RHYDYCAR WEST, MERTHYR TYDFIL

EUROPEAN PROTECTED SPECIES CONSERVATION STRATEGY

April 2024
Bioscan Report ref: E1835-EPSCS-v1

COMMISSIONED BY

Marvel Ltd

Rhydycar West, Merthyr Tydfil
European Protected Species Conservation Strategy

April 2024

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1. INTRODUCTION AND SCOPE OF PLAN

1.1. Introduction

1.1.1. This document sets out the strategies intended to be followed to ensure the maintenance or enhancement of Favourable Conservation Status (FCS)[1] of certain European Protected Species[2] impacted by the proposed development at Rhydycar West, Merthyr Tydfil; specifically bats and great crested newts.

1.1.2. It accompanies a planning application for development of a "*mixed leisure development comprising Indoor Snow Centre (up to 39,200 sq m), Water park (up to 7,500 sq m), Indoor Activity Centre (up to 9,000 sq m), Outdoor Activity Centre, Hotel Accommodation (up to 418 bedrooms), Woodland Lodge accommodation (up to 30 units), car parking (up to 830 spaces) and associated earthworks, access, drainage, servicing and utilities connections/infrastructure*" (Merthyr Tydfil County Borough Council Planning Application reference P/23/0065).

1.1.3. The proposed development site, which extends to some 30.4 hectares, is shown on **Figure 1**[3]. The development is EIA development and an Environmental Impact Assessment duly accompanies the planning application. In respect of ecological impacts, the EIA is based on a large volume of survey work carried out since 2015 which has afforded a thorough understanding of the key ecological receptors affected by the proposed development. That suite of ecological receptors includes European Protected Species, namely great crested newts and several species of bats.

1.1.4. The proposed development site forms part of a much larger landholding under the control of the applicant and which extends to some 209.75 hectares of undeveloped land surrounding the proposed development and which includes land subject to SSSI and/or SINC designations. This undeveloped land will be brought under a conservation management regime in order to optimise its condition[4]. As set out in the Environmental Statement accompanying the application, this wider landholding also affords ample opportunity to deliver appropriate compensation for the identified impacts on bats and great crested newts. Whilst this does not appear to be in dispute, Natural Resources Wales (NRW) have requested further detail on the mitigation and compensation strategies for species subject to the EPS licensing regime – namely bats and great crested newts. Providing additional detail on how

[1] In the sense defined by the Conservation of Habitats and Species Regulations 2017 and as one of the 'three tests' required to be engaged by decision makers in both the planning determination and (more fully) the European Protected Species licensing processes.

[2] i.e. animals listed at Schedule 2 to the Conservation of Habitats and Species Regulations 2017

[3] It should be noted that the redline boundary for the proposed development encompasses a larger area of land than required for construction and operation: specifically, it includes a number of scheduled monuments that will be subject to restoration and/or stabilisation works as part of the benefits of the scheme. These activities will, or have the potential to, impact on bat roosts and therefore are directly relevant to this plan. The works proposed to these structures are detailed in a Heads of Terms Conservation Management Plan produced by EDP.

[4] A Heads of Terms management plan for the landholding is set out in Bioscan report E1835-MP-R1-HOT submitted with the application.

Favourable Conservation Status (FCS) for these species will be maintained is therefore the purpose of this document.

1.1.5. Planning application P/23/0065 has yet to be determined. As and when a positive determination (i.e. a grant of planning consent) is achieved, the applicant anticipates and indeed invites that its commitment to the measures and objectives set out within this document will be secured via a planning condition requiring, inter alia, the finer details on matters such as timescales to be worked up into a fully finalised EPS Mitigation Strategy in liaison with relevant stakeholders such as Natural Resources Wales and Merthyr Council. That document would then form the basis of necessary applications for derogation/mitigation licences in respect of these species.

1.2. Scope and purpose

1.2.1. The Plan is focused on outlining the conservation strategy to ensure the maintenance and/or enhancement of Favourable Conservation Status of the European Protected Species known to be impacted by the proposed development. Great crested newts are dealt with first, in section 2, followed by bats (collectively) in section 3. A brief summary and conclusions are set out at Section 4.

2. GREAT CRESTED NEWTS

2.1. Baseline position and predicted future impacts

2.1.1. Appendix 8.10a of the ES (reproduced as Appendix 1 of this document), provides details of the many repeat desk and field surveys since 2015 which have collectively established an excellent understanding of this species' baseline status on the site. A summary of this status, relative to the application site and the scope for impacts on this species, is given below:

2.1.2. By virtue of the site's land-use history, and in particular the scatter of redundant bell-pits, reservoir ponds and other standing water impoundments related to colliery operations across the landholding, there are a large number of features that hold standing water for at least parts of the year.

2.1.3. Fifty-five such features fall either within the application site or within a 250m buffer to it. **Figure 1** shows the location of these features relative to the application site. It also shows the spread of such features in other parts of the landholding outside the application site to the north and west.

2.1.4. In terms of the proposed development and its impact on this baseline, great crested newts have consistently been confirmed as present since 2015 in an ephemeral ditch (P29) close to the northern edge of the current application site (**Figure 1**). A small population was initially confirmed here in 2015, and whilst population assessment in subsequent years have to a greater or lesser degree been compromised by dry conditions, the maximum counts (three and five individuals) indicate that this is the focus for a small breeding, population which also uses the nearby waterbodies P26 and P10 at times.

2.1.5. The proposed development site excludes P29 itself, but terrestrial phase animals associated with both this waterbody and P10 are likely to range into the adjoining section of the application site. In addition, the highly ephemeral P26 falls within the development site boundary and will be removed.

2.1.6. There is a further cluster of ponds P17, P10, P15 and P38 at the southwestern edge of the application site which have all returned positive eDNA results since 2017, albeit no GCN have been observed over that time via torching or bottle trapping surveys (for details see Appendix 1). P15 supports fish so is highly suboptimal for the species, but it has historic GCN records and may have once been more suitable. It is possible there is a relict population here, surviving in the face of fish having been introduced to P15 by anglers some decades ago, but it is difficult to see how it can sustain itself without recruitment from the wider area. Works to stabilise P15 are envisaged as a consequence of the development. The adjacent highly ephemeral P17 might be able to be retained in some form or even enhanced in the detailed design of this area, but is assumed more likely to be lost for the present purposes.

2.1.7. The nearest other known population loci are former colliery reservoir ponds, P11 (around 240m to the north of the application site) and P48 to the south-west (**Figure 1**). P11 may be used transiently by GCN during the breeding season but does not appear to support a breeding population itself. Single GCN were found here in 2017 (female), 2018 (male) and 2021 (female), though breeding has not been confirmed in any survey year. This may be a relict population surviving in a residual state as P11 has become more unsuitable over time. This population may have transferred its focus to P29.

2.1.8. P48 is the location of older GCN records but was dry in 2015, negative for GCN eDNA in 2017, positive in 2018 and negative in 2021. The situation with this pond is similar to that of P11 and there may be a relationship between this pond and the cluster around P17, P10, P15 and P38. P48 is outside the area controlled by the applicant however.

2.2. Mitigation and compensation strategy

2.2.1. In accordance with the species' stringent legal protection under the Conservation of Habitats and Species Regulations 2017 (as amended) and the Wildlife and Countryside Act 1981 (as amended) mitigation will have to be adopted to avoid killing or injuring great crested newts in the course of site clearance and subsequent development, and compensation for the loss of breeding and terrestrial habitat will also be required.

2.2.2. All such mitigation and compensation will follow the established best practice standards set out in English Nature (2001). Great Crested Newt Mitigation Guidelines and in Langton, T.E.S., Beckett, C.L., and Foster, J.P. (2001), Great Crested Newt Conservation Handbook, and will be secured by a relevant European Protected Species licence that will be applied for at the appropriate post-consent juncture.

2.2.3. In order for the authorities charged with determining the planning application to be comfortable that a European Protected Species licence is 'not unlikely to be granted' (pursuant to the relevant E+W case law in *Morge*), consideration must be given to whether the avoidance, mitigation and compensation proposals associated with the development satisfy the three licensing tests set out under Regulation 55 to the 2017 Regulations.

2.2.4. The first two tests of "imperative reasons of overriding public interest, including those of a social or economic nature" (Regulation 55 (2) (e)) and "no satisfactory alternative" (Regulation 55 (9) (a)) will be engaged by the exercise of the planning balance and the applicable tests of planning policy, and are not therefore the primary focus for this document. On the matter of the latter "no satisfactory alternative" test, it is however relevant for the determining authorities to note that (as set out in the planning submission and ES) the development footprint and design has been an iterative process that has sought to minimise landtake from the SSSI and minimise impacts on ecological receptors, including great crested newts, more generally. Specifically, both the location of the development within the wider landholding and

the detailed positioning and extent of the Application Site have been configured through numerous design iterations, pre-empting but in alignment with the step-wise approach advocated in the latest revisions to Planning Policy Wales, and in order that overlap with the designated Cwm Glo a Glyndyrys SSSI is restricted to the absolute minimum necessary. This has seen the quantum of SSSI land, and waterbodies used by GCN, that is affected by the proposed development incrementally reduced over time in order to reduce impacts.

2.2.5. In respect of the test under regulation 55 (9) (b) - that "the action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range" – the Environmental Statement notes that the scope for conditions to be improved for great crested newts across the wider landholding is a) significant and b) presents itself as a logical means to improve conditions for the species in ponds where populations are residual or have been lost. Taking such measures provides clear and ample scope for compensation for the limited scale impacts arising from the loss to development of P26 and P17, and an associated volume of terrestrial habitat.

2.2.6. In particular, the extent to which natural processes of terrestrialisation and overshading have reduced the suitability and carrying capacity of numerous ponds across the wider landholding, P11 being a classic example, presents a clear opportunity for the net improvement of conservation status for great crested newts locally. Interventions in such ponds to restore them to optimum condition for great crested newt breeding are likely to have significant and rapid results in terms of the local metapopulation.

2.2.7. Although the ample scope for delivery of appropriate and licensable mitigation and compensation does not appear to be in dispute, NRW have asked for such measures to be further particularised, and therefore the points below and as shown on **Figure 1** attached, provide further detail:

- In advance of the commencement of development, works to improve breeding and terrestrial habitat conditions will be carried out in parts of the landholding where this is most appropriate. This will include measures to reverse terrestrialisation in overshaded and silted up ponds known to harbour GCN or to have recently done so. (e.g. P11, P14) enhance conditions in others, potentially via expansion (e.g. P10, P9) and works to optimise habitat condition for GCN around these features, where compatible with SSSI interests (e.g. via the provision of enhanced hibernacula/refugia placed within extant scrub around or close to these waterbodies)[5]. Such works will be undertaken as far in advance of implementation as possible, and at latest in the appropriate season prior to works commencing, to ensure headroom capacity is created and ready in time to receive displaced or translocated newts.

[5] Pp18-27 of the Great Crested Newt Conservation Handbook provide guidance on pond restoration and these and other sources of guidance would determine the final detail and methodologies of pond restoration, such detail to be submitted and approved by NRW as part of the process of obtaining a derogation licence under regulation 55 of the 2017 Regulations.

- Immediately prior to commencement of development, and to address the risks of killing or injuring individual GCN during the initial implementation of development works on the site, standard form mitigation, secured by a future EPS licence, would be implemented. This would be expected to include the following:

  - Advanced fencing and trapping out of terrestrial habitat areas where GCN might be expected to be sheltering. This would utilise exclusion fencing, internal drift fencing, pitfall trapping and the deployment of refugia such as carpet tiles to assist in capture. It is likely that a minimum of 30 capture days would be required to achieve clearance, and potentially more, but this would be determined by further population assessment surveys in the season prior to commencement and as required to inform the fine detail of the licence application.

  - Once consistently low capture rates have been obtained in suitable weather and temperature conditions (e.g. 5 clear and sequential 'no capture days' in conditions where terrestrial phase GCN might be expected to be active) a destructive search of such affected areas would be undertaken to capture any residual newts prior to site clearance.

  - Concentrated trapping enclosures/exclosures would be erected around P26 and P17 and these would be drained down (where necessary) and subject to destructive search once 5 clear 'no capture' days in suitable conditions have been reached (this could potentially take place in advance of clearance of the terrestrial habitat).

  - All newts caught would be released into designated release areas within the wider landholding – likely to be enhanced terrestrial habitat around restored waterbodies P11 and P14 and/or potentially involving restoration or enhancement of other waterbodies such as P12 and P25 subject to further investigations (e.g. of water quality and historic considerations). A fish rescue in P15 may also be employed in conjunction with stabilisation/restoration efforts there to improve its long-term and future suitability for GCN.

  - At least two ponds will be restored or enhanced for GCN for each one lost (i.e. a minimum of 4 existing and/or moribund ponds in the wider landholding will be enhanced/restored, with at least two of these having recent or current use by GCN). As indicated by **Figure 1**, there is ample capacity within the wider landholding for this to be achieved.

  - Newt proof fencing around the development boundary would be maintained through the construction phase to prevent terrestrial phase animals dispersing into the site and placing themselves at risk. This would likely require fencing for 500m centred on the nearest points of the boundary to P26 and P17 for the duration of construction works.

- Secured management and monitoring of all ponds and terrestrial habitat restored or enhanced would continue for the life of the development (as secured by the long-term management plan) and/or as defined by the licence. Monitoring would be likely to continue for a minimum of five years.

2.2.8. The above details should provide further reassurance and underline how there is ample scope to deliver a net enhancement of conditions for great crested newts across the wider landholding, resulting in net benefits for the local metapopulation and a net enhancement of favourable conservation status, as well as how this might be achieved.

3. BATS

3.1. Baseline position and predicted future impacts

3.1.1. Appendices 8.11a, 8.14a and 8.15a of the ES (reproduced at Appendix 2 to this document), provide details of the desk and field surveys since 2015 which have collectively established a good understanding of the use of the site by bats, the assemblage of species involved and the locations of a number of roosts. A summary of this status, relative to the application site and the scope for impacts on this species, is given below:

3.1.2. A diverse range of 14 bat species has been confirmed as using the landholding with summer, autumn and winter roosts confirmed (or strongly suspected on the balance of evidence) in a number of built structures falling within or close to the Application Site and in a smaller number of trees.

Building roosts

3.1.3. Species found in roosts in built structures within the Application Site to date comprise lesser horseshoe, brown long-eared bat and *Myotis* bats (inc Daubenton's bat), all found in bridge or retaining wall structures with both *Myotis* and horseshoe bats suspected to roost in the nearby Aberdare tunnel. **Figure 2** shows the location of structures within the site confirmed to be used by bats, and indicates the bat roosting potential of those where bats have not to date been confirmed during various surveys since 2015.

Tree roosts

3.1.4. The woodland habitats within the Application Site and the more open-grown mature trees within the SSSI component of the Application Site offer additional potential roosting sites for bats. Trees with medium or higher potential to support bat roosts have been identified by ground-based assessments in 2021 and 2022 and subject to campaigns of climbing inspections in November 2022. This confirmed the presence of a small number of tree roosts for brown long-eared and Daubenton's bats (Appendix 8.14). The locations of these trees are also marked on **Figure 2**.

3.1.5. In addition to the above bat species confirmed as using roost sites, the following additional bat species have been recorded within or close to the Application Site during activity surveys since 2015: greater horseshoe (Welsh Priority), barbastelle (Welsh Priority), Whiskered/Alcathoe/Brandt's, noctule, serotine, common, soprano and Nathusius' pipistrelle (Appendix 8.11a).

3.2. Mitigation and compensation strategy

3.2.1. The key commuting and foraging areas across the site appear to be the stream courses of the Nant Llywynreos, Nant Rhyd-y-car, Nant Cwm-pant-bach, Nant Canaid,

associated woodlands, and habitat interfaces elsewhere. The Application Site, in occupying predominantly elevated tip mounds, largely sits within a network of habitat edges and features, rather than severing or blocking them. The lighting design associated with the outline consent (which can be secured by conditions) has been designed to be suitably sensitive so as to avoid significant spillage into adjoining areas and to therefore avoid any significant disruption to commuting or foraging patterns across the land holding, with any net denudation of foraging area compensated by improved management of the wider landholding to maintain an optimum ratio between open and enclosed habitats and their interfaces. Measures such as opening up ponds as part of compensatory and restoration activities for great crested newts will also likely benefit the site's bat populations.

3.2.2. Beyond this, the mitigation and compensation requirements for bats centre on the approach to maintaining favourable conservation status in the context of anticipated impacts to and likely loss (at least temporarily) of roosts in trees that require to be cleared to implement the development, and historic colliery or railway structures that will in most or all instances be retained, but which may require interventions to secure their structural integrity.

3.2.3. Mitigation and compensation measures and design will follow the best practice standards set out in Mitchell-Jones (2004) Bat Mitigation Guidelines. English Nature, Peterborough, as updated by more recent research and practice, and will be secured by a relevant European Protected Species licence that will be applied for at the appropriate post-consent juncture.

3.2.4. In order for the authorities charged with determining the planning application to be comfortable that a European Protected Species licence is 'not unlikely to be granted' (pursuant to the relevant E+W case law in *Morge*), consideration must be given to whether the avoidance, mitigation and compensation proposals associated with the development satisfy the three licensing tests set out under Regulation 55 to the 2017 Regulations.

3.2.5. The first two tests of "imperative reasons of overriding public interest, including those of a social or economic nature" (Regulation 55 (2) (e)) and "no satisfactory alternative" (Regulation 55 (9) (a)) will be engaged by the exercise of the planning balance and the applicable tests of planning policy, and are not therefore the primary focus for this document. On the matter of the latter "no satisfactory alternative" test, it is however relevant for the determining authorities to note that (as set out in the planning submission and ES) the development footprint and design has been an iterative process that has sought to minimise landtake from the SSSI and minimise impacts on ecological receptors, including bats, more generally, as summarised at paragraph [2.2.4] above).

3.2.6. In respect of the test under regulation 55 (9) (b) - that "the action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range", the information in the Environmental Statement is supplemented with further detail below.

3.2.7. In respect of trees and tree roosts, further surveys will naturally be required once the final design details and timescales for implementation are decided upon. Such surveys will confirm the number of tree-roosts triggering licensing requirements prior to any works or removal. The tree-climbing inspections to date do not suggest that high conservation status roosts are likely to be found in trees at the point of such further surveys.

3.2.8. As set out in the Bat Mitigation Guidelines, a range of licensable and standard form mitigation and compensation options are available to address impacts on tree roosts and to compensate for their loss where justified or unavoidable. These vary from timing of works to avoid periods of higher sensitivity (e.g. avoiding the summer where maternity roosts are impacted, and avoiding the winter where hibernation roosts are impacted) through to direct measures to ensure individual bats are not harmed in the process of tree works or removal. Into the latter category fall pre-works re-surveys and checks, capture and relocation by hand or the fitting of one-way excluders to cavity entrances, followed by a period to allow bats to vacate, and then close supervision of felling and post-felling checks to ensure no bats are present.

3.2.9. Options to compensate for the loss of tree roosts, or tree roosting opportunities, vary from the erection of bat boxes on retained trees in other parts of the landholding, through to works to trees to create roosting opportunities, or even the wholesale translocation of roosting features (for example the removal of limbs with integral cavities and the reattachment of these to other trees nearby). Any and all such options will be considered in the course of defining the final mitigation and compensation strategy for licensing and there is ample scope to deliver all of them within the wider landholding.

3.2.10. In respect of roosts in built structures, once again, careful timing of works relative to the roost type, pre-works checks and the use of interventions such as excluders to ensure bats are not present at the time of works are all standard licensable approaches to minimising the risk of harm to individual bats. They can be combined with pre-works erection of bat boxes on unaffected structures or trees as a place to release any bats that need to be actively captured or translocated, and during- or post-works installation of bat boxes or roosting provision back into the structures. At Rhydycar West, the opportunity will be taken to work closely with historic buildings advisors and regulators to ensure restoration of historic structures on the site, as part of the heritage objectives of the development (as agreed with CADW and detailed in the Heads of Terms Conservation Management Plan for heritage assets produced by EDP and which accompanies the application), takes due account of the presence of bat roosts and of the value of these structures to bats, and allows, where possible, for roosting provision to be retained or reinstated as part of the stabilisation and restoration works.

3.2.11. By reference to **Figure 2**, it will be noted that the scope for retention and/or compensatory provision of roosting opportunities on buildings either within the

application site, or in the wider landholding, is significant. Consequently, decision makers can have reassurance that there is ample scope to deliver adequate compensation for impacts on bats across the wider landholding pursuant to the FCS test, and indeed that there are potential net benefits for certain species that favour building roosts such as greater and lesser horseshoe bats.

4. SUMMARY AND CONCLUSIONS

4.1.1. This document sets out further details of the approach the Applicant undertakes to follow in designing and implementing appropriate mitigation and compensation to ensure the maintenance of Favourable Conservation Status (FCS) in respect of European Protected Species (bats and great crested newts) affected by the Rhydycar West proposed development.

4.1.2. As the planning application is in outline, and the discharge of reserved matters and conditions at the detailed design stage takes time, further surveys will be inevitably required to fully determine the prescriptive details of mitigation and compensation, and to inform the necessary licence applications to NRW for impacts on great crested newts and bat roosts. The full detail of avoidance, mitigation and compensation measures in respect of works to retained historic structures, and the bat roosts or roosting opportunities associated with them, will also need to be worked up in liaison with other stakeholders, such as CADW and Merthyr BC.

4.1.3. Nevertheless, this document sets down the principles and approaches that will be taken to mitigation and compensation and how, in view of the ample scope for delivery presented by the wider landholding under the control of the Applicant, with its multitude of waterbodies and terrestrial habitat suitable for enhancement or restoration, and similar abundance of trees and retained built structures, determining authorities can have very high confidence that measures sufficient to secure favourable conservation status can be secured and consequently the grant of EPS licences is not 'unlikely', per the threshold test established in English and Welsh case law by *Morge*. This test is amply cleared by the broad scope to secure appropriate mitigation and compensation proposals that is inherent with the proposals such that the presence of EPS on the site and the fact that they are likely to be affected by the development need not be an impediment to positive determination of the outline planning application.

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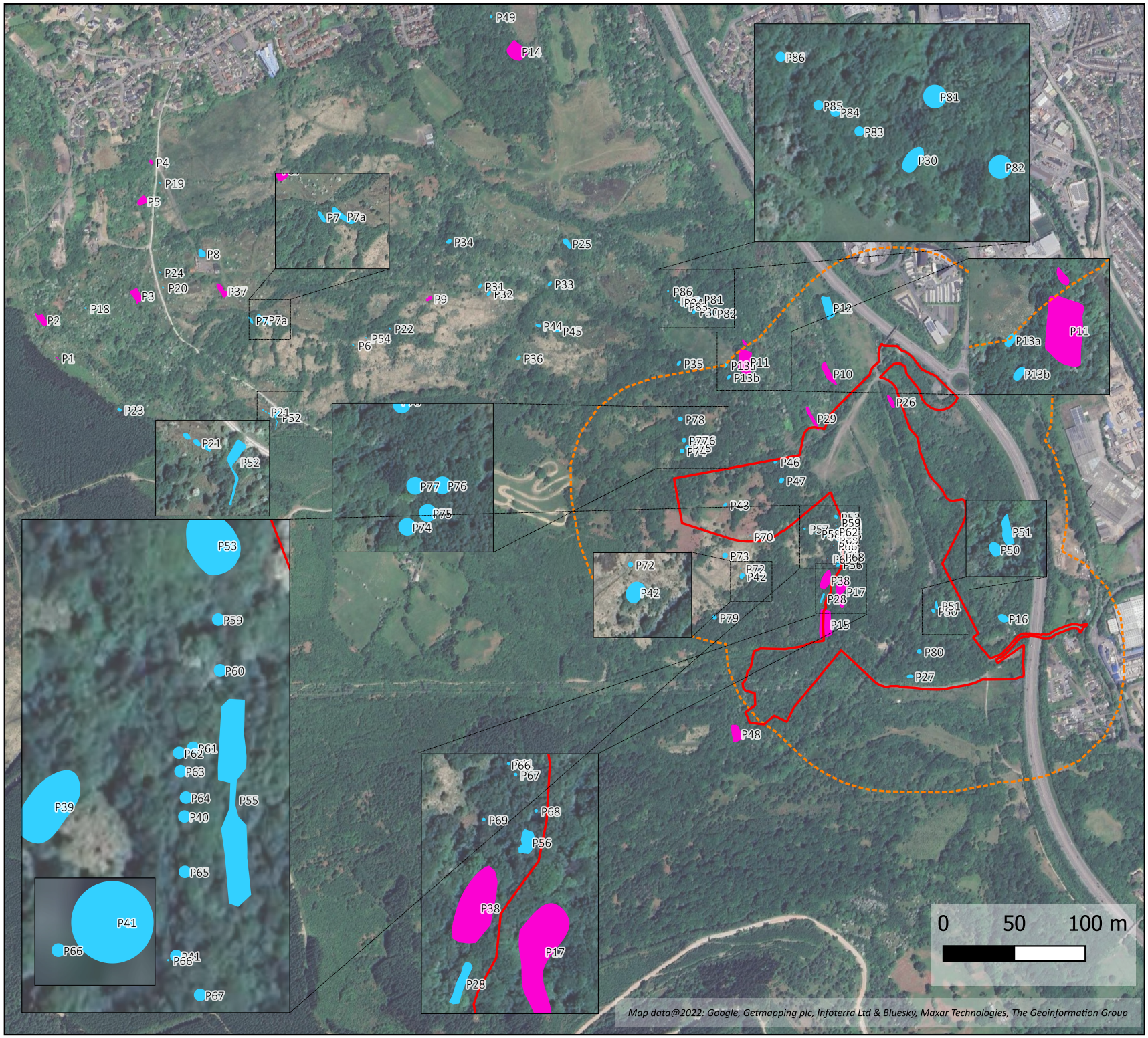
FIGURES



Key

- Application site
- 250m buffer
- Ponds with GCN present (identified via eDNA, torching, egg search or bottle trapping surveys between 2015 and 2021)
- Ponds where no GCN have been identified despite having either been targeted by appropriate surveys or scoped out as deemed approporiate for each individual waterbody

Title		
Great crested newt survey results (2015-2021)		
Project		Client
Rhydycar West		Marvel Ltd
Drawing No.	Revision	Project No.
Figure 1	-	E1835
Drawn	Checked	Date
CD	DW	April 2024

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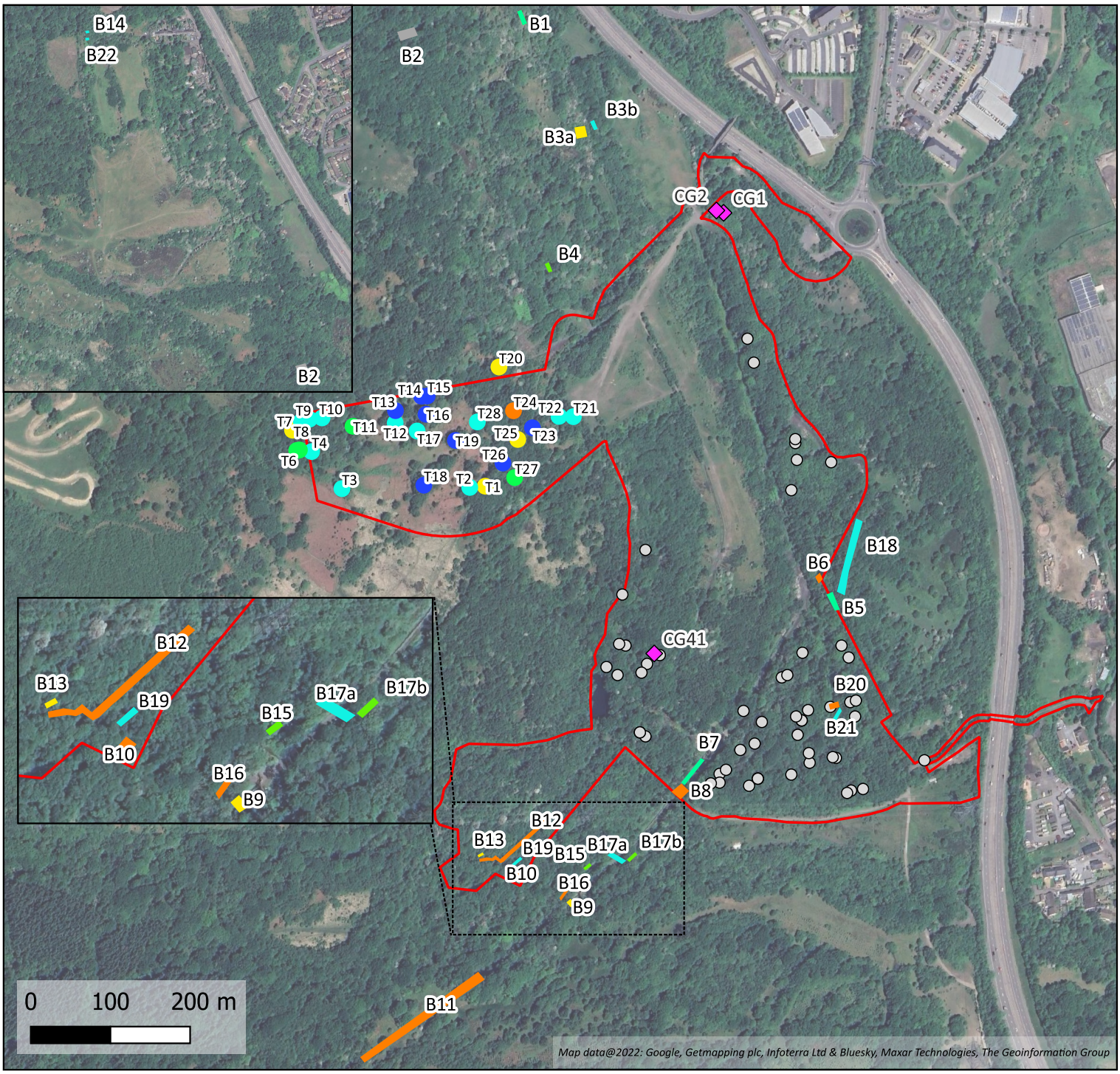

Key

Application site

Ground based tree roost assessment

- High
- Moderate-high
- Moderate
- Low-moderate
- Low

Climbed tree inspections

- Confirmed tree roost
- Tree subject to climbing inspection with no bats found

Building roosting potential

- High/confirmed roost
- High-moderate
- Moderate
- Moderate-low
- Low
- Low-negligible

For full details of tree and building inspections, see Appendix 2

Title		
Results of building and tree surveys for bat roosts 2015-2023		
Project		Client
Rhydycar West		Marvel Ltd
Drawing No.	Revision	Project No.
Figure 2	-	E1835
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APPENDIX 1

Cwm Glo a Glyndyrys, Merthyr Tydfil

Species Survey Report:

Great Crested Newt

February 2022

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Cwm Glo a Glyndrys, Merthyr Tydfil
Species Survey Report:
Great Crested Newt

February 2022
Bioscan Report No.
E1835-GCN-R1

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Figure 1 Application site location and pre-2021 survey areas

Figure 2 GCN Survey Results 2015-2021

APPENDICES

Appendix 1 Summary Survey Results (2015 – 2021)

Appendix 2 Location and Description of Ponds Identified in 2021

Appendix 3 Raw Habitat Suitability Index (HSI) Results (2021 and 2015)

Appendix 4 eDNA Results (2017 - 2021)

1 INTRODUCTION

1.1 Background

1.1.1 This report presents the results of surveys for newt species, principally great crested newts *Triturus cristatus* (GCN), carried out in 2015, 2017, 2018 and 2021 by Bioscan UK Ltd on the Marvel Ltd landholding at Cwm Glo a Glyndrys, Rhyd-y-car West, Merthyr Tydfil. The site has been known to support great crested newts since at least 1994, and therefore the purpose of the surveys has been to establish the current distribution and relative abundance of this species across the site to an extent sufficient to inform master planning, site promotion and subsequent impact assessments and planning determination, with reference to applicable industry standards.

1.1.2 The surveys form a component of a broader suite of ecological surveys carried out on the site between 2015 and 2021 to inform the design and ultimately assessment of proposals to redevelop parts of the site. The scope and scale of the proposed development has changed throughout the years and this is reflected in the extent of coverage of the GCN surveys carried out. For example, initially in 2015 the survey area encompassed a much larger area (~224ha) which included much of Cwm Glo and Rhyd-Y-Car West SINCs, and Cwm Glo a Glyndyrys SSSI to the north and west of the current application site. In contrast the current application site (~27ha) comprises much of the south-eastern corner of the original greater landholding (see **Figure 1**).

1.1.3 As such, while some results from previous survey years may not be directly relevant to the current (2021) application they are included for completeness. For clarity, ponds that were surveyed in previous years but are outside the 250m buffer for the current application site are shown in grey in tables within this report.

2 METHODOLOGY

2.1.1 The following paragraphs provide a technical overview of all survey methods employed between 2015-2021, while section 3 provides further detail of the survey techniques employed in each survey year.

2.2 Desk Study

2.2.1 Initially a desk-based exercise was undertaken in 2015 involving review of previous Environmental Statements and (where available), supporting amphibian survey reports, as well as recorded habitat information, in order to define the level of survey effort required to assemble an adequately representative dataset from which to define the baseline position as regards this species.

2.2.2 The main sources of data preceding Bioscan's involvement in the site from 2015 were the following:

- **David Clements Ecology Ltd (2006).** Merthyr Tydfil County Borough Sites of Importance for Nature Conservation (SO 00NW/7: Cwm Glo) Survey & Assessment for SINC Designation.

- **Merebrook Science and Environment (2008).** *Appendix 6.1: Baseline Ecological Report* **in:** Merthyr Village Limited Reclamation Scheme Land at Rhydycar, Merthyr Tydfil Environmental Statement.

2.2.3 These background data sources were further supplemented and updated by two desk-studies undertaken in 2018 and 2021. This comprised requests for existing ecological data relating to statutory designations and important habitats and species in the vicinity of the study area from the South East Wales Biodiversity Records Centre (SEWBReC). SEWBReC was contacted in April 2018 and again in May 2021 to request any information they held relating to statutory and non-statutory nature conservation designations within a 2km (5km in 2021) search radius from the centre of the study areas at the time. Protected and/or notable species records (including GCN) were also requested for this search area. This was supplemented by a search of Bioscan's own inhouse archives and available online resources, such as the government's MAGIC website[1].

2.3 Habitat Suitability Index

2.3.1 Each pond on the site has been subjected to a standardised assessment to evaluate its suitability to support great crested newts, based on the calculation of a Habitat Suitability Index (HSI) score following the methodology described by Oldham[2]. The HSI methodology attributes a score between 0 and 1 through application of ten suitability criteria derived from factors known to affect great crested newt presence or absence. An HSI score of >0.8

1 https://magic.defra.gov.uk/

2 Oldham, R.S., Keeble, J., Swan, M.J.S. & Jeffcote, M. (2000). Evaluating the suitability of habitat for the Great Crested Newt (Triturus cristatus). Herpetological Journal 10: 143-155.

indicates excellent pond suitability for occupation by great crested newts, while an HSI score of <0.5 indicates poor pond suitability. Whilst the efficacy of the HSI in predicting the presence of great crested newts is highly variable, particularly when out of the traditional 'core range' of the species as here, it does allow certain conclusions about the potential value of a pond to be drawn, albeit with caveats attached.

2.4 Presence/absence and population assessment surveys

2.4.1 Ponds identified for further survey were surveyed in accordance with standard survey methodologies[3] adapted in some instances to account for site specific conditions - in particular concern over hazardous conditions within and around some of the features derived from the former mining activity (see under 'limitations' below). The techniques employed were nocturnal searching of the waterbodies using high-powered torches (1 million candlepower), bottle trapping and egg searches. Wherever possible, surveys were conducted on nights with a minimum temperature of at least 5°C (in order to avoid nights during which newt activity levels may be reduced), and with minimal wind and no rain (avoiding conditions which can reduce the effectiveness of torchlight surveys).

2.4.2 Where GCN had not been previously recorded in a pond (and where none were found during the year of the survey), these were subject to an initial four visits to determine presence/absence. Survey effort followed industry standard guidance[4] wherever possible, with three methods (bottle trapping, torching, and egg searching) employed across four visits in suitable conditions, with at least two of these visits conducted in the peak season (mid-April to mid-May) for GCN.

2.4.3 Where GCN were present (either in that survey year or historically), then typically these ponds were subject to two further survey visits (therefore six visits in total) in order to determine a population size class estimate. As above, survey effort was based on industry standard guidance whereby bottle trapping and torching surveys were employed where possible, with three of the six surveys being conducted during peak season[5].

2.5 Environment DNA (eDNA) sampling

2.5.1 The eDNA technique is a method of assessing the presence of GCN in a waterbody by testing for the species' genetic marker in the water. it involves collecting water samples from a waterbody whilst strictly adhering to the survey protocols[6] and sending the sample to a specialist laboratory for analysis to determine if GCN DNA is present.

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3 Langton, T.E.S., Becket, C.L. and Foster, J.P. (2001). Great crested newt conservation handbook. Froglife, Halesworth.

4 English Nature (2001). Great Crested Newt Mitigation Guidelines. English Nature (now Natural England). Pg. 26. Para 5.7.1.1.

5 English Nature (2001). Great Crested Newt Mitigation Guidelines. English Nature (now Natural England). Pg. 26. Para 5.7.2.1.

6 Biggs, J., Ewald, N., Valentini, A., Gaboriaud, C., Griffiths, R.A., Foster, J., Wilkinson, J., Arnett, A., Williams, P. and Dunn, F. (2014). Analytical and methodological development for improved surveillance of the Great Crested Newt. Defra Project C1067. Freshwater Habitats Trust: Oxford.

3 SUMMARY OF SURVEY TECHNIQUES EMPLOYED 2015-2021

3.1 Background

3.1.1 Ordnance Survey (OS) maps, previous reports of survey work, information from landowners, aerial photographs and the results of a limited-scale initial walkover in January 2015 were used to locate an initial 15 ponds for survey in 2015. Through subsequent surveys and walkovers between 2015 and 2021 the number of ponds identified within the greater landholding increased to 86. 55 of these ponds fall either within the current application site, or within a 250m buffer from it.

3.1.2 The features indicated on **Figure 2** encompass a range of permanent or seasonal waterbodies, from very small and sometimes highly ephemeral pool features, such as depressions caused by collapsed historic bell-pits possibly as old as 17th century in origin, or areas of standing water caused by local topographical conditions, through to larger permanent features derived from former reservoirs constructed as part of the more intensive 19th century mining activity on the site.

3.2 2015 Surveys

3.2.1 The scope of the 2015 surveys encompassed the entirety of the greater landholding and thus resulted in a much larger sample of ponds than in some subsequent years. Survey effort was initially predicated on 15 ponds; however, during the course of the survey programme, some ponds initially identified for survey were not subsequently found while a more substantial number of additional ones were identified (primarily small features such as collapsed and flooded bell-pits). Ultimately, a total of 39[7] ponds were surveyed during 2015.

3.2.2 Following on from initial HSI assessments, presence/absence and population assessment surveys covering these 39 ponds took place over fourteen nights between the 6th May and 19th June 2015. **Table 1** details the prevailing survey conditions during 2015 and highlights the 16 ponds from this total that fall within the application site buffer area.

3.3 2017 Surveys

3.3.1 Following a refinement of the potential development boundary, surveys in 2017 focussed on the eastern half of the wider landholding. The 21 ponds present (and holding water) within this part of the site were subject to initial eDNA sampling on the 16th April and 4th May 2017. The three ponds returning positive results were then subject to presence/absence and population assessment surveys over six nights between 4th May 2017 and 14th June 2017. Two ponds returned inconclusive eDNA results, and thus were surveyed alongside the other three ponds as a precaution. **Table 2** details the prevailing

7 Two ponds shown in table 1, P23 and P33, was not surveyed at all during 2015 as it was dry for each survey after they were found.

survey conditions during 2017 and highlights the four ponds from this surveyed group that fall within the application site buffer area.

3.4 2018 Surveys

3.4.1 As per 2017, surveys in 2018 were focussed in the eastern half of the wider landholding and employed a two-phased approach whereby all ponds present and holding water were initially subject to eDNA sampling on the 24th April 2018 and then a subset underwent presence/absence and population assessment surveys if they returned positive eDNA results or had recorded GCN in previous years. In total, 14 ponds were subject to eDNA sampling and eight subsequently underwent bottle trapping and torching surveys over six nights between 24th April and 30th May 2018. **Table 3** details the prevailing survey conditions during 2018 and highlights the six ponds from this group that fall within the application site buffer area.

3.5 2021 surveys

3.5.1 Surveys conducted in 2021 were focussed in the south-eastern corner of the original wider landholding following further changes to the proposed development boundary. All ponds identified from desk-based sources and during previous surveys within the development boundary plus a 250m buffer were subject to eDNA sampling, where possible, on the 15th April 2021 (only those ponds which were found to be dry on 15th April 2021 were not subject to eDNA surveys). An updated HSI assessment was also undertaken during this visit. The proposed application site boundary underwent additional changes after surveys were conducted in 2021 and as a result, one pond (P48) surveyed in 2021 now falls outside the 250m application site buffer.

3.5.2 In total, 19 ponds were subject to eDNA sampling. As in previous years all ponds returning a positive eDNA result were subject to further presence/absence and population assessment surveys. A precautionary approach was also taken in recognition of the possibility of a delayed start to the newt breeding season due to a colder and drier than usual start to spring in 2021. As such, it was decided to also undertake torch surveys of the ponds where GCN had been recorded in previous years to safeguard against the possibility of a 'false negative' from the eDNA sampling.

3.5.3 Consequently, survey effort initially focussed on seven ponds. Bottle trapping, and/or torching surveys of these features was undertaken over six nights between the 29th April and the 7th June 2021, with an egg search also being carried out on the 7th June. **Table 4** details the prevailing survey conditions during 2021 for these ponds. During the course of the survey programme, a number of additional small and varyingly ephemeral ponds were identified following periods of wet weather. Two of these ponds had been identified in previous years (P26 and P56) but most were 'new' and consisted of very small wet woodland depressions, or collapsed historic bell-pits. As such they were precluded from bottle-trapping surveys due to safety concerns and/or limited water depth. Despite their limited suitability for GCN most waterbodies were subject to torching surveys as a

precaution on all subsequent GCN surveys when they were not dry (see **Appendices 1 and 2** for detail).

3.6 Limitations

3.6.1 The size, habitat complexity, effects of habitat succession since the mid-1990s and absence of prior records of a large proportion of the ponds on the site gave rise to a number of challenges that ultimately translated into limitations on the scope and coverage of the surveys carried out between 2015 and 2021, in some instances resulting in survey coverage differing from best practice guidelines. The following paragraphs provide a summary of the limitations related to ponds within the 250m buffer of the current application site. For full survey details of all ponds see **Appendix 1**.

3.6.2 The ephemeral nature of, and difficulty in finding, some ponds within the application site, combined with variable spring weather patterns resulted in several ponds not receiving the full suite of surveys (four for presence/absence, or six for population size class estimates) between 2015 and 2021. This often also meant that these ponds did not receive the recommended number of visits during the peak season too, due either to them drying up, being found only late in the season, or only holding water intermittently. Specifically;

- In 2015 eight ponds (P26, P27, and P38-P43) did not receive or the recommended visits in the mid-April to mid-May peak season window (see **Table 1**). A further three ponds (P28-P30) also did not receive the recommended number of visits during the peak season window due to their late discovery, but they did subsequently receive a full suite of four or six survey visits.

- In 2017 three ponds (P13b, P26, P29) dried out and thus did not receive the minimum four survey visits or the recommended visits in the mid-April to mid-May peak season window (see table 2). Prolonged dry conditions throughout June 2017 also precluded any additional surveys being carried out before the end of the GCN survey season in this year.

- In 2021 two ponds (P26 and P29) did not receive the recommended four or six survey visits (see table 4) as they were dry on several survey visits (see **Appendix 1** for detail).

3.6.3 The ephemeral nature of the ponds also impacted the survey techniques that could be implemented. For example, low water levels precluded the use of bottle trapping in several cases (see **Appendix 1** for detail). Similarly, bottle trapping was not employed at all in several ponds due to safety concerns as to the stability of some bell pit ponds or, in one case, to the suspected presence of a fungal disease within the waterbody and concerns over contamination (P15 in 2018). However, the small size of most of these ponds and/or their good visibility meant that torching was a reliable technique to determine presence/absence in these cases[8].

8 Langton, T.E.S., Becket, C.L. and Foster, J.P. (2001). Great crested newt conservation handbook. Froglife, Halesworth. Pg 45.

3.6.4 Additionally, seven of the 'new' ponds found in 2021 were not subject to any surveys (P74-P80 in **Appendices 1 and 2**) as they were not present/found until mid-way through May and had dried up before the following GCN survey visit. Given their extremely ephemeral nature it is unlikely that these waterbodies would be of significance to resident GCN populations, and thus this is not considered a major limitation.

3.6.5 Finally, whilst surveys were targeted for nights with suitable temperature conditions, on a few nights the temperature dropped below 5°C. However, given site's location in the South Wales valleys, and the prevailing temperatures at such elevations in early spring, such conditions are not atypical and were noted not to suppress or preclude newt activity.

3.6.6 Overall, whilst the scope of the GCN surveys carried out by Bioscan has deviated from standard guidelines in some cases, it is not believed that this has serious consequences for the validity of the findings due to the amount of data amassed from repeatedly surveying the site over four years. However, in recognition of fewer than six surveys being carried out at some ponds and/or more than three being outside peak season, population size classes are treated as a minimum estimate in these instances.

4 SURVEY CONDITIONS

4.1.1 Table 1 below provides the details of bottle trapping and torching surveys conducted in 2015.

Table 1. GCN survey conditions (2015)[9]

Date	07/05/2015			13/05/2015			20/05/2015			26/05/2015			04/06/2015			10/06/2015			17/06/2015			18/06/2015		
Conditions / Pond ID	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C
P1	0	0	3	0	0	6.5	0	0	6	0	0	7.5	DRY			DRY			NS			NS		
P2	1-2	3	3	2	3	6.5	2	3	6	2	3	7.5	2	3	10	2	3	7.5	NS			NS		
P3	3	0	3	3	0	6.5	3	0	6	3	2	7.5	3	2	10	3	2	7.5	NS			NS		
P4	0	0	3	0	0	6.5	0	0	6	0	1	7.5	0	2	10	0	3	7.5	NS			NS		
P5	0	0	3	0	0	6.5	0	0	6	0	1	7.5	0	2	10	0	2	7.5	NS			NS		
P6	0	0	3	0	0	6.5	0	0	6	0	0	7.5	NS			NS			NS			NS		
P7	0	2	3	0	2	6.5	0	2	6	0	2	7.5	NS			NS			NS			NS		
P7a	0	4	3	0	4	6.5	0	4	6	0	4	7.5	NS			NS			NS			NS		
P8	0	2-3	3	0	2-3	6.5	0	2-3	6	0	2-3	7.5	NS			NS			NS			NS		
P9	2	0	3	2	0	6.5	2	0	6	2	0	7.5	2	1	10	2	1	7.5	NS			NS		
P18	4	0	3	4	0	6.5	4	0	6	4	0	7.5	NS			NS			NS			NS		
P19	NF			0	0	6.5	0	0	6	0	0	7.5	0	0	10	NS			NS			NS		
P20	0	0	3	0	0	6.5	0	0	6	0	0	7.5	NS			NS			NS			NS		
P21	0	0	3	0	0	6.5	0	0	6	0	0	7.5	NS			NS			NS			NS		
P22	2	0	3	2	0	6.5	2	0	6	2	0	7.5	NS			NS			NS			NS		
P23	NF			DRY			DRY			DRY			NS			NS			NS			NS		
P24	0	0	3	0	0	6.5	0	0	6	DRY			NS			NS			NS			NS		
P25	NF			NF			3-4	0	6	3-4	0	7.5	3-4	0	10	3-4	0	7.5	NS			NS		
P26	NF			NF			0	0	9	DRY			DRY			DRY			NS			NS		
P27	NF			NF			1	1	9	2 -3	1	7.5	DRY			DRY			NS			NS		
P31	NF			NF			NF			DRY			0	0	10	DRY			NS			NS		
P32	NF			NF			NF			2	0	7.5	0	0	10	0	0	7.5	DRY			DRY		
P33	NF			NF			NF			DRY			DRY			DRY			NS			NS		
P36	NF			NF			NF			NF			1	1	10	1	1	7.5	1	2	10	1	2	5.5
P37	NF			NF			NF			NF			1	1	10	1	1	7.5	NS			NS		
P54	0	2	3	0	2	6.5	0	2	6	0	2	7.5	NS			NS			NS			NS		

9 For clarity ponds outside the 2021 250m buffer are shown in grey.

Date		06/05/2015			14/05/2015			20/05/2015			26/05/2015			03/06/2015			11/06/2015			17/06/2015			18/06/2015		
Conditions		Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C
Pond ID	P10	0	0	6	0	0	7	0	0	3.5	0	0	7.5	NS			NS			NS			NS		
	P12	1	0	6	1	0	7	1	0	9	1	0	7.5	NS			NS			NS			NS		
	P14	0	0	3	0	0	6.5	0	0	6	0	0	7.5	0	1	2	0	2	14	NS			NS		
	P15	3	0	6	3	0	7	3	0	9	3	0	7.5	NS			NS			NS			NS		
	P16	0	0	6	0	0	7	0	0	9	0	0	7.5	NS			NS			NS			NS		
	P17	3	0	6	3	0	7	3	0	9	3	0	7.5	NS			NS			NS			NS		
	P28	NF			NF			0	0	9	0	0	7.5	0	0	2	0	0	14	NS			NS		
	P29	NF			NF			0	0	9	0	0	7.5	1	0	2	1	0	14	1	0	10	1	0	5.5
	P30	NF			NF			1	1	9	1-2	1	7.5	1	1	2	1-2	1	14	NS			NS		
	P41	NF			NF			NF			NF			0	0	2	DRY			NS			NS		
	P42	NF			NF			NF			NF			NF			1	1	14	NS			NS		
	P43	NF			NF			NF			NF			NF			1	1	14	NS			NS		

Table 1: GCN survey conditions (2015) cont.

Date		06/05/2015			14/05/2015			20/05/2015			26/05/2015			04/06/2015			11/06/2015		
Conditions		Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C
Pond ID	P38	NF			NF			NF			NF			1	0	2	0	0	14
	P39	NF			NF			NF			NF			3	1	2	DRY		
	P40	NF			NF			NF			NF			2	1	2	2	1	14

NF = Not found, NS = Not surveyed

4.1.2 **Table 2** below provides the details of bottle trapping and torching surveys conducted in 2017.

Table 2: GCN survey conditions (2017)[10]

Date		04/05/2017			11/05/2017			23/05/2017			01/06/2017			06/06/2017			14/06/2017		
Conditions		Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C
Pond ID	P11	1	2	6	DRY			1	2	9.5	DRY			1	1	9	1	2	9
	P26	DRY			DRY			DRY			DRY			1	1	9	1	1	9
	P30	DRY			DRY			1	0	9.5	DRY			1	0	9	1	0	9
	P13b	DRY			DRY			DRY			DRY			0	0	9	DRY		
	P29	4-5	1	6	DRY			4-5	1	9.5	DRY			DRY			DRY		

4.1.3 **Table 3** below provides the details of bottle trapping and torching surveys conducted in 2018.

Table 3: GCN survey conditions (2018)[11]

Date		24/04/2018			30/04/2018			03/05/2018			10/05/2018			22/05/2018			30/05/2018		
Conditions		Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C
Pond ID	P11	2	2	5.5	2	2	1.5	2	2	9	3	3	0.5	3	3	6	2	2	14.5
	P14	2	3	5.5	2	3	1.5	2	3	9	2	3	0.5	2	3	6	2	3	14.5
	P15	2	1	5.5	2	0	1.5	2	0	9	1	1	0.5	2	1	6	2	1	14.5
	P29	4	3	5.5	4	3	1.5	5	3	9	3	4	0.5	4	4	6	4	4	14.5
	P38	2	1	5.5	2	1	1.5	2	1	9	2	5	0.5	DRY			DRY		
	P48	3	3	5.5	2	3	1.5	2	3	9	2	3	0.5	3	4	6	2	3	14.5
	P55	2	1	5.5	2	1	1.5	2	1	9	2	1	0.5	2	1	6	2	1	14.5
	P56	2	2	5.5	1	2	1.5	3	3	9	2	4	0.5	DRY			1	4	14.5

10 For clarity ponds outside the 2021 250m buffer are shown in grey.

11 For clarity ponds outside the 2021 250m buffer are shown in grey.

4.1.4 **Table 4** below provides the details of bottle trapping and torching surveys conducted in 2021.

Table 4: GCN survey conditions (2021)

Date		29/04/2021			05/05/2021			10/05/2021			17/05/2021			27/05/2021			07/06/2021		
Conditions		Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/oC	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C	Turbidity	Vegetation cover	Air temperature/°C
Pond ID	**P10**	1-2	1	5.5	0-1	4	3.5	1	4	8.5	1	4	8	0	4	14	1-2	3	12
	P11	2	1	5.5	0	1	3.5	2	1	8.5	0	1	8	0-1	1	14	2	1	12
	P15	1-2	1	6	2	1	3.5	4-5	1	8.5	4-5	1	8	3	1	14	1	1	12
	P26	DRY			DRY			0	0	8.5	0	0	8	0	0	14	DRY		
	P29	DRY			5	4	3.5	5	3	8.5	5	3	8	0-1	3	14	4	3	12
	P38	DRY			0	0	3.5	0	0	8.5	0	0	8	0	0	14	DRY		
	P48	1	3	6	0	3	3.5	0	3	8.5	0	3	8	1	3	14	1	3	12

5 RESULTS

5.1 Desk Study

5.1.1 The site was subject to a number of great crested newt surveys between 1994 and 2008. The results of these, as reported in background source documents (2.1.2), are briefly summarised in chronological order below, with reference to the pond numbers shown on **Figure 2**;

- 1994. Great crested newt records provided by the then Countryside Council for Wales (CCW) (to consultants acting for a previous landowner) for P3, P4, P5, P7 and P7a.
- 1997. The southern and central areas of the site were surveyed including P10, 11, 12, 13, 15 and 16 as well as "several" other bell-pits and depressions and P48 outside the south-west corner of the site. A single great crested newt was recorded in P6 and three great crested newts were recorded in P48. Great crested newts were also recorded in P3, P4, P5, and P7 during surveys carried out by CCW in this year.
- 1998. Great Crested newts recorded by the Wildlife Trust at P15.
- 2002. "Several" waterbodies within the site, including waterbodies where no great crested newts had previously been found, were surveyed. The survey confirmed continued presence of GCN within the site and no additional ponds were found to support great crested newt other than those already known.
- 2005. A "comprehensive" re-survey of waterbodies within the site was undertaken by consultants White Young Green with great crested newt found in P1, P2, P9 and P11, in addition to those waterbodies already confirmed by previous surveys (P3, P4, P5, P6, P7 and P7a).
- 2007. Ponds P10, 11, 12, 13, 15 & 16 were surveyed and no great crested newts were recorded.
- 2008. Environmental Statement produced by Merebrook Science and Environment Limited for Merthyr Village Limited reported that "*Surveys undertaken since 1997 have found great crested newts to be present in thirteen of the seventeen ponds within the site with a further pond*[12] *with great crested newts just outside the application area to the south-west*". It was also reported that "*In the wider area there are known populations to the north (Tragor Mills), north-west (Wynch Fawr) and south (Gethin Woods)*".

12 This is pond P48 with reference to **Figure 2**.

5.1.2 In addition, data from SEWBReC shows 60 records of great crested newt within a 2km radius from the current application site. These records range from 1986 to 2020 including two records of GCN in P15 from 2001 which are in addition to the records presented above.

5.2 Habitat Suitability Index Results

2015

5.2.1 In 2015 the Habitat Suitability Index assessment found 20 ponds on the site to be of average to excellent suitability for great crested newts, with the ponds assessed to be below average to poor suitability. The raw HSI data can be found at **Appendix 3**.

2021

5.2.2 In 2021 the Habitat Suitability Index assessment found six the ponds (including highly ephemeral bell-pits) to be of average to excellent suitability for supporting great crested newts, with the remaining ponds assessed to be below average to poor suitability. The raw HSI data can be found at **Appendix 3**.

5.3 eDNA results

2017

5.3.1 Of the 21 ponds surveyed by eDNA methods in 2017, three (P26, P11, P29) returned a positive result, two (P30, P13b) were inconclusive and the remainder returned negative results. For full results see **Appendix 4**.

2018

5.3.2 Of the 14 ponds surveyed by eDNA methods in 2018, four (P15, P48, P17, P38) returned a positive result while the remainder were negative. For full results see **Appendix 4**. Note while P17 returned positive eDNA results in 2018, by the time further surveys were carried out water levels in and around P17 had risen such that it was a flowing watercourse and thus not suitable for GCN. As such P17 was not surveyed further in this year.

2021

5.3.3 Of the 19 ponds subject to eDNA survey, two (P29 and P10) returned a positive result. Fifteen were negative and a further two (P36, P45) were inconclusive. While P36 and P45 returned inconclusive results, they were not surveyed further as they are outside the 250m buffer zone for the current application site boundary. For full results see **Appendix 4**.

5.4 Presence/absence and population assessment results

2015

5.4.1 Nine of the 39 ponds surveyed were found to contain populations of great crested newts, including one confirmed breeding population (P5). A further fifteen ponds were found to

contain palmate and/or smooth newt, with sixteen ponds recording no newts of any species. **Figure 2** shows the results of the surveys with **Table 5** below showing the ponds containing great crested newts and the maximum count for each pond.

Table 5: Ponds with positive returns for GCN (2015).[13]

Pond Reference	Maximum Count	Breeding confirmed (GCN eggs present or egg laying observed)
P1	1	N
P2	2	N
P3	3	N
P4	1	N
P5	42	Y
P9	1	N
P14	1	N
P29	3	N
P37	2	N

2017

5.4.2 Of the four ponds surveyed in 2017, only one was found to contain a population of great crested newts while two contained populations of smooth/palmate newt and two recorded no newts of any species. **Figure 2** shows the results of the surveys with **Table 6** below showing the ponds containing great crested newts and the maximum count for each pond.

Table 6: Ponds with positive returns for GCN (2017).[14]

Pond Reference	Maximum Count	Breeding confirmed (GCN eggs present or egg laying observed)
P11	1	N

2018

5.4.3 Of the eight ponds surveyed in 2018, three were found to contain populations of great crested newts, including one confirmed breeding population (P29), while all eight contained populations of smooth/palmate newt. **Figure 2** shows the results of the surveys with **Table 7** below showing the ponds containing great crested newts and the maximum count for each pond.

13 For clarity ponds outside the 2021 250m buffer are shown in grey.

14 For clarity ponds outside the 2021 250m buffer are shown in grey.

Table 7: Ponds with positive returns for GCN (2018).[15]

Pond Reference	Maximum Count	Breeding confirmed (GCN eggs present or egg laying observed)
P11	1	N
P29	3	Y
P48	1	N

2021

5.4.4 Of the seven ponds surveyed in 2021, three were found to contain populations of great crested newts, including one confirmed breeding population (P29), while six contained populations of smooth/palmate newt and one recorded no newts of any species. **Figure 2** shows the results of the surveys with **Table 8** below showing the ponds containing great crested newts and the maximum count for each pond.

Table 8: Ponds with positive returns for GCN (2021)[16].

Pond Reference	Maximum Count	Breeding confirmed (GCN eggs present or egg laying observed)
P11	1	N
P29	5	Y
P48	1	N

Summary

5.4.5 Between 2015 and 2021, GCN have been identified in seven ponds within the current application site and 250m buffer area, via eDNA, bottle trapping, torching, and/or egg search surveys. Of the ponds where GCN have been identified the maximum count across all survey years was observed in P29 (5). This was also the only pond where breeding was confirmed.

Table 9: Summary results for ponds with GCN present (2015-2021) within the application site and 250m buffer[17]

Pond Reference	eDNA positive	Maximum Count of Adult GCN (across all survey years)[18]	Breeding confirmed (GCN eggs present or egg laying observed)
P10	2021	0	N
P11	2017	1	N
P15	2018	0	N
P17	2018	0	N
P26	2017	-	N
P29	2017, 2019	5	Y – 2018 & 2021
P38	2018	0	N

15 For clarity ponds outside the 2021 250m buffer are shown in grey.
16 For clarity ponds outside the 2021 250m buffer are shown in grey.
17 For clarity ponds outside the 2021 250m buffer are shown in grey.
18 Where GCN were not found (during bottle trapping/torching/egg search surveys) in ponds that did not receive full set of four or six surveys in any year, maximum count is indicated by '-'.

6 DISCUSSION AND CONCLUSIONS

6.1.1 Great crested newts have consistently been confirmed as present (in 2015, 2018, and 2021) in an ephemeral ditch (P29) at the northern edge of the current application site. A small population was confirmed in 2015, and whilst the full number of population assessment surveys was precluded during subsequent years due to dry conditions, the maximum counts (three and five individuals) indicate that this is the focus for a small breeding, population which also uses P26 and P10 at times.

6.1.2 The situation elsewhere is more difficult to explain. Taking into account the results of all four survey years and historic data together it suggests a scatter of satellite or separate population nuclei spread throughout the application site and 250m buffer that may or may not be sustainable in the longer term.

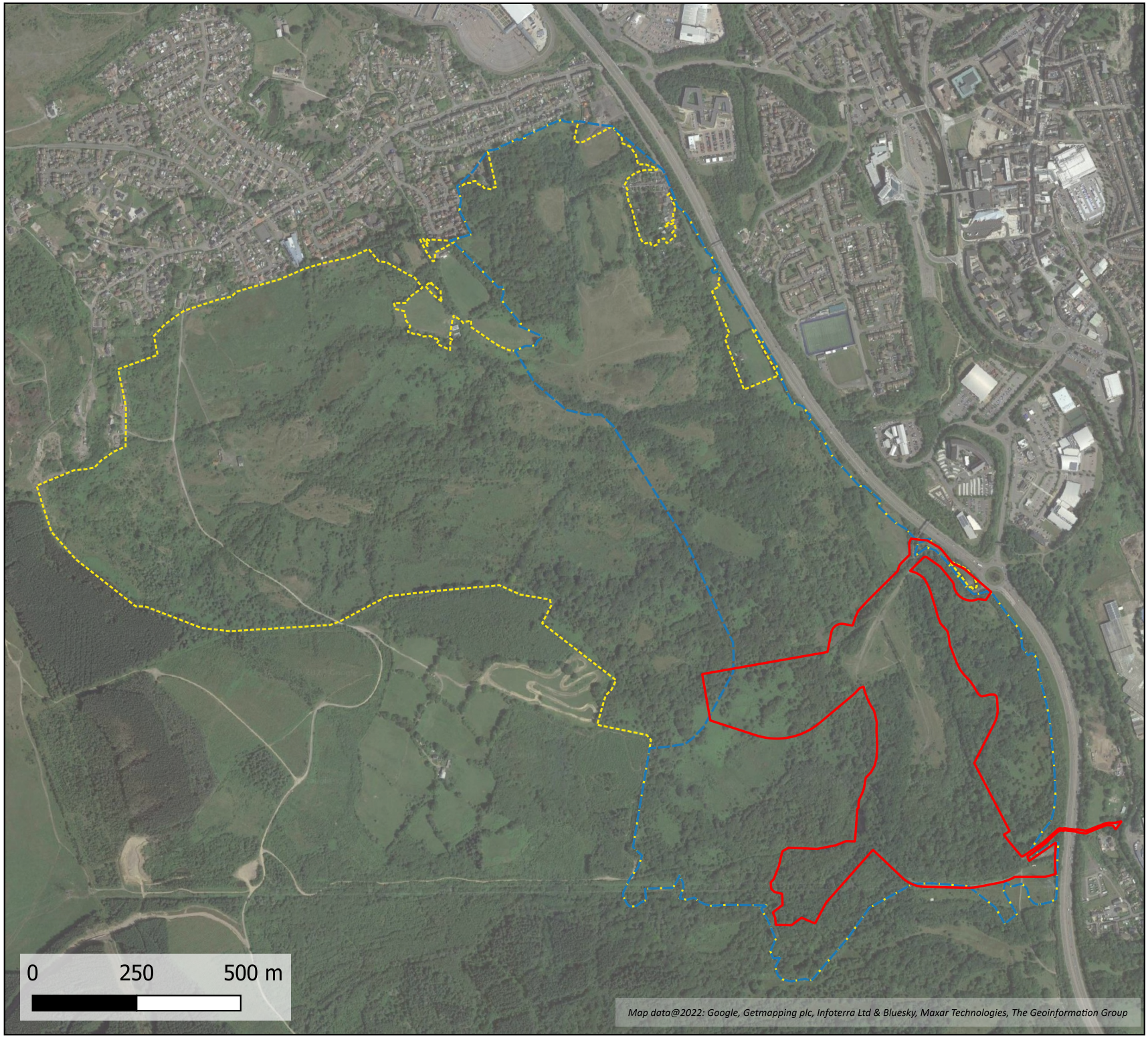
6.1.3 The data suggests that a former reservoir, P11 (around 240m to the north of the application site) may be used transiently by GCN during the breeding season but does not support a breeding population itself. Single GCN were found here in 2017 (female), 2018 (male) and 2021 (female), though breeding has not been confirmed in any survey year. This may be a relict population surviving in a residual state as P11 has become more unsuitable over time. The population may have transferred its focus to P29.

6.1.4 A similar explanation may apply to the cluster of ponds P17, P10, P15 and P38 at the south-western edge of the application site. These have all returned positive eDNA results between 2017 – 2021, but no GCN have been observed over that time via torching or bottle trapping surveys. P15 supports fish so is highly suboptimal for the species, but it has historic GCN records and may have once been more suitable. It is possible there is a relict population here, surviving in the face of fish having been introduced to P15 by anglers some decades ago, but it is difficult to see how it can sustain itself without recruitment from the wider area.

6.1.5 In summary, the results of the surveys carried out between 2015 and 2021 suggest there is a small core breeding pond at the northern edge of the current application site and a possible additional relict population at the south-western edge. The terrestrial range of newts from these focal points is likely to encompass much of the application site. However, newts are also present in the greater landholding extending beyond the application site with an increasing likelihood of animals being present as one moves away from the south and east, significantly limiting the scope for significant effects from the proposed development.

6.1.6 Great crested newts are protected under The Conservation of Habitats and Species Regulations 2017 (as amended), and the Wildlife and Countryside Act 1981 (as amended). They are also Species of Principal Importance under Section 7 of the Environment (Wales) Act 2016.

Figure 1
Application site location and pre-2021 survey areas



Key

- Application site
- Wider landholding/2015 survey area
- 2017/18 survey area

Title

Application site location and pre-2021 survey areas

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 1	2	E1835

Drawn	Checked	Date
WH	DW	November 2023

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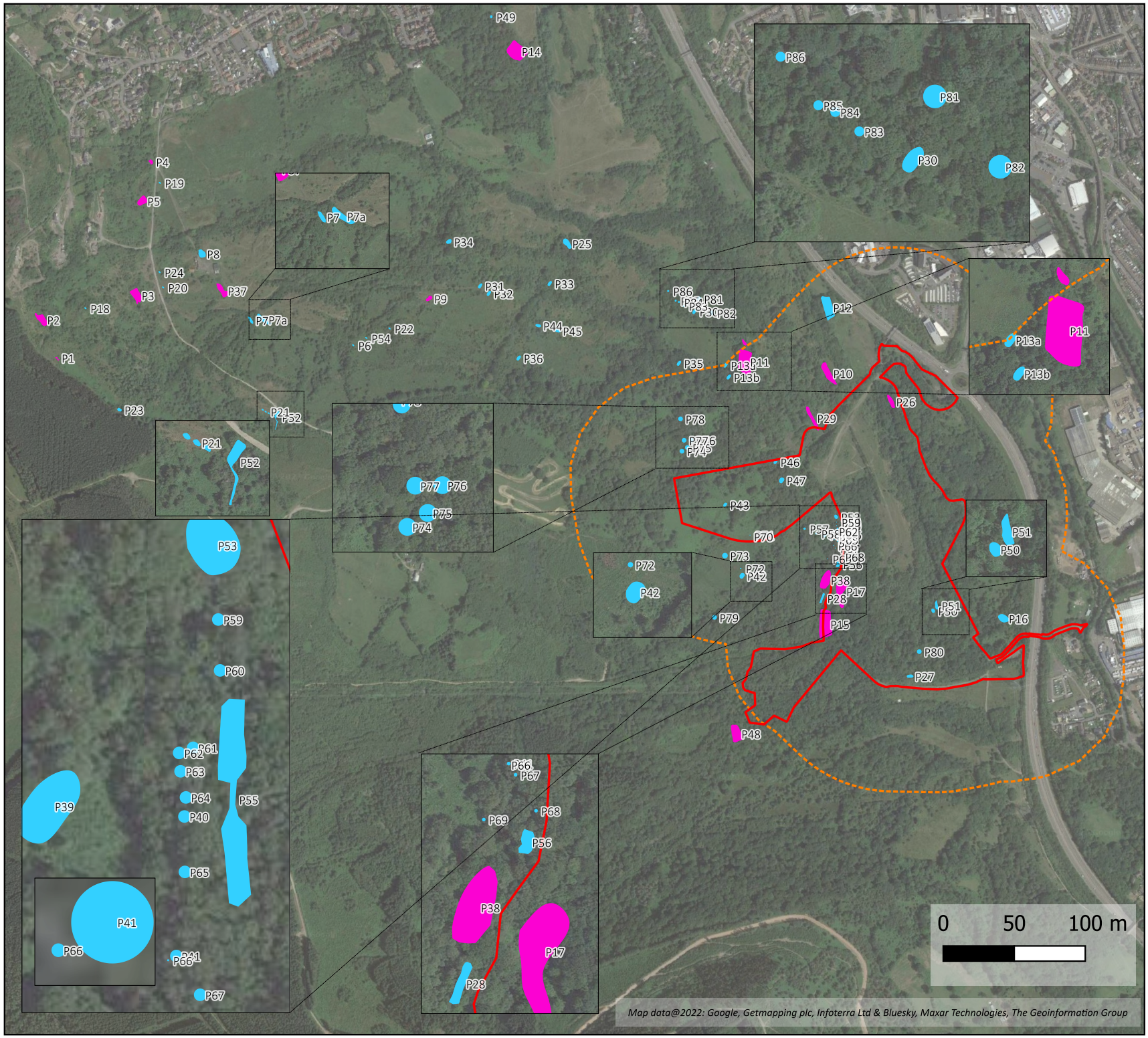
Figure 2
GCN survey results 2015-2021



Key

- Application site
- 250m buffer
- Ponds with GCN present (identified via eDNA, torching, egg search or bottle trapping surveys between 2015 and 2021)
- Ponds where no GCN have been identified despite having either been targeted by appropriate surveys or scoped out as deemed approporiate for each individual waterbody

Title		
Great crested newt survey results (2015-2021)		
Project		Client
Cwm Glo		Marvel Ltd
Drawing No.	Revision	Project No.
Figure 2	-	E1835
Drawn	Checked	Date
CD	DW	November 2023

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Appendix 1

Summary Survey Results (2015- 2021)

Appendix 1: Summary Survey Results 2015-2021

Survey results from all ponds surveyed between 2015-2021 are included for context. See figure 2 for ponds within the current 250m application site buffer

2015 - Summary surveys and results for all waterbodies identified during 2015 survey season

Pond Ref.	Survey techniques	No. of visits (BT,T)	HSI	GCN (BT, T OR ES)	GCN breeding (BT,T OR ES)	Other newts (BT,T OR ES)	1st Survey (BT,T)	2 in peak (BT,T)	Below min temp (BT,T)	Dried up (BT,T)	Fenced/ Access limited	Notes
P1	BT+T+ES	4	Good 0.76	Y	N	P	07/05/15	Y	Y -1	N	N	
P2	BT+T+ES	6	Good 0.76	Y	Y	P	07/05/15	Y	Y -1	N	N	
P3	BT+T+ES	6	Excellent 0.84	Y	N	-	07/05/15	Y	Y -1	N	N	
P4	BT+T+ES	6	Excellent 0.85	Y	N	P	07/05/15	Y	Y -1	N	N	
P5	BT+T+ES	6	Excellent 0.84	Y	Y	P	07/05/15	Y	Y -1	N	N	Larvae found
P6	T	1	Poor 0.44	N	N	-	07/05/15	N	Y -1	Y	Y	Dried up after 1st survey
P7	BT+T+ES	4	Average0 .61	N	N	P	07/05/15	Y	Y -1	N	N	
P7a	T+ES	4	Good 0.78	N	N	-	07/05/15	Y	Y -1	N	N	Too shallow to trap
P8	BT+T+ES	4	Excellent 0.82	N	N	P	07/05/15	Y	Y -1	N	N	
P9	BT+T+ES	6	Excellent 0.82	Y	N	P	07/05/15	Y	Y -1	N	N	
P10	BT+T+ES	4	Excellent 0.81	N	N	P	06/05/15	Y	Y -1	N	N	
P11	Not surveyed											Indicated on previous survey plans but not found in 2015
P12	BT+T+ES	4	Excellent 0.84	N	N	S/P	06/05/15	Y	Y -1	N	N	S/P only seen torching so not possible to distinguish

Pond Ref.	Survey techniques	No. of visits (BT,T)	HSI	GCN (BT, T OR ES)	GCN breeding (BT,T OR ES)	Other newts (BT,T OR ES)	1st Survey (BT,T)	2 in peak (BT,T)	Below min temp (BT,T)	Dried up (BT,T)	Fenced/ Access limited	Notes
P13	Not surveyed											Indicated on previous survey plans but not found in 2015
P14	BT+T+ES	6	Good 0.74	Y	N	S+P	06/05/15	Y	Y -2	N	N	
P15	BT+T+ES	4	Below average 0.56	N	N	S/P	06/05/15	Y	Y -1	N	N	S/P only seen torching so not possible to distinguish. Presence of stickleback fish
P16	BT+T+ES	BTx1, Tx3 Total = 3	Good 0.77	N	N	-	06/05/15	Y	N	Y	N	Dried up after 3rd survey
P17	BT+T+ES	4	Below average 0.59	N	N	P	06/05/15	Y	Y -1	N	N	
P18	T	4	Below average 0.54	N	N	-	07/05/15	Y	Y -1	N	Y	
P19	BT+T+ES	4	Below average 0.58	N	N	S/P	13/05/15	N	N	N	N	Discovered late. S/P only seen collecting bottles so not possible to distinguish.
P20	T	3	Average 0.62	N	N	-	07/05/15	Y	Y -1	Y	Y	Dried up after 3rd survey
P21	T+ES	4	Below average 0.55	N	N	-	07/05/15	Y	Y -1	N	N	Too shallow to trap
P22	BT+T+ES	3	Poor 0.45	N	N	-	07/05/15	Y	Y -1	Y	N	Dried up after 3rd survey

Pond Ref.	Survey techniques	No. of visits (BT,T)	HSI	GCN (BT, T OR ES)	GCN breeding (BT,T OR ES)	Other newts (BT,T OR ES)	1st Survey (BT,T)	2 in peak (BT,T)	Below min temp (BT,T)	Dried up (BT,T)	Fenced/ Access limited	Notes
P23	Not surveyed	0	Poor 0.43							Y	N	It was dry when discovered.
P24	BT+T+ES	Tx3, BTx1 Total = 3	Average 0.65	N	N	S	07/05/15	Y	Y -1	Y	N	Too shallow to trap after 1st survey; dried up after 3rd survey
P25	T	4	Average 0.61	N	N	P	20/05/15	N	N	N	Y	Pond margins not safe, discovered late
P26	T+ES	1	Below average 0.59	N	N	-	20/05/15	N	N	Y	N	Discovered late, dried up after 1st survey
P27	T+ES	2	Poor 0.49	N	N	-	20/05/15	N	Y -1	N	N	Discovered late, just damp ground at 2nd survey
P28	BT+T+ES	BTx2, Tx4 Total = 4	Good 0.72	N	N	P	20/05/15	N	Y -1	N	N	Found late, too shallow for the first 2 surveys.
P29	BT+T+ES	BTx4, Tx6 Total = 6	Average 0.62	Y	N	S	20/05/15	N	Y -2	N	N	Found late, too shallow for the first 2 surveys.
P30	BT+T+ES	BTx1, Tx4 Total = 4	Below average 0.56	N	N	S/P	20/05/15	N	Y -2	N	N	Found late, too shallow to trap on first 2 surveys and on the 4th. S/P only seen torching so not possible to distinguish.
P31	T	1	Poor 0.40	N	N	-	26/05/15	N	N	Y	N	Discovered late, water level too low to trap and then dried up.
P32	BT+T+ES	3	Poor 0.48	N	N	-	26/05/15	N	N	Y	N	Discovered late

Pond Ref.	Survey techniques	No. of visits (BT,T)	HSI	GCN (BT, T OR ES)	GCN breeding (BT,T OR ES)	Other newts (BT,T OR ES)	1st Survey (BT,T)	2 in peak (BT,T)	Below min temp (BT,T)	Dried up (BT,T)	Fenced/ Access limited	Notes
P33	T	3	Poor 0.47	N	N	-	26/05/15	N	N	Y	N	Soaked moss, discovered late
P34	Not surveyed		Not found									Found after the completion of newt surveys.
P35	Not surveyed		Not found									Found after the completion of newt surveys.
P36	T	4	Below average 0.57	N	N	-	04/06/15	N	N	N	Y	Discovered late
P37	BT+T+ES	2	Below average 0.57	Y	N	P	04/06/15	N	N	N	N	Discovered late
P38	BT+T+ES	BTx1, Tx2 Total = 2	Poor 0.48	N	N	-	04/06/15	N	Y -1	N	N	Discovered late
P39	BT+T+ES	1	Poor 0.39	N	N	-	04/06/15	N	Y -1	N	N	Discovered late
P40	BT+T+ES	BTx1, T2 Total = 2	Poor 0.39	N	N	S/P	04/06/15	N	Y -1	N	N	Discovered late. S/P only seen torching so not possible to distinguish
P41	BT+T+ES	1	Poor 0.39	N	N	-	04/06/15	N	Y -1	Y	N	Discovered late. Dried up after 1st survey
P42	T	1	Poor 0.61	N	N	S/P	11/06/15	N	N	N	Y	Discovered late. Pond margins not safe. S/P only seen torching so not possible to distinguish
P43	T	1	Poor 0.57	N	N	-	11/06/15	N	N	N	Y	Discovered late. Pond margins not safe.

