1.3 In Tree 25, bat droppings were found in the base of a large cavity in main trunk approximately 7m above the ground. The entrance into the cavity was 40cm x 25cm with significant heartwood rot with only cambium remaining. The cavity continued up main trunk and was large enough to support a higher status roost. A number of woodpecker holes and rot holes were located towards the top of the tree, higher up in the canopy, but these features could not be safely accessed.
- 4.1.4 Due to the nature of roost features and the structure of Tree 5, not all the features in the upper part of the tree could be examined with an endoscope during the climbing survey, but based on the low value of the accessible features the potential value of the tree for roosting bats was downgraded.
- 4.1.5 All the PRFs on Trees 2, 3, 4, 13, 23, 24, and 26 were inspected. The cavity features had limited value for roosting bats and there was no evidence of use. Consequently these trees were downgraded to low value following the climbing endoscope inspection.

Emergence Surveys

- 4.1.6 No bat roosts were recorded during the emergence surveys of Trees 6, 7 & 8, or the woodland edge trees 12 and 13.
- 4.1.7 During the spring survey visit Tree 19 was noted as having a (dead?) tree limb with multiple woodpecker holes. This limb has been removed prior to the July emergence surveys and the value of the tree was downgraded to Low. Activity along the hedgerow in which Tree 19 is located included commuting common and soprano pipistrelles with occasionally periods of foraging.

Summary

- 4.1.8 In total there were four trees with confirmed roosts within or adjacent to the application boundary recorded during tree climbing and the emergence/re-entry surveys with noctule *Nyctalus noctule*, and an unidentified pipistrelle species recorded. The roosts were located in the following trees:-
- Tree 1 – noctule roost, single bat
 - Tree 10 – noctule roost, three bats
 - Tree 22 – soprano pipistrelle, single bat
 - Tree 25 – bat roost with droppings in the base of a large cavity but no bats present

- 4.1.9 The location of the confirmed tree roosts are shown on Figure 5 with the photographs presented in Appendix C. The results of the emergence and re-entry activity is summarised below in Table 4.1. Full details of the tree climbing survey are provided in Appendix B.

Table 4-1 Results of emergence/re-entry surveys for trees.

Tree Number	Roost Status	Summarised Bat Activity
1	Confirmed Noctule bat roost.	One bat seen re-entering top section of tree limbs (southwest aspect) on 08/08/2019 at 04:54. Early noctules were foraging high above tree canopy. Occasional noctule and pipistrelle commuting passes and later foraging of common and soprano pipistrelles around the tree.
10	Confirmed Noctule bat roost.	First two climbing inspections confirmed presence of bat. Three noctules emerged from a woodpecker hole on the southern aspect, on 19/09/2019 at 19:28 – 19:55. Continuous and numerous foraging of noctule, common and soprano pipistrelle was recorded throughout survey, around the trees within the field.
12	No confirmed roost	No emergences/re-entries during surveys. Activity included soprano and common pipistrelle foraging along the woodland edge as well as within and above the woodland canopy.
13	No confirmed roost	No re-entries or emergences were recorded. First two visits were conducted as endoscope examinations. Third visit, a re-entry survey recorded soprano and common pipistrelle foraging along the woodland edge as well as within and above the woodland canopy.
19	No confirmed roost	No emergences recorded. First survey visit confirmed that the tree limb containing potential roost features (woodpecker holes) had been removed since the initial inspection. Tree no longer held significant potential to support roosting bats. Activity included commuting common and soprano pipistrelles along the hedgerow, occasionally foraging. Early commuting noctules were recorded overhead.
22	Pipistrelle species roost	One pipistrelle bat (species unknown due to no echolocation emitted at the time) seen emerging on 11/09/2019 at 19:48 and circling beneath canopy on the southeast aspect. Roost features include several split limbs, rot holes and hazard beams. Foraging activity was recorded for soprano and common pipistrelles along connecting hedgerows and tree line leading east. Occasional commuting noctules were recorded overhead.
25	Confirmed bat roost (undefined species)	Bat droppings found in large cavity in stem approximately 7m up stem discovered (40 x 25cm entrance) significant heartwood rot only cambium remaining. Cavity continues up stem and is considered suitable for maternity roost. A number of woodpecker holes and rot holes were located higher up the canopy but no access on live limbs so not inspected however tree considered to be of high potential on merit of lower features alone.

Buildings

Descriptions

- 4.1.10 The barn complex consists of three single storey and two two-storey brick-built buildings with slate tiled apex rooves, ridge tiles timber fascia and barge boards. The central buildings include a granary (Section B), cattle barn and additional brick buildings. These central buildings are surrounded by an additional 9 large open single sheet metal roofed barns with metal rafters used for storing farm equipment and hay.
- 4.1.11 Section A consists of a small two storey building immediately adjacent to the brick built central barn, it has timber barge boards, slate tiles and on the south aspect a pair of timber latched doors on the second storey. The northeast corner wall is shared with Section B (the granary). Internal inspection of this building was not possible.
- 4.1.12 Section B (the granary) consists of the same brick and roof structure with wood barge boards as Section A, it adjoins a single storey brick barn on the south aspect, the joining lined with lead flashing. A complete internal inspection of the granary was not possible due to health and safety concerns over the stability of the second floor. A partial inspection was carried out which identified a small number of bat droppings. The internal roof void had timber rafters and ridge beam with exposed roof slates.

- 4.1.13 Section C is a brick building with slate tiles, on the north aspect there is a large open entrance where a presumed garage door has been removed. Part of the roof void was visible from the outside through this entrance and was connected to the cattle barn to the south aspect. The building was partially open to the roof void which had timber rafters with the other half a timber ceiling supported by timber ceiling joists. Again internal inspection of this building was not possible due to health and safety concerns over its stability.
- 4.1.14 Section D consists of a large storage barn with single sheet corrugated walls and metal roof panelling with metal beams.
- 4.1.15 The brick cattle barn joined to the southern aspect of the granary consisted of three sections with a central single corrugated sheet roof supported by timber trussed rafters and ridge beam. This central building was open fronted to the south. Further buildings either side supported slate roofs again supported by timber trussed rafters and ridge beam. There were many open areas within the roofs due to missing tiles.
- 4.1.16 The farmhouse consists of two stories with a single storey porch on the north aspect and two extended single storey rooms with apex rooves on the south aspect, all adjoined with lead flashing. The roof tiles have all been recently replaced and fascia boards are all plastic. No obvious gaps were noticeable on the roof or apex tiles. Gaps were evident in some areas of the fascia with house sparrows nesting at the south eastern aspect.

Roost Activity

- 4.1.17 Two features on the farmhouse were utilised by individual soprano pipistrelle bats during the first emergence survey visit on 24 July (Figure 4 & Appendix C, Plates 9 – 10). No other bats were seen emerging or re-entering the farmhouse building during the other two surveys. Three structures within the barn complex were found to be utilised by soprano and common pipistrelles bats, emerging and re-entering from roost features during the three survey visits. (Figure 4 and Appendix C, Plates 5 - 8). The recorded bat roost activity at the farmhouse and barn complex is summarised in Table 4.2.
- 4.1.18 Foraging activity around the barns during emergence surveys primarily comprised frequent soprano pipistrelle bat passes with a smaller number of common pipistrelle detections. In addition, noctules were recorded commuting overhead.

Table 4-2 Results of emergence/re-entry surveys for buildings.

Building section	Number of roosts	Roost and Activity Summary	Date of emergence/ re-entry
Barn Complex Section A	2	Soprano pipistrelle - 1 bat emerged from the eastern elevation on 22/07/19. 2 bats emerged from the western elevation (around the area of the barge board) on the 14/08/2019 and two bats re-entered at the same location beneath the roof overhang and pitching point on the 12/09/2019 Section A is a two-storey unit that shares a wall with adjacent two-storey granary building. It has an apex tiled roof.	22/07/2019 14/08/2019 12/09/2019
Barn Complex Section B	1	Droppings found inside (too decomposed for analysis). No bats were recorded during the emergence and re-entry surveys indicating that use in summer 2019 is less likely. Section B is a two-storey granary, with apex roof and several roost features including an open front on ground level leading to cavities for perching and roosting. It adjoins Section A and there may be internal connections between the two.	None

Building section	Number of roosts	Roost and Activity Summary	Date of emergence/ re-entry
Barn Complex Section C	1	Soprano pipistrelle – One bat emerged from open section of building on northern aspect on one of the surveys Section C is a single storey building immediately west of Section B with an open-ended front on the northern aspect, several slipped tiles and varied roosting features.	22/07/2019
Barn Complex Section D	1	Soprano pipistrelle – A single bat emerged from the southern aspect on 22/07/19 and two bats emerged on the 14/08/09. No bats were recorded during the re-entry survey in September. Section D is a large hay barn with one complete side open, single corrugated sheet roof and few potential roosting features where roof support beams meet. Very exposed to wind and temperature change.	22/07/2019 14/08/2019
Farm House	2	Pipistrelle species - Probable emergence from two locations; beneath the ridge tiles on a single storey extension (southwest aspect of building), and beneath lead flashing where the tiled roof of front porch meets wall of the main house (northern aspect). Foraging activity of soprano and common pipistrelles along hedgerow on eastern side of house, around the garden and trees south of the house and occasional commuting passes of noctules. During the first survey, bats were seen to land on the wall by a window, rest and then fly off. Birds were recorded nesting in the gaps between the fascia board on the second two survey visits.	24/07/2019

4.2 Bat Activity

Activity Transect Survey

- 4.2.1 A minimum of four species of bat were recorded using the site during each survey visit including common and soprano pipistrelle, NSL¹ and Myotis sp². The majority of NSL calls were considered to be noctule. A qualitative description of each transect can be found below with corresponding Figures 5A – 5F.

October 04/10/2018

- 4.2.2 The majority of activity across the site recorded during the October transect was from soprano and common pipistrelle (Figure 5A). Activity was associated primarily with the woodland blocks and hedgerows adjacent to these blocks. Activity was higher in those fields which were used for pasture rather than arable farming. At least 5 individual soprano pipistrelle were recorded foraging within the pasture field adjacent to the barn complex and farmhouse. The edges of the woodland blocks and adjacent hedgerows were also utilised for both foraging and commuting.

April 25/04/2019

- 4.2.3 Activity recorded during the April transect was lower than that during the previous autumn survey (Figure 5B). Activity was again dominated by common and soprano pipistrelle as well as intermittent noctule and occasional Myotis species. Pipistrelle species were recorded both foraging and commuting along the woodland edges and hedgerows within the survey area, noctule were also recorded commuting across the site.

¹ Large bat species refer to noctule *Nyctalus noctula*, Leislers *Nyctalus leisleri* or serotine *Eptesicus serotinus*

² Due to the difficulty in determining Myotis sonograms to species level they were grouped as Myotis sp.

May 16/05/2019

- 4.2.4 Activity was slightly higher during the May transect compared to April, but still slightly lower than recorded during the autumn survey (Figure 5C). The majority of activity was again related to common and soprano pipistrelle bats with very occasional noctule and Myotis detections. During the transect the majority of activity was recorded along the northern edge of the most western woodland block with extended common and soprano pipistrelle foraging.
- 4.2.5 Foraging activity was also associated with the wooded stream on the eastern boundary with only occasional commuting and foraging recorded along the internal hedgerows.

July 25/07/2019

- 4.2.6 Activity levels in July were slightly lower than in May (Figure 5D) comprising primarily common and soprano pipistrelle passes recorded plus occasional noctule and Myotis calls. Activity was low within the eastern area of the site during the July visit in comparison with previous surveys with activity reduced to occasional commuting noctule. The majority of the bat activity was recorded along the northern edge of the most western woodland block with common and soprano pipistrelle utilising the area for foraging. Occasional commuting and foraging bats were also recorded along the hedgerows in the western and southern half of the site as well as the middle woodland block.

August 27/08/2019

- 4.2.7 Activity levels recorded during the August transect visit were more evenly distributed throughout the site compared to some of the previous surveys (Figure 5E). The majority of activity again came from both common and soprano pipistrelle as well as occasional noctule and Myotis species. Both common and soprano pipistrelle were recorded utilising the woodland edges and hedgerows within the survey area for both foraging and commuting as well as the middle of some of the pasture fields.