Pond Ref.	Survey techniques	No. of visits (BT,T)	HSI	GCN (BT, T OR ES)	GCN breeding (BT,T OR ES)	Other newts (BT,T OR ES)	1st Survey (BT,T)	2 in peak (BT,T)	Below min temp (BT,T)	Dried up (BT,T)	Fenced/ Access limited	Notes
P44	Not surveyed											Found after the completion of newt surveys.
P45	Not surveyed											Found after the completion of newt surveys.
P46	Not surveyed											Found after the completion of newt surveys.
P47	Not surveyed											Found after the completion of newt surveys.
P48	Not surveyed											Offsite pond indicated on previous survey plans, found to no longer hold water in 2015
P49	Not surveyed											Found after the completion of newt surveys.
P50	Not surveyed											Indicated on base mapping data, no significant standing water in 2015
P51	Not surveyed											Indicated on base mapping data, no significant standing water in 2015
P52	Not surveyed											Found after the completion of newt surveys.

Pond Ref.	Survey techniques	No. of visits (BT,T)	HSI	GCN (BT, T OR ES)	GCN breeding (BT,T OR ES)	Other newts (BT,T OR ES)	1st Survey (BT,T)	2 in peak (BT,T)	Below min temp (BT,T)	Dried up (BT,T)	Fenced/ Access limited	Notes
P53	Not surveyed											Found after the completion of newt surveys.
P54	BT+T+ES	4	Average 0.67	N	N	P	06/05/15	Y	Y -1	N	N	

Key –

BT	Bottle trap	P	Palmate newt
T	Torch	S	Smooth newt
ES	Egg search	GCN	Great crested newt

2017 - Summary surveys and results for all waterbodies surveyed during 2017 survey season

Pond Ref.	Survey techniques	No. of visits (BT,T)	eDNA result	GCN (eDNA, BT, T OR ES)	GCN breeding (BT,T OR ES)	Other newts (BT,T OR ES)	1st Survey (BT,T)	2 in peak (BT,T)	Below min temp (BT,T)	Dried up (BT,T)	Fenced/ Access limited	Notes
P10	eDNA	0	Negative	N	N						N	
P11	eDNA + BT + T + ES	4	Positive	Y	N	S	04/05/17	N	N	y		Dried up on several surveys, only deep enough to BT on one survey
P12	eDNA	0	Negative	N	N						N	
P13b	eDNA + BT + T + ES	1	Inconclusive	N	N		06/06/17	N	N	Y	N	Dry on most surveys
P14	eDNA	0	Negative	N	N						N	Tested for eDNA twice as first result returned a negative but GCN found in previous surveys. Second result also negative.
P15	eDNA	0	Negative	N	N						N	
P16	eDNA	0	Negative	N	N						N	
P26	eDNA + BT + T + ES	2	Positive	N	N		06/06/17	N	N	Y	N	Dried up on several surveys, only deep enough to BT on one survey
P28	eDNA	0	Negative	N	N						N	
P29	eDNA + BT + T + ES	1	Positive	Y	N	S	23/05/17	N	N	Y	N	Tested for GCN eDNA twice as first result returned a negative result but GCN found in previous surveys and pond is known to be ephemeral. Second eDNA

Pond Ref.	Survey techniques	No. of visits (BT,T)	eDNA result	GCN (eDNA, BT, T OR ES)	GCN breeding (BT,T OR ES)	Other newts (BT,T OR ES)	1st Survey (BT,T)	2 in peak (BT,T)	Below min temp (BT,T)	Dried up (BT,T)	Fenced/ Access limited	Notes
												positive. Dried up on several surveys, only deep enough to BT on one survey
P30	eDNA + BT + T + ES	3	Inconclusive	N	N	S/P	23/05/17	N	N	Y	N	Dried up on several surveys, only deep enough to BT on two surveys
P36	eDNA	0	Negative	N	N						N	
P38	eDNA	0	Negative	N	N						N	
P39	eDNA	0	Negative	N	N						N	
P40	eDNA	0	Negative	N	N						N	
P41	eDNA	0	Negative	N	N						N	
P42	eDNA	0	Negative	N	N						N	
P43	eDNA	0	Negative	N	N						N	
P44	eDNA	0	Negative	N	N						N	
P48	eDNA	0	Negative	N	N						N	
P53	eDNA	0	Negative	N	N						N	

Key –

BT	Bottle trap	P	Palmate newt
T	Torch	S	Smooth newt
ES	Egg search	GCN	Great crested newt

2018 – Summary surveys and results for all waterbodies surveyed during 2018 survey season

Pond Ref.	Survey techniques	No. of visits (BT,T)	eDNA	GCN (eDNA, BT, T or ES)	GCN breeding(BT,T OR ES)	Other newts (BT,T OR ES)	1st Survey (BT,T)	2 in peak (BT,T OR ES)	Below min temp (BT,T)	Dried up (BT,T)	Notes
P10	eDNA	0	Negative	N	N						
P11	BT + T + ES	6	NA	Y	N	P	24/04/18	Y	Y - 2	N	
P12	eDNA	0	Negative	N	N						
P14	BT + T + ES	6	NA	N	N	P	24/04/18	Y	Y - 2	N	Not enough water to BT on two surveys
P15	eDNA + T + ES	6	Positive	N	N	P/S	24/04/18	Y	Y - 2	N	Not BT due to concerns of potential fungal disease
P16	eDNA	0	Negative	N	N						
P17	eDNA	0	Positive	Y	N						Water levels rose in and around P17 between eDNA survey and 1st BT/T survey, such that it was then part of a flowing waterbody. As it was no longer suitable for GCN it was not surveyed further.
P27	eDNA	0	Negative	N	N						
P28	eDNA	0	Negative	N	N						
P29	BT + T + ES	6	NA	Y	Y	P	24/04/18	Y	Y - 2	N	Not enough water to BT on one survey
P30	eDNA		Negative	N	N						
P38	eDNA	4	Positive	Y	N	P	24/04/18	Y	Y - 2	Y	Not enough water to BT on one survey
P42	eDNA	0	Negative	N	N						
P43	eDNA	0	Negative	N	N						
P48	eDNA	6	Positive	Y	N	P/S	24/04/18	Y	Y - 2	N	
P55	eDNA	6	Negative	N	N	P	24/04/18	Y	Y - 2	N	Not enough water to BT on some surveys
P56	BT + T + ES	5	NA	N	N	P	24/04/18	Y	Y - 2	Y	Not enough water to BT on one survey
P68	eDNA	0	Negative	N	N						

Key –

BT	Bottle trap	P	Palmate newt
T	Torch	S	Smooth newt
ES	Egg search	GCN	Great crested newt

2021 – Summary surveys and results for all waterbodies identified during 2021 survey season

Pond Ref.	Survey techniques	No. of visits (BT,T OR ES)	HSI	eDNA	GCN (eDNA, BT, T or ES)	GCN breeding (BT,T OR ES)	Other newts (BT,T OR ES)	1st Survey (BT,T OR ES)	2 in peak (BT,T)	Below min temp (BT,T)	Dried up (BT,T)	Notes
P10	eDNA + BT + T + ES	6	0.62	Positive	Y	N	P/S	29/04/2021	Y	Y -1		
P11	eDNA + BT + T + ES	6	0.65	Negative	Y	N	P/S	29/04/2021	Y	Y -1		Only 2 BT surveys after 1 GCN found during T survey
P12	eDNA	0	0.79	Negative	N	N						
P13b	Dry so not surveyed											
P15	eDNA + T + ES	6	0.61	Negative	N	N	P/S	29/04/2021	Y	Y -1		
P16	eDNA	0	0.57	Negative	N	N						
P25	eDNA	0	0.49	Negative	N	N						
P26	T +ES	3	0.4	Dry on sampling day	N	N		10/05/2021	Y	Y -1		Only present after a period of extended rained. Not possible to BT so T only.
P28	T	4	0.37	Dry on sampling day	N	N		05/05/2021	Y	Y -1	Y	Only present after a period of extended rained. Not possible to BT so T only.
P29	eDNA	5	0.29	Positive	Y	Y	P/S	05/05/2021	Y	Y -1	Y	Dry for 1st BT and T survey
P30	eDNA	0	0.46	Negative	N	N						

Pond Ref.	Survey techniques	No. of visits (BT,T OR ES)	HSI	eDNA	GCN (eDNA, BT, T or ES)	GCN breeding (BT,T OR ES)	Other newts (BT,T OR ES)	1st Survey (BT,T OR ES)	2 in peak (BT,T)	Below min temp (BT,T)	Dried up (BT,T)	Notes
P36	eDNA	0	0.49	Inconclusive	N	N						Not surveyed despite inconclusive eDNA because pond was outside 250m buffer.
P38	T	4	0.37	Dry	N	N		05/05/2021	Y	Y -1		Only present after a period of extended rained. Not possible to BT so T only.
P39	eDNA + T	6	0.39	Negative	N	N	P/S	05/05/2021	Y	Y -1		Only present after a period of extended rained. Not possible to BT so T only.
P40	T	4	0.37	Dry on sampling day	N	N		05/05/2021	Y	Y -1	Y	Only present after a period of extended rained. Not possible to BT so T only.
P41	T	5	0.44	Dry on sampling day	N	N		05/05/2021	Y	Y -1	Y	Only present after a period of extended rained. Not possible to BT so T only.
P42	eDNA + T	5	0.48	Negative	N	N	P/S	05/05/2021	Y	Y -1		Only present after a period of extended rained. Not possible to BT so T only.
P45	eDNA	0	0.59	Inconclusive	N	N						Not surveyed despite inconclusive eDNA because pond was outside 250m buffer.

Pond Ref.	Survey techniques	No. of visits (BT,T OR ES)	HSI	eDNA	GCN (eDNA, BT, T or ES)	GCN breeding (BT,T OR ES)	Other newts (BT,T OR ES)	1st Survey (BT,T OR ES)	2 in peak (BT,T)	Below min temp (BT,T)	Dried up (BT,T)	Notes
P48	eDNA + BT + T + ES	6	0.59	Negative	Y	N	P/S	29/04/2021	Y	Y -1		Only 1 BT survey after 1 GCN found during T survey
P50	eDNA	0	0.6	Negative	N	N						
P51	eDNA	0	0.62	Negative	N	N						
P53	eDNA	0	0.44	Negative	N	N						
P55	eDNA	0	0.4	Negative	N	N						
P56	eDNA + T	4	0.48	Negative	N	N	P/S		Y	Y -1		
P57	eDNA	0	0.45	Negative	N	N						
P58	T	4	0.43	Dry on sampling day	N	N		05/05/2021	Y	Y -1		Only present after a period of extended rain. Not possible to BT so T only.
P59	T	4	0.37	Dry on sampling day	N	N		05/05/2021	Y	Y -1	Y	Only present after a period of extended rain. Not possible to BT so T only.
P60	T	4	0.37	Dry on sampling day	N	N		05/05/2021	Y	Y -1	Y	Only present after a period of extended rain. Not possible to BT so T only.
P61	T	4	0.37	Dry on sampling day	N	N		05/05/2021	Y	Y -1	Y	Only present after a period of extended rain. Not possible to BT so T only.
P62	T	4	0.37	Dry on sampling day	N	N		05/05/2021	Y	Y -1	Y	Only present after a period of extended

Pond Ref.	Survey techniques	No. of visits (BT,T OR ES)	HSI	eDNA	GCN (eDNA, BT, T or ES)	GCN breeding (BT,T OR ES)	Other newts (BT,T OR ES)	1st Survey (BT,T OR ES)	2 in peak (BT,T)	Below min temp (BT,T)	Dried up (BT,T)	Notes
												rain. Not possible to BT so T only.
P63	T	4	0.37	Dry on sampling day	N	N		05/05/2021	Y	Y -1	Y	Only present after a period of extended rain. Not possible to BT so T only.
P64	T	4	0.37	Dry on sampling day	N	N		05/05/2021	Y	Y -1	Y	Only present after a period of extended rain. Not possible to BT so T only.
P65	T	4	0.41	Dry on sampling day	N	N		05/05/2021	Y	Y -1	Y	Only present after a period of extended rain. Not possible to BT so T only.
P66	T	4	0.37	Dry on sampling day	N	N		05/05/2021	Y	Y -1	Y	Only present after a period of extended rain. Not possible to BT so T only.
P67	T	4	0.37	Dry on sampling day	N	N		05/05/2021	Y	Y -1	Y	Only present after a period of extended rain. Not possible to BT so T only.
P68	T	4	0.37	Dry on sampling day	N	N		05/05/2021	Y	Y -1	Y	Only present after a period of extended rain. Not possible to BT so T only.

Pond Ref.	Survey techniques	No. of visits (BT,T OR ES)	HSI	eDNA	GCN (eDNA, BT, T or ES)	GCN breeding (BT,T OR ES)	Other newts (BT,T OR ES)	1st Survey (BT,T OR ES)	2 in peak (BT,T)	Below min temp (BT,T)	Dried up (BT,T)	Notes
P69	T	4	0.37	Dry on sampling day	N	N		05/05/2021	Y	Y -1	Y	Only present after a period of extended rain. Not possible to BT so T only.
P70	T	5	0.51	Dry/Not found till 2nd survey	N	N		05/05/2021	Y	Y -1	Y	Only present after a period of extended rain. Not possible to BT so T only.
P71	T	5	0.51	Dry/Not found till 2nd survey	N	N		05/05/2021	Y	Y -1	Y	Only present after a period of extended rain. Not possible to BT so T only.
P72	T	5	0.49	Dry on sampling day	N	N		05/05/2021	Y	Y -1	Y	Only present after a period of extended rain. Not possible to BT so T only.
P73	T	4	0.5	Dry on sampling day	N	N		05/05/2021	Y	Y -1	Y	Only present after a period of extended rain. Not possible to BT so T only.
P74	Not found till mid-way through survey season and then dry by next survey. Not surveyed at all in 2021.											
P75												
P76												
P77												

Pond Ref.	Survey techniques	No. of visits (BT,T OR ES)	HSI	eDNA	GCN (eDNA, BT, T or ES)	GCN breeding (BT,T OR ES)	Other newts (BT,T OR ES)	1st Survey (BT,T OR ES)	2 in peak (BT,T)	Below min temp (BT,T)	Dried up (BT,T)	Notes
P78												
P79												
P80												
P81	Not found till mid-way through the survey season and outside the 250m buffer zone for the application site so not surveyed.											
P82												
P83												
P84												
P85												
P86												

Key –

BT	Bottle trap	P	Palmate newt
T	Torch	S	Smooth newt
ES	Egg search	GCN	Great crested newt

Appendix 2

Location and Description of Ponds Identified in 2021

Appendix 2: locations and descriptions of ponds identified in 2021 within the current application site boundary plus within a 250m buffer

(It should be noted that to avoid confusion, the numbering of each of the ponds below is not always sequential but follows on from that used by Bioscan whilst undertaking surveys of the wider landholding since 2015 (e.g., ponds P1 to P9 lie outside the current application boundary to the north)).

Pond Ref No:	P10	(April 2021)
W3W:	*chained.ozone.lined*	
Approx size:	45m x 10m	
Description:	A long waterbody, shaded by woodland along western and southern banks, aquatic vegetation includes curly pondweed, floating sweet-grass and water plantain. A small amount of litter present along the banks and within the margins of the pond. Shallow in the southern part.	
Pond Ref No:	P11	(April 2021)
W3W:	*gave.defend.logic*	
Approx size:	40 x 15m	
Description:	A silted-up former reservoir seemingly holding standing water for only limited periods after rain. Heavily overshaded by dense sallow.	

Pond Reference No:	P12	(April 2021)
W3W:	*sketch.fork.spot*	
Approx size:	50m x 15m	
Description:	A former reservoir associated with the mining works which has become heavily silted, shallow and overgrown with vegetation. It is heavily shaded by surrounding trees and poached along western edge. Aquatic vegetation is limited to floating sweet-grass, water plantain and willowherb Epilobium sp. Close to dual carriageway.	
Pond Ref No:	P13b	(April 2021)
W3W:	*places.snow.pilots*	
Approx size:	1 x 5m	
Description:	Shallow woodland pond, shaded by surrounding trees with no aquatic vegetation. Likely highly ephemeral. Dry in 2021	

Pond Ref No:	P15	(April 2021)
W3W:	*drip.switch.pipe*	
Approx size:	70m x 25m	
Description:	A large reservoir. The eastern bank is constructed of brick, with trees at intervals along the bank with their roots projecting into the water consequently the margins are largely shaded by the surrounding trees and woodland. The water appears deep suggesting a lack of silt entering the waterbody. There is fringe on the western side of water horsetail and common reedmace, while broad-leaved pondweed is frequent in the centre. The pond occasionally supports waterfowl. Fish are present, with fishermen occasionally present along the eastern bank. Rubbish also present around most of the periphery, particularly along the more accessible eastern bank.	

Pond Ref No:	P16	(April 2021)
W3W:	*funny.notes.drive*	
Approx size:	3 x 20m	
Description:	A roughly oblong heavily silted pond with a stream flowing in at the northern end. Surrounded by a larger area of shallowly flooded grassland with goat and grey willow, and hawthorn present throughout. Aquatic vegetation includes brooklime, willowherb sp and floating sweet-grass. Water <30cm deep (April 2021).	
Pond Ref No:	P25	(April 2021)
W3W:	*swear.shack.slides*	
Approx size:	10 x 5m	
Description:	Likely some form of collapsed mining structure, heavily shaded by surrounding woodland and higher ground to the west. No aquatic vegetation was noted, with only fallen leaves present.	

Pond Ref No:	P26	(April 2021)
W3W:	*turns.look.zebra*	
Approx size:	2 x 30m	
Description:	A woodland ditch roughly 2m wide and stretching to more than 30m in length when very wet. It appears to be highly ephemeral in nature, only holding water after extended periods of heavy rain. No aquatic vegetation was noted only leaf litter and tree debris, water was 60cm at its deepest.	
Pond Ref No:	P28	(May 2021)
W3W:	*wakes.useful.elder*	
Approx size:	1 x 10m	
Description:	Long shallow ditch that is potentially an overflow from P15, and ephemeral in nature. No aquatic vegetation noted.	

Pond Ref No:	P29	(April 2021)
W3W:	*drank.pencil.bossy*	
Approx size:	2 x 20m	
Description:	A fairly shallow and ephemeral ditch, it is open and un-shaded towards its southern end with soft rush present on banks throughout. More shaded towards its northern end where willow and birch scrub appear to be encroaching. Other aquatic vegetation is limited.	
Pond Ref No:	P30	(April 2021)
W3W:	*expert.police.farmer*	
Approx size:	2 x 2m	
Description:	A small, partially collapsed bell pit, c.4.5m in diameter within dense woodland and is therefore heavily shaded. No aquatic vegetation.	

Pond Ref No:	P36	(April 2021)
W3W:	*successes.brain. precautions*	
Approx size:	2 x 2m	
Description:	Collapsed bell pit c.5m in diameter partially shaded by nearby young trees. Soft rush dominant, small amount of water in centre (April 2021).	
Pond Ref No:	P38	(April 2021)
W3W:	*atoms.burns.mouse*	
Approx size:	2 x 15m	
Description:	Shallow ditch on western side of raised path between P54 and P28. Dry during eDNA but holding water from second newt survey (2021). No aquatic vegetation, only leaf litter.	

Pond Ref No:	P39	(April 2021)
W3W:	*mixed.herbs.hopes*	
Approx size:	5 x 5m	
Description:	One of a few series of collapsed bell-pits in an area of Molinia dominated grassland. Steep banks with no aquatic vegetation noted apart from rush.	
Pond Ref No:	P40	(May 2021)
W3W:	*frames.react.seat*	
Approx size:	1.5 x 1.5m	
Description:	One of a series of several bell pits ranging from c 2-5m diameter in an area of woodland. Formed around the base of a multi-stemmed tree. Heavily shaded by surrounding trees, no aquatic vegetation noted, just leaf litter. Likely highly ephemeral and only holding water during periods of extended rain.	

Pond Ref No:	P41	(May 2021)
W3W:	*foods.owners.dare*	
Approx size:	1.5 x 2m	
Description:	One of a series of several bell pits ranging from c 2-5m diameter in an area of woodland. Heavily shaded by surrounding trees, quite heavily vegetated with grasses and moss. Likely highly ephemeral and only holding water during periods of extended rain.	
Pond Ref No:	P42	(April 2021)
W3W:	*unions.shield.manage*	
Approx size:	2 x 2m	
Description:	A circular pond within grassland and partially shaded by silver birch growing on the northern bank. Aquatic vegetation was limited to soft rush growing on the banks.	

Pond Ref No:	P45	(April 2021)
W3W:	*ranked.geared.feared*	
Approx size:	1.5 x 2m	
Description:	One of two collapsed mine workings, with vegetation including soft rush and bog-pondweed. Fenced off from surrounding grassland. Holding water when surveyed in 2021.	
Pond Ref No:	P48	(April 2021)
W3W:	*lately.exchanges.kinks*	
Approx size:	10 x 20m	
Description:	Large waterbody, likely to be a reservoir for the historic mining activity. Heavily shaded with willow growth in water and islands present. Water is ~20-30cm deep (April 2021). Large amount of leaf litter on bottom. Tadpoles present. Bramble around pond in places.	

Pond Ref No:	P50	(April 2021)
W3W:	*prone.clips.joke*	
Approx size:	3 x 3m	
Description:	One of two depressions within woodland. Roughly circular and visible looking west from the main path. Bell pit possibly topped up by joining river in winter. Steep sides, water ~ 1m deep, surrounded by scrub.	
Pond Ref No:	P51	(April 2021)
W3W:	*prone.clips.joke*	
Approx size:	3 x 2m	
Description:	Second of two woodland depressions. Smaller than P50 and separated from it by a large dead tree. In April 2021 it was holding less water than P51 <1m, with significantly more macrophyte cover.	

Pond Ref No:	P53	(April 2021)
W3W:	*cares.upset.jokes*	
Approx size:	3 x 3m	
Description:	Small and shallow bell-pit type pond. Just west of main raised track in a relatively open woodland clearing. Shallow, no aquatic vegetation noted in 2021.	
Pond Ref No:	P55	(April 2021)
W3W:	*worry.theme.takes*	
Approx size:	2.5 x 15m	
Description:	Ditch in woodland ravine just west of main raised track. In two parts during 2021 survey but joins in wetter conditions. Water ~ 10-15cm deep, tadpoles present.	

Pond Ref No:	P56	(April 2021)
W3W:	*falls.best.blows*	
Approx size:	2 x 12m	
Description:	Ephemeral pool on west side of raised track, likely to dry out. Heavily shaded by surrounding woodland, no aquatic vegetation.	
Pond Ref No:	P57	(April 2021)
W3W:	*thank.flash.give*	
Approx size:	1 x 1m	
Description:	One of a series of small bell pits in scrubby woodland. 30cm at its deepest, toad and tadpoles present (2021).	

Pond Ref No:	P58	(April 2021)
W3W:	*divide.summer.epic*	
Approx size:	1.5 x 1.5m	
Description:	One of several small pits in an area of Molinia dominated grassland. Soft rush present, clear water	
Pond Ref No:	P59	(May 2021)
W3W:	*caves.veal.bridge*	
Approx size:	2 x 2m	
Description:	One of a series of several bell pits ranging from c 2-5m diameter in an area of woodland. Heavily shaded by surrounding trees, no aquatic vegetation noted, just leaf litter. Likely highly ephemeral and only holding water during periods of extended rain.	

Pond Ref No:	P60	(May 2021)
W3W:	*think.joins.yoga*	
Approx size:	2 x 3m	
Description:	One of a series of several bell pits ranging from c 2-5m diameter in an area of woodland. Heavily shaded by surrounding trees, no aquatic vegetation noted, just leaf litter. Likely highly ephemeral and only holding water during periods of extended rain.	
Pond Ref No:	P61	(May 2021)
W3W:	*gloves.humble.itself*	
Approx size:	2 x 2m	
Description:	One of a series of several bell pits ranging from c 2-5m diameter in an area of woodland. Heavily shaded by surrounding trees, no aquatic vegetation noted, just leaf litter. Likely highly ephemeral and only holding water during periods of extended rain.	

Pond Ref No:	P62	(May 2021)
W3W:	*slides.jeeps.blows*	
Approx size:	2 x 2m	
Description:	One of a series of several bell pits ranging from c 2-5m diameter in an area of woodland. Heavily shaded by surrounding trees, no aquatic vegetation noted, just leaf litter. Likely highly ephemeral and only holding water during periods of extended rain.	
Pond Ref No:	P63	(May 2021)
W3W:	*rubble.visit.that*	
Approx size:	1.5 x 1.5m	
Description:	One of a series of several bell pits ranging from c 2-5m diameter in an area of woodland. Heavily shaded by surrounding trees, no aquatic vegetation noted, just leaf litter. Likely highly ephemeral and only holding water during periods of extended rain.	

Pond Ref No:	P64	(May 2021)
W3W:	*relay.magma.cubs*	
Approx size:	1.5 x 1.5m	
Description:	One of a series of several bell pits ranging from c 2-5m diameter in an area of woodland. Formed around the base of young silver birch trees. Heavily shaded by surrounding trees, no aquatic vegetation noted, just leaf litter. Likely highly ephemeral and only holding water during periods of extended rain.	
Pond Ref No:	P65	(May 2021)
W3W:	*grows.held.cool*	
Approx size:	2 x 2m	
Description:	One of a series of several bell pits ranging from c 2-5m diameter in an area of woodland. Heavily shaded by surrounding trees, no aquatic vegetation noted, just leaf litter. Two trees growing out of the pond. Likely highly ephemeral and only holding water during periods of extended rain. Small amount of submerged vegetation noted.	

Pond Ref No:	P66	(May 2021)
W3W:	*foods.owners.dare*	
Approx size:	<1 x 1m	
Description:	Small depression ~1m west of P41 in the area of woodland containing several bell pits. Less than a meter in diameter and heavily shaded by surrounding trees. No aquatic vegetation noted.	
Pond Ref No:	P67	(May 2021)
W3W:	*unit.frozen.shed*	
Approx size:	1.5 x 2m	
Description:	One of a series of several bell pits ranging from c 2-5m diameter in an area of woodland. Heavily shaded by surrounding trees, no aquatic vegetation noted, just leaf litter. Likely highly ephemeral and only holding water during periods of extended rain.	

Pond Ref No:	P68	(May 2021)
W3W:	*ladder.nobody.blame*	
Approx size:	1.5 x 2m	
Description:	One of a series of several bell pits ranging from c 2-5m diameter in an area of woodland. Steep sided and heavily shaded by surrounding trees, no aquatic vegetation noted, just leaf litter. Likely ephemeral and only holding water during periods of extended rain.	
Pond Ref No:	P69	(May 2021)
W3W:	*loans.lined.eaten*	
Approx size:	1.5 x 1.5m	
Description:	One of a series of several bell pits ranging from c 2-5m diameter in an area of woodland. Heavily shaded by surrounding trees, no aquatic vegetation noted, just leaf litter. Likely highly ephemeral and only holding water during periods of extended rain.	

Pond Ref No:	P70	(May 2021)
W3W:	*fresh.shell.unwanted*	
Approx size:	1 x 3m	
Description:	Shallow depression in an open grassland area. Likely ephemeral as its presence was only noted after a period of heavy rain. Soft rush and other floating aquatic vegetation noted.	
Pond Ref No:	P71	(May 2021)
W3W:	*limes.push.sketch*	
Approx size:	<1 x 1m	
Description:	A small and shallow depression in an open grassland area. Limited aquatic vegetation noted.	

Pond Ref No:	P72	(May 2021)
W3W:	*change.span.petal*	
Approx size:	1 x 1.5m	
Description:	Small ephemeral pond in an area of grassland, less than 2m in diameter. Likely ephemeral as water was only noted after a period of heavy rain. Dominated by soft rush with little other aquatic vegetation noted.	
Pond Ref No:	P73	(May 2021)
W3W:	*humble.onion.status*	
Approx size:	2 x 3m	
Description:	A shallow boggy depression in an area of open grassland near the base of a silver birch. Likely ephemeral as only observed holding water after an extended period of heavy rain. Dominated by soft rush.	

Pond Ref No:	P74	(May 2021)
W3W:	*Labels.tester.curl*	
Approx size:	2 x 2m	
Description:	One of several small woodland pits. Shallow and formed around the base of a tree, heavily shaded and no aquatic vegetation noted, only leaf litter. Likely highly ephemeral as only discovered after extended period of rain.	
Pond Ref No:	P75	(May 2021)
W3W:	*Likely.matter.flesh*	
Approx size:	1.5 x 1.5m	
Description:	One of several small woodland pits. Shallow, heavily shaded and no aquatic vegetation noted, only leaf litter. Likely highly ephemeral as only discovered after extended period of rain.	

Pond Ref No:	P76	(May 2021)
W3W:	*Stared.stud.kings*	
Approx size:	1.5 x 1.5m	
Description:	One of several small woodland pits. Shallow, heavily shaded and no aquatic vegetation noted, only leaf litter. Likely highly ephemeral as only discovered after extended period of rain.	
Pond Ref No:	P77	(May 2021)
W3W:	Milky.book.commented	
Approx size:	1.5 x 1.5m	
Description:	One of several small woodland pits. Shallow, heavily shaded and no aquatic vegetation noted, only leaf litter. Likely highly ephemeral as only discovered after extended period of rain.	

Pond Ref No:	P78	(May 2021)
W3W:	Riots.senses.years	
Approx size:	1.5 x 1.5m	
Description:	One of several small woodland pits. Shallow, heavily shaded and no aquatic vegetation noted, only leaf litter. Likely highly ephemeral as only discovered after extended period of rain.	
Pond Ref No:	P79	(May 2021)
W3W:	Sweep.gent.intelligible	
Approx size:	3 x 10m	
Description:	Shallow ditch/woodland depression formed around the base of several trees. Heavily shaded by surrounding woodland, no aquatic vegetation noted only leaf litter. Likely highly ephemeral as only noted after an extended period of rain.	

Pond Ref No:	P80	(May 2021)
W3W:	Drum.harder.helps	
Approx size:	2 x 2m	
Description:	Small and shallow woodland depression. Heavily shaded by surrounding woodland, no aquatic vegetation noted only leaf litter. Likely highly ephemeral as only noted after an extended period of rain.	

Appendix 3

Raw HSI Results (2021 and 2015)

Appendix 3: Raw Habitat Suitability Index (HSI) Results (2021 and 2015)

HSI results for ponds surveyed in 2021

Pond Ref.	P10	P11	P12	P15	P16	P25	P26	P28	P29	P30	P36	P38	P39	P40
Site Location	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Pond Area	0.95	1.00	1.00	0.85	0.50	0.05	0.10	0.05	0.15	0.05	0.05	0.05	0.05	0.05
Pond Permanence	0.90	0.50	1.00	0.90	0.10	1.00	0.10	0.10	0.10	1.00	0.30	0.10	0.50	0.10
Water Quality	0.50	0.50	0.50	0.50	0.50	0.33	0.33	0.33	0.50	0.30	0.67	0.33	0.40	0.33
Shade	0.30	0.30	0.40	0.30	0.30	0.30	0.20	0.20	1.00	0.20	0.30	0.20	1.00	0.20
Impact of Water Fowl	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fish Presence	0.33	1.00	1.00	0.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ponds Nearby	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.05	1.00
Terrestrial Habitat	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.67	1.00	0.67	1.00	1.00	1.00
Macrophytes	0.40	0.35	1.00	0.36	1.00	0.30	0.30	0.30	0.35	0.30	0.85	0.30	0.35	0.30
Overall HSI Value (product of 10 values)$^{0.1}$ & Suitability for Great Crested Newts	**0.62 Average**	**0.65 Average**	**0.79 Good**	**0.61 Average**	**0.57 Below average**	**0.49 Poor**	**0.40 Poor**	**0.37 Poor**	**0.49 Poor**	**0.46 Poor**	**0.49 Poor**	**0.37 Poor**	**0.39 Poor**	**0.37 Poor**

Pond Ref.	P41	P42	P45	P48	P50	P51	P53	P55	P56	P57	P58	P59	P60	P61
Site Location	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Pond Area	0.05	0.05	0.05	1.00	0.20	0.20	0.05	0.10	0.30	0.05	0.05	0.05	0.05	0.05
Pond Permanence	0.10	0.30	0.50	0.50	0.50	0.50	0.50	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Water Quality	0.50	0.67	0.50	0.50	0.33	0.33	0.33	0.33	0.50	0.50	0.50	0.33	0.33	0.33
Shade	0.20	0.20	1.00	0.20	1.00	0.60	0.20	0.20	0.30	1.00	0.60	0.20	0.20	0.20
Impact of Water Fowl	1.00	1.00	1.00	0.67	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fish Presence	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ponds Nearby	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Terrestrial Habitat	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Macrophytes	1.00	0.70	0.80	0.30	0.35	0.90	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Overall HSI Value (product of 10 values)$^{0.1}$ & Suitability for Great Crested Newts	**0.44 Poor**	**0.48 Poor**	**0.59 Below average**	**0.59 Below average**	**0.60 Average**	**0.62 Average**	**0.44 Poor**	**0.40 Poor**	**0.48 Poor**	**0.45 Poor**	**0.43 Poor**	**0.37 Poor**	**0.37 Poor**	**0.37 Poor**

Pond Ref.	P62	P63	P64	P65	P66	P67	P68	P69	P70	P71	P72	P73
Site Location	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Pond Area	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Pond Permanence	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Water Quality	0.33	0.33	0.33	0.50	0.33	0.33	0.33	0.33	0.50	0.50	0.33	0.50
Shade	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	1.00	1.00	1.00	1.00
Impact of Water Fowl	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fish Presence	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ponds Nearby	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Terrestrial Habitat	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Macrophytes	0.30	0.30	0.30	0.50	0.30	0.30	0.30	0.30	0.90	1.00	1.00	0.85
Overall HSI Value (product of 10 values)$^{0.1}$ & Suitability for Great Crested Newts	**0.37 Poor**	**0.37 Poor**	**0.37 Poor**	**0.41 Poor**	**0.37 Poor**	**0.37 Poor**	**0.37 Poor**	**0.37 Poor**	**0.51 Below average**	**0.51 Below average**	**0.49 Poor**	**0.50 Below average**

HSI results for ponds surveyed in 2015

Pond Ref.	P1	P2	P3	P4	P5	P6	P7	P7a	P8	P9	P10	P12	P14	P15
Site Location	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Pond Area	0.4	0.5	0.8	0.6	0.8	0.05	0.24	0.95	1	0.6	0.92	0.99	0.97	0.8
Pond Permanence	0.5	0.75	1	1	0.9	0.1	1	0.5	1	0.75	0.9	0.9	0.9	0.9
Water Quality	0.67	0.83	0.67	1	1	0.33	0.83	0.67	0.5	1	1	0.67	0.83	0.83
Shade	1	1	1	1	1	1	0.3	1	1	1	1	0.6	0.2	0.3
Impact of Water Fowl	1	0.67	0.67	0.67	0.67	1	0.67	1	0.67	1	1	1	0.67	0.67
Fish Presence	1	1	1	1	1	1	1	0.67	1	1	0.33	1	1	0.17
Ponds Nearby	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Terrestrial Habitat	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Macrophytes	1	0.6	1	1	0.75	0.35	0.35	0.8	0.8	0.6	0.85	1	1	0.32
Overall HSI Value (product of 10 values)$^{0.1}$ & Suitability for Great Crested Newts	**0.76 Good**	**0.76 Good**	**0.84 Excellent**	**0.85 Excellent**	**0.84 Excellent**	**0.44 Poor**	**0.61 Average**	**0.78 Good**	**0.82 Excellent**	**0.82 Excellent**	**0.81 Excellent**	**0.84 Excellent**	**0.74 Good**	**0.56 Below Average**

Pond Ref.	P16	P17	P18	P19	P20	P21	P22	P23	P24	P25	P26	P27	P28
Site Location	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Pond Area	1	0.92	0.05	0.05	0.05	0.08	0.05	0.1	0.1	0.4	0.4	0.05	0.8
Pond Permanence	0.9	0.9	0.5	0.5	0.5	0.5	0.5	0.1	0.5	0.9	1	0.5	1
Water Quality	0.67	0.67	0.5	0.5	0.67	0.67	0.5	0.33	0.67	0.5	0.33	0.33	0.33
Shade	0.4	0.2	1	1	1	0.2	0.2	0.4	1	0.4	0.4	0.6	1
Impact of Water Fowl	1	1	1	1	1	1	1	1	1	1	0.67	1	1
Fish Presence	0.67	0.33	1	1	1	1	1	1	1	0.67	1	1	1
Ponds Nearby	1	1	1	1	1	1	1	1	1	1	1	1	1
Terrestrial Habitat	1	1	1	1	1	1	1	1	1	1	1	1	1
Macrophytes	0.9	0.3	0.35	0.7	1	1	0.3	0.3	0.85	0.3	0.3	0.3	0.3
Overall HSI Value (product of 10 values)$^{0.1}$ & Suitability for Great Crested Newts	**0.77 Good**	**0.59 Below Average**	**0.54 Below Average**	**0.58 Below Average**	**0.62 Average**	**0.55 Below Average**	**0.45 Poor**	**0.43 Poor**	**0.65 Average**	**0.61 Average**	**0.59 Below Average**	**0.49 Poor**	**0.72 Good**

Pond Ref.	P29	P30	P31	P32	P33	P36	P37	P38	P39	P40	P41	P42	P43	P54
Site Location	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Pond Area	0.2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.3
Pond Permanence	0.5	1	0.1	0.5	0.1	1	1	1	0.1	0.1	0.1	1	0.5	1
Water Quality	0.5	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67
Shade	1	0.2	0.2	0.2	1	1	1	0.2	0.2	0.2	0.2	1	1	0.2
Impact of Water Fowl	1	1	1	1	1	1	0.67	1	1	1	1	1	1	1
Fish Presence	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Ponds Nearby	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Terrestrial Habitat	1	1	1	1	1	0.67	1	0.67	0.67	0.67	0.67	1	1	1
Macrophytes	0.35	0.9	0.3	0.35	0.3	0.3	0.35	0.3	0.35	0.35	0.35	0.45	0.45	0.95
Overall HSI Value (product of 10 values)$^{0.1}$ & Suitability for Great Crested Newts	**0.62 Average**	**0.56 Below Average**	**0.40 Poor**	**0.48 Poor**	**0.47 Poor**	**0.57 Below Average**	**0.57 Below Average**	**0.48 Poor**	**0.39 Poor**	**0.39 Poor**	**0.39 Poor**	**0.61 Average**	**0.57 Below Average**	**0.67 Average**

Appendix 4

eDNA Results (2017- 2021)

DNA Analysis Report - Commercial in Confidence

Customer:	Bioscan UK Ltd
Address:	The Old Parlour Little Baldon Farm, Little Baldon Oxford Oxfordshire OX44 9PU
Contact:	Sam Watson
Email:	samwatson@bioscanuk.com
Tel:	01865 341321
Report date:	24-Apr-2017
Order Number:	GCN17-0365
Samples:	Pond Water
Analysis requested:	Detection of Great Crested Newt eDNA from pond water.

Thank you for submitting your samples for analysis with the Fera eDNA testing service. The details of the analysis are as follows:

Method:
The method detects pond occupancy from great crested newts (GCN) using traces of DNA shed into the pond environment (eDNA). The detection of GCN eDNA is carried out using real time PCR to amplify part of the cytochrome 1 gene found in mitochondrial DNA. The method followed is detailed in Biggs J., et al, (2014). Analytical and methodological development for improved surveillance of the Great Crested Newt. Appendix 5. Technical advice note for field and laboratory sampling of great crested newt (Triturus cristatus) environmental DNA. Freshwater Habitats Trust, Oxford.

The limits of this method are as follows: 1) the results are based on analyses of the samples supplied by the client and as received by the laboratory, 2) any variation between the characteristics of this sample and a batch will depend on the sampling procedure used. 3) the method is qualitative and therefore the levels given in the score are for information only, they do not constitute the quantification of GCN DNA against a calibration curve, 4) a 'not detected' result does not exclude presence at levels below the limit of detection.

The results are defined as follows:

Positive:	DNA from the species was detected.
eDNA Score:	Number of positive replicates from a series of twelve.
Negative:	DNA from the species was not detected; in the case of negative samples the DNA extract is further tested for PCR inhibitors and degradation of the sample.
Inconclusive:	Controls indicate degradation or inhibition of the sample, therefore the lack of detection of GCN DNA is not conclusive evidence for determining the absence of the species in the sample provided.

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CustomerReference	Fera Reference	GCN Detection	GCN Score	Inhibition	Degradation
MERTHYR P41	S17-003814	Negative	0	No	No
MERTHYR P42	S17-003813	Negative	0	No	No
MERTHYR P38	S17-003812	Negative	0	No	No
MERTHYR P44	S17-003811	Negative	0	No	No
MERTHYR P12	S17-003810	Negative	0	No	No
MERTHYR P53	S17-003809	Negative	0	No	No
MERTHYR P43	S17-003808	Negative	0	No	No
MERTHYR P28	S17-003807	Negative	0	No	No
MERTHYR P29	S17-003806	Negative	0	No	No
MERTHYR P40	S17-003804	Negative	0	No	No
MERTHYR P48	S17-003801	Negative	0	No	No
MERTHYR P39	S17-003800	Negative	0	No	No
MERTHYR P30	S17-003802	Inconclusive	0	No	YES
MERTHYR P16	S17-003797	Negative	0	No	No
MERTHYR P10	S17-003796	Negative	0	No	No
MERTHYR P14	S17-003794	Negative	0	No	No
MERTHYR P13b	S17-003793	Inconclusive	0	No	YES
MERTHYR P36	S17-003792	Negative	0	No	No
MERTHYR P26	S17-003815	Positive	1	n/a	n/a
MERTHYR P11	S17-003795	Positive	1	n/a	n/a

The results indicate that eDNA for great crested newts was detected in two of the samples and in the remaining samples eDNA was not detected (as detailed in the table above). However, with samples S17-003793 and S17-003802 we detected PCR inhibitors and degradation of the internal control. Therefore, due to the risk of inhibition of the eDNA assay and any eDNA also being degraded resulting in a false negative, we have issued an inconclusive result. Analysis was conducted in the presence of the following controls: 1) Extraction blank, 2) appropriate positive and negative PCR controls for each of the TaqMan assays (GCN, Inhibition, and Degradation). All controls performed as expected.

This test procedure was developed using research funded by the Department of Environment, Food and Rural Affairs, and was performed under the conditions of licensing arrangements with Applied Biosystems and patent rights owned by F. Hoffman-La Roche Ltd.

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DNA Analysis Report - Commercial in Confidence

Customer:	Bioscan UK Ltd
Address:	The Old Parlour Little Baldon Farm, Little Baldon Oxford Oxfordshire OX44 9PU
Contact:	Sam Watson
Email:	samwatson@bioscanuk.com
Tel:	01865 341321
Report date:	12-May-2017
Order Number:	GCN17-0365
Samples:	Pond Water
Analysis requested:	Detection of Great Crested Newt eDNA from pond water.

Thank you for submitting your samples for analysis with the Fera eDNA testing service. The details of the analysis are as follows:

Method:
The method detects pond occupancy from great crested newts (GCN) using traces of DNA shed into the pond environment (eDNA). The detection of GCN eDNA is carried out using real time PCR to amplify part of the cytochrome 1 gene found in mitochondrial DNA. The method followed is detailed in Biggs J., et al, (2014). Analytical and methodological development for improved surveillance of the Great Crested Newt. Appendix 5. Technical advice note for field and laboratory sampling of great crested newt (Triturus cristatus) environmental DNA. Freshwater Habitats Trust, Oxford.

The limits of this method are as follows: 1) the results are based on analyses of the samples supplied by the client and as received by the laboratory, 2) any variation between the characteristics of this sample and a batch will depend on the sampling procedure used. 3) the method is qualitative and therefore the levels given in the score are for information only, they do not constitute the quantification of GCN DNA against a calibration curve, 4) a 'not detected' result does not exclude presence at levels below the limit of detection.

The results are defined as follows:

Positive:	DNA from the species was detected.
eDNA Score:	Number of positive replicates from a series of twelve.
Negative:	DNA from the species was not detected; in the case of negative samples the DNA extract is further tested for PCR inhibitors and degradation of the sample.
Inconclusive:	Controls indicate degradation or inhibition of the sample, therefore the lack of detection of GCN DNA is not conclusive evidence for determining the absence of the species in the sample provided.

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CustomerReference	Fera Reference	GCN Detection	GCN Score	Inhibition	Degradation
- **P29**	S17-003791	Positive	12	n/a	n/a
- **P14**	S17-003817	Negative	0	No	No
- **P15**	S17-003816	Negative	0	No	No

The results indicate that eDNA for great crested newts was detected in one of the samples and in the remaining samples eDNA was not detected (as detailed in the table above). Analysis was conducted in the presence of the following controls: 1) Extraction blank, 2) appropriate positive and negative PCR controls for each of the TaqMan assays (GCN, Inhibition, and Degradation). All controls performed as expected.

This test procedure was developed using research funded by the Department of Environment, Food and Rural Affairs, and was performed under the conditions of licensing arrangements with Applied Biosystems and patent rights owned by F. Hoffman-La Roche Ltd.

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DNA Analysis Report - Commercial in Confidence

Customer:	Bioscan UK Ltd
Address:	The Old Parlour Little Baldon Farm, Little Baldon Oxford Oxfordshire OX44 9PU
Contact:	Sam Watson
Email:	samwatson@bioscanuk.com
Tel:	01865 341321
Report date:	24-Apr-2018
Order Number:	GCN18-0779
Samples:	Pond Water
Analysis requested:	Detection of Great Crested Newt eDNA from pond water.

Thank you for submitting your samples for analysis with the Fera eDNA testing service. The details of the analysis are as follows:

Method:
The method detects pond occupancy from great crested newts (GCN) using traces of DNA shed into the pond environment (eDNA). The detection of GCN eDNA is carried out using real time PCR to amplify part of the cytochrome 1 gene found in mitochondrial DNA. The method followed is detailed in Biggs J., et al, (2014). Analytical and methodological development for improved surveillance of the Great Crested Newt. Appendix 5. Technical advice note for field and laboratory sampling of great crested newt (Triturus cristatus) environmental DNA. Freshwater Habitats Trust, Oxford.

The limits of this method are as follows: 1) the results are based on analyses of the samples supplied by the client and as received by the laboratory, 2) any variation between the characteristics of this sample and a batch will depend on the sampling procedure used. 3) the method is qualitative and therefore the levels given in the score are for information only, they do not constitute the quantification of GCN DNA against a calibration curve, 4) a 'not detected' result does not exclude presence at levels below the limit of detection.

The results are defined as follows:

Positive:	DNA from the species was detected.
eDNA Score:	Number of positive replicates from a series of twelve.
Negative:	DNA from the species was not detected; in the case of negative samples the DNA extract is further tested for PCR inhibitors and degradation of the sample.
Inconclusive:	Controls indicate degradation or inhibition of the sample, therefore the lack of detection of GCN DNA is not conclusive evidence for determining the absence of the species in the sample provided.

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CustomerReference	Fera Reference	GCN Detection	eDNA Score	Inhibition	Degradation
- P30	S18-003753	Negative	0	No	No
- P43	S18-003752	Negative	0	No	No
- P42	S18-003751	Negative	0	No	No
- P28	S18-003749	Negative	0	No	No
- P68	S18-003748	Negative	0	No	No
- P55	S18-003747	Negative	0	No	No
- P12	S18-003746	Negative	0	No	No
- P16	S18-003745	Negative	0	No	No
- P27	S18-003744	Negative	0	No	No
- P10	S18-003488	Negative	0	No	No
- P15	S18-003750	Positive	1	n/a	n/a
- P48	S18-003489	Positive	6	n/a	n/a
- P17	S18-003487	Positive	1	n/a	n/a
- P38	S18-003486	Positive	1	n/a	n/a

The results indicate that eDNA for great crested newts was detected in four of the samples and in the remaining samples eDNA was not detected (as detailed in the table above). Analysis was conducted in the presence of the following controls: 1) Extraction blank, 2) appropriate positive and negative PCR controls for each of the TaqMan assays (GCN, Inhibition, and Degradation). All controls performed as expected.

This test procedure was developed using research funded by the Department of Environment, Food and Rural Affairs.

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NATURE METRICS
DNA-BASED MONITORING

GREAT CRESTED NEWT **DETECTION RESULTS**

Company: BioScan (UK) Ltd
Order number: 102082
Project code: E1835-2021
Date of Report: 26 April 2021
Number of samples: 19

Thank you for sending your sample(s) for analysis by NatureMetrics. Your sample(s) have been processed in accordance with the protocol set out in Appendix 5 of Biggs et al. (2014).

Summary of the results

Results indicate GCN presence in 'P10' and 'P29'.

No GCN were detected in 'P11', 'P12', 'P15', 'P16', 'P25', 'P56', 'P30', 'P39', 'P42', 'P48', 'P50', 'P51', 'P53', 'P57', and 'P55'.

The negative controls were blank, the extraction blank control was negative, and the positive controls and their replicates were standard.

Inhibition was detected in 'P36' and 'P45', which was not resolved with multiple rounds of DNA dilution as prescribed by Biggs et al. 2014, we therefore return these results as inconclusive.

Results are based on the samples as supplied by the client to the laboratory. Incorrect sampling methodology may affect the results. Note that a negative result does not preclude the presence of Great Crested Newts at a level below the limits of detection.

Methods

eDNA was precipitated via centrifugation at 14,000 x g and then extracted using Qiagen Blood and Tissue extraction kits. qPCR amplification was carried out in 12 replicates per sample, using GCN specific primers and probes described in Biggs et al. (2014), in the presence of positive controls, extraction controls, and template negative controls. A score is given for the number of positive replicates out of 12.

The qPCR method follows the recommendations set out by NatureMetrics for Natural England in the qPCR validation project and helps improve the reliability of the interpretation of the data. Results from the assay are considered to have a high rating of confidence according to our Validation Scale (Harper et al. 2021).

The quality control methods exceed the requirements outlined in Biggs et al. (2014) Appendix 5. These consist of the use of kit blanks, additional extraction blanks and template negative controls, and positive controls standards of known concentration in triplicate to generate limits of detection and give confidence to the low and late amplifications.

Kit ID	Pond ID	Arrived	Inhibition	Degradation	Score	Status
106	'P10'	20-Apr	NA	No	10	Positive
116	'P11'	20-Apr	No	No	0	Negative
109	'P12'	20-Apr	No	No	0	Negative
102	'P15'	20-Apr	No	No	0	Negative
122	'P16'	20-Apr	No	No	0	Negative
105	'P25'	20-Apr	No	No	0	Negative
114	'P56'	20-Apr	No	No	0	Negative
113	'P29'	20-Apr	NA	No	3	Positive
118	'P30'	20-Apr	No	No	0	Negative
107	'P36'	20-Apr	Yes	No	0	Inconclusive
103	'P39'	20-Apr	No	No	0	Negative
110	'P42'	20-Apr	No	No	0	Negative
119	'P45'	20-Apr	Yes	No	0	Inconclusive
121	'P48'	20-Apr	No	No	0	Negative
115	'P50'	20-Apr	No	No	0	Negative
104	'P51'	20-Apr	No	No	0	Negative
123	'P53'	20-Apr	No	No	0	Negative
120	'P57'	20-Apr	No	No	0	Negative
112	'P55'	20-Apr	No	No	0	Negative

END OF REPORT

Report issued by: **Dr. Cuong Q. Tang**

Contact: **team@naturemetrics.co.uk**

NATURE METRICS
DNA-BASED MONITORING

Understanding your results

Positive Target DNA has been detected in this sample, meaning that at least 1 of the 12 qPCR replicates has amplified. This is not a quantitative test, so you should not interpret a high number of positive replicates (e.g. 12/12) as necessarily indicating a larger population of GCN than a low eDNA score (e.g. 1/12).

Negative No target DNA has been detected in this sample, and the internal and external controls worked as expected. This tells us that if there had been GCN DNA in the sample, we would have detected it, so we can be confident in its absence from the sample provided.

Inconclusive No GCN DNA was detected in the sample, but the internal controls failed to amplify as expected. This means that any GCN DNA in the sample might also have failed to amplify properly, so we cannot have confidence in this negative result. Inconclusive results can be caused by the degradation of the DNA (when the DNA marker contained in the ethanol in the kits fails to amplify) or by inhibition of the reaction (when the marker added in the lab fails to amplify) caused by certain chemicals or organic compounds that may be present in the water sample.

Validation Scale We have developed our own confidence assessment tool for qPCR eDNA assays that builds upon the Thalinger et al. (2021) validation scale and helps end-users to interpret the qPCR outputs but also contextualise these with the level of validation that the assay itself has gone through. Briefly, the level of confidence that can be assigned to results coming from an assay is derived from several validation steps:

- Basic analysis - can the assay work in principle on the computer?
- PCR protocol - has the protocol been optimised in the lab?
- Specificity analysis - has the assay been tested in the lab against other co-inhabiting and/or closely related species?
- How extensive has the assay been tested with natural samples?
- Have the theoretical limits of detection been established?
- Have detection probabilities been estimated with extensive site occupancy modelling?
- Have external factors affecting detectability been extensively tested (e.g. seasonality, spatial heterogeneity)?

- Low Results from these assays are difficult to interpret with confidence. It is impossible to conclusively tell if the target species is present or absent because of the limited amounts of *in silico*, *in vitro*, and *in vivo* testing.

- Medium Assays with this rating have been tested *in silico*, have optimised lab protocols, specificity and sensitivity tested in and out of the lab, but with no estimates of detection probabilities or extensive testing of external factors that may affect the detectability of the target. Positive results can be interpreted as meaning the target species DNA is present (assuming the correct sampling conditions), but negative results could mean that the target is absent or that external factors such as ecology, seasonality, spatial scales are influencing the detections.

- High High rating assays have everything that a Medium assay has, in addition to site occupancy modelling and extensive testing of external influencers such as ecological, temporal and spatial factors. Positive results can be conclusively interpreted, and negative results can be interpreted as meaning the target species DNA is absent (assuming the correct sampling conditions). In some instances, a probability of target species presence at a site and in a sample can be given.

Glossary

controls Controls are used to monitor both the performance of the assays but also any contamination. These samples are treated in the same way as a normal sample. This is particularly important given the sensitivity of these eDNA qPCR methods. Our full complement of controls enables us to fully monitor the whole GCN eDNA process from kits to data.

- kit blank Used to determine if the kits are contaminated but also to monitor the early stages of the pipelines - e.g. sample reception. These samples also act as uninhibited samples that can be used as a baseline to compare against. This is an additional control not specifically mentioned in the Biggs et al. 2014 protocol.

- EB Extraction blank. Used to monitor potential contamination during the DNA extraction process.

- TNC Template negative control. Used to monitor potential contamination during the qPCR setup process. For every qPCR reaction, we run we include more template negative controls than are prescribed in the Biggs et al. 2014 protocol.

- positive Used to determine whether the assay is working correctly. In addition to the 4 standard dilutions prescribed by the Biggs et al. 2014 protocol, we include an additional standard dilution and amplify all standards in triplicate. We can use this increased number of replicates and standards to generate standard curves that will allow us to calculate the limit of detection (LOD).

- LOD Limit of detection. The lowest concentration of positive control DNA that amplifies. LOD is determined for every single reaction performed. Target amplification below the LOD cannot automatically be considered as negative but should be further investigated as spurious amplifications are more prevalent at these low concentrations.

eDNA Short for 'environmental DNA'. Refers to DNA deposited in the environment through excretion, shedding, mucous secretions, saliva etc. This can be collected in environmental samples (e.g. water, sediment) and used to identify the organisms that it originated from. eDNA in water is broken down by environmental processes over a period of days to weeks. It can travel some distance from the point at which it was released from the organism, particularly

in running water. eDNA is sampled in low concentrations and can be degraded (i.e. broken into short fragments), which limits the analysis options.

inhibitors Naturally-occurring chemicals/compounds that cause DNA amplification to fail, potentially resulting in false-negative results. Common inhibitors include tannins, humic acids and other organic compounds. Inhibitors can be overcome by either diluting the DNA (and the inhibitors), but dilution carries the risk of reducing the DNA concentration below the limits of detection.

qPCR Stands for 'quantitative PCR', a PCR reaction incorporating a coloured dye that fluoresces during amplification, allowing a machine to track the progress of the reaction. Often used with species-specific primers where detection of amplification is used to infer the presence of the target species' DNA in the sample. If the species is not present in the sample, no fluorescence will be detected.

- primers Short sections of synthesised DNA that bind to either end of the DNA segment to be amplified by PCR.

- probe A short section of synthesised DNA that binds to a specific section of the target species' DNA within the section flanked by the primers. The probe is designed to be totally specific to that species. The probe is labelled such that it fluoresces during amplification, which is used to infer the presence of the target species' DNA in the sample.

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APPENDIX 2

Cwm Glo a Glyndyrys, Merthyr Tydfil

Species Survey Report:

Bats

February 2022

COMMISSIONED BY
Marvel Ltd

Written by: *Christina Derrick*

Approved by: *Dominic Woodfield*

Cwm Glo a Glyndyrys, Merthyr Tydfil
Species Survey Report:
Bats

February 2022

Bioscan Report No.
E1835-BAT-R1

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APPENDICES

Appendix 1	Results of inspection surveys and summary of confirmed/probable roosts
Appendix 2	Preliminary tree roost assessment survey results and details of confirmed tree roost

1 INTRODUCTION

1.1 Background

1.1.1 This report sets out the accumulated results of bat surveys carried out during 2015, 2016, 2018 and 2021, by Bioscan on the Marvel Ltd landholding at Rhyd-y-car West, Merthyr Tydfil, as well as reporting on older survey data and third-party records.

1.1.2 The surveys form a component of a broader suite of ecological surveys carried out on the site between 2015 and 2021, to inform the design and ultimately assessment of the proposals to redevelop parts of the site for a major leisure attraction.

1.2 Site Location & Study Area

1.2.1 The site is located on the lower slopes of Mynydd Merthyr, to the west of Merthyr Tydfil and the A470, centred at approx. British National Grid reference SO 047047. The scope and scale of the proposed development has evolved over the period and this is reflected in the extent of coverage of the surveys carried out (see **Figure 1**).

1.2.2 Initially, in 2015, the survey area encompassed more or less the entirety of the Marvel landholding (which at 224ha, is a significantly larger area than the current application site), and which included the whole of the Cwm Glo a Glyndyrys Site of Special Scientific Interest (SSSI) and all or parts of two Sites of Importance for Nature Conservation (SINCs): Cwm Glo SINC and Rhyd-y-Car West SINC (refer to the separate Pre-Application Report, reference E1835-HABITATS-R7, covering habitats and designations for further details). The current application site is focussed on a smaller sub-site (comprising approximately 27ha or 12% of the greater landholding), which is located within the south-eastern extent of the wider site (see **Figure 1**).

1.2.3 All survey results are presented in this report. While some results from previous survey years are not directly relevant to the proposed development (i.e., being outside the putative 2021 application site), they are nonetheless included for completeness, and in recognition of the mobile nature of bats and the high degree of linkage between habitat in and out of the current application site. For ease of interpretation, results from surveys conducted outside, or only partially within the current application site are shown in light grey and dark grey, respectively, within the tables within this report and its appendices.

1.3 Report Purpose

1.3.1 The purpose of the surveys has been to establish a comprehensive understanding of the current distribution and relative abundance of bat species across the site to inform masterplanning, site promotion and subsequent impact assessments and planning determination, with reference to applicable industry standards.

2 METHODOLOGY

2.1 Background Records & Desk Study

2.1.1 Initially a desk-based exercise was undertaken, involving review of previous Environmental Statements and (where available), supporting bat survey reports, as well as recorded habitat information, in order to define the level of survey effort required to assemble an adequately representative dataset from which to define the baseline position as regards bat species.

2.1.2 The main sources of data available, preceding Bioscan's involvement in the site from 2015, were the following:

- **David Clements Ecology Ltd (2006).** Merthyr Tydfil County Borough Sites of Importance for Nature Conservation (SO 00NW/7: Cwm Glo) Survey & Assessment for SINC Designation[1].

- **Merebrook Science and Environment Limited (June 2008).** Reclamation Scheme Land at Rhydycar, Merthyr Tydfil: 'Environmental Statement' (Report reference: ES-S3846-08-106) and accompanying 'Baseline Ecological Report' (Appendix 6.1), as produced for Merthyr Village Limited.

2.1.3 This background data resource was further supplemented and updated by requests to the local records centre for background information. In order to obtain existing ecological data relating to statutory designations and important habitats and species in the vicinity of the study area, the South East Wales Biodiversity Records Centre (SEWBReC) was contacted in April 2018 and again in May 2021 to request any information held relating to statutory and non-statutory nature conservation designations within a 2km (5km in 2021) search radius of the centre of the study areas. Protected and/or notable species records (including bats) were also requested for this search area. This was supplemented by a search of Bioscan's own in-house archives and available online resources, such as the government's MAGIC website[2].

2.2 Activity Transect Surveys

Background

2.2.1 The principal aim of the bat activity surveys was to collect sufficient data to characterise the assemblage of bat species that use the site, afford an appreciation of the relative levels of use between species and areas and to identify any landscape features of particular value or importance for commuting/foraging. The methodology for these surveys was derived from the industry-standard BCT Survey

1 Which was itself informed by the following: CCW Phase 1 survey (1991-93); Landscape Strategy (TACP 1996); CCW Phase 2 surveys (1993-94) (2003); Merthyr Tydfil LBAP (2001); Wildlife Trust records (2002); Humphries Rowell Associates (2002); Wildlife Trust records (2002); Woods & Hand (2005)

2 Multi-Agency Geographic Information for the Countryside. *MAGIC database.* Via: http://magic.defra.gov.uk/home.htm

Guidelines incumbent at the time of each of the surveys[3,4], adapted for reasons of practicality and in view of the fact that while wholesale development of the site was known to be excluded from the proposals at the outset, the location of areas likely to be subject to impacts from development had not at that time been determined. The bat activity transect survey comprised surveyors following pre-determined walked transect routes, which differed between the years, and were informed by habitat assessments and followed not only existing landscape features such as hedgerows, footpaths and woodland edges but also covered the more open aspects of the site.

2.2.2 Each surveyor was equipped with one or more Anabat detectors (comprising Anabat SD1/2, Express or Swift)[5], and typically supplemented by use of an Echo Meter Touch 2 or Pettersson D240x bat detector with recording device. Bats detected during the surveys were identified to species level based on a combination of real-time heterodyne/time-expansion detector call pattern, screen display from the Echo Meter Touch 2, and visual/behavioural evidence. The survey recordings were later subject to computer analysis at the Bioscan offices using the propriety software for each detector type: Analook (version 4.1t) for the Anabat SD1/2 and Anabat Express detectors; Anabat Insight for the Anabat Swift; Batsound v10.0 for the Pettersson recordings; and Kaleidoscope for the Echo Meter Touch 2.

2.2.3 Identifying and labelling recorded bat calls was undertaken with the aid of published species call parameters[6], as well as Bioscan's in-house library of calls. For Anabat recordings, the label(s) for each sound file were tallied to produce a sound file count for each transect. Because the detector systems used to capture the bat data was different, the numbers provided in the results table below reflect the number of discrete bat call registrations (in relation to the Pettersson detector) and the number of sound files[7] (in relation to the Anabat detectors, and the Echo Meter Touch 2), rather than necessarily reflecting the number of bats present.

Strategic Approach to Bat Activity Surveys: 2015

2.2.4 **Figures 2a-f** show the four transect routes as surveyed in 2015, each of were approximately equal in length (between 6km and 7km). The majority of Transect 4 and a southern section of Transect 3 fall within the 2021 study area (refer to **Figure 1** for the study areas for each year). Each transect was walked by a single surveyor from dusk into the first few hours after nightfall, over three occasions in each of May, June and July 2015. **Table 1** below provides the details of surveys conducted in 2015.

3 Hundt, L. (2012). *Bat surveys – good practice guidelines, 2nd edition.* Bat Conservation Trust.
4 Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London.
5 On a single occasion the Anabat detector failed and survey data was derived from a Pettersson alone.
6 Russ, J. (2012). British Bat Calls: A Guide to Species Identification. Pelagic Publishing.
7 The Anabat system records in 15 second segments when ultrasound (bats or otherwise) triggers the detector. For example, if one bat is detected for two seconds one sound file is created; if four bats are recorded continuously for 15 seconds again one sound file is created. Numbers of sound files do not therefore reflect numbers of registrations.

Table 1. *Dates, timings and weather for bat activity surveys in 2015*

Survey Period	Date	Survey Timing	Transect Reference	Start time	End time	Sunset	Weather
May-15	26/05/2015	Dusk	T1	21:10	00:05	21:13	No rain or wind. Cloud- 0/8. Temperature dropping from 10°C to 4.5°c at end.
			T2				
			T3				
			T4				
Jun-15	24/06/2015	Dusk	T1	21:45	00:20	21:34	15°C at start dropping to 12°C at end.
			T2	21:45	00:20		
	25/06/2015		T3	21:30	00:03	21:34	20°C at start, 18°C at end.
			T4	21:30	00:03		
Jul-15	15/07/2015	Dusk	T1	21:08	23:50	21:26	16°C- 14°C. Cloudy.
			T2	21:08	23:50		
	08/07/2015		T3	21:16	23:34	21:30	13.5°C at start, 11.5°C at end. Calm, Cloud- 2/8.
			T4	21:16	23:34		

Strategic Approach to the Bat Activity Surveys: 2016

2.2.5 Following a refinement in the proposed development boundary the surveys conducted in 2016 were concentrated in the eastern half of the wider landholding. Two pre-defined transect routes of approximately equal length (4.5km to 6km) were established in order to ensure good coverage of the 2016 study area. **Figures 3a-d** show the transect routes followed. Transect 2 and the extreme southern part of Transect 1 fall within the 2021 study area. Each transect was walked by a single surveyor from one hour after sunset for approximately two hours; and walked from approximately three hours prior to sunrise until one hour prior to sunrise on one occasion in each of August and September 2016. This departure from typical survey timings also allowed surveyors to focus on bat activity as it related to buildings/structures in the earliest part of the evening (for further details refer to section 2.5). **Table 2** below provides the details of each survey conducted in 2016.

Table 2. *Dates, timings and weather for each bat activity survey in 2016*

Survey Period	Date	Survey Timing	Transect Reference	Start time	End time	Sunset/ Sunrise	Weather
Aug-16	23/08/2016	Dusk	T1	21:19	23:28	20:19	Cloud- 5/8. 22°C at start dropping to 18°C by end. Southerly wind.
			T2				
	24/08/2016	Dawn	T1	02:57	04:42	06:19	Cloud- 5/8. 15°C. Southerly wind.
			T2				
Sep-16	15/09/2016	Dusk	T1	20:20	22:20	19:26	Cloud- 0/8. Full moon. No wind. C.15°C
			T2				
	16/09/2016	Dawn	T1	04:05	05:55	06:50	Slight drizzle for five minutes at start. Slight southerly breeze. 13-15°C
			T2				

Strategic Approach to the Bat Activity Surveys: 2018

2.2.6 As per 2016, the surveys conducted in 2018 were concentrated in the eastern half of the wider landholding. The two transect routes (differing from the routes used in 2016) were approximately equal in length (3.7km) and were typically walked twice in an evening. Transect 2, and the extreme southern part of Transect 1 lie within the 2021 application site. **Figures 4a-k** shows the transect routes followed. Each transect was walked on ten occasions by a single surveyor; nine visits were undertaken at dusk, with one visit (in late August) conducted at dawn. Table 3 below provides the details of each survey conducted in 2018.