September 25/09/2019

- 4.2.8 Activity levels recorded during the September survey were similar to July and August with the majority of activity from common and soprano pipistrelle with occasional noctule and Myotis (Figure 5F). In addition, a lesser horseshoe *Rhinolophus hipposideros* commuting pass was recorded along a hedgerow in the western half of the site. The majority of bat activity was again focused on the western half of the site with pipistrelle bats foraging and commuting around woodland and the adjacent hedgerows.

Static Detector Recording

- 4.2.9 The results of the static detector recording are described below and summaries of the findings at each area and for each species provided in Tables 4.3 and 4.4. The dates and locations where static recording was undertaken are shown on Figure 8. Detailed results are provided in Appendix D.

Woodland

Western woodland block: Locations 1, 3, 9

- 4.2.10 Numbers of calls recorded at the western woodland ranged from very high to moderate. The majority of calls were soprano pipistrelle and common pipistrelle.
- 4.2.11 Numbers of Myotis sp. calls and lesser horseshoe calls in the woodland were notably higher than recorded elsewhere at the site. Other species recorded included noctule, serotine *Eptesicus serotinus*, Leisler's bat *Nyctalus leisleri*, brown long-eared bat *Plecotus auritus* and Nathusius pipistrelle *Pipistrellus nathusii*.

Central woodland block: Location 7

- 4.2.12 Low numbers of common and soprano pipistrelle were recorded on a static detector at Location 7 during May. No other species were recorded at the location.

Eastern boundary woodland/wooded stream: Location 2, 12, 16

- 4.2.13 Very high numbers of calls were recorded at Location 16 in September.
- 4.2.14 Low numbers of calls were recorded within the eastern copses in August, October and November at Locations 2 and 12 but several species were detected, notably five lesser horseshoe passes at Location 2.
- 4.2.15 At Location 16, the detections included five lesser horseshoe passes and relatively high number of both *Myotis* sp. and serotine passes. Lower numbers of Leisler's bat passes and a single Nathusius bat pass were also recorded.

Farmhouse and barn complex:

Locations 10, 11

- 4.2.16 Very high numbers of calls were recorded at Location 11 during August. Moderate numbers of calls were recorded at Location 10 in July. The majority of calls were soprano pipistrelle and common pipistrelle but serotine, noctule, *Myotis* sp., Leisler's bat and Nathusius' pipistrelle were also recorded.

Eastern fields:

Locations 4, 6, 13

- 4.2.17 High levels of activity were recorded at Location 4 in October. Moderate-low numbers of calls were recorded at Location 13 in August and September and very few calls were recorded at Location 6 in April.
- 4.2.18 The majority of calls were either common pipistrelle or soprano pipistrelle with noctule, *Myotis* sp., Leisler's bat, serotine and brown long-eared bat also recorded in the eastern part of the site.

Western fields:

Locations 8, 5

- 4.2.19 Moderate to low numbers of calls were recorded on static detectors located on the boundaries of fields in the western part of the site. The detections included the following less common species: *Myotis* sp., Leisler's bat, serotine, lesser horseshoe, brown long-eared bat and Nathusius pipistrelle.

Table 4-3 Summary table of static recording results at each location

Location	Dates during which static recording was undertaken	Average number of calls per night	Species recorded at location
Western woodland			
Location 1	Oct 26-31st	31.2	Soprano pipistrelle
	Nov 4-9th	162.2	Common pipistrelle
Location 3	Oct 4-9th	345.2	Noctule
Location 9	May 20-25th	75.4	<i>Myotis</i> sp.
	June 2-7th	74.8	Serotine
			Leisler's bat
			Lesser horseshoe
			Brown long-eared bat
			Nathusius' pipistrelle
Central woodland (off-site)			
Location 7	May 9-14th	5.4	Soprano pipistrelle
			Common pipistrelle
Eastern boundary woodland			
Location 2	Oct 26-31st	8.6	Soprano pipistrelle
	Nov 4-9th	15.0	Common pipistrelle
Location 12	Aug 15-20th	7.6	Noctule
Location 16	Sep 13-18th	529.8	<i>Myotis</i> sp.
			Serotine
			Leisler's bat
			Nathusius' pipistrelle
			Lesser horseshoe
Farmhouse			
Location 10	Jul 24-29th	21.8	Soprano pipistrelle
Location 11	Aug 13-18th	406.0	Common pipistrelle
			Noctule
			<i>Myotis</i> sp.
			Serotine
			Leisler's bat
			Nathusius' pipistrelle
Eastern fields – boundaries			
Location 4	Oct 4-9th	162.8	Soprano pipistrelle
Location 6	April 2-7th	1.2	Common pipistrelle
Location 13	Aug 27-1st	25.6	Noctule
	Sep 1-3rd	27.0	<i>Myotis</i> sp.
			Serotine
			Leisler's bat
			Brown long-eared bat
Western fields - boundaries			
Location 5	April 2-7th	3.0	Soprano pipistrelle
Location 8	May 17-22nd	12.6	Common pipistrelle
Location 14	Aug 27th	235.0	Noctule
Location 15	Sep 3-8th	28.6	<i>Myotis</i> sp.
			Serotine
Location 17	Sep 13-18th	28.8	Leisler's bat
			Lesser horseshoe
			Brown long-eared bat
			Nathusius' pipistrelle

Table 4-4 Summary table of static recording results of each species

Species	Locations where species recorded	Total number of static detector calls	Percentage of total static detector calls
Soprano pipistrelle	All areas	4536	45.29
Common pipistrelle	All areas	4137	41.30
Noctule	All areas	397	3.96
Myotis sp.	All areas	675	6.74
Serotine	All areas	126	1.26
Leisler's bat	All areas	79	0.79
Pipistrelle sp. (social call only)	Western woodland Eastern boundary woodland	29	0.29
Lesser horseshoe	Western woodland Eastern boundary woodland Western fields - boundaries	26	0.26
Brown long-eared bat	Western woodland Eastern fields - boundaries Western fields - boundaries	5	0.05
Nathusius pipistrelle	Western woodland Farmhouse and buildings Western fields - boundaries	6	0.06

4.3 Hazel Dormouse Survey

Habitats

- 4.3.1 There is suitable habitat for dormice within the site and the wider landholding. The most substantial areas of habitat are found in the semi-natural woodland blocks with a small proportion of this habitat located within the application site.

Survey Effort

- 4.3.2 A total survey effort score of 20 is considered to be the minimum requirement to determine the presence / likely absence of dormouse. With 100 nest tubes placed within and around the site, the survey effort, covering October 2018 to June 2019 but excluding May 2019, achieves an Index of Probability score of 42.

Survey Results

- 4.3.3 No signs of dormouse were recorded during the nest tube survey visits. Evidence of other mice species *Apodemus* sp. using the nest tubes was recorded in November 2018 and in August and September 2019.

Table 4-5 Summary of dormouse nest tube survey results

Survey Visit	Evidence of Dormouse in Nest Tubes	Evidence of Use by Other Species
25/10/18	None	None
29/11/18	None	Empty <i>Apodemus</i> sp. nest in tube no. 48
26/04/19	None	None
09/07/19	None	None
31/07/19	None	None
30/08/19	None	<i>Apodemus</i> sp. nest in tube no. 42, 81, 82, 84
02/10/19	None	<i>Apodemus</i> sp. nest in tube no. 29, 42, 49, 81, 82, 84

4.4 GCN eDNA Survey

Potential Habitat

- 4.4.1 The concrete lined waterbody providing a water source for cattle is the only waterbody on-site. There are no other known waterbodies within 250m of the site boundary. A former garden pond located within 250m of the application boundary, has been infilled in the past and no longer exists.
- 4.4.2 The on-site waterbody is located on the edge of a pasture field, directly south of Port Road adjacent to the Model Farm barn complex (Appendix C, Plate 11).
- 4.4.3 Suitable terrestrial habitat for GCN, within the application boundary, includes banked hedgerows and woodland with additional suitable terrestrial habitat in the wider land ownership. There are known GCN populations in the local area with records from waterbodies within 500m of the eastern boundary.

Results of eDNA

- 4.4.4 The results from the eDNA analysis were negative for GCN, indicating that GCN were not present in the waterbody during this season. All additional tests produced a pass result (sample integrity check, degradation check and inhibition check), confirming the validity of the sample tested. The results received from NatureMetrics can be found in Appendix E. The eDNA presence/absence data collected in April 2019 will remain valid for two years.

4.5 Breeding Birds

- 4.5.1 A total of 22 bird species were recorded as having possible, probable or confirmed breeding territories within the survey area. A total of seven species were confirmed to be breeding within the site including blue tit *Cyanistes caeruleus*, great tit *Parus major*, starling *Sturnus vulgaris*, blackbird *Turdus merula*, dunnoek *Prunella modularis*, house sparrow *Passer domesticus* and goldfinch *Carduelis carduelis*. A total of 17 species were recorded as being probably breeding with a further 16 classified as possibly breeding within the site.
- 4.5.2 A number of red list farmland bird specialists were recorded using the site including yellowhammer *Emberiza citrinella*, linnet *Linaria cannabina* and starling as well as amber list species including skylark *Alauda arvensis*.
- 4.5.3 The territory mapping results are presented on can be found in Figure 6 and Table 4.6.

Table 4-6 Territory mapping analysis results

Species	Possible breeding	Probable breeding	Confirmed breeding	Designations ³
Great Spotted Woodpecker <i>Dendrocopos major</i>	1			
Goldcrest <i>Regulus regulus</i>		2		Amber
Blue Tit	1	1	4	
Great Tit	1	1	1	
Skylark	1	4		Amber
Chiffchaff <i>Phylloscopus collybita</i>		2		
Willow Warbler <i>Phylloscopus trochilus</i>	1			Red
Blackcap <i>Sylvia atricapilla</i>	1	3		
Garden Warbler <i>Sylvia borin</i>	1			
Nuthatch <i>Sitta europaea</i>		1		

³ Red/Amber: Red or Amber listed on the Wales Birds of Conservation Concern List 2016

Species	Possible breeding	Probable breeding	Confirmed breeding	Designations ³
Wren <i>Troglodytes troglodytes</i>	2	5		
Starling	1		1	Red
Blackbird	3	2	1	
Song Thrush <i>Turdus philomelos</i>	2	1		Amber
Robin <i>Erithacus rubecula</i>	5	3		
Dunnock	3	3	1	
House Sparrow			2	Amber
Chaffinch <i>Fringilla coelebs</i>	1	2		
Bullfinch <i>Pyrrhula pyrrhula</i>		1		Red
Linnet	1			Red
Goldfinch		1	1	
Yellowhammer		1		Red

4.6 Badger

Potential Habitat

- 4.6.1 There is suitable habitat for badger setts and foraging badgers around the field margins and in the woodland block that partly falls within the site boundary. The woodland provides the most substantial area of cover and undisturbed habitat for badger within the site.

Badger Scoping Survey

- 4.6.2 No badger setts were recorded within or adjacent to the site but evidence of badger activity (recently used dung pits) was recorded alongside four of the internal hedgerows (Figure 7).
- 4.6.3 Foraging activity was primarily associated with the woodland both on-site and off-site with clear badger paths in the vicinity of the areas of digging.
- 4.6.4 Paths and small groups of dung pits were also recorded along the eastern site boundary on the edge of the wooded stream with clear badger paths where badgers are crossing the stream to access fields to the east of the site.
- 4.6.5 There was also an ad hoc sighting of badger observed moving along the internal hedgerow field boundary close to this boundary during one of the bat transect surveys.
- 4.6.6 It has been noted that while there was no evidence of setts found within the application site boundary, the current tenant farmer has reported the presence of badger setts in both woodland and on field boundaries in the wider landholding.

4.7 Otter

- 4.7.1 There is suitable habitat for otter within and adjoining the site but no signs of otter activity were recorded during the survey and there are no past records of otter within the 2km area around the site.
- 4.7.2 Whitelands Brook along the southern boundary provides suitable foraging habitat and could facilitate the movement of otter through the landscape, if present in the local area. Although separated from the brook by fields, the woodlands within and outside the site have areas of dense scrub cover. No mammal paths led into these areas indicating that otters are not using these features as cover.
- 4.7.3 A small, disused mammal hole was additionally recorded off-site alongside Whitelands Brook. The entrance was overgrown by bramble and nettles and not of sufficient size to be used by otter.

5 DISCUSSION & EVALUATION OF IMPACT

5.1 Bats

Trees

- 5.1.1 Four trees (T1, T10, T22 & T25) within or immediately adjacent to the application boundary were confirmed to contain bat roosts in the active season of 2019 with two daytime summer noctule bat roosts, one daytime summer roost used by soprano pipistrelle and third roost used by a pipistrelle species.
- 5.1.2 Three of the tree roosts (T1, T10, T22) lie within the construction footprint for industrial use (see Appendix A and Figure 5) and will be removed. Tree 25 is located within close proximity to the works and may therefore be subject to disturbance in the absence of appropriate mitigation.
- 5.1.3 Therefore, the proposed development will directly impact on roosts used by bats and has the potential to disturb, injure or kill bats as well as destroy the roost sites. Local bat populations could be negatively impacted in the absence of appropriate mitigation and compensation.

Buildings

- 5.1.4 Three sections of the barn complex were confirmed as soprano pipistrelle bat roosts following the emergence/re-entry surveys in 2019 (Building Sections A, C, and D) with further evidence of roosting in Section B, although not bats emerged or re-entered this section during the surveys.
- 5.1.5 Building D is a detached partly open barn and is classified as a soprano pipistrelle summer day roost used by small numbers of bats (maximum roost count 2).
- 5.1.6 Building C lies on the opposite side of the yard to Section D. A single bat emerged from the wide open 'garage' doorway during one of the three surveys. There was limited visibility of features inside this section of the building due to the stored materials and there was no safe access with the roof is a poor state of repair. Section C is a summer day roost used by small numbers of bats (maximum roost count 1).
- 5.1.7 Two soprano pipistrelle bats was recorded emerging and re-entering from the area of the barge board on the western side of Building Section A. Based on the height and direct of flights the roost is considered to be beneath the barge board/fascia board on the western side of the pitched roofed section. In addition, an individual soprano pipistrelle also emerged from the eastern elevation during only the first of three surveys.
- 5.1.8 During the daytime survey of the barn complex a small pile of old decomposing droppings were seen inside Section B from an entrance doorway. Access into this part of the barn complex was restricted due to safety concerns and a detailed internal inspection could not be completed. The droppings confirm that this section of the barn complex has been used by a roost in the past. The small number of droppings indicate a past day roost used by a small number of bats.
- 5.1.9 The proposed development includes the demolition of the entire barn complex. The proposed works directly impact the bat roosts and would have the potential to disturb, injure or kill bats. As with the tree roosts, appropriate mitigation and compensation will be required under licence from to ensure the development is lawful and to avoid adverse effects on the conservation status of local bat populations.

Bat Activity and Habitat

- 5.1.10 The application site contains habitats with high suitability for roosting, foraging and commuting for bats and is connected to habitat with high suitability for foraging and commuting in the wider landscape and wider area of landownership.

- 5.1.11 At least nine species of bat were recorded throughout the bat activity surveys (transects and remote recording). Both common and soprano pipistrelle bat were consistently the most frequently recorded species. Small numbers of soprano pipistrelle bats were confirmed as roosting within the site but much of the activity will relate to bats entering the site from roosts in the surrounding area with several of the bats foraging around the barn complex observed flying into yard from the wider area.
- 5.1.12 The woodland blocks and eastern woodland boundary are frequently used for foraging and by commuting with high levels of activity also recorded on the static detectors deployed in these locations.
- 5.1.13 Relatively high levels of pipistrelle activity were also observed/detected along some of the hedgerows, particularly those adjacent to the woodland blocks on the southern boundary. This was again supported by high numbers of calls recorded on static detectors.
- 5.1.14 During the transect surveys high levels of pipistrelle activity were often recorded in the pasture fields which had recently had livestock present. This is most likely due to the abundance of airborne insects associated with the manure.
- 5.1.15 Noctule foraging activity was also recorded over the western pasture field with day roosts identified in Tree 10 and Tree 1, both located in this area of the site. Noctule activity recorded in other areas of the site, during the transects or during emergence surveys, were limited to commuting passes.
- 5.1.16 Less commonly occurring species; lesser horseshoe, Myotis species, serotine, Leislers were all recorded on the edge of the western woodland block and eastern boundary woodland with a small number of passes of these species also recorded on static detectors placed on field boundary hedgerows in the western and eastern parts of the site.
- 5.1.17 In the absence of mitigation and suitable compensation the development has the potential to sever commuting routes for bat species using the site and reduce available habitat for foraging. In order to prevent such impacts suitable compensation and mitigation should be followed.

Core Sustenance Zone for Bats

- 5.1.18 The desk study includes records of pipistrelle maternity roosts in the café and toilet block in the Porthkerry Country Park approximately 630m to the south of the site on the edge of extensive woodland blocks. The maternity roosts recorded at this location in the last 8 years are:
- Pipistrelle species, 2011 - 57 bats
 - Common pipistrelle, 2011 - 70 bats
 - Pipistrelle species, 2014 - 21 bats
 - Soprano pipistrelle, 2017 – 80 bats
- 5.1.19 The Core Sustenance Zone (CSZ) is the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony (BCT 2016). The CSZ for common and soprano pipistrelle bats is 2 and 3 km respectively. Therefore, the site will contribute to the total extent of foraging habitat and will help sustain the local maternity roosts as part of an extensive network of foraging habitat in the wider area.

5.2 Hazel Dormouse

- 5.2.1 No evidence of dormice was found during the dormouse nest tube survey. The closest record of dormice is approximately 1.35km northeast of the application site boundary. This is in a location with connection to the site through hedgerows and blocks of semi-natural woodland. The record indicates that it is very likely that a dormouse population exists within the wider area.
- 5.2.2 The site supports relatively extensive habitat of potential value for dormice including hedgerows, broadleaf woodland with extensive scrub understory and smaller patches of dense continuous scrub. These habitats support food resources that could be utilised by dormice, including hazel and

bramble with honeysuckle also a noted component of the woodland which, where present, is often used to construct nests.

5.2.3 The site is also well connected through hedgerow networks and further broadleaf woodland to the south and east. A busy main road (Port Road) lies beyond the northern boundary and would be a partial barrier to movement. The airport airfield lies to the west and lacks features that could be of value to dormice.

5.2.4 Due to the presence of dormice in the wider landscape and habitat connectivity to woodland south of the application boundary, precautionary measures should be included for dormice during construction activities and the protection of key woodland habitats and their connectivity should be incorporated into the layout.

5.3 GCN

5.3.1 The eDNA analysis results for the on-site waterbody were negative for GCN, indicating that GCN were not present in the waterbody during this season. Suitable terrestrial habitat is present within the application boundary and wider area of land owned by the client.

5.3.2 Due to the relative proximity of known populations outside the site, precautionary measures should be employed under a Reasonable Avoidance Measures Method Statement during the removal of the localised areas of good cover (hedgerows and hedge bases).

5.4 Breeding Birds

5.4.1 A total of 22 species were recorded as either possible, probable or confirmed breeding within the site. Of these, nine species are listed as either red or amber on the Birds of Conservation Concern list for Wales. Farmland specialists breeding / probably breeding include yellowhammer (single territory, probably breeding), linnet (single territory, possibly breeding), starling (one confirmed and a second possible breeding pair) and skylark (four probable breeding territories).

5.4.2 The UK yellowhammer population fell by 54 per cent between 1970 and 1998 and is listed as a red list species in Wales. Starlings have undergone continuing population declines since 1995 and are red listed in Wales. Linnet, a further red list species, has also undergone significant declines in recent decades, with the UK population estimated to have declined by 57% between 1970 and 2008. Recent surveys suggest that populations in Wales are continuing to decline. Skylark populations have decreased significantly throughout the UK during recent decades and are listed as an amber species in Wales.

5.4.3 UK house sparrow populations have fluctuated greatly over the centuries, with a gradual decline during the last 100 years. They are listed and an amber species in Wales. House sparrow were found to be breeding within the farmhouse and barn complex within the survey area.

5.4.4 Willow warbler and bullfinch are also both red list species in Wales and were recorded as possibly and probably breeding respectively during the survey.

5.4.5 In addition, goldcrest and song thrush are amber listed in Wales and were also recorded as probably breeding within the site, being associated with the woodland and adjoining hedgerows.

5.4.6 In order to facilitate the development breeding habitat for the species discussed above and identified during the 2019 survey will be lost. In order to mitigate the impact of these losses and to avoid impacts during the construction phases, precautionary and compensation measures have been outlined in the following section.

5.5 Badger

5.5.1 There are no recorded badger setts within the application site boundary however badgers are known to forage and move through the site. With badgers active within the site and suitable habitat for setts

present within the woodland blocks there is potential for new setts to be created within the site in the future.

5.6 Otter

- 5.6.1 Otters are considered to be absent from the site at present with no evidence of otter activity recorded within the site and no records of otters within 2km. Suitable habitat is present along Whitelands Brook which provides a potential wildlife corridor for this species.
- 5.6.2 The development proposals include a significant buffer between the built footprint and Whitelands Brook, protecting the habitat from disturbance.
- 5.6.3 Given the absence of any otter signs and lack of records within the wider landscape, the likelihood of otter using the habitats within and adjoining the site is considered to be low. While considered unlikely, if otters were to begin using places of shelter in the woodland blocks, development could result in indirect disturbance primarily through noise. Precautionary measures should be followed during each phase of construction as detailed in Section 6.

5.7 Other Species

Reptiles

- 5.7.1 There are recent records of slow worm common lizard and adder from the local area. Habitats within the application boundary generally have low habitat suitability for common reptile species but the hedge bases, woodland edge and scrub have higher potential to support slow worm.
- 5.7.2 Precautionary measures should be employed for reptiles (alongside GCN) to avoid injury to individuals during vegetation clearance as part of each phase of construction. The implementation of appropriate precautionary measures would ensure that the development is compliant with wildlife legislation and planning policy pertaining to reptiles.

Hedgehog

- 5.7.3 Hedgehog have been identified on site during other phase II protected species surveys. Additionally, records of hedgehog were recorded during the desk study for the PEA report (RPS, 2018) as recent as 2017 and the closest record was 6m from site. The site contains extensive suitable foraging, commuting and hibernation habitat for hedgehog. The implementation of precautionary measures for reptiles and GCN should also consider the potential for hedgehog to be present in construction areas and the protection of this species should be built into the working methods.

Invasive Species

- 5.7.4 Japanese knotweed is listed under Schedule 9 of the WCA as an invasive plant species which makes it an offence to facilitate its spread. The site also has the potential to support further schedule 9 species. Recommendations for the mitigation and control of this species is outlined in Section 6.