Table 3. *Dates, timings and weather for each bat activity survey in 2018*

Survey Period	Date	Survey Timing	Transect	Start Time	End time	Sunset/ Sunrise	Weather
Apr-18	4/24/2018	Dusk	T1	20:26	22:30	20:26	Cloud - 8/8. 13°C. Occasional breeze, light drizzle towards end of survey
			T2				
May-18	5/17/2018	Dusk	T1	21:00	23:06	21:07	Cloud - 0/8. 13°C. No wind.
			T2				
Jun-18	6/14/2018	Dusk	T1	21:33	23:40	21:33	Cloud - 0/8. 12.5°C. No wind.
			T2				
	26/06/2018	Dusk	T1	21:36	11:36	21:36	Cloud - 1/8. 24-21°C. Very light breeze, dry.
			T2				
Jul-18	07/12/2018	Dusk	T1	21:30	23:40	21:30	Cloud - 6/8. 18.5°C. No wind.
			T2				
	7/18/2018	Dusk	T1	21:24	23:37	21:26	Cloud - 0/8. 17.5°C. No wind.
			T2				
Aug-18	08/09/2018	Dusk	T1	20:48	22:50	20:48	Cloud - 1/8. 13°C. No wind.
			T2				
	8/20/2018	Dusk	T1	20:30	22:35	20:30	Cloud - 8/8. 20°C. No wind, light drizzle showers.
			T2				
	8/21/2018	Dawn	T1	04:05	06:10	06:11	Cloud - 8/8. 16°C.No wind, light drizzle showers.
			T2				
Sep-18	13/09/2018	Dusk	T1	19:32	21:32	19:32	13-14°C. No wind, light drizzle at 21:00.
			T2				
	27/09/2018	Dusk	T1	19:00	21:01	19:00	Cloud - 0/8. 15°C. Very light breeze, dry.
			T2				

Combined survey mapping: 2015, 2016 and 2018

2.2.7 A summary of the information collated from years 2015, 2016 and 2018 is presented on a single plan at **Figure 5**. This bat activity 'heatmap' was generated from collated point data from the pre-2021 transect surveys, whereby one point equated to one bat observed/heard. The areas of higher activity shown on the map indicate locations where multiple bats were observed/heard, and/or single bats were observed/heard on repeated visits.

Strategic Approach to the Bat Activity Surveys: 2021

2.2.8 In response to further refinement of development proposals in 2021, the surveys were focussed on the south-eastern corner of the wider landholding. Two transect routes (differing from the routes used in previous years) of approximately equal length (4.0km - 4.5km) were established. **Figures 6a-m** shows the transect routes followed. Each of the two transects was walked by a single surveyor from sunset for a period of two hours twice a month between April and September inclusive (and therefore comprising twelve surveys for each transect). During the late August visit a dawn survey was also conducted; this commenced two hours prior to sunrise and concluded at sunrise. Further refinement of the application site boundary has occurred since the transect surveys were conducted in the spring and summer of 2021. As such some parts of both transects now fall outside the application site boundary. **Table 4** below provides the details of each survey conducted in 2021.

Table 4. *Dates, timings and weather for each bat activity survey in 2021*

Survey Period	Date	Survey Timing	Transect	Start Time	End time	Sunset/ Sunrise	Weather
Apr-21	21/04/2021	Dusk	T1	20:29	22:26	20:21	Cloud - 0/8. 9°C. Occasional breeze.
			T2				
	29/04/2021	Dusk	T1	20:42	23:07	20:35	Cloud - 8/8. 7.5-5.5°C. Occasional breeze, no rain during survey but rain preceding survey.
			T2				
May-21	17/05/2021	Dusk	T1	21:06	23:46	21:03	Cloud - 2/8. 8°C. No wind, no rain.
			T2				
	27/05/2021	Dusk	T1	21:17	23:17	21:17	Cloud 0/8 to 8/8. 13°C. Light breeze, no rain.
			T2		00:15		
Jun-21	15/06/2021	Dusk	T1	21:35	23:35	21:34	Cloud 0/8. 20°C - 14.5°C. Light breeze, no rain.
			T2				
	28/06/2021	Dusk	T1	21:36	23:36	21:36	Cloud 8/8. 14°C-15°C. No wind
	29/06/2021		T2	21:36	23:36		Cloud 4/8. 15°C - 14°C. Light breeze, no rain.
Jul-21	12/06/2021	Dusk	T1	21:28	23:28	21:28	Cloud 8/8. 15.5°c. Occasional breeze, no rain until last 20 minutes of survey where there was a light misting of rain.
			T2				
	26/07/2021	Dusk	T1	21:12	23:12	21:12	Cloud 8/8. 21°c. Light wind, no rain, warm and humid.
			T2				
Aug-21	10/08/2021	Dusk	T1	20:42	22:46	20:46	Cloud 0/8. 20°C-14°C. No wind.

Survey Period	Date	Survey Timing	Transect	Start Time	End time	Sunset/ Sunrise	Weather
	12/08/2021		T2	20:42	22:42	20:42	Cloud 8/8. 15°C-16.5°C. Occasional wind, intermittent light rain showers.
	25/08/2021	Dusk	T1	20:15	22:15	20:15	Cloud 8/8. 17.5°C-14°C. Light rain.
			T2				
	26/08/2021	Dawn	T1	04:16	06:16	06:16	Cloud 1/8 to 8/8. 10°C - 13°C. No wind.
			T2				
Sep-21	15/09/2021	Dusk	T1	19:28	21:28	19:28	Cloud 6/8. 19-17.5°C. Light wind. No rain, warm and humid.
			T2				
	27/09/2021	Dusk	T1	19:00	21:00	19:00	Cloud 6/8. 12-11.5°C. Light wind. Heavy showers in the day before the survey. Light rain for first 50 minutes of survey then intermittent showers.
			T2				

2.2.9 Consistent with Figure 5 described at paragraph 2.2.7 above, a summary of the information collated in 2021 has been presented on a single plan at **Figure 7**. This bat activity 'heatmap' was generated from collated point data from the 2021 transect surveys, whereby one point equated to one bat observed/heard. The areas of higher activity shown on the map indicate locations where multiple bats were observed/heard, and/or single bats were observed/heard on repeated visits.

2.3 Automated Bat Surveys

Background

2.3.1 The transect surveys were augmented by a substantial amount of data collected from static detectors (Anabat Express) operating at fixed points within the site, in locations selected to provide information on key bat species, species assemblages and to assess potential landscape features of particular value for commuting/foraging. The methodology for these surveys was derived from the best practice guidance[8,9] incumbent at the time of the survey campaigns, adapted for the reasons described within this report.[10]

2.3.2 Each detector was placed at locations selected as likely to give the best data returns, such as woodland edge, rides/tracks through woodland and hedgerows/tree lines, taking account of practical issues such as the ability to affix the detector within features and the security of the detector. Generally, each detector was deployed for a minimum of five nights.

2.3.3 The recordings were analysed using the propriety software for the Anabat Express detectors; Analook (version 4.1t) or in the case of Anabat Swift detectors; Analook

8 Hundt, L. (2012). *Bat surveys – good practice guidelines, 2nd edition.* Bat Conservation Trust.

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

10 For example, as at paragraph 2.3.2 in respect of the deliberate bias towards positioning static detectors in the lower and more wooded parts of the site in view of likely wider landscape-change effects from development in these areas; and as described at paragraph 2.3.5 in respect of analysis of more than the 5-night minimum survey data

Insight. The Anabat system records in 15 second segments when sound (bats or otherwise) triggers the detector. For example, if one bat is detected for two seconds one sound file is created; if four bats are recorded continuously for 15 seconds again one sound file is created. Identifying and labelling bat calls within recording segments was undertaken as described at paragraphs 2.2.2 – 2.2.3 above. The label(s) for each sound file were then tallied to produce the file count for each detector and survey period.

2.3.4 It should be noted that registration or call tallies derived from Anabat recordings may not precisely reflect the number of bats present. For example, simple tallies of sound files will over-estimate bat numbers, and while distinguishing numbers of bats from recordings is possible (and was done) when one or two bats are present, it becomes impossible where high levels of constant activity have been recorded.

2.3.5 In addition, as some detectors were deployed for at least two weeks (which generated a substantial amount of data), for some deployments only five consecutive nights were analysed (i.e., the minimum number of nights as per the incumbent BCT guidelines). The number of nights the detectors were deployed is described within each table below. Following the manual identification of bat calls, Analook filters were deployed to provide additional automated checks for identify rarer species that have unambiguous calls (e.g., lesser horseshoe, greater horseshoe and Nathusius' pipistrelle are unlikely to be confused by a filter from other species; which is in contrast to the *Myotis* species which are generally similar in their call parameters).

Automated Bat Surveys: 2015

2.3.6 Static detectors were deployed at four different locations during each of June and July 2015 (therefore totalling eight locations), as shown at **Figure 8**. Detector 15-6 is the only detector location that falls within the current application site boundary. **Table 5** below provides details of each survey period covered by automated data collection in 2015.

Table 5. *Details of the automated bat detector surveys in 2015*

Survey period	June 2015		July 2015
Start date (evening of)	18/06/2015	25/06/2015	08/07/2015
End date (morning of)	25/06/2015	07/07/2015	15/07/2015
Detector reference (location shown at **Figure 8**)	15-3, 15-2, 15-4	15-1	15-8, 15-7, 15-6, 15-5
Number of nights deployed	7	13	8
Average temperature (°C) over survey period (night only) for two detectors[11]	11.4 and 11	14	13.9 and 13.5

11 Data obtained from internal thermometer within two Anabat Express detectors from different locations and microclimates (e.g., one from an exposed elevated location, and another at lower altitude within a woodland) were used in order to show the likely temperature range difference over the survey period.

Survey period	June 2015		July 2015
Maximum temperature (°C) over survey period (night only) for two detectors[9]	25 and 24.5	21.2	22.5 and 19
Minimum temperature (°C) over survey period (night only) for two detectors[9]	7 and 4.8	9.8	8.3 and 7.8

Automated Bat Surveys: 2016

2.3.7 During the 2016 surveys (conducted in August and September), three automated detectors were deployed in different locations along each of the two transects for each month (therefore six automated detectors deployed in each month of survey). Detector 16-7 is the only detector within the current application site boundary (**Figure 8**). **Table 6** below provides details of each survey period covered by automated data collection in 2016.

Table 6. *Details of the automated bat detector surveys in 2016*

Survey period	August 2016	September 2016
Start date (evening of)	23/08/2016	08/09/2016
End date (morning of)	01/09/2016	16/09/2016
Detector reference (location shown at **Figure 8**)	16-1, 16-2, 16-3, 16-4, 16-5, 16-6	16-7, 16-8, 16-9, 16-10, 16-11, 16-12
Number of nights deployed	9	8
Average temperature (°C) over survey period (night only) for two detectors[12]	13.9 and 14.6	13.6 and 14.1
Maximum temperature (°C) over survey period (night only) for two detectors	19.5 and 20.5	19 and 19.8
Minimum temperature (°C) over survey period (night only) for two detectors	6.8 and 7.3	5.3 and 7

Automated Bat Surveys: 2018

2.3.8 During the active bat season of 2018, three static detectors were deployed along each transect during each month of survey (April[13]-September). In order to assess seasonal variations in bat activity, the same locations were used during each survey month. Detectors 18-3 and 18-6 fall within the current application site boundary (**Figure 8**).

2.3.9 **Table 7** below provides details of each survey period covered by automated data collection in 2018.

12 Data obtained from internal thermometer within two Anabat Express detectors from different locations and microclimates (e.g., one from an exposed elevated location, and another at lower altitude within a woodland) were used in order to show the likely temperature range difference over the survey period.

13 Except for April 2018 where only two detectors per transect were deployed (four total).

Table 7. *Details of the automated bat detector surveys in 2018*

Survey period	April 2018	May 2018	June 2018	July 2018	August 2018	September 2018
Start date	26/04/2018	13/05/2018	15/06/2018	12/07/2018	13/08/2018	13/09/2018
End date	30/04/2018	17/05/2018	19/06/2018	16/07/2018	17/08/2018	17/09/2018
Detector reference (location shown at **Figure 8**)	18-1, 18-2, 18-3, 18-4	18-1, 18-2, 18-3, 18-4, 18-5, 18-6	18-1, 18-2, 18-3, 18-4, 18-5, 18-6	18-1, 18-2, 18-3, 18-4, 18-5, 18-6	18-1, 18-2, 18-3, 18-4, 18-5, 18-6	18-1, 18-2, 18-3, 18-4, 18-5, 18-6
Number of nights deployed	5	5	5	5[14]	5	5
Average temperature (°C) over survey period (night only) for two detectors	5.7 and 5.9	9.9 and 8.7	13.8 and 14.4	14.3 and 15	14.4 and 15.2	13.8 and 14.3
Maximum temperature (°C) over survey period (night only) for two detectors	11.5 and 12.5	18 and 18.5	16 and 16.8	20 and 27	16.8 and 17.8	17.3 and 19.8
Minimum temperature (°C) over survey period (night only) for two detectors	1 and 1.5	1.5 and 3	11.5 and 11.8	8.3 and 10.3	8 and 9.5	10 and 11.5

Automated Bat Surveys: 2021

2.3.10 As per previous years, three automated detectors were deployed in locations along each of the two transects (six automated detectors in total) for each month of survey (April- September). One detector (labelled Sep-1 at **Figure 8**) failed to record during the initial September survey period but was subsequently redeployed at a later date in September (see **Table 8**).

2.3.11 The position of the detectors varied between each month in order to obtain greater site coverage and spatial data of bat activity throughout the 2021 study area. As a result of changes to the application site boundary after surveys were conducted. The location of several automated detectors deployed now fall outside the application site boundary (**Figure 8**). Automated detectors that fall outside the current application site boundary include: Apr-1, May-1, Jun-1, Jul-1, Jul-4, Jul-5, Jul-6, Aug-1, Aug-2, Aug-3, Aug-6, Sep-3 and Sep-5.

2.3.12 **Table 8** below provides details of each survey period covered by automated data collection in 2021.

14 Except 18-4 which recorded for two days only. This detector failed after two days of deployment during the July 2018 survey period and was unable to be redeployed before the end of the month. 18-4 is outside the current application site boundary.

Table 8. *Details of the automated bat detector surveys in 2021*

Survey period	April 2021	May 2021	June 2021	July 2021	August 2021	September 2021	
Start date	21/04/2021	03/05/2021	16/06/2021	14/07/2021	10/08/2021	19/09/2021	27/09/2021
End date	25/04/2021	07/05/2021	20/06/2021	18/07/2021	14/08/2021	23/09/2021	01/10/2021
Detector reference (location shown at **Figure 8**)	Apr-01, Apr-02, Apr-03, Apr-04, Apr-05, Apr-06	May-01, May-02, May-03, May-04, May-05, May-06	Jun-01, Jun-02, Jun-03, Jun-04, Jun-05, Jun-06	Jul-01, Jul-02, Jul-03, Jul-04, Jul-05, Jul-06	Aug-01, Aug-02, Aug-03, Aug-04, Aug-05, Aug-06	Sep-02, Sep-03, Sep-04, Sep-05, Sep-06	Sep-01
Number of nights deployed	5	5	5	5	5	5	5
Average temperature (°C) over survey period (night only) for two detectors	5 and 6.3	3.5 and 4.2	12.9 and 13.7	15.1 and 15.9	14.4 and 14.7	11.7 and 11.8	9.5
Maximum temperature (°C) over survey period (night only) for two detectors	13 and 14.5	8.5 and 8.8	16.3 and 18	20.3 and 20.8	17.8 and 23	15.3 and 15.8	14.8
Minimum temperature (°C) over survey period (night only) for two detectors	-1 and 0.8	-1 and -0.3	10.3 and 10.5	11.5 and 13	10.5 and 11.3	8.5 and 8.5	5.8

2.4 Autumn Swarming Surveys: 2015

2.4.1 Tunnels and other built structures considered suitable to be used by swarming bats[15] were subject to surveys on the 15th and 30th September 2015. The survey methodology was derived from the BCT guidelines incumbent at the time. The surveys involved three surveyors each attending one of three structures from sunset until four hours after sunset. **Figure 9** shows the locations of buildings subject to the swarming surveys. (Note that all structures subject to swarming surveys in 2015 are outside the current application site boundary with the closest (B12 and B11) being ~200-300m from the south-western edge of the site.) Each surveyor was equipped with a bat detector (Anabat SD1 or SD2) and was stationed from a viewpoint where the structures could be readily observed. During the first visit, automated detectors were also placed near to the three structures and were left to record for the duration of that night. During the second visit, an automated detector was placed at an

15 During autumn, *Myotis* bats may swarm at caves and subterranean mines in order to mate and/or find hibernation sites.

additional otherwise unsupervised structure in order to aid in understanding whether swarming occurred there. **Table 9** below provides the details of these surveys.

Table 9. *2015 Swarming survey details*

Survey period	September 2015	
Date	15/09/2015	30/09/2015
Start time	19:29	18:39
End time	23:29	22:54
Sunset time	19:29	18:54
Sunrise time	06:49	07:13
Structures surveyed (see **Figure 9**)	B1, B11, B12	B1, B11, B12
Temperature	13°C-12°C	14°C- 11°c
Weather	Cloud- 7/8, no wind	Cloud- 0/8
Buildings surveyed by remote detector	B1, B11, B12	B1, B11, B12, B14
Minimum overnight temperature (with time of low temp.)	8.25°C (06:18)	7.75°C (03:10-04:30)

2.5 Emergence/Re-entry surveys: 2016

2.5.1 Tunnels and other built structures considered suitable to be used by roosting bats were subject to surveys in mid-August and mid-September 2016. The survey methodology was derived from the BCT guidelines incumbent at the time. The surveys involved two surveyors each attending a different structure from sunset until approximately one hour after sunset, and then attending two different structures the following dawn. Each surveyor was equipped with a bat detector (Anabat SD1, Anabat SD2, Anabat Express, and/or a Pettersson D240x bat detector and recording device) and the surveyors were positioned in a location where the structures could be easily observed. **Table 10** below provides the details of these surveys. **Figure 9** shows the location of the structures covered during the emergence/re-entry surveys. Note all structures subject to emergence/re-entry surveys in 2016 are outside the current application site boundary with the closest (B16 and B11) being ~190-300m from the south-western edge of the site.

Table 10. *Emergence/ re-entry survey details in 2016*

Survey period	August 2016				September 2016			
Date	23/08/2016		24/08/2016		15/09/2016		16/09/2016	
Survey timing	Dusk		Dawn		Dusk		Dawn	
Structure (shown on **Figure 9**)	B3a	B11	B1	B16	B14	B16	B3a	B11
Start time	20:04		05:02		19:20		05:55	
End time	21:19		06:19		20:20		07:00	
Sunset	20:19		-		19:26		-	
Sunrise	-		06:19		-		06:50	

Survey period	August 2016				September 2016			
Date	23/08/2016		24/08/2016		15/09/2016		16/09/2016	
Survey timing	Dusk		Dawn		Dusk		Dawn	
Structure (shown on **Figure 9**)	B3a	B11	B1	B16	B14	B16	B3a	B11
Weather	Cloud- 5/8. 22°C at start dropping to 18°C by completion. Southerly wind.		Cloud- 5/8. 15°C. Southerly wind.		Cloud- 0/8. Full moon. No wind. s.15°C		Slight southerly breeze. c.13-15°C	

2.6 Built Structure Inspections

Built Structure Inspection: 2016

2.6.1 *Winter roosting bats:* A number of built structures are present within the wider landholding (**Figure 9**), with the majority of these located in the south-east of the landholding (largely in associated with the former Cyfarthfa Canal and related historic mining operations). These were subject to a structural inspection for evidence of hibernating bats on the 23rd and 24th February 2016. These surveys were carried out with the aid of a six-metre sectional ladder, bright Clulite torch and endoscope as appropriate. The survey was carried out by Geoff Moxon[16], aided by Francesca Morini.

2.6.2 *Autumn roosting bats*: All the structures within the revised site boundary were inspected for evidence of roosting bats on the 15th September 2016. These surveys were carried out with the aid of a six-metre sectional ladder, bright Clulite torch and endoscope as appropriate. The survey was carried out by Dominic Woodfield[17], and aided by Ben Carpenter. **Figure 9** shows the location of these structures.

Built Structure Inspection: 2021

2.6.3 All the structures that were previously assessed as having greater than 'low' potential for roosting bats, and were within the revised site boundary at the time were re-inspected for evidence of hibernating bats on the 12th March 2021. These surveys were carried out with the aid of a six-metre sectional ladder, bright Clulite torch and endoscope as appropriate. The surveys were carried out by Rebecca Read[18], and aided by Ben Carpenter. To obtain further information on hibernating bats, Anabat Express detectors were deployed concurrently with the inspections at B1, B8 and B11 (structures considered to be more suitable to support roosting bats) for approximately 14 nights. **Figure 9** shows the location of these structures. Note structures B1 and B11 are outside the current application site boundary. The results

16 Under Natural Resources Wales licence number: 70513:OTH:CSAB:2016
17 Under Natural Resources Wales licence number: 69264:OTH:CSAB:2015
18 Under Natural Resources Wales licence number: S089238-1

from these detectors are detailed in in the table at **Appendix 1** alongside the structure inspection summaries.

2.7 Preliminary Tree Roost Inspections

2.7.1 The preliminary tree roost inspection survey carried out in 2021 was not comprehensive but instead focussed in the north-west area of the proposed site extents (at the time of the survey[19]) as this is where the location of the proposals (and in particular the proposed ski slope) are focussed and is thus the focus for potential impacts on existing trees within the site. Trees outside of this area have not yet undergone assessment. The approximate extent of the search area is shown in **Figure 10**.

2.7.2 Preliminary tree roost inspections were carried out in April and early May 2021. The survey methodology was based on current best practice guidance[20] and involved a surveyor visually inspecting (with binoculars where needed) all aspects of each tree from the ground to search for features such as woodpecker holes, cracks or tears in bark that bats could exploit for roosting.

2.7.3 Trees were assessed as 'low', 'moderate' or 'high' depending on various factors including the type, size, and number of potential roosting features present as well as the size and age of the tree, in-line with the categorization provided in the Bat Conservation Guidelines[21]. Where it was not possible to accurately assess the quality of a potential roosting feature for bats from the ground due to its height in the tree, vegetation and/or aspect (e.g., facing skyward), a precautionary approach was taken (e.g., low-moderate).

19 The northern edge of the proposed application site changed since the time of the tree roost assessment surveys and thus there are trees beyond the search area that may be within a development footprint that have not been assessed. The results presented in this report are thus preliminary and would need updating to include all areas potentially affected by development prior to any works being carried out.

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

21 Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London. Table 4.1, Pg, 35.

3 RESULTS

3.1 Background Records & Desk Study

3.1.1 The Merthyr Village ES reported the results of a trawl for existing records within and up to 1km from the landholding up to that time. This revealed:

- A foraging noctule *Nyctalus noctula* record approximately 400m to the south of the landholding;
- A hibernating brown long-eared bat *Plecotus auritus* in the disused Merthyr/Abercanaid to Aberdare railway tunnel (B11);
- A pipistrelle *Pipistrellus* sp. roost at a location east of the A470 (Grid ref SO 0505); and
- An unidentified bat species roost within Grid ref SO 0505.

3.1.2 **Table 11** below summarises the results of surveys known to have been undertaken within or near the current application and/or the wider landholding, as reported in background source documents (see paragraph 2.1.2 above), with reference to the building numbers shown on **Figure 9**.

Table 11. *Summary of results of previous bat surveys undertaken on or adjacent to the site*

Year	Survey type	Results
1997	Bat activity	Foraging pipistrelles (*Pipistrellus pipistrellus* and/or *P. pygmaeus*). One noctule. Group of Daubenton's bat feeding over Pond P15 (Figure 2 in Great Crested Newt Species report).
1997	Emergence survey of B1	Pipistrelle sp. and Daubenton's bat observed emerging.
2002	Bat roost inspection of buildings and mature trees	No bat roosts found.
2002	Emergence survey of B1	No bats emerging.
2005 (June and July)	Bat activity	Common pipistrelle, soprano pipistrelle, Daubenton's bat, one noctule and two *Myotis* sp.
2005	Bat roost inspection of buildings and mature trees	No roosts found.
2007	Bat activity survey outside of wider landholding to the north	Common pipistrelle, brown long-eared bat, serotine recorded with individuals commuting south into the greater landholding.
2007 and 2008	Tree and building assessments	No roosts found.
2008	Bat activity in south of site	Common pipistrelle and soprano pipistrelle commuting and foraging.

3.1.3 Moreover, data from SEWBReC in 2021 showed 121 bat records within 2km of the current application site, with species including common and soprano pipistrelle *Pipistrellus pipistrellus* and *P. pygmaeus*, *Myotis* sp., noctule, brown long-eared bat,

and lesser horseshoe bat *Rhinolophus hipposideros*. In addition to foraging/ commuting activity, at least 12 roosts have been recorded within 2km of the current application site, almost all (11) of which relate to buildings within Merthyr Tydfil itself, to the east of the A470. Of these:

- Eight are recorded as common pipistrelle (or pipistrelle species) roosts dating from 2003 to 2018, and ranging from 200m south-east to 1.8km north-east of the current application site;
- Two are recorded as brown long-eared bat roosts in 2019 and 2020, and are 1.5km and 1.4km north-east of the current application site respectively; and
- One is recorded as a lesser horseshoe day roost of a single individual in a former YMCA building 1.5km north-east of the current application site in 2019 (this appears to be the same building as one of the brown long-eared bat and common pipistrelle roosts).

3.1.4 To the western side of the A470, approximately 500m south of the current application site, an additional brown long-eared bat roost has also been recorded. The data provided by SEWBReC describes a single brown long-eared bat observed hibernating in the Merthyr/Abercanaid to Aberdare Railway Tunnel (B11) in February 2005.

3.1.5 In summary, eight species have previously been recorded within or near to the site. These species comprise common pipistrelle, soprano pipistrelle, noctule, brown long-eared bat, Daubenton's bat *Myotis daubentonii*, serotine *Eptesicus serotinus* and unidentified *Myotis* sp. With the exception of roosting pipistrelle and Daubenton's bat in B1 in 1997, and a single hibernating brown long-eared bat in B11, no other evidence of bat roosting has been recorded in any other structure or tree on the current application site or the wider landholding.

3.2 Bat Activity Surveys

Bat Activity Survey Results: 2015

3.2.1 **Figures 2a-f** show the distribution of bat registrations recorded on each of the four transect surveys carried out in May, June and July 2015. **Table 12** below lists the species recorded and the number of sound files/registrations for each recorded on each survey visit and for each transect.

Table 12. *Species and number of sound files recorded for each species during each bat transect survey: 2015*

Survey session	Transect	Common pipistrelle	Soprano pipistrelle	*Pipistrellus* sp. (common/Nathusius')[22]	Pipistrelle sp. (common/soprano)[23]	Nathusius' pipistrelle*	Barbastelle*	Noctule	*Plecotus* sp.[24]	*Myotis* sp.[25]			
										WAB[26]	*Myotis* sp.	Daubenton's bat	Natterer's bat
May-15	T1	34	1	0	3	0	0	0	0	1	0	0	0
	T2	34	12	0	4	0	0	0	0	2	0	0	0
	T3	22	5	0	0	0	0	0	1	0	1	0	1
	T4	20	7	0	0	0	2	0	1	0	7	6	0
Jun-15	T1	71	2	2	2	5	0	0	0	0	0	1	0
	T2	36	3	3	4	0	0	0	0	1	1	0	0
	T3	69	2	0	0	0	0	0	0	5	3	1	0
	T4	34	9	0	0	0	0	0	0	0	7	2	0
Jul-15	T1	45	0	0	1	0	0	0	0	5	2	0	0
	T2	45	1	3	0	0	0	0	0	0	1	0	0
	T3	63	1	1	0	0	0	0	0	0	0	0	0
	T4	42	11	1	1	0	0	1	0	4	2	0	1
Total (all transects)		515	54	10	15	5	2	2	1	2	24	2	2
% of calls		78.1	8.2	1.5	2.3	0.8	0.3	0.3	0.2	0.3	3.6	0.3	0.3
Total (transects within/partially within current site extents)		250	35	2	1	0	2	2	1	2	20	2	2
% of calls		75.1	10.5	0.6	0.3	0	0.6	0.6	0.3	0.6	6	0.6	0.6

* Possible identification

22 Where calls were around 40kHz these have been noted to genus level only, as the calls could not be definitively attributed to either Nathusius' or common pipistrelle.

23 Where Pipistrelle calls were at approximately 50kHz these have been noted as Pipistrelle sp. Both common and soprano pipistrelle can produce calls at or around 50kHz and as such it is not possible to directly attribute a call of this frequency to either species.

24 Long-eared bat calls can be difficult to distinguish to the species level even during sound analysis. However, given that the survey area is well outside the known range of grey long-eared bat, these calls are almost certainly brown long-eared bat *Plecotus auratus.*

25 The use of the slope function in Analook is used to aid in the identification of *Myotis* species (*Myotis* calls are generally difficult to attribute to a specific species); however, where slope is ambiguous these have been noted as *Myotis* sp. The *Myotis* species above (Daubenton's bat, Natterer's bat, whiskered/Alcathoe/Brandt's bat) are probable identifications.

26 'WAB' is an acronym used to describe Whiskered/Alcathoe/Brandt's bat, i.e. *Myotis mystacinus / M. alcathoe / W. brandti*. These three species produce calls with a similar structure and thus cannot be definitively identified to the species level from computer analysis alone.

3.2.2 For transects within (partially or otherwise) or near the current application site, the most frequently recorded species was common pipistrelle, accounting for approximately 75% of all registrations. Much less frequently encountered were soprano pipistrelle (at least 10.5% of registrations), *Myotis* species (including 'WAB'[25], i.e. whiskered/Alcathoe/Brandt's bat (2.7%), Daubenton's bat (2.7%) and Natterer's bat *Myotis nattereri* (0.6%)); and very few registrations of other species, including long-eared bat (almost certainly brown long-eared bat) at 0.6% and noctule (0.3%). Two registrations identified as barbastelle *Barbastella barbastellus* were made in the field (from Pettersson heterodyne and time-expansion call pattern) in May 2015. These calls were detected on the open hillside in the centre of the current application site (**Figure 2a**); however, the calls could not be corroborated with a digital record due to the failure of the recording equipment, which also prevented more detailed analysis of calls.

3.2.3 Also of note are a number of registrations around the 40 kHz frequency that were recorded during the June 2015 survey (**Figure 2c**). Five of these calls fit with the published call parameters of Nathusius's pipistrelle, as were classified as such. Others were classified as 'Pipistrelle sp. (Nathusius'/common)' and may include common pipistrelle bats calling at an unusually low frequency. All such recordings were located outside of the current application site in the extreme north and north west of the wider landholding.

3.2.4 In general, the nature of the bat activity recorded was fairly consistent across the current application site, with bat passes noted along the enclosed woodland paths/rides as well as along woodland edge. Foraging was also noted at several open glades/grasslands, in particular the open hillside in the centre of site, as well as the large area of rough grassland which is contiguous with the north west of the current application site, and the large reservoir (P15) just outside the south west corner of the current application site. In addition, displays of swarming/light-sampling activity observed at the entrance to the Merthyr to Aberdare Railway Tunnel (B11) by *Myotis* species during the May transect (**Figure 2b**) was considered to be strongly indicative of a roost within the tunnel. Detailed analysis of the calls precluded identification of the bats to species level due to equipment failure in the field (detailed above).

Bat Activity Survey Results: 2016

3.2.5 **Figures 3a-d** indicate the distribution of bat registrations recorded on each of the two transect surveys (dusk and dawn) conducted in August and September 2016. **Table 13** below lists the species recorded and the number of sound files/registrations for each recorded on each survey visit and for each transect.

3.2.6 As in 2015, the bulk of the registrations recorded across transects within or near the current site extents can be attributed to common pipistrelle (52.7%) and to a lesser extent soprano pipistrelle (17%). Furthermore, a similar suite of species was recorded overall, although in contrast to 2015, *Myotis* species made up a greater proportion of the species recorded (22.3%).

3.2.7 Of note were two registrations identified during *post facto* analysis as probable barbastelle. These were recorded during the September dusk and dawn survey in the north of the current application site (**Figures 3c and 3d**).

3.2.8 Overall, the activity noted during 2016 is consistent with that noted in the previous year, with foraging activity consistently noted again at the entrance to B11 during several surveys. This was particularly evident during the August dusk survey (**Figure 3a**) where both common and soprano pipistrelle and *Myotis* species were present.

***Table 13**. Species and number of sound files recorded for each species during each bat transect survey: 2016*

Survey Period	Date	Survey Timing	Transect	Common Pipistrelle	Soprano Pipistrelle	*Pipistrellus* sp. (Common/soprano)[27]	Noctule	*Nyctalus/Eptesicus* sp.[28]	Barbastelle*	*Plecotus* sp.[29]	*Myotis* sp.[30]	Daubenton's bat	Total
Aug-16	23/08/2016	Dusk	T1	22	5	0	2	0	0	0	0	0	29
			T2	6	10	0	1	0	0	0	14	0	31
	24/08/2016	Dawn	T1	10	2	0	0	0	0	0	0	0	12
			T2	9	2	0	0	0	0	0	1	0	12
Sep-16	15/09/2016	Dusk	T1	8	1	1	1	1	0	0	1	0	12
			T2	20	5	4	0	0	1	0	10	2	42
	16/09/2016	Dawn	T1	10	4	2	2	0	0	1	7	0	23
			T2	24	2	0	0	0	1	0	0	0	27
Total (all transects)				109	31	7	4	1	2	1	33	2	189
% of calls				57.7	16.4	3.7	2.1	0.5	1	<0.1	17.4	1.1	
Total (transects within current site extents)				59	19	4	1	0	2	0	25	2	59
% of calls				52.7	17	3.6	0.9	0	1.8	0	22.3	1.8	52.7

* Possible identification

<u>Bat Activity Survey Results: 2018</u>

3.2.9 **Figures 4a-k** indicate the distribution of bat registrations recorded on each of the activity surveys conducted between April and September 2018. **Table 14** below lists

27 Where Pipistrelle calls were at approximately 50kHz these have been noted as Pipistrelle sp. Both common and soprano pipistrelle can produce calls at or around 50kHz and as such it is not possible to directly attribute a call of this frequency to either species.

28 Calls where it was not possible to identify which 'big bat' species (common noctule, Leisler's or serotine) was present with absolute certainty.

29 Call was not recorded on Anabat express detector but identified via real-time handheld detector in the field. It is not possible to distinguish between grey and brown long-eared bats using a real-time heterodyne detector however, given that the survey area is well outside the known range of grey long-eared bat, these calls are almost certainly brown long-eared bat *Plecotus auratus.*

30 The use of the slope function in Analook is used to aid in the identification of *Myotis* species (*Myotis* calls are generally difficult to attribute to a specific species); however, where slope is ambiguous these have been noted as *Myotis* sp. The *Myotis* species above (Daubenton's bat, Natterer's bat, whiskered/Alcathoe/Brandt's bat) are probable identifications.

the species recorded and the number of sound files/registrations for each recorded on each survey visit and for each transect.

3.2.10 The majority of calls recorded within or near the current site extents can be attributed to common pipistrelle (79.9%), and the assemblage of species recorded is comparable to previous years. Much less frequently encountered were soprano pipistrelle (10.9%), *Myotis* species (5.4%), and very few registrations of other species including noctule (1.7%). Of note is a single potential Nathusius's pipistrelle in June (0.3%) and one potential barbastelle (0.3%) in May. Both were noted in woodland to the west of the current application site (**Figure 4b**).

3.2.11 Observed activity in 2018 replicated that of previous years, whereby there was a fairly consistent level of activity noted throughout the current application site with foraging, in particular, in more open areas and/or near to waterbodies.

Table 14. *Species and number of sound files recorded for each species during each bat transect survey in 2018*

Survey period	Date	Transect	Common pipistrelle	Soprano pipistrelle	*Pipistrellus* sp. (Common/soprano)[31]	Nathusius' pipistrelle	*Pipistrellus* sp. (Common/Nathusius)[32]	Noctule	*Nyctalus* sp.[33]	Barbastelle*	*Myotis* sp.			Total
											WAB[34]	*Myotis* sp.[35]	Daubenton's bat	
April 2018	24/04/2018	T1	3	0	0	0	0	0	0	0	0	0	0	3
		T2	2	1	0	0	0	0	0	0	0	1	0	4
May 2018	17/05/2018	T1	61	13	5	0	0	1	0	1	1	1	0	83
		T2	12	3	0	0	0	1	0	0	0	4	0	21
June 2018	14/06/2018	T1	19	8	2	0	0	0	0	0	2	1	0	32
		T2	13	5	0	1	0	0	0	0	0	6	0	25
	26/06/2018	T1	33	4	0	0	0	0	0	0	0	0	0	37
		T2	27	4	0	0	1	0	0	0	0	3	0	35
July 2018	12/07/2018	T1	35	3	0	0	0	0	0	0	0	1	0	39
		T2	19	3	1	0	0	3	0	0	0	0	0	26
	18/07/2018	T1	50	2	1	8	0	0	0	0	0	1	0	62
		T2	73	0	0	0	0	0	0	0	0	0	0	73
	09/08/2018	T1	23	2	0	0	0	0	0	0	0	0	0	25

31 Where Pipistrelle calls were at approximately 50kHz these have been noted as Pipistrelle sp. Both common and soprano pipistrelle can produce calls at or around 50kHz and as such it is not possible to directly attribute a call of this frequency to either species.

32 Where calls were around 40kHz these have been noted to genus level only, as the calls could not be definitively attributed to either Nathusius' or common pipistrelle.

33 Calls where it was not possible to identify which noctule species (common noctule or Leisler's) was present with absolute certainty.

34 Whiskered/Alcathoe/Brandt's Bat. These three species produce calls with a similar structure and thus cannot be definitively identified to the species level from computer analysis alone.

35 The use of the slope function in Analook is used to aid in the identification of *Myotis* species (*Myotis* calls are generally difficult to attribute to a specific species); however, where slope is ambiguous these have been noted as *Myotis* sp. The *Myotis* species above (Daubenton's bat, Natterer's bat, Whiskered/Alcathoe/Brandt's bat) are probable identifications.

Survey period	Date	Transect	Common pipistrelle	Soprano pipistrelle	*Pipistrellus* sp. (Common/soprano)[31]	Nathusius' pipistrelle	*Pipistrellus* sp. (Common/Nathusius)[32]	Noctule	*Nyctalus* sp.[33]	Barbastelle*	*Myotis* sp.			Total
											WAB[34]	*Myotis* sp.[35]	Daubenton's bat	
August 2018		T2	28	5	0	0	0	0	0	0	0	0	0	33
	20/08/2018 (dusk)	T1	44	8	0	0	0	3	0	0	0	0	1	56
		T2	43	7	0	0	0	1	0	0	0	0	0	51
	21/08/2018 (dawn)	T1	13	1	2	0	0	0	0	0	0	0	0	16
		T2	10	0	1	0	0	0	0	0	0	1	0	12
September 2018	13/09/2018	T1	33	8	1	0	0	0	0	0	0	0	0	42
		T2	7	3	0	0	0	0	1	0	0	0	0	11
	27/09/2018	T1	16	4	0	0	0	0	0	0	0	3	0	23
		T2	1	1	0	0	0	0	0	0	0	1	0	3
Total (all transects)			565	85	13	9	1	9	1	1	3	23	1	712
% of calls			79.4	11.9	1.8	1.3	0.1	1.3	0.1	0.3	0.4	3.2	0.1	
Total (transects within current site extents)			235	32	2	1	1	5	1	1	0	16	0	294
% of calls			79.9	10.9	0.7	0.3	0.3	1.7	0.3	0.3	0.0	5.4	0.0	

* Possible identification

Bat Activity Survey Results: 2021

3.2.12 **Figures 6a-m** indicate the distribution of bat registrations recorded on each of the activity surveys conducted between April and September 2021. **Table 15** below lists the species recorded and the number of sound files/registrations for each recorded on each survey visit and for each transect.

3.2.13 Building on the previous three years of data, common pipistrelle makes up the majority of the total registrations (74.9%) recorded across all transect surveys, with soprano pipistrelle also recorded but much less frequently (8.5%). A similar suite of species was also recorded as in previous years including, *Myotis* species (a combined total of 9.1% for Whiskered/Alcathoe/Brandt's bat, Daubenton's bat and other *Myotis* sp.), noctule (2%) and Nathusius' pipistrelle (0.2%), Serotine (0.7%) and long-eared bats (1.4%) to a lesser extent.

3.2.14 A notable difference from previous years' data is the identification of lesser horseshoe on three occasions during May, June and August (see **Figures 6c, 6f and 6k**). In addition, barbastelle was not recorded during any transect surveys in 2021.

3.2.15 During the transects in 2021, surveyors paid close attention to the time at which bats first appeared so as to aid in identifying potential roost sites nearby. This was complemented by analysis of calls at Bioscan's office whereby the timings of bat

passes recorded during transects were compared to known emergence times of bats as quoted in guidance by Russ (2012)[36]. A brief analysis is provided below.

3.2.16 Early emerging bats (mostly common and soprano pipistrelle) were recorded across much of the woodland/woodland edge present within the application site during transect surveys conducted in 2021. Given the abundance of mature trees within the woodland that could offer roosting opportunities, as well as several confirmed roosts within structures on/near site, this is largely unsurprising. However, early detection of bats was most pronounced at the following target note referenced locations (refer to **Figure 7** for target note locations):

- *Target Note 1 (Woodland glade in north-east corner of the application site):* Pipistrelle bats (common and soprano[37]) were noted in this locality within 30 minutes after sunset on seven surveys, four of which included bats observed (often foraging) within 15 minutes. The earliest emerging bat was a foraging soprano pipistrelle recorded only 8 minutes after sunset, on the 15th of September 2021. Consistent activity of this type is highly suggestive of nearby roosts within the surrounding woodland. Given the small number of bats observed (maximum of two at a time), it is considered likely that these would comprise small day roosts.

- *Target Note 2 (Open hillside in north-west of the application site):* Common pipistrelle bats were recorded across this large area soon after sunset on four transect surveys in 2021, including as early as only 11 minutes after sunset on 12th July 2021. As above, bats were observed in small numbers, flying overhead or foraging along the woodland edge and grassland, again indicating the potential presence of nearby small common pipistrelle day roosts. Indeed, preliminary tree roost inspection results indicate several trees in this area with elevated potential to support bat roosts (see **Appendix 2**), and thus it is possible that the bats observed emerged from one of these trees (see **Figure 10**).

- *Target Note 3 (Pond P15):* Pipistrelle bats (common, soprano and common/Nathusius'[38]) were recorded at or near pond P15 soon after sunset on six transect surveys, including as early as 14 minutes after sunset on 26th July 2021, indicating they had likely emerged from a nearby roost within the surrounding woodland. Generally, one or two individuals were observed foraging over P15, but during 15th June 2021 a minimum of five pipistrelles were observed. In addition, a brown long-eared tree roost was identified to the north of P15 during the dawn survey on 26th August 2021 (see **Figure 6k**). During the survey 10-12 bats were observed swarming and then entering the

36 Russ, J. (2012). British Bat Calls: A Guide to Species Identification. Pelagic Publishing.
37 With reference to pgs. 139 and 147 of Russ, J (2012), common and soprano pipistrelle tend to emerge between 20 and 30 minutes after sunset.
38 With reference to pg. 155 of Russ, J (2012), Nathusius' pipistrelle tends to emerge between 20 and 25 minutes after sunset.

roost. Given the number of bats observed, as well as the time of year[39], this is considered to be a maternity roost.

- *Target Note 4 (Structure B8):* An early emerging *Myotis* sp.[40] pass was recorded at a stone bridge (B8) during 17th May 2021, at only 29 minutes after sunset, and a roost was later confirmed here during a dusk survey on the 27th of September 2021. Three to four *Myotis* sp. bats were observed swarming and entering roosts between gaps in bricks under bridge B8 (see **Figure 6m** and photo within the table at **Appendix 1**) at 37 minutes after sunset. The *Myotis* were later identified as likely Whiskered/Alcathoe/Brandt's bat using AnalookW software.

3.2.17 Additionally, a lesser horseshoe bat[41] pass was recorded at only 25 minutes after sunset on 28th June 2021, in the woodland just south of P15 (denoted on **Figure 7** by the label 'LsHs'; see also see **Figure 6f** for location). This is indicative of a bat having recently emerged from a nearby roost, and indeed, the record is only 200-300m from two confirmed lesser horseshoe roosts identified at structures B6 and B12 in 2015/16 (for details of which, refer to the table at **Appendix 1**).

39 The maternity season for bats (i.e., the time when female bats rear young to independence) is generally begins in May and ends in late August when adult female bats leave maternity colonies and move onto mating roosts. Brown long-eared bat maternity colonies generally range from 10-30 individuals, so an observation of a minimum of 10 bats in late August is unlikely to be anything other than a maternity colony.

40 With reference to Russ, J (2012) *Myotis* species tend to emerge between 25 and 60 minutes after sunset depending on the species.

41 With reference to pg. 74 of Russ, J (2012), lesser horseshoe bats tend to emerge between 35 and 45 minutes after sunset.

Table 15. Species and number of sound files recorded for each species during each bat transect survey in 2021[42].

Survey period	Date	Transect	Common Pipistrelle	Soprano pipistrelle	*Pipistrellus* sp. (Common/soprano)[43]	Nathusius' pipistrelle	*Pipistrellus* sp. (Common/Nathusius')[44]	Noctule	Serotine	Brown long-eared bat	Lesser horseshoe bat	*Myotis* sp.			Unidentified bat	Total
												WAB[45]	*Myotis* sp.[46]	Daubenton's bat		
April 2021	21/04/2021	T1	25	3	1	0	1	10	0	0	0	0	1	4	0	45
		T2	48	7	0	0	0	3	0	0	0	0	1	0	0	59
	29/04/2021	T1	1	0	0	0	0	0	0	0	0	0	0	0	0	1
		T2	2	2	0	2	0	3	0	0	0	0	1	0	0	10
May 2021	17/05/2021	T1	71	7	0	0	0	1	0	0	2	13	0	1	0	95
		T2	43	6	0	0	0	0	0	0	0	0	4	0	0	53
	27/05/2021	T1	125	3	0	0	1	0	0	0	0	0	4	0	0	133
		T2	53	15	5	0	0	0	0	0	0	0	81	0	2	156
June 2021	15/06/2021	T1	85	5	0	0	0	3	0	0	0	1	0	2	0	96
		T2	60	5	0	0	2	0	0	0	0	2	1	0	0	70
	28/06/2021	T1	45	7	1	0	0	0	0	0	1	2	1	0	0	57
	29/06/2021	T2	9	6	0	0	0	0	0	0	0	0	2	0	0	17
July 2021	12/07/2021	T1	57	0	1	0	6	0	1	0	0	0	0	0	0	65
		T2	50	2	0	1	3	0	0	0	0	0	1	0	0	57
	26/07/2021	T1	44	1	0	0	0	1	0	0	0	0	0	0	0	46
		T2	55	4	0	0	0	13	0	0	0	0	2	0	0	74
August 2021	10/08/2021	T1	78	1	5	0	0	0	0	0	0	1	0	0	0	85
	12/08/2021	T2	71	16	0	0	0	0	0	0	0	0	1	0	0	88
	25/08/2021-Dusk	T1	55	7	6	0	0	1	0	0	0	0	0	0	0	69
		T2	47	5	0	0	0	0	0	0	0	0	1	0	0	53
	26/08/2021-Dawn	T1	0	10	0	0	0	0	0	22	0	0	0	0	0	32
		T2	2	0	0	0	0	0	0	0	1	0	0	0	0	3
September 2021	15/09/2021	T1	70	0	1	0	10	0	0	0	0	0	1	0	0	82
		T2	38	10	0	1	0	2	0	0	0	0	1	0	0	52
	27/09/2021	T1	0	1	0	0	0	0	0	0	0	0	1	0	0	2
		T2	0	7	0	0	0	0	1	0	0	11	0	0	0	27
Total			1138	129	20	4	22	31	1	22	4	30	104	4	2	
% of calls			75.3	8.5	1.3	0.3	1.5	2.1	0.1	1.5	0.3	2.0	6.9	0.3	0.1	**1511**

42 Surveyors were equipped with two recording detectors (either an Anabat Express/Swift and an Echometer Touch 2 Pro) during most surveys, and both were subsequently analysed. Where a species was recorded on both detectors the median average of registrations was calculated.

43 Where Pipistrelle calls were at approximately 50kHz these have been noted as Pipistrelle sp. Both common and soprano pipistrelle can produce calls at or around 50kHz and as such it is not possible to directly attribute a call of this frequency to either species.

44 Where calls were around 40kHz these have been noted to genus level only, as the calls could not be definitively attributed to either Nathusius' or common pipistrelle.

45 Whiskered/Alcathoe/Brandt's Bat. These three species produce calls with a similar structure and thus cannot be definitively identified to the species level from computer analysis alone.

46 The use of the slope function in Analook is used to aid in the identification of *Myotis* species (*Myotis* calls are generally difficult to attribute to a specific species); however, where slope is ambiguous these have been noted as *Myotis* sp. The *Myotis* species above (Daubenton's bat, Natterer's bat, Whiskered/Alcathoe/Brandt's bat) are probable identifications.

Summary of observed activity

3.2.18 The results of the four years of transect data conducted between 2015 and 2021 are largely corroborative across the years, with similar levels of activity noted within the application site[47]. This can be visualised in **Figure 5** and **Figure 7** which show the collated activity data for surveys conducted before 2021 and in 2021 respectively.

3.2.19 Overall bat activity was fairly well distributed throughout the transects and largely typical of the habitat type, with foraging activity observed over large waterbodies, open glades within woodlands and the large areas of open hillside. Similarly, bats were regularly observed commuting along linear features such as wide pathways (e.g., the footpath the runs north to south along the eastern boundary of the application site), tree lined-corridors (e.g., the footpath leading to P15 on the western boundary of the application site), and woodland edges (e.g., woodland edge along the central open hillside within the application site).

3.2.20 Areas of relatively higher activity levels within/near the application site include the large waterbody (pond P15, indicated by Target Note 1 at **Figure 7**) just outside the south west corner of the application site, where several species of bat were recorded passing, foraging and commuting across several transect surveys in multiple years. A brown long-eared tree roost was also confirmed in this area.

3.2.21 A similar cluster of activity is also evident around structure B8 by reference to both **Figure 5 and 7** (Target Note 4). B8 is a stone bridge and several *Myotis* bats were noted roosting here during a walked transect in 2021. A small stream runs underneath B8 and it is likely that this provides some foraging habitat while also acting as a corridor for commuting bats.

3.2.22 Clusters of relatively high levels of activity were also evident around the large area of open hillside in the north west of the application site (Target Note 2 on **Figure 7**). The long vegetation here, combined with the presence of small ephemeral pools and woodland edge in this area likely provides good foraging habitat, and indeed common pipistrelle bats were regularly observed foraging here.

3.2.23 The final notable area of bat activity within site is the path that runs parallel to the A470 road (Target Note 5 on **Figure 7**) and the woodland edge at the north-east of the survey area (Target Note 1 on **Figure 7**). Many common and soprano pipistrelle bats (as well as some *Myotis* bat species) were recorded here, often including multiple bats at one time, and foraging was regularly observed here. As well as the likely presence of potential roosts within this woodland (as identified above at paragraph 3.2.16), activity in this area can also be explained by the presence of the road lights on the A470, which is expected to attract invertebrates such as moths; and whilst bats typically avoid bright lights, pipistrelle species are known to be

47 Note transect routes did differ slightly between years and thus 'strict' comparisons between years are not possible as some areas of the application site may be relatively 'under sampled' or 'over sampled'.

relatively light tolerant away from roost sites and are regularly observed foraging around street lights.

3.3 Automated/Static Detector Surveys

Automated/Static Detector Surveys Results: 2015

3.3.1 **Table 16** below provides the results of the automated bat surveys carried out within the site during each of June and July 2015.

3.3.2 Broadly speaking, the automated results for all detectors mirror those obtained on the transect surveys with again by far the most frequently recorded species being common pipistrelle (approximately 68% of all registrations). Non-*Pipistrellus* species collectively make up approximately 15%; they include noctule (with a higher proportion than that recorded during the transect surveys), brown long-eared bat, Daubenton's bat, Natterer's bat, and Whiskered/ Alcathoe/ Brandt's bat; and of particular note is one registration of greater horseshoe bat *Rhinolophus ferrumequinum* at detector 15-2, which was located to the north of the current application site.

3.3.3 In addition, the real-time barbastelle identification made on the May 2015 transect surveys was corroborated by two probable registrations of this species at remote detector 15-1. However, this is outside the current application site.

Table 16. *Number and percentage of sound files recorded at each automated bat detector location for each species in 2015*

Survey period		June 2015						June/July2015		July 2015								Total number (all detectors)	
Detector location (see Figure 8)		15-3		15-2		15-4		15-1		15-8		15-7		15-6		15-5			
Species		No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%
Common Pipistrelle		110	54.5	306	87.2	259	50.5	1944	68.4	381	83.74	17	17.9	45	22.7	484	85.1	3546	68.0
Soprano Pipistrelle		4	2.0	7	2.0	36	7.0	18	0.6	17	3.74	12	12.6	56	28.3	35	6.2	185	3.6
Pipistrellus sp. (common/soprano)[48]		1	0.5	0	0	0	0	8	0.3	1	0.22	2	2.1	1	0.5	5	0.9	18	0.4
Nathusius' pipistrelle		39	19.3	0	0.0	0	0.0	96	3.4	0	0	0	0	0	0	0	0	135	2.6
Pipistrellus sp. (Nathusius'/common)[49]		41	20.3	1	0.3	2	0.4	397	14.0	40	8.79	0	0.0	19	9.6	1	0.2	501	9.6
Noctule		5	2.5	22	6.3	138	27.5	69	2.4	9	1.98	47	49.5	61	30.8	8	1.4	359	6.9
Serotine		0	0	2	0.6	8	1.6	3	0.1	0	0.00	0	0.0	0	0.0	0	0	13	0.25
Nyctalus/Eptesicus sp[50]		0	0	0	0	2	0.4	2	0.1	0	0.00	0	0.0	0	0.0	0	0	4	0.1
Nyctalus sp[51]		1	0.5	0	0.0	0	0.0	0	0.0	0	0	0	0	0	0	0	0	1	0.02
Barbastelle[52]		0	0	0	0	0	0	2	0.1	0	0	0	0	0	0	0	0	2	0.04
Brown long-eared bat		1	0.5	3	0.9	0	0.0	261	9.2	6	1.32	0	0.0	1	0.5	12	2.1	284	5.5
Greater horseshoe bat		0	0	1	0.3	0	0.0	0	0.0	0	0	0	0	0	0	0	0	1	0.02
Myotis sp.[53]	*Myotis* sp.	0	0	2	0.6	32	6.2	40	1.4	1	0.22	17	17.9	15	7.6	22	3.9	129	15
	Natterer's bat	0	0	1	0.3	0	0.0	0	0.0	0	0	0	0	0	0	0	0	1	0
	WAB[54]	0	0	3	0.9	23	4.5	2	0.1	0	0.00	0	0.00	0	0.00	1	0.2	29	0
Unidentified bat[55]		0	0	2	0.6	2	0.4	0	0	0	0	0	0	0	0	1	0.2	3	0.1
Total number of files		202		350		502		2842		455		95		198		569		5213	

48 Where Pipistrelle calls were at approximately 50kHz these have been noted as Pipistrelle sp. Both common and soprano pipistrelle can produce calls at or around 50kHz and as such it is not possible to directly attribute a call of this frequency to either species.

49 Where calls were around 40kHz these have been noted to genus level only, as the calls could not be definitively attributed to either Nathusius' or common pipistrelle.

50 Calls where it was not possible to identify which 'big bat' species (common noctule, Leisler's or serotine) was present with absolute certainty.

51 Calls where it was not possible to identify which noctule species (common noctule or Leisler's) was present with absolute certainty.

52 Recorded barbastelle call parameters: Fc- 28.4kHz and 28.37kHz, Cycles- 28.5 and 29.772, average TBC- 139.5, average call length- 1.4, 60% certainty in identification.

53 The use of the slope function in Analook is used to aid in the identification of *Myotis* species (*Myotis* calls are generally difficult to attribute to a specific species); however, where slope is ambiguous these have been noted as *Myotis* sp. The *Myotis* species above (Daubenton's bat, Natterer's bat, whiskered/Alcathoe/Brandt's bat) are probable identifications.

54 WAB or Whiskered/Alcathoe/Brandt's Bat. These three species produce calls with a similar structure and thus cannot be definitively identified to the species level from computer analysis alone.

55 For a small number of bat calls it was not possible to identify to the genus or species level due to poor quality recording and/or the presence of an atypical call.

Automated/Static Detector Surveys Results: 2016

3.3.4 **Table 17** below provides the results of the automated bat surveys carried out within the site during each of August and September 2016.

3.3.5 The results of the automated survey are broadly in line with the results of the 2016 transect surveys. However, the 2016 results (both automated and transect surveys) show slightly different results to that of the 2015 results. These differences include: the lower number of species recorded in 2016 (minimum of seven species, compared with a minimum of ten for 2015), and there appears to have been a higher proportion of *Myotis* species (35.1%) recorded which has resulted in a lower percentage of common pipistrelle (49.7%). The higher proportion of *Myotis* bat activity in 2016 appears to be largely due to the large number of calls recorded at Detector 16-11 (where more than half of the *Myotis* sp. registrations were recorded).

Table 17. *Number and percentage of sound files recorded at each automated bat detector location for each species in 2016*

Survey period	August 2016												September 2016												Total number (all detectors)	
Detector location (see Figure 8)	16-1		16-2		16-3		16-4		16-5		16-6		16-7		16-8		16-9		16-10		16-11		16-12			
Species	Number of files	%	Number of files	%	Number of files	%	Number of files	%	Number of files	%	Number of files	%	Number of files	%	Number of files	%	Number of files	%	Number of files	%	Number of files	%	Number of files	%	Total	%
Common pipistrelle	0	0	891	95.4	172	47.4	6	4.8	0	0	182	58.9	0	0	0	0	14	8.6	21	38.9	25	4.0	310	50.2	1621	49.7
Soprano pipistrelle	0	0	15	1.6	146	40.2	11	8.8	0	0	3	1.0	0	0	4	30.8	27	16.6	8	14.8	0	0.0	102	16.5	316	9.7
Pipistrellus sp. (common/soprano) [56]	0	0	0	0.0	0	0.0	0	0	0	0	5	1.6	0	0	0	0.0	16	9.8	15	27.8	0	0.0	75	12.1	111	3.4
Noctule	0	0	1	0.1	0	0.0	0	0	1	3.8	8	2.6	8	25	7	53.8	0	0.0	8	14.8	0	0.0	2	0.3	35	1.1
Brown long-eared bat	0	0	6	0.6	21	5.8	2	1.6	0	0.0	0	0.0	0	0	0	0.0	4	2.5	0	0.0	1	0.2	0	0.0	34	1.0
Myotis sp.[57]	5	100	21	2.2	24	6.6	106	84.8	25	96.2	111	35.9	24	75	2	15.4	102	62.6	2	3.7	596	95.8	129	20.9	1147	35.1
Total number of files	5		934		363		125		26		309		32		13		163		54		622		618		3264	

56 Where Pipistrelle calls were at approximately 50kHz these have been noted as Pipistrelle sp. Both common and soprano pipistrelle can produce calls at or around 50kHz and as such it is not possible to directly attribute a call of this frequency to either species.

57 The use of the slope function in Analook is used to aid in the identification of *Myotis* species (*Myotis* calls are generally difficult to attribute to a specific species); however, where slope is ambiguous these have been noted as *Myotis* sp. The *Myotis* species above (Daubenton's bat, Natterer's bat, whiskered/Alcathoe/Brandt's bat) are probable identifications.

Automated/Static Detector Surveys Results: 2018

3.3.6 **Table 18** below provides the results of the automated bat surveys carried out within the site between April and September 2018.

3.3.7 The results of the 2018 automated detector survey are similar to the previous year (2016) in terms of the number, type and proportion of species recorded with the notable exception of lesser horseshoe which was recorded three times in April, August and September on detectors to the south-east and north of the current application site. As in 2016, *Myotis* species made up a greater proportion of the total registrations (48.4% collectively for *Myotis* sp. and Daubenton's bat), with a corresponding decrease in the proportion of common pipistrelle bat activity (38.4% overall). Soprano pipistrelle, noctule brown long-eared bat accounted for a minor proportion of the total registrations.

3.3.8 Relative to the 2018 transect results, *Myotis* sp. make up a significantly larger proportion of the total registrations and correspondingly, common pipistrelle makes up significantly less, whilst the other species recorded are largely comparable. The higher proportion of *Myotis* and Daubenton's bat activity recorded in 2018 appears to be largely due to the large number of calls recorded between May and July at detectors 18-2, 18-3, and 18-4 in particular. This likely reflects species-specific foraging preferences, as detectors with higher proportions of *Myotis* registrations were located within areas of dense woodland, and most *Myotis* species typically favour woodland for foraging (by contrast with common pipistrelle which forage much more readily in open grassland or along edge habitat).

Table 18. *Number and percentage of sound files recorded at each automated bat detector location for each species in 2018*

Survey period	Apr-18								May-18											
Detector location (see Figure 8)	18-1		18-2		18-3		18-4		18-1		18-2		18-3		18-4		18-5		18-6	
Species	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%
Common pipistrelle	188	72	17	38	0	0	0	0	34	27	9	0.9	10	2.5	272	48	39	75	162	93
Soprano pipistrelle	63	24	1	2.2	0	0	1	4.2	0	0	5	0.5	1	0.2	23	4	8	15	2	1.1
Pipistrellus sp. (common/soprano)	1	0.4	0	0	0	0	0	0	0	0	0	0	0	0	4	0.7	0	0	0	0
Noctule	0	0	0	0	0	0	1	4.2	1	0.8	0	0	1	0.2	0	0	0	0	7	4
Brown long-eared bat	0	0	0	0	0	0	1	4.2	0	0	0	0	0	0	0	0	0	0	0	0
Brown long-eared bat (probable)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lesser horseshoe bat	0	0	1	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myotis sp.	4	1.5	26	58	11	100	20	83	8	6.3	447	45	237	59	224	39	1	1.9	2	1.1
Daubenton's bat	4	1.5	0	0	0	0	1	4.2	83	65	536	54	149	37	49	8.6	4	7.7	1	0.6
Unidentified bat	0	0	0	0	0	0	0	0	1	0.8	2	0.2	4	1	0	0	0	0	0	0
Total number of files	260		45		11		24		127		999		402		572		52		174	

Table 18. *Number and percentage of sound files recorded at each automated bat detector location for each species in 2018 (cont.)*

Survey period	Jun-18												Jul-18											
Detector location (see Figure 8)	18-1		18-2		18-3		18-4		18-5		18-6		18-1		18-2		18-3		18-4		18-5		18-6	
Species	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%
Common pipistrelle	0	0	9	2	0	0	416	42	280	79	19	68	0	0	0	0	119	83	94	54	223	56	0	0
Soprano pipistrelle	0	0	5	1.1	5	3	87	8.8	12	3.4	6	21	11	44	3	14	7	4.9	4	2.3	126	32	4	12
Pipistrellus sp. (common/soprano)	0	0	0	0	0	0	4	0.4	3	0.8	0	0	0	0	2	9.1	2	1.4	4	2.3	5	1.3	4	12
Noctule	0	0	1	0.2	0	0	2	0.2	0	0	1	3.6	0	0	1	4.5	8	5.6	0	0	16	4.1	0	0
Brown long-eared bat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brown long-eared bat (probable)	0	0	0	0	0	0	0	0	0	0	1	3.6	0	0	0	0	0	0	0	0	0	0	0	0
Lesser horseshoe bat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myotis sp.	136	39	415	92	127	77	444	45	12	3.4	0	0	7	28	11	50	2	1.4	70	40	17	4.3	25	74
Daubenton's bat	215	61	20	4.4	31	19	33	3.3	118	33	1	3.6	7	28	5	23	5	3.5	0	0	7	1.8	1	2.9
Unidentified bat	0	0	0	0	1	0.6	3	0.3	0	0	0	0	0	0	0	0	0	0	2	1.1	1	0.3	0	0
Total number of files	351		450		164		989		425		28		25		22		143		174		395		34	

Table 18. *Number and percentage of sound files recorded at each automated bat detector location for each species in 2018 (cont.)*

Survey period	Aug-18												Sep-18											
Detector location (see Figure 8)	18-1		18-2		18-3		18-4		18-5		18-6		18-1		18-2		18-3		18-4		18-5		18-6	
Species	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%
Common Pipistrelle	0	0	2	6.7	0	0	34	16	311	87	522	71	0	0	33	65	0	0	23	18	145	66	24	43
Soprano Pipistrelle	5	4	0	0	2	3.9	80	37	29	8.1	152	21	0	0	9	18	5	38	12	9.4	25	11	18	32
Pipistrellus sp. (common/soprano)	13	10	10	33	0	0	21	9.8	5	1.4	36	4.9	0	0	5	9.8	0	0	0	0	26	12	2	3.6
Noctule	1	0.8	0	0	0	0	1	0.5	6	1.7	1	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Brown long-eared bat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brown long-eared bat (probable)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lesser horseshoe bat	0	0	0	0	0	0	1	0.5	0	0	0	0	0	0	0	0	0	0	1	0.8	0	0	0	0
Myotis sp.	21	17	12	40	48	94	46	21	5	1.4	17	2.3	1	100	4	7.8	7	54	88	69	20	9.1	9	16
Daubenton's bat	84	68	6	20	1	2	24	11	1	0.3	4	0.5	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified bat	0	0	0	0	0	0	7	3.3	1	0.3	1	0.1	0	0	0	0	1	7.7	3	2.4	4	1.8	3	5.4
Total number of files	124		30		51		214		358		733		1		51		13		127		220		56	

Table 18. Number and percentage of sound files recorded at each automated bat detector location for each species in 2018 (cont.)

Survey period		
Detector location (see Figure 8)	Total number (all detectors)	
Species	No. of files	%
Common pipistrelle	2985	38.4
Soprano pipistrelle	723	9.3
Pipistrellus sp. (common/soprano)[58]	147	1.9
Noctule	48	0.6
Brown long-eared bat	1	0.0
Brown long-eared bat (probable)[59]	1	0.0
Lesser horseshoe bat	3	0.0
Myotis sp.[60]	2524	32.5
Daubenton's bat	1390	17.9
Unidentified bat[61]	34	0.4
Total number of files	7856	

58 Where Pipistrelle calls were at approximately 50kHz these have been noted as Pipistrelle sp. Both common and soprano pipistrelle can produce calls at or around 50kHz and as such it is not possible to directly attribute a call of this frequency to either species.

59 The call is most likely that of brown long-eared bat, however it was atypical and thus not possible to be completely certain.

60 The use of the slope function in Analook is used to aid in the identification of *Myotis* species (*Myotis* calls are generally difficult to attribute to a specific species); however, where slope is ambiguous these have been noted as *Myotis* sp. The *Myotis* species above (Daubenton's bat, Natterer's bat, whiskered/Alcathoe/Brandt's bat) are probable identifications.

61 For a small number of bat calls it was not possible to identify to the genus or species level due to poor quality recording and/or the presence of an atypical call.

Automated/Static Detector Surveys Results: 2021

3.3.9 **Table 19** below provides the results of the automated bat surveys carried out within the site between April and September 2021.

3.3.10 The results of the automated survey are broadly in line with the results of the 2021 transect surveys. They are also largely similar to the previous year's results with regards to the species recorded, albeit there is a slight difference in the proportion of registrations attributed to each species. Common pipistrelle bats accounted for the greater majority of the total registrations (71.4%), with *Myotis* species and soprano pipistrelle bats accounting for the next largest proportions (13.3% and 9%) respectively. All other species recorded accounted for a minor proportion of the total registrations.

3.3.11 As identified above at paragraph 3.3.8, this likely is a reflection of the location of detectors with regards to particular foraging features. Around 20 of the 36 detectors deployed were located in areas of open grassland, woodland edge or along wide pathways, especially in the north west of the current application site, as this was a key study area and one that had been relatively 'under-sampled' in previous survey years. These are all habitats favoured more by common pipistrelle and therefore it is perhaps unsurprising that they account for the majority of registrations recorded here.

3.3.12 Notably, three registrations of lesser horseshoe were recorded in April and July 2021 on detectors placed to the south east of the current application site. This count of three registrations is consistent with 2018, and in contrast to 2015 and 2016, when this species was not detected during the static monitoring. Additionally, five registrations were assessed to meet the call parameters for serotine bat, which corroborates the single serotine pass recorded on during transect surveys.

Table 19. *Number and percentage of sound files recorded at each automated bat detector location for each species in 2021*

Survey period	Apr-21												May-21											
Detector location (see Figure 8)	Apr-01		Apr-02		Apr-03		Apr-04		Apr-05		Apr-06		May-01		May-02		May-03		May-04		May-05		May-06	
Species	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%
Common pipistrelle	9	29	285	73	138	17	55	37	38	69	232	96	7	7	4	100	7	54	41	39	26	76	35	65
Soprano pipistrelle	3	9.7	74	19	39	4.8	52	35	4	7.3	0	0	1	1	0	0	1	7.7	42	40	3	8.8	6	11
Pipistrellus sp. (common/soprano)	0	0	4	1	9	1.1	1	0.7	2	3.6	1	0.4	0	0	0	0	0	0	1	0.9	0	0	0	0
Nathusius' pipistrelle	0	0	1	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pipistrellus sp. (common/Nathusius')	1	3.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Noctule	13	42	27	6.9	7	0.9	17	11	7	13	7	2.9	4	4	0	0	0	0	1	0.9	5	15	11	20
Nyctalus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Serotine	2	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctalus/Etesicus sp.	1	3.2	0	0	0	0	2	1.4	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0
Brown long-eared bat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lesser horseshoe bat	1	3.2	0	0	1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myotis sp.	0	0	0	0	610	74	12	8.1	3	5.5	0	0	1	1	0	0	4	31	19	18	0	0	2	3.7
WAB	0	0	1	0.3	6	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Daubenton's bat	0	0	0	0	0	0	2	1.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Natterer's bat	0	0	0	0	4	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified bat	1	3	0	0	7	0.9	7	4.7	1	1.8	1	0.4	0	0	0	0	1	7.7	2	1.9	0	0	0	0
Total number of files	31		392		821		148		55		241		15		4		13		106		3		54	

Table 19. *Number and percentage of sound files recorded at each automated bat detector location for each species in 2021 (cont.)*

Survey period	Jun-21												Jul-21											
Detector location (see Figure 8)	Jun-01		Jun-02		Jun-03		Jun-04		Jun-05		Jun-06		Jul-01		Jul-02		Jul-03		Jul-04		Jul-05		Jul-06	
Species	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%
Common Pipistrelle	101	55	1420	90.5	34	81	254	87	19	33	634	74	27	35	112	44	33	73	17	27.9	146	88	64	78
Soprano Pipistrelle	50	27	70	4.46	2	4.76	4	1.4	4	7	156	18	16	21	23	9	2	4.4	30	49.2	4	2.4	4	4.9
Pipistrellus sp. (common/soprano)	0	0	13	0.83	0	0	2	0.7	29	51	17	2	2	2.6	20	8	2	4.4	0	0	0	0	0	0
Nathusius's pipistrelle	0	0	0	0	0	0	1	0.3	0	0	0	0	0	0	0	0	0	0	0	0	2	1.2	1	1.2
Pipistrellus sp. (common/Nathusius's)	0	0	0	0	0	0	23	7.9	0	0	2	0.2	1	1.3	0	0	0	0	3	4.92	1	0.6	1	1.2
Noctule	0	0	0	0	0	0	6	2.1	2	3.5	0	0	0	0	24	9	1	2.2	0	0	3	1.8	2	2.4
Nyctalus sp.	0	0	0	0	1	2.38	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Serotine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctalus/Eptesicus sp.	0	0	0	0	0	0	0	0	0	0	1	0.1	1	1.3	0	0	0	0	0	0	0	0	0	0
Brown long-eared bat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lesser horseshoe bat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Myotis sp.	6	3	34	2.17	2	4.76	2	0.7	0	0	35	4.1	27	35	66	26	7	16	3	4.92	3	1.8	8	9.8
WAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Daubenton's bat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Natterer's bat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified bat	28	15	32	2.04	3	7.14	0	0	3	5.3	7	0.8	4	5.1	8	3	0	0	8	13.1	6	3.6	2	2.4
Total number of files	185		1569		42		292		57		852		78		255		45		61		165		82	

Table 19. *Number and percentage of sound files recorded at each automated bat detector location for each species in 2021 (cont.)*

Survey period	Aug-21												Sep-21											
Detector location (see Figure 8)	Aug-01		Aug-02		Aug-03		Aug-04		Aug-05		Aug-06		Sep-01		Sep-02		Sep-03		Sep-04		Sep-05		Sep-06	
Species	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%	No. of files	%
Common Pipistrelle	5	22	12	43	51	72	252	78	766	91	365	93	24	96	63	24	38	40	680	95	34	62	0	0
Soprano Pipistrelle	7	30	1	3.6	0	0	52	16	45	5.3	7	1.8	1	4	25	9.5	21	22	10	1.4	0	0	0	0
Pipistrellus sp. (common/soprano)	9	39	1	3.6	2	2.8	6	1.8	2	0.2	2	0.5	0	0	11	4.2	0	0	1	0.1	0	0	0	0
Nathusius's pipistrelle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1	0	0	0	0
Pipistrellus sp. (common/Nathusius's)	0	0	0	0	0	0	1	0.3	6	0.7	1	0.3	0	0	0	0	0	0	2	0.3	0	0	0	0
Noctule	0	0	0	0	0	0	1	0.3	1	0.1	5	1.3	0	0	3	1.1	0	0	0	0	0	0	0	0
Nyctalus sp.	0	0	0	0	0	0	0	0	0	0	1	0.3	0	0	0	0	0	0	0	0	0	0	0	0
Serotine	0	0	3	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nyctalus/Eptesicus sp.	0	0	1	3.6	0	0	0	0	2	0.2	0	0	0	0	0	0	0	0	1	0.1	0	0	0	0
Brown long-eared bat	0	0	1	3.6	0	0	0	0	0	0	2	0.5	0	0	0	0	0	0	5	0.7	0	0	0	0
Lesser horseshoe bat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myotis sp.	0	0	2	7.1	6	8.5	9	2.8	17	2	6	1.5	0	0	134	51	34	36	7	1	19	35	1	100
WAB	0	0	0	0	0	0	1	0.3	7	0.8	1	0.3	0	0	10	3.8	0	0	6	0.8	0	0	0	0
Daubentons bat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Natterer's bat	0	0	0	0	0	0	0	0	0	0	1	0.3	0	0	6	2.3	0	0	0	0	0	0	0	0
Unidentified bat	2	8.7	7	25	12	17	3	0.9	0	0	1	0.3	0	0	10	3.8	1	1.1	6	0.8	2	3.6	0	0
Total number of files	23		28		71		325		846		392		25		262		94		719		55		1	

Table 19. *Number and percentage of sound files recorded at each automated bat detector location for each species in 2021 (cont.)*

Survey period		
Detector location (see Figure 8)	Total number	
Species	No. of files	%
Common pipistrelle	5964	71.4
Soprano pipistrelle	755	9.0
Pipistrellus sp. (common/soprano)[62]	137	1.6
Nathusius' pipistrelle	5	0.1
Pipistrellus sp. (common/Nathusius')[63]	41	0.5
Noctule	145	1.7
Nyctalus sp.[64]	3	0.0
Serotine	5	0.1
Nyctalus/Eptesicus sp. [65]	11	0.1
Brown long-eared bat	8	0.1
Lesser horseshoe bat	3	0.0
Myotis sp.[66]	1071	12.8
WAB[67]	32	0.4
Daubenton's bat	2	0.0
Natterer's bat	11	0.1
Unidentified bat[68]	166	2
Total number of files	8356	

62 Where Pipistrelle calls were at approximately 50kHz these have been noted as Pipistrelle sp. Both common and soprano pipistrelle can produce calls at or around 50kHz and as such it is not possible to directly attribute a call of this frequency to either species.