6 RECOMMENDATIONS AND MITIGATION

6.1 Bats

- 6.1.1 Bats are legally protected under the Wildlife and Countryside Act 1981, as amended by the Countryside and Rights of Way Act 2000, and the Conservation of Habitats, & Species Regulations 2017. As such measures will be required to avoid the disturbance, damage or destruction of any roost identified within the site without a suitable derogation licence in place. Developments that are likely to compromise the protection afforded to bats or roosts under the provisions of the Conservation of Habitats, & Species Regulations 2016 will require a European Protected Species (EPS) mitigation licence from NRW. Three tests must be satisfied before this licence (to permit otherwise prohibited acts) can be issued:
1. Regulation 44(2)(e) states that licences may be granted to “preserve public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment.
 2. Regulation 44(3)(a) states that a licence may not be granted unless “there is no satisfactory alternative”.
 3. Regulation 44(3)(b) states that a licence cannot be issued unless the action proposed “will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range”.
- 6.1.2 These tests will need to be addressed in a formal EPS licence application to NRW following planning permission.
- 6.1.3 In order to comply with the third test of Regulation 44, the proposed development must ensure the favourable conservation status of the bat population onsite during the development period and after its completion. The level of mitigation must also be proportional to the ecological impact of the development (Mitchell-Jones, 2004).
- 6.1.4 This strategy will include the following elements which will form the basis of a detailed method statement to accompany the EPS licence application:
- Avoiding killing and injury of bats during the development,
 - Provision of bat roosting habitat in the refurbished/new buildings,
 - Avoiding killing and injury of bats during development,
- 6.1.5 The EPS mitigation licence will cover the loss of six low status pipistrelle summer day roosts in the farm house and barn complex and at least three low status day roosts in trees. The method statement will be submitted as part of the EPS mitigation licence application, will include a schedule of works that specifies tasks to be completed before the loss of the roosts.
- 6.1.6 Compensation measures will be required for the loss of six low status pipistrelle bat roosts (barn complex, farmhouse and trees), two low status noctule bat roosts in trees and a further low status pipistrelle tree roost (species not defined).
- Incorporation of eight roosting tubes within suitably located new buildings away from artificial lighting and with connectivity to the southern or eastern boundary hedgerows/woodland
 - Incorporation of roosting cavities into the structures of new industrial buildings where practical for the nature and type of buildings being constructed
 - Provision of ten 2F and five 3FF Schweglar Bat Boxes or equivalent on large trees on the southern or eastern boundaries. A third of the boxes could be installed on larger trees in the wider landholding.
- 6.1.7 Full details of the species protection measures during the dismantling / removal of roost features and location of all the replacement bat roost features will be included in the licence application.

- 6.1.8 Any stripping of the roof or mortar on the farmhouse or barns will be undertaken by hand, under the supervision of a licensed bat ecologist or accredited agent. In the unlikely event that bats are found during this process, the licensed bat ecologist will relocate them to a suitable safe habitat.
- 6.1.9 All contractors should be briefed to be mindful of the potential presence of bats and follow the licence holder's instructions and guidance. Suitable evidence of the completion and inclusion of recommended measures will be submitted to the local planning authority post development in the form of an email update from a suitably qualified ecologist.
- 6.1.10 In addition, it is recommended that additional bat boxes are provided on new buildings that adjoin connected green space or hedgerows within the completed development as a habitat enhancement measure, as detailed in Section 7.

Core Sustenance Zone for Bats

- 6.1.11 The site falls into the CSZ (2-3 km) of maternity pipistrelle bat roosts recorded in the past from a location approximately 650m southeast of the application site.
- 6.1.12 As the whole application site will fall within the CSZ of the pipistrelle maternity roosts, with reference to planning and development the CSZ will indicate:
- The area surrounding the roost within which development work can be assumed to impact the commuting and foraging habitats of bats using the roost, in the absence of information of local foraging behaviour. This will highlight the need for species specific survey techniques where necessary;
 - The area within which mitigation measures will ensure no net reduction in the quality and availability of foraging habitat for the colony, in addition to mitigation measures shown to be necessary following ecological survey work.
- 6.1.13 Mitigation should include protection of retained suitable foraging and commuting habitat and mitigation for loss of suitable habitat.

Retained Habitat

- 6.1.14 A dark buffer zone of at least 15 m should be erected around ancient woodland blocks and a 10m dark zone should be maintained on the boundary of other woodland and hedgerows. This would ensure that the lighting schemes during each phase of construction phase and in the completed development areas will not result in light spill onto retained habitats that are important resources for foraging and commuting.
- 6.1.15 This can be achieved through appropriate siting of lighting columns, environmentally sensitive lighting specifications and as a last resort hoods or cowls to shield an adjoining dark buffer zone from light spill.

Replacement Habitat

- 6.1.16 Habitat scheduled to be removed that is utilised by foraging and commuting bats should be replaced as part of the mitigation, to ensure no net loss in the quality and availability of foraging habitat for bats roosting in trees and buildings on site. Hedges included should be species-rich and include night pollinated species to attract suitable prey for bats.

6.2 Dormouse and Great Crested Newt

Relevant Legislation

- 6.2.1 Dormice and GCN are European protected species, individuals and their breeding/resting places, are protected under; the EU Habitats Directive (transposed into UK law as the Conservation of Species and Habitats Regulations 2010), and the Wildlife and Countryside Act 1981 (as amended) and under the Conservation of Habitats and Species Regulations 2017. Together these protect

dormice and GCN from killing, injury, capture and disturbance, and their breeding/resting places from damage, destruction and obstruction.

- 6.2.2 Both are also listed under Section 7 of the Environment (Wales) Act 2016 and classified as Species of Principal Importance in Wales.

Dormouse

- 6.2.3 No dormice were found during survey visits in 2018 and 2019, therefore there will not be a requirement for a EPS mitigation licence. However, due to the local dormice records and presence of woodland on the southern boundary, precautionary measures will be implemented during the removal of hedgerows. A precautionary dormouse mitigation strategy should be prepared for the whole development to set out the species protection methods that will be fully implemented during each phase of development.

GCN

- 6.2.4 The results from the eDNA analysis indicate that GCN are not present in aquatic or terrestrial habitats within the site. Records of GCN were found within 1.5km of the site and extensive suitable terrestrial habitat is present within the wider land ownership. GCN breeding ponds are located to the west and east of the site and therefore create a potential risk of GCN utilising the terrestrial habitat on site between these waterbodies.

- 6.2.5 Precautionary measures for GCN are as follows:

- Clearance of suitable terrestrial habitats within the application boundary will be undertaken in two stages, the first during the hibernation period (November-February inclusive) and the second during the active period (May – October). The first stage will include cutting vegetation down to 30cm above ground level and no lower. The second stage will allow for removal of root bundles and remaining vegetation.
- Cut vegetation will be removed from site and not left within the application boundary, with the exception of materials used for enhancement features.
- Newly cut vegetation will be removed immediately as stacking this on site would potentially create suitable hibernacula for hibernating species.
- No burning of materials will take place on site.
- Hibernation features such as log piles, fallen trees and brash piles will be left in-situ during the hibernation period and dismantled by hand during the dormouse active period (April-October) by a suitably qualified ecologist and licence holder.

- 6.2.6 The measures detailed above will remove the suitable habitat from the construction footprint allowing the construction to progress without harming protected species. In the unlikely event that a GCN is found on site, all works will cease, and the advice of an ecologist will be followed which may require consultation with NRW.

- 6.2.7 Provided the measures above are carried out the proposal will comply with all known legislation pertaining to GCN.

6.3 Breeding Birds

- 6.3.1 Breeding birds are protected under the WCA which makes it illegal to intentionally kill, injure or take a wild bird and take damage or destroy its nest or egg. In addition, some bird species are listed under Schedule 1 of the WCA which also makes it an offence to disturb them whilst they are building a nest, nesting or in or near a nest that contains their young as well as disturb their young.

- 6.3.2 In order to protect any birds which may be nesting within the development site prior during works a breeding bird survey will be undertaken immediately prior to works undertaken during March – August inclusive by a suitable qualified ecologist. This survey should be undertaken no more than 24 hours prior to works in the area. Should an active nest be identified within or in the vicinity of

works a suitable no works buffer will be places around the nest until the natural nesting conclusion has been reached. This buffer will be designated under the professional judgement of the ecologist and will be dependent on the species and stage of the nesting attempt.

- 6.3.3 Further details regarding suggested enhancement measures to compensate for the loss of breeding bird habitat is detailed in Section 7.

6.4 Badger

- 6.4.1 Badgers are afforded protection under the Protection of Badgers Act 1992 which makes it an offence to intentionally capture, kill or injure a badger, damage, destroy or block access to their setts and disturb badgers within their setts.
- 6.4.2 No badger setts were found within the application boundary; however badgers were recorded utilising habitats within the site for foraging.
- 6.4.3 As precautionary measure, all pits, trenches or holes dug during the construction phase will be covered at night, include a sloped side for exit or have a sturdy ramp or plank in place to avoid trapping badgers.
- 6.4.4 A pre-construction works surveys should be undertaken by a competently qualified ecologist where there are areas of suitable habitat within 30m of works to identify if any new badger setts have been established. Should a new sett have been excavated in a location where it could be damaged by construction activities, then an ecologist would need to review the potential impacts, and define the protection measures to comply with legislation. Where impacts on a sett or badgers cannot be avoided then a badger licence would need to be obtained from NRW for the works within 30m of the sett.
- 6.4.5 Following these precautions should ensure that the development will be compliant with all legislation and planning policy pertaining to badgers.

6.5 Otter

- 6.5.1 Otter are listed as a European Protected Species (EPS) under the Conservation of Habitats and Species Regulations 2017 and are additionally protected by the WCA 1981. It is an offence to deliberately kill, injure, disturb or take a wild otter as well as damage, destroy or obstruct access to a breeding or resting place. Otter is also listed under Section 7 of the Environment (Wales) Act 2016 and classified as Species of Principal Importance in Wales.
- 6.5.2 No potential resting places or features in which holts could be present are located within the built footprint of the development but the development in the southern sections of the site will be adjacent to woodland and brook.
- 6.5.3 Repeat checks for otter activity should be made prior to phases of construction in the southern part of the site where development in the agricultural fields will be within 50m of the woodland boundary.
- 6.5.4 In the event that a resting place is present within 30m of a construction working area or of there is a holt within 200m, then advise should be sought from NRW and the works within these zones may need to be covered under a NRW EPS licence in order to proceed.

6.6 Invasive Species

- 6.6.1 Japanese knotweed was identified in one two location within the site, in the hedgerow on the north-eastern site boundary. A second stand was identified in the wider landholding to the south of the site (PEA, RPS 2019). A suitable eradication strategy should be developed and initiated prior to the start of the first phase of construction, in order to both prevent further spread and facilitate future development.
- 6.6.2 In order to meet legal requirements consideration would be required during any construction phase. This would likely consist of the following measures; no earthworks should be carried out within 10m

of the visible plants as they the area could contain live Japanese knotweed material. The area should be cordoned off with a no works exclusion zone to avoid facilitating its spread. Should any be identified within the vicinity of the proposed development a method statement would need to be approved prior to works in order to clear the area. Control options include herbicide applications (ideally injections) in mid / late summer and early autumn or controlled excavation and removal to a licensed waste facility.

6.7 Other Species

Reptiles

- 6.7.1 The UK is home to six species of reptile, two (sand lizard and smooth snake) of which are European protected species under the Conservation of Habitats and Species Regulations 2017, however these species restricted ranges in the UK and there is no suitable habitat within this site. The remaining four species of reptile are protected under the WCA 1981, which protects them from intentional killing and injury.
- 6.7.2 The timing of vegetation clearance and removal of suitable hibernation habitat, as outlined in the mitigation for GCN, will incorporate precautionary measures relevant to reptiles.

Hedgehog

- 6.7.3 Hedgehog is partially protected under the Wildlife and Countryside Act (1981) and is listed as a Species of Principal Importance under Section 7 the Environment (Wales) Act 2016. The presence of hedgehog, therefore needs to be taken into consideration by a public body when performing any of its functions with a view to conserving biodiversity.
- 6.7.4 Clearance of vegetation will be carried out in a two-stage process as detailed above in Section 6.2. The precautionary measures detailed for GCN will also be applicable to ensure the protection of hedgehogs present within construction areas.

7 ECOLOGICAL ENHANCEMENTS

- 7.1.1 The Environment Act (Wales) 2016 requires that local planning authority will seek to maintain and enhance biodiversity in accordance with Part 1 Section 6 ‘*Biodiversity and Resilience of Ecosystems Duty*’, the duties of which include the follow:

“(1) A public authority must seek to maintain and enhance biodiversity in the exercise of functions in relation to Wales, and in so doing promote the resilience of ecosystems, so far as consistent with the proper exercise of those functions.

(2) In complying with subsection (1), a public authority must take account of the resilience of ecosystems, in particular the following aspects—

(A) diversity between and within ecosystems;

(B) the connections between and within ecosystems;

(C) the scale of ecosystems;

(D) the condition of ecosystems (including their structure and functioning);

(E) the adaptability of ecosystems.”

- 7.1.2 To ensure that the proposed development results in a gain of biodiversity opportunities and enhancement of existing habitats, ecological protection and enhancements detailed below have been included into the whole site masterplan and will be incorporated into the detailed landscape schemes for the proposed development.

Habitats

- 7.1.3 Native tree and shrub planting within the landscape buffer along the southern boundary of the application site should include species-rich mixes for woodland understorey, hedges, scrub, and grassland. The basins / waterbodies being created for the site’s sustainable drainage system (SuDS) should have biodiversity features incorporated into their design with the establishment of neutral grassland, marshy grassland.
- 7.1.4 The development will result in the loss of a low value waterbody and ideally areas of open water and marginal vegetation should be incorporated into the SuDS design to compensate for this loss and further increase the habitat and species diversity in the final development.

Bats

- 7.1.5 As enhancement beyond the replacement roots being provided under the EPS licence it is recommended that a further ten Schwegler 1FF or 2F bat boxes should be mounted on trees along the woodland edge, positions to be confirmed and instalment supervised by a suitably qualified and licensed bat ecologist. The bat boxes will be mounted on large trees that will not be affected by light spill and in locations connected to flight lines. Each box would installed at a height of at least 3 m, with an unobstructed access point and on a southerly aspect where possible, facing away from the prevailing winds.
- 7.1.6 The landscaping proposals for the development should include native planting of night flowering, fruit or nectar-bearing plants and trees, to encourage a greater diversity of insects for bats to feed on.

Hazel Dormouse

- 7.1.7 Habitat enhancements that will directly increase the potential value of the wider land ownership for hazel dormouse are specified in the precautionary dormouse mitigation strategy. This will include new woodland planting to increase the size of existing woodland blocks and increase the connectivity between them. The amount of hazel will be increased along with a range of other native

species and tall bramble thicket should be encouraged to establish in woodland edge locations to provide additional dense cover.

Breeding Birds

- 7.1.8 Ten Schwegler 1B Bird Box two bird boxes should be installed on trees along the woodland buffer to provide additional nesting/roosting opportunities on site. They will be mounted 2-3 m from ground level and will avoid facing directly north or south.
- 7.1.9 In addition, four 1SP Schweglar Sparrow Terrace will be installed on the buildings within the development to compensate for the loss of nesting habitat utilised during the 2019 breeding bird survey within the farm complex.
- 7.1.10 Due to the presence of the farmland specialist species namely yellowhammer, linnet, skylark and starling and the loss of habitat associated with the proposed development it is recommended that this is compensated for through the provision of alternative habitat and food supplies. This should aim to include a year-round supply of food which may be achieved through increased field margins, areas of scrub, fallow and wildflower grasslands, a range of trimming styles on the hedgerows with some maintained as short, dense features, and allow others to develop into taller, untrimmed features.
- 7.1.11 Late cut hay meadows or silage fields which are not cut before late May with subsequent cuts at least seven weeks apart can also benefit skylark. These compensation measures can be achieved through a combination of amended management of the retained farmland fields within the land ownership and also through the creation of the scrub and grassland areas on the periphery of the development. In addition, nest boxes have also proved successful for use by starlings.
- 7.1.12 In order to compensate for the loss of hedgerows within the scheme compensatory planting will be carried out to extend the retained woodland, as well as buffers of at least 10 metres on the retained hedgerows and woodland areas.

Other Species

- 7.1.13 Ten log wood piles should be created from native hardwood species in appropriate locations within the landscaping buffer. Ten brash piles of mixed vegetation will be created directly beside log piles. These enhancements will create foraging and hibernation opportunities for several species, including (but not limited) to reptiles, hedgehogs, other small mammals, invertebrates and amphibians. Material for log and brash piles will be collected from the cutting of removed habitat within the application site boundary. Removed material will be collected and re-located to appropriate locations within the habitat buffer.

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FIGURES

Figure 1 – Bat Static Recording Detector Locations Plan

Figure 2 – Dormouse Survey Tube Location Plan

Figure 3 – Bat Roost Location Plan for Trees

Figure 4 – Bat Roost Location Plan for Buildings

Figure 5a – Bat Activity Transect Results – October 2018

Figure 5b – Bat Activity Transect Results – April 2019

Figure 5c – Bat Activity Transect Results – May 2019

Figure 5d – Bat Activity Transect Results – July 2019

Figure 5e – Bat Activity Transect Results – August 2019

Figure 5f – Bat Activity Transect Results – September 2019

Figure 6 – Breeding Bird Survey Results

Figure 7 – Badger Survey Results

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Legend

Application Site Boundary

Static Detector Locations

1	--	--	--	--
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Project Land at Rhoose (aka Model Farm)

Title Bat Activity Survey - Static Detector Recording

Status
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Drawn By
LW

PM/Checked By
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Project Number
ECO00138

Scale @ A3
1:3,750

Date Created
SEP 2019

Drawing Number
1

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- Application Area
- Wider Survey Area
- Dormouse Tube

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Project Land at Rhoose

Title Dormouse Tube Location Plan

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Figure Number 2	Rev 01	

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- Legend**
- Application Site Boundary
 - Confirmed Roost - Noctule
 - Confirmed Roost - Pipistrelle species
 - Confirmed Roost - Unknown species
 - High Bat Roost Potential
 - Moderate Bat Roost Potential
 - Low Bat Roost Potential

Rev	Description	By	CB	Date
1	--	--	--	--

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Title Bat Roost Location Plan for Trees

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Project Number	Scale @ A3	Date Created
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Drawing Number		Rev
3		1.0

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- Legend**
- Application Site Boundary
 - Barn Complex Building Sections
- Emergence and Re-entries**
- Pipistrelle Species
 - Soprano Pipistrelle
 - Pipistrelle Species Roost
 - Soprano Pipistrelle Roost
 - Droppings Found - Evidence of previous roosting space

1	--	--	--	--
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Title Bat Roost Location Plan for Buildings

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Project Number	Scale @ A3	Date Created
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Drawing Number		Rev
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- Legend**
- Application Site Boundary
 - Transect Route
 - Myotis species
 - Noctule, Leisler or Serotine
 - Common Pipistrelle
 - Soprano Pipistrelle
 - Point Counts

1	--	--	--	--
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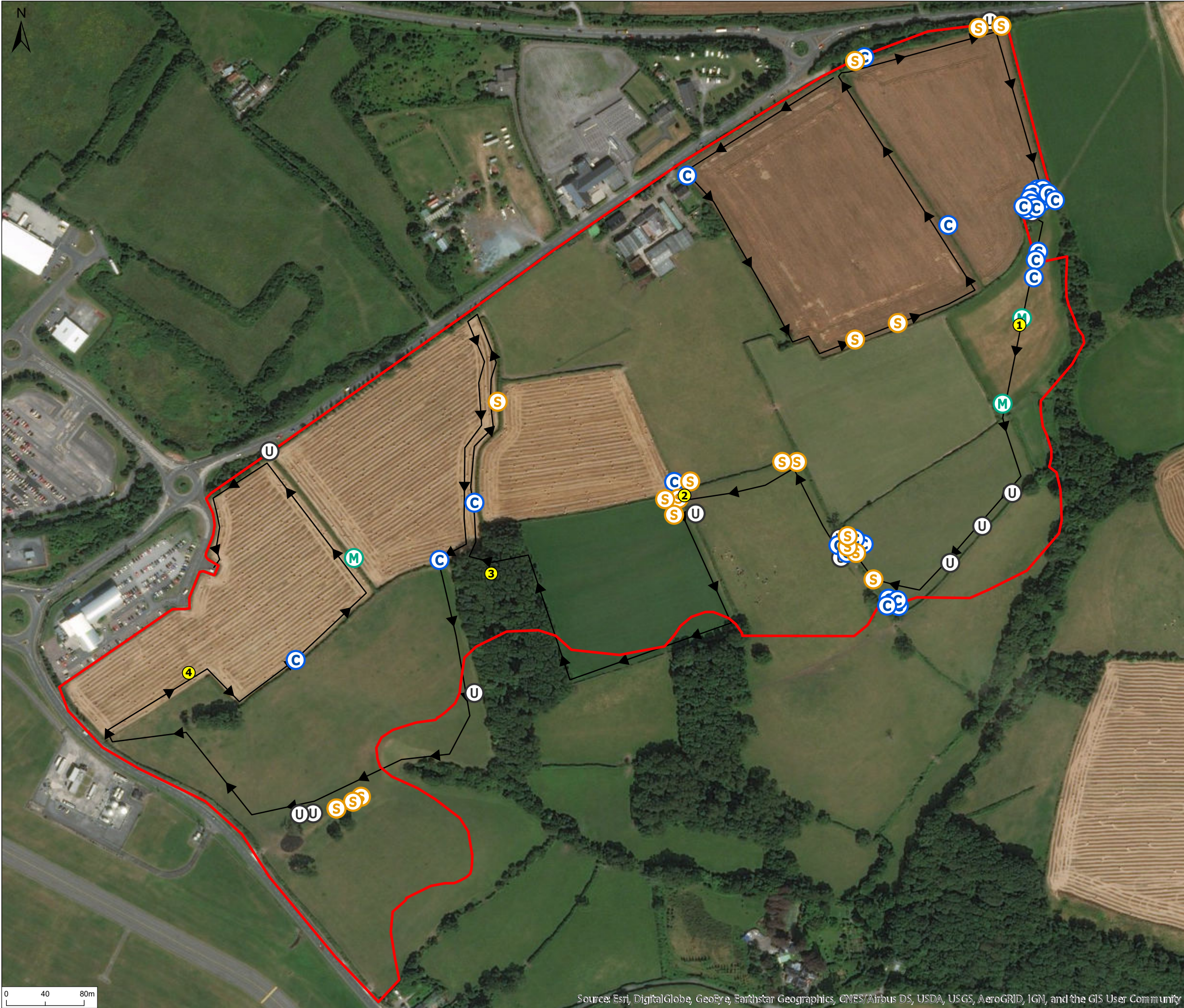
Project Land at Rhoose (aka Model Farm)

Title Bat Activity Transect Results October 2018

Status	Drawn By	PM/Checked By
FINAL	LW	KD
Project Number	Scale @ A3	Date Created
ECO00138	1:3,750	OCT 2019
Drawing Number		Rev
5A		1.0

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Legend

- Application Site Boundary
- Transect Route
- Myotis species
- Noctule, leisler or serotine (NSL)
- Common pipistrelle
- Soprano pipistrelle
- Point Counts

1	--	--	--	--
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Title Bat Activity Transect Results April 2019

Status	Drawn By	PM/Checked By
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Project Number	Scale @ A3	Date Created
ECO00138	1:3,750	OCT 2019
Drawing Number		Rev
5B		1.0

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- Legend**
- Application Site Boundary
 - Transect Route
 - Myotis species
 - Noctule, Serotine or Leisler
 - Common Pipistrelle
 - Soprano Pipistrelle
 - Point Counts