63 Where Pipistrelle calls were at approximately 40-41kHz these have been noted as Pipistrelle sp. Both common and Nathusius' pipistrelle can produce calls at or around 40-41kHz and as such it is not possible to directly attribute a call of this frequency to either species.

64 Calls where it was not possible to identify which noctule species (common noctule or Leisler's) was present with absolute certainty.

65 Calls where it was not possible to identify which 'big bat' species (common noctule, Leisler's or serotine) was present with absolute certainty.

66 The use of the slope function in Analook is used to aid in the identification of *Myotis* species (*Myotis* calls are generally difficult to attribute to a specific species); however, where slope is ambiguous these have been noted as *Myotis* sp. The *Myotis* species above (Daubenton's bat, Natterer's bat, whiskered/Alcathoe/Brandt's bat) are probable identifications.

67 Whiskered/Alcathoe/Brandt's Bat. These three species produce calls with a similar structure and thus cannot be definitively identified to the species level from computer analysis alone.

68 For a small number of bat calls it was not possible to identify to the genus or species level due to poor quality recording and/or the presence of an atypical call.

3.4 Autumn swarming surveys: 2015 results

3.4.1 The two bat swarming surveys undertaken of three structures in September 2015 did not conclusively record or confirm the presence of swarming bats. However, one lesser horseshoe bat was noted roosting in structure B12 (a long stone retaining wall) during the 15th September 2015 survey (see table within **Appendix 1** for further detail).

3.4.2 **Table 20** below provides a summary of the number of sound files recorded by each surveyor during the period that the structure was observed for.

Table 20. *The number of sound files recorded for each species during the autumn swarming surveys in 2015*

Survey period		September 2015					
Date		15/09/2015			30/09/2015		
Sunset		19:29			18:54		
Location (see Figure 9)		B1	B11	B12	B1	B11	B12
Common pipistrelle		150	11	2	324	41	5
Soprano pipistrelle		113	32	7	158	10	58
Pipistrellus sp. (common/soprano)[69]		116	7	0	29	1	0
Nathusius' pipistrelle		1	0	0	0	0	0
Pipistrellus sp. (common/Nathusius')[70]		0	0	1	0	0	0
Noctule		0	0	1	0	0	0
Plecotus sp.[71]		3	1	0	1	2	17
Myotis sp.[72]		1	53	13	2	6	32
Daubenton's bat		0	0	1	0	0	2
Social calls	Common pipistrelle	1	16	0	2	28	0
	Soprano pipistrelle	14	0	0	37	0	30
	Pipistrellus sp. (common/soprano)	182	7	0	122	1	0
	Daubenton's bat	0	0	1	0	0	1
	Myotis sp.	0	0	0	0	0	1

3.4.3 **Table 21** below provides the number of sound files recorded by the detectors deployed over the entire night at various locations adjacent to built structures/possible swarming sites during the swarming surveys. In order for the data to be comparable between each location, the results presented also incorporate the three-hour swarming survey results in **Table 20**.

69 Where Pipistrelle calls were at approximately 50kHz these have been noted as Pipistrelle sp. Both common and soprano pipistrelle can produce calls at or around 50kHz and as such it is not possible to directly attribute a call of this frequency to either species.

70 Where Pipistrelle calls were at approximately 40-41kHz these have been noted as Pipistrelle sp. Both common and Nathusius' pipistrelle can produce calls at or around 40-41kHz and as such it is not possible to directly attribute a call of this frequency to either species.

71 Likely brown long-eared bat.

72 The use of the slope function in Analook is used to aid in the identification of *Myotis* species (*Myotis* calls are generally difficult to attribute to a specific species); however, where slope is ambiguous these have been noted as *Myotis* sp. The *Myotis* species above (Daubenton's bat, Natterer's bat, Whiskered/Alcathoe/Brandt's bat) are probable identifications.

Table 21. *The number of sound files for each species and location recorded by static detectors operating overnight during the swarming survey in 2015*

Date		15/09/2015			30/09/2015			
Location (see Figure 9)		B1	B11	B12	B1	B11	B12	B14
Common Pipistrelle		176	36	2	67	102	6	0
Soprano Pipistrelle		124	32	6	110	8	79	0
Pipistrelle sp. (common/soprano)[73]		181	11	0	4	11	0	0
Nathusius' pipistrelle		1	0	0	0	0	0	0
Plecotus sp.[74]		4	9	1	2	6	8	1
Greater Horseshoe bat		0	0	1	0	0	0	0
Lesser Horseshoe bat		0	0	4	0	0	0	0
Myotis sp.[75]		1	57	261	8	12	128	0
Whiskered/ Alcathoe/ Brandt's bat[76]		0	0	0	0	1	76	62
Daubenton's bat		0	0	2	0	7	1	0
Natterer's bat		0	0	0	1	0	0	0
Social calls	Common pipistrelle	1	26	0	3	84	0	0
	Soprano pipistrelle	18	0	0	75	1	32	0
	Pipistrellus sp. (common/soprano)	249	12	0	152	20	0	0
	Daubenton's bat	0	0	1	0	0	1	0
	Myotis sp.	0	0	4	0	1	68	0
	Plecotus sp.	0	3	0	0	0	1	0

73 Where Pipistrelle calls were at approximately 50kHz these have been noted as Pipistrelle sp. Both common and soprano pipistrelle can produce calls at or around 50kHz and as such it is not possible to directly attribute a call of this frequency to either species.

74 Likely brown long-eared bat.

75 The use of the slope function in Analook is used to aid in the identification of *Myotis* species (*Myotis* calls are generally difficult to attribute to a specific species); however, where slope is ambiguous these have been noted as *Myotis* sp. The *Myotis* species above (Daubenton's bat, Natterer's bat, Whiskered/Alcathoe/Brandt's bat) are probable identifications.

76 Whiskered/Alcathoe/Brandt's Bat. These three species produce calls with a similar structure and thus cannot be definitively identified to the species level from computer analysis alone.

3.5 Emergence/ re-entry surveys: 2016 results

3.5.1 The two emergence and re-entry surveys undertaken of the five structures in August and September 2016 did not conclusively confirm the presence of any roosting bats. However, a minimum of two *Myotis* bats were observed flying around the entrance to tunnel B11 and then entering shortly before dawn. They were not subsequently observed re-emerging during the course of the survey. Thus whilst their specific roosing location/s was not confirmed, it is considered highly likely they were roosting within the structure.

3.5.2 **Table 22** below provides a summary of the number of sound files recorded by each surveyor during the period that the structure was observed for. See **Figure 9** for the locations of the structures surveyed.

Table 22. *The number of sound files for each species and location recorded by the surveyors during the emergence/ re-entry surveys in 2016*

Survey Period	August 2016				September 2016			
Date	23/08/2016		24/08/2016		15/09/2016		16/09/2016	
Survey Timing	Dusk		Dawn		Dusk		Dawn	
Sunrise/Sunset	20:19		06:13		19:27		06:50	
Location (see Figure 9)	B3a	B11	B1	B16	B14	B16	B3a	B11
Soprano pipistrelle	3	0	0	20	0	0	0	149
Common pipistrelle	112	0	2	2	0	0	0	0
Myotis sp. (probable Daubenton's bat)	0	0	0	43	0	0	0	83
Notes	No bats observed emerging	No bats observed emerging	No bats observed re-entering	No bats observed re-entering	No bats observed emerging	No bats observed emerging	No bats observed re-entering	Approximately 2-3 *Myotis* bats flying around tunnel entrance, then joined by a single soprano pipistrelle. Last *Myotis* probably entered tunnel at around 06:27. Soprano pipistrelle continued flying in front of entrance until 06:52 (two minutes after sunrise time) but did not appear to enter tunnel- possibly headed north-west.

3.6 Inspection of buildings/structures for hibernating and roosting bats: February 2016, September 2016 and March 2021

3.6.1 **Figure 9** shows the location of each of the built structures within the site that were subject to structural surveys for hibernating bats in February 2016 and March 2021, and for autumn roosting bats in September 2016. **Appendix 1** provides the results of these inspections along with photos of the structures, and a summary of the results of the autumn swarming or other surveys of the same structure carried out between 2015 and 2021 (where relevant).

3.6.2 In summary, four of structures surveyed were assessed to have high or moderate-high roosting potential, four were assessed as moderate, and the remaining 12 low or low-moderate. Of those specifically within the current application site, one (B6) is assessed as 'high' potential, two as 'moderate/high' (B7 and B8), one as 'low/moderate' (B5), and the remaining two as 'low' (B20 and B21).

3.6.3 There are four structures that have been identified as confirmed roosts by surveys undertaken by Bioscan. These include:

- B8: *Myotis* (likely Whiskered/Alcathoe/Brant's) summer roost within the stone bridge in 2021.
- B6: Brown long-eared bat summer roost and lesser horseshoe bat hibernation roost within the stone bridge abutments in 2016.
- B10: Brown long-eared bat hibernation roost within former chimney in 2016.
- B12: Lesser horseshoe bat roost summer roost within long retaining wall in 2015.

3.6.4 In addition, while specific roosing location/s have not been confirmed within tunnel B11, there is evidence from several surveys to indicate the possible presence of *Myotis* roosts within the tunnel (see results described at paragraph 3.5.1 and **Table 22** above). Similarly, desk study data from SEWBReC identified a brown long-eared hibernation roost (single individual observed) also in B11. The likely presence of a brown long-eared hibernation roost was further indicated by analysis of data from automated detector placed within the tunnel entrance in March 2021. This same data also indicated the likely presence of a greater horseshoe hibernation roost within the same structure (see **Appendix 1** for detail).

3.6.5 Of the confirmed roosts, two (bridges B8 and B6) are within the current application site.

3.7 Preliminary tree roost inspection surveys: 2021

3.7.1 **Figure 10** shows the locations of trees assessed to have greater than 'negligible' potential for bat roosting within the search area, and **Appendix 2** provides detailed survey results along with pictures of the trees where possible. Note that any trees considered to have negligible potential for bat roosting are not identified here nor on **Figure 10**.

3.7.2 In summary, within the search area, five trees were assessed as having either 'high' or 'moderate-high' for bat roosting potential. Three were assessed as 'moderate', whilst 20

are of either 'low-moderate' or 'low' potential. In addition, one tree (tree T29) located outside of the search area has been confirmed as a bat roost after a minimum of 10 brown long-eared bats were observed entering a roost feature on the 26th August 2021 (see **Figure 6k, Figure 10** and **Figure 11** for location).

4 DISCUSSION & CONCLUSIONS

4.1 Summary of Bat Interest at the Site

4.1.1 In summary, 14 species/species groups have been recorded within or near to the application site across all surveys conducted between 2015 and 2021. Species range from those that are common, widespread and fully to be expected on the site to those that are rare and range restricted. **Table 23** below provides a summary of the bat species recorded on the site, and their status within the site (as derived from the survey data) and their wider status in Wales.

Table 23. *Summary of bat species recorded within the site, and its status within the site and in Wales*

Species	Site summary	Notes	Status in Wales/ Glamorgan (sourced from SSSI selection criteria, Bat Action Plans for Wales, and JNCC)
Common pipistrelle	Widespread and very common across the site. By far the most common bat species encountered on the site typically accounting for around 65% of registrations from all bat detector surveys (activity, automated and swarming). Possible (but not confirmed) presence of a low number of small day roosts within/near the application site (mainly identified via automated detector/transect analysis). Historic records of a roost of this species in tunnel B1 outside the application site (via desk study).	As expected, given the size of the site, and the extent of woodland cover.	Widespread and common across Wales.
Soprano pipistrelle	Relatively widespread across the site. The second-most commonly recorded species within the site, accounting for around 10% of registrations from all bat detector surveys. Possible (but not confirmed) presence of a low number of small day roosts within/near the application site (mainly identified via automated detector/transect analysis).	As expected, given the abundance of waterbodies within the application site, and this species' apparent preference for riparian habitats and waterbodies.	Widespread and common across Wales.
Nathusius' pipistrelle	Only rarely detected within the site. Species calls meeting the published parameters of this species comprise around 0.8% of registrations.	Calls identified for this species with 95% confidence.	Scattered records across Wales, however, no maternity sites have been found in Wales and its status in Wales is unclear.
Barbastelle	Very rarely detected within the site. All registrations appear to be possible identifications, with these comprising around 0.4% of registrations.	Confidence levels are assigned as follows for calls identified via: -automated detectors and transect surveys in 2015, 90% confidence; -by transect surveys in 2016, 60% confidence; & -by transect surveys in 2018, 50% confidence.	Rare, with few known roosts. Records scattered throughout Wales, mainly in the southern half.

Species	Site summary	Notes	Status in Wales/ Glamorgan (sourced from SSSI selection criteria, Bat Action Plans for Wales, and JNCC)
Myotis sp.	Widespread and recorded throughout most of the site, particularly near water (e.g., pond P15). The percentage composition of the calls recorded within the application site for this genus typically constitutes around 14%. Transect survey in May 2015 indicated the possible use of the Merthyr-Aberdare railway tunnel (B11) as a roost, with the stone bridge B8 noted to be used as a roost in 2021.	Identifying species within the Myotis genus based on their calls is difficult due to the similarity of their calls, especially in areas with cluttered environments (such as the application site). Nevertheless, wherever possible, calls were identified to species level largely based on the slope function in Analook. Where there was ambiguity in the calls, these have been noted as Myotis sp. to avoid false precision.	See individual species accounts below
Daubenton's bat	As stated above, species within the *Myotis* genus are typically difficult to distinguish by call alone, therefore the 4% of registrations attributable to this species is likely to be an under-estimate. Where it was possible to identify to this species, records appeared to be concentrated over the waterbodies. Historic records of a roost of this species in tunnel B1 (identified via desk study).	The presence of this species is to be expected, especially in association with the large reservoir, P15.	Widely distributed species, commonly recorded foraging low over still waterbodies making identification relatively straight forward. Gaps in range in Wales are likely due to a lack of records rather than true absence.
Natterer's bat	Species within the *Myotis* genus are typically difficult to distinguish by call alone, and therefore the 0.15% of registrations attributable to this species is likely to be an under-estimate.	The presence of this species is to be expected given their preference for semi-natural broadleaved woodland for foraging habitat.	Widespread in the UK and has been recorded throughout Wales in all wooded landscapes
Whiskered/Alcathoe/ Brandt's (WAB)	As stated above, species within the *Myotis* genus are typically difficult to distinguish by call alone, therefore the 1.4% of registrations attributable to these three species is likely to be an under-estimate. A *Myotis* species, thought to be one of the WAB species, was noted to be roosting in bridge B8 in 2021 and the tunnel B11 was identified as a likely roosting site in 2015.	Due to the similarity of the bat calls from these three species, these species have been grouped. Identification to species requires capture and identification in the hand.	Whiskered bats are widely distributed across Wales. Some gaps in range in Wales are likely due to a lack of records rather than true absence. Whiskered and Brandt's bat are very similar to each other, and therefore the distribution and each species' status is difficult to ascertain. Swarming sites and roosts are patchier for Brandt's than for whiskered bats.[77]
Noctule	Uncommon here; infrequently recorded. Accounting for around 1.3% of registrations.	A species one would expect to be present within the application site, albeit in low numbers.	Insufficient information, but probably reasonably widespread in low

77 https://jncc.gov.uk/jncc-assets/Art17/S1330-WA-Habitats-Directive-Art17-2019.pdf

Species	Site summary	Notes	Status in Wales/ Glamorgan (sourced from SSSI selection criteria, Bat Action Plans for Wales, and JNCC)
			numbers across lowland Wales
Serotine	Very rarely detected within the site. Recorded only once during a transect survey and calls attributed to this species during automated detector surveys in 2021 accounted for <0.1%.	Some call parameters of this species, Leisler's bat and noctule overlap, and therefore it is difficult to always have certainty of the identifications of these species. Calls of this species identified during automated analysis in 2015 60 to 80%, 2021 (April) -60% confidence, (August) – 80% confidence, and transects in 2021 – 70% confidence.	Some records for this species show a reasonably widespread, but somewhat patchy distribution across Wales. Most records concentrated in the south. Not clear how much of this trend is due to under recording vs actual absence of the species.
Nyctalus/Eptesicus sp.	Rarely detected within the site, 0.4% of registrations.	Some call parameters of these three species overlap, and therefore it is difficult to have certainty of the identifications of these species.	Noctule and serotine: as above. Leisler's bat: Rare throughout Wales, but with a concentration of records in the south-east. Its status in Wales is unclear.
Brown long-eared bat	Insufficient information. Highly likely to be under-recorded due to the quiet nature of the calls of this species, and therefore the 0.7% of registrations attributable to this species is likely to be a significant under-estimate. Several roosts of this species within/near the application site; Six individuals hibernating in B10 in February 2016, and three individuals roosting in B6 in September 2016. Around 10-12 individuals found to be roosting in tree overlooking pond P15 in 2021. Desk study data and analysis of automated detector data from hibernation surveys in 2021 indicate the presence of hibernation roosts in B11.	It is difficult to distinguish between brown and grey long-eared bats, but given the known species distribution of these two species, the records from the site are considered most likely to be for brown long-eared bat.	Insufficient information, but probably widespread in low numbers across lowland Wales.
Greater horseshoe bat	Very rarely detected within the site. One registration from an automated detector in 2015 outside of the current site boundary. One registration during swarming survey of B12 in September 2015. Seven registrations found in March 2021 from a static detector deployed within the Merthyr-Aberdare railway tunnel (B11), comparison of the time of recorded registrations with sunset/sunrise times indicates the possible presence of a hibernation roost in this structure.	Presence not entirely unexpected given the location of the application site in south Wales and the number of abandoned/disused tunnels within/near site.	Restricted and fragmented distribution in Britain, scattered populations in south and south-west Wales.

Species	Site summary	Notes	Status in Wales/ Glamorgan (sourced from SSSI selection criteria, Bat Action Plans for Wales, and JNCC)
Lesser horseshoe bat	Very rarely detected within the site, albeit with slightly more records than greater horseshoe bat. 1no individual roosting in B12 in 2015, and 1no individual found hibernating in B6 in 2016. Two registrations from a static detector near B12 in 2018. Three registrations from static detectors in 2021, and four registrations during activity surveys in 2021. Seven registrations from a static detector deployed within the Merthyr-Aberdare railway tunnel (B11) in March 2021.	Presence not entirely unexpected given the location of the application site in south Wales and the number of abandoned/disused tunnels within/near site.	Restricted distribution in Britain, although widely distributed throughout lowland Wales.

4.2 Assigning a Value to the Assemblage of Bats at the Site

4.2.1 By reference to emerging guidance on impact assessment for bats (see **Table 24** below), common pipistrelle and soprano pipistrelle fall into the lowest rarity category, being ranked as 'abundant and widespread'. The guidance ranks brown long-eared bat, noctule, and several *Myotis* species (Daubenton's bat, Natterer's bat and whiskered/Brandt's bat) as 'less abundant' in Wales; whilst both horseshoe bats, Leisler's bat, Alcathoe bat, Bechstein's bat, barbastelle, serotine and Nathusius' pipistrelle fall into the highest tier, termed 'Rare/Annex II/Red List/ Vulnerable'.

Table 24. *Bat rarity categorisation, extract reproduced from emerging CIEEM guidance*[78]

Rarity category	SW England & Wales
Abundant and widespread	• Common pipistrelle • Soprano pipistrelle
Less abundant +selected data-deficient	• Whiskered/Brandt's bat • Daubenton's bat • Natterer's bat • Noctule • Brown long-eared bat
Rare/Annex II /Red List Vulnerable or higher, + selected data-deficient	• Greater horseshoe bat • Lesser horseshoe bat • Alcathoe bat • Bechstein's bat • Leisler's bat • Nathusius' pipistrelle • Serotine • Barbastelle • Grey long-eared bat

** Those species which were not confirmed as present within/near the application site are listed in grey*

78 CIEEM (June 2021). *Bat Mitigation Guidelines. A guide to impact assessment, mitigation and compensation for developments affecting bats.* Beta version 1.0. Pg. 19, Table 3.1.

4.2.2 Roosts of a number of different species have been identified within or near the current application site. These are summarised in **Table 25** below. By reference to emerging CIEEM guidance [79], of the roosts within the current application site, the lesser horseshoe hibernation roost found in 2016 within bridge B6 could be classified under the highest tier of importance ('Regional/National'). However, the scale of importance in this instance is calibrated by the size of the roost, and given that only a single individual was observed, and that the roost appears to be infrequently used, the value of 'National' level importance is not warranted. As such the lesser horseshoe hibernation roost in B6 is assessed as of 'District' or 'County' level importance.

4.2.3 Similarly, with reference to the same guidance, the brown long-eared maternity roost confirmed within tree T29 could be assessed as 'County' level importance as a minimum.

4.2.4 All other roosts identified within the application site are assessed as no more than 'Local' level importance in-line with the guidelines.

4.2.5 With regards to identified roosts outside the application site, the summer roost within structure B12 (the long stone retaining wall) is assessed as being of 'District' level importance owing to its apparent infrequent use and the small number of bats observed. While the brown long-eared hibernation roost identified within the former chimney B10 in 2016 could be could be classified under the highest tier of importance ('County/Regional'), the scale of importance in this instance again needs to be calibrated by the size of the roost, and given that only six bats were observed and that the roost appears to be infrequently used, the value of 'Regional' level importance is not warranted. As such, it is assessed as 'County' level importance; likewise, also for the apparent brown long-eared hibernation roost in tunnel B11 (identified via desk study and automated analysis).

4.2.6 The probable greater horseshoe hibernation roost in B11 (identified via automated analysis, whereby seven registrations were recorded across 14 days of survey in March 2021) could be classed as 'Regional/National' level of importance dependent on the number of bats utilising the roost. However, this assessment is only preliminary as detailed inspections/surveys of the tunnel have not been carried out. If any evidence were to indicate the likely presence of greater numbers of hibernating bats, then the importance of this roost could be elevated to 'National'.

4.2.7 All other roosts outside the application site are assessed as no more than 'Local' level importance, with the exception of the lesser horseshoe/brown long-eared/common pipistrelle roost in a building in Merthyr (identified via desk study), which would likely be of District importance owing to the assemblage of species found (albeit in small numbers).

Table 25. *Summary of bat roosts identified in or near the site, also see* ***Appendix 1 and 2*** *for detail.*

79 CIEEM (June 2021). *Bat Mitigation Guidelines. A guide to impact assessment, mitigation and compensation for developments affecting bats.* Beta version 1.0. Pg. 19, Table 3.2.

Location/Feature	Bat roost type identified
On-site features	
B6 – Stone and metal bridge	**Lesser horseshoe:** confirmed hibernation roost. A single individual was present in the east abutment during a structure inspection carried out in February 2016. However, inspection surveys carried out in March 2021 revealed no evidence of bats roosting, suggesting the roost may be only infrequently used. **Brown long-eared bat:** confirmed summer day roost. A minimum of three bats present were present in cracks the west abutment during a structure inspection carried out in September 2016. However, inspection surveys carried out in March 2021 revealed no evidence of bats roosting, suggesting the roost may be infrequently used.
B8 – Stone bridge	***Myotis* species (likely Whiskered/Alcathoe/Brandt's):** confirmed summer roost. A minimum of three bats were observed flying in and out of gaps between bricks under the bridge (south side) during a rain shower, on a dusk transect in September 2021. Although the structure has potential for hibernation, inspection surveys carried out in March 2021 revealed no evidence of bats. Suggesting this roost is likely a summer day roost only.
T29 – Alder tree north of reservoir P15	**Brown long-eared bat:** confirmed maternity roost. A minimum of 10 bats were observed swarming and then entering a large split on the western aspect of tree T29 during an August dusk transect in 2021. Based on the number of individuals observed roosting, and the time of year, it is considered that tree T29 is a maternity roost.
Other structures and trees present on site	**No confirmed roosts** but possible presence of small pipistrelle (common and soprano) and lesser horseshoe roosts in woodland/structures at several locations within/near the application site (Target Notes 1-4 on **Figure 7**). Identified via transect survey analysis.
Off-site features	
B12 – Stone retaining wall with tunnels	**Lesser horseshoe:** confirmed summer roost. A single individual was noted roosting during a swarming survey in September 2015. Subsequent structure inspections in February and September 2016 and March 2021 found no evidence of bats, suggesting this roost is infrequently used.
B10 – Base of collapsed chimney	**Brown long-eared bat:** confirmed hibernation roost. Six bats were found during inspection surveys carried out in February 2016. Subsequent inspections in September 2016 and March 2021 found no evidence of bats, suggesting this roost may be infrequently used.
B11 – Abercanaid-Aberdare tunnel	**Brown long-eared bat:** apparent small hibernation roost (min 1 individual). Identified via desk study c.2005. Automated detector analysis from hibernation surveys conducted by Bioscan in 2021 also indicates the likely presence of a brown long-eared hibernation roost. ***Myotis* species**: Possible roost. Displaying swarming/light-sampling activity observed at the entrance to the tunnel during the May 2015 transect was strongly indicative of a roost within the tunnel. Additionally, a minimum of 2-3 bats appeared to enter the tunnel at dawn during surveys conducted in September 2016, but roost not conclusively confirmed. **Greater horseshoe bat**: Automated detector analysis from hibernation surveys conducted by Bioscan in 2021 indicate also indicates the possible presence of a greater horseshoe hibernation roost.
Within Merthyr Tydfil (and within 2km radius	**Common pipistrelle/Pipistrelle species:** Eight roosts in buildings within Merthyr dating from 2003-2018. Identified via desk study.

Location/Feature	Bat roost type identified
from the application site)	**Brown long-eared bat:** two roosts in buildings within Merthyr dated 2019 and 2020. Identified via desk study. **Lesser horseshoe**: one roost in a former YMCA building within Merthyr dated 2019. Identified via desk study.
B1 – Cyfartha Canal tunnel	**Common pipistrelle:** Bats of this species noted emerging from B1 during surveys carried out by other surveyors in 1997. Further surveys in 2002 found no bats emerging. Further repeated surveys by Bioscan have revealed no evidence of use by bats, so likely an infrequently used or now disused roost. **Daubenton's bat:** Bats of this species noted emerging from B1 during surveys carried out by other surveyors in 1997. Further surveys in 2002 found no bats emerging. Further repeated surveys by Bioscan have revealed no evidence of use by bats, so likely an infrequently used or now disused roost.
Other structures and trees present on site	**No confirmed roosts** but possible presence of small pipistrelle (common and soprano) roosts in woodland at several locations within/near the application site (Target Notes 1-4 on **Figure 7**). Identified via transect survey analysis.

4.2.8 An alternative method of determining the value of the bat assemblage on the application site is the methodology suggested by Wray *et al.*[80]. This calculates the value of a site for bats in relation to the rarity of the species, the nature of the roost or approximate number of individuals present, the proximity of foraging/commuting habitat to roosts and the character and complexity of the habitat being used. **Table 26** below provides the results for the bat species recorded during the surveys using this method.

Table 26. *Species calculations and score, based on Wray et al. (2010).*

Species	Species Weighting	Number of bats	Roosts	Foraging habitat characteristics	Score	Resulting geographical frame of reference
Common pipistrelle	2	10	4	4	20	District, local or parish
Soprano pipistrelle	2	10	4	4	20	District, local or parish
Nathusius' pipistrelle	20	5	2	4	31	Regional
Daubenton's bat	5	5	4	4	18	District, local or parish
Natterer's bat	5	5	4	4	18	District, local or parish
Noctule	20	5	2	4	31	Regional
Barbastelle	20	5	2	4	31	Regional
Brown long-eared bat	5	10	4	4	23	County
Greater horseshoe bat	20	5	3	4	32	Regional
Lesser horseshoe bat	5	5	3	4	17	District, local or parish

4.2.9 It should be noted that there is some significant subjectivity to the above calculations inherent in assessing the number of bats present, and the placing of a value on the

80 Wray, S., Wells, D., Long, E. and Mitchell-Jones, T. (2010). *Valuing Bats in Ecological Impact Assessment*. In Practice. CIEEM.

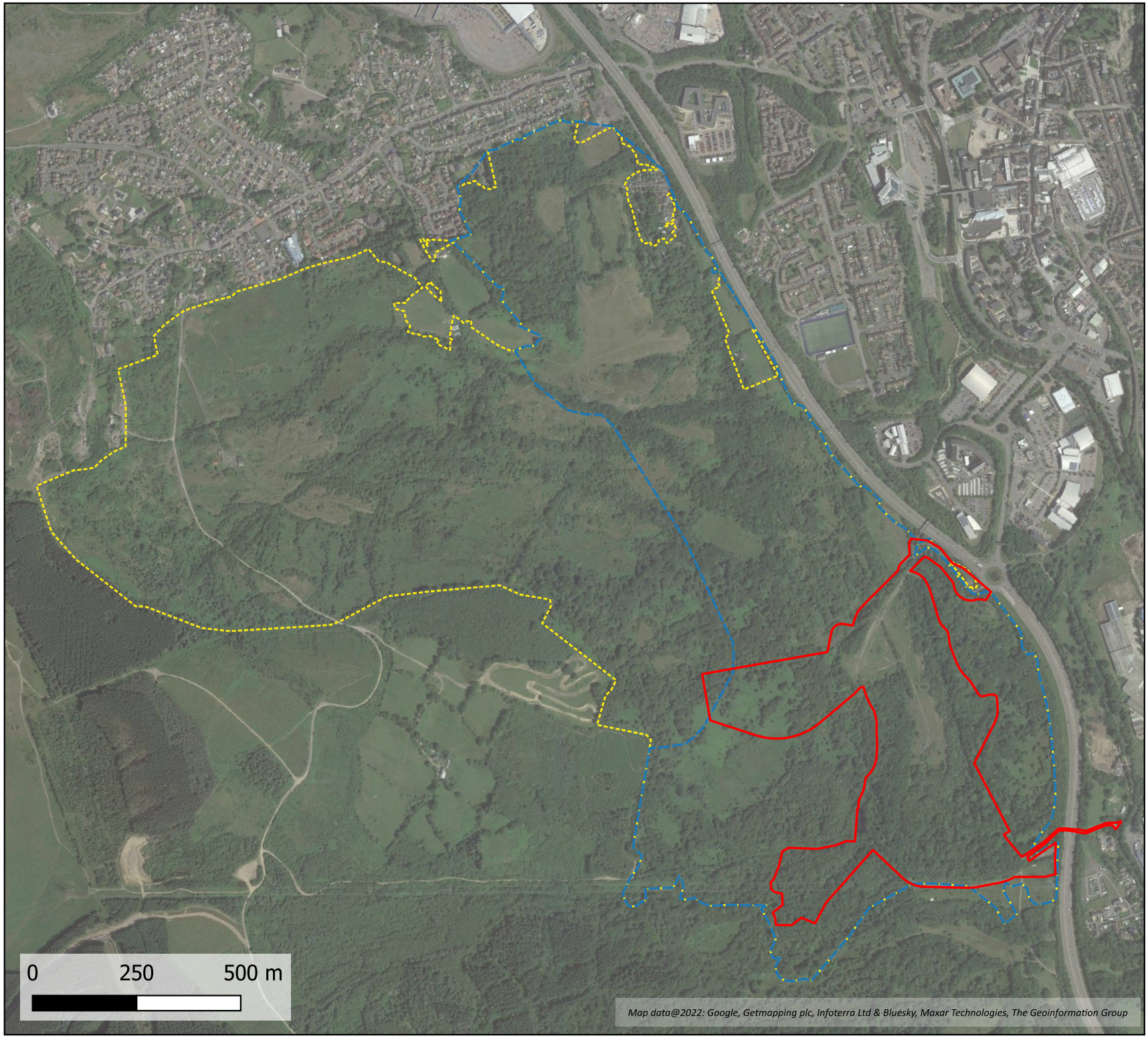
potential for roosts in and near to a site; however, it is considered that it can still provide a helpful alternative indication of the overall value of a site. It should also be noted that the value of the site to bats is not uniform across the application site, with some areas not likely to be graded at any geographical frame of reference above the 'immediate local' or 'site' context due to no or few bats having been recorded. Although there are species which fall within the 'Regional' category, these comprise species which are either very infrequently recorded or are 'possible' identifications (based on the call parameters, see **Appendix 1**). Therefore, overall, the cumulative grading of the bat assemblage of the application site would suggest the geographical frame of reference for the importance of foraging activity is, overall, at the 'District' level.

4.2.10 In summary, the bat assemblage of the application site can be considered a key receptor, being fairly diverse, with an evident high number of individuals of two pipistrelle species (common and soprano), and winter and summer roosting in some of the structures by various species including brown long-eared bat, lesser horseshoe bat, and *Myotis* species. On the basis of the presence and relative abundance of these species indicated by the survey data, the bat assemblage of the application site, considered in isolation, is placed at the 'District' level. In part, this is due to the position of the application site as an integral part of a wider landholding that contains high value roosting and foraging habitat for a diverse assemblage of species.

Figures

Figure 1

Application site location and pre-2021 survey areas



Key

- Application site
- Wider landholding/2015 survey area
- 2017/18 survey area

Title

Application site location and pre-2021 survey areas

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 1	2	E1835

Drawn	Checked	Date
WH	DW	November 2023

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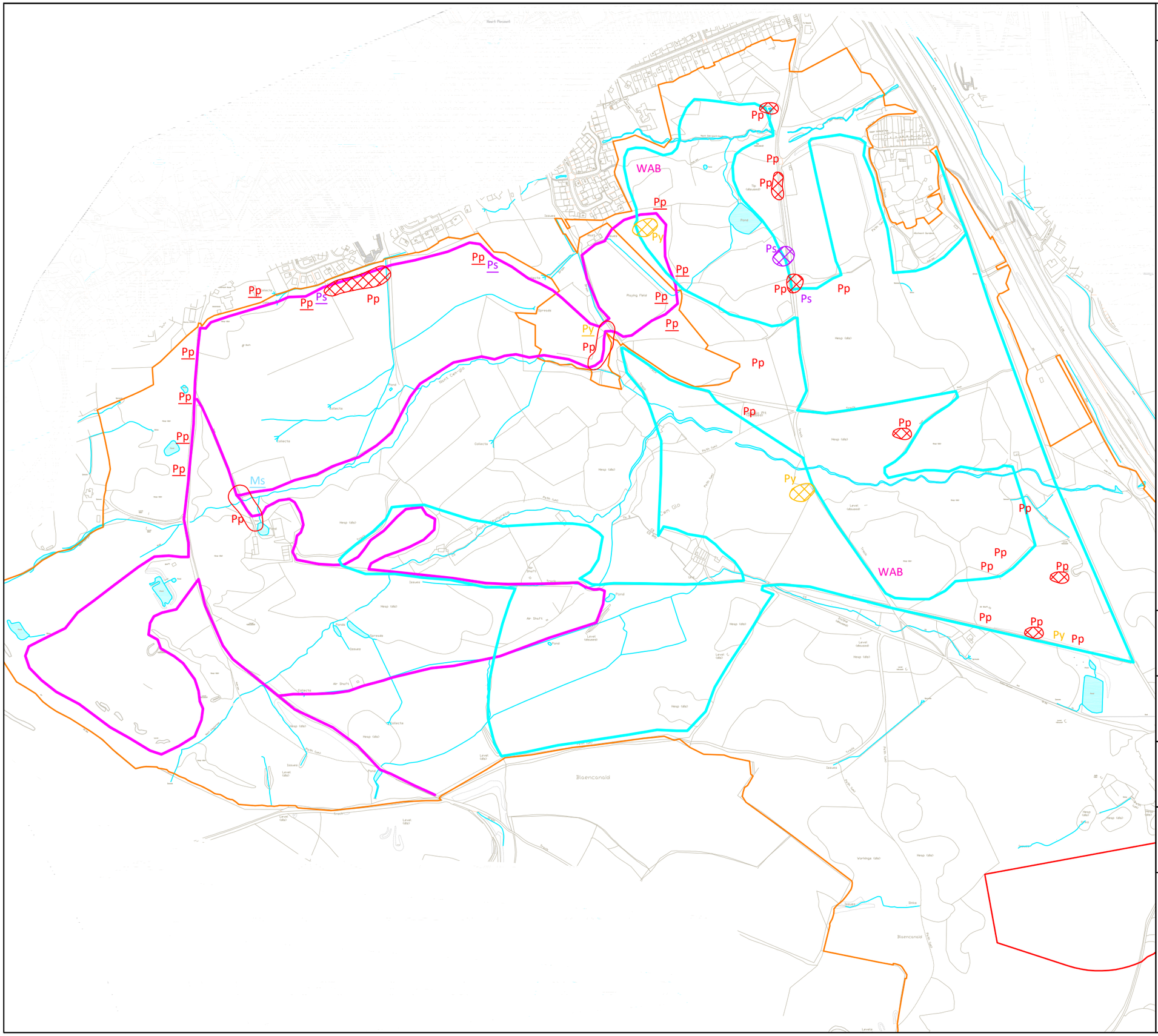
Figure 2a-f

Bat transect survey results - 2015



Key

- Application site
- 2015 study area
- Transect 1
- Transect 2
- Pp Common pipistrelle
- Py Soprano pipistrelle
- Ps Pipistrelle species (common/soprano)
- WAB Whiskered/Alcathoe/ Brandt's
- Foraging
- Pp→ Commuting (showing direction of flight)
- (Pp) Social call
- Pp Pass
- Pp2 Number of bats

DO NOT SCALE

Title

Bat activity transect results- May 2015 (Transects 1 and 2)

Project	Client
Cwm Glo	Marvel Ltd.

Drawing No.	Revision	Project No.
Figure 2a		E1835

Drawn	Checked	Date
FM	BC	November 2023

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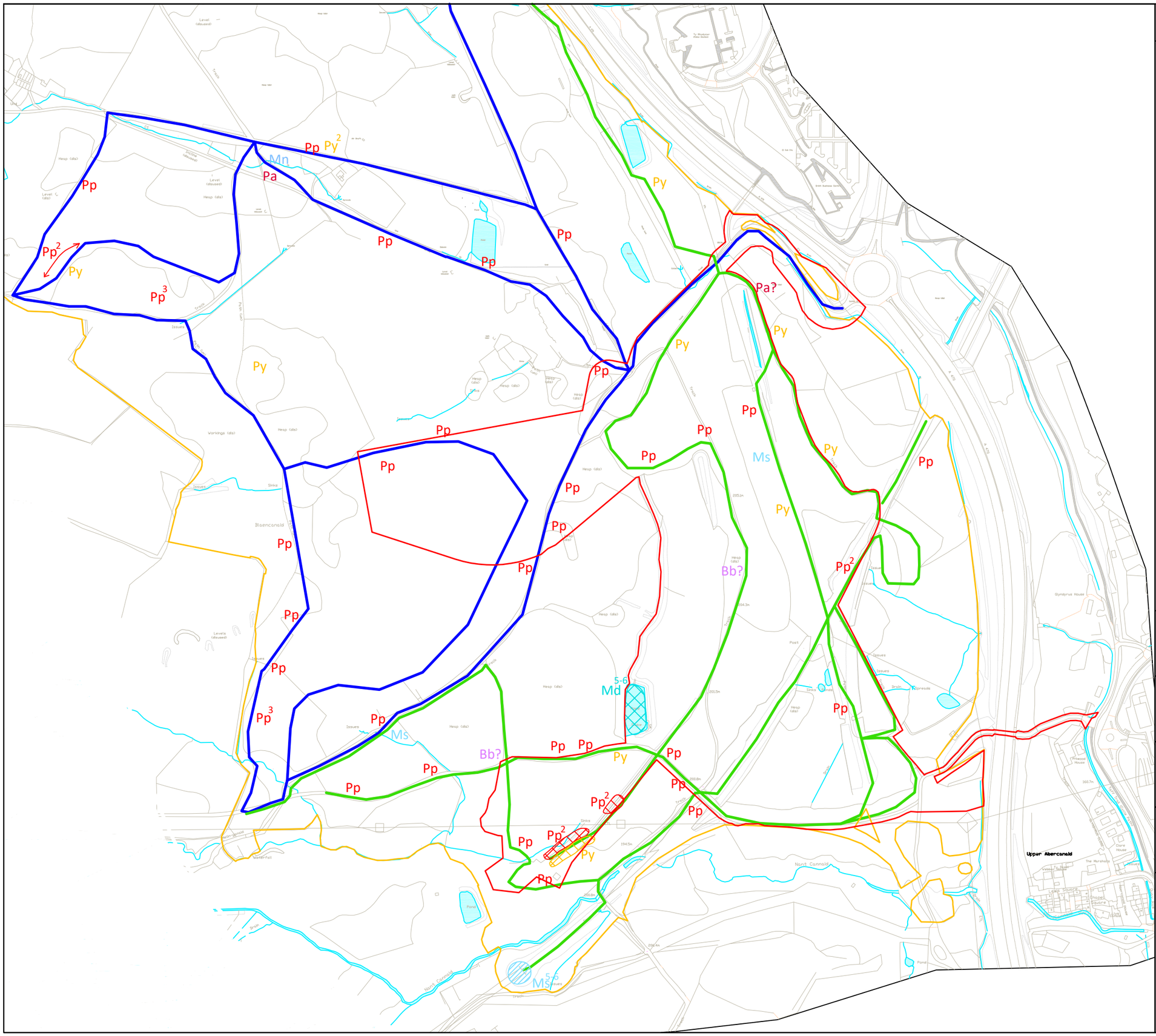

Key

- Application site
- 2015 study area
- Transect 3
- Transect 4
- Pp Common pipistrelle
- Py Soprano pipistrelle
- Md Daubenton's bat
- Mn Natterer's bat
- Ms Myotis sp.
- Pa Brown long-eared bat
- Bb Barbastelle
- Foraging
- Swarming / light sampling
- Pp→ Commuting (showing direction of flight)
- (Pp) Social call
- Pp Pass
- Pp2 Number of bats

DO NOT SCALE

Title

Bat activity transect results- May 2015 (Transects 3 and 4)

Project	Client
Cwm Glo	Marvel Ltd.

Drawing No.	Revision	Project No.
Figure 2b		E1835

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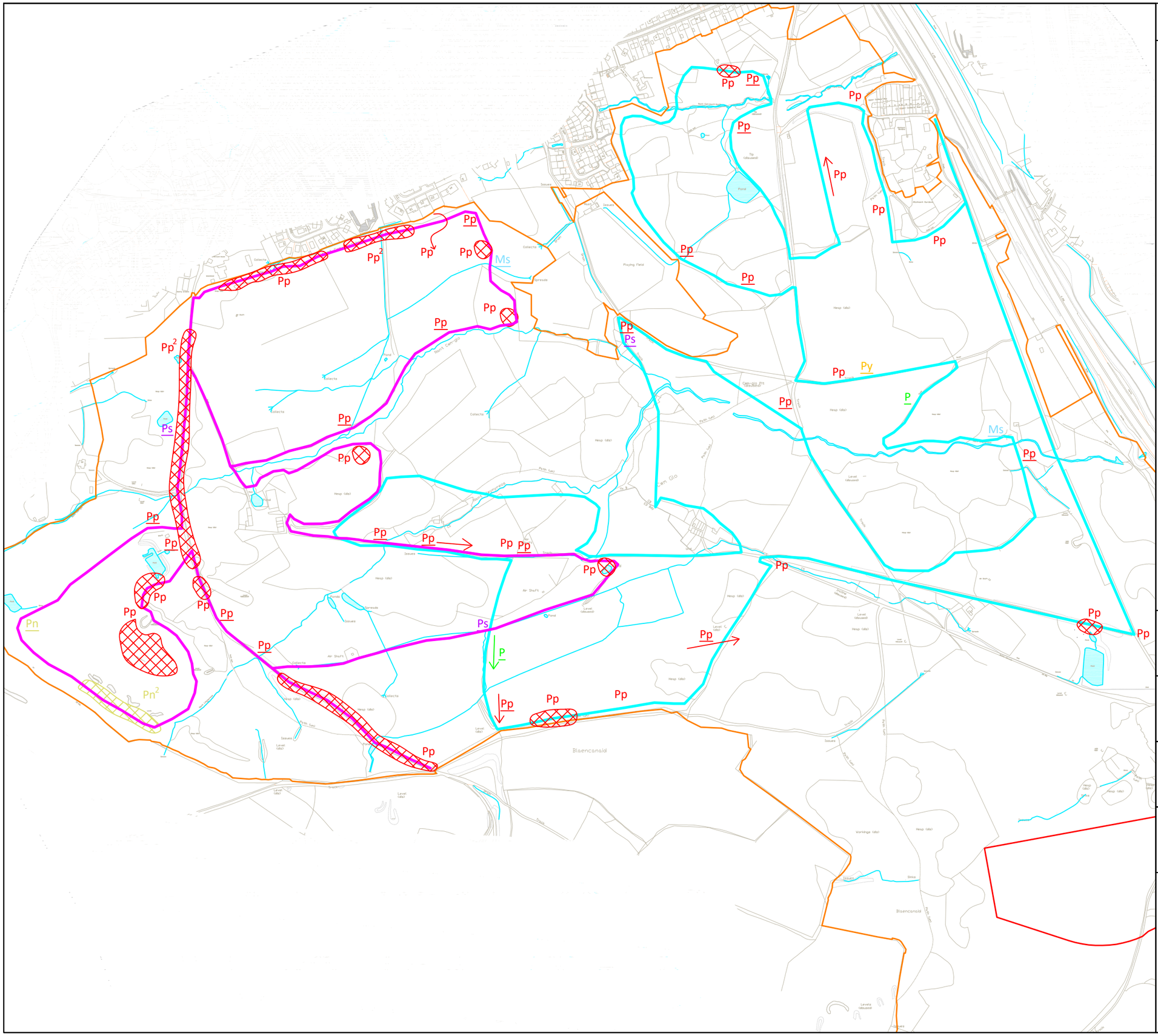

Key

- Application site
- 2015 study area
- Transect 1
- Transect 2
- Pp Common pipistrelle
- Py Soprano pipistrelle
- Ps Pipistrelle species (common/soprano)
- P Pipistrelle species (Nathusius'/ Common)
- Pn Nathusius' pipistrelle
- Ms Myotis sp.
- Foraging
- Pp→ Commuting (showing direction of flight)
- (Pp) Social call
- Pp Pass
- Pp2 Number of bats

DO NOT SCALE

Title

Bat activity transect results - June 2015 (Transects 1 and 2)

Project	Client
Cwm Glo	Marvel Ltd.

Drawing No.	Revision	Project No.
Figure 2c		E1835

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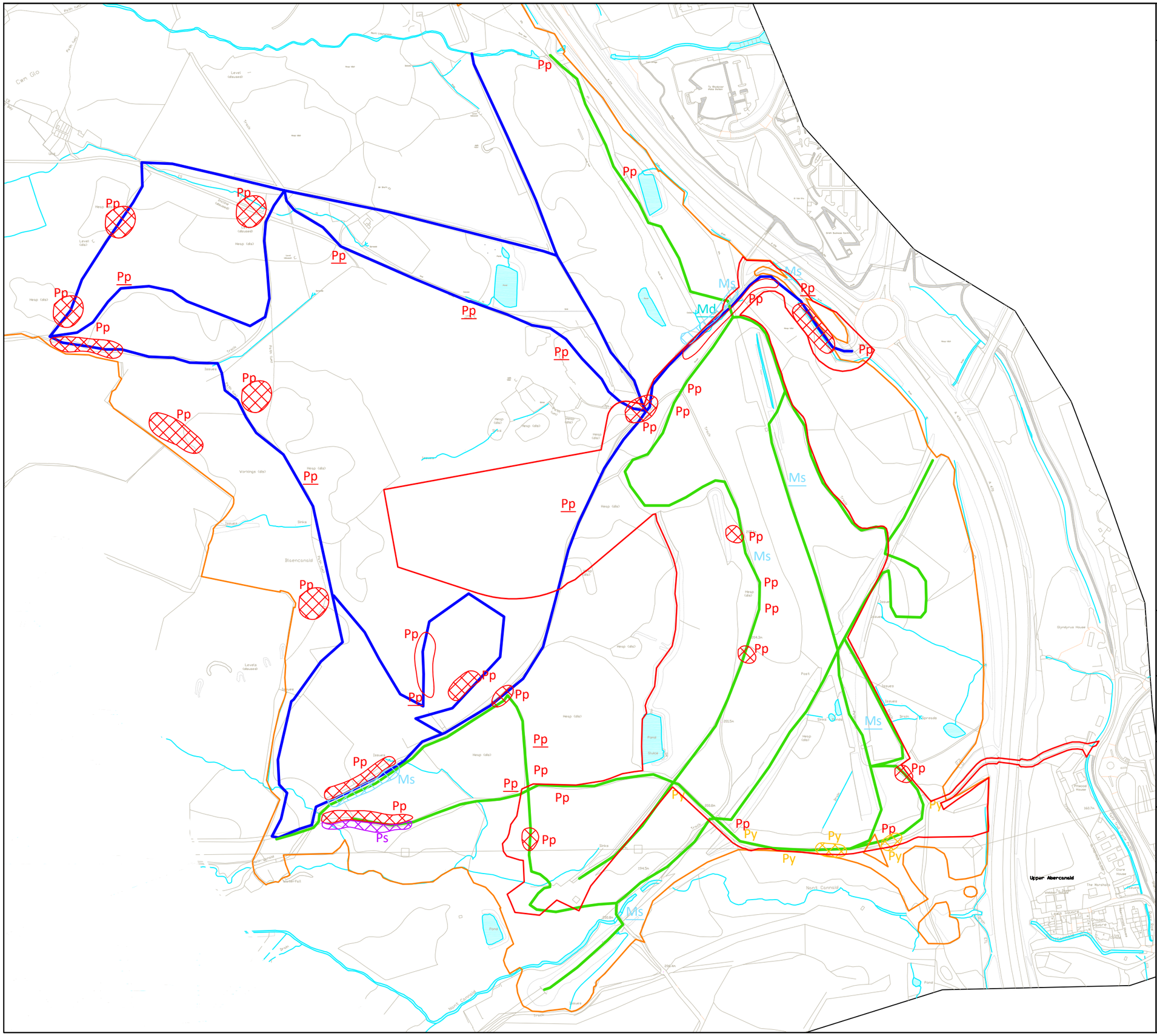

Key

- Application site
- 2015 study area
- Transect 3
- Transect 4
- Pp Common pipistrelle
- Py Soprano pipistrelle
- Ps Pipistrelle species (common/soprano)
- Md Daubenton's bat
- Ms Myotis sp.
- Foraging
- Pp→ Commuting (showing direction of flight)
- (Pp) Social call
- Pp Pass
- Pp2 Number of bats

DO NOT SCALE

Title

Bat activity transect results - June 2015 (Transects 3 and 4)

Project	Client
Cwm Glo	Marvel Ltd.

Drawing No.	Revision	Project No.
Figure 2d		E1835

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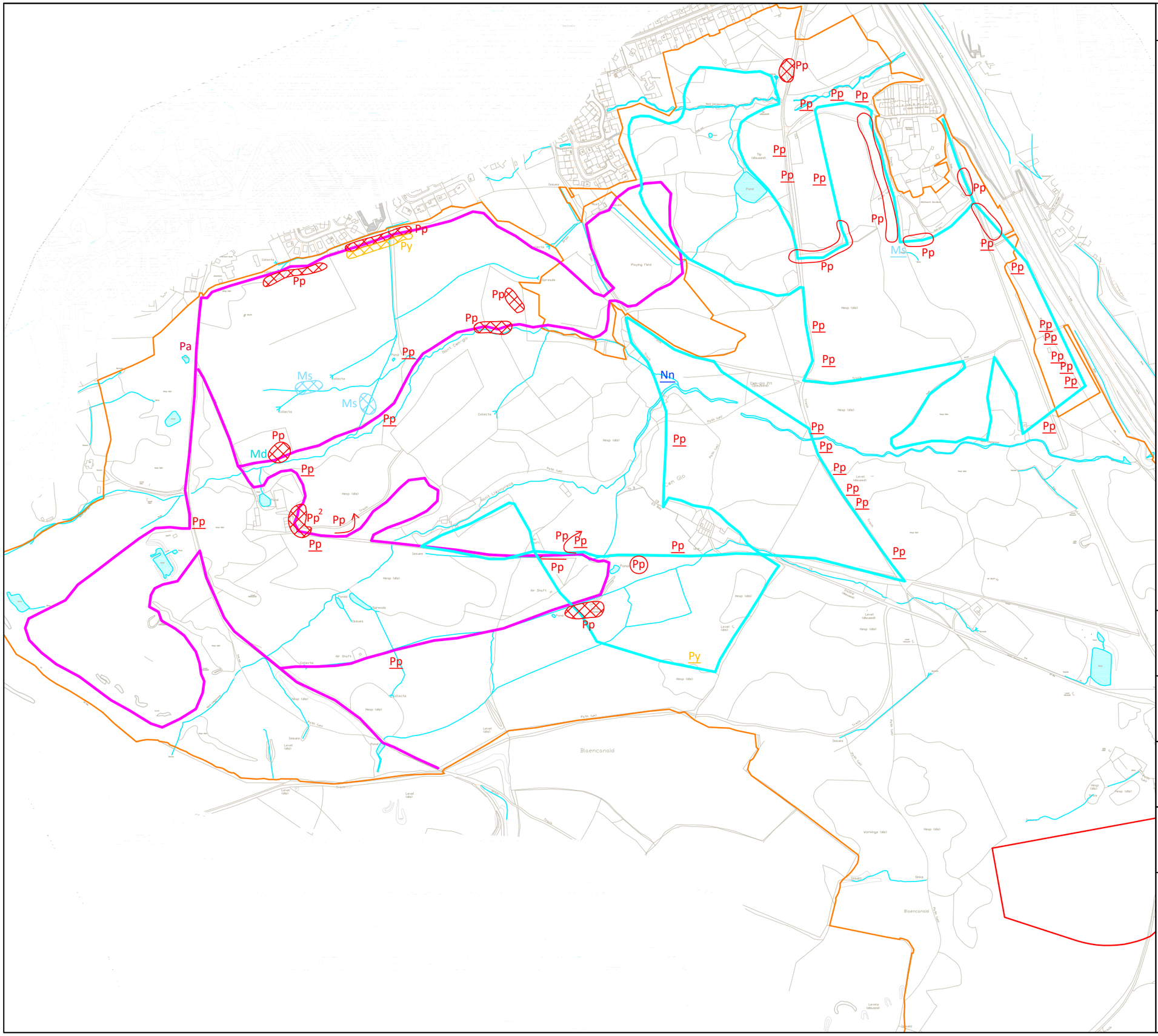

Key

- Application site
- 2015 study area
- Transect 1
- Transect 2
- Pp Common pipistrelle
- Py Soprano pipistrelle
- Md Daubenton's bat
- Ms Myotis sp.
- Nn Noctule
- Pa Brown long-eared bat
- Foraging
- Pp→ Commuting (showing direction of flight)
- (Pp) Social call
- Pp Pass
- Pp2 Number of bats

DO NOT SCALE

Title

Bat activity transect results - July 2015 (Transects 1 and 2)

Project	Client
Cwm Glo	Marvel Ltd.

Drawing No.	Revision	Project No.
Figure 2e		E1835

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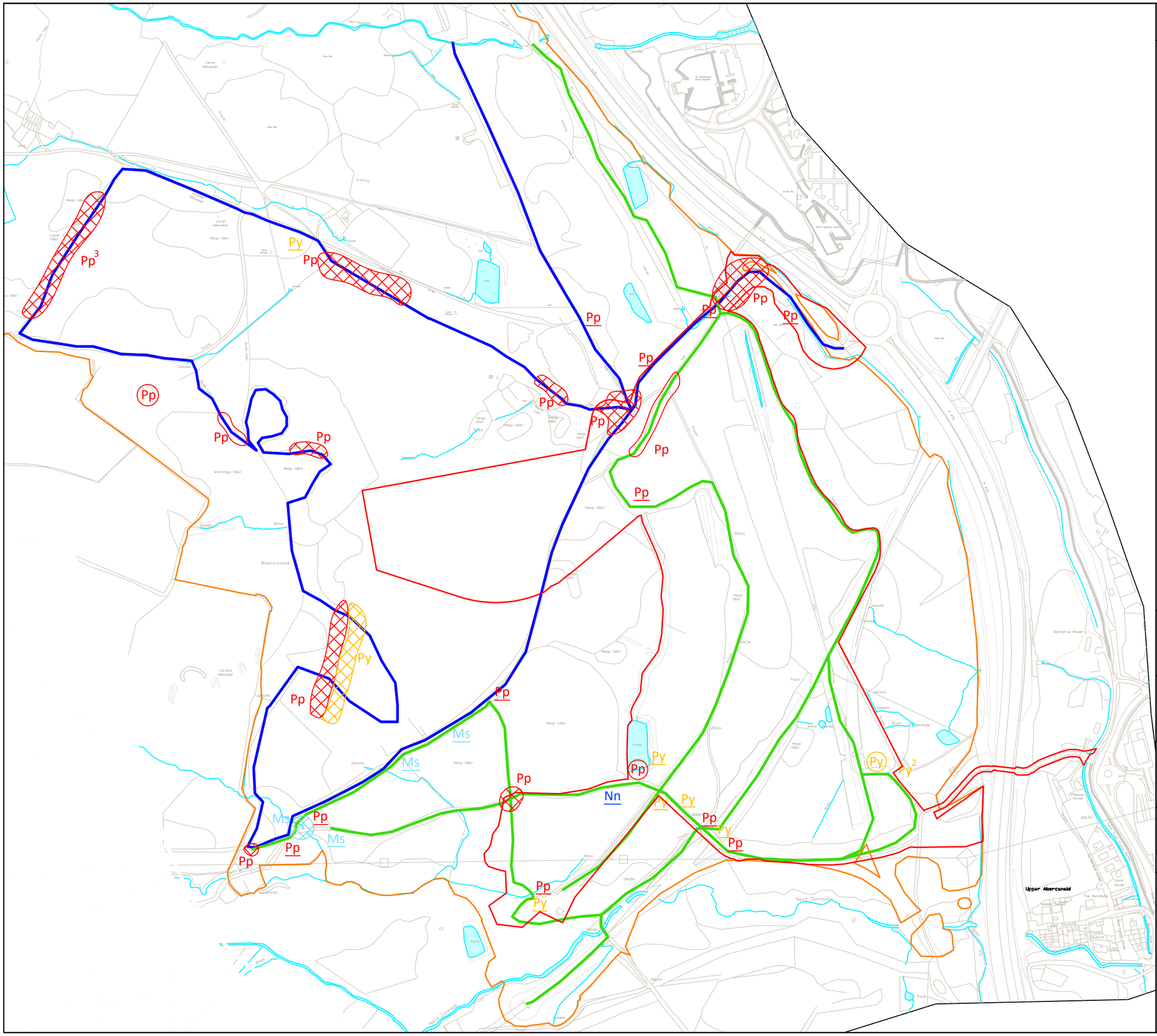

Key

- Application site
- 2015 study area
- Transect 3
- Transect 4
- Pp Common pipistrelle
- Py Soprano pipistrelle
- Ms Myotis sp.
- Nn Noctule
- Foraging
- Pp Commuting (showing direction of flight)
- Pp Social call
- Pp Pass
- Pp2 Number of bats

DO NOT SCALE

Title

Bat activity transect results - July 2015 (Transects 3 and 4)

Project	Client
Cwm Glo	Marvel Ltd.

Drawing No.	Revision	Project No.
Figure 2f		E1835

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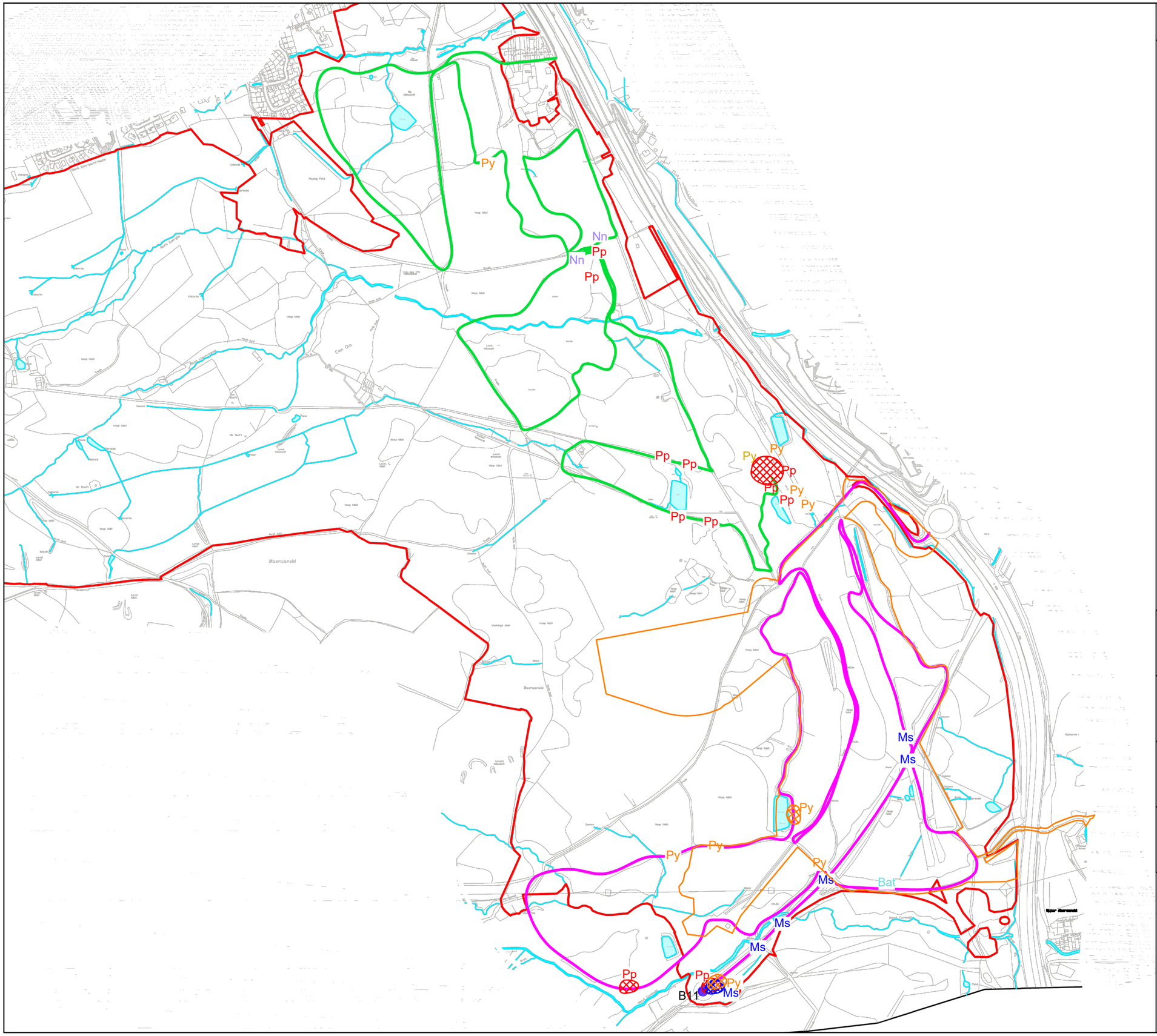
Figure 3a-d

Bat transect survey results - 2016



Key

- Application site boundary
- 2016 survey area
- Transect route 1
- Transect route 2
- Pp Common pipistrelle
- Py Soprano pipistrelle
- Ms Myotis sp.
- Nn Noctule
- Bat Unidentified bat
- Foraging

DO NOT SCALE

Title

Bat activity transect (dusk) results 23.08.16

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 3a	-	E1835

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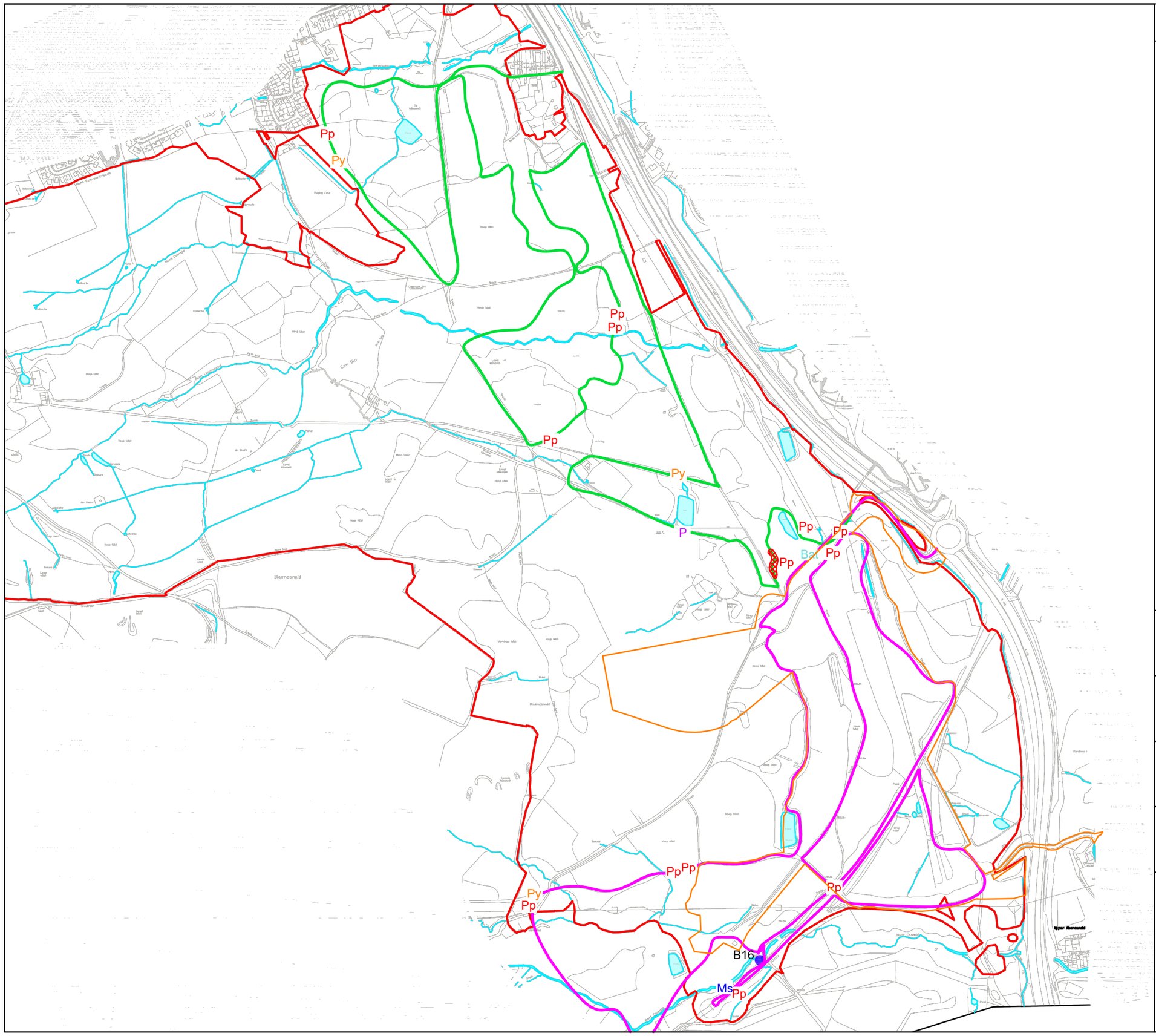

Key

- Application site boundary
- 2016 study area
- Transect route 1
- Transect route 2
- Pp Common pipistrelle
- Py Soprano pipistrelle
- P Pipistrelle species
- Bat Unidentified bat
- Foraging

DO NOT SCALE

Title

Bat activity transect (dawn) results 24.08.16

Project	Client
Cwm Glo	Marvel Ltd.