1	--	--	--	--
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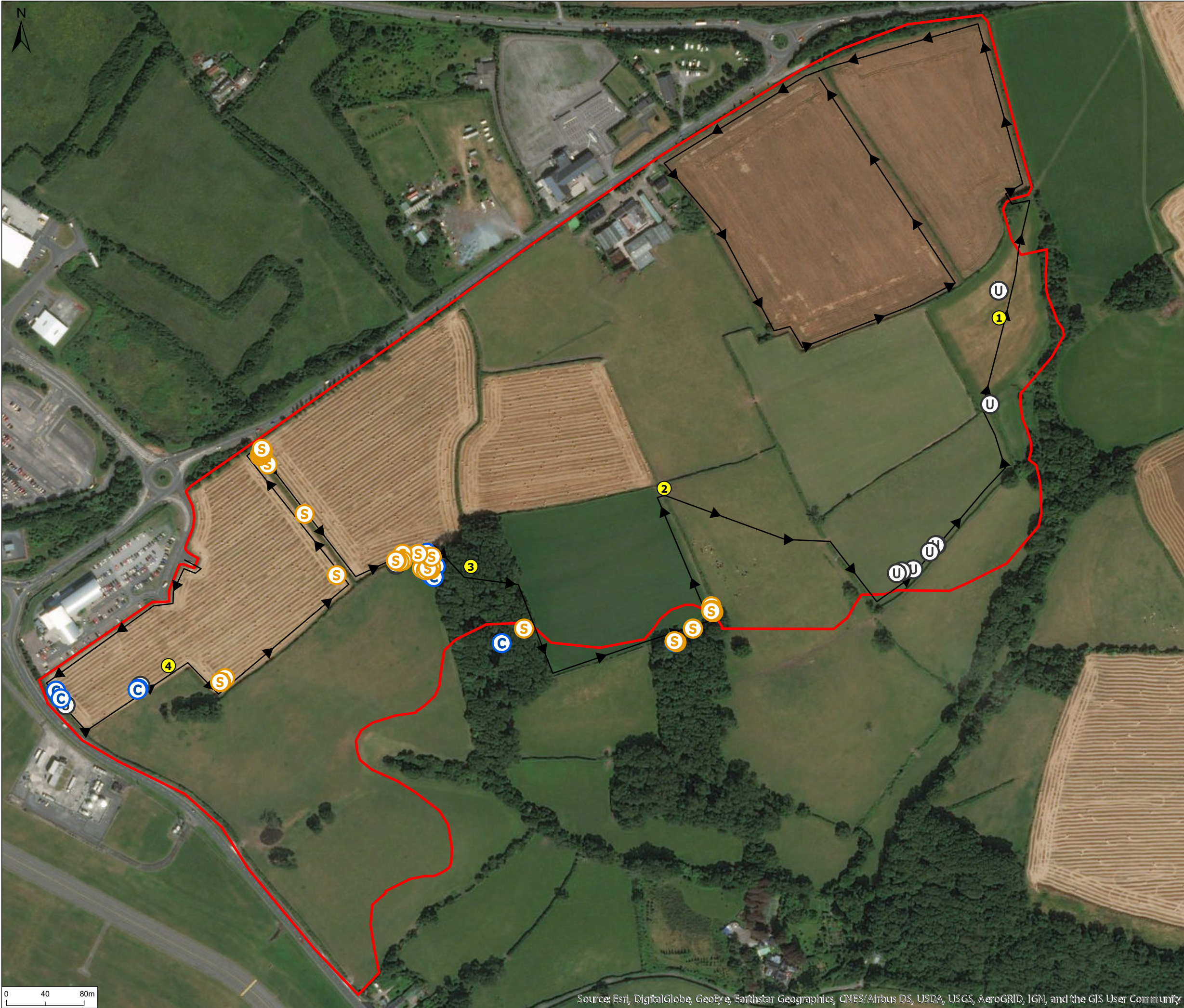
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Title Bat Activity Transect Results May 2019

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Project Number	Scale @ A3	Date Created
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5C		1.0

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Legend

- Application Site Boundary
- Transect Route
- Myotis species
- Noctule, Leisler or Serotine (NSL)
- Common Pipistrelle
- Soprano Pipistrelle
- Point Counts

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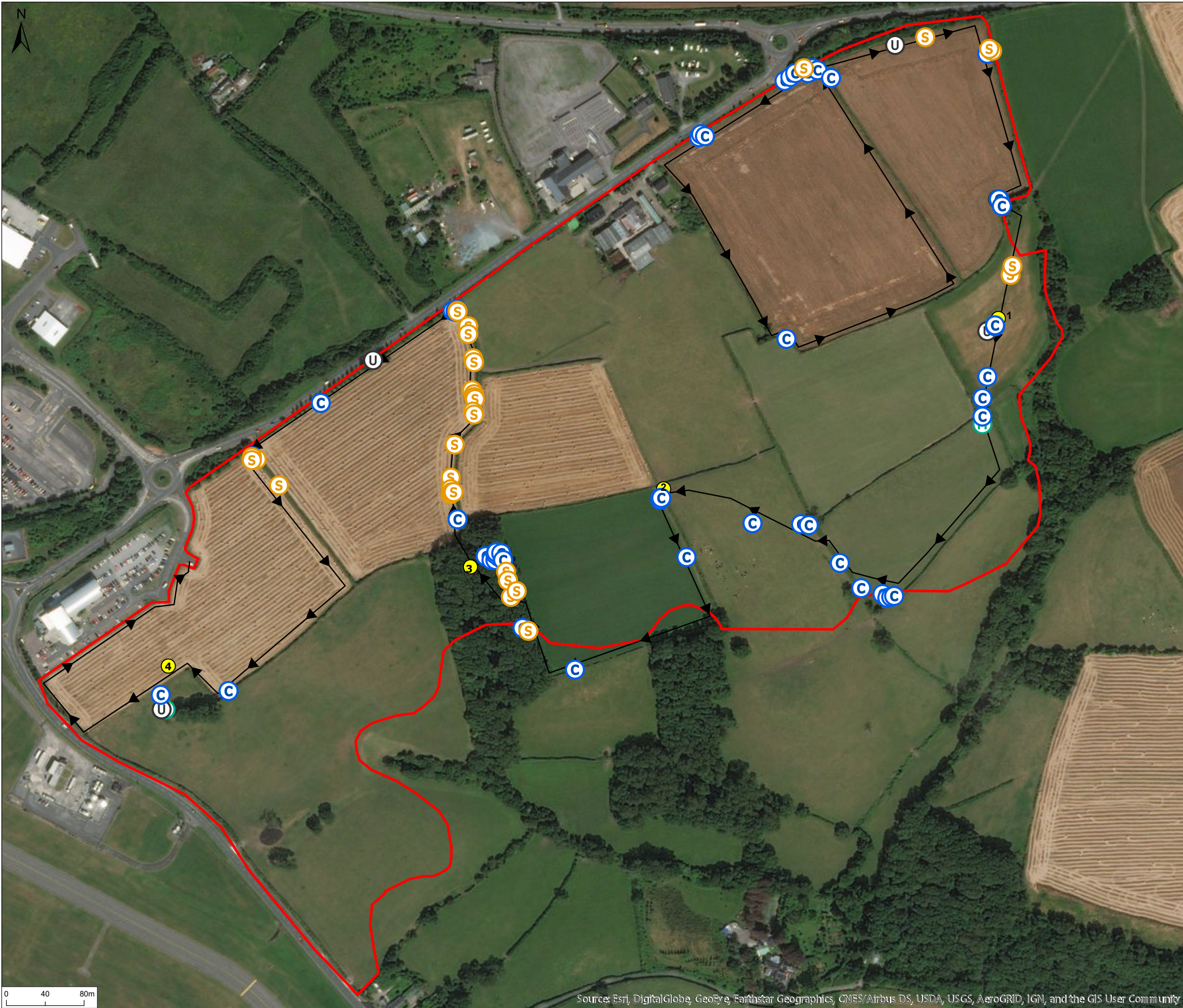
Project Land at Rhoose (aka Model Farm)

Title Bat Activity Transect Results July 2019

Status	Drawn By	PM/Checked By
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Project Number	Scale @ A3	Date Created
ECO00138	1:3,750	OCT 2019
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5D		1.0

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- Legend**
- Application Site Boundary
 - Transect Route
 - Myotis species
 - Noctule, Leisler or Serotine (NSL)
 - Common Pipistrelle
 - Soprano Pipistrelle
 - Point Counts

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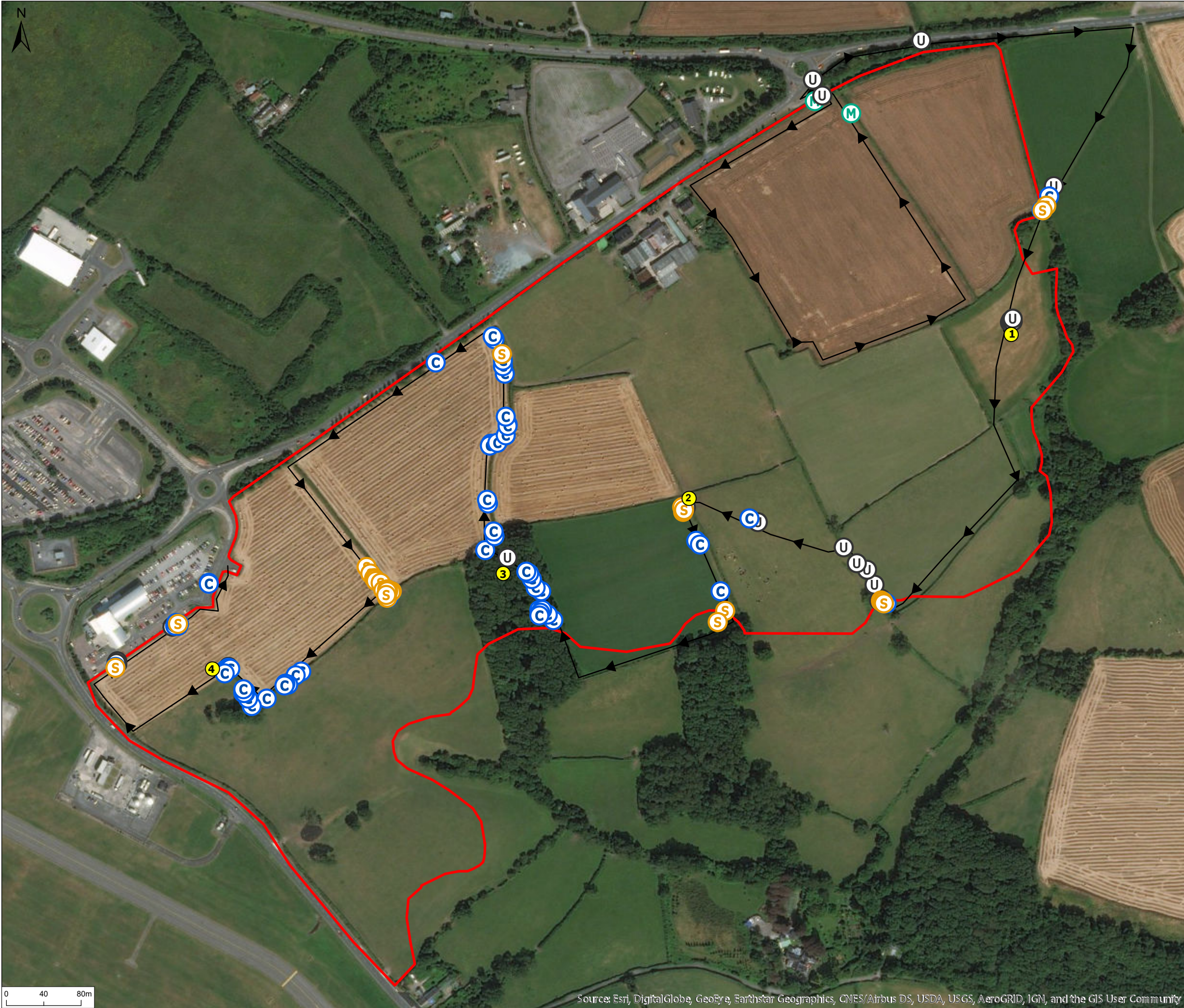
Project Land at Rhoose (aka Model Farm)

Title Bat Activity Transect Results August 2019

Status	Drawn By	PM/Checked By
FINAL	LW	KD
Project Number	Scale @ A3	Date Created
ECO00138	1:3,750	OCT 2019
Drawing Number		Rev
5E		1.0

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Legend

- Application Site Boundary
- Transect Route
- Myotis species
- Noctule, Leisler or Serotine (NSL)
- Common Pipistrelle
- Soprano Pipistrelle
- Point Counts

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Title Bat Activity Transect Results September 2019

Status FINAL Drawn By LW PM/Checked By KD

Project Number ECO00138 Scale @ A3 1:3,900 Date Created OCT 2019

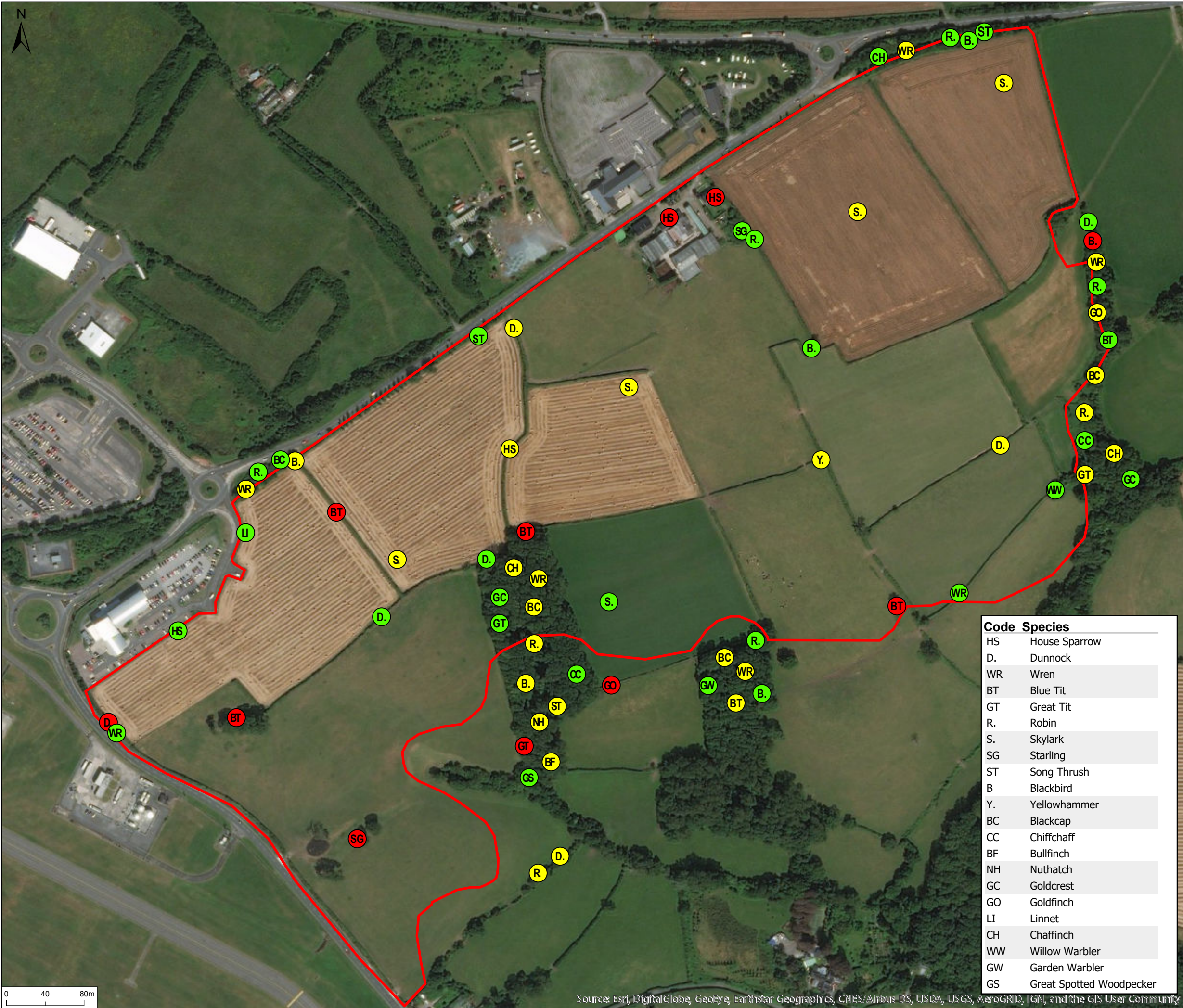
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Legend

- Application Site Boundary
- Confirmed Breeding
- Possible Breeding
- Probable Breeding

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Title Breeding Birds Survey Results

Status Drawn By PM/Checked By
FINAL **LW** **KD**

Project Number Scale @ A3 Date Created
ECO00138 **1:3,750** **OCT 2019**

Drawing Number Rev
6 **1.0**

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- Legend**
- Application Site Boundary
 - Badger seen
 - Foraging
 - Dung Pit
 - Mammal Path
 - Print
 - Push through in hedge

1	--	--	--	--
Rev	Description	By	CB	Date



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Project Land at Rhoose (aka Model Farm)

Title Badger Scoping Survey

Status	Drawn By	PM/Checked By
FINAL	LW	KD
Project Number	Scale @ A3	Date Created
ECO00138	1:3,750	OCT 2019
Drawing Number		Rev
7		1.0

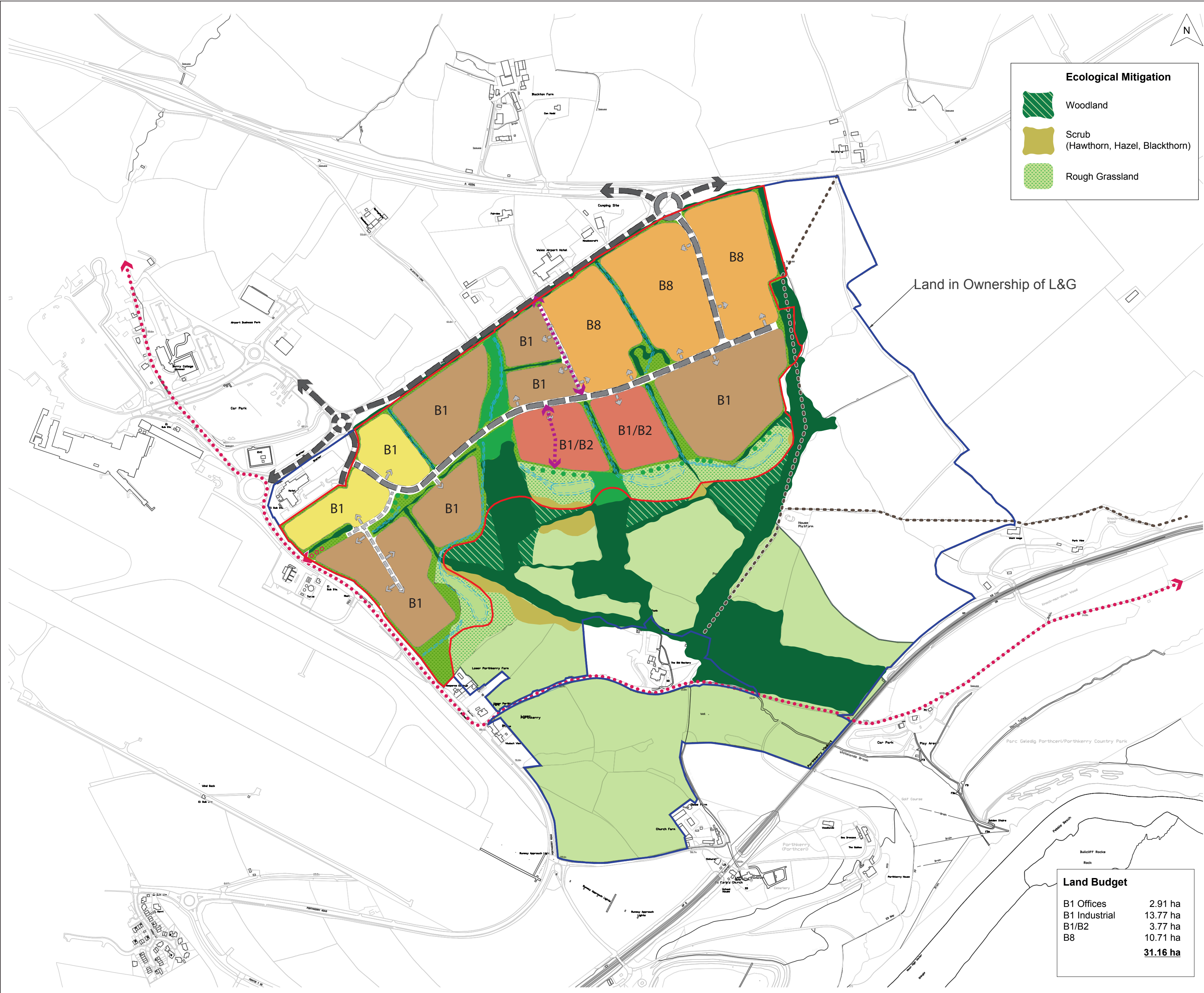
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APPENDICES

- **Appendix A.** Masterplan of the Proposed Development
- **Appendix B.** Bat Tree Climbing Survey Results/Report
- **Appendix C.** Site Photos
- **Appendix D.** Full Results from Static Bat Detectors
- **Appendix E.** GCN eDNA Analysis Results

Appendix A

Masterplan of the Proposed Development



Ecological Mitigation

Woodland

Scrub
(Hawthorn, Hazel, Blackthorn)

Rough Grassland

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Notes

1. This drawing has been prepared in accordance with the scope of RPS's appointment with its client and is subject to the terms and conditions of that appointment. RPS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.

2. If received electronically it is the recipients responsibility to print to correct scale. Only written dimensions should be used.

Land In Ownership of L&G

Site Boundary

Allocated Porthkerry Park Extension

B1 Small Business Units, Office,
(up to 5 Storeys Height)

B1 Industrial Use

B2 General Industrial Use

B8 Storage

Existing Road Network

Proposed Spine Road Corridor
(setting of spine road shown in a corridor to allow flexibility for final alignment)

Access Roads

Existing PROW

Existing Cycle Route

Proposed Link to Cycle Route

Proposed Pedestrian Link

Proposed Landscaping

Existing Tree Belts / Existing hedgerows

Landscape Buffer/Open Space

Combined Ecology and Drainage Corridors

SUDS Attenuation Areas/Swales

Rev	Description	Date	Initial	Checked

rps

MAKING
COMPLEX
EASY

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Client

L&G

Project

Land at Rhoose

Title

Concept Masterplan

Status

DRAFT

Drawn By

AW/PO

PM/Checked by

HD/DP

Job Ref

JCD0064

Scale @ A2

1:5000

Date Created

MAY 2018

Drawing Number

JCD0064-010

Rev

H

rpsgroup.com

Land Budget

B1 Offices

2.91 ha

B1 Industrial

13.77 ha

B1/B2

3.77 ha

B8

10.71 ha

31.16 ha

Appendix B

Bat Tree Climbing Survey Results/Report

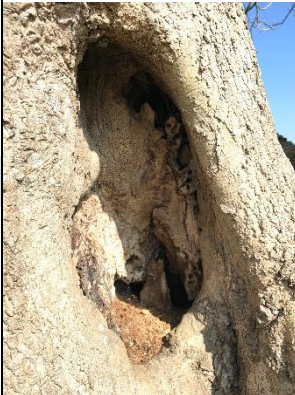
Summary

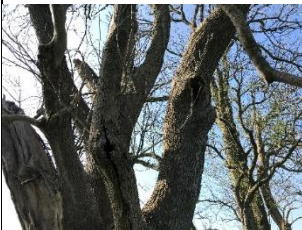
Soltys Brewster Ecology were commissioned by RPS to undertake aerial inspections of potential bat roost features within a number of trees at Model Farm, Rhoose. A previous ground-based survey undertaken by RPS in Spring 2019 aimed to categorise groups of trees and blocks of woodland by their potential to support bats as well as highlighting individual trees of Low, Moderate and High Potential. It also aimed to identify those trees (Moderate and High Potential), which were considered suitable to climb; Aerial inspection surveys aimed to visually assess – both externally and internally – all Moderate and High Potential trees identified as suitable to climb.

A total of 9 individual Ash *Fraxinus excelsior* trees, associated with woodland blocks and remnant tree groups of historic hedgerows were inspected via climbing. Checks were undertaken over a number of days spread throughout the active Bat season between the dates of 8th August – 2nd October 2019. Number of visits to individual trees were based on their categorisation such that Moderate Potential trees were subject to 2no. visits and High Potential trees were subject to 3no.