Drawing No.	Revision	Project No.
Figure 3b	-	E1835

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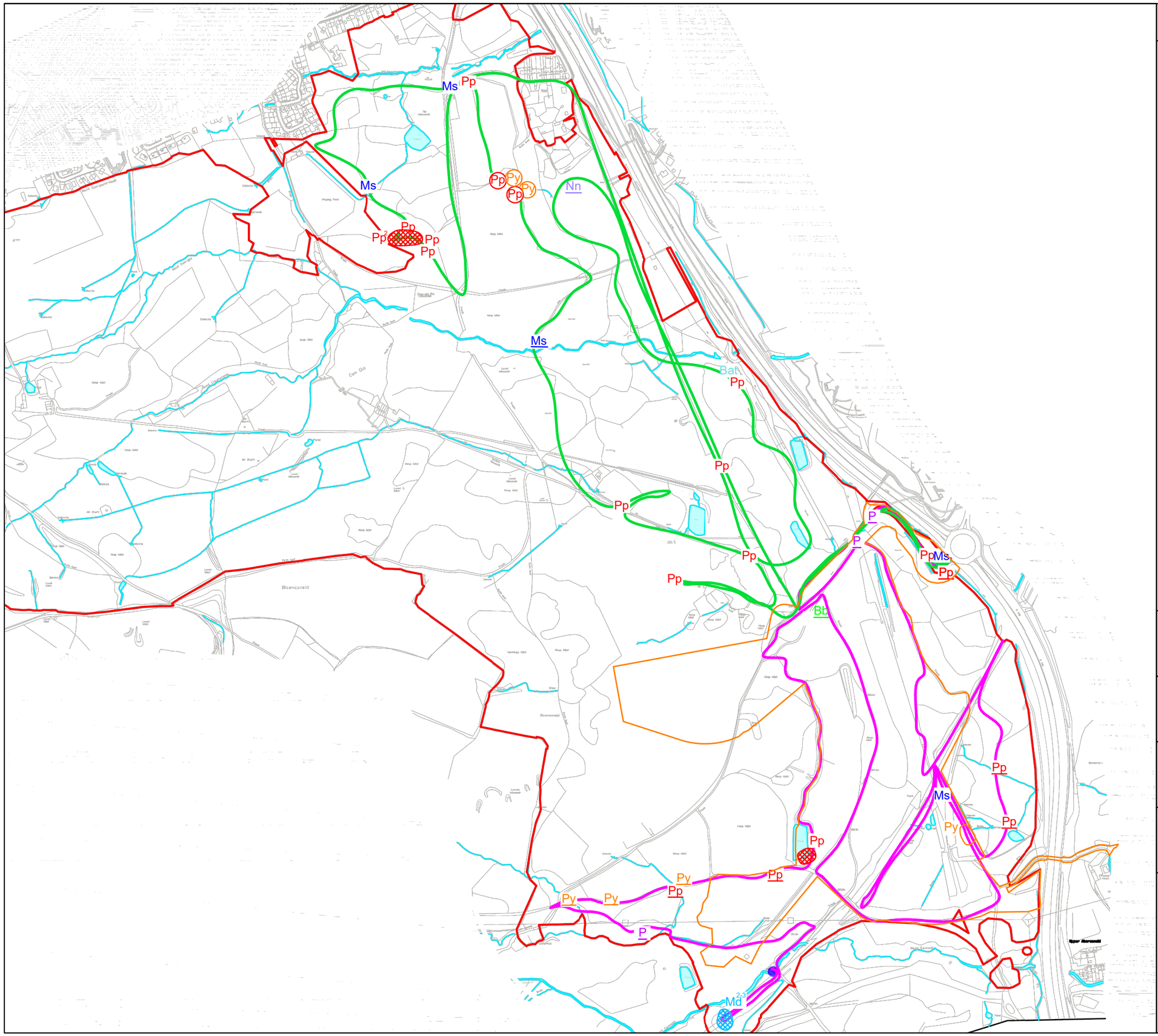

Key

- Application site boundary
- 2016 survey area
- Transect route 1
- Transect route 2
- Pp Common pipistrelle
- Py Soprano pipistrelle
- P Pipistrelle species
- Ms Myotis sp.
- Nn Noctule
- Bb Barbastelle
- Bat Unidentified bat
- Foraging
- Activity in the area
- Pp Pass
- Pp2 Number of bats
- Pp Social call

DO NOT SCALE

Title

Bat activity transect (dusk) results 15.09.16

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 3c	-	E1835

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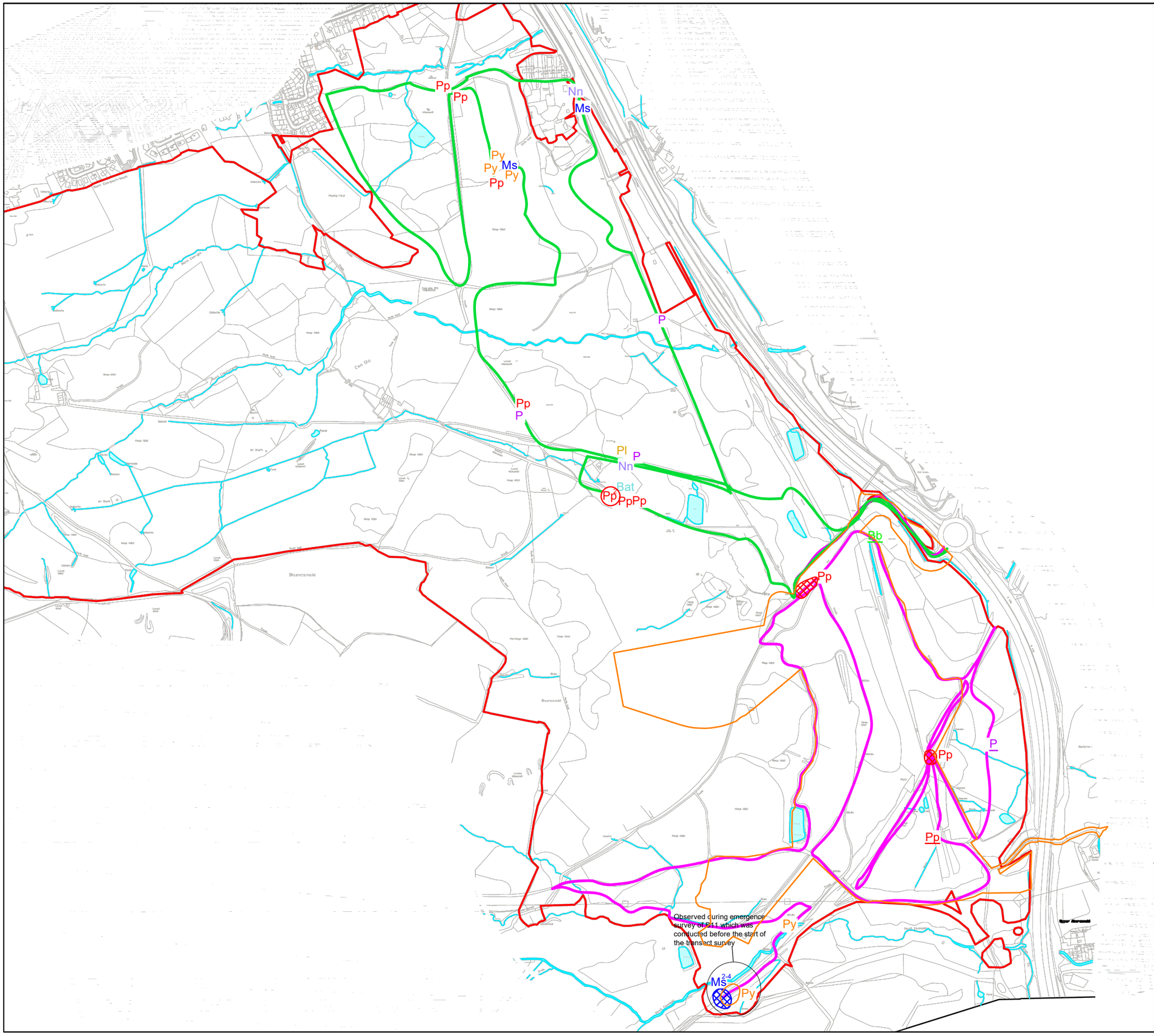

Key

- Application site boundary
- 2016 survey area
- Transect route 1
- Transect route 2
- Pp Common pipistrelle
- Py Soprano pipistrelle
- P Pipistrelle species
- Ms Myotis sp.
- Nn Noctule
- Pl Long-eared bat
- Bb Barbastelle
- Bat Unidentified bat
- Foraging
- Activity in the area
- Pp Pass
- Pp Social call
- Pp2 Number of bats

DO NOT SCALE

Title

Bat activity transect (dawn) results 16.09.16

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 3d	-	E1835

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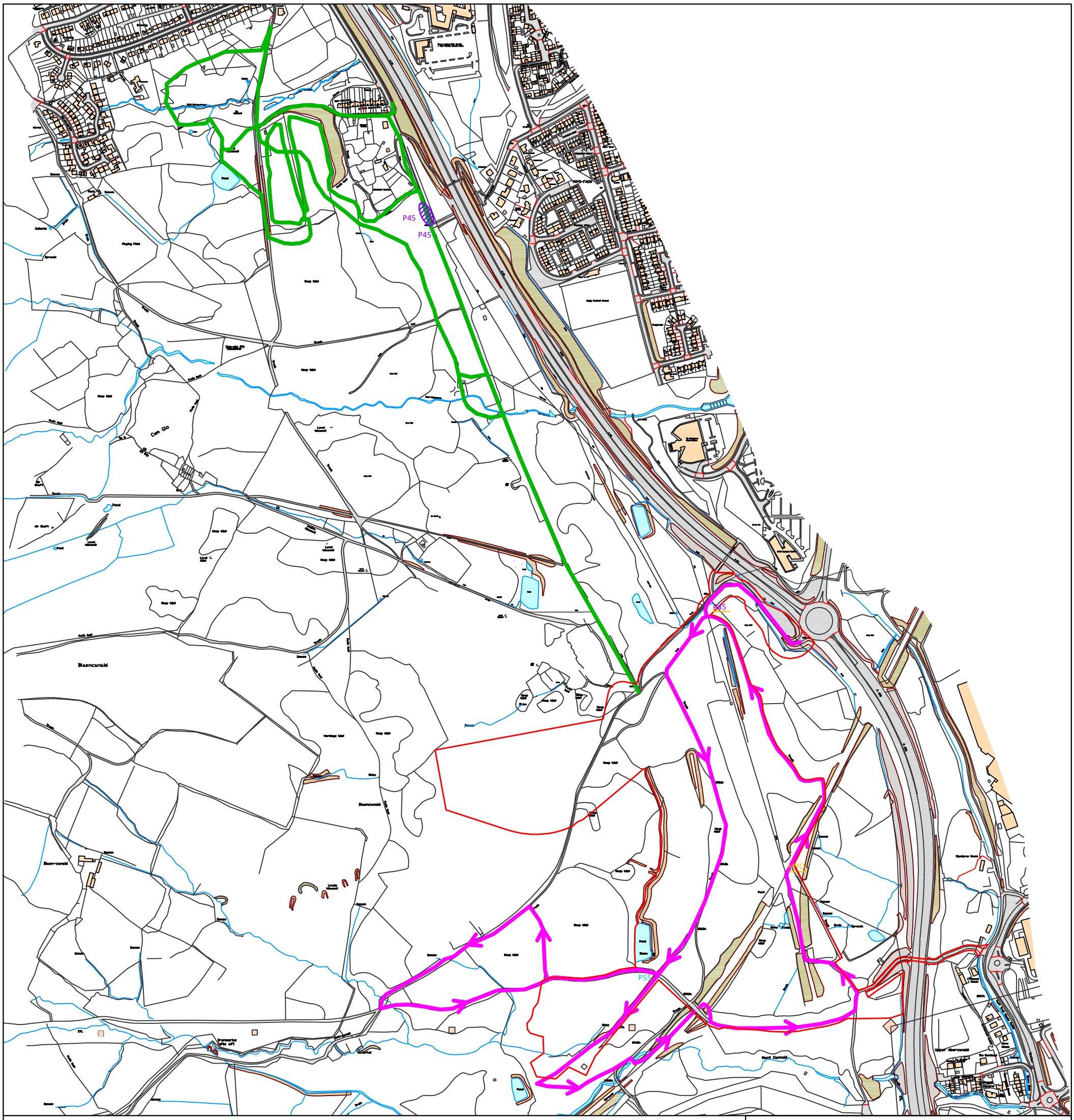
Figure 4a-k

Bat transect survey results - 2018



Key

- Application site
- Transect 1
- Transect 2
- P45 Common pipistrelle
- P55 Soprano pipistrelle
- MYO Myotis species
- Foraging area
- Bat Bat passing by

DO NOT SCALE

Title
Bat activity survey results 24.04.2018

Project	Client
Cwm Glo	Marvel Ltd.

Drawing No.	Revision	Project No.
Figure 4a	-	E1835

Drawn	Checked	Date
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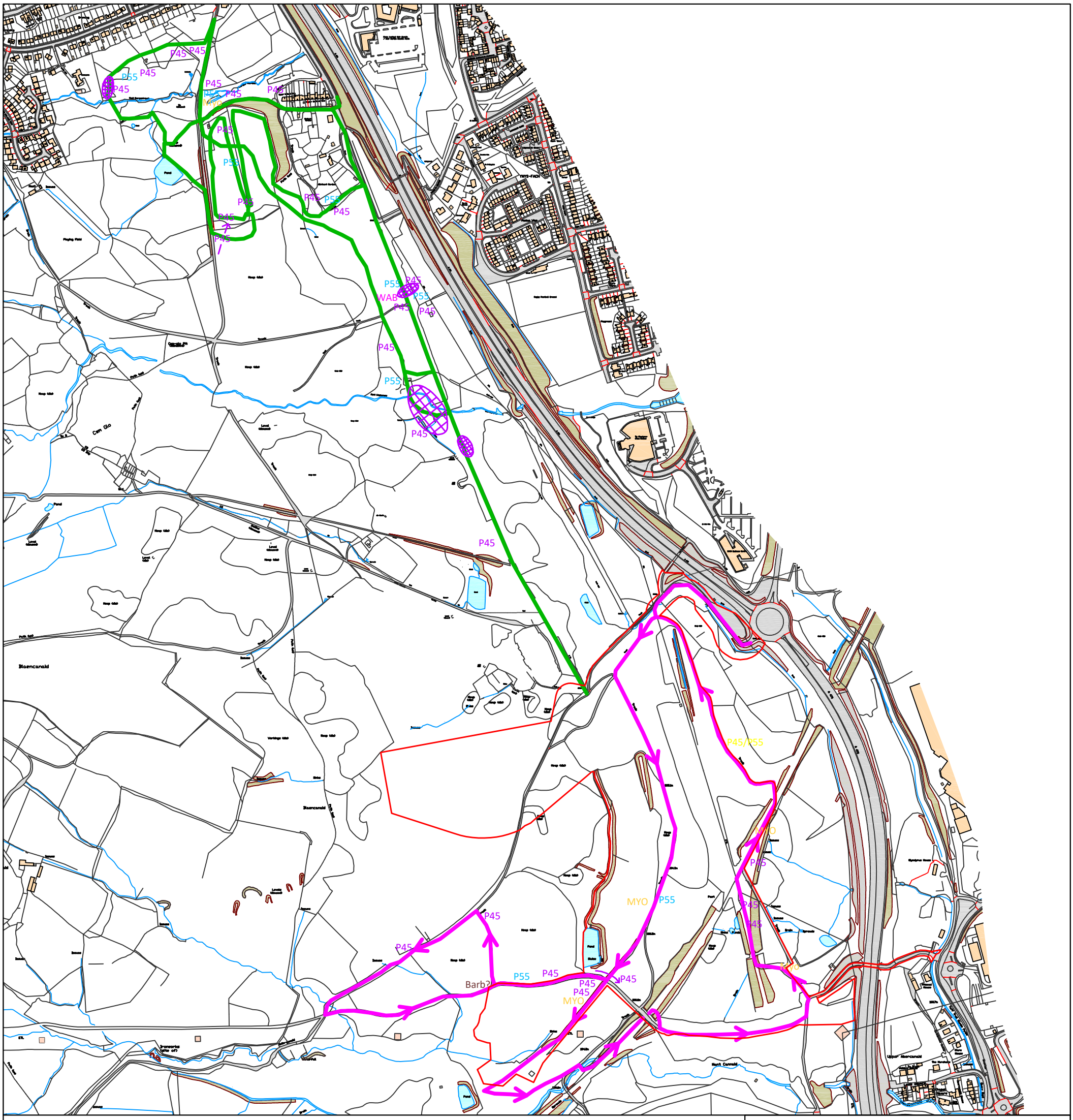

Key

- Application site
- Transect 1
- Transect 2
- P45 Common pipistrelle
- P55 Soprano pipistrelle
- P45/P55 Common/soprano pipistrelle
- MYO Myotis species
- Barb? Barbastelle (potential)
- WAB Whiskered/Alcathoe/Brandt's bat
- Foraging area
- Bat Bat passing by
- Bat Social call

DO NOT SCALE

Title
Bat activity transect results 17.05.2018

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 4b	-	E1835

Drawn	Checked	Date
CD	DW	November 2023

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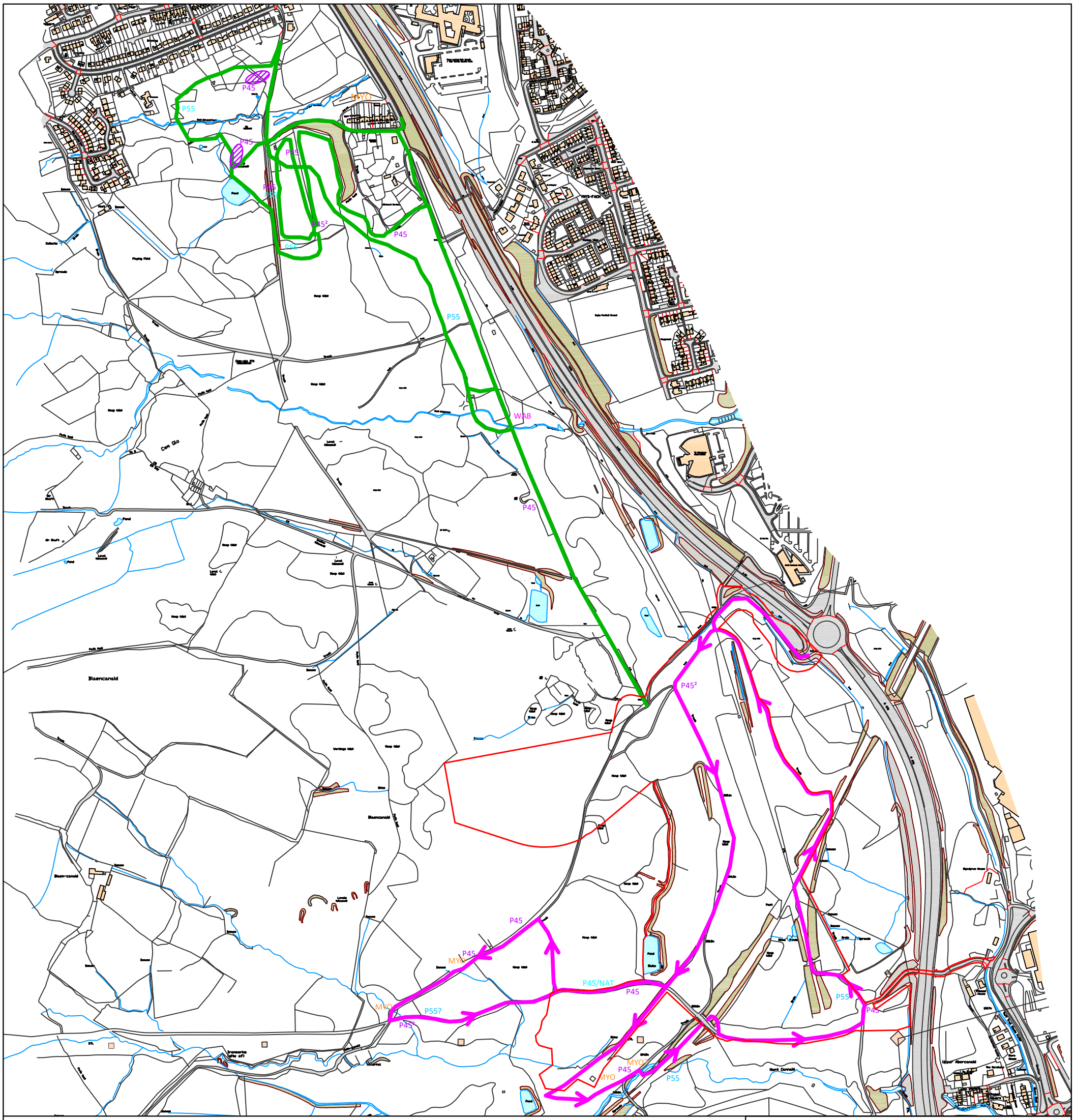

Key

- Application site
- Transect 1
- Transect 2
- P45 Common pipistrelle
- P55 Soprano pipistrelle
- P45/NAT Common/nathusius' pipistrelle
- MYO Myotis species
- Bat² Two bats

DO NOT SCALE

Title
Bat activity transect results 14.06.2018

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 4c	-	E1835a

Drawn	Checked	Date
CD	DW	November 2021

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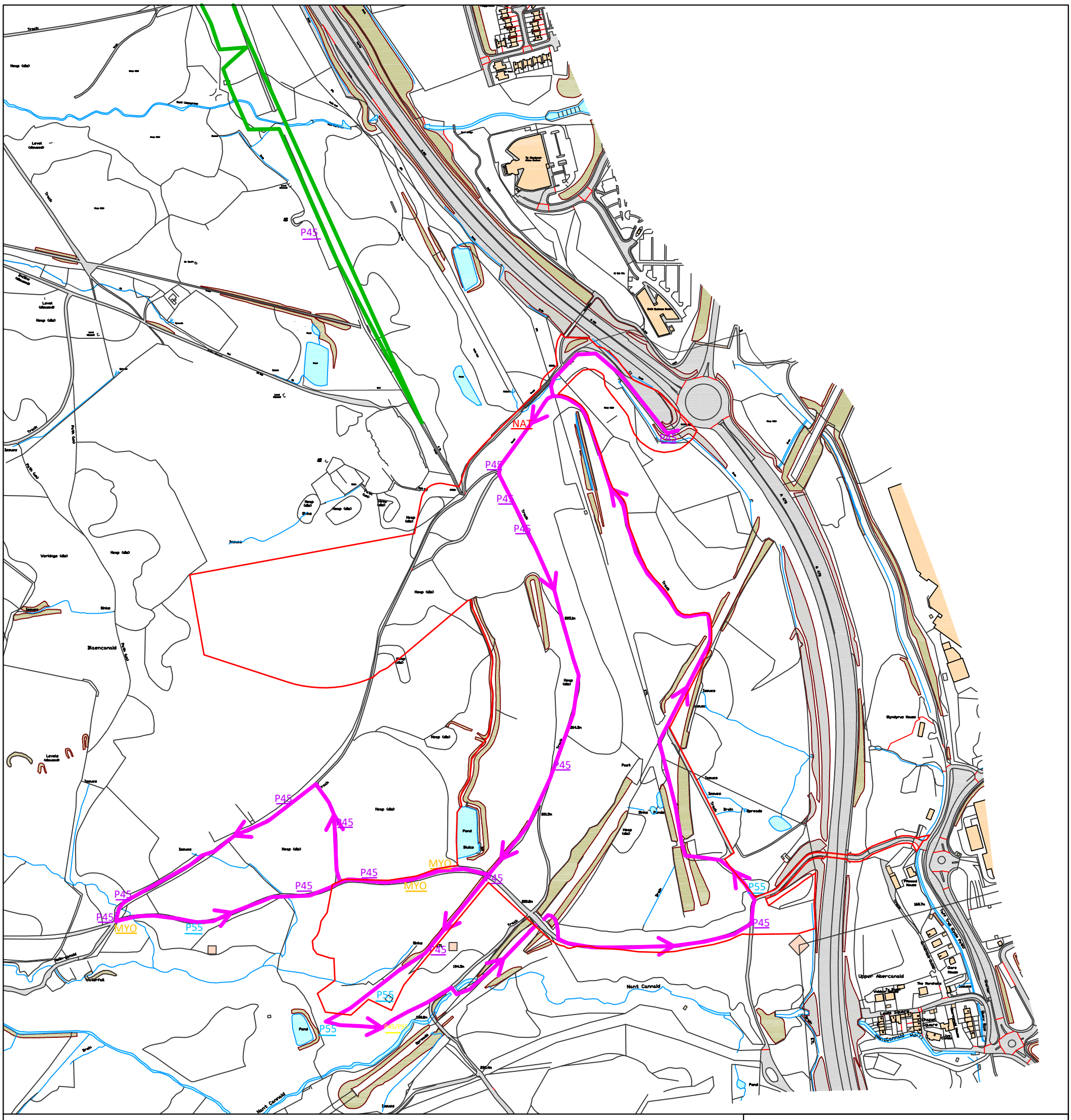
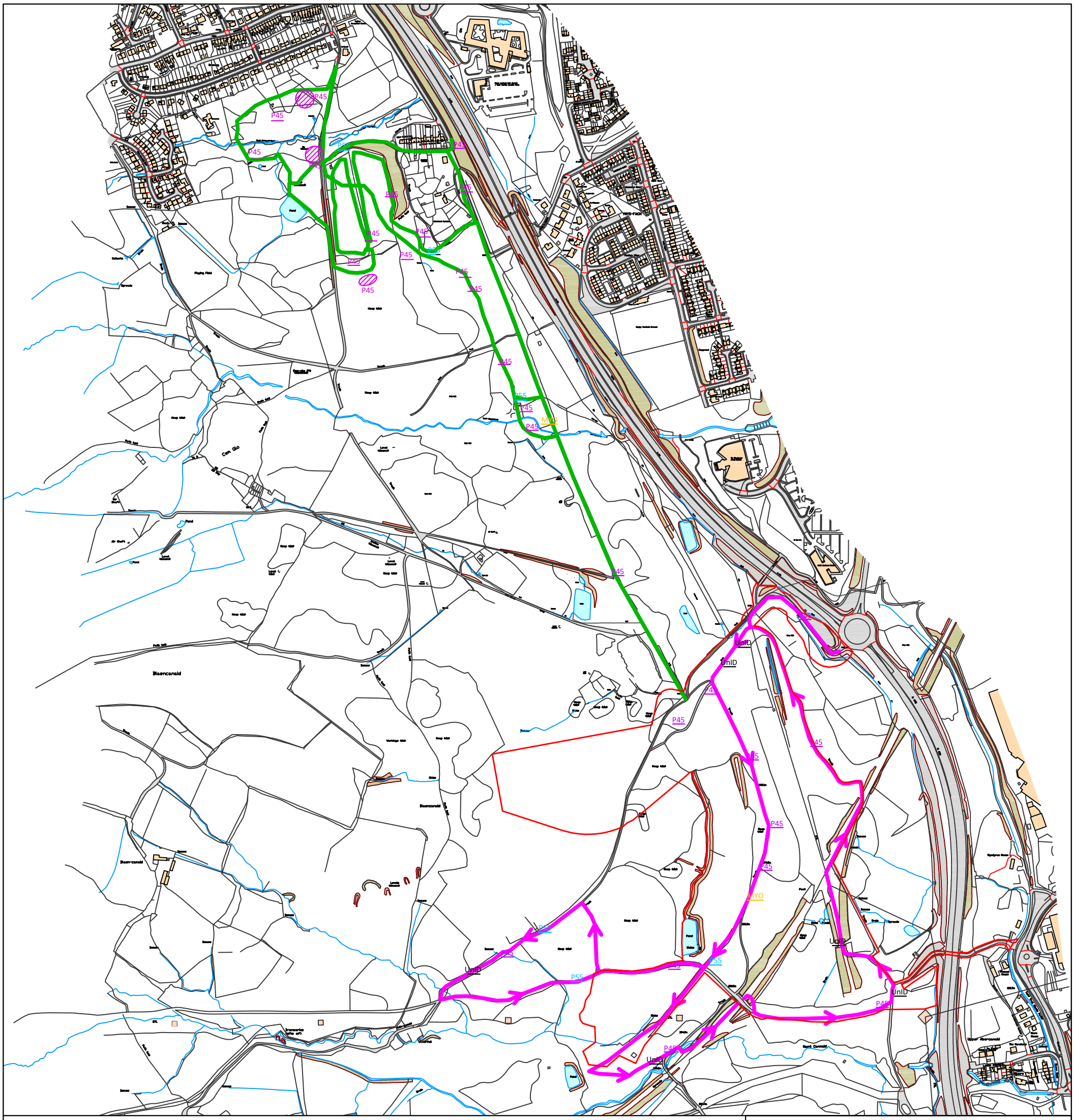

P45
NA1
P45
P45
P45



Key

- Application site
- Transect 1
- Transect 2
- P45 Common Pipistrelle
- P55 Soprano Pipistrelle
- MYO Myotis Species
- UnID Unidentified Bat Species
- BAT Foraging area
- Bat passing by

DO NOT SCALE

Title
Bat activity transect results 12.07.2018

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 4e	-	E1835

Drawn	Checked	Date
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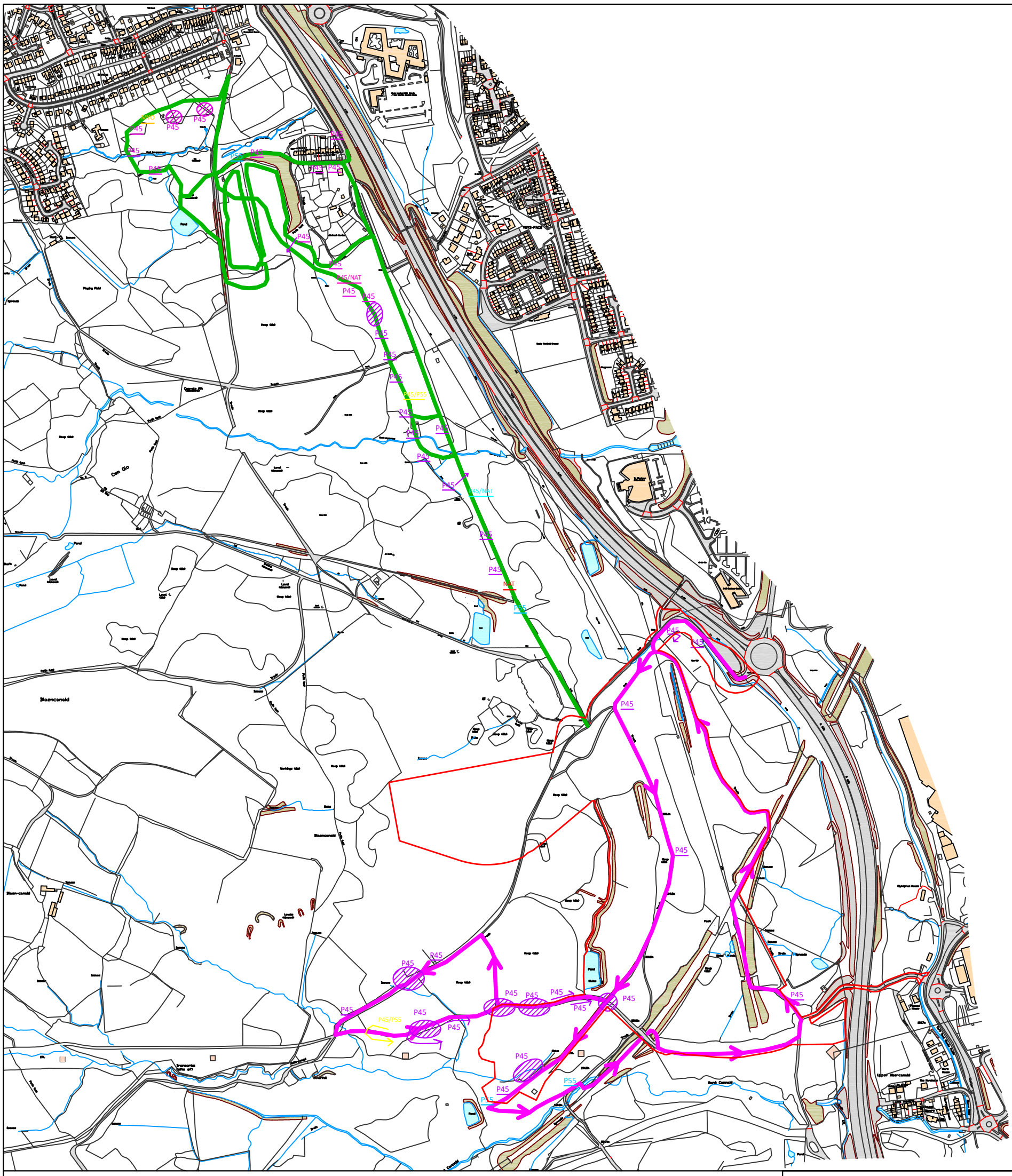

Key

- Application site
- Transect 1
- Transect 2
- P45 Common pipistrelle
- P55 Soprano pipistrelle
- P45/P55 Common/soprano pipistrelle
- P45/NAT Common/nathusius' pipistrelle
- NAT Nathusius' pipistrelle
- Foraging area
- Bat Bat passing by
- Commuting

DO NOT SCALE

Title
Bat activity transect results 18.07.18

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 4f	-	E1835

Drawn	Checked	Date
CD	DW	November 2023

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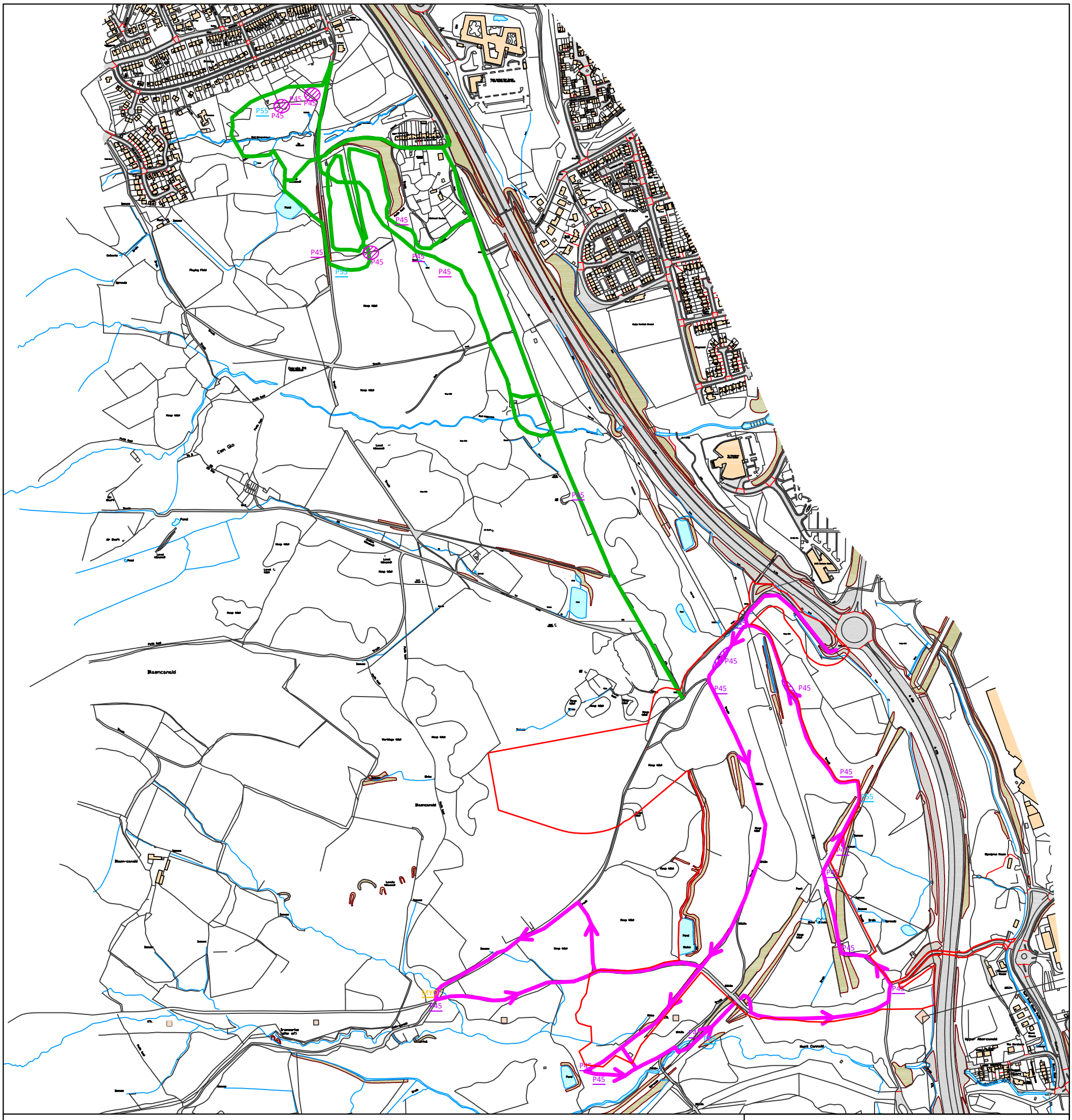

Key

- Application site
- Transect 1
- Transect 2
- P45 Common pipistrelle
- P55 Soprano pipistrelle
- MYO Myotis species
- Foraging area
- Bat Bat passing by

DO NOT SCALE

Title
Bat activity transect results 09.08.18

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 4g	-	E1835

Drawn	Checked	Date
CD	DW	November 2023

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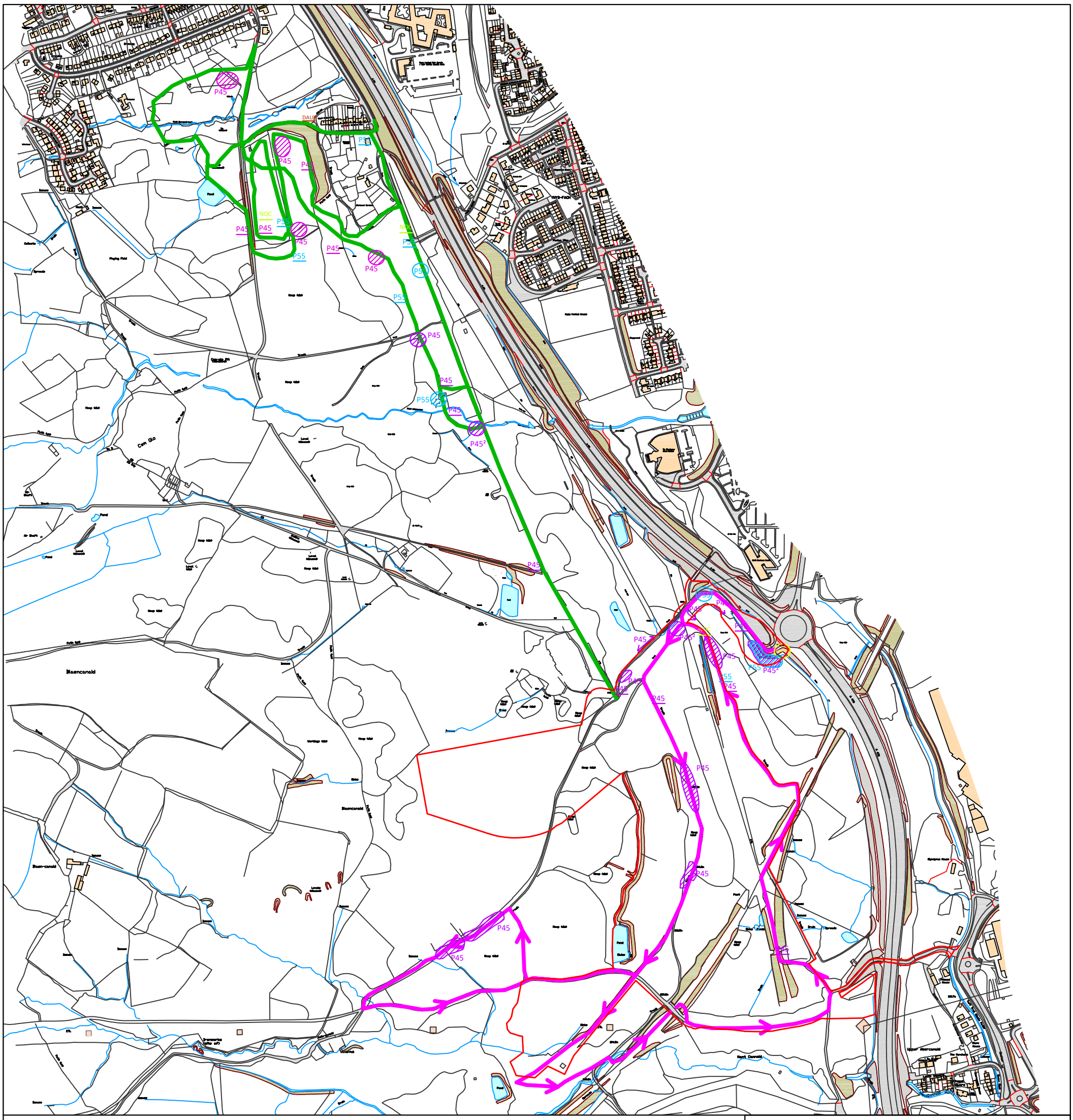

Key

- Application site
- Transect 1
- Transect 2
- P45 Common pipistrelle
- P55 Soprano pipistrelle
- P45/P55 Common/soprano pipistrelle
- P45/NAT Common/nathusius' pipistrelle
- NOC Common noctule
- Foraging area
- Bat Bat passing by
- Commuting
- Bat social call

DO NOT SCALE

Title
Bat activity transect results 20.08.18

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 4h	-	E1835

Drawn	Checked	Date
CD	DW	November 2023

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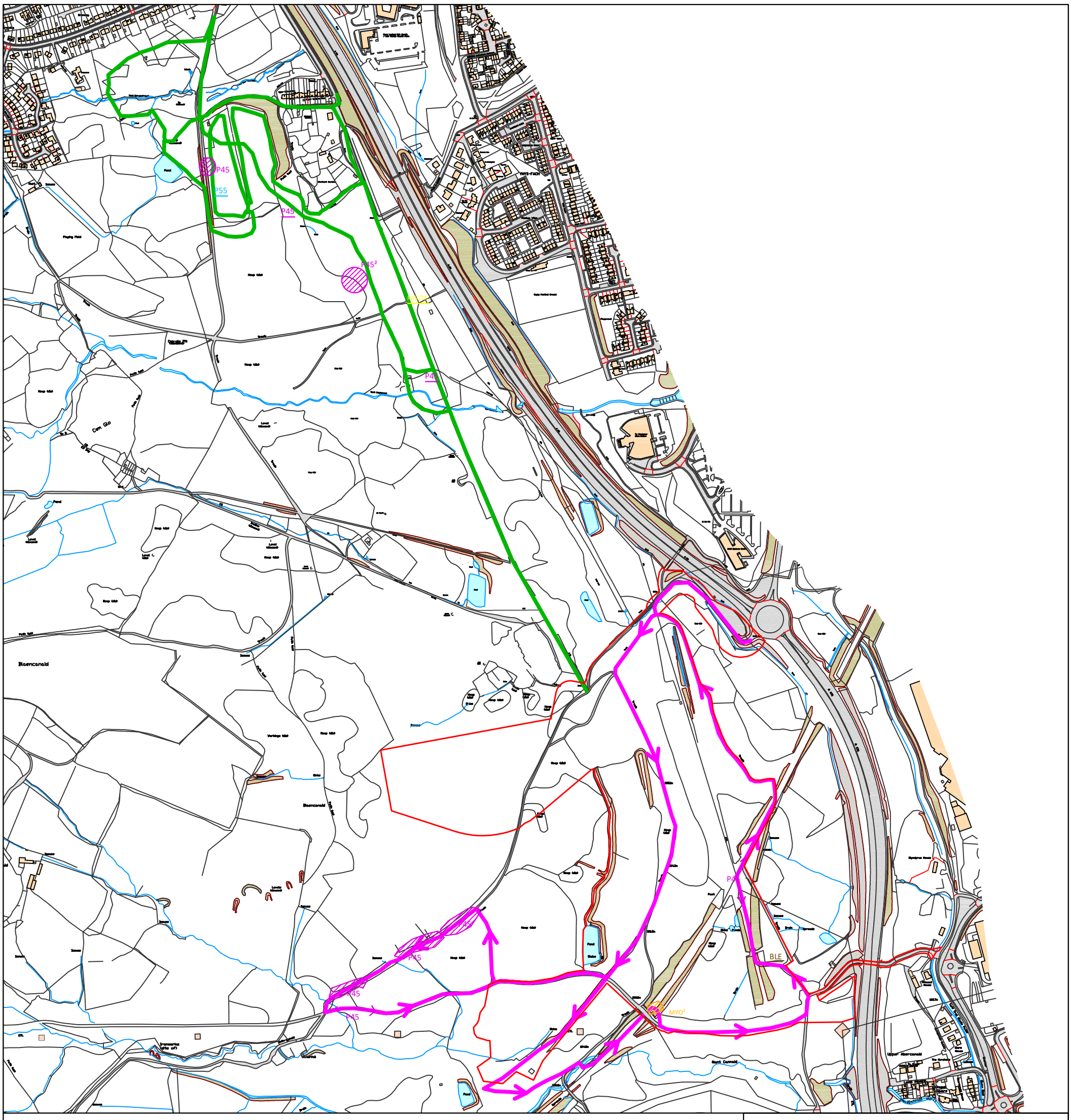
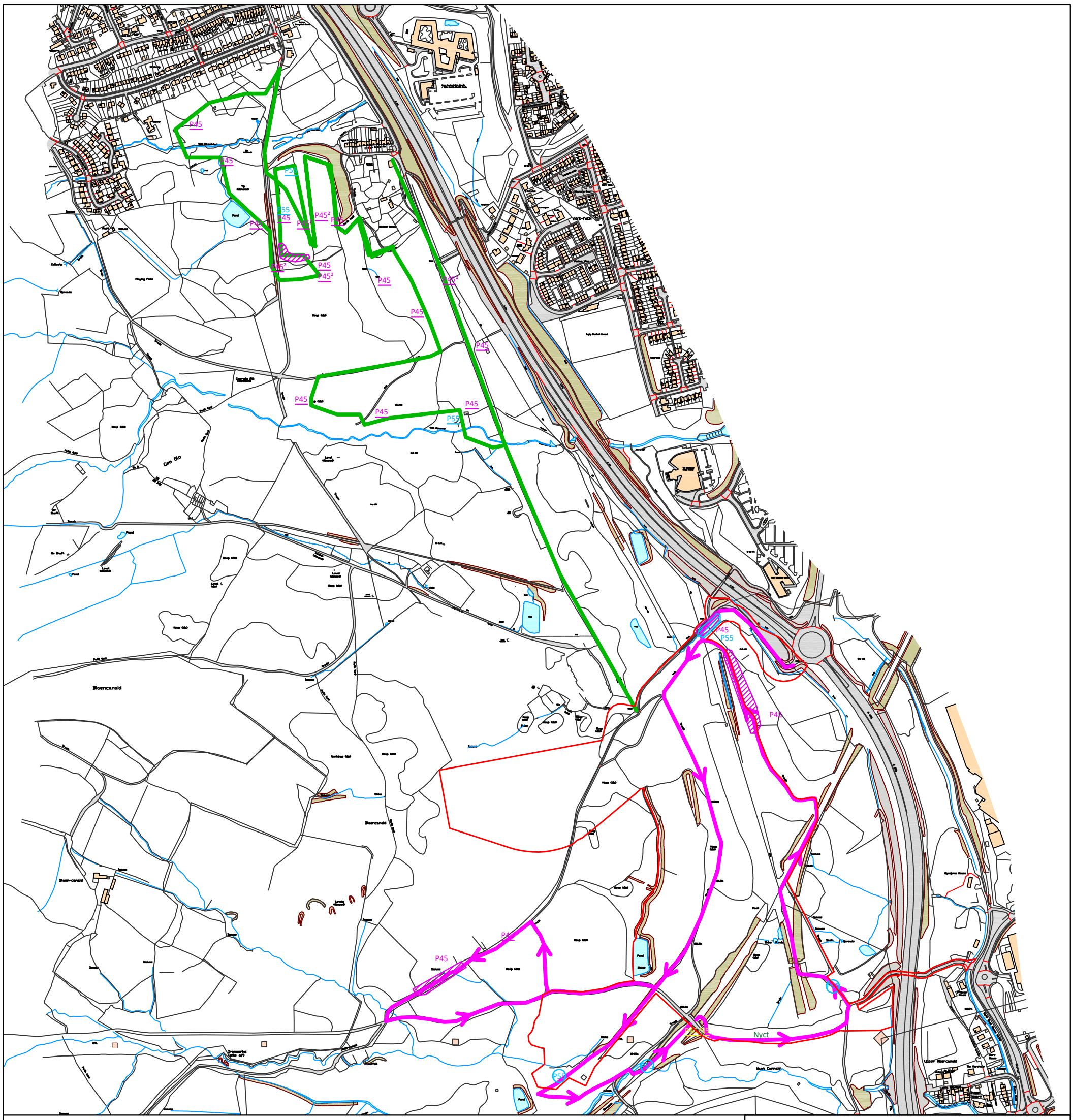

P45
P55
P45
P45²
P45
P45
P45
P45
P45
BLE
MYO²
Cwm Glo
Blaencanaid
Blaencanaid
Pond
Playing Field
Hedge Gilbert
Hedge Gilbert
Hedge Gilbert



Key

- Application site
- Transect 1
- Transect 2
- P45 Common Pipistrelle
- P55 Soprano Pipistrelle
- P45/55 Common/Soprano Pipistrelle
- Nyct Nyctalus species
- BLE Brown Long-eared Bat
- Foraging area
- BAT Bat passing by
- BAT² Two bats

DO NOT SCALE

Title
Bat activity transect results 13.09.18

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 4j	-	E1835

Drawn	Checked	Date
CD	DW	November 2023

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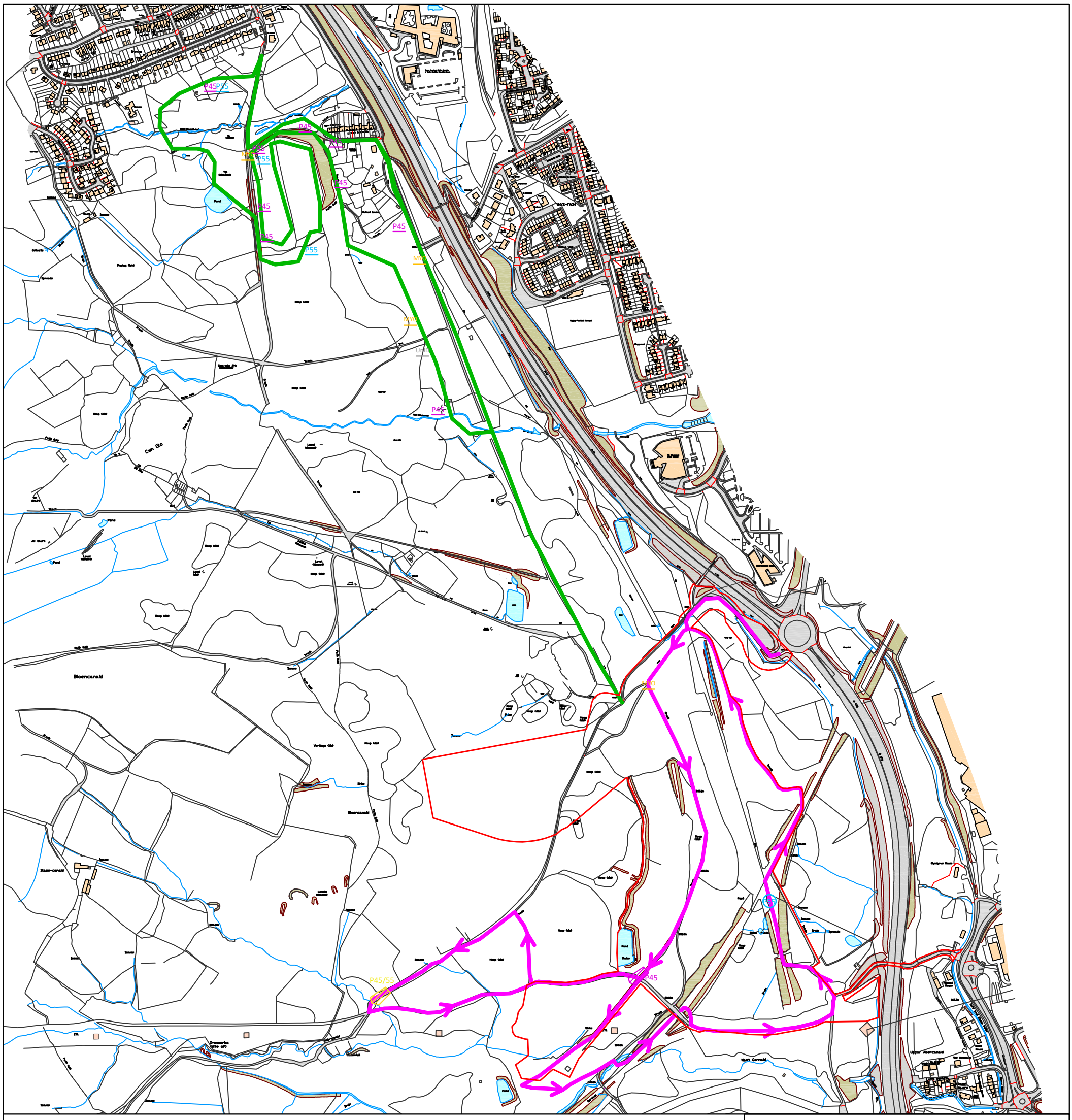

Key

- Application site
- Transect 2
- Transect 2
- P45 Common pipistrelle
- P55 Soprano pipistrelle
- MYO Myotis species
- UnID Unidentified bat species
- P45/55 Common/Soprano Pipistrelle
- Foraging area
- BAT Bat passing by

DO NOT SCALE

Title
Bat activity transect results 27.09.18

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 4k	-	E1835

Drawn	Checked	Date
CD	DW	November 2023

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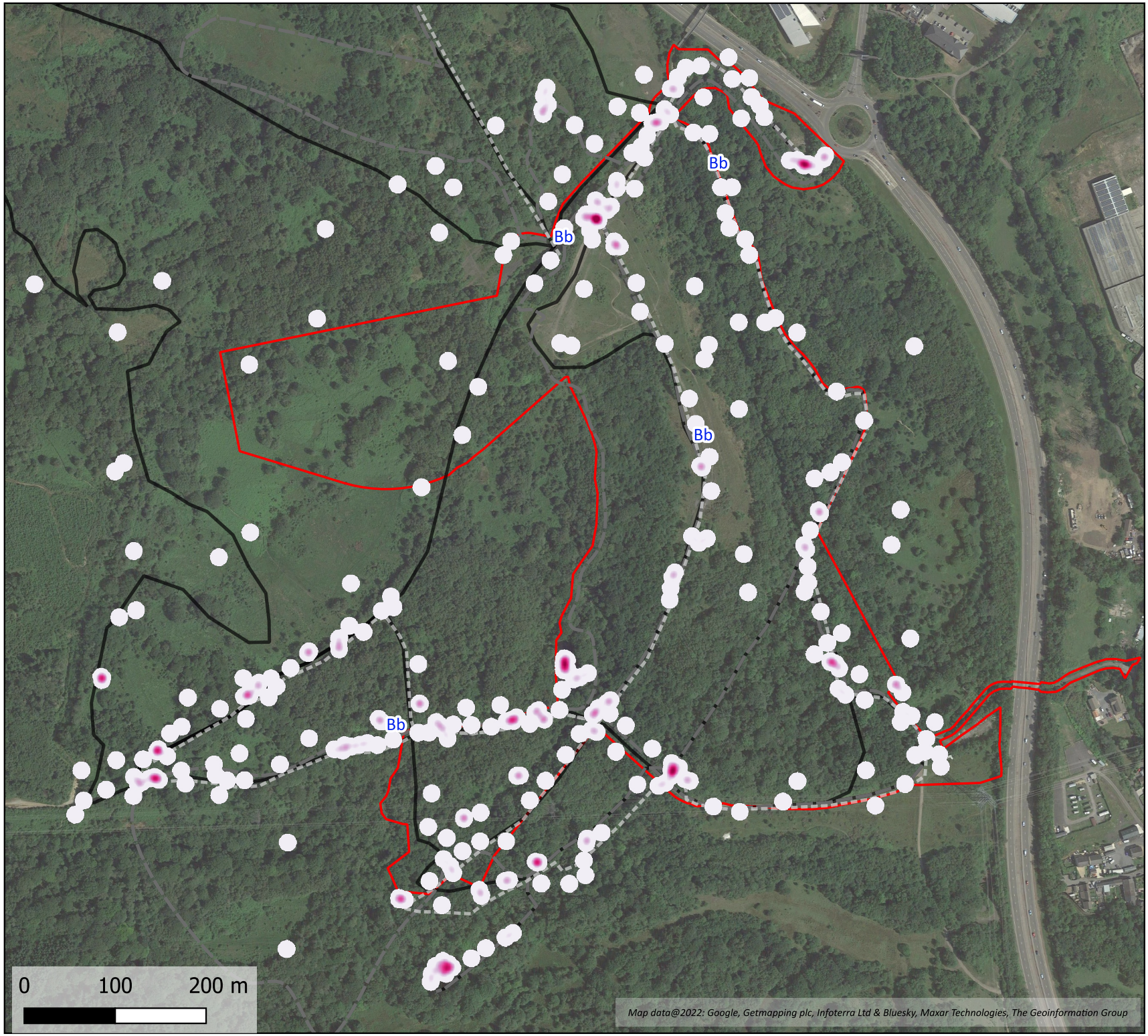
Figure 5

Pre-2021 Collated bat transect survey results



Key

Application site

Relative bat activity (collated 2015-2018)

Low

High

Transect routes 2018

Transect routes 2016

Transect routes 2015

Bb Barbastelle bat detected during transects conducted in May 2015 and September 2016

The heatmap was generated from collated point data from the pre-2021 transect surveys, whereby one point equated to one bat observed/heard. The areas of higher activity shown on the map indicate locations where multiple bats were observed/heard and/or bats were observed/heard on repeated visits. Note the assignment of activity as low-high here is relative to the site and pre-2021 data and is for qualitative purposes only.

Title

Pre-2021 collated bat activity results and notable bat species

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 5	-	E1835

Drawn	Checked	Date
RB	DW	November 2023

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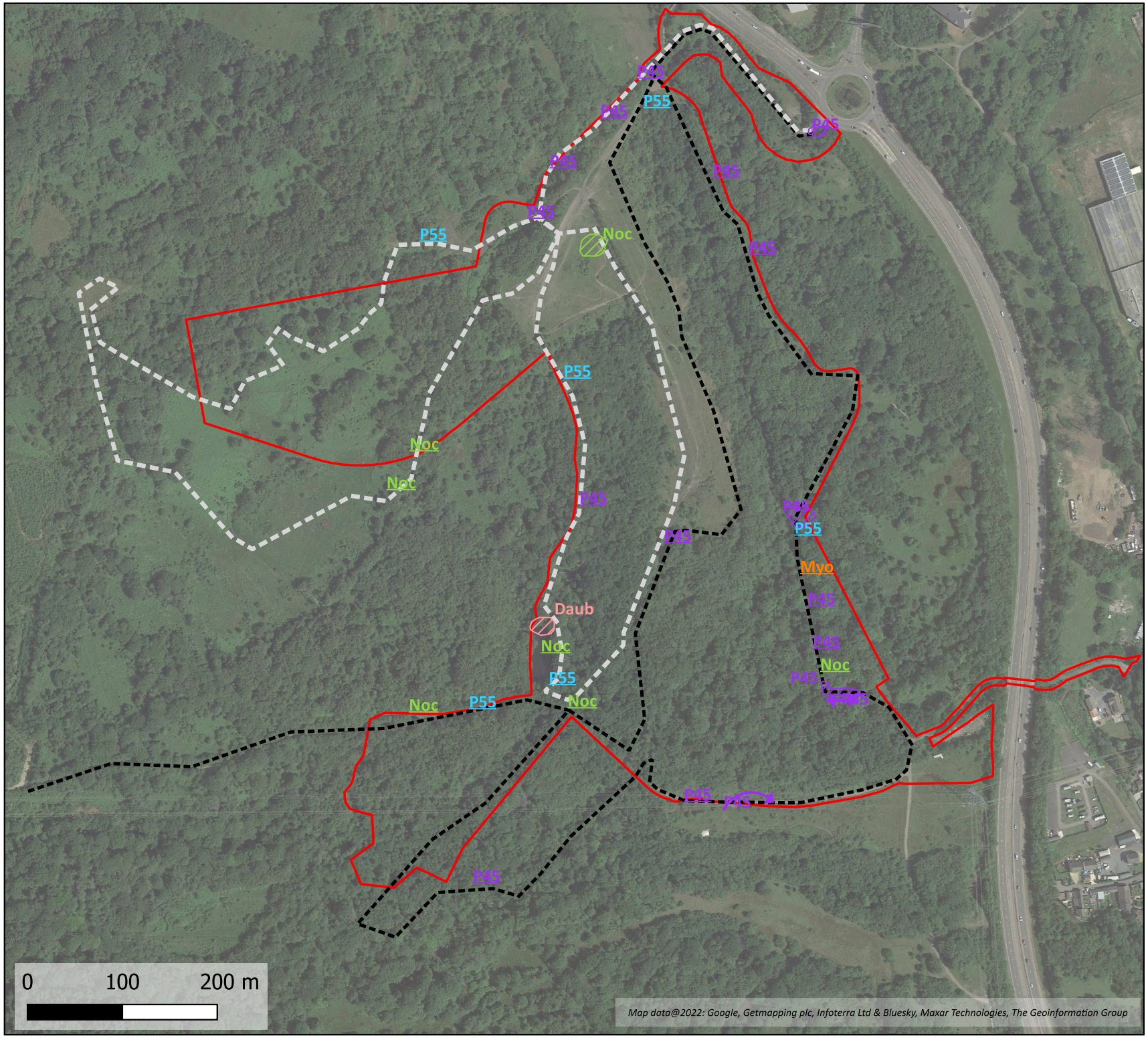
Figure 6a-m

Bat transect survey results - 2021



Key

- Application site
- North transect (T1)
- South transect (T2)
- P45 Bat pass
- Foraging activity
- Direction of commuting bat
- P45 Common pipistrelle
- P55 Soprano pipistrelle
- Daub Daubentons bat
- Noc Common noctule
- Myo *Myotis sp*

Title		
Bat activity transect results 21.04.2021		
Project		**Client**
Cwm Glo		Marvel Ltd
Drawing No.	**Revision**	**Project No.**
Figure 6a	-	E1835
Drawn	**Checked**	**Date**
CD	DW	November 2023

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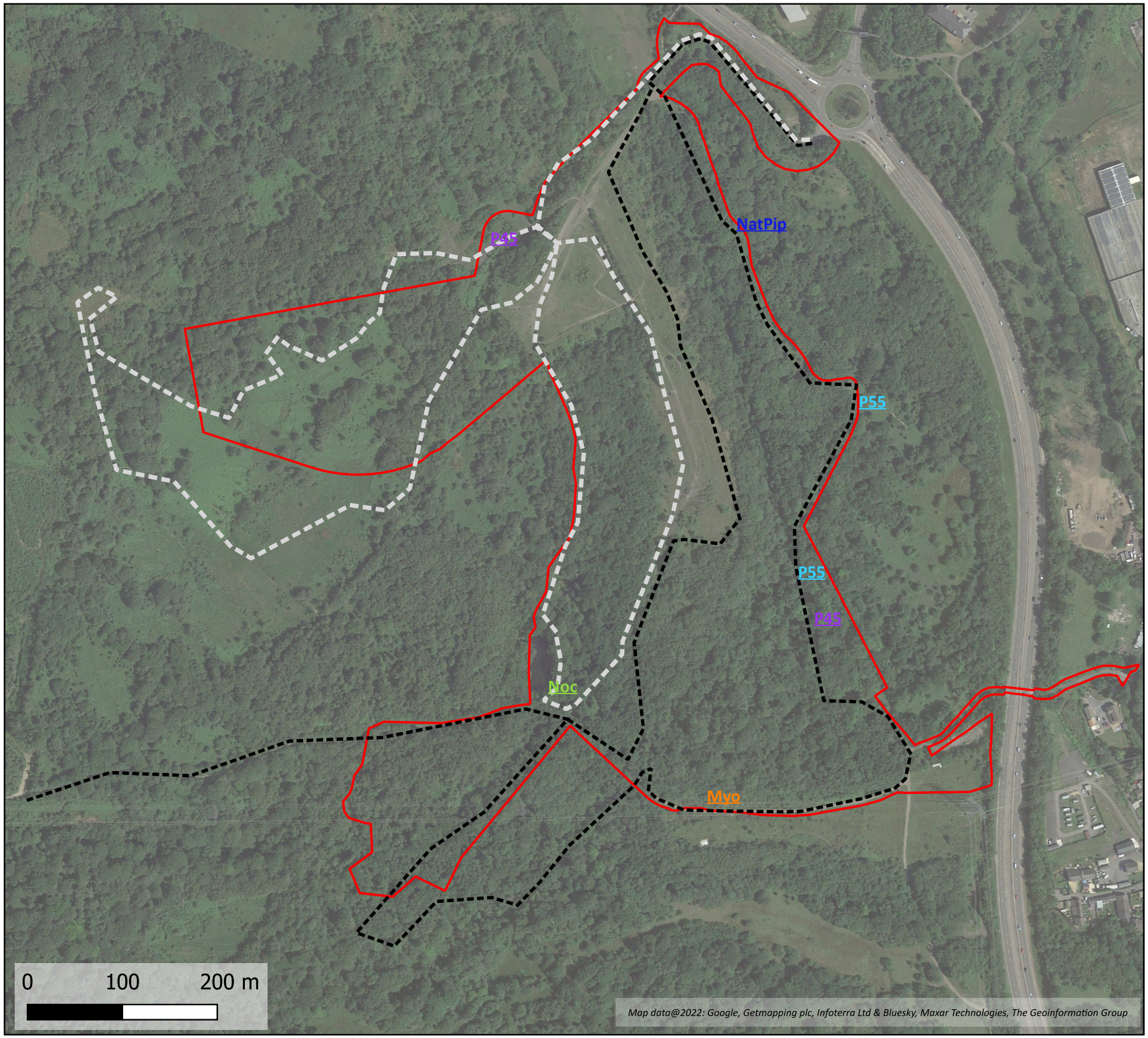

Key

- Application site
- North transect (T1)
- South transect (T2)
- P45 Bat pass
- P45 Common pipistrelle
- P55 Soprano pipistrelle
- Noc Common noctule
- Myo *Myotis sp*
- NatPip Nathusius' pipistrelle

Title
Bat activity transect results 29.04.2021

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 6b	-	E1835

Drawn	Checked	Date
CD	DW	November 2023

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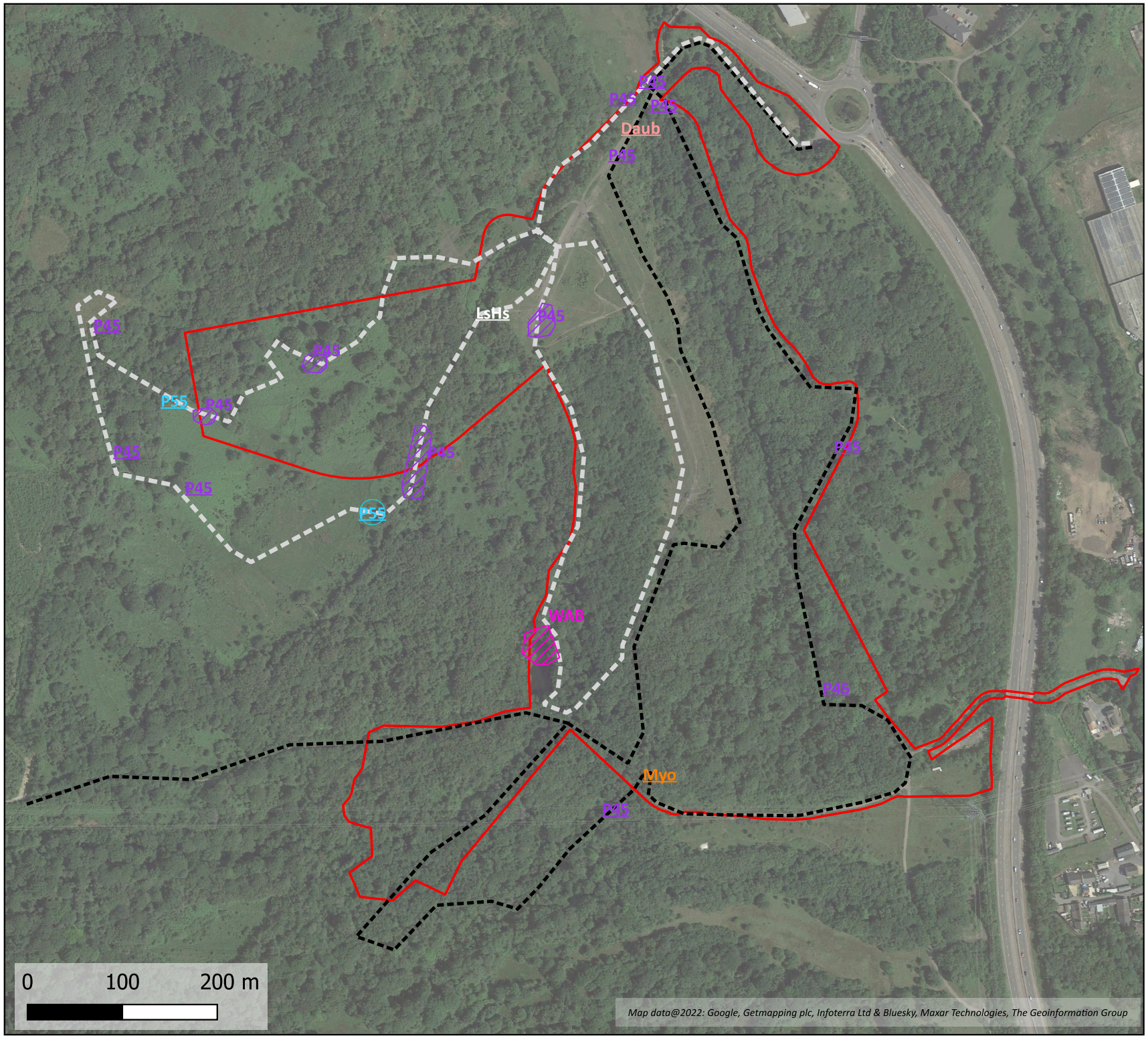

Key

- Application site
- North transect (T1)
- South transect (T2)
- P45 Bat pass
- P45 Social calling
- Foraging activity
- P45 Common pipistrelle
- P55 Soprano pipistrelle
- Myo *Myotis sp*
- Daub Daubenton's bat
- WAB Whiskered/Alcathoe/Brandt's bat
- LsHs Lesser horseshoe bat

Title
Bat activity transect results 17.05.2021

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 6c	-	E1835

Drawn	Checked	Date
CD	DW	November 2023

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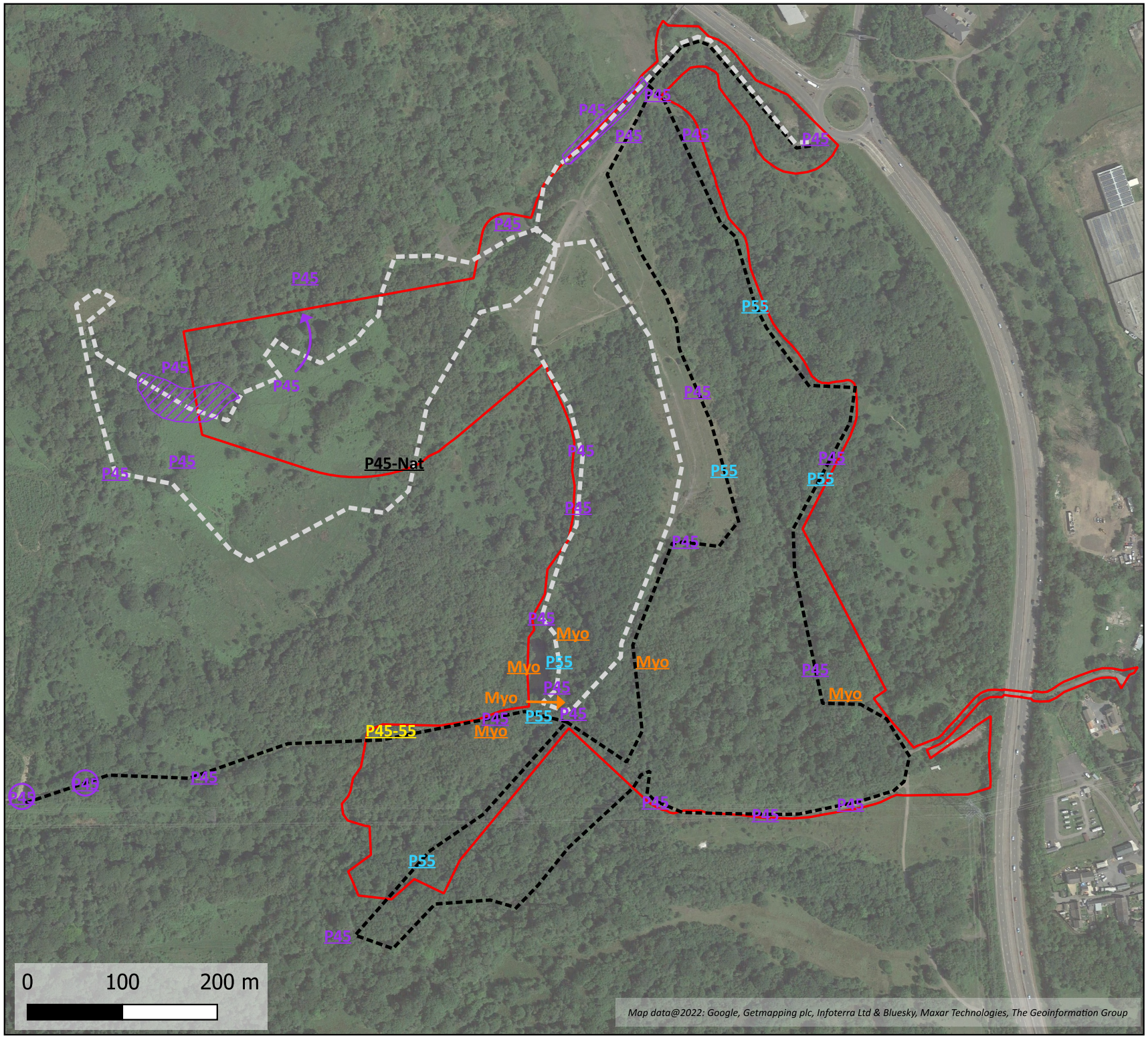

Key

- Application site
- North transect (T1)
- South transect (T2)
- P45 Bat pass
- (P45) Social calling
- Direction of commuting bat
- Foraging activity

P45	Common pipistrelle
P55	Soprano pipistrelle
Myo	*Myotis sp*
Daub	Daubenton's bat
P45-55	Common/soprano pipistrelle
P45-Nat	Common/Nathusius' pipistrelle
UnID	Unidentified bat