Features identified from the ground as having potential to support roosting bats, were accessed using rope and harness. Furthermore, any additional features previously unidentified from the ground (due to obscurity from limbs etc.) were also subject to inspection. Each feature was carefully examined for signs and assessed for likely presence/usage by bats, both externally and internally. Internal inspections were carried out using an LED endoscope with camera recording functionality.

Details of tree categorisations and their bat potential are presented in the table overleaf supported by notes and images. A number of trees were recategorized following closer inspection. Both T10 and T25 were identified as Confirmed Bat Roosts. The former was identified as having a Noctule *Nyctalus noctula* roost, the latter contained a single dropping with characteristics consistent with Brown Long-eared *Plecotus autritus*.

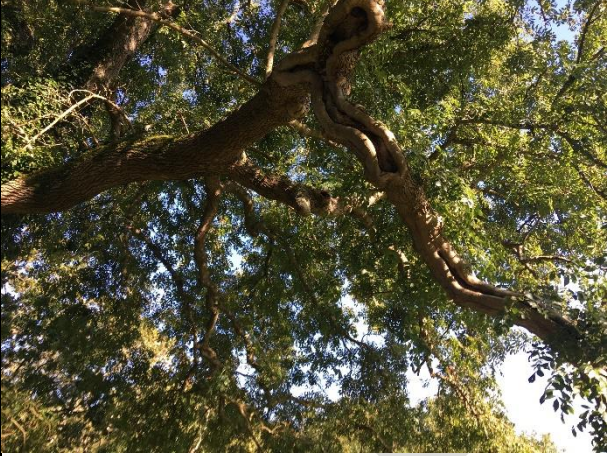
Tree Ref	Location	Climbing notes and categorisation changes	Illustrative photos of aerial inspection	Photos Ground based inspection
2	ST 07435 67280	Moderate → Low All potential features on tree examined using endoscope where necessary. No features retained more than low potential to support roosting bats.		 
3	ST 07445 67279	Moderate → Low All potential features on tree examined using endoscope where necessary. No features retained more than low potential to support roosting bats.		 

4	ST 07456 67286	Moderate → Low All potential features on tree examined using endoscope where necessary. No features retained more than low potential to support roosting bats.		
5	ST 07469 67282	Moderate/Low Throwline weight caught in canopy and unable to retrieve. Second attempt to climb was made however gusts were strong with damaged limbs hanging precariously. Climb was not completed on safety grounds under the dynamic risk assessment.	N/A	

10	ST 07573 67164	Moderate/High → Confirmed Roost Audible calls heard from bats within the woodpecker hole on the south side of Stem. On grounds of likely disturbance full internal inspection was not undertaken and climbers were unable to identify species. However, a subsequent emergence survey undertaken by RPS identified a Noctule roost with max count of three individuals emerging.		
23	ST 08328 67789	High Low lying features inspected with rope access Both woodpecker hole and fracture able to support multiple bats. Features considered to be of Moderate Potential on their own and; in combination with ivy cover of the stem and higher limbs tree considered to have High overall potential. Image depicts the internal cavity of picture in ground based check column. Light speck indicates rot hole on the end of limb. Cavity was over 2m long with a 10-20cm diameter.		

24	ST 08330 67756	Moderate → Low No significant features identified during the aerial inspection. Knot hole had diameter of 10cm with no protection. Considered unsuitable to support bats. Low Potential overall considering ivy cover on the stem.		
25	ST 08338 67707	High → Confirmed Roost Bat droppings found Large Cavity in stem approximately 7m up stem discovered (40 x 25cm entrance) significant heartwood rot only cambium remaining. Cavity continues up stem and is considered suitable for maternity roost. A number of woodpecker holes and rot holes were located higher up the canopy but no access on live limbs so not inspected however tree considered to be of high potential on merit of lower features alone.		

				
26	ST 08317 67518	High → Moderate Large cavity discovered on secondary limb high in the canopy (top left picture). Access to higher (smaller) canopy feature above this considered unsafe. Lower limb features (middle pic) contained no canopies suitable to support roosting bats and a moderate potential feature was identified 11m up the main stem. At the time of survey the feature was occupied by a honey bee colony (external pic top right internal pic bottom)	 	

		 	
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Appendix C

Site Photos



Plate 1: Tree 1 (T1) Confirmed noctule roost during emergence surveys.



Plate 2: Tree 10 (T10) Confirmed noctule roost during emergence surveys.



Plate 3: Tree 22 (T22) Confirmed pipistrelle species roost during emergence surveys.



Plate 4: Tree 25 (T25) Confirmed bat roost during tree climbing endoscope inspection.



Plate 5: Section A (barn complex) and confirmed soprano pipistrelle roost, red circle indicates where bats emerged.



Plate 6: Section B (barn complex) and confirmed bat roost, droppings were found during initial bat roost assessment.



Plate 7: Section C (barn complex) and confirmed pipistrelle species roost, red circle indicates where bats emerged.



Plate 8: Section D (barn complex) and confirmed soprano pipistrelle roost.

**Plate 9:**

Section E (farm house) northeast porch with pipistrelle species roost, red circle indicates where bats emerged..

**Plate 10:**

Section F (farm house) northeast porch with pipistrelle species roost, red circle indicates where bats emerged.

**Plate 11:**

Concrete lined waterbody beside barn complex, sloped access for cattle. GCN eDNA results were negative.

Appendix D

Full Results from Static Bat Detectors

Location	Date	Bat Species										Total bat calls per location	Average number of calls per night
		Soprano pipistrelle	Common pipistrelle	Noctule	Myotis sp.	Serotine	Leisler's bat	Pipistrelle sp. (social call only)	Lesser horseshoe	Brown long-eared bat	Nathusius' pipistrelle		
Western woodland													
Location 1	26-31st Oct	87	68		1							156	31.2
	4-9th Nov	782	20	7			1		1			811	162.2
Location 3	4-9th Oct	653	740	38	229	22	13	16	12	3		1726	345.2
Location 9	20-25th May	320	41	11	1	2	2					377	75.4
	2-7th June	84	256	27	4				1		2	374	74.8
Central woodland													
Location 7	9-14th May	19	8									27	5.4
Eastern copses													
Location 2	26-31st Oct	17		22					4			43	8.6
	4-9th Nov	20	47					7	1			75	15.0
Location 12	15-20th Aug	1	23	6	1	5	2					38	7.6
Location 16	13-18th Sep	683	1465	51	372	57	9	6	5		1	2649	529.8
Farmhouse and buildings													
Location 10	24-29th Jul	42	50	8	4	4	1					109	21.8
Location 11	13-18th Aug	1265	700	21	11	24	7				2	2030	406.0
Eastern fields													
Location 4	4-9th Oct	254	494	20	31		13			1		813	162.6
Location 6	2-7th April	3	3									6	1.2
Location 13	27 Aug -1st Sep	55	21	43		3	6					128	25.6
Western fields													
Location 5	2-7th April	2	5	4		1	2			1		15	3.0
Location 8	17-22nd May			62			1					63	12.6
Location 14	27th Aug	68	142	13	1	5	5		1			235	235.0
Location 15	3-8th Sep	87	17	15	18	1	5					143	28.6
Location 17	13-18th Sep	80	31	27	1	1	2		1		1	144	28.8
Total calls		4536	4137	397	675	126	79	29	26	5	6		
Percentage of calls		45.29	41.30	3.96	6.74	1.26	0.79	0.29	0.26	0.05	0.06		

Appendix E

GCN eDNA Analysis Results

Folio No: E4425
Report No: 1
Order No: 0309218
Client: RPS GROUP
Contact: Laura White
Contact Details: laura.white@rpsgroup.com
Date: 18/04/2019

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA IN POND WATER FOR THE DETECTION OF GREAT CRESTED NEWTS

Date sample received at Laboratory: 16/04/2019
Date Reported: 18/04/2019
Matters Affecting Results: None

RESULTS

Lab Sample No.	Site Name	O/S Reference	SIC	DC	IC	Result	Positive Replicates
0183	B ECO 00138, Model Farm, Land at Rhoose	ST07843 67786	Pass	Pass	Pass	Negative	0

SUMMARY

When Great Crested Newts (GCN); *Triturus cristatus* inhabit a pond, they deposit traces of their DNA in the water as evidence of their presence. By sampling the water, we can analyse these small environmental DNA (eDNA) traces to confirm GCN habitation, or establish GCN absence.

The water samples detailed below were submitted for eDNA analysis to the protocol stated in DEFRA WC1067 (Latest Amendments). Details on the sample submission form were used as the unique sample identity.

RESULTS INTERPRETATION

Lab Sample No.- When a kit is made it is given a unique sample number. When the pond samples have been taken and the kit has been received back in to the laboratory, this sample number is tracked throughout the laboratory.

Site Name- Information on the pond.

O/S Reference - Location/co-ordinates of pond.

SIC- Sample Integrity Check. Refers to quality of packaging, absence of tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to results errors. Inspection upon receipt of sample at the laboratory. To check if the Sample is of adequate integrity when received. Pass or Fail.

DC- Degradation Check. Analysis of the spiked DNA marker to see if there has been degradation of the kit since made in the laboratory to sampling to analysis. Pass or Fail.

IC- Inhibition Check- PCR inhibitors can cause false results. Inhibitors are analysed to check the quality of the result. Every effort is made to clean the sample pre-analysis however some inhibitors cannot be extracted. An unacceptable inhibition check will cause an indeterminate sample and must be sampled again.

Result- NEGATIVE means that GCN eDNA was not detected or is below the threshold detection level and the test result should be considered as no evidence of GCN presence. POSITIVE means that GCN eDNA was found at or above the threshold level and the presence of GCN at this location at the time of sampling or in the recent past is confirmed. Positive or Negative.

Positive Replicates- To generate the results all of the tubes from each pond are combined to produce one eDNA extract. Then twelve separate analyses are undertaken. If one or more of these analyses are positive the pond is declared positive for the presence of GCN. It may be assumed that small fractions of positive analyses suggest low level presence but this cannot currently be used for population studies. In accordance with Natural England protocol, even a score of 1/12 is declared positive.

METHODOLOGY

The laboratory testing adheres to strict guidelines laid down in WC1067 Analytical and Methodological Development for Improved Surveillance of The Great Crested Newt, Version 1.1

The analysis is conducted in two phases. The sample first goes through an extraction process where all six tubes are pooled together to acquire as much eDNA as possible. The pooled sample is then tested via real time PCR (also called q-PCR). This process amplifies select part of DNA allowing it to be detected and measured in 'real time' as the analytical process develops. qPCR combines PCR amplification and detection into a single step. This eliminates the need to detect products using gel electrophoresis. With qPCR, fluorescent dyes specific to the target sequence are used to label PCR products during thermal cycling. The accumulation of fluorescent signals during the exponential phase of the reaction is measured for fast and objective data analysis. The point at which amplification begins (the Ct value) is an indicator of the quality of the sample. True positive controls, negatives and blanks as well as spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared so they act as additional quality control measures.

The primers used in this process are specific to a part of mitochondrial DNA only found in GCN ensuring no DNA from other species present in the water is amplified. The unique sequence appropriate for GCN analysis is quoted in DEFRA WC 1067 and means there should be no detection of closely related species. We have tested our system exhaustively to ensure this is the case in our laboratory. We can offer eDNA analysis for most other species including other newts.

Analysis of eDNA requires scrupulous attention to detail to prevent risk of contamination. Kits are manufactured by SureScreen Scientifics to strict quality procedures in a separate building and with separate staff, adopting best practice from WC1067 and WC1067 Appendix 5. Kits contain a 'spiked' DNA marker used as a quality control tracer (SureScreen patent pending) to ensure any DNA contained in the sampled water has not deteriorated in transit. Stages of the DNA analysis are also conducted in different buildings at our premises for added security.

SureScreen Scientifics Ltd also participate in Natural England's proficiency testing scheme and we also carry out inter-laboratory checks on accuracy of results as part of our quality procedures.

Reported by: Troy Whyte

Approved by: Derry Hickman

End Of Report