Title
Bat activity transect results 27.05.2021

Project	Client
Cwm Glo	Marvel ltd

Drawing No.	Revision	Project No.
Figure 6d	-	E1835

Drawn	Checked	Date
CD	DW	November 2023

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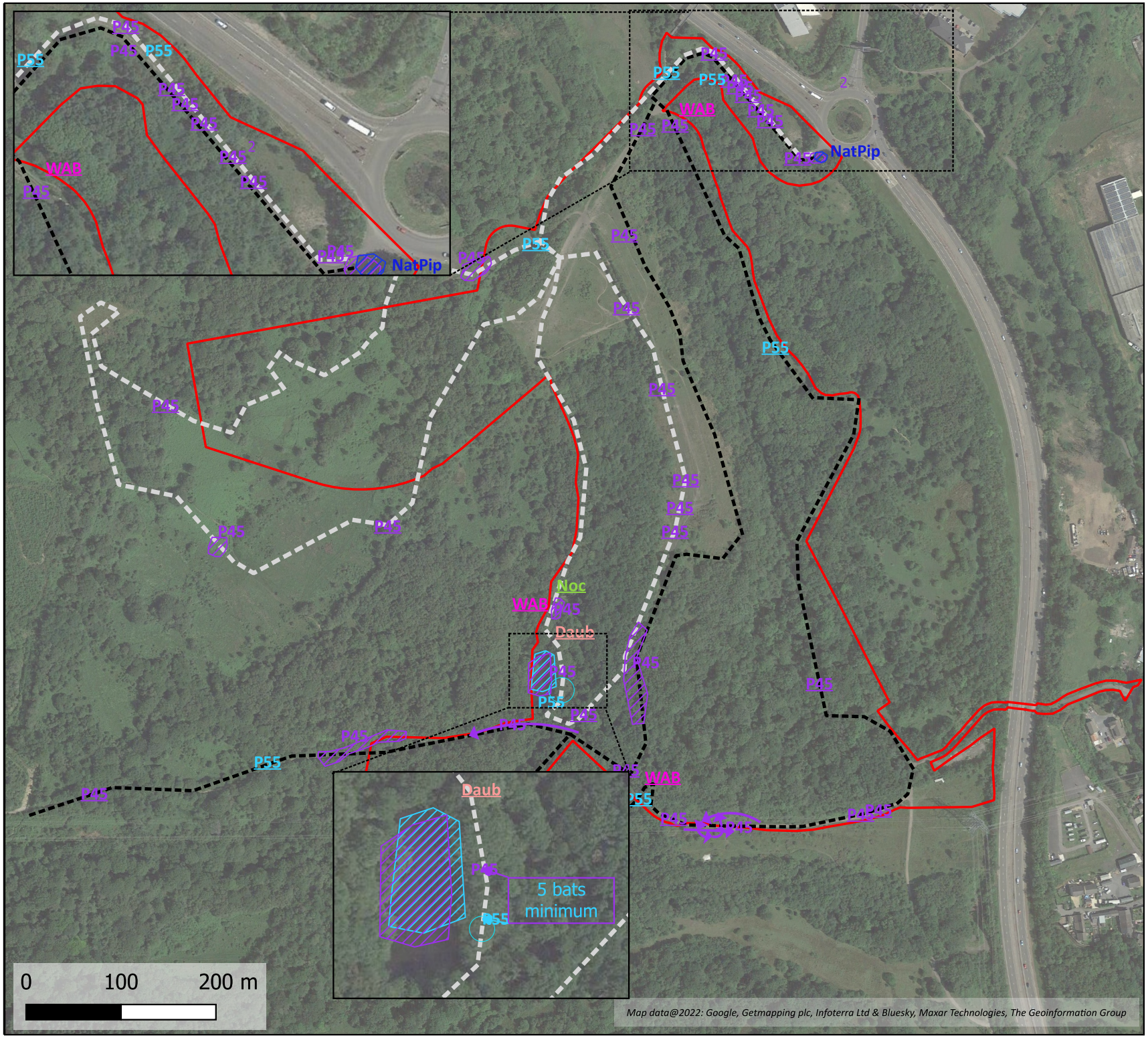

Key

- Application site
- North transect (T1)
- South transect (T2)
- P45 Bat pass
- P45 Social calling
- Direction of commuting bat
- Foraging activity
- Bat^2 Number of bats
- P45 Common pipistrelle
- P55 Soprano pipistrelle
- Myo *Myotis sp*
- Daub Daubenton's bat
- WAB Whiskered/Alcathoe/Brandt's bat
- Noc Common noctule
- NatPip Nathusius' pipistrelle

Title
Bat activity transect results 15.06.2021

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 6e	-	E1835

Drawn	Checked	Date
CD	DW	November 2023

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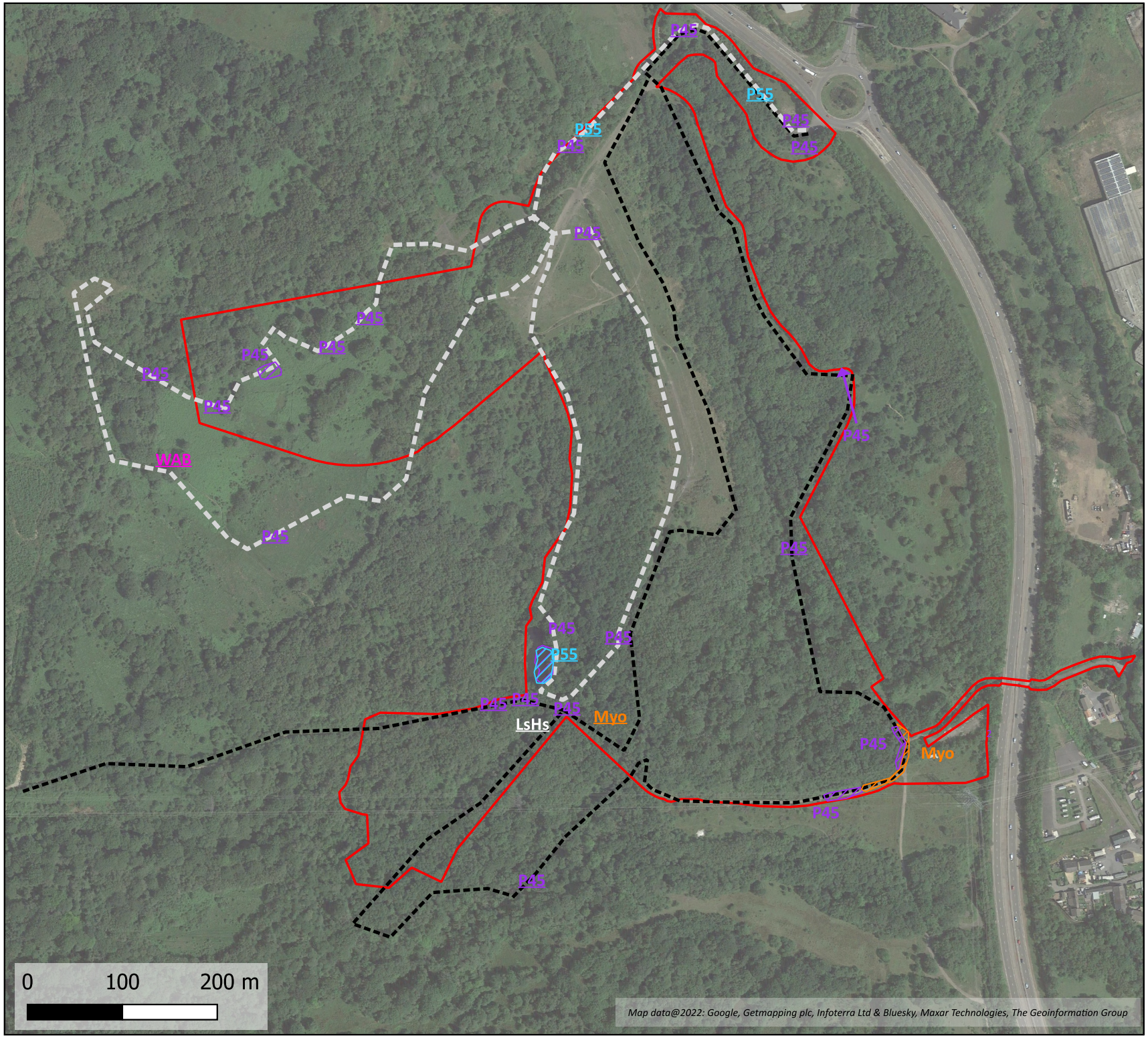
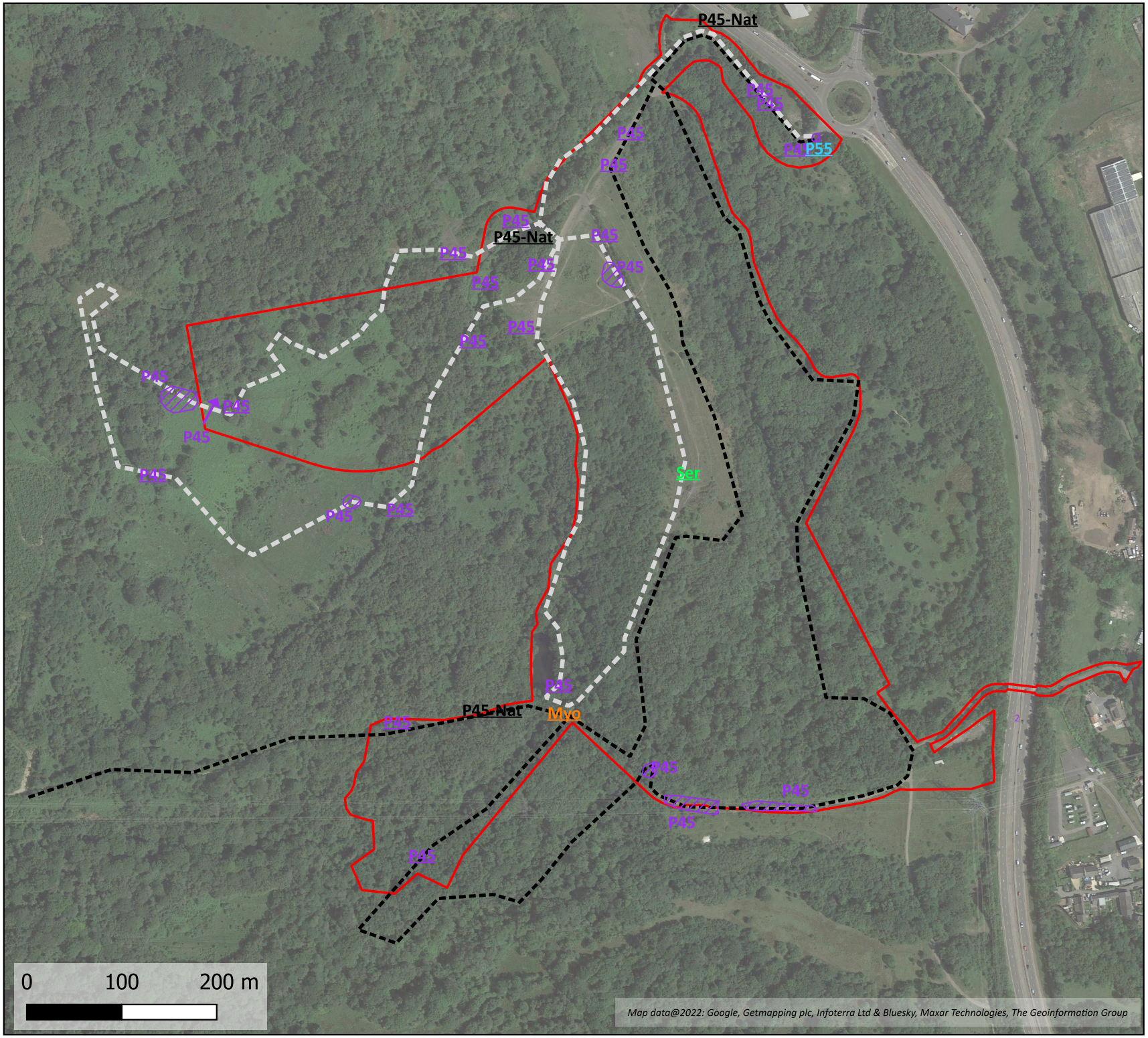

P45
P55
P45
P45
P45



Key

- Application site
- North transect (T1)
- South transect (T2)
- P45 Bat pass
- Direction of commuting bat
- Foraging activity

P45	Common pipistrelle
P55	Soprano pipistrelle
Myo	*Myotis sp*
P45-Nat	Common/Nathusius' pipistrelle
Ser	Serotine

Title
Bat activity transect results 12.07.2021

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 6g	-	E1835

Drawn	Checked	Date
CD	DW	November 2023

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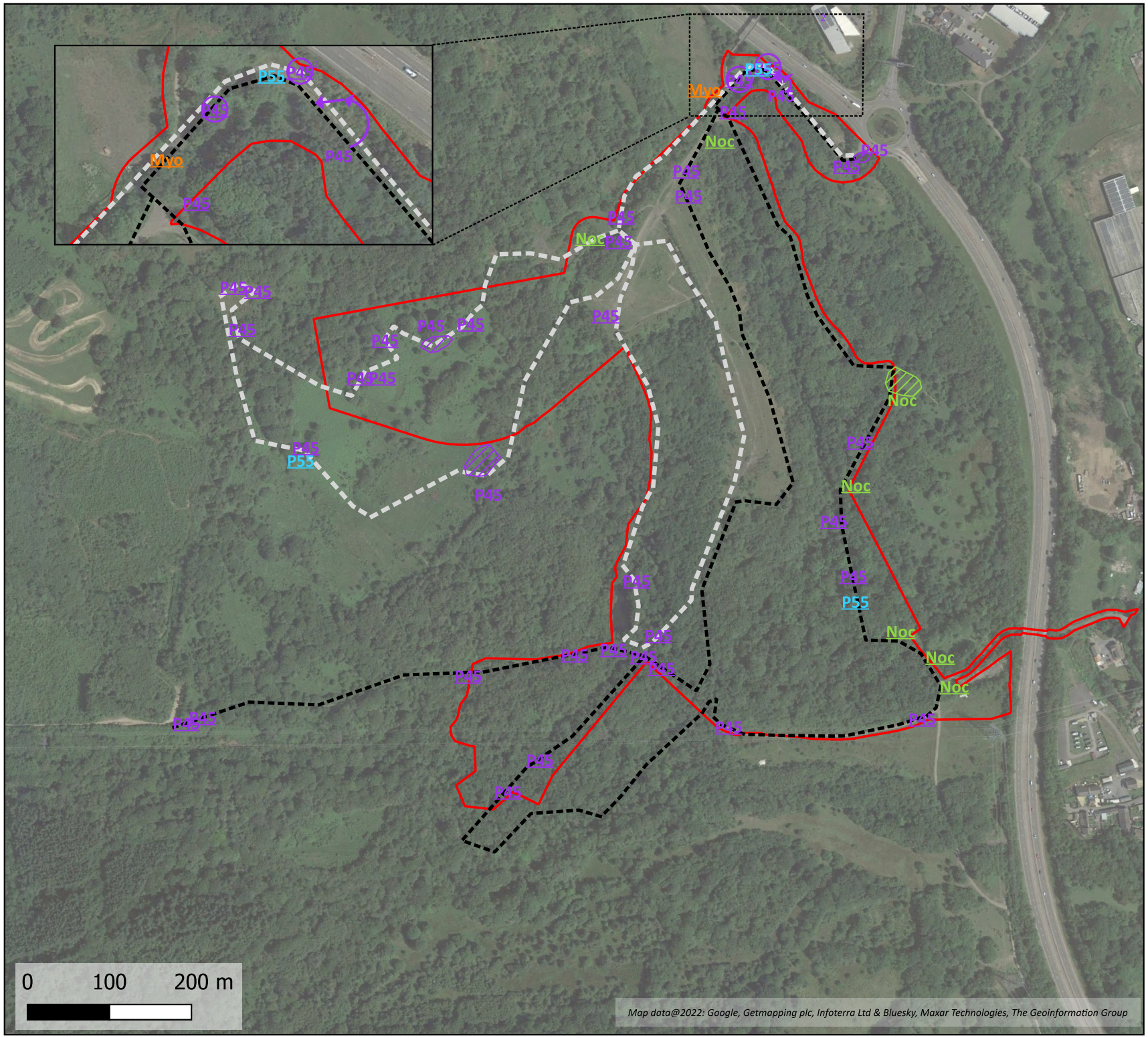

Key

- Application site
- North transect (T1)
- South transect (T2)
- P45 Bat pass
- (P45) Social calling
- Direction of commuting bat
- Foraging activity
- Bat^2 Number of bats
- P45 Common pipistrelle
- P55 Soprano pipistrelle
- Myo *Myotis sp*
- Noc Common noctule

Title		
Bat activity transect results 26.07.2021		
Project		**Client**
Cwm Glo		Marvel Ltd
Drawing No.	**Revision**	**Project No.**
Figure 6h	-	E1835
Drawn	**Checked**	**Date**
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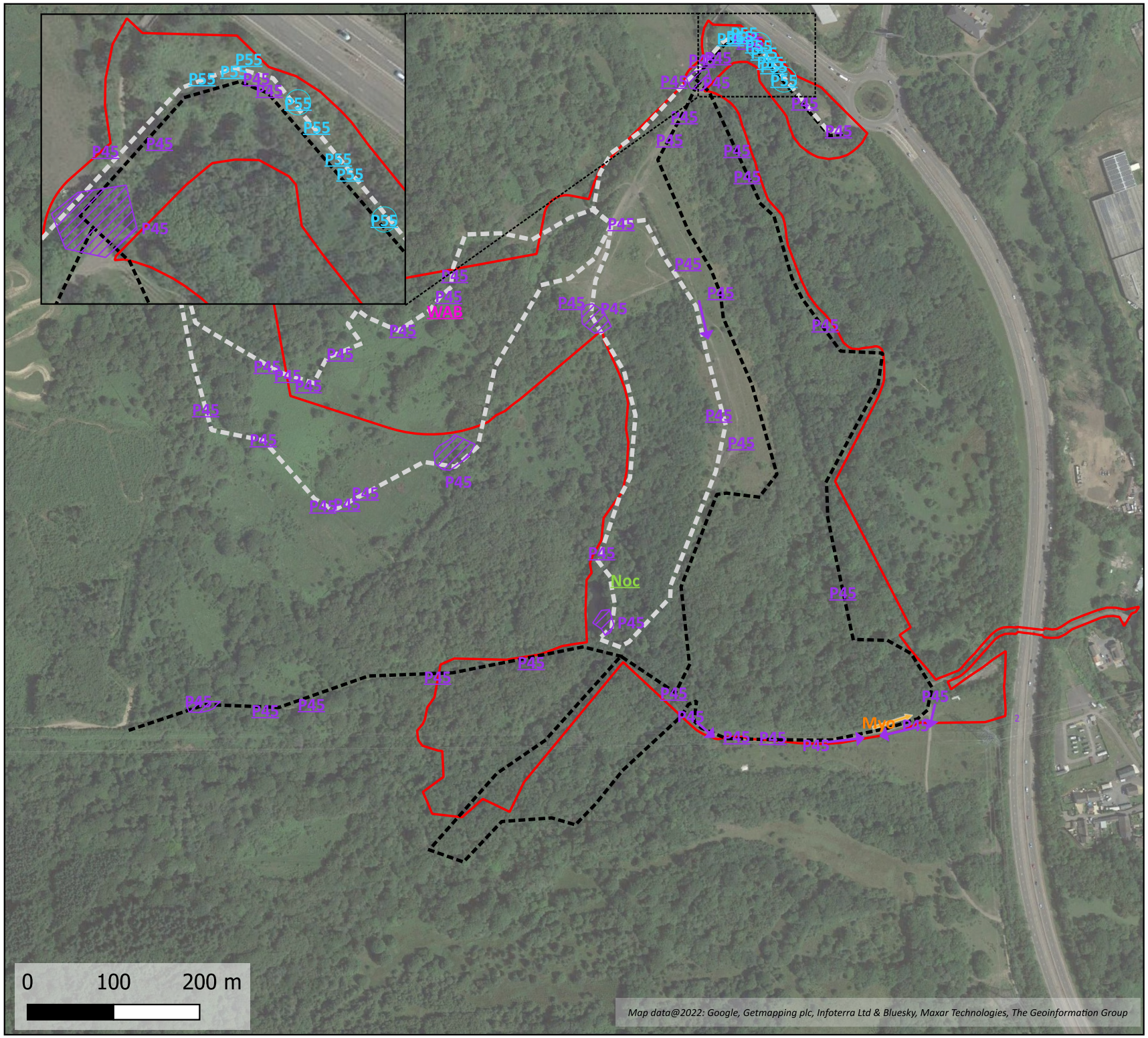

Key

- Application site
- North transect (T1)
- South transect (T2)
- P45 Bat pass
- (P45) Social calling
- Direction of commuting bat
- Foraging activity

P45 Common pipistrelle
P55 Soprano pipistrelle
Myo *Myotis sp*
Noc Common noctule
WAB Whiskered/Alcathoe/Brandt's

Title
Bat activity transect results 12.08.2021

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 6i	-	E1835

Drawn	Checked	Date
CD	DW	November 2023

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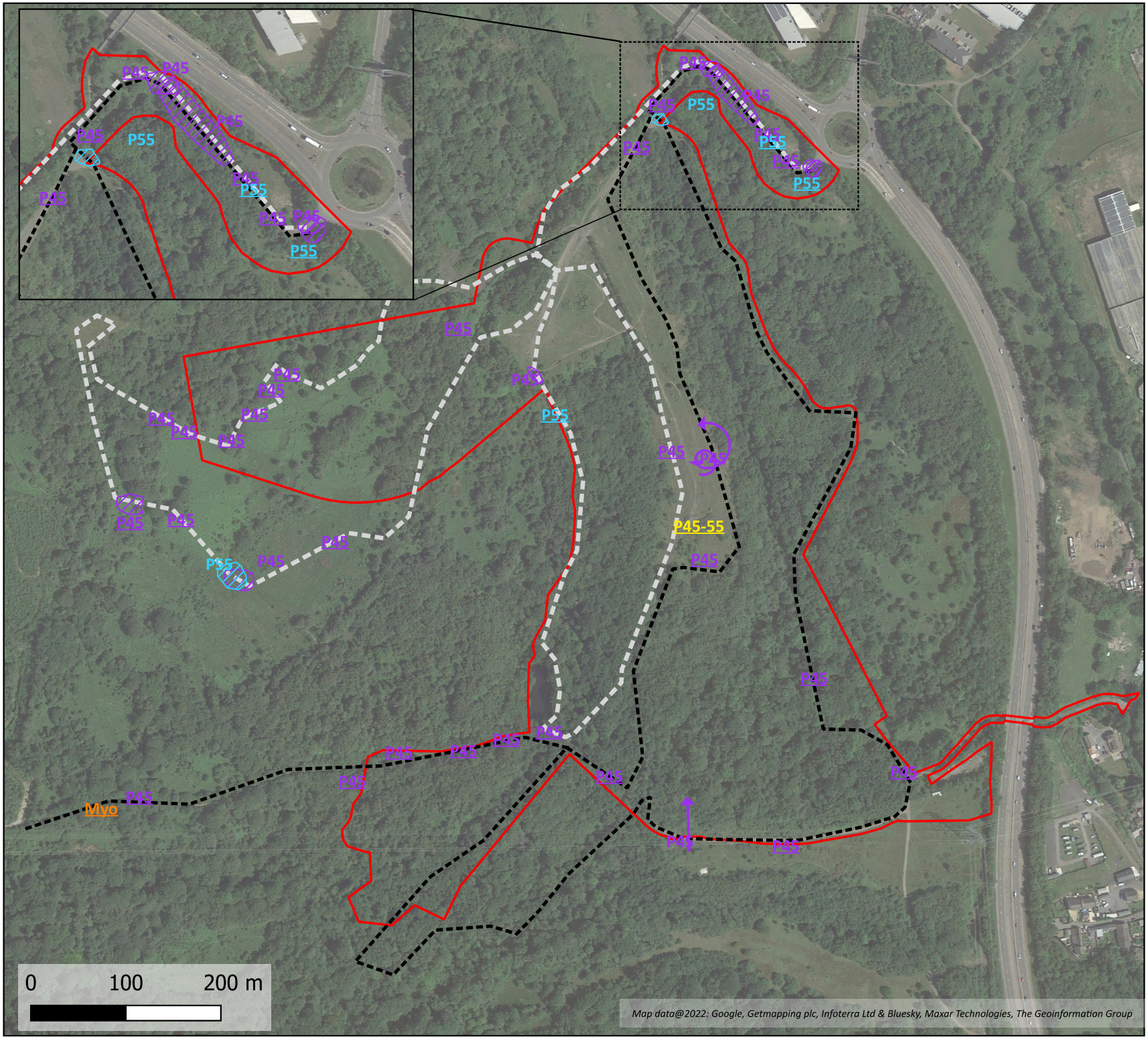

Key

- Application site
- North transect (T1)
- South transect (T2)
- P45 Bat pass
- Direction of commuting bat
- Foraging activity
- P45 Common pipistrelle
- P55 Soprano pipistrelle
- Myo *Myotis sp*
- P45-55 Common/soprano pipistrelle

Title		
Bat activity transect results 25.08.2021		
Project		Client
Cwm Glo		Marvel Ltd
Drawing No.	Revision	Project No.
Figure 6j	-	E1835
Drawn	Checked	Date
CD	DW	November 2023

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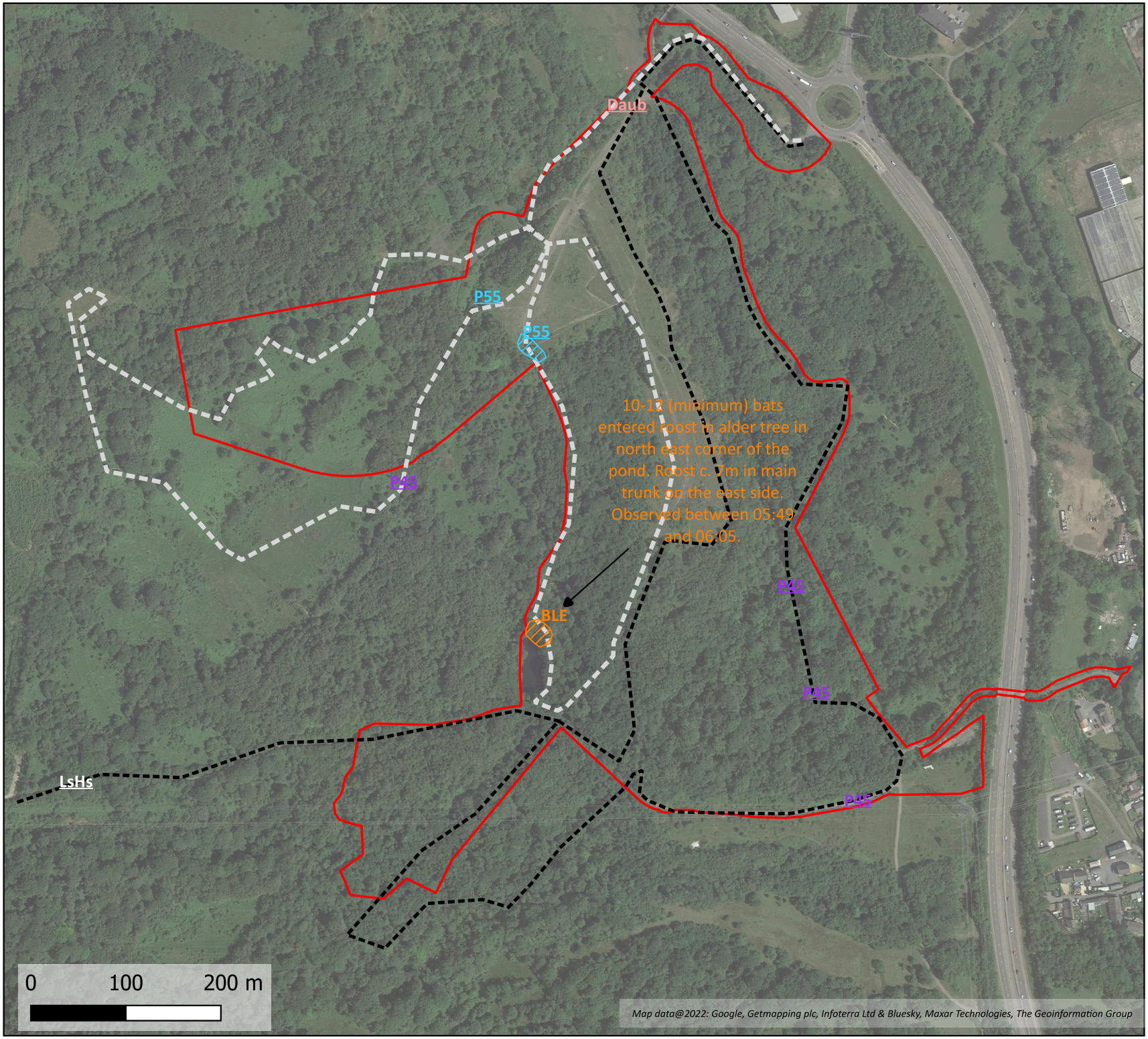

Key

- Application site
- North transect (T1)
- South transect (T2)
- P45 Bat pass
- Foraging activity

P45	Common pipistrelle
P55	Soprano pipistrelle
BLE	Brown long-eared bat
Daub	Daubenton's bat
LsHs	Lesser horseshoe bat

Title
Bat activity transect results 26.08.2021 (dawn)

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 6k	-	E1835

Drawn	Checked	Date
CD	DW	November 2023

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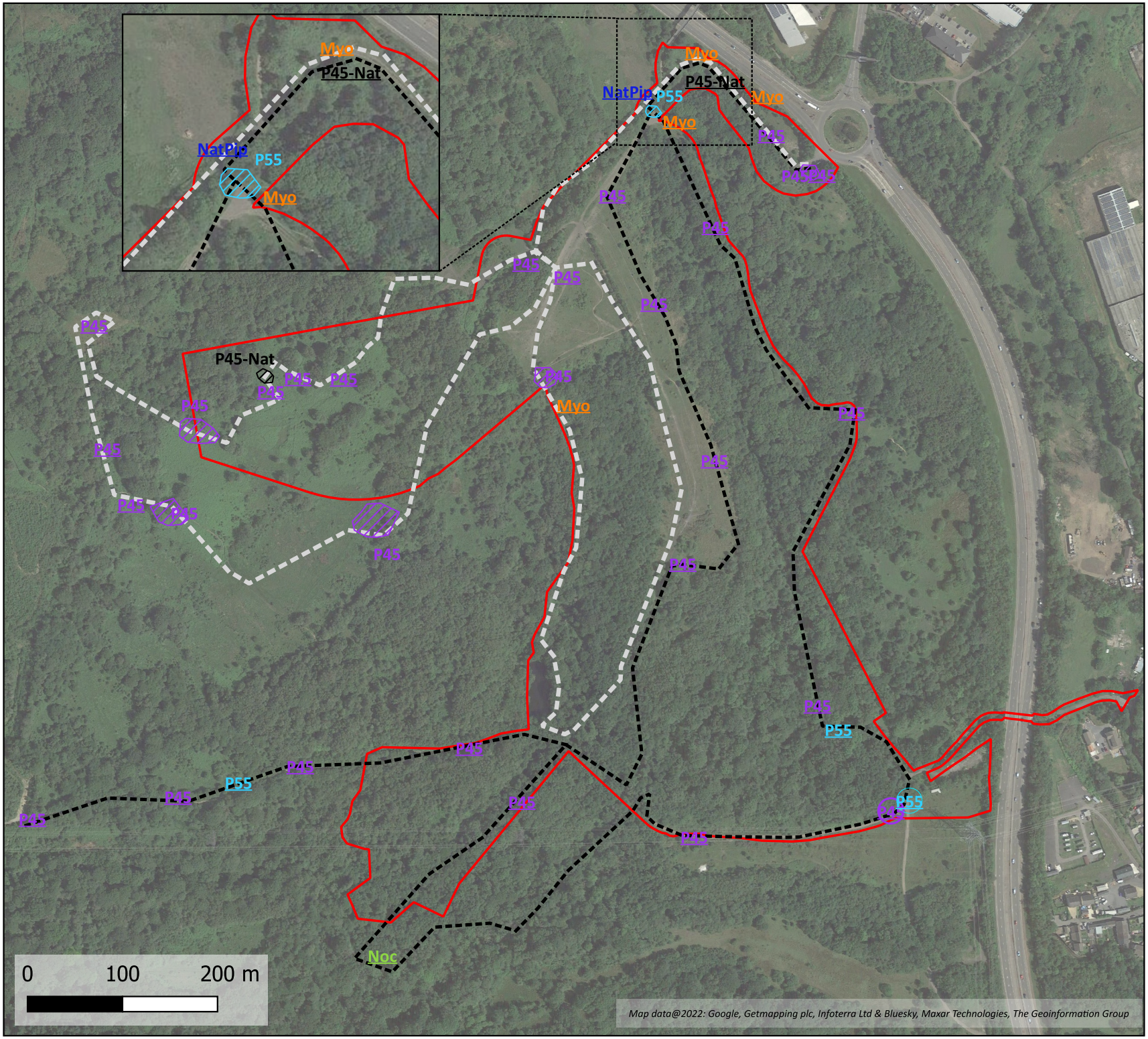
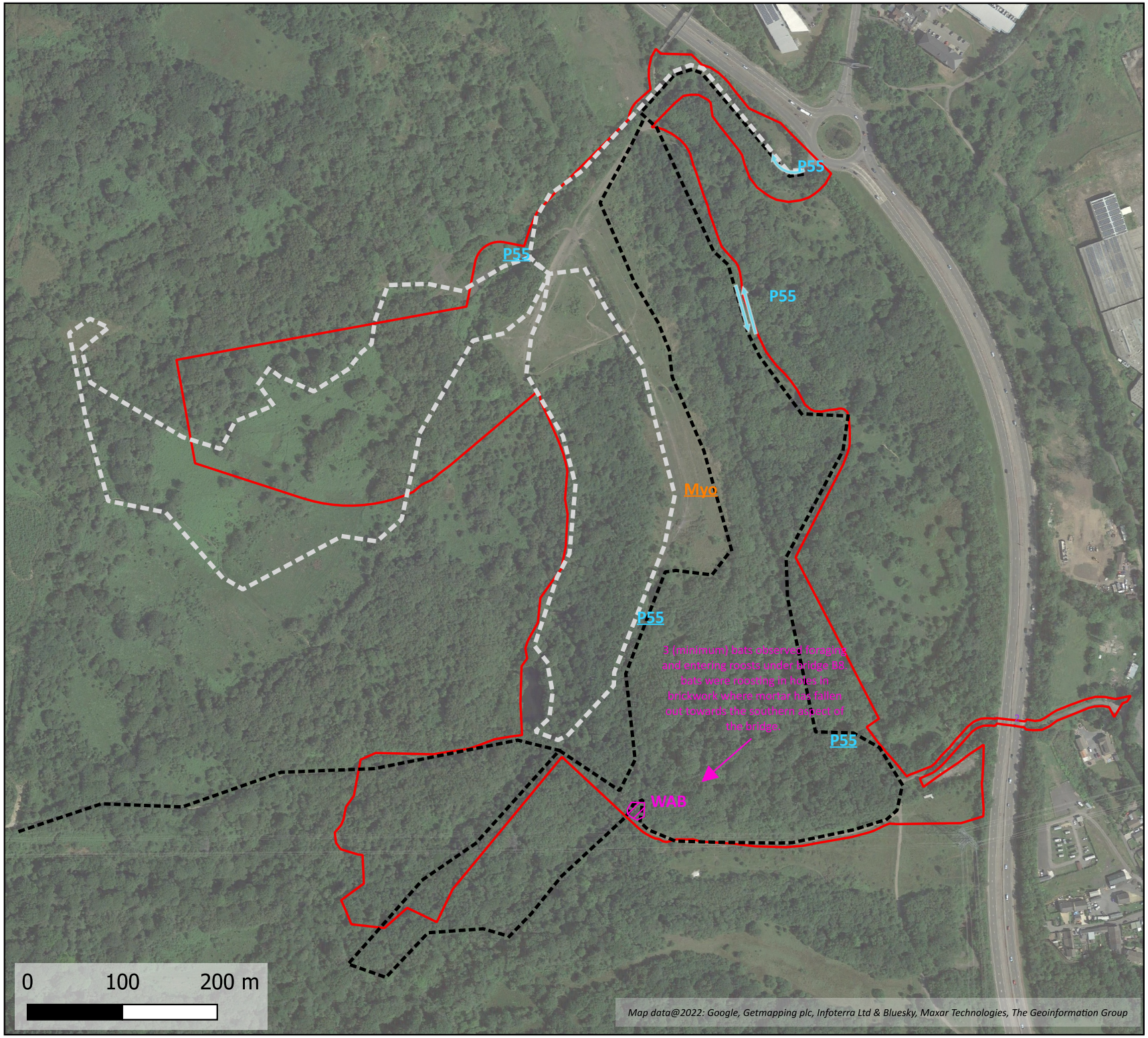

Myo
P45-Nat
NatPip
P55
Myo
P45-Nat
NatPip
P55
Myo
Myo
P45
P45
P45



Key

- Application site
- North transect (T1)
- South transect (T2)
- P45 Bat pass
- Direction of commuting bat
- Bat^2 Number of bats
- P55 Soprano pipistrelle
- Myo *Myotis sp*
- WAB Whiskered/Alcathoe/Brandt's bat

Title		
Bat activity transect results 27.09.2021		
Project		Client
Cwm Glo		Marvel Ltd
Drawing No.	Revision	Project No.
Figure 6m	-	E1835
Drawn	Checked	Date
CD	DW	November 2023

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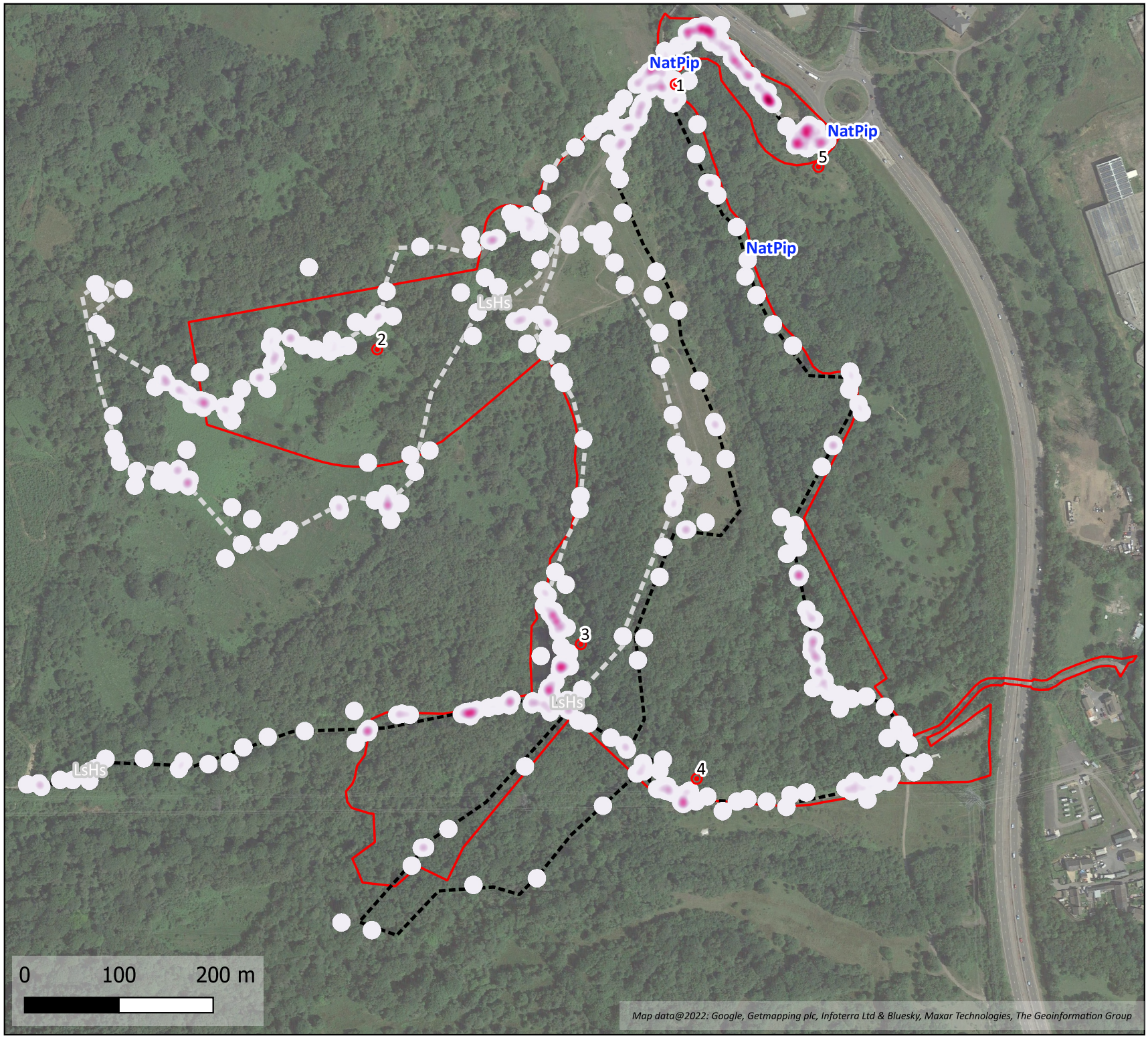
Figure 7

2021 collated bat transect survey results



Key

- Application site
- North transect (T1)
- South transect (T2)

Relative bat activity

- Low
- High

Target note

LsHs Lesser horseshoe bat detected during transects conducted in May, June and August 2021

NatPip Nathusius' pipistrelle detected during transects conducted in April, June and September 2021

The heatmap was generated from collated point data from the 2021 transect surveys, whereby one point equated to one bat observed/heard. The areas of higher activity shown on the map indicate locations where multiple bats were observed/heard and/or bats were observed/heard on repeated visits. Note the assignment of activity as low-high here is relative to the site and 2021 data and is for qualitative purposes only.

Title		
2021 collated bat activity results and notable bat species		
Project		Client
Cwm Glo		Marvel Ltd
Drawing No.	Revision	Project No.
Figure 7	-	E1835
Drawn	Checked	Date
CD	DW	November 2023

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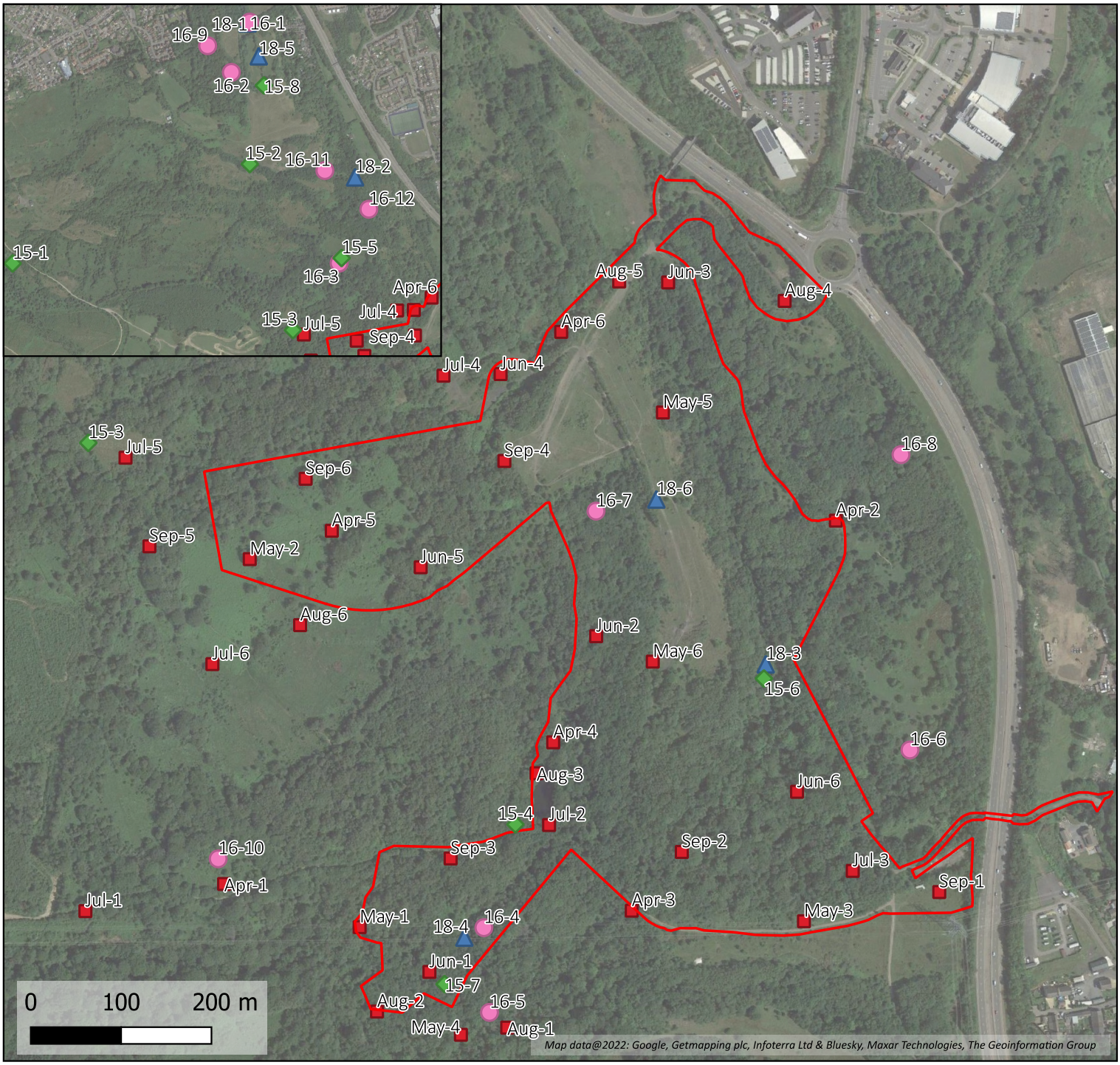
Figure 8

Automated detector locations – 2015 to 2021



Key

- Application site
- 2021 static detector location
- 2018 static detector location
- 2016 static detector location
- 2015 static detector location

Title		
Automated detector locations 2015-2021		
Project		Client
Cwm Glo		Marvel Ltd
Drawing No.	Revision	Project No.
Figure 8	-	E1835
Drawn	Checked	Date
CD	DW	November 2023

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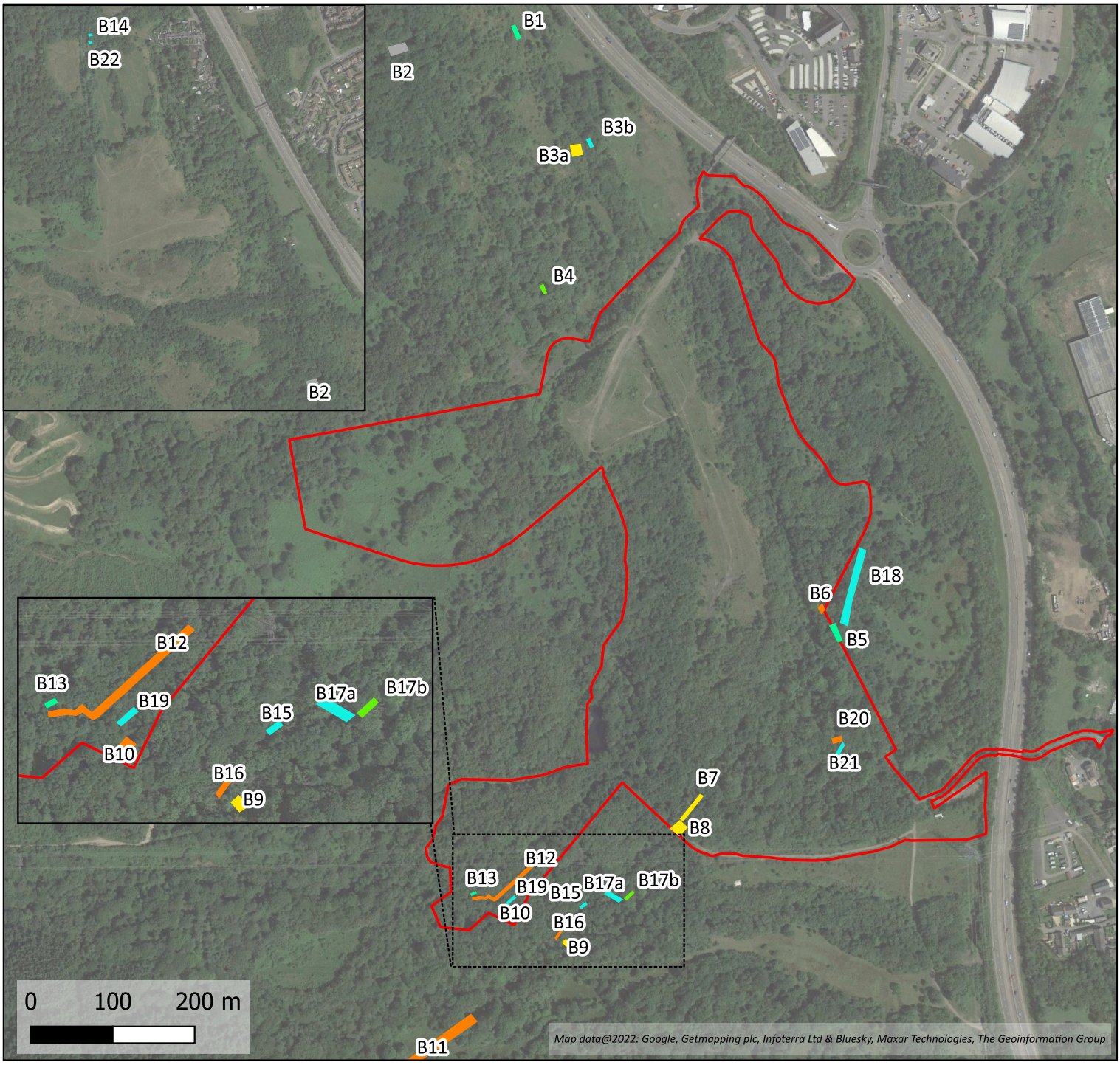
Figure 9

Buildings and structures surveyed for bats – 2015 to 2021



Key

Application site

Roosting potential

- High
- Moderate-high
- Moderate
- Low-moderate
- Low
- Low-negligible

Title
Buildings and structures surveyed for bats 2015 - 2021

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 9	-	E1835

Drawn	Checked	Date
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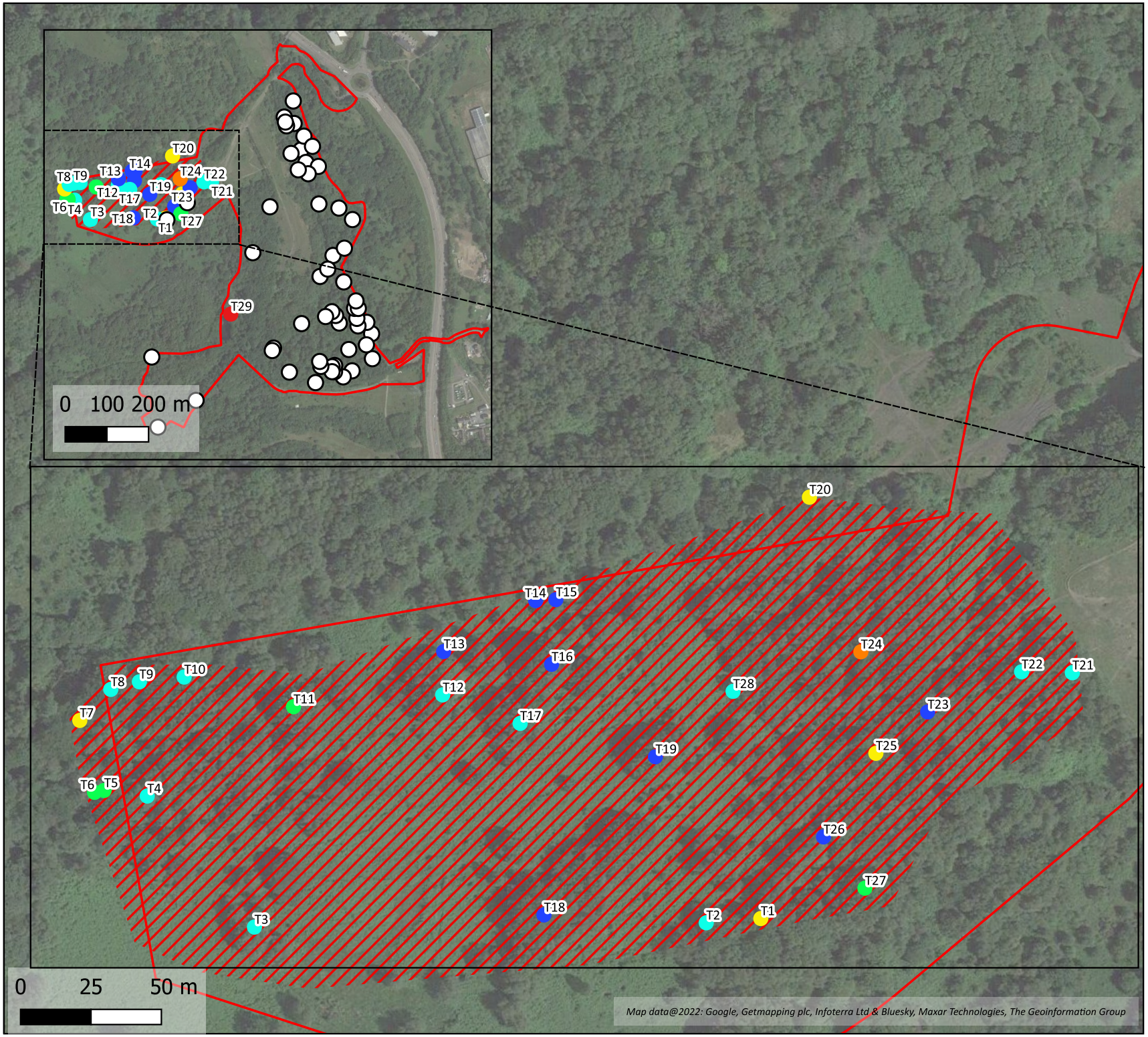
Figure 10

Preliminary tree roost assessment survey results –2021



Key

- Application site
- Approximate search/survey area

Roosting potential

- Confirmed roost
- High
- Moderate-high
- Moderate
- Low-moderate
- Low

Title		
Preliminary tree roost assesment survey results		
Project		Client
Cwm Glo		Marvel ltd
Drawing No.	Revision	Project No.
Figure 10	-	E1835
Drawn	Checked	Date
CD	DW	November 2023

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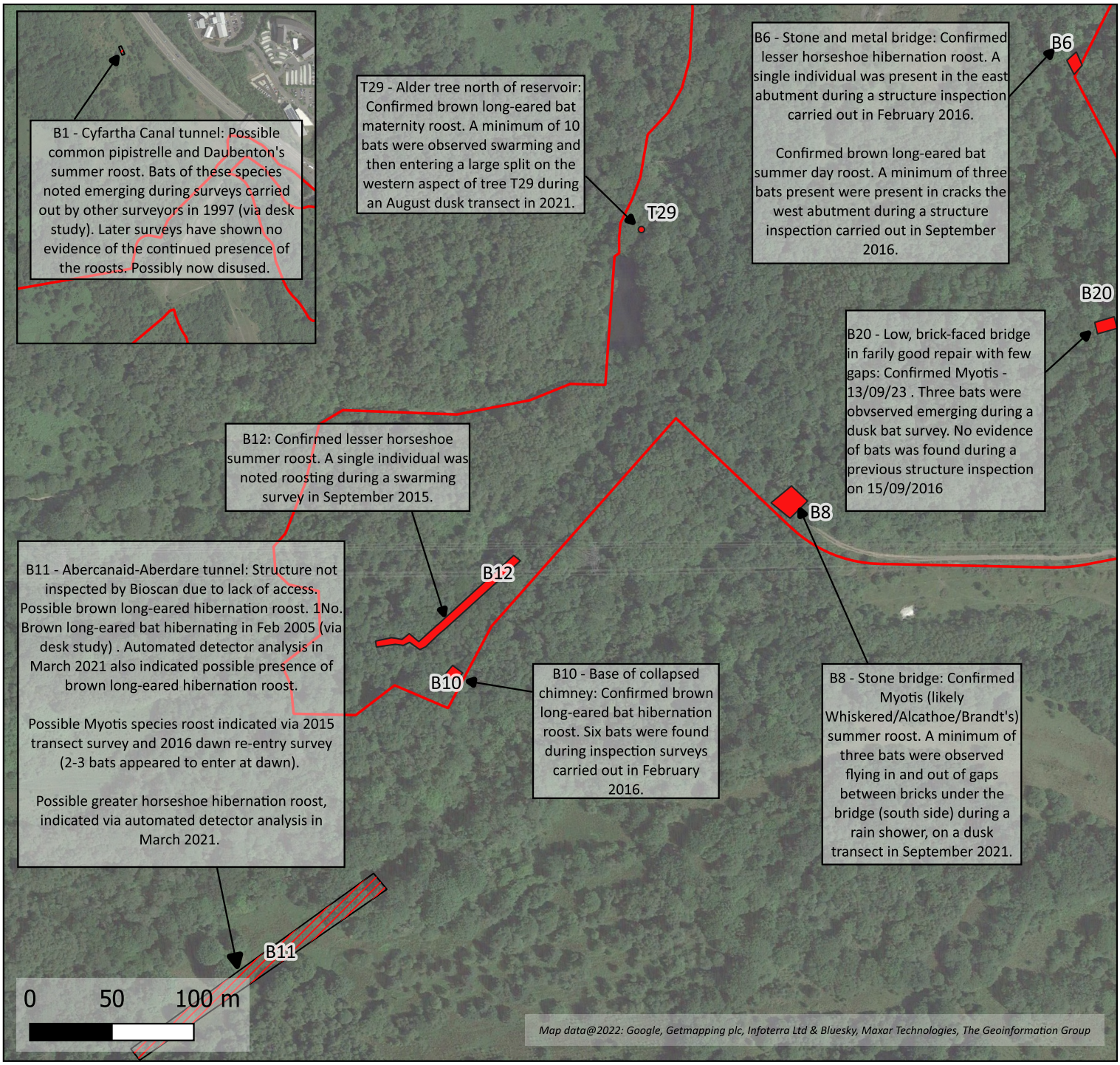
Figure 11

Confirmed/suspected bat roosts within or near site



Key

- Application site
- Structure/tree with confirmed roost
- Structure with suspected/potential roost

Title
Confirmed/suspected roosts within or near the application site

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 11	-	E1835

Drawn	Checked	Date
CD	DW	November 2023

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Appendices

Appendix 1:

Results of inspection surveys and summary of confirmed/probable roosts (including hibernation use).

Refer to Figure 9 for locations.

Note text shaded in grey indicates structures that are outside the current application site.

Building/Structure Reference Nº & Photographs	Building description	Potential bat hibernation/ roosting features & evidence of bats	Results of activity surveys
B1- Cyfarthfa Canal tunnel entrance (Scheduled Monument: GM467 - Cyfarthfa Canal Level)	Tunnel very damp, with water dripping through the tunnel ceiling, although some of the lower parts of the walls are drier. Some cracks on roof (mostly too damp) and in walls (some drier) of tunnel entrance. Cobweb over tunnel entrance on 15th September 2016 suggesting no recent bat passage. Some parts of protection grille had been cut through (likely to be due to past vandalism). **Reported to be a bat roost in 1997 on the basis of pipistrelle and Daubenton's bats seen emerging.**	Moderate bat hibernation/roost potential. Unable to inspect internally beyond the grille. Structure inspection (23-24th February 2016): No evidence of bats found. Structure inspection (15th September 2016): No evidence of bats found. Structure inspection (12th March 2021): No evidence of bats found.	Autumn swarming survey (24th September 2015): No evidence of swarming; however, species recorded flying over (in descending order of call frequency): - Common pipistrelle - Soprano pipistrelle - *Myotis* sp. - Long-eared bat - Nathusius' pipistrelle - Natterer's bat Static detector survey (September 2016): Results from static detector deployed for 8 nights near to this structure (in descending order of call frequency): - Common pipistrelle - *Myotis* sp. - Soprano pipistrelle - Pipistrelle sp. - Noctule Static detector survey (March 2021): Results from static detector deployed for 18 nights at entrance portal: - Common pipistrelle (92% of calls) - Soprano pipistrelle (7%) - Myotis sp. (1%) Bat activity recorded on every night except one between 15th and 25th March. Earliest bat call over the ten nights was 39 mins after sunset, with an average first call of the night at just over an hour after sunset. Only one bat call recorded occurring after 21:05 (at 06:23).

Building/Structure Reference Nº & Photographs	Building description	Potential bat hibernation/ roosting features & evidence of bats	Results of activity surveys
			The above results do not conclusively indicate the use of the structure for hibernation by bats, as the times of bat passes recorded do not indicate particularly 'early emerging' bats. Which might suggest the presence of a roost.
B2- Concrete wall Structure Reference: "Industrial 429"	A well-sealed solid concrete structure; the only two crevices arising where metal additions had previously been affixed to the outer wall, but on inspection these crevices were only superficial. No internal access present. To the rear the structure was half collapsed but back-filled with earth. Some partially-open cavities have arisen where concrete slabs have fallen in on each other (lower photo). Sparse ivy growth on northern part.	Very low/negligible bat hibernation potential. The collapsed slabs (lower photo) has some limited potential as a minor day/night roost. <u>Structure inspection</u> (23-24th February 2016): No evidence of bats found. <u>Structure inspection</u> (15th September 2016): No evidence of bats found. <u>Structure inspection</u> (12th March 2021): No evidence of bats found.	Not surveyed due to very low roosting potential
B3a- Square stone structure	Walls comprise stones and crumbling mortar. External survey only. The structure contains holes and cracks of varying sizes. Bramble and blackthorn grow against the structure, with mounded earth and more vegetation (scrub) growing on top and leading to damp upper sections from vertical seepage. There is collapsed rubble inside.	Moderate to high bat hibernation/ roost potential. Five to ten cavities in stonework capable of supporting roosting bats on each side of structure. East-facing wall is shaded but has 3-4 deep cavities. Scrub on eastern side is encroaching and increasingly rendering cavities	<u>Dusk emergence survey</u> (23rd August 2016): No bats observed emerging during dusk survey. <u>Dawn re-entry survey</u> (16th September 2016): No bats observed re-entering structure during dawn survey.

Building/Structure Reference Nº & Photographs	Building description	Potential bat hibernation/ roosting features & evidence of bats	Results of activity surveys
		inaccessible to bats. Structure inspection (23-24th February 2016): No evidence of bats found. Structure inspection (15th September 2016): No evidence of bats found. Structure inspection (12th March 2021): No evidence of bats found.	
B3b- Retaining wall 	A better-preserved structure, and therefore has fewer opportunities for roosting bats, with the west wall fairly well-mortared and increasingly rendered inaccessible to bats by dense scrub and ivy growth. It is also heavily shaded on both sides, and damp from vertical seepage. There is more vegetation growing on and against this structure than the adjacent B3a. The ground around B3b is littered with tins/bottles suggesting a highly disturbed location.	Low bat hibernation/roost potential. Holes too damp, shaded, obstructed or with rodent access to be suitable as roost sites. Structure inspection (23-24th February 2016): No evidence of bats found. Structure inspection (15th September 2016): No evidence of bats found. Structure inspection (12th March 2021): No evidence of bats found.	Not directly surveyed and no emergence/re-entry noted during survey of adjacent structure (B3a).
B4- Stone structure	Stone structure with occasional horizontal metal sheets between stones, and few external cavities due to intact mortar. The structure is largely covered in vegetation/ bramble and is banked up with earth to	Moderate bat hibernation/roost potential. Structure inspection (23-24th February 2016): No	Not surveyed

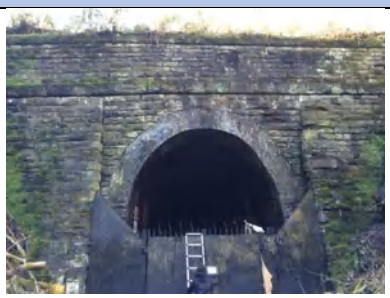
Building/Structure Reference Nº & Photographs	Building description	Potential bat hibernation/ roosting features & evidence of bats	Results of activity surveys
 	the rear. The two low-level alcoves have square holes in the ceiling (see lower photo) leading to cavities, one of which extends upward for 1-2m, but were found to be very wet. One of the square holes in February 2016 was noted to be clear of cobwebs although in September 2016 each square hole was covered by cobwebs. Two upper alcoves with a few crevices potentially suitable for bats.	evidence of bats found. Structure inspection (15th September 2016): No evidence of bats found. Structure inspection (12th March 2021): No evidence of bats found.	
B5- Paired stone retaining walls Structure Reference: "Industrial 415"	Eastern side: fairly well sealed with a few larger cracks in upper section; cracks generally superficial in nature. Western side: partly missing/broken-facing with shallow crevices, but these mostly damp from seepage and/or exposed to illumination and rodent access, etc.	Revised after September 2016 visit to low-moderate bat hibernation/ roost potential. Structure inspection (23-24th February 2016): No evidence of bats found. Structure inspection (15th September 2016): No evidence of bats found. Structure inspection (12th March 2021): No evidence of bats found.	Not surveyed
B6- Stone bridge abutments with metal deck	Occasional large/deep putlog-type holes between abutment stones. Many	High potential for hibernation/	Static detector survey (March 2021):

Building/Structure Reference Nº & Photographs	Building description	Potential bat hibernation/ roosting features & evidence of bats	Results of activity surveys
	are wet and oozing with water, but some are dry and several appear quite clear.	roosting bats. Confirmed roosts. Structure inspection (23-24th February 2016): **One lesser horseshoe bat present in east abutment. Hibernation roost.** Structure inspection (15th September 2016): **Three brown long-eared bats present, in west abutment. Summer roost.** Structure inspection (12th March 2021): No evidence of bats found.	Results from static detector deployed for 14 nights under the deck of this structure revealed 47 bat registrations, all of which were considered to be Natterer's bat. These registrations occurred over five nights with the calls occurring between 88 minutes after sunset, and 80 minutes prior to sunrise. The above results do not conclusively indicate the use of the structure for hibernation by bats, as the times of bat passes recorded do not indicate particularly 'early emerging'[1] bats. Which might suggest the presence of a roost.
B7- Retaining wall 	Stone-built wall, with a number of deep putlog-type holes suitable for roosting bats, albeit some cavities very wet inside with occasional stalactite-type features, indicating frequently dripping-wet conditions.	Moderate/high bat hibernation/ roosting potential. Structure inspection (23-24th February 2016): No evidence of bats found. Structure inspection (15th September 2016): No evidence of bats found. Structure inspection (12th March 2021): No evidence of bats found.	Not surveyed
B8- Stone bridge	A few holes suitable for bats (especially in ceiling near portal apexes) with some wetter than others. Some of these appeared as though they could turn the corner. Most apparent	Moderate/high bat hibernation/roost potential. Confirmed roost. Structure inspection (23-24th	Not surveyed

[1] With reference to pg. 100 in Russ (2012) Natterer's bat tends to emerge between 30 and 60 minutes after sunset.

Building/Structure Reference Nº & Photographs	Building description	Potential bat hibernation/ roosting features & evidence of bats	Results of activity surveys
   The above image shows the location of one crevice roost with a bat inside, noted on 27/09/21.	cavities in retaining abutments are only c.2.5cms deep before hitting mortar. Some holes in the outer section of the bridge were beyond the reach of a ladder and thus inaccessible for survey, (but appeared to be suitable for roosting bats). Overall, structure in fairly good repair.	February 2016): No evidence of bats found. <u>Structure inspection</u> (15th September 2016): No evidence of bats found. <u>Structure inspection</u> (12th March 2021): No evidence of bats found. <u>Dusk transect survey</u> (27th September 2021): *Myotis* sp. bats (min. 3) seen roosting in crevices (see photo) during a rain shower. The structure doesn't offer enough opportunities for larger roosts such as maternity. Confirmed summer roost.	
B9- Stone bridge with metal deck Structure Reference: "Bridge 418"	Approximately 10-12 regularly spaced putlog-type holes extending c.0.5m into stonework. Seepage makes many of these too moist however. Mortar still intact in most other gaps. Some putlog-type holes contained evidence that they had supported bird's nests. It was not possible to check between the metal deck and the stone walls due to the height being beyond the reach of a ladder. Ivy and moss growing on bridge suggesting damp walls. Relatively limited opportunities for bat roosting.	Moderate bat hibernation/roost potential. <u>Structure inspection</u> (23-24th February 2016): No evidence of bats found. <u>Structure inspection</u> (15th September 2016): No evidence of bats found. <u>Structure inspection</u> (12th March 2021): No evidence of bats found.	Not surveyed

Building/Structure Reference Nº & Photographs	Building description	Potential bat hibernation/ roosting features & evidence of bats	Results of activity surveys
B10- Base of now collapsed chimney (Listed Building: 81752 - Base of Chimney at Cwm Pit) Structure Reference: "Industrial 64/419"	Stone building with earth and vegetation collected on top. One arched alcove on each side with collapsed rubble inside. It was possible to only safely check one alcove. A large number of holes and crevices present on walls and the alcoves.	High potential for hibernation/ roosting bats. Confirmed roost. Structure inspection (23-24th February 2016): **Six brown long eared bats** present in three different clusters, all in vertical cracks shoulder-high, south-west facing. The bats were all found to be relatively close to the entrance of the cracks. Hibernation roost. Structure inspection (15th September 2016): No evidence of bats found, but many cavities notable for 'clean' appearance. Structure inspection (12th March 2021): No evidence of bats found.	Not surveyed
B11- Abercanaid-Aberdare Tunnel 	Tunnel portal with stone facing with few gaps on tunnel entrance, some of which used by nesting birds (e.g., blue tit). Not able to safely check all opportunities in portal walls due to high elevation of structure. Internal access not possible; however, the tunnel appeared to consist of brick lining with occasional gaps and larger alcoves also present. Tunnel known to extend for c.1.4 miles and therefore doubtless offers numerous bat roosting opportunities	High bat hibernation/roost potential. Not surveyed to date due to lack of access but one record of one brown long-eared bat noted hibernating in February 2005 from SEWBReC.	Dusk emergence/ Dawn re-entry survey (26th May 2015): Light sampling/swarming activity by 5-6 *Myotis* sp. noted at tunnel entrance during dusk survey indicative of possible maternity roost. Autumn swarming survey (15th September 2015 and 30th September 2015): No evidence of autumn swarming; however, species recorded flying over (in descending order of call frequency):

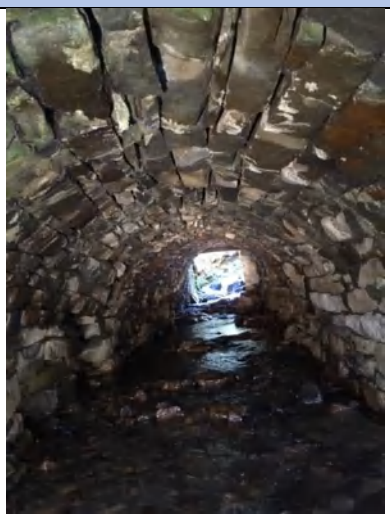
Building/Structure Reference Nº & Photographs	Building description	Potential bat hibernation/ roosting features & evidence of bats	Results of activity surveys
 Structure Reference GM 606	at various locations along that length.		- Common pipistrelle - *Myotis* sp. - Soprano pipistrelle - Long-eared bat sp. <u>Autumn re-entry survey</u> (16th September 2016): Approximately 2-3 *Myotis* bats appearing to enter tunnel at dawn. One soprano pipistrelle constantly flying in front of tunnel entrance but did not appear to enter. <u>Static detector survey</u> (March 2021): Results from static detector deployed for 17 nights on the gate facing into the tunnel recorded 255 bat calls. The following species (and percentage of the calls) were recorded: - Long-eared bat (likely to be brown long-eared bat) (44% of calls) - Common pipistrelle (39%) - Myotis sp. (4%) - Greater horseshoe bat (2.7%) - Lesser horseshoe bat (2.3%) - Natterer's bat (0.8%). Comparison of the time of recorded registrations with sunset/sunrise times indicates the possible presence of brown long-eared hibernation roost (recorded as early as 18-27[2] minutes after sunset on 4 days), and a greater horseshoe hibernation roost (recorded as late as 15-

2

Building/Structure Reference Nº & Photographs	Building description	Potential bat hibernation/ roosting features & evidence of bats	Results of activity surveys
			24 minutes before sunrise on 2 days) in this structure.
B12- Long stone retaining wall 	Feature located beside a stream. Occasional cracks present. Regular brick-sized deep alcoves present. Some upper sections not comprehensively surveyed due to reduced ladder accessibility because of presence of stream. Includes several tunnels: including two long, two short and one larger/longer. One tunnel with chimney-type recess in ceiling.	High bat hibernation/roost potential. Confirmed roost. Swarming survey (15th September 2015): Single roosting **lesser horseshoe bat** in recess in roof of larger/longer tunnel, so a confirmed summer roosting site. Structure inspection (23-24th February 2016): No evidence of bats found. Structure inspection (15th September 2016): No evidence of bats found. Structure inspection (12th March 2021): No evidence of bats found.	Autumn swarming survey (15th September 2015 and 30th September 2015): No evidence of swarming; however, species recorded flying over (in descending order of call frequency): - *Myotis* sp. - Soprano pipistrelle - Long-eared bat sp. - Common pipistrelle - Whiskered/Alcathoe /Brandt's bat - Lesser horseshoe bat - Daubenton's bat - Noctule - Greater horseshoe bat
B13- Stone wall opposite B12 above 	Feature contains a large deep alcove, which experiences seepage, but with a few deep crevices that were not too wet. The few holes present, partly due to collapse, are not particularly suitable for bats however, and the whole alcove shows evidence of human disturbance.	Low/moderate bat hibernation/roost potential. Structure inspection (23-24th February 2016): No evidence of bats found. Structure inspection (15th September 2016): No evidence of bats found. Structure inspection	Not specifically surveyed, but results from B12 above also relevant to this structure.

Building/Structure Reference Nº & Photographs	Building description	Potential bat hibernation/ roosting features & evidence of bats	Results of activity surveys
		(12th March 2021): No evidence of bats found.	
B14- Culvert carrying northern arm of Nant Cwm Pant Bach Structure Reference: "Industrial 537"	Not able to access internally due to presence of grille. Nevertheless, the interstices in the stone within the culvert were seen to be very damp and dripping with water for the first few metres (although the although the structure was not entered for a full examination).	Low bat hibernation/roost potential. Structure inspection (23-24th February 2016): No evidence of bats found. Structure inspection (15th September 2016): No evidence of bats found. Structure inspection (February 2020): No evidence of bats found. Not surveyed in 2021.	Static detector survey (30th September 2015): Species recorded (in descending order of call frequency)[3] - *Myotis* sp. - Long-eared bat sp. Dusk emergence survey (15th September 2016): No bats emerged.
B15- Low stone culvert 	Calcium carbonate covering inside, indicating exceptionally wet conditions, and with no gaps found. One gap at western end where stonework has failed at apex of arch.	Low bat hibernation/roost potential. Structure inspection (23-24th February 2016): No evidence of bats found. Structure inspection (15th September 2016): No evidence of bats found. Structure inspection (12th March 2021): No evidence of bats found.	Not surveyed
B16- Low stone culvert	Rough-faced stone interior with numerous cavities. Culvert acts as conduit for stream and is	High bat hibernation/roost potential.	Dusk emergence survey (15th September 2016): No bats observed emerging.

[3] Based on one night of automated detector recording

Building/Structure Reference Nº & Photographs	Building description	Potential bat hibernation/ roosting features & evidence of bats	Results of activity surveys
	consequently very wet in winter.	Structure inspection (23-24th February 2016): No evidence of bats found. Structure inspection (15th September 2016): No evidence of bats found. Lots of roof cavities appear very 'clean'. Structure inspection (12th March 2021): No evidence of bats found.	
B17a- related small tunnel immediately to south-east of B17 	Long and low brick-lined tunnel with low height above silted floor. Too restricted to access. Any gaps likely to be rodent-vulnerable. Cobwebs over entrance in September 2016.	Low bat roost potential. Structure inspection (15th September 2016): No evidence of bats found. Structure inspection (12th March 2021): No evidence of bats found.	Not surveyed
B17b- Low stone bridge/culvert Structure Reference: "Bridge 417"	Well-sealed internally, with calcium carbonate covering interior. A few opportunities particularly on the outer stone at the northern end. Over stream.	Moderate bat hibernation/roost potential. Structure inspection (23-24th February 2016): No evidence of bats found. Structure inspection (15th September 2016): No evidence of bats found (B17 and B17a). Structure inspection (12th March 2021): No evidence of bats found.	Not surveyed

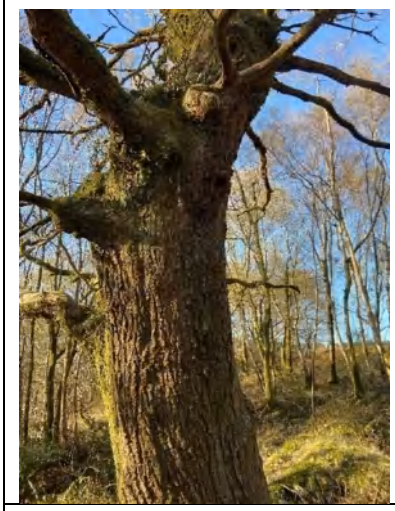
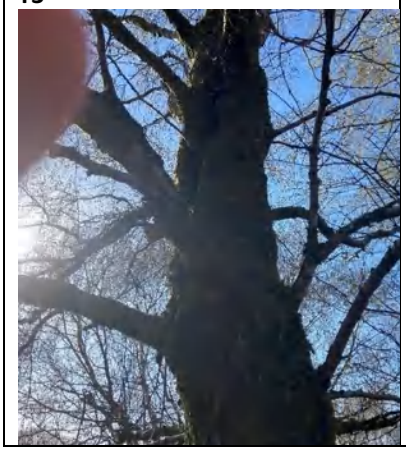
Building/Structure Reference Nº & Photographs	Building description	Potential bat hibernation/ roosting features & evidence of bats	Results of activity surveys
B18- Long supporting wall 	East-facing wall with earth banked up to western side. Stonework interstices mostly quite shallow with a few larger cracks and hollows, and some sections of broken-facing. All mostly damp from seepage and/or exposed to rodent access etc.	Low-moderate bat hibernation/roost potential. Structure inspection (23-24th February 2016): Not surveyed. Structure inspection (15th September 2016): No evidence of bats found. Structure inspection (12th March 2021): No evidence of bats found.	Not surveyed
B19- Retaining wall 	Wall in front of B10. Up to 1.7m in places. Comprising bricks and mortar. Very occasional holes which were all damp.	Low bat hibernation/roost potential. Structure inspection (23-24th February 2016): No evidence of bats found. Structure inspection (15th September 2016): No evidence of bats found. Structure inspection (12th March 2021): No evidence of bats found.	Not surveyed
B20- Stone Bridge 	Low, brick-faced bridge in fairly good repair with few gaps.	Low bat hibernation/roost potential. Structure inspection (15th September 2016): No evidence of bats found.	Not surveyed

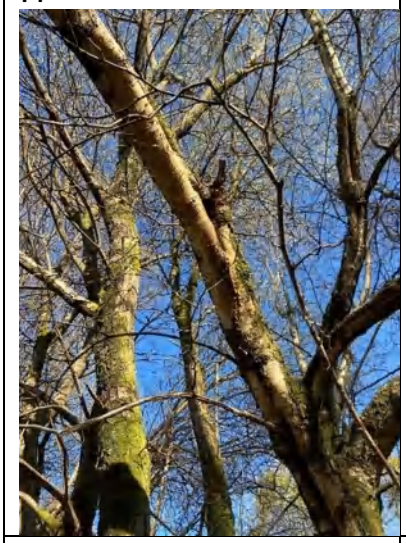
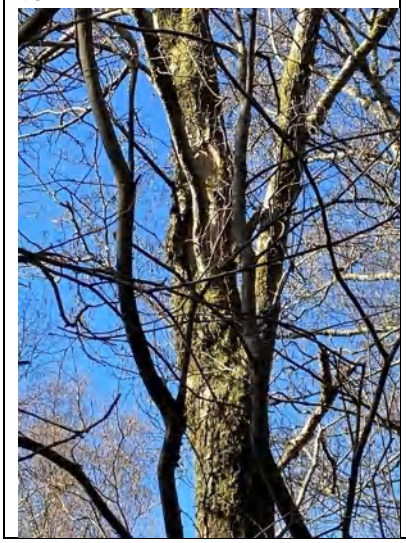
Building/Structure Reference Nº & Photographs	Building description	Potential bat hibernation/ roosting features & evidence of bats	Results of activity surveys
B21- Low stone culvert 	Long and low brick-lined tunnel with low height above silted floor. Too restricted to access. Any gaps likely to be rodent-vulnerable.	Low bat hibernation/roost potential. <u>Structure inspection</u> (15th September 2016): No evidence of bats found (although feature too low to access internally).	Not surveyed
B22- Culvert carrying southern arm of Nant Cwm Pant Bach	Not able to access internally due to presence of grille. Nevertheless, the interstices in the stone within the culvert were seen to be very damp and dripping with water for the first few metres (although the although the structure was not entered for a full examination).	Low bat hibernation/roost potential. <u>Structure inspection</u> (DATE): DW to confirm <u>Structure inspection</u> (25th February 2020): No evidence of bats found. Not surveyed in 2021.	Not surveyed

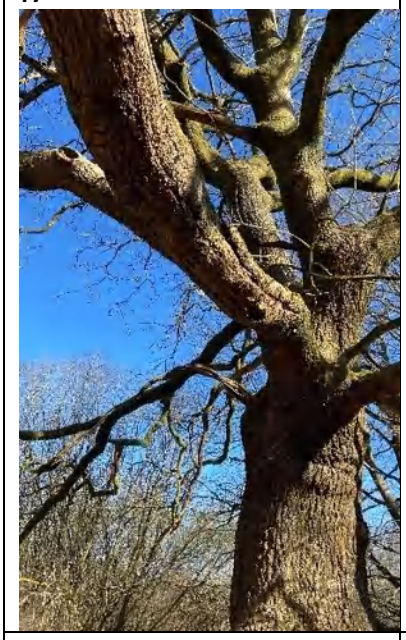
Appendix 2

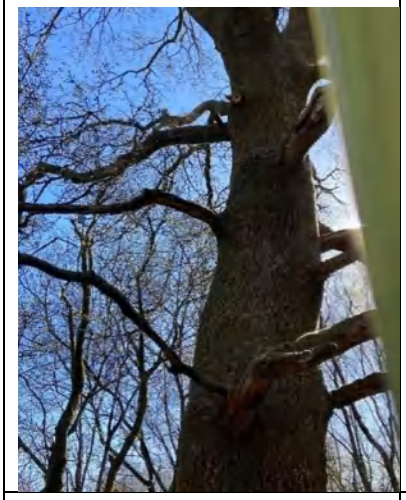
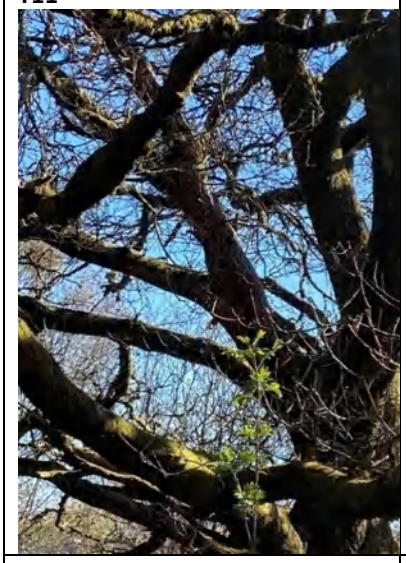
Preliminary tree roost assessment survey results and details of confirmed tree roost

See Figure 10 for locations.

Tree reference number & photo	Description	Potential Roosting Features	Roosting potential
T1 	Large gnarled oak tree surrounded by smaller silver birch.	2No. woodpecker/knot holes on NE aspect at ~ 2m. Several patches of loose bark on dead looking branches on various aspects. 1No. woodpecker/knot hole on branch on E aspect at ~ 4 m.	Moderate-High
T2	An oak situated in a small gully.	Crack in dead branch on S aspect.	Low-Moderate
T3 	Moderately-sized silver birch surrounded by bramble and other smaller silver birch	Potential crack in bark on N aspect at 2-3m, covered in moss. Not possible to tell if it is deep/hollow or superficial from the ground.	Low-Moderate

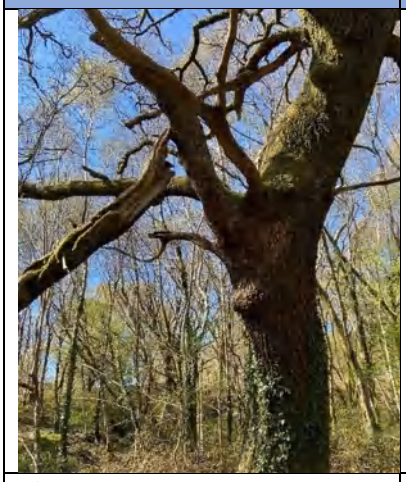
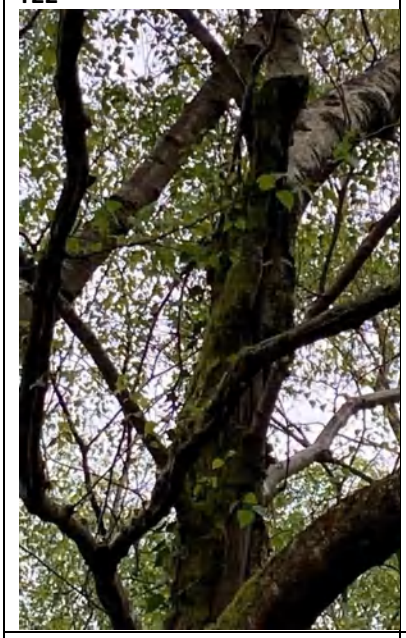
Tree reference number & photo	Description	Potential Roosting Features	Roosting potential
T4 	Multi-stemmed silver birch not far from southern edge of woodland.	Broken branch and adjoining crack in bark on S aspect at ~ 2.5m. Not possible to assess how deep it is from the ground.	Low-Moderate
T5	Large oak with several snapped branches.	Loose bark on branch on W side at ~2-3m. 3No. potential holes due to cracks in bark/fallen branches visible from N aspect, not possible to assess how deep they are from the ground.	Moderate
T6 	Multi-stemmed large silver birch.	Large crack in stem on N aspect ~4m up.	Moderate

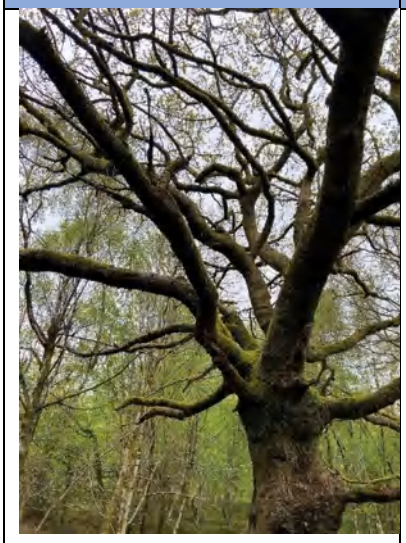
Tree reference number & photo	Description	Potential Roosting Features	Roosting potential
T7 	A large oak, largest of a group of 3 huge and sprawling trees. The branches on this oak are so long they touch the ground.	2No. large splits on N aspect of 2 branches on W aspect of the tree at ~ 2.5m. Loose bark on SW branch at ~2-3m. Loose bark on N branch at ~2-3m. Split in branch on S side.	Moderate-High
T8 **[Photo not available]**	A large oak, middle one of the three huge trees.	Loose bark on branches on S side at ~ 2m. No other PRFs observed from ground but given the age and size of tree it has potential for more.	Low-Moderate
T9 	Most easterly of the three huge trees. Beech.	Loose bark on S side ~ 6m up. No other PRFs observed from ground but given the age and size of tree it has potential for more.	Low-Moderate

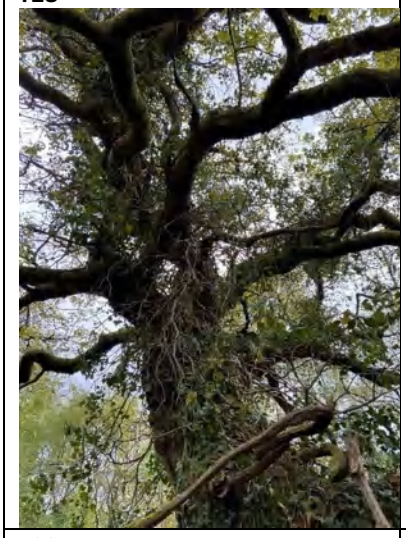
Tree reference number & photo	Description	Potential Roosting Features	Roosting potential
T10 	Large oak.	Crack at base of branch on W side at ~2-3m. Loose bark on SE branch.	Low-Moderate
T11 	Huge oak with branches drooping close to the ground, surrounded by dense bracken & bramble, near the edge of the grassland.	Large crack on W branch at ~3-4m. Snapped branch on W side at ~5m. Knot hole/woodpecker hole on S side branch facing N. Loose bark on E branch at ~4-5m.	Moderate
T12	Silver birch situated in a shallow pit with lots of bramble & bracken.	Cracks on tops of 3 branches on E aspect visible from the W side at ~ 4, 4 and 5m.	Low-Moderate
T13	Silver birch	Dense ivy.	Low

Tree reference number & photo	Description	Potential Roosting Features	Roosting potential
T14 **[photo not available]**	One of two ivy clad silver birches ~ 5m apart.	Dense ivy.	Low
T15 **[photo not available]**	One of two ivy clad silver birches ~ 5m apart.	Dense ivy.	Low
T16 	Largest of two big, old oaks near two smaller oaks. Surrounded by bramble & bracken.	Loose bark on a small branch on S side ~6m up.	Low
T17	Oak	Crack on E branch visible from the W, S or E at ~ 2m.	Low-Moderate

Tree reference number & photo	Description	Potential Roosting Features	Roosting potential
		Cracks on top of N branch visible from S.	
T18	Huge two stemmed sprawling beech tree.	Cracks in bark visible on a few branches on E side at ~ 5m. Not obvious from the ground if these are deep or not. Loose bark on S branch ~2-3, up.	Low
T19	Big sprawling oak in and near to a number of bell pits.	Split in small branch visible from NW side at ~ 10m. Potentially too small to allow bat access but not possible to tell from the ground.	Low
T20	Large oak with big fallen limb on the E side.	1No. woodpecker/knot hole on E side at ~ 3m. Loose bark on W branch.	Moderate -High

Tree reference number & photo	Description	Potential Roosting Features	Roosting potential
		Crack in base of dead branch on W side at ~ 5m. Crack in middle of forked branches at ~6-7m, visible from the W. 1No. potential woodpecker/knot hole on E branch ~ 6-7m up, visible from E facing NE. Might be superficial but can't assess this from the ground.	
T21 	Silver birch on eastern edge of woodland.	Large crack on W side. Might be superficial but can't assess this from the ground.	Low-Moderate
T22 	Silver birch ~ 5m from E woodland edge	Crack on W side at ~ 3m.	Low-Moderate
T23	Large gnarled oak.	No visible features from the ground but presence can't be	Low

Tree reference number & photo	Description	Potential Roosting Features	Roosting potential
		ruled out due to age and size of the tree.	
T24	Huge oak.	1-2m long crack on branch at ~ 1-2m, visible from the N side. Loose bark on branch visible from W side looking E. 2No. knot/woodpecker holes visible on E side at 1 & 3m. Other features potentially present but not visible from the ground due to size and age of the tree.	High
T25	Oak with huge flake of bark/cracked trunk at base.	Several small cracks in bark/broken branches. Big hole in trunk on w side at ~ 1.3m not clear how far up into the trunk it goes.	Moderate-high
T26	Oak on S side of rocky footpath.	1No. possible hole on S side branch visible from the W. Other than this no features visible from the ground but presence can't be ruled out due to the size and age of the tree.	Low

Tree reference number & photo	Description	Potential Roosting Features	Roosting potential
T27	Large oak ~ 3m south of a path	Various sections of loose bark and cracks in trunk at base	Low-Moderate
T28 	Ivy covered oak growing on the edge of a bell pit	Few cracks/loose bark on dead branches, possibly more but ivy obscuring most of the trunk and base of branches.	Low-Moderate
T29	Alder tree on the north east corner of P15.	Large split/hole on western aspect of the tree (circled in photo). Minimum of 10No. brown long-eared bats observed swarming and then entering the	Confirmed roost

Tree reference number & photo	Description	Potential Roosting Features	Roosting potential
		roosting feature during dawn survey on 26.08.21.	

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14th November 2022

Re: Results of a climb and inspect survey of trees at Cwm Glo for their potential to hold roosting bats – Campaign 1

Dear Mr. Woodfield,

In accordance with your instructions Lee Gwyther (NRW bat licence S089870/1) and I (NRW bat licence S091229/1) attended your site at Cwm Glo to perform a climb and inspect survey of an initial 55 trees; hereafter referred to as the 'Campaign 1 trees'.

The Campaign 1 trees were ascended, inspected and recorded over three days; 7th to 11th November 2022. Inspections were performed using Ridgid CA350 endoscopes and torches as appropriate.

Features were assessed and recorded using the protocol set out within: -

BTHK 2018. *Bat Roosts in Trees: A guide to identification and assessment for tree-care and ecology professionals*. Pelagic Publishing, Exeter

Of the 55 trees: four were found to be dead and not safely accessible due to a lack of an adjacent living tree with an overhanging canopy; and, features on 27 trees were found to be either discontinuous or open and exposed and therefore did not offer a sheltered internal environment. This left 28 trees that offered Potential Roost Features that we judge to be superficially suitable to hold roosting bats. However, none of these trees were occupied by bats.

The data are provided in a free-standing Excel spreadsheet: -

AEcol & GT - PRF Data - Campaign 1 - Nov 2022

When you review the data, you will note that all the trees we could safely access you have comprehensive data. Some we could not safely ascend, and some it would have been irresponsible to ascend due to the risk of damaging the PRF; these are identified as red values. Those that were deemed unsuitable are identified with grey fill. For the remainder you will find

that the final two columns tell you that it is a viable PRF, and give you a broad assessment of its potential to hold maternity or mating groups.

Photographs have been provided to you via wetransfer.com on 14th November 2022.

The data for each of the PRF were processed through the BTHK predictive framework to provide a hypothesis of which bat species might occupy them, and when. The results are provided at Table 1.

Table 1. Predictive analysis results / Cwm Glo / Campaign 1.

TREE REF.	PRF type proven to be occupied in this habitat in **winter** period (Jan / Feb)	PRF type proven to be occupied in this habitat in **spring-flux** period (Mar / Apr)	PRF type proven to be occupied in this habitat in **pregnancy** period (May / Jun)	PRF type proven to be occupied in this habitat in **nursery** period (Jul / Aug)	PRF type proven to be occupied in this habitat in **mating** period (Sep / Oct)	PRF type proven to be occupied in this habitat in **autumn-flux** period (Nov / Dec)
GC2b	----	----	----	----	----	----
GC3	----	***M. nat***	----	***M. bec***	----	***M. nat***
GC4	----	----	----	----	----	----
GC7c	----	***M. nat***	----	***M. bec***	----	***M. nat***
GC11	----	***M. nat***	----	***M. bec***	----	***M. nat***
GC13a	----	----	----	----	----	----
GC13b	----	----	----	----	----	----
GC17	----	----	----	----	----	----
GC18a	----	----	----	----	----	----
GC18b	----	----	***M. dau***	***M. dau***	----	----
GC18c	----	----	***M. dau***	***M. dau***	----	----
GC18d	----	----	----	----	----	----
GC19a	----	----	----	----	----	----
GC20	----	***M. dau*** ***M. nat***	***P. pyg***	***P. aur***	***N. noc***	----
GC21	***N. noc***	----	----	----	----	----
GC27	----	----	----	----	----	----
GC30a	----	----	----	----	----	----
GC30b	----	----	----	----	----	----
GC31	----	----	----	----	----	----
GC34	----	----	***M. bec*** ***N. noc***	***M. dau*** ***N. noc***	***N. noc***	----
GC41	----	----	***P. pip***	----	----	----
GC43	***P. aur***	***P. aur***	***M. dau*** ***P. aur***	----	***B. bar*** ***M. dau***	----
GC45	----	----	----	----	***B. bar***	----
GC47	----	***P. aur***	***P. aur***	***M. dau***	***M. dau***	----
GC48	----	----	----	----	***B. bar***	----
GC49	----	***M. nat***	----	***M. bec***	----	***M. nat***

TREE REF.	PRF type proven to be occupied in this habitat in **winter** period (Jan / Feb)	PRF type proven to be occupied in this habitat in **spring-flux** period (Mar / Apr)	PRF type proven to be occupied in this habitat in **pregnancy** period (May / Jun)	PRF type proven to be occupied in this habitat in **nursery** period (Jul / Aug)	PRF type proven to be occupied in this habitat in **mating** period (Sep / Oct)	PRF type proven to be occupied in this habitat in **autumn-flux** period (Nov / Dec)
GC51	----	----	***M. dau***	***M. dau***	----	----
GC52a	***P. aur***	***B. bar*** ***M. nat*** ***P. aur***	***B. bar*** ***M. nat***	***P. aur***	***P. aur***	***P. aur***
GC52b	***P. aur***	***B. bar*** ***M. nat*** ***P. aur***	***B. bar*** ***M. nat***	***P. aur***	***P. aur***	***P. aur***
GC53	----	***M. nat*** ***P. aur***	----	----	***P. aur***	----
GC54	----	***M. bec***	***M. bec*** ***M. nat*** ***N. noc***	***M. bec*** ***M. nat*** ***N. noc*** ***P. aur***	***M. bec*** ***N. noc*** ***P. aur***	----
GC55	***P. aur***	***B. bar*** ***M. nat*** ***P. aur***	***B. bar*** ***M. nat***	***P. aur***	***P. aur***	***P. aur***

Key: ---- = No data to construct hypothesis (PRF does offer shelter but there is no comparative data on BTHK Database); Species abbreviations e.g., *M. nat* = *Myotis nattereri* Natterer's bat.

PRF in Campaign 1 may variously be exploited by eight species of bat, comprising: **1)** barbastelle; **2)** Bechstein's bat; **3)** Daubenton's bat; **4)** Natterer's bat; **5)** noctule; **6)** common pipistrelle; **7)** soprano pipistrelle; and, **8)** brown long-eared bat.

We will finish a second campaign of trees over Tuesday and Wednesday this week, and will submit the data by close of business on 18th November.

If you have any questions relating to our survey and assessment, you can contact me on 07896 013007.

Yours sincerely

Henry Andrews MSc CEcol MCIEEM MRSB

Parcel	Phase 1 code	Phase 1 habitat	Canopy height minimum (m)	Canopy height maximum (m)	Canopy tree species	dbh minimum (cm)	dbh maximum (cm)	abundance (DAFOR)
Hedges / Scattered trees	*J2.3*	*Other / Boundaries / hedge with trees*	*6*	*18*	*Quercus robur*	*49.2*	*159.1*	*D*

Insert a plan showing the different habitat parcels

Bat species inventory	Barbastelle	Bechstein's bat	Alcathoe's bat	Brandt's bat	Daubenton's bat	Whiskered bat	Natterer's bat	Leisler's bat	Noctule	Nathusius pipistrelle	Common pipistrelle	Soprano pipistrelle	Brown long-eared bat	Lesser horseshoe bat
Species present in county?	y	n	n	n	y	y	y	n	y	n	y	n	y	y
Site is within CSZ of off-site roost? (take from the results of the data search)														
Site is within CSZ of location bat species recorded 'in-flight'? (take from the results of the data search)														
Species historically recorded roosting on-site? (take from the results of the data search and any historic surveys)														

Insert a plan showing in-flight and roost records within range of the site

Family	Tree species	Scientific	Species recorded on site (y/n)	Maximum DBH present on site (cm)	Minimum DBH at which species is proven to form Decay PRF that are proven to be exploited by roosting bats	Trees within DBH range present on site (y/n)	Minimum DBH at which species is proven to form Damage PRF that are proven to be exploited by roosting bats	Trees within DBH range present on site (y/n)	Minimum DBH at which species is proven to form Association PRF that are proven to be exploited by roosting bats	Trees within DBH range present on site (y/n)
Alder	**Common alder**	***Alnus glutinosa***	y	45	15	y	31.2	y	N/A	n
Ash	**Ash**	***Fraxinus excelsior***	**y**	12	11.8	y	14.1	n	32.5	n

Family	Tree species	Scientific	DECAY PRF INVENTORY	PRF proven to form and be expoited by roosting bats on this tree species	PRF proven to be exploited by bats in semi-natural woodland habitats	PRF proven to be exploited by bats in plantation	PRF proven to be exploited by bats in orchards	PRF proven to be exploited by bats in hedge or tree-line habitats	PRF proven to be exploited by bats in shelter-belts	PRF proven to be exploited by bats in riparian fringe	PRF proven to be exploited by bats in parkland / scattered trees	PRF proven to be exploited by bats in churchyards or gardens	Barbastelle	Bechstein's bat	Alcathoe's bat	Brandt's bat	Daubenton's bat	Whiskered bat	Natterer's bat	Leisler's bat	Noctule	Nathusius' pipistrelle	Common pipistrelle	Soprano pipistrelle	Brown long-eared bat	Lesser horseshoe-bat
Alder	**Common alder**	***Alnus glutinosa***	Woodpecker-holes	**Woodpecker-holes**	y	n	n	y	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n
Alder	**Common alder**	***Alnus glutinosa***	Tear-outs	**Tear-outs**	y	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	y	n
Alder	**Common alder**	***Alnus glutinosa***	Wounds	**Wounds**	y	n	n	y	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	y	n
Alder	**Common alder**	***Alnus glutinosa***	Butt-rott	**Butt-rotts**	y	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	y	n
Ash	**Ash**	***Fraxinus excelsior***	Woodpecker-holes	**Woodpecker-holes**	y	n	n	y	n	n	y	n	n	y	n	n	y	n	y	n	y	n	n	n	n	n
Ash	**Ash**	***Fraxinus excelsior***	Squirrel-holes	**Squirrel-holes**	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n
Ash	**Ash**	***Fraxinus excelsior***	Knot-holes	**Knot-holes**	y	n	n	n	n	n	n	n	n	n	n	n	y	n	y	n	y	n	n	y	y	n
Ash	**Ash**	***Fraxinus excelsior***	Pruning-cuts	**Pruning-cuts**	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n
Ash	**Ash**	***Fraxinus excelsior***	Tear-outs	**Tear-outs**	y	n	n	n	n	n	y	n	n	n	n	n	y	n	y	n	y	n	y	y	n	n
Ash	**Ash**	***Fraxinus excelsior***	Butt-rots	**Butt-rots**	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n
Ash	**Ash**	***Fraxinus excelsior***	Wounds	**Wounds**	y	n	n	y	n	y	n	n	n	y	n	n	y	n	y	y	y	n	n	y	y	n
Ash	**Ash**	***Fraxinus excelsior***	Cankers	**Cankers**	y	n	n	n	n	n	n	n	n	n	n	n	y	n	y	n	n	n	n	y	y	n

Family	Tree species	Scientific	Damage PRF INVENTORY	PRF proven to form and be expoited by roosting bats on this tree species	PRF proven to be exploited by bats in semi-natural woodland habitats	PRF proven to be exploited by bats in plantation	PRF proven to be exploited by bats in orchards	PRF proven to be exploited by bats in hedge or tree-line habitats	PRF proven to be exploited by bats in shelter-belts	PRF proven to be exploited by bats in riparian fringe	PRF proven to be exploited by bats in parkland / scattered trees	PRF proven to be exploited by bats in churchyards or gardens	Barbastelle	Bechstein's bat	Alcathoe's bat	Brandt's bat	Daubenton's bat	Whiskered bat	Natterer's bat	Leisler's bat	Noctule	Nathusius' pipistrelle	Common pipistrelle	Soprano pipistrelle	Brown long-eared bat	Lesser horseshoe-bat
Ash	**Ash**	***Fraxinus excelsior***	Hazard-beams	**Hazard-beam**	y	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	y	n	y	y	n	n
Ash	**Ash**	***Fraxinus excelsior***	Subsidence-cracks	**Subsidence-crack**	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	y	n
Ash	**Ash**	***Fraxinus excelsior***	Transverse-snaps	**Transverse-snap**	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n
Ash	**Ash**	***Fraxinus excelsior***	Bark-plates	**Bark-plate**	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	y	n

Family	Tree species	Scientific	ASSOCIATION PRF INVENTORY	PRF proven to form and be expoited by roosting bats on this tree species	PRF proven to be exploited by bats in semi-natural woodland habitats	PRF proven to be exploited by bats in plantation	PRF proven to be exploited by bats in orchards	PRF proven to be exploited by bats in hedge or tree-line habitats	PRF proven to be exploited by bats in shelter-belts	PRF proven to be exploited by bats in riparian fringe	PRF proven to be exploited by bats in parkland	PRF proven to be exploited by bats in churchyards or gardens	Barbastelle	Bechstein's bat	Alcathoe's bat	Brandt's bat	Daubenton's bat	Whiskered bat	Natterer's bat	Leisler's bat	Noctule	Nathusius' pipistrelle	Common pipistrelle	Soprano pipistrelle	Brown long-eared bat	Lesser horseshoe-bat
Alder	Common alder	*Alnus glutinosa*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ash	Ash	*Fraxinus excelsior*	Ivy	Ivy	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ash	Manna ash	*Fraxinus ornus*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Beech	Beech	*Fagus sylvatica*	Fluting	Fluting	y	y	n	n	n	n	y	n	n	n	n	y	y	y	y	n	n	y	y	y	y	n
Beech	Sweet chestnut	*Castanea sativa*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Birch	Downy birch	*Betula pubescens*	Fluting	Fluting	y	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	y	n
Birch	Hornbeam	*Carpinus betulus*	Fluting	Fluting	y	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	y	n
Birch	Silver birch	*Betula pendula*	Fluting	Fluting	y	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n
Elder	Elder	*Sambucus nigra*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Elm	Wych elm	*Ulmus glabra*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hawthorn	Hawthorn	*Crataegus monogyna*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hazel	Hazel	*Corylus avellana*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Holly	Holly	*Ilex aquifolium*	Fluting	Fluting	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n
Horse chestnut	Hose chestnut	*Aesculus hippocastanum*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Juniper	Monterey cypress	*Cupressus macrocarpa*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lime	Large-leaved lime	*Tilia platyphyllos*	Ivy	Ivy	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Lime	Lime	*Tilia x europaea*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Maple	Field maple	*Acer campestre*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Maple	Norway maple	*Acer platanoides*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Maple	Sycamore	*Acer pseudoplatanus*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Oak	Pedunculate oak	*Quercus robur*	Ivy	Ivy	y	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n
Oak	Sessile oak	*Quercus petraea*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Oak	Turkey oak	*Quercus cerris*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pine	European larch	*Larix decidua*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pine	Lebanon cedar	*Cedrus libani*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pine	Scot's pine	*Pinus sylvestris*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Plane	London plane	*Platanus x acerifolia*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Redwood	Wellingtonia	*Sequoiadendron gigante*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rose	Apple	*Malus domestica*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rose	Crab apple	*Malus sylvestris*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rose	Rowan	*Sorbus aucuparia*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rose	Wild cherry	*Prunus avium*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Willow	Crack willow	*Salix fragilis*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Willow	Goat willow	*Salix caprea*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Willow	Hybris black poplar	*Populus x canadensis*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Willow	Grey willow	*Salix cinerea*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Willow	White willow	*Salix alba*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Witch-hazel	Sweetgum	*Liquidambar styraciflua*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Yew	Yew	*Taxus baccata*	Fluting	Fluting	y	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	y	y	y	n

Bat species proven to occur in [County]		Bat species present in [County] that are proven to exploit PRF potentially present in the context of the site (this list is those that for which there is sufficient evidence to suggest might 'potentially' occur i.e. the habitat is correct and they occur in the county)		Bat species recorded within range of the site (this list is those for which there is sufficient evidence to suggest a *"reasonable likelihood"* of occurance i.e. the habitat is correct, the species occurs in the county <u>and</u> there is a record of their presence within their respective CSZ)		Bat species that readily take to artificial bat boxes	Transitory capacity (y/n)	Maternity capacity (y/n)	Winter capacity (y/n)
Barbastelle	y	**Barbastelle**	y	**Barbastelle**	y	Barbastelle	y*	n	n
Bechstein's bat	n	**Bechstein's bat**	y	**Bechstein's bat**	n	Bechstein's bat	y*	y*	n
Alcathoe's bat	n	**Alcathoe's bat**		**Alcathoe's bat**		Alcathoe's bat	n	n	n
Brandt's bat	n	**Brandt's bat**		**Brandt's bat**		Brandt's bat	y*	n	n
Daubenton's bat	y	**Daubenton's bat**		**Daubenton's bat**		Daubenton's bat	y*	y*	n
Whiskered bat	y	**Whiskered bat**		**Whiskered bat**		Whiskered bat	y*	n	n
Natterer' s bat	y	**Natterer' s bat**		**Natterer' s bat**		Natterer' s bat	y*	y*	n
Leisler's bat	n	**Leisler's bat**		**Leisler's bat**		Leisler's bat	y*	n	y*
Noctule	y	**Noctule**		**Noctule**		Noctule	y*	y*	y*
Nathusius' pipistrelle	n	**Nathusius' pipistrelle**		**Nathusius' pipistrelle**		Nathusius' pipistrelle	y*	y*	y*
Common pipistrelle	y	**Common pipistrelle**		**Common pipistrelle**		Common pipistrelle	y*	n	y*
Soprano pipistrelle	n	**Soprano pipistrelle**		**Soprano pipistrelle**		Soprano pipistrelle	y*	y*	y*
Brown long-eared bat	y	**Brown long-eared bat**		**Brown long-eared bat**		Brown long-eared bat	y*	y*	y*
Lesser horseshoe-bat	y	**Lesser horseshoe-bat**		**Lesser horseshoe-bat**		Lesser horseshoe-bat	n	n	n

*Korsten E 2012. Vleermuiskasten: Overzicht van toepassing, gebruik en succesfacoren. Zoogdier Vereniging, Bureau

Tree ref	PRF ID	Grid reference	Species	Alive/dead	Stem/limb	Tree height (m)	PRF height (m)	Facing	Form	Enlarged	DBH (cm)	photo	First Recorder	Second Recorder	Also present	Comments	TAG
CGVG1	1	SO 04687 05071	*Corylus avellana*	alive	limb	11	5	N	transverse-snap (snag)	N/A	31	y	Lee Gwyther	N/A	N/A		N/A
CGVG2	2a	SO 04669 05039	*Alnus glutinosa*	alive	stem	9	4.21	NE	transverse-snap (snag)	N/A	67	y	Lee Gwyther	N/A	N/A		N/A
CGVG2	2b	SO 04669 05039	*Alnus glutinosa*	alive	stem	9	4.54	SSE	shearing-crack	N/A	67	y	Lee Gwyther	N/A	N/A		N/A
CGVG3	3	SO 04669 05029	*Salix caprea*	alive	stem	7	5.39	SE	wound	N/A	60	y	Lee Gwyther	N/A	N/A		N/A
CGVG4	4	SO 04671 05018	*Fraxinus excelsior*	alive	stem	12	1.2	E	butt-rot	N/A	98.5	y	Lee Gwyther	N/A	N/A		N/A
CGVG5	5	SO 04694 05030	*Quercus petraea*	alive	stem	9	3.5	SW	knot-hole	N/A	46.5	y	Lee Gwyther	N/A	N/A		N/A
CGVG6	6	SO 04721 04994	*Salix caprea*	alive	stem	7	4	NW	wound	N/A	16	y	Lee Gwyther	N/A	N/A		N/A
CGVG7	7a	SO 04740 04972	*Salix caprea*	alive	limb	10	5	ENE	tear-out	N/A	41	y	Lee Gwyther	N/A	N/A		N/A
CGVG7	7b	SO 04740 04972	*Salix caprea*	alive	limb	10	8	N	wound	N/A	41	y	Lee Gwyther	N/A	N/A		N/A
CGVG7	7c	SO 04740 04972	*Salix caprea*	alive	stem	10	4.44	W & N	wound	N/A	30	y	Lee Gwyther	N/A	N/A		N/A
CGVG8	8	SO 04720 04944	*Betula pubescens*	alive	limb	6	3	NE	transverse-snap	N/A	16.6	y	Lee Gwyther	N/A	N/A		N/A
CGVG9	9	SO 04690 04960	*Quercus petraea*	alive	limb	13	4	W	transverse-snap	N/A	99	y	Lee Gwyther	N/A	N/A		N/A
CGVG10	10	SO 04717 04922	*Fraxinus excelsior*	alive	stem	13	6	NE	wound	N/A	47	y	Lee Gwyther	N/A	N/A		N/A
CGVG11	11	SO 04746 04919	*Salix caprea*	alive	stem	13	8	S	wound	N/A	63	y	Lee Gwyther	N/A	N/A		N/A
CGVG12	12	SO0473604914	*Alnus glutinosa*	dead	stem	5	1.2	N	bark-plates	N/A	23.5	y	Lee Gwyther	N/A	N/A		N/A
CGVG13	13a	SO 04750 04832	*Salix caprea*	alive	stem	9	2	S	weld	N/A	28	y	Lee Gwyther	N/A	N/A		N/A
CGVG13	13b	SO 04750 04832	*Salix caprea*	alive	stem	9	1.4	S	weld	N/A	28	y	Lee Gwyther	N/A	N/A		N/A
CGVG14	14	SO 04828 04805	*Salix caprea*	alive	stem	9	5	S	wound	N/A	21.5	y	Lee Gwyther	N/A	N/A		N/A
CGVG15	15	SO 04813 04727	*Salix sp.*	alive	limb	10	5.92	N & S	hazard-beam	N/A	122	y	Lee Gwyther	N/A	N/A		N/A
CGVG16	16	SO 04758 04672	*Betula pubescens*	alive	stem	9	1.2	E	knot-hole	N/A	35	y	Lee Gwyther	N/A	N/A		N/A
CGVG17	17	SO 04812 04640	*Fraxinus excelsior*	alive	stem	13	1.2	W & E	compression-fork	N/A	53	y	Lee Gwyther	N/A	N/A		N/A
CGVG18	18a	SO 04843 04603	*Alnus glutinosa*	alive	stem	15	6.71	W	woodpecker-hole	N/A	89.5	y	Lee Gwyther	N/A	N/A		N/A
CGVG18	18b	SO 04843 04603	*Alnus glutinosa*	alive	stem	15	6.25	NE	woodpecker-hole	N/A	89.5	y	Lee Gwyther	N/A	N/A		N/A
CGVG18	18c	SO 04843 04603	*Alnus glutinosa*	alive	stem	15	4.34	N	woodpecker-hole	N/A	89.5	y	Lee Gwyther	N/A	N/A		N/A
CGVG18	18d	SO 04843 04603	*Alnus glutinosa*	alive	stem	15	1.13	SSW & W	butt-rot	N/A	89.5	y	Lee Gwyther	N/A	N/A		N/A
CGVG19	19a	SO 04848 04575	*Alnus glutinosa*	alive	stem	12	6.25	NNW	knot-hole	N/A	60.2	y	Lee Gwyther	N/A	N/A		N/A
CGVG19	19b	SO 04848 04575	*Alnus glutinosa*	alive	stem	12	4	WSW	woodpecker hole	N/A	60.2	y	Lee Gwyther	N/A	N/A		N/A
CGVG20	20	SO 04846 04556	*Quercus petraea*	alive	limb	12	5.1	N & S	hazard-beam	N/A	75.9	y	Lee Gwyther	N/A	N/A		N/A
CGVG21	21	SO 04845 04545	*Quercus petraea*	alive	stem	13	5.8	NNW	tear-out	N/A	110.9	y	Lee Gwyther	N/A	N/A		N/A
CGVG22	22	SO 04868 04548	*Quercus petraea*	alive	stem	13	4.87	NNW	knot-hole	N/A	87.5	y	Lee Gwyther	N/A	N/A		N/A
CGVG23	23	SO 04871 04530	*Quercus petraea*	alive	limb	11	3.15	ENE	transverse-snap (snag)	N/A	91.9	y	Lee Gwyther	N/A	N/A		N/A
CGVG24	24	SO 04867 04498	*Salix caprea*	alive	limb	8	5.1	S & down	transverse-snap (snag)	N/A	27	y	Lee Gwyther	N/A	N/A		N/A
CGVG25	25	SO 04882 04457	*Alnus glutinosa*	alive	stem	4	4	up	transverse-snap (snag)	N/A	30	y	Lee Gwyther	N/A	N/A		N/A
CGVG26	26	SO 04834 04436	*Fraxinus excelsior*	alive	limb	14	8.2	ESE	transverse-snap (snag)	N/A	58.7	y	Lee Gwyther	N/A	N/A		N/A
CGVG27	27	SO 04810 04413	*Alnus glutinosa*	alive	stem	12	9.5	N	knot-hole	N/A	62.2	y	Lee Gwyther	N/A	N/A		N/A
CGVG28	28	SO 04797 04429	*Quercus petraea*	alive	limb	18	9.2	W	transverse-snap (snag)	N/A	105	y	Lee Gwyther	N/A	N/A		N/A
CGVG29	29	SO 04785 04428	*Quercus petraea*	alive	limb	12	4	NE	shearing crack	N/A	65.9	y	Lee Gwyther	N/A	N/A		N/A
CGVG30	30a	SO 04773 04439	*Quercus petraea*	alive	limb	13	4.38	W	shearing crack	N/A	59.2	y	Lee Gwyther	N/A	N/A		N/A
CGVG30	30b	SO 04773 04439	*Quercus petraea*	alive	limb	13	2.9-5.1	NNE & SSW & up and down	shearing crack	N/A	59.2	y	Lee Gwyther	N/A	N/A		N/A
CGVG31	31	SO 04780 04439	*Alnus glutinosa*	alive	stem	11	2.16	WNW	knot-hole	N/A	38.7	y	Lee Gwyther	N/A	N/A		N/A
CGVG32	32	SO 04778 04438	*Quercus petraea*	alive	stem	7	2.29	SSW	knot-hole	N/A	35.2	y	Lee Gwyther	N/A	N/A		N/A
CGVG33	33	SO 04764 04443	*Quercus petraea*	alive	limb	12	6.65	ESE	tear-out	N/A	53.5	y	Lee Gwyther	N/A	N/A		N/A
CGVG34	34	SO 04760 04451	*Fraxinus excelsior*	alive	stem	11	5.42	SSW	woodpecker-hole	N/A	74.6	y	Lee Gwyther	N/A	N/A		N/A
CGVG35	35	SO 04682 04436	*Quercus petraea*	alive	limb	9	2.23	up	wound	N/A	85.5	y	Lee Gwyther	N/A	N/A		N/A
CGVG36	36	SO 04823 04484	*Quercus petraea*	alive	limb	13	5.28	NE	bark-plate	N/A	75.5	y	Lee Gwyther	N/A	N/A		N/A
CGVG37	37	SO 04806 04552	*Fraxinus excelsior*	dead	stem	14	multiple	multiple	bark-plate	N/A	not possible	y	Lee Gwyther	N/A	N/A		N/A
CGVG38	38	SO 04794 04568	*Fraxinus excelsior*	dead	stem	10	multiple	multiple	bark-plate	N/A	not possible	y	Lee Gwyther	N/A	N/A		N/A
CGVG39	39	SO 04787 04574	*Fraxinus excelsior*	dead	stem	10	multiple	multiple	wound	N/A	not possible	y	Lee Gwyther	N/A	N/A		N/A
CGVG40	40	SO 04762 04572	*Quercus petraea*	alive	stem	9	3.38	S	knot-hole	N/A	49.8	y	Lee Gwyther	N/A	N/A		N/A
CGVG41	41	SO 04739 04554	*Alnus glutinosa*	dead	stem	3	1.7	S	bark-plate	N/A	29.8	y	Lee Gwyther	N/A	N/A		N/A
CGVG42	42	SO 04713 04540	*Fraxinus excelsior*	dead	stem	6	4.77	S	knot-hole	N/A	65.2	y	Lee Gwyther	N/A	N/A		N/A
CGVG43	43	SO 04646 04486	*Alnus glutinosa*	alive	stem	8	2.17	S	wound	N/A	28.7	y	Lee Gwyther	N/A	N/A		N/A
CGVG44	44	SO 04645 04478	*Alnus glutinosa*	alive	stem	10	6	S	wound & knot-hole	N/A	?	y	Lee Gwyther	N/A	N/A		N/A
CGVG45	45	SO 04456 04371	*Betula pubescens*	dead	stem	6	1.89-3.69	E	bark-plate	N/A	33	y	Lee Gwyther	N/A	N/A		N/A
CGVG46	46	SO 04457 04347	*Alnus glutinosa*	alive	stem	4.5	4.32	WNW	transverse-snap (snag)	N/A	16.5	y	Lee Gwyther	N/A	N/A		N/A
CGVG47	47	SO 04442 04353	*Alnus glutinosa*	dead	stem	6	2.53	WNW	tear-out	N/A	41.6	y	Lee Gwyther	N/A	N/A		N/A
CGVG48	48	SO 04368 04303	*Betula pubescens*	dead	stem	5	2	E	bark-plate	N/A	33.1	y	Lee Gwyther	N/A	N/A		N/A
CGVG49	49	SO 04351 04469	*Salix caprea*	alive	stem	9	3.26	NNE	wound	N/A	36.6	y	Lee Gwyther	N/A	N/A		N/A
CGVG50	50	SO 04588 04713	*Alnus glutinosa*	alive	stem	9	5.27	W	knot-hole	N/A	33.5	y	Lee Gwyther	N/A	N/A		N/A
CGVG51	51	SO 04631 04814	*Alnus glutinosa*	alive	stem	8	4.4	E	woodpecker-hole	N/A	45	y	Lee Gwyther	N/A	N/A		N/A
CGVG52	52a	SO 04479 04804	*Quercus petraea*	alive	stem	12	1.81	ESE	lightning-strike	N/A	101.4	y	Lee Gwyther	N/A	N/A		N/A
CGVG52	52b	SO 04479 04804	*Quercus petraea*	alive	stem	12	1.81	ESE	lightning-strike	N/A	101.4	y	Lee Gwyther	N/A	N/A		N/A
CGVG53	53	SO 04436 04829	*Betula pubescens*	alive	stem	9	2.28	NW	wound	N/A	15.7	y	Lee Gwyther	N/A	N/A		N/A
CGVG54	54	SO 04382 04788	*Quercus robur*	alive	stem	12	2.28	W	squirrel-hole	N/A	89	y	Lee Gwyther	N/A	N/A		N/A
CGVG55	55	SO 04379 04805	*Quercus petraea*	alive	stem	12	1.83	NNW	lightning-strike	N/A	71.4	y	Lee Gwyther	N/A	N/A		N/A

Family	Tree species	Scientific	Phase 1 habitat recorded in	Phase 1 code	PRF Group	PRF Type	PRF recorded during ground truthing (y/n)	PRF type proven to be occupied in this habitat in **winter** period	PRF type proven to be occupied in this habitat in **spring-flux** period	PRF type proven to be occupied in this habitat in **pregancy** period	PRF type proven to be occupied in this habitat in **nursery** period	PRF type proven to be occupied in this habitat in **mating** period	PRF type proven to be occupied in this habitat in **autumn-flux** period	[Site] PRF ID
Birch	Alder	*Alnus glutinosa*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Bark-plate	y	x	x	P. pip	x	x	x	12, 41
Birch	Alder	*Alnus glutinosa*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Butt-rot	y	x	x	x	x	x	x	18d
Birch	Alder	*Alnus glutinosa*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Knot-hole	y	x	x	x	x	x	x	19a, 27, 31, 44, 50
Birch	Alder	*Alnus glutinosa*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Tear-out	y	x	P. aur	P. aur	M. dau	M. dau	x	47
Birch	Alder	*Alnus glutinosa*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Woodpecker hole	y	x	x	M. dau	M. dau	x	x	18a, 18b, 18c, 19b, 51
Birch	Alder	*Alnus glutinosa*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Wound	y	P. aur	P. aur	M. dau, P. aur	x	B. bar, M. dau	x	43, 44
Birch	Alder	*Alnus glutinosa*	Woodland / Broadleaved / Semi-natural	A1.1.1	Damage	Shearing-crack	y	x	x	x	x	x	x	2b
Birch	Alder	*Alnus glutinosa*	Woodland / Broadleaved / Semi-natural	A1.1.1	Damage	Transverse-snap	y	x	P. pip	x	x	x	x	2a, 25, 46
Birch	Hazel	*Corylus avellana*	Woodland / Broadleaved / Semi-natural	A1.1.1	Damage	Transverse-snap	y	x	x	x	x	x	x	1
Birch	Downy birch	*Betula pubescens*	Woodland / Broadleaved / Semi-natural	A1.1.1	Damage	Transverse-snap	y	x	x	x	x	x	x	8
Birch	Downy birch	*Betula pubescens*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Bark-plate	y	x	x	x	x	B. bar	x	45, 48
Birch	Downy birch	*Betula pubescens*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Knot-hole	y	x	P. aur	x	x	x	x	16
Birch	Downy birch	*Betula pubescens*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Wound	y	x	M. nat, P. aur	x	x	P. aur	x	53
Oak	Sessile oak	*Quercus petraea*	Woodland / Broadleaved / Semi-natural	A1.1.1	Damage	Hazard-beam	y	x	M. dau, M. nat	P. pyg	P. aur	N. noc	x	20
Oak	Sessile oak	*Quercus petraea*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Tear-out	y	N. noc	x	x	x	x	x	21, 33
Oak	Sessile oak	*Quercus petraea*	Woodland / Broadleaved / Semi-natural	A1.1.1	Damage	Lightning-strike	y	P. aur	B. bar, M. nat, P. aur	B. bar, M. nat	P. aur	P. aur	P. aur	52a, 52b, 55
Oak	Sessile oak	*Quercus petraea*	Woodland / Broadleaved / Semi-natural	A1.1.1	Damage	Shearing-crack	y	x	x	x	x	x	x	29, 30a, 30b
Oak	Sessile oak	*Quercus petraea*	Woodland / Broadleaved / Semi-natural	A1.1.1	Damage	Transverse-snap	y	x	P. aur	x	x	x	x	9, 23, 28
Oak	Sessile oak	*Quercus petraea*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Bark-plate	y	N. noc	B. bar, P. aur	B. bar, P. pyg, P. aur	x	x	P. pip	36
Oak	Sessile oak	*Quercus petraea*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Knot-hole	y	x	x	x	x	M. nat	x	5, 22, 32, 40
Oak	Sessile oak	*Quercus petraea*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Wound	y	P. aur	M. nat	M. nat, P. pyg	x	x	P. pip, P. aur	35
Oak	Pedunculate oak	*Quercus robur*		A1.1.1	Decay	Squirrel-hole	y	x	M. bec	M. bec, M. nat, N. noc	M. bec, M. nat, N. noc, P. aur	M. bec, N. noc, P. aur	x	54
Olive	Ash	*Fraxinus excelsior*	Woodland / Broadleaved / Semi-natural	A1.1.1	Damage	Transverse-snap	y	x	x	x	x	P. pip	x	26
Olive	Ash	*Fraxinus excelsior*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Bark-plate	y	x	P. pip, P. aur	P. aur	x	x	x	37, 38
Olive	Ash	*Fraxinus excelsior*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Butt-rot	y	x	x	x	x	x	x	4
Olive	Ash	*Fraxinus excelsior*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Compression-fork	y	x	x	x	x	x	x	17
Olive	Ash	*Fraxinus excelsior*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Knot-hole	y	x	x	M. nat, N. noc, P. pyg, P. aur	M. dau	x	x	42
Olive	Ash	*Fraxinus excelsior*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Woodpecker hole	y	x	x	M. bec, N. noc	M. dau, N. noc	N. noc	x	34
Olive	Ash	*Fraxinus excelsior*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Wound	y	P. pyg, P. aur	M. dau, M. nat	M. bec, M. dau, M. nat	M. bec, M. dau, M. nat, N. noc, P. pyg, P. aur	M. dau, M. nat, P. aur	M. nat, P. pyg, P. aur	10, 39
Willow	Willow	*Willow sp.*	Woodland / Broadleaved / Semi-natural	A1.1.1	Damage	Hazard-beam	y	x	x	x	x	x	P. pip	15
Willow	Goat willow	*Salix caprea*	Woodland / Broadleaved / Semi-natural	A1.1.1	Damage	Transverse-snap	y	x	x	x	x	x	x	24
Willow	Goat willow	*Salix caprea*	Woodland / Broadleaved / Semi-natural	A1.1.1	Damage	Weld	y	x	x	x	x	x	x	13a, 13b
Willow	Goat willow	*Salix caprea*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Tear-out	y	P. aur	x	x	x	M. nat	x	7a
Willow	Goat willow	*Salix caprea*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Wound	y	x	M. nat	x	M. bec	x	M. nat	3, 6, 7b, 7c, 11, 14, 49

Study ID	Site ID	Equipment used	Full address	Transcriptionist ID (Initials or numbers if blind, leave blank if not blind)	Site name	Date	Time	Site ID	Site name	Site type	Site type other	Site ID	Site name	Site type	Site type other	Site ID	Site name	Site type	Site type other	Site ID	Site name	Site type	Site type other	Site ID	Site name	Site type	Site type other	Site ID	Site name	Site type	Site type other	Site ID	Site name	Site type	Site type other	Site ID	Site name	Site type	Site type other	Site ID	Site name	Site type	Site type other
A112	C112	tablet	N/A	N/A	Cricket Bay	Harbor Café	7	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	7	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	7	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	7	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	7	11	2012	atlantic-4ka	5QW0WQ0Y1
A113	C113	tablet	N/A	N/A	Cricket Bay	Harbor Café	8	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	8	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	8	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	8	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	8	11	2012	atlantic-4ka	5QW0WQ0Y1
A114	C114	tablet	N/A	N/A	Cricket Bay	Harbor Café	9	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	9	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	9	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	9	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	9	11	2012	atlantic-4ka	5QW0WQ0Y1
A115	C115	tablet	N/A	N/A	Cricket Bay	Harbor Café	10	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	10	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	10	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	10	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	10	11	2012	atlantic-4ka	5QW0WQ0Y1
A117	C117	tablet	N/A	N/A	Cricket Bay	Harbor Café	11	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	11	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	11	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	11	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	11	11	2012	atlantic-4ka	5QW0WQ0Y1
A118	C118	tablet	N/A	N/A	Cricket Bay	Harbor Café	12	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	12	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	12	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	12	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	12	11	2012	atlantic-4ka	5QW0WQ0Y1
A119	C119	tablet	N/A	N/A	Cricket Bay	Harbor Café	13	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	13	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	13	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	13	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	13	11	2012	atlantic-4ka	5QW0WQ0Y1
A120	C120	tablet	N/A	N/A	Cricket Bay	Harbor Café	14	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	14	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	14	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	14	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	14	11	2012	atlantic-4ka	5QW0WQ0Y1
A121	C121	tablet	Transcribed by Cricket Bay	N/A	Cricket Bay	Harbor Café	15	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	15	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	15	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	15	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	15	11	2012	atlantic-4ka	5QW0WQ0Y1
A122	C122	tablet	N/A	N/A	Cricket Bay	Harbor Café	16	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	16	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	16	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	16	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	16	11	2012	atlantic-4ka	5QW0WQ0Y1
A123	C123	tablet	N/A	N/A	Cricket Bay	Harbor Café	17	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	17	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	17	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	17	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	17	11	2012	atlantic-4ka	5QW0WQ0Y1
A124	C124	tablet	N/A	N/A	Cricket Bay	Harbor Café	18	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	18	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	18	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	18	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	18	11	2012	atlantic-4ka	5QW0WQ0Y1
A125	C125	tablet	N/A	N/A	Cricket Bay	Harbor Café	19	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	19	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	19	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	19	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	19	11	2012	atlantic-4ka	5QW0WQ0Y1
A126	C126	tablet	N/A	N/A	Cricket Bay	Harbor Café	20	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	20	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	20	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	20	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	20	11	2012	atlantic-4ka	5QW0WQ0Y1
A127	C127	tablet	N/A	N/A	Cricket Bay	Harbor Café	21	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	21	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	21	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	21	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	21	11	2012	atlantic-4ka	5QW0WQ0Y1
A128	C128	tablet	N/A	N/A	Cricket Bay	Harbor Café	22	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	22	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	22	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	22	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	22	11	2012	atlantic-4ka	5QW0WQ0Y1
A129	C129	tablet	N/A	N/A	Cricket Bay	Harbor Café	23	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	23	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	23	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	23	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	23	11	2012	atlantic-4ka	5QW0WQ0Y1
A130	C130	tablet	N/A	N/A	Cricket Bay	Harbor Café	24	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	24	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	24	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	24	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	24	11	2012	atlantic-4ka	5QW0WQ0Y1
A131	C131	tablet	N/A	N/A	Cricket Bay	Harbor Café	25	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	25	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	25	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	25	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	25	11	2012	atlantic-4ka	5QW0WQ0Y1
A132	C132	tablet	N/A	N/A	Cricket Bay	Harbor Café	26	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	26	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	26	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	26	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	26	11	2012	atlantic-4ka	5QW0WQ0Y1
A133	C133	tablet	N/A	N/A	Cricket Bay	Harbor Café	27	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	27	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	27	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	27	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	27	11	2012	atlantic-4ka	5QW0WQ0Y1
A134	C134	tablet	N/A	N/A	Cricket Bay	Harbor Café	28	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	28	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	28	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	28	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	28	11	2012	atlantic-4ka	5QW0WQ0Y1
A135	C135	tablet	N/A	N/A	Cricket Bay	Harbor Café	29	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	29	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	29	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	29	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	29	11	2012	atlantic-4ka	5QW0WQ0Y1
A136	C136	tablet	N/A	N/A	Cricket Bay	Harbor Café	30	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	30	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	30	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	30	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	30	11	2012	atlantic-4ka	5QW0WQ0Y1
A137	C137	tablet	N/A	N/A	Cricket Bay	Harbor Café	31	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	31	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	31	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	31	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	31	11	2012	atlantic-4ka	5QW0WQ0Y1
A138	C138	tablet	N/A	N/A	Cricket Bay	Harbor Café	32	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	32	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	32	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	32	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	32	11	2012	atlantic-4ka	5QW0WQ0Y1
A139	C139	tablet	N/A	N/A	Cricket Bay	Harbor Café	33	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	33	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	33	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	33	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	33	11	2012	atlantic-4ka	5QW0WQ0Y1
A140	C140	tablet	N/A	N/A	Cricket Bay	Harbor Café	34	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	34	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	34	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	34	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	34	11	2012	atlantic-4ka	5QW0WQ0Y1
A141	C141	tablet	N/A	N/A	Cricket Bay	Harbor Café	35	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	35	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	35	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	35	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	35	11	2012	atlantic-4ka	5QW0WQ0Y1
A142	C142	tablet	N/A	N/A	Cricket Bay	Harbor Café	36	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	36	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	36	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	36	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	36	11	2012	atlantic-4ka	5QW0WQ0Y1
A143	C143	tablet	N/A	N/A	Cricket Bay	Harbor Café	37	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	37	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	37	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	37	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	37	11	2012	atlantic-4ka	5QW0WQ0Y1
A144	C144	tablet	N/A	N/A	Cricket Bay	Harbor Café	38	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	38	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	38	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	38	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	38	11	2012	atlantic-4ka	5QW0WQ0Y1
A145	C145	tablet	N/A	N/A	Cricket Bay	Harbor Café	39	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	39	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	39	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	39	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	39	11	2012	atlantic-4ka	5QW0WQ0Y1
A146	C146	tablet	N/A	N/A	Cricket Bay	Harbor Café	40	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	40	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	40	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	40	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	40	11	2012	atlantic-4ka	5QW0WQ0Y1
A147	C147	tablet	N/A	N/A	Cricket Bay	Harbor Café	41	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	41	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	41	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	41	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	41	11	2012	atlantic-4ka	5QW0WQ0Y1
A148	C148	tablet	N/A	N/A	Cricket Bay	Harbor Café	42	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	42	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	42	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	42	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	42	11	2012	atlantic-4ka	5QW0WQ0Y1
A149	C149	tablet	N/A	N/A	Cricket Bay	Harbor Café	43	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	43	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	43	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	43	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	43	11	2012	atlantic-4ka	5QW0WQ0Y1
A150	C150	tablet	N/A	N/A	Cricket Bay	Harbor Café	44	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	atlantic-4ka	5QW0WQ0Y1	atlantic-4ka	Breakwater concrete seawall	A1.1.1	Sub	44	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	44	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	44	11	2012	atlantic-4ka	5QW0WQ0Y1	Cricket Bay	Harbor Café	44	11	2012	atlantic-4ka	5QW0WQ0Y1

velvet-coat	jacket(s)	green waistpoints to	great-pocket waistpocket to	turn-ed(s)	bit-of-stuffing	bit-of-leather / -skin	bit-of-wax	grey-sqr-stuff	grey-sqr-of-paper	grey-sqr-of-wax	dirt-mass / -derrine	dirt-mass-on	weaktrous / -weaktrous	weaktrous-on	Other (x: name present, if something is present, name it)	photo	Fra-Fra-order	Sound-Fra-order	Also present	Comments	Number of tuft	Where (x), below (b) or in-side (i) of extra-ear	Approximate dist-ance from extra-ear (cm)	Tuft Description	Tuft-hair	Tuft-[illegible]	Tuft-	Tuft-[illegible] / Number	DNA Result	TRF	TrefFiner: Tuft-hair release for materials / making jersey
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	y	Hany Anderes	Lac-Greyfur	N/A	Fraynod, silke-se-antenna-ne	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		no	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	y	Hany Anderes	Lac-Greyfur	N/A	Fraynod, silke-se-antenna-ne	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		no	N/A
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Hany Anderes	Lac-Greyfur	N/A	PRF	N/A	N/A	N/A	wit-wood	x	x	x	x		no	no
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Hany Anderes	Lac-Greyfur	N/A	PRF	N/A	N/A	N/A	wit-wood	x	x	x	x		no	no - rooting
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	y	Hany Anderes	Lac-Greyfur	N/A	dromedaries-silke-se-antenna-ne	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		no	N/A

Habitat parcel	Habitat type	Tree ref	Tree species	PRF ref	PRF type	Bat species predicted to be present	The predictive status of each bat species within the application site. 'P' = Present; 'RL' = "reasonable likelihood" of occurance; 'PO' = Potentially present	SEASON						Apex shape	Internal height (cm)	Internal width (cm)	Internal depth (cm)	Estimated internal volume (cm3) of PRF	Minimum internal volume (cm3) required for a maternity roost (BTHK 2018).	Is there sufficient space for a maternity colony to occupy the PRF	Are there sufficient grounds to warrant further survey
								Winter	Spring-flux	Pregnancy	Nursery	Mating	Autumn-flux								
N/A	Woodland / Broadleaved / Semi-natural	3	*Salix caprea*	3	wound	*Myotis bechsteinii*	no desk study	*n*	*n*	*n*	*y*	*n*	*n*	*spire*	*19*	*2*	*0*	*19.90*	1,189	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	3	*Salix caprea*	3	wound	*Myotis nattereri*	no desk study	n	y	n	n	n	y	*spire*	*19*	*2*	*0*	*19.90*		*Yes*	yes
N/A	Woodland / Broadleaved / Semi-natural	7c	*Salix caprea*	7c	wound	*Myotis bechsteinii*	no desk study	*n*	*n*	*n*	*y*	*n*	*n*	spire	46	7	10	*718*	1,189	*No*	yes
N/A	Woodland / Broadleaved / Semi-natural	7c	*Salix caprea*	7c	wound	*Myotis nattereri*	no desk study	n	y	n	n	n	y	spire	46	7	10	*718*		*Yes*	yes
N/A	Woodland / Broadleaved / Semi-natural	11	*Salix caprea*	11	wound	*Myotis bechsteinii*	no desk study	*n*	*n*	*n*	*y*	*n*	*n*	*spire*	12	6	0	*113*	1,189	*No*	yes
N/A	Woodland / Broadleaved / Semi-natural	11	*Salix caprea*	11	wound	*Myotis nattereri*	no desk study	n	y	n	n	n	y	*spire*	12	6	0	*113*		*Yes*	yes
N/A	Woodland / Broadleaved / Semi-natural	15	*Willow sp*	15	hazard beam	*Pipistrellus pipistrellus*	no desk study	n	n	n	n	n	y	peak/wedge	16	15	18	*3,825*	1007	*Yes*	no
N/A	Woodland / Broadleaved / Semi-natural	18a	*Alnus glutinosa*	18a	woodpecker hole	*Myotis daubentonii*	no desk study	n	n	y	y	n	n	dome	10	18	12	*5,598*	1,076	*Yes*	yes
N/A	Woodland / Broadleaved / Semi-natural	18b	*Alnus glutinosa*	18b	woodpecker hole	*Myotis daubentonii*	no desk study	n	n	y	y	n	n	dome	9	19	22	*8,789*	1,076	*Yes*	yes
N/A	Woodland / Broadleaved / Semi-natural	18c	*Alnus glutinosa*	*18c*	woodpecker hole	*Myotis daubentonii*	no desk study	n	n	y	y	n	n	flat	5	15	0	*884*	1,076	*No*	yes
N/A	Woodland / Broadleaved / Semi-natural	20	*Quercus petraea*	20	hazard beam	*Myotis daubentonii*	no desk study	n	y	n	n	n	n	peak/wedge	20	15	32	*5,850*	1,076	*Yes*	yes
N/A	Woodland / Broadleaved / Semi-natural	20	*Quercus petraea*	20	hazard beam	*Myotis nattereri*	no desk study	n	y	n	n	n	n	peak/wedge	20	15	32	*5,850*	912	*Yes*	yes
N/A	Woodland / Broadleaved / Semi-natural	20	*Quercus petraea*	20	hazard beam	*Nyctalus noctula*	no desk study	n	n	n	n	y	n	peak/wedge	20	15	32	*5,850*	1,059	*Yes*	yes
N/A	Woodland / Broadleaved / Semi-natural	20	*Quercus petraea*	20	hazard beam	*Pipistrellus pygmaeus*	no desk study	n	n	y	n	n	n	peak/wedge	20	15	32	*5,850*		*Yes*	yes
N/A	Woodland / Broadleaved / Semi-natural	20	*Quercus petraea*	20	hazard beam	*Plecotus auritus*	no desk study	n	n	n	y	n	n	peak/wedge	20	15	32	*5,850*	312	*Yes*	yes
N/A	Woodland / Broadleaved / Semi-natural	21	*Quercus petraea*	21	tear out	*Nyctalus noctula*	no desk study	n	n	n	n	**y**	**n**	spire	8	9	9	*360*	1,059	*No*	yes
N/A	Woodland / Broadleaved / Semi-natural	34	*Fraxinus excelsior*	34	woodpecker hole	*Myotis bechsteinii*	no desk study	n	n	y	n	n	n	no data	no data	26	12	*#REF!*	1,189	*#REF!*	yes
N/A	Woodland / Broadleaved / Semi-natural	34	*Fraxinus excelsior*	34	woodpecker hole	*Myotis daubentonii*	no desk study	n	n	n	y	n	n	no data	no data	26	12	*#REF!*	1,076	*#REF!*	yes
N/A	Woodland / Broadleaved / Semi-natural	34	*Fraxinus excelsior*	34	woodpecker hole	*Nyctalus noctula*	no desk study	n	n	n	y	y	n	no data	no data	26	12	*#REF!*	1,059	*#REF!*	yes
N/A	Woodland / Broadleaved / Semi-natural	41	*Alnus glutinosa*	41	*Bark plate*	*Pipistrellus pipistrellus*	no desk study	n	n	y	n	n	n	peak/wedge	0	14	0	*0*	1,007	*No*	yes
N/A	Woodland / Broadleaved / Semi-natural	43	*Alnus glutinosa*	43	wound	*Barbastellea barbastellus*	no desk study	n	n	n	n	y	n	spire	200	12	98	*min 11234.34*	979	*Yes*	yes
N/A	Woodland / Broadleaved / Semi-natural	43	*Alnus glutinosa*	43	wound	*Myotis daubentonii*	no desk study	n	n	y	n	y	n	spire	200	12	98	*min 11234.34*	1,076	*Yes*	yes
N/A	Woodland / Broadleaved / Semi-natural	43	*Alnus glutinosa*	43	wound	*Plecotus auritus*	no desk study	y	y	y	n	n	n	spire	200	12	98	*min 11234.34*	312	*Yes*	yes
N/A	Woodland / Broadleaved / Semi-natural	45	*Betula pubescens*	45	bark -plate	*Barbastellea barbastellus*	no desk study	n	n	n	n	y	n	peak/wedge	33	5	0	*max 647.95*	979	*Yes*	yes
N/A	Woodland / Broadleaved / Semi-natural	47	*Alnus glutinosa*	47	tear-out	*Myotis daubentonii*	no desk study	n	n	n	y	y	n	tube	33.5	5	0	*658*	1,076	*No*	yes
N/A	Woodland / Broadleaved / Semi-natural	47	*Alnus glutinosa*	47	tear-out	*Plecotus auritus*	no desk study	n	y	y	n	n	n	tube	33.5	5	0	*419*	312	*Yes*	yes
N/A	Woodland / Broadleaved / Semi-natural	48	*Betula pubescens*	48	Bark plate	*Barbastellea barbastellus*	no desk study	n	n	n	n	y	n	peak/wedge	29	3	0	*131*	979	*No*	yes
N/A	Woodland / Broadleaved / Semi-natural	49	*Salix caprea*	49	wound	*Myotis bechsteinii*	no desk study	*n*	*n*	*n*	*y*	*n*	*n*	peak/wedge	24	3	0	*108*	1,189	*No*	yes
N/A	Woodland / Broadleaved / Semi-natural	49	*Salix caprea*	49	wound	*Myotis nattereri*	no desk study	n	y	n	n	n	y	peak/wedge	24	3	0	*108*	912	*No*	yes
N/A	Woodland / Broadleaved / Semi-natural	51	*Alnus glutinosa*	51	woodpecker hole	*Myotis daubentonii*	no desk study	n	n	y	y	n	n	spire/chambered	28	15	48	*8,550*	1,076	*Yes*	yes
N/A	Woodland / Broadleaved / Semi-natural	52a	*Quercus petraea*	52a	lightning strike	*Barbastellea barbastellus*	no desk study	n	y	y	n	n	n	peak/wedge	57	6	0	*1,026*	979	*Yes*	yes
N/A	Woodland / Broadleaved / Semi-natural	52a	*Quercus petraea*	52a	lightning strike	*Myotis nattereri*	no desk study	n	y	y	n	n	n	peak/wedge	57	6	0	*1,026*	912	*Yes*	yes
N/A	Woodland / Broadleaved / Semi-natural	52a	*Quercus petraea*	52a	lightning strike	*Plecotus auritus*	no desk study	y	y	n	y	y	y	peak/wedge	57	6	0	*1,026*	312	*Yes*	yes
N/A	Woodland / Broadleaved / Semi-natural	52b	*Quercus petraea*	52b	lightning strike	*Barbastellea barbastellus*	no desk study	n	y	y	n	n	n	spire/chambered	64	3	0	*288*	979	*No*	yes
N/A	Woodland / Broadleaved / Semi-natural	52b	*Quercus petraea*	52b	lightning strike	*Myotis nattereri*	no desk study	n	y	y	n	n	n	spire/chambered	64	3	0	*288*	912	*No*	yes
N/A	Woodland / Broadleaved / Semi-natural	52b	*Quercus petraea*	52b	lightning strike	*Plecotus auritus*	no desk study	y	y	n	y	y	y	spire/chambered	64	3	0	*151*	312	*No*	yes
N/A	Woodland / Broadleaved / Semi-natural	53	*Betula pubescens*	53	wound	*Myotis nattereri*	no desk study	n	y	n	n	n	n	spire	8	3	0	*19*	912	*No*	yes
N/A	Woodland / Broadleaved / Semi-natural	53	*Betula pubescens*	53	wound	*Plecotus auritus*	no desk study	n	y	n	n	y	n	spire	8	3	0	*19*	312	*No*	yes
N/A	Woodland / Broadleaved / Semi-natural	54	Quercus robur	54	squirrel-hole	*Myotis bechsteinii*	no desk study	n	y	y	y	y	n	spire	46.5	12	25	*2,695*	1,189	*Yes*	yes
N/A	Woodland / Broadleaved / Semi-natural	54	Quercus robur	54	squirrel-hole	*Myotis nattereri*	no desk study	n	n	y	y	n	n	spire	46.5	12	25	*2,695*	912	*Yes*	yes
N/A	Woodland / Broadleaved / Semi-natural	54	Quercus robur	54	squirrel-hole	*Nyctalus noctula*	no desk study	n	n	y	y	y	n	spire	46.5	12	25	*2,695*	1,059	*Yes*	yes
N/A	Woodland / Broadleaved / Semi-natural	54	Quercus robur	54	squirrel-hole	*Plecotus auritus*	no desk study	n	n	n	y	y	n	spire	46.5	12	25	*2,695*	312	*Yes*	yes
N/A	Woodland / Broadleaved / Semi-natural	55	*Quercus petraea*	55	lightning strike	*Barbastellea barbastellus*	no desk study	n	y	y	n	n	n	chambered/spire	19	4	0	*152*	979	*No*	yes
N/A	Woodland / Broadleaved / Semi-natural	55	*Quercus petraea*	55	lightning strike	*Myotis nattereri*	no desk study	n	y	y	n	n	n	chambered/spire	19	4	0	*152*	912	*No*	yes
N/A	Woodland / Broadleaved / Semi-natural	55	*Quercus petraea*	55	lightning strike	*Plecotus auritus*	no desk study	y	y	n	y	y	y	chambered/spire	19	4	0	*152*	312	*No*	yes

Bat species (recorded in the BTHK database to date)	Minimum internal volume (cm3) required for a maternity roost (BTHK 2018).
Barbastelle	979
Bechstein's bat	1,189
Daubenton's bat	1,076
Whiskered bat	678
Natterer's bat	912
Noctule	1,059
Leisler's bat	1598
Nathusius' pipistrelle	#VALUE!
Common pipistrelle	1,007
Soprano pipistrelle	#VALUE!
Brown long-eared bat	312
Lesser horseshoe-bat	#VALUE!

Mr D Woodfield
Bioscan (UK) Ltd
The Old Parlour
Little Baldon Farm
Oxford
OX44 9PU

18th November 2022

Re: Results of a climb and inspect survey of trees at Cwm Glo for their potential to hold roosting bats – Campaign 2

Dear Mr. Woodfield,

In accordance with your instructions Lee Gwyther (NRW bat licence S089870/1) and I (NRW bat licence S091229/1) attended your site at Cwm Glo to perform a climb and inspect survey of 54 trees that were additional to 55 trees already assessed; these additional trees are hereafter referred to as the 'Campaign 2 trees'.

Following some prior work, the bulk of the Campaign 2 trees were ascended, inspected and recorded over four days; 10th & 11th and 15th & 16th November 2022. Inspections were performed using Ridgid CA350 endoscopes and torches as appropriate.

Features were assessed and recorded using the protocol set out within: -

BTHK 2018. *Bat Roosts in Trees: A guide to identification and assessment for tree-care and ecology professionals*. Pelagic Publishing, Exeter

Of the 55 trees: two that held roosting brown long-eared bats *Plecotus auritus* are outside your red line boundary; one has already been identified by you as a brown long-eared bat roost and was climbed only in order to collect detailed data; three were found to be dead and not safely accessible due to a lack of an adjacent living tree with an overhanging canopy; and, features on 23 trees were found to be either discontinuous or open and exposed and therefore did not offer a sheltered internal environment. This left 26 trees that offered Potential Roost Features that we judge to be superficially suitable to hold roosting bats. Of these 26 trees, one held an individual roosting Daubenton's bat *Myotis daubentonii*.

The data are provided in a free-standing Excel spreadsheet: -

AEcol & GT - PRF Data - Campaign 2 - Nov 2022

When you review the data, you will note that all the trees we could safely access you have comprehensive data. Some we could not safely ascend, and some it would have been irresponsible to ascend due to the risk of damaging the PRF; these are identified as red values. Those that were deemed unsuitable are identified with grey fill. For the remainder you will find that the final two columns tell you that it is a viable PRF, and give you a broad assessment of its potential to hold maternity or mating groups.

Photographs have been provided to you via wetransfer.com on 17th November 2022.

The data for each of the roost trees (both outside and inside the red line boundary) and all other PRF were processed through the BTHK predictive framework to provide a hypothesis of which bat species might occupy them, and when. The results are provided at Table 1.

Table 1. Predictive analysis results / Cwm Glo / Campaign 2.

TREE REF.	PRF type proven to be occupied in this habitat in **winter** period (Jan / Feb)	PRF type proven to be occupied in this habitat in **spring-flux** period (Mar / Apr)	PRF type proven to be occupied in this habitat in **pregnancy** period (May / Jun)	PRF type proven to be occupied in this habitat in **nursery** period (Jul / Aug)	PRF type proven to be occupied in this habitat in **mating** period (Sep / Oct)	PRF type proven to be occupied in this habitat in **autumn-flux** period (Nov / Dec)
CGx1	----	***M. nat***	----	***M. bec***	***P. aur***	***M. nat*** ***P. aur***
CGx2a	***P. aur***	----	----	----	***M. nat*** ***P. aur***	***P. aur***
CGx2b	----	***M. nat***	----	***M. bec***	***P. aur***	***M. nat*** ***P. aur***
CGx3	----	***M. nat***	----	***M. bec***	***P. aur***	***M. nat*** ***P. aur***
CGx4	----	***M. nat***	----	***M. bec***	***P. aur***	***M. nat*** ***P. aur***
CGx5	----	***M. nat***	----	***M. bec***	***P. aur***	***M. nat*** ***P. aur***
CGx8	----	----	----	----	***P. pip***	----
CGx11	***P. aur***	***M. nat***	***M. nat*** ***P. pyg***	----	----	***M. dau*** ***P. pip*** ***P. aur***
CGx15	----	***M. nat***	----	***M. bec***	***P. aur***	***M. nat*** ***P. aur***
CGx20	----	----	----	----	----	----
CGx24	***P. aur***	***M. nat***	***M. nat*** ***P. pyg***	----	----	***M. dau*** ***P. pip*** ***P. aur***
CGx27	----	***M. dau*** ***M. nat***	***P. pyg***	***P. aur***	***N. noc***	----
CGx28	----	----	----	----	----	----

TREE REF.	PRF type proven to be occupied in this habitat in **winter** period (Jan / Feb)	PRF type proven to be occupied in this habitat in **spring-flux** period (Mar / Apr)	PRF type proven to be occupied in this habitat in **pregnancy** period (May / Jun)	PRF type proven to be occupied in this habitat in **nursery** period (Jul / Aug)	PRF type proven to be occupied in this habitat in **mating** period (Sep / Oct)	PRF type proven to be occupied in this habitat in **autumn-flux** period (Nov / Dec)
CGx30	----	----	----	----	----	----
CGx32	----	----	----	----	----	----
CGx33a	----	----	----	----	***M. nat***	----
CGx33b	----	----	----	----	***M. nat***	----
CGx33c	----	----	----	----	***M. nat***	----
CGx34	***P. aur***	***P. aur***	***M. dau*** ***P. aur***	----	***B. bar*** ***M. dau***	----
CGx37	----	***P. aur***	***P. aur***	***M. dau***	***M. dau***	----
CGc38	----	----	***M. dau***	***M. dau***	----	----
CGx39	***P. aur***	***P. aur***	***M. dau*** ***P. aur***	----	***B. bar*** ***M. dau***	----
CGx40	----	----	----	----	----	----
CGx41a	***P. aur***	***M. nat***	***M. nat*** ***P. pyg***	----	----	***M. dau*** ***P. pip*** ***P. aur***
CGx41b	***P. aur***	***M. nat***	***M. nat*** ***P. pyg***	----	----	***M. dau*** ***P. pip*** ***P. aur***
CGx44a	***P. aur***	***P. aur***	***M. dau*** ***P. aur***	----	***B. bar*** ***M. dau***	----
CGx44b	----	----	----	----	----	----
CGx46	----	***P. aur***	----	----	----	----
CGx49	***P. aur***	***P. aur***	***M. dau*** ***P. aur***	----	***B. bar*** ***M. dau***	----
CGx50	----	----	----	----	----	----
CGx51	----	----	----	----	----	----
CGx53a	----	----	***M. dau***	***M. dau***	----	----
CGx53b	----	----	***M. dau***	***M. dau***	----	----
CGx54	----	***P. aur***	***P. aur***	***M. dau***	***M. dau***	----
CG Lake *P. aur* roost	***P. aur***	***M. nat***	***M. nat*** ***P. pyg***	*Bioscan own data suggest P. aur but there is no comparable data on BTHK Database*	----	***M. dau*** ***P. pip*** ***P. aur***

Key: ---- = No data to construct hypothesis (PRF does offer shelter but there is no comparative data on BTHK Database); Species abbreviations e.g., *M. nat* = *Myotis nattereri* Natterer's bat.

PRF in Campaign 2 may variously be exploited by eight species of bat, comprising: **1)** barbastelle; **2)** Bechstein's bat; **3)** Daubenton's bat; **4)** Natterer's bat; **5)** noctule; **6)** common pipistrelle; **7)** soprano pipistrelle; and, **8)** brown long-eared bat.

This letter concludes our survey and assessment and all Grounded Trees & AEcol commissions from Bioscan.

If you have any questions relating to our survey and assessment, you can contact me on 07896 013007.

Yours sincerely

Henry Andrews MSc CEcol MCIEEM MRSB

Parcel	Phase 1 code	Phase 1 habitat	Canopy height minimum (m)	Canopy height maximum (m)	Canopy tree species	dbh minimum (cm)	dbh maximum (cm)	abundance (DAFOR)
Hedges / Scattered trees	*J2.3*	*Other / Boundaries / hedge with trees*	*6*	*18*	*Quercus robur*	*49.2*	*159.1*	*D*

Insert a plan showing the different habitat parcels

Bat species inventory	Barbastelle	Bechstein's bat	Alcathoe's bat	Brandt's bat	Daubenton's bat	Whiskered bat	Natterer's bat	Leisler's bat	Noctule	Nathusius pipistrelle	Common pipistrelle	Soprano pipistrelle	Brown long-eared bat	Lesser horseshoe bat
Species present in county?	y	n	n	n	y	y	y	n	y	n	y	n	y	y
Site is within CSZ of off-site roost? (take from the results of the data search)														
Site is within CSZ of location bat species recorded 'in-flight'? (take from the results of the data search)														
Species historically recorded roosting on-site? (take from the results of the data search and any historic surveys)														

Insert a plan showing in-flight and roost records within range of the site

Family	Tree species	Scientific	Species recorded on site (y/n)	Maximum DBH present on site (cm)	Minimum DBH at which species is proven to form Decay PRF that are proven to be exploited by roosting bats	Trees within DBH range present on site (y/n)	Minimum DBH at which species is proven to form Damage PRF that are proven to be exploited by roosting bats	Trees within DBH range present on site (y/n)	Minimum DBH at which species is proven to form Association PRF that are proven to be exploited by roosting bats	Trees within DBH range present on site (y/n)
Alder	Common alder	*Alnus glutinosa*	y	45	15	y	31.2	y	N/A	n
Ash	Ash	*Fraxinus excelsior*	y	12	11.8	y	14.1	n	32.5	n
Ash	Manna ash	*Fraxinus ornus*			57.5	n	N/A	n	N/A	n
Beech	Sweet chestnut	*Castanea sativa*			37.4	n	32	n	N/A	n
Beech	Beech	*Fagus sylvatica*			11	n	15	n	66	n
Birch	Silver birch	*Betula pendula*			8	n	25.5	n	60	n
Birch	Downy birch	*Betula pubescens*			12	n	12.7	n	22.5	n
Birch	Hornbeam	*Carpinus betulus*			17	n	20	n	45	n
Elder	Elder	*Sambucus nigra*			N/A	n	N/A	n	N/A	n
Elm	Wych elm	*Ulmus glabra*			7.9	n	N/A	n	N/A	n
Elm	English elm	*Ulmus procera*			N/A	n	33	n	N/A	n
Hawthorn	Hawthorn	*Crataegus monogyna*			28	n	N/A	n	N/A	n
Hazel	Hazel	*Corylus avellana*			10.2	n	N/A	n	N/A	n
Holly	Holly	*Ilex aquifolium*			25.4	n	N/A	n	45	n
Horse chestnut	Horse chestnut	*Aesculus hippocastanum*			50	n	33	n	N/A	n
Juniper	Monterey cypress	*Cupressus macrocarpa*			N/A	n	73	n	N/A	n
Lime	Small-leaved lime	*Tilia cordata*			36	n	N/A	n	N/A	n
Lime	Large-leaved lime	*Tilia platyphyllos*			258.2	n	N/A	n	148.6	n
Lime	Lime	*Tilia x europaea*			120	n	78.1	n	N/A	n
Maple	Field maple	*Acer campestre*			6.4	n	N/A	n	N/A	n
Maple	Norway maple	*Acer platanoides*			16.5	n	N/A	n	N/A	n
Maple	Sycamore	*Acer pseudoplatanus*			6.2	n	23.5	n	N/A	n
Oak	Turkey oak	*Quercus cerris*			121.3	n	N/A	n	N/A	n
Oak	Sessile oak	*Quercus petraea*			15.3	n	8.6	n	N/A	n
Oak	Pedunculate oak	*Quercus robur*			13	n	20	n	78.1	n
Pine	Lebanon cedar	*Cedrus libani*			N/A	n	120	n	N/A	n
Pine	European larch	*Larix decidua*			N/A	n	90	n	N/A	n
Pine	Scot's pine	Pinus sylvestris			31.5	n	34	n	N/A	n
Plane	London plane	*Platanus x acerifolia*			100	n	N/A	n	N/A	n
Redwood	Wellingtonia	*Sequoiadendron gigante*			N/A	n	189	n	N/A	n
Rose	Apple	*Malus domestica*			27	n	N/A	n	N/A	n
Rose	Crab apple	*Malus sylvestris*			40	n	N/A	n	N/A	n
Rose	Wild cherry	*Prunus avium*			36.4	n	N/A	n	N/A	n
Rose	Rowan	*Sorbus aucuparia*			9.7	n	25	n	N/A	n
Willow	Grey poplar	*Populus x canadensis*			117.5	n	N/A	n	N/A	n

Willow	**White willow**	***Salix alba***			N/A	n	66	n	N/A	n
Willow	**Goat willow**	***Salix caprea***			19	n	N/A	n	N/A	n
Willow	**Grey willow**	***Salix cinerea***			32.1	n	N/A	n	N/A	n
Willow	**Crack willow**	***Salix fragilis***			54	n	27.5	n	N/A	n
Witch-hazel	**Sweetgum**	***Liquidambar styraciflua***			69	n	N/A	n	N/A	n
Yew	**Yew**	***Taxus baccata***			26.8	n	47	n	38.1	n

Family	Tree species	Scientific	DECAY PRF INVENTORY	PRF proven to form and be expoited by roosting bats on this tree species	PRF proven to be exploited by bats in semi-natural woodland habitats	PRF proven to be exploited by bats in plantation	PRF proven to be exploited by bats in orchards	PRF proven to be exploited by bats in hedge or tree-line habitats	PRF proven to be exploited by bats in shelter-belts	PRF proven to be exploited by bats in riparian fringe	PRF proven to be exploited by bats in parkland / scattered trees	PRF proven to be exploited by bats in churchyards or gardens	Barbastelle	Bechstein's bat	Alcathoe's bat	Brandt's bat	Daubenton's bat	Whiskered bat	Natterer's bat	Leisler's bat	Noctule	Nathusius' pipistrelle	Common pipistrelle	Soprano pipistrelle	Brown long-eared bat	Lesser horseshoe-bat
Alder	Common alder	*Alnus glutinosa*	Woodpecker-holes	Woodpecker-holes	y	n	n	y	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n
Alder	Common alder	*Alnus glutinosa*	Tear-outs	Tear-outs	y	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	y	n
Alder	Common alder	*Alnus glutinosa*	Wounds	Wounds	y	n	n	y	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	y	n
Alder	Common alder	*Alnus glutinosa*	Butt-rott	Butt-rotts	y	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	y	n
Ash	Ash	*Fraxinus excelsior*	Woodpecker-holes	Woodpecker-holes	y	n	n	y	n	n	y	n	n	y	n	n	y	n	y	n	y	n	n	n	n	n
Ash	Ash	*Fraxinus excelsior*	Squirrel-holes	Squirrel-holes	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n
Ash	Ash	*Fraxinus excelsior*	Knot-holes	Knot-holes	y	n	n	n	n	n	n	n	n	n	n	n	y	n	y	n	y	n	n	y	y	n
Ash	Ash	*Fraxinus excelsior*	Pruning-cuts	Pruning-cuts	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n
Ash	Ash	*Fraxinus excelsior*	Tear-outs	Tear-outs	y	n	n	n	n	n	y	n	n	n	n	n	y	n	y	n	y	n	y	y	n	n
Ash	Ash	*Fraxinus excelsior*	Butt-rots	Butt-rots	y	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n
Ash	Ash	*Fraxinus excelsior*	Wounds	Wounds	y	n	n	y	n	y	n	n	n	y	n	n	y	n	y	y	y	n	n	y	y	n
Ash	Ash	*Fraxinus excelsior*	Cankers	Cankers	y	n	n	n	n	n	n	n	n	n	n	n	y	n	y	n	n	n	n	y	y	n
Ash	Manna ash	*Fraxinus ornus*	Woodpecker-holes	Woodpecker-holes	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ash	Manna ash	*Fraxinus ornus*	Knot-holes	Knot-holes	n	n	n	n	n	n	y	n	n	y	n	n	n	n	y	n	n	n	n	n	n	n
Beech	Beech	*Fagus sylvatica*	Knot-holes	Knot-holes	n	n	n	n	n	n	y	n	n	n	n	n	y	n	y	y	n	n	n	n	n	n
Beech	Beech	*Fagus sylvatica*	Tear-outs	Tear-outs	y	n	n	n	n	n	n	n	n	n	n	n	y	n	y	n	y	n	y	y	n	n
Beech	Beech	*Fagus sylvatica*	Cankers	Cankers	y	n	n	y	n	n	y	n	n	n	n	n	y	n	n	n	n	n	n	n	y	n
Beech	Beech	*Fagus sylvatica*	Compression-forks	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Beech	Beech	*Fagus sylvatica*	Butt-rots	Butt-rots	y	n	n	n	n	n	y	n	n	n	n	n	y	n	n	n	n	n	y	n	y	n
Beech	Beech	*Fagus sylvatica*	Wounds	Wounds	y	y	n	n	n	n	y	n	n	n	n	n	y	n	y	y	y	n	y	n	y	n
Beech	Sweet chestnut	*Castanea sativa*	Jim-gems	Jim-gems	y	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n
Beech	Sweet chestnut	*Castanea sativa*	Knot-holes	Knot-holes	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n
Beech	Sweet chestnut	*Castanea sativa*	Wounds	Wounds	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	y	n
Birch	Downy birch	*Betula pubescens*	Tear-outs	Tear-outs	y	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	y	n
Birch	Downy birch	*Betula pubescens*	Knot-holes	Knot-holes	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n
Birch	Downy birch	*Betula pubescens*	Wounds	Wounds	y	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	y	n
Birch	Hornbeam	*Carpinus betulus*	Wounds	Wounds	y	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	y	n	y	n
Birch	Silver birch	*Betula pendula*	Woodpecker-holes	Woodpecker-holes	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n
Birch	Silver birch	*Betula pendula*	Cankers	Cankers	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n
Birch	Silver birch	*Betula pendula*	Tear-outs	Tear-outs	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n
Birch	Silver birch	*Betula pendula*	Knot-holes	Knot-holes	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n
Birch	Silver birch	*Betula pendula*	Wounds	Wounds	y	y	n	n	n	n	n	n	n	n	n	n	n	n	y	n	y	n	y	y	y	n
Elder	Elder	*Sambucus nigra*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Elm	Wych elm	*Ulmus glabra*	Wounds	Wounds	y	n	n	y	n	n	n	n	n	n	n	n	n	n	y	n	n	n	y	n	y	n
Hawthorn	Hawthorn	*Crataegus monogyna*	Wounds	Wounds	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n
Hazel	Hazel	*Corylus avellana*	Wounds	Wounds	y	n	n	n	n	n	y	n	n	n	n	n	n	n	y	n	n	n	n	n	y	n
Holly	Holly	*Ilex aquifolium*	Tear-outs	Tear-outs	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n
Holly	Holly	*Ilex aquifolium*	Wounds	Wounds	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	y	n
Holly	Holly	*Ilex aquifolium*	Cankers	Cankers	y	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n
Horse chestnut	Horse chestnut	*Aesculus hippocastanum*	Cankers	Cankers	y	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n
Horse chestnut	Horse chestnut	*Aesculus hippocastanum*	Tear-outs	Tear-outs	n	n	n	n	n	n	y	y	n	y	n	n	n	n	n	n	n	n	n	n	n	n
Juniper	Monterey cypress	*Cupressus macrocarpa*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lime	Small-leaved lime	*Tilia cordata*	Knot-holes	Knot-holes	y	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n
Lime	Large-leaved lime	*Tilia platyphyllos*	Butt-rots	Butt-rots	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y
Lime	Lime	*Tilia x europaea*	Knot-holes	Knot-holes	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n
Maple	Field maple	*Acer campestre*	Tear-outs	Tear-outs	y	n	n	n	n	n	n	n	n	y	n	n	y	n	y	n	n	n	n	n	n	n
Maple	Field maple	*Acer campestre*	Knot-holes	Knot-holes	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	y	y	n
Maple	Field maple	*Acer campestre*	Wounds	Wounds	y	n	n	n	n	n	n	n	y	y	n	n	y	n	y	n	n	n	y	y	y	n
Maple	Norway maple	*Acer platanoides*	Knot-holes	Knot-holes	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n
Maple	Norway maple	*Acer platanoides*	Wounds	Wounds	y	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n
Maple	Sycamore	*Acer pseudoplatanus*	Knot-holes	Knot-holes	y	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	y	n	n	n
Maple	Sycamore	*Acer pseudoplatanus*	Tear-outs	Tear-outs	y	y	n	n	n	n	y	n	n	n	n	n	y	n	y	n	n	n	n	y	y	n
Maple	Sycamore	*Acer pseudoplatanus*	Wounds	Wounds	y	y	n	n	n	n	n	n	y	n	n	n	y	n	y	n	y	n	y	y	y	n
Maple	Sycamore	*Acer pseudoplatanus*	Cankers	Cankers	y	n	n	n	n	n	n	n	n	n	n	n	y	n	y	y	n	n	y	n	y	n
Maple	Sycamore	*Acer pseudoplatanus*	Butt-rotts	Butt-rotts	y	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n
Oak	Pedunculate oak	*Quercus robur*	Woodpecker-holes	Woodpecker-holes	y	n	n	y	n	n	y	n	n	y	n	n	n	n	y	y	y	n	n	n	y	n
Oak	Pedunculate oak	*Quercus robur*	Squirrel-holes	Squirrel-holes	y	n	n	n	n	n	y	n	n	n	n	n	y	n	y	n	n	n	n	n	n	n
Oak	Pedunculate oak	*Quercus robur*	Knot-holes	Knot-holes	y	n	n	y	n	n	y	n	n	y	n	n	y	n	y	n	y	n	y	y	y	n
Oak	Pedunculate oak	*Quercus robur*	Pruning-cuts	Pruning-cuts	y	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	y	y	y	n	n	n
Oak	Pedunculate oak	*Quercus robur*	Tear-outs	Tear-outs	y	n	n	y	n	n	y	n	n	y	n	n	y	n	y	n	y	n	y	y	y	n
Oak	Pedunculate oak	*Quercus robur*	Wounds	Wounds	y	y	n	n	n	n	y	n	n	y	n	n	y	n	y	n	y	y	y	y	y	n
Oak	Sessile oak	*Quercus petraea*	Woodpecker-holes	Woodpecker-holes	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n
Oak	Sessile oak	*Quercus petraea*	Squirrel-holes	Squirrel-holes	y	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	y	n
Oak	Sessile oak	*Quercus petraea*	Knot-holes	Knot-holes	y	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n
Oak	Sessile oak	*Quercus petraea*	Compression-forks	Compression-forks	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n
Oak	Sessile oak	*Quercus petraea*	Tear-outs	Tear-outs	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n
Oak	Sessile oak	*Quercus petraea*	Wounds	Wounds	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	y	y	n
Oak	Turkey oak	*Quercus cerris*	Butt-rots	Butt-rots	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y
Pine	European larch	*Larix decidua*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pine	Lebanon cedar	*Cedrus libani*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pine	Scot's pine	*Pinus sylvestris*	Wounds	Wounds	y	y	n	n	n	n	n	n	n	n	n	n	y	n	y	n	y	n	n	n	y	n
Plane	London plane	*Platanus x acerifolia*	Butt-rots	Butt-rots	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y
Plane	London plane	*Platanus x acerifolia*	Wounds	Wounds	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n
Redwood	Wellingtonia	*Sequoiadendron gigante*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rose	Apple	*Malus domestica*	Woodpecker-holes	Woodpecker-holes	n	y	y	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n
Rose	Apple	*Malus domestica*	Knot-holes	Knot-holes	n	y	y	n	n	n	n	n	n	y	n	n	y	n	y	n	n	n	n	n	n	n
Rose	Apple	*Malus domestica*	Wounds	Wounds	n	y	y	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n
Rose	Crab apple	*Malus sylvestris*	Wounds	Wounds	y	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n
Rose	Rowan	*Sorbus aucuparia*	Wounds	Wounds	y	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	y	n
Rose	Wild cherry	*Prunus avium*	Cankers	Cankers	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n
Rose	Wild cherry	*Prunus avium*	Tear-outs	Tear-outs	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n
Willow	Crack willow	*Salix fragilis*	Woodpecker-holes	Woodpecker-holes	n	n	n	y	n	y	n	n	n	y	n	n	y	n	n	n	n	n	n	n	n	n
Willow	Crack willow	*Salix fragilis*	Tear-outs	Tear-outs	n	n	n	y	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n
Willow	Crack willow	*Salix fragilis*	Knot-holes	Knot-holes	n	y	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n
Willow	Crack willow	*Salix fragilis*	Wounds	Wounds	y	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n
Willow	Goat willow	*Salix caprea*	Woodpecker-holes	Woodpecker-holes	y	n	n	y	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n
Willow	Goat willow	*Salix caprea*	Tear-outs	Tear-outs	y	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	y	n
Willow	Goat willow	*Salix caprea*	Wounds	Wounds	y	n	n	y	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n
Willow	Hybrid black poplar	*Populus x canadensis*	Woodpecker-holes	Woodpecker-holes	n	n	n	y	y	n	n	n	n	n	n	n	y	n	n	n	n	n	n	y	n	n
Willow	Hybrid black poplar	*Populus x canadensis*	Knot-holes	Knot-holes	n	n	n	y	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Willow	Grey willow	*Salix cinerea*	Wound	Wound	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	y	n	n
Willow	White willow	*Salix alba*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Witch-hazel	Sweetgum	*Liquidambar styraciflua*	Tear-outs	Tear-outs	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n
Yew	Yew	*Taxus baccata*	Compression-forks	Compression-forks	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n
Yew	Yew	*Taxus baccata*	Tear-outs	Tear-outs	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n
Yew	Yew	*Taxus baccata*	Wounds	Wounds	y	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	y	n

Family	Tree species	Scientific	Damage PRF INVENTORY	PRF proven to form and be expoited by roosting bats on this tree species	PRF proven to be exploited by bats in semi-natural woodland habitats	PRF proven to be exploited by bats in plantation	PRF proven to be exploited by bats in orchards	PRF proven to be exploited by bats in hedge or tree-line habitats	PRF proven to be exploited by bats in shelter-belts	PRF proven to be exploited by bats in riparian fringe	PRF proven to be exploited by bats in parkland / scattered trees	PRF proven to be exploited by bats in churchyards or gardens	Barbastelle	Bechstein's bat	Alcathoe's bat	Brandt's bat	Daubenton's bat	Whiskered bat	Natterer's bat	Leisler's bat	Noctule	Nathusius' pipistrelle	Common pipistrelle	Soprano pipistrelle	Brown long-eared bat	Lesser horseshoe-bat
Ash	**Ash**	***Fraxinus excelsior***	Hazard-beams	**Hazard-beam**	y	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	y	n	y	y	n	n
Ash	**Ash**	***Fraxinus excelsior***	Subsidence-cracks	**Subsidence-crack**	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	y	n
Ash	**Ash**	***Fraxinus excelsior***	Transverse-snaps	**Transverse-snap**	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n
Ash	**Ash**	***Fraxinus excelsior***	Bark-plates	**Bark-plate**	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	y	n

Family	Tree species	Scientific	ASSOCIATION PRF INVENTORY	PRF proven to form and be expoited by roosting bats on this tree species	PRF proven to be exploited by bats in semi-natural woodland habitats	PRF proven to be exploited by bats in plantation	PRF proven to be exploited by bats in orchards	PRF proven to be exploited by bats in hedge or tree-line habitats	PRF proven to be exploited by bats in shelter-belts	PRF proven to be exploited by bats in riparian fringe	PRF proven to be exploited by bats in parkland	PRF proven to be exploited by bats in churchyards or gardens	Barbastelle	Bechstein's bat	Alcathoe's bat	Brandt's bat	Daubenton's bat	Whiskered bat	Natterer's bat	Leisler's bat	Noctule	Nathusius' pipistrelle	Common pipistrelle	Soprano pipistrelle	Brown long-eared bat	Lesser horseshoe-bat
Alder	Common alder	*Alnus glutinosa*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ash	Ash	*Fraxinus excelsior*	Ivy	Ivy	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Ash	Manna ash	*Fraxinus ornus*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Beech	Beech	*Fagus sylvatica*	Fluting	Fluting	y	y	n	n	n	n	y	n	n	n	n	y	y	y	y	n	n	y	y	y	y	n
Beech	Sweet chestnut	*Castanea sativa*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Birch	Downy birch	*Betula pubescens*	Fluting	Fluting	y	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	y	n
Birch	Hornbeam	*Carpinus betulus*	Fluting	Fluting	y	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	y	n
Birch	Silver birch	*Betula pendula*	Fluting	Fluting	y	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n
Elder	Elder	*Sambucus nigra*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Elm	Wych elm	*Ulmus glabra*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hawthorn	Hawthorn	*Crataegus monogyna*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hazel	Hazel	*Corylus avellana*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Holly	Holly	*Ilex aquifolium*	Fluting	Fluting	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n
Horse chestnut	Hose chestnut	*Aesculus hippocastanum*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Juniper	Monterey cypress	*Cupressus macrocarpa*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lime	Large-leaved lime	*Tilia platyphyllos*	Ivy	Ivy	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Lime	Lime	*Tilia x europaea*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Maple	Field maple	*Acer campestre*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Maple	Norway maple	*Acer platanoides*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Maple	Sycamore	*Acer pseudoplatanus*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Oak	Pedunculate oak	*Quercus robur*	Ivy	Ivy	y	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n
Oak	Sessile oak	*Quercus petraea*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Oak	Turkey oak	*Quercus cerris*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pine	European larch	*Larix decidua*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pine	Lebanon cedar	*Cedrus libani*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pine	Scot's pine	*Pinus sylvestris*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Plane	London plane	*Platanus x acerifolia*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Redwood	Wellingtonia	*Sequoiadendron gigante*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rose	Apple	*Malus domestica*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rose	Crab apple	*Malus sylvestris*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rose	Rowan	*Sorbus aucuparia*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rose	Wild cherry	*Prunus avium*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Willow	Crack willow	*Salix fragilis*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Willow	Goat willow	*Salix caprea*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Willow	Hybris black poplar	*Populus x canadensis*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Willow	Grey willow	*Salix cinerea*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Willow	White willow	*Salix alba*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Witch-hazel	Sweetgum	*Liquidambar styraciflua*	None	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Yew	Yew	*Taxus baccata*	Fluting	Fluting	y	n	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	y	y	y	n

Bat species proven to occur in [County]		Bat species present in [County] that are proven to exploit PRF potentially present in the context of the site (this list is those that for which there is sufficient evidence to suggest might 'potentially' occur i.e. the habitat is correct and they occur in the county)		Bat species recorded within range of the site (this list is those for which there is sufficient evidence to suggest a *"reasonable likelihood"* of occurance i.e. the habitat is correct, the species occurs in the county <u>and</u> there is a record of their presence within their respective CSZ)		Bat species that readily take to artificial bat boxes	Transitory capacity (y/n)	Maternity capacity (y/n)	Winter capacity (y/n)
Barbastelle	y	**Barbastelle**	y	**Barbastelle**	y	Barbastelle	y*	n	n
Bechstein's bat	n	**Bechstein's bat**	y	**Bechstein's bat**	n	Bechstein's bat	y*	y*	n
Alcathoe's bat	n	**Alcathoe's bat**		**Alcathoe's bat**		Alcathoe's bat	n	n	n
Brandt's bat	n	**Brandt's bat**		**Brandt's bat**		Brandt's bat	y*	n	n
Daubenton's bat	y	**Daubenton's bat**		**Daubenton's bat**		Daubenton's bat	y*	y*	n
Whiskered bat	y	**Whiskered bat**		**Whiskered bat**		Whiskered bat	y*	n	n
Natterer' s bat	y	**Natterer' s bat**		**Natterer' s bat**		Natterer' s bat	y*	y*	n
Leisler's bat	n	**Leisler's bat**		**Leisler's bat**		Leisler's bat	y*	n	y*
Noctule	y	**Noctule**		**Noctule**		Noctule	y*	y*	y*
Nathusius' pipistrelle	n	**Nathusius' pipistrelle**		**Nathusius' pipistrelle**		Nathusius' pipistrelle	y*	y*	y*
Common pipistrelle	y	**Common pipistrelle**		**Common pipistrelle**		Common pipistrelle	y*	n	y*
Soprano pipistrelle	n	**Soprano pipistrelle**		**Soprano pipistrelle**		Soprano pipistrelle	y*	y*	y*
Brown long-eared bat	y	**Brown long-eared bat**		**Brown long-eared bat**		Brown long-eared bat	y*	y*	y*
Lesser horseshoe-bat	y	**Lesser horseshoe-bat**		**Lesser horseshoe-bat**		Lesser horseshoe-bat	n	n	n

*Korsten E 2012. Vleermuiskasten: Overzicht van toepassing, gebruik en succesfacoren. Zoogdier Vereniging, Bureau

Tree ref	PRF ID	Grid reference	Species	Alive/dead	Stem/limb	Tree height (m)	PRF height (m)	Facing	Form	Enlarged	DBH (cm)	photo	First Recorder	Second Recorder	Also present	Comments	TAG
CGx1	x1	SO 04681 05142	*Salix caprea*	alive	stem	6	1.7	NNE	wound	y	30.2	y	Lee Gwyther	N/A	N/A		N/A
CGx2	x2	SO 04672 05145	*Salix caprea*	alive	stem	8	1.75	SSW	tear-out	n	27	y	Lee Gwyther	N/A	N/A		N/A
CGx3	x3	SO0477104853	*Salix caprea*	alive	stem	10	7.29	NE	wound	n	35.8	y	Lee Gwyther	N/A	N/A		N/A
CG4x	x4	SO0477104858	*Salix caprea*	alive	stem	10	6.66	WSW	wound	n	29.5	y	Lee Gwyther	N/A	N/A		N/A
CG5x	x5	SO0477304832	*Salix caprea*	alive	stem	10	2.13	S	wound	n	24.8	y	Lee Gwyther	N/A	N/A		N/A
CG6x	x6	SO0476604794	*Salix caprea*	alive	stem	9	3.05	ESE	transverse-snap	n	23.9	y	Lee Gwyther	N/A	N/A		N/A
CGx7	x7	SO0481604829	*Salix caprea*	alive	stem	9	7.6	SSE	wound	n	80.1	y	Lee Gwyther	N/A	N/A		N/A
CGx8	x8	SO0481504522	*Fraxinus excelsior*	alive	stem	7	1.28	SSE & NNW	transverse-snap	n	13.6	y	Lee Gwyther	N/A	N/A		N/A
CGx9	x9	SO0484604510	*Quercus petraea*	alive	stem	10	1.26	SSW	wound	n	87.7	y	Lee Gwyther	N/A	N/A		N/A
CGx10	x10	SO0484004528	*Quercus petraea*	alive	limb	11	8.1	W & E	bark-plates	n	77.4	y	Lee Gwyther	N/A	N/A		N/A
CGx11	x11	SO0484704530	*Quercus petraea*	alive	stem	10	0.5	NW	wound	n	58.1	y	Lee Gwyther	N/A	N/A		N/A
CGx12	x12	SO0482904599	*Alnus glutinosa*	alive	stem	10	7.2	NE	knot-hole	n	73.2	y	Lee Gwyther	N/A	N/A		N/A
CGx13	x13	SO0483804584	*Alnus glutinosa*	alive	stem	10	7.8	W	knot-hole	n	61.2	y	Lee Gwyther	N/A	N/A		N/A
CGx14	x14	SO0482604550	*Salix caprea*	alive	limb	7	5.88	SSW	hazard-beam	n	41.5	y	Lee Gwyther	N/A	N/A		N/A
CGx15	x15	SO0493304455	*Salix caprea*	alive	stem	9	3.1	ENE	wound	n	55.6	y	Lee Gwyther	N/A	N/A		N/A
CGx16	x16	SO0482204458	*Quercus petraea*	alive	limb	12	8.3	ESE	tear-out	n	53.9	y	Lee Gwyther	N/A	N/A		N/A
CGx17	x17	SO0484104417	*Alnus glutinosa*	alive	stem	4	3.1	W	transverse-snap	n	22	y	Lee Gwyther	N/A	N/A		N/A
CGx18	x18	SO0485604419	*Salix caprea*	alive	stem	9	7	NNW & SSE	hazard-beam	n	19.8	y	Lee Gwyther	N/A	N/A		N/A
CGx19	x19	SO0483604414	*Alnus glutinosa*	alive	stem	11	2.46	SSW	knot-hole	n	28.9	y	Lee Gwyther	N/A	N/A		N/A
CGx20	x20	SO0478904452	*Alnus glutinosa*	alive	stem	9	2.75	SSE	knot-hole	y	49.2	y	Lee Gwyther	N/A	N/A		N/A
CGx21	x21	SO0481804459	*Fraxinus excelsior*	alive	limb	14	8.5	E	wound	n	80.4	y	Lee Gwyther	N/A	N/A		N/A
CGx22	x22	SO0478804464	*Alnus glutinosa*	alive	stem	9	4.2	N	tear-out	n	26.7	y	Lee Gwyther	N/A	N/A		N/A
CGx23	x23	SO0471304423	*Fraxinus excelsior*	alive	stem	9	8.11	E	transverse-snap	n	80.3	y	Lee Gwyther	N/A	N/A		N/A
CGx24	x24	SO0467604438	*Quercus petraea*	alive	limb	7	5.56	E	wound	n	49.2	y	Lee Gwyther	N/A	N/A		N/A
CGx25	x25	SO0467604427	*Quercus petraea*	alive	limb	9	7.56	ENE	transverse-snap	n	80.4	y	Lee Gwyther	N/A	N/A		N/A
CGx26	x26	SO0466504426	*Quercus petraea*	alive	stem	10	6.22	E	knot-hole	n	69.5	y	Lee Gwyther	N/A	N/A		N/A
CGx27	x27	SO0468404443	*Quercus petraea*	alive	limb	11	4.36	ESE & WNW	hazard-beam	n	77	y	Lee Gwyther	N/A	N/A		N/A
CGx28	x28	SO0470204468	*Crateagus monogyna*	dead	stem	7	2.8	NW	flute	n	37	y	Lee Gwyther	N/A	N/A		N/A
CGx29	x29	SO0472004476	*Alnus glutinosa*	dead	stem	6	5.1	NNW	woodpecker-hole	y	45.9	y	Lee Gwyther	N/A	N/A		N/A
CGx30	x30	SO0472904503	*Crateagus monogyna*	dead	stem	6	1.44	SW	lightning-strike	n	19.5	y	Lee Gwyther	N/A	N/A		N/A
CGx31	x31	SO0477404487	*Quercus petraea*	alive	stem	9	various	various	tear-out	n	65.6	y	Lee Gwyther	N/A	N/A		N/A
CGx32	x32	SO0476604437	*Betula pubescens*	alive	stem	7	1.9	S	tear-out	n	27	y	Lee Gwyther	N/A	N/A		N/A
CGx33	x33a	SO0477904505	*Quercus petraea*	alive	limb	11	2.88	WSW	knot-hole	y	63.2	y	Lee Gwyther	N/A	N/A		N/A
CGx33	x33b	SO0477904505	*Quercus petraea*	alive	limb	11	2.68	WSW	knot-hole	y	63.2	y	Lee Gwyther	N/A	N/A		N/A
CGx33	x33c	SO0477904505	*Quercus petraea*	alive	limb	11	2.68	WSW	knot-hole	y	63.2	y	Lee Gwyther	N/A	N/A		N/A
CGx34	x34	SO0477204510	*Alnus glutinosa*	alive	limb	8	3.19	SSE	wound	n	36.2	y	Lee Gwyther	N/A	N/A		N/A
CGx35	x35	SO0478704518	*Quercus petraea*	alive	limb	8	various	various	tear-out	n	46.3	y	Lee Gwyther	N/A	N/A		N/A
CGx36	x36	SO0478004590	*Alnus glutinosa*	alive	limb	13	6	SSE	woodpecker-hole	y	69.5	y	Lee Gwyther	N/A	N/A		N/A
CGx37	x37	SO0475404559	*Alnus glutinosa*	alive	stem	9	2.9	ESE	tear-out	n	44.4	y	Lee Gwyther	N/A	N/A		N/A
CGx38	x38	SO0476104562	*Alnus glutinosa*	dead	stem	8	4.06	WSW	woodpecker-hole	n	44.5	y	Lee Gwyther	N/A	N/A		N/A
CGx39	x39	SO0470604517	*Alnus glutinosa*	alive	stem	9	2.57	NE	wound	n	38.3	y	Lee Gwyther	N/A	N/A		N/A
CGx40	x40	SO0458504576	*Alnus glutinosa*	alive	stem	11	2.06	WSW & ESE	hazard-beam	n	15.2	y	Lee Gwyther	N/A	N/A		N/A
CGx41	x41a	SO0459404589	*Quercus petraea*	alive	stem	7	3.15	NNE	wound	n	18.1	y	Lee Gwyther	N/A	N/A		N/A
CGx41	x41b	SO0459404589	*Quercus petraea*	alive	stem	7	2.43	SW	wound	n	18.1	y	Lee Gwyther	N/A	N/A		N/A
CGx42	x42	SO0460104587	*Quercus petraea*	alive	limb	10	2.31	W	tear-out	n	67.2	y	Lee Gwyther	N/A	N/A		N/A
CGx43	x43	SO0458304485	*Quercus petraea*	alive	limb	10	5.62	E & W	hazard-beam	n	71.2	y	Lee Gwyther	N/A	N/A		N/A
CGx44	x44a	SO0457604490	*Alnus glutinosa*	alive	stem	11	1.14	SSE	woumd	n	25.2	y	Lee Gwyther	N/A	N/A		N/A
CGx44	x44b	SO0457604490	*Alnus glutinosa*	alive	stem	11	0.73	SSE	butt-rot	n	25.2	y	Lee Gwyther	N/A	N/A		N/A
CGx45	x45	SO0471904954	*Quercus petraea*	alive	stem	11	3.33	ENE	knot-hole	n	96	y	Lee Gwyther	N/A	N/A		N/A
CGx46	x46	SO0471104984	*Quercus petraea*	alive	stem	13	4.31	SSE	transverse-snap	n	60.3	y	Lee Gwyther	N/A	N/A		N/A
CGx47	x47	SO0455404663	*Betula pubescens*	dead	stem	6	5	E	woodpecker-hole	y	32	y	Lee Gwyther	N/A	N/A		N/A
CGx48	x48	SO0458304719	*Betula pubescens*	alive	stem	11	3.21	ENE	knot-hole	n	47.3	y	Lee Gwyther	N/A	N/A		N/A
CGx49	x49	SO0457804565	*Alnus glutinosa*	alive	stem	9	1.98	WNW	wound	n	27.4	y	Lee Gwyther	N/A	N/A		N/A
CGx50	x50	SO0455804599	*Alnus glutinosa*	alive	stem	16	1.34	multiple	butt-rot	n	57.4	y	Lee Gwyther	N/A	N/A		N/A
CGx51	x51	SO0455004601	*Alnus glutinosa*	alive	stem	12	2.37	WSW	squirrel-hole	y	39.4	y	Lee Gwyther	N/A	N/A		N/A
CGx52	x52	SO0454804562	*Quercus petraea*	alive	limb	13	4.12	NNE	wound	n	74.3	y	Lee Gwyther	N/A	N/A		N/A
CGx53	x53a	SO0472404432	*Alnus glutinosa*	alive	stem	15	3.18	ENE	woodpecker-hole	n	47.1	y	Lee Gwyther	N/A	N/A		N/A
CGx53	x53b	SO0472404432	*Alnus glutinosa*	alive	stem	15	2.35	ENE	woodpecker-hole	n	47.1	y	Lee Gwyther	N/A	N/A		N/A
CGx54	x54	SO0472404432	*Alnus glutinosa*	alive	limb	15	8.4	NE	tear-out	n	69.2	y	Lee Gwyther	N/A	N/A		N/A
Lake P. aur roost	Lake P. aur roost	SO0453404572	*Quercus petraea*	alive	stem	15	6.69	ESE	wound	n	59.6	y	Lee Gwyther	N/A	N/A		N/A

Family	Tree species	Scientific	Phase 1 habitat recorded in	Phase 1 code	PRF Group	PRF Type	PRF recorded during ground truthing (y/n)	PRF type proven to be occupied in this habitat in **winter** period	PRF type proven to be occupied in this habitat in **spring-flux** period	PRF type proven to be occupied in this habitat in **pregancy** period	PRF type proven to be occupied in this habitat in **nursery** period	PRF type proven to be occupied in this habitat in **mating** period	PRF type proven to be occupied in this habitat in **autumn-flux** period	[Site] PRF ID
Birch	Alder	*Alnus glutinosa*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Butt-rot	y	x	x	x	x	x	x	x44b, x50
Birch	Alder	*Alnus glutinosa*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Knot-hole	y	x	x	x	x	x	x	x20
Birch	Alder	*Alnus glutinosa*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Tear-out	y	x	P. aur	P. aur	M. dau	M. dau	x	x37, x54
Birch	Alder	*Alnus glutinosa*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Woodpecker hole	y	x	x	M. dau	M. dau	x	x	x38, x53a, x53b
Birch	Alder	*Alnus glutinosa*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Wound	y	P. aur	P. aur	M. dau, P. aur	x	B. bar, M. dau	x	x34, x39, x44a, x49
Birch	Alder	*Alnus glutinosa*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Squirrel-hole	y	x	x	x	x	x	x	x51
Birch	Alder	*Alnus glutinosa*	Woodland / Broadleaved / Semi-natural	A1.1.1	Damage	hazard beam	y	x	x	x	x	x	x	x40
Birch	Downy birch	*Betula pubescens*	Woodland / Broadleaved / Semi-natural	A1.1.2	Decay	Tear out	y	x	x	x	x	x	x	x32
Rose	Hawthorn	*Crataegus monogyna*	Woodland / Broadleaved / Semi-natural	A1.1.1		Flute	y	x	x	x	x	x	x	x28
Rose	Hawthorn	*Crataegus monogyna*	Woodland / Broadleaved / Semi-natural	A1.1.2	Damage	Lightning-strike	y	x	x	x	x	x	x	x30
Olive	Ash	*Fraxinus excelsior*	Woodland / Broadleaved / Semi-natural	A1.1.1	Damage	Transverse-snap	y	x	x	x	x	P. pip	x	x8
Oak	Sessile oak	*Quercus petraea*	Woodland / Broadleaved / Semi-natural	A1.1.1	Damage	Hazard-beam	y	x	M. dau, M. nat	P. pyg	P. aur	N. noc	x	x27
Oak	Sessile oak	*Quercus petraea*	Woodland / Broadleaved / Semi-natural	A1.1.1	Damage	Transverse-snap	y	x	P. aur	x	x	x	x	x46
Oak	Sessile oak	*Quercus petraea*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Knot-hole	y	x	x	x	x	M. nat	x	x33a, x33b, x33c
Oak	Sessile oak	*Quercus petraea*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Wound	y	P. aur	M. nat	M. nat, P. pyg	x	x	P. pip, P. aur, M. dau	x11, x24, x41a, x41b, Lake P. aur roost
Willow	Goat willow	*Salix caprea*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Tear-out	y	P. aur	x	x	x	M. nat	P. aur	x2a
Willow	Goat willow	*Salix caprea*	Woodland / Broadleaved / Semi-natural	A1.1.1	Decay	Wound	y	x	M. nat	x	M. bec	P. aur	M. nat, P. aur	x1, x2b, x3, x4, x5, x15

| Trap_ref | PHF_ID | Inspection trash | Bait species | Bait species: only one species per bait, or multiple species if bait is offered to more than one sp., even if that one species an same day (actual) | Site name | Locality | Site | Month | Year | Season | Kind of reference | Species | Alive/Dead | Photo 1 habitat | Photo 2 habitat | Photo 1 code | Stem/Bush | Tree height (m) | PHF height (m) | Fruiting | Fat m. | Enlarged | DPO (cm) | DPO (cm) | PHF face-more-than-one-side-visible-only-if-one-side-visible-only-if-one-side-visible-only-if

redwash real	jackmaddy	green woodpecker to	great spotted woodpecker to	barn owl(s)	bird of mapping	bird feathers / down	bird nest	grey squirrel (sky)	grey squirrel grazing	grey squirrel nest	dormouse / dormice	dormouse nest	woodmouse / woodmice	woodmouse nest	Other (w. name present, if something is present, name it)	photo	Fox Recorder	Sound Recorder	Fox present	Comments	Number of bait	Where (x), below (b) or in side (s) of entrance	Approximate grid cers from entrance (cm)	Smell Description	Smell Note	Smell ++++	Smell	Smell [illegible] / Nature	DNA Result	TBI	PRP	Sufficient information values for materials / mating group
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	N/A	N/A	outside red line boundary - bats	2	x	15	N/A	y	x	x	x		yes	yes - both
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	N/A	N/A	outside red line boundary - bats	3	x	15	N/A	y	x	x	x		yes	yes - both
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	N/A	N/A	outside red line boundary - bats	N/A	N/A	N/A	N/A	y	x	x	x		yes	yes - both
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	N/A	N/A	outside red line boundary - bat	1	x	15	N/A	y	x	x	x		yes	yes - both
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	Hoary Anderes	N/A	strider outside red line boundary - bats	2	x	15	N/A	y	x	x	x		yes	yes - both
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	Hoary Anderes	N/A	strider outside red line boundary - bat	1	x	15	N/A	y	x	x	x		yes	yes - both
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	Hoary Anderes	N/A	strider outside red line boundary - bats	2	x	15	N/A	y	x	x	x		yes	yes - both
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	Hoary Anderes	N/A	strider outside red line boundary - bat	1	x	15	N/A	y	x	x	x		yes	yes - both
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	Hoary Anderes	N/A	strider outside red line boundary - bat	N/A	N/A	N/A	N/A	y	x	x	x		yes	yes - both
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	Hoary Anderes	N/A	strider outside red line boundary - bat	1	x	15	N/A	y	x	x	x		yes	yes - both
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	Hoary Anderes	N/A	strider outside red line boundary - bat	1	x	2	mouty	x	x	y	x		yes	no
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	Hoary Anderes	N/A	strider outside red line boundary - bat	1	x	2	mouty	x	x	y	x		yes	no
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	Hoary Anderes	N/A	strider outside red line boundary - bat	1	x	2	mouty	x	x	y	x		yes	no
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	Hoary Anderes	N/A	strider outside red line boundary - bat	N/A	N/A	N/A	N/A	y	x	x	x		yes	no
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	Hoary Anderes	N/A	strider outside red line boundary - bat	1	x	2	mouty	x	x	y	x		yes	no
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	Hoary Anderes	N/A	strider outside red line boundary - bat	N/A	N/A	N/A	N/A	y	x	x	x		yes	no
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	Hoary Anderes	N/A	strider outside red line boundary - bat	N/A	N/A	N/A	N/A	y	x	x	x		yes	no
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	N/A	N/A	strider outside red line boundary - bat	7	x	15	N/A	y	x	x	x		yes	yes - both
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	N/A	N/A	strider outside red line boundary - bat	7	x	15	N/A	y	x	x	x		yes	yes - both
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	N/A	N/A	strider outside red line boundary - bat	8	x	15	N/A	y	x	x	x		yes	yes - both
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	N/A	N/A	strider outside red line boundary - bat	8	x	15	N/A	y	x	x	x		yes	yes - both
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	Hoary Anderes	N/A	strider outside red line boundary - bat	8	x	15	N/A	y	x	x	x		yes	yes - both
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	Hoary Anderes	N/A	strider outside red line boundary - bat	8	x	15	N/A	y	x	x	x		yes	yes - both
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	Hoary Anderes	N/A	strider outside red line boundary - bat	8	x	15	N/A	y	x	x	x		yes	yes - both
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	Hoary Anderes	N/A	strider outside red line boundary - bat	8	x	15	N/A	y	x	x	x		yes	yes - both
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	Hoary Anderes	N/A	strider outside red line boundary - bat	8	x	15	N/A	y	x	x	x		yes	yes - both
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Hoary Anderes	Lac-Greyhar	N/A	strider outside red line boundary - bat	3	x	15	N/A	y	x	x	x		yes	yes - both
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Hoary Anderes	Lac-Greyhar	N/A	Retrieved end of bait is disconnected	N/A	N/A	N/A	damp wood	x	x	y	x		yes	no
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Hoary Anderes	Lac-Greyhar	N/A	PRP	N/A	N/A	N/A	wet wood	x	x	y	x		yes	yes - mating
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	y	Hoary Anderes	Lac-Greyhar	N/A	PRP	N/A	N/A	N/A	wet wood	N/A	N/A	N/A	N/A		no	yes - mating
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	y	Hoary Anderes	Lac-Greyhar	N/A	expected, either no potential	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		no	N/A
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	Hoary Anderes	N/A	PRP	N/A	N/A	N/A	N/A	y	x	x	x		yes	no
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	y	Hoary Anderes	Lac-Greyhar	N/A	expected, either no potential	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		no	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	y	Hoary Anderes	Lac-Greyhar	N/A	expected, either no potential	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		no	N/A
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	Hoary Anderes	N/A	PRP	N/A	N/A	N/A	N/A	y	x	x	x		yes	no
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	y	Hoary Anderes	Lac-Greyhar	N/A	Bait lost, either end of bait is disconnected	N/A	N/A	N/A	damp wood	x	x	y	x		yes	no
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Hoary Anderes	Lac-Greyhar	N/A	PRP	N/A	N/A	N/A	wet wood	x	x	y	x		yes	yes - mating
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	y	Hoary Anderes	Lac-Greyhar	N/A	expected, either no potential	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		no	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	y	Hoary Anderes	Lac-Greyhar	N/A	expected, either no potential	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		no	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	y	Hoary Anderes	Lac-Greyhar	N/A	PRP	N/A	N/A	N/A	N/A	y	x	x	x		yes	yes - both
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	y	Hoary Anderes	Lac-Greyhar	N/A	offer no potential	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		no	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	y	Hoary Anderes	Lac-Greyhar	N/A	offer no potential	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		no	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	y	Hoary Anderes	Lac-Greyhar	N/A	offer no potential	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		no	N/A
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Hoary Anderes	Lac-Greyhar	N/A	PRP	N/A	N/A	N/A	wet moss	x	x	y	x		yes	no
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	y	Hoary Anderes	Lac-Greyhar	N/A	offer no potential	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		no	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	y	Hoary Anderes	Lac-Greyhar	N/A	offer no potential	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		no	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	y	Hoary Anderes	Lac-Greyhar	N/A	offer no potential	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		no	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	y	Hoary Anderes	Lac-Greyhar	N/A	offer no potential	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		no	N/A
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Hoary Anderes	Lac-Greyhar	N/A	PRP	N/A	N/A	N/A	N/A	y	x	x	x		yes	yes - both
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Hoary Anderes	Lac-Greyhar	N/A	randomly expired and will offer no potential	N/A	N/A	N/A	dry moss	x	x	y	x		yes	no
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Hoary Anderes	Lac-Greyhar	N/A	expired not safe	?	?	?	?	?	?	?	?		?	?
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Hoary Anderes	Lac-Greyhar	N/A	PRP	N/A	N/A	N/A	N/A	x	x	x	x		yes	yes - both
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	y	Hoary Anderes	Lac-Greyhar	N/A	PRP	N/A	N/A	N/A	wet moss	x	x	y	x		yes	yes - mating
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	Hoary Anderes	N/A	Rarer	1	x	1	non enjoyes	x	x	y	x		yes	yes - mating
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	Hoary Anderes	N/A	PRP	N/A	N/A	N/A	N/A	x	x	y	x		yes	yes - both
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	y	Hoary Anderes	Lac-Greyhar	N/A	dissociation, offer no potential	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		no	N/A
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Hoary Anderes	Lac-Greyhar	N/A	Not a PRP yet other repellent wounding	N/A	N/A	N/A	wet moss	x	x	y	x		no	N/A
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Hoary Anderes	Lac-Greyhar	N/A	dissociation, offer no potential											
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Hoary Anderes	Lac-Greyhar	N/A	old tract or bate	N/A	N/A	N/A	wet moss	x	x	y	x		yes	yes - mating
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Hoary Anderes	Lac-Greyhar	N/A	PRP	N/A	N/A	N/A	dry old	x	x	y	x		yes	no
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	y	Hoary Anderes	Lac-Greyhar	N/A	offer no potential	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		no	N/A
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Hoary Anderes	Lac-Greyhar	N/A	PRP	N/A	N/A	N/A	N/A	x	x	x	x		yes	yes - mating
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Hoary Anderes	Lac-Greyhar	N/A	not safely attached	?	?	?	?	?	?	?	?		?	?
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	y	Hoary Anderes	Lac-Greyhar	N/A	offer no potential	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		no	N/A
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Hoary Anderes	Lac-Greyhar	N/A	PRP	N/A	N/A	N/A	TCP	x	x	x	x		yes	yes - both
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Hoary Anderes	Lac-Greyhar	N/A	PRP	N/A	N/A	N/A	wet wood	x	x	y	x		yes	yes - mating
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Hoary Anderes	Lac-Greyhar	N/A	PRP	N/A	N/A	N/A	wet moss	x	x	y	x		yes	yes - mating
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	Hoary Anderes	N/A	Rarer	1	x	1	non enjoyes	x	x	y	x		yes	yes - mating
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Lac-Greyhar	Hoary Anderes	N/A	PRP	N/A	N/A	N/A	N/A	x	x	y	x		yes	yes - both
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	y	Hoary Anderes	Lac-Greyhar	N/A	dissociation, offer no potential	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		no	N/A
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Hoary Anderes	Lac-Greyhar	N/A	PRP	N/A	N/A	N/A	N/A	x	x	x	x		yes	yes - both
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Hoary Anderes	Lac-Greyhar	N/A	PRP	N/A	N/A	N/A	mouty	x	x	x	x		yes	yes - both
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Hoary Anderes	Lac-Greyhar	N/A	PRP	N/A	N/A	N/A	N/A	x	x	x	x		yes	yes - mating
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	y	Hoary Anderes	Lac-Greyhar	N/A	Karen Plunier: earlier most	N/A	N/A	N/A	N/A	y	x	x	x		yes	yes - both

								SEASON													
Habitat parcel	Habitat type	Tree ref	Tree species		PRF type	Bat species predicted to be present	The predictive status of each bat species within the application site. 'P' = Present; 'RL' = "reasonable likelihood" of occurance; 'PO' = Potentially present	Winter	Spring-flux	Pregnancy	Nursery	Mating	Autumn-flux	Apex shape	Internal height (cm)	Internal width (cm)	Internal depth (cm)	Estimated internal volume (cm3) of PRF	Minimum internal volume (cm3) required for a maternity roost (BTHK 2018).	Is there sufficient space for a maternity colony to occupy the PRF	Are there sufficient grounds to warrant further survey
N/A	Woodland / Broadleaved / Semi-natural	x1	*Salix caprea*	x1	wound	*Myotis bechsteinii*	no desk study	*n*	*n*	*n*	*y*	*n*	*n*	peak/wedge	83	5	0	*1,038*	1,189	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x1	*Salix caprea*	x1	wound	*Myotis nattereri*	no desk study	n	y	n	n	n	y	peak/wedge	83	5	0	*1,038*	912	*Yes*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x1	*Salix caprea*	x1	wound	*Plecotus auritus*	no desk study	n	n	n	n	y	y	peak/wedge	83	5	0	*1,038*	312	*Yes*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x2a	*Salix caprea*	x2a	tear-out	*Myotis nattereri*	no desk study	*n*	*n*	*n*	*n*	*y*	*n*	spire	34	3.5	0	*109*	912	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x2a	*Salix caprea*	x2a	tear-out	*Plecotus auritus*	no desk study	y	n	n	n	n	y	spire	34	3.5	0	*109*	312	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x2b	*Salix caprea*	x2b	wound	*Myotis bechsteinii*	no desk study	*n*	*n*	*n*	*y*	*n*	*n*	no data	no data	no data	no data				
N/A	Woodland / Broadleaved / Semi-natural	x2b	*Salix caprea*	x2b	wound	*Myotis nattereri*	no desk study	n	y	n	n	n	y	no data	no data	no data	no data				
N/A	Woodland / Broadleaved / Semi-natural	x2b	*Salix caprea*	x2b	wound	*Plecotus auritus*	no desk study	n	n	n	n	y	y	no data	no data	no data	no data				
N/A	Woodland / Broadleaved / Semi-natural	x3	*Salix caprea*	x3	wound	*Myotis bechsteinii*	no desk study	*n*	*n*	*n*	*y*	*n*	*n*	spire	10	2	0	*10*	1,189	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x3	*Salix caprea*	x3	wound	*Myotis nattereri*	no desk study	n	y	n	n	n	y	spire	10	2	0	*10*	912	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x3	*Salix caprea*	x3	wound	*Plecotus auritus*	no desk study	n	n	n	n	y	y	spire	10	2	0	*10*	312	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x4	*Salix caprea*	x4	wound	*Myotis bechsteinii*	no desk study	*n*	*n*	*n*	*y*	*n*	*n*	spire	17	3	0	*40*	1,189	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x4	*Salix caprea*	x4	wound	*Myotis nattereri*	no desk study	n	y	n	n	n	y	spire	17	3	0	*40*	912	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x4	*Salix caprea*	x4	wound	*Plecotus auritus*	no desk study	n	n	n	n	y	y	spire	17	3	0	*40*	312	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x5	*Salix caprea*	x5	wound	*Myotis bechsteinii*	no desk study	*n*	*n*	*n*	*y*	*n*	*n*	spire	12	4	10	*92*	1,189	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x5	*Salix caprea*	x5	wound	*Myotis nattereri*	no desk study	n	y	n	n	n	y	spire	12	4	10	*92*	1,007	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x5	*Salix caprea*	x5	wound	*Plecotus auritus*	no desk study	n	n	n	n	y	y	spire	12	4	10	*92*	312	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x8	*Fraxinus excelsior*	x8	transverse-snap	*Pipistrellus pipistrellus*	no desk study	n	n	n	n	y	n	peak/wedge	10	9	10	*4,021*	912	*Yes*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x11	*Quercus petraea*	x11	wound	*Myotis nattereri*	no desk study	*n*	*y*	*y*	*n*	*n*	*n*	spire	60	16	0	*4,021*	312	*Yes*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x11	*Quercus petraea*	x11	wound	*Plecotus auritus*	no desk study	y	n	n	n	n	y	spire	60	16	0	*4,021*	312	*Yes*	no
N/A	Woodland / Broadleaved / Semi-natural	x11	*Quercus petraea*	x11	wound	*Pipistrellus pipistrellus*	no desk study	n	*n*	*n*	*n*	*n*	*y*	spire	60	16	0	*4,021*	912	*Yes*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x11	*Quercus petraea*	x11	wound	*Pipistrellus pygmaeus*	no desk study	n	n	y	n	n	n	spire	60	16	0	*50*	11,899	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x15	*Salix caprea*	15x	wound	*Myotis bechsteinii*	no desk study	*n*	*n*	*n*	*y*	*n*	*n*	spire	12	4	0	*50*	1,189	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x15	*Salix caprea*	15x	wound	*Myotis nattereri*	no desk study	n	y	n	n	n	y	spire	12	4	0	*283*	912	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x15	*Salix caprea*	x15	wound	*Plecotus auritus*	no desk study	n	n	n	n	y	y	spire	12	4	0	*283*	312	*No*	
N/A	Woodland / Broadleaved / Semi-natural	x24	*Quercus petraea*	24x	wound	*Myotis nattereri*	no desk study	*n*	*y*	*y*	*n*	*n*	*n*	spire	30	6	0	*283*	312	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x24	*Quercus petraea*	24x	wound	*Plecotus auritus*	no desk study	y	n	n	n	n	y	spire	30	6	0	*283*	312	*No*	no
N/A	Woodland / Broadleaved / Semi-natural	x24	*Quercus petraea*	24x	wound	*Pipistrellus pipistrellus*	no desk study	n	*n*	*n*	*n*	*n*	*y*	spire	30	6	0	*283*	912	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x24	*Quercus petraea*	24x	wound	*Pipistrellus pygmaeus*	no desk study	n	n	y	n	n	n	spire	30	6	0	*8,036*	1,076	*Yes*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x27	*Quercus petraea*	x27	hazard beam	*Myotis daubentonii*	no desk study	n	y	n	n	n	n	peak/wedge	57	14	25	*8,036*	912	*Yes*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x27	*Quercus petraea*	x27	hazard beam	*Myotis nattereri*	no desk study	n	y	n	n	n	n	peak/wedge	57	14	25	*8,036*	1,059	*Yes*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x27	*Quercus petraea*	x27	hazard beam	*Nyctalus noctula*	no desk study	n	n	n	n	y	n	peak/wedge	57	14	25	*8,036*	1059	*Yes*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x27	*Quercus petraea*	x27	hazard beam	*Pipistrellus pygmaeus*	no desk study	n	n	y	n	n	n	peak/wedge	57	14	25	*8,036*	312	*Yes*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x27	*Quercus petraea*	x27	hazard beam	*Plecotus auritus*	no desk study	n	n	n	y	n	n	peak/wedge	57	14	25	*0*	312	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x33a	*Quercus petraea*	x33a	knot-hole	*Myotis nattereri*	no desk study	n	n	n	n	y	n	spire	0	12	0	*4,084*	912	*Yes*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x33b	*Quercus petraea*	x33b	knot-hole	*Myotis nattereri*	no desk study	n	n	n	n	y	n	spire	39	20	0	*2,042*	912	*Yes*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x33c	*Quercus petraea*	x33c	knot-hole	*Myotis nattereri*	no desk study	n	n	n	n	y	n	flat	6	10	20	*3*	912	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x34	*Alnus glutinosa*	x34	wound	*Barbastellea barbastellus*	no desk study	n	n	n	n	y	n	spire	11	1	0	*3*	1,076	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x34	*Alnus glutinosa*	x34	wound	*Myotis daubentonii*	no desk study	n	n	y	n	y	n	spire	11	1	0	*3*	1076	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x34	*Alnus glutinosa*	x34	wound	*Plecotus auritus*	no desk study	y	y	y	n	n	n	spire	11	1	0	*330*	312	*Yes*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x37	*Alnus glutinosa*	x37	tear-out	*Myotis daubentonii*	no desk study	n	n	n	y	y	n	spire	35	6	0	*330*	1076	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x37	*Alnus glutinosa*	x37	tear-out	*Plecotus auritus*	no desk study	n	y	y	n	n	n	spire	35	6	0	*692*	312	*Yes*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x38	*Alnus glutinosa*	x38	woodpecker hole	*Myotis daubentonii*	no desk study	n	n	y	y	n	n	spire	3	23	2	*4,647*	1076		*yes*
N/A	Woodland / Broadleaved / Semi-natural	x39	*Alnus glutinosa*	x39	wound	*Barbastellea barbastellus*	no desk study	n	n	n	n	y	n	spire/chambered	51	13.5	0	*4,647*	1,076	*Yes*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x39	*Alnus glutinosa*	x39	wound	*Myotis daubentonii*	no desk study	n	n	y	n	y	n	spire/chambered	51	13.5	0	*4,647*	1076	*Yes*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x39	*Alnus glutinosa*	x39	wound	*Plecotus auritus*	no desk study	y	y	y	n	n	n	spire/chambered	51	13.5	0	*#VALUE!*	312	*#VALUE!*	no
N/A	Woodland / Broadleaved / Semi-natural	x41a	*Quercus petraea*	x41a	wound	Myotis daubentonii	no desk study	n	n	n	n	n	y	no data	no data	4	8	*#VALUE!*	1076	*#VALUE!*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x41a	*Quercus petraea*	x41a	wound	*Myotis nattereri*	no desk study	*n*	*y*	*y*	*n*	*n*	*n*	no data	no data	4	8	*#VALUE!*	912	*#VALUE!*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x41a	*Quercus petraea*	x41a	wound	*Plecotus auritus*	no desk study	y	n	n	n	n	y	no data	no data	4	8	*#VALUE!*	312	*#VALUE!*	no
N/A	Woodland / Broadleaved / Semi-natural	x41a	*Quercus petraea*	x41a	wound	*Pipistrellus pipistrellus*	no desk study	n	*n*	*n*	*n*	*n*	*y*	no data	no data	4	8	*#VALUE!*	912	*#VALUE!*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x41a	*Quercus petraea*	x41a	wound	*Pipistrellus pygmaeus*	no desk study	n	n	y	n	n	n	no data	no data	4	8	*302*	912	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x41b	*Quercus petraea*	x41b	wound	*Myotis nattereri*	no desk study	*n*	*y*	*y*	*n*	*n*	*n*	spire	32	6	0	*302*	912	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x41b	*Quercus petraea*	x41b	wound	*Plecotus auritus*	no desk study	y	n	n	n	n	y	spire	32	6	0	*302*	312	*No*	no
N/A	Woodland / Broadleaved / Semi-natural	x41b	*Quercus petraea*	x41b	wound	*Pipistrellus pipistrellus*	no desk study	n	*n*	*n*	*n*	*n*	*y*	spire	32	6	0	*302*	912	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x41b	*Quercus petraea*	x41b	wound	*Pipistrellus pygmaeus*	no desk study	n	n	y	n	n	n	spire	32	6	0	*#REF!*	1,076	*#REF!*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x44a	*Alnus glutinosa*	x44a	wound	*Barbastellea barbastellus*	no desk study	n	n	n	n	y	n	dome	4	9	22	*1,654*	1,076	*Yes*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x44a	*Alnus glutinosa*	x44a	wound	*Myotis daubentonii*	no desk study	n	n	y	n	y	n	dome	4	9	22	*1,654*	1076	*Yes*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x44a	*Alnus glutinosa*	x44a	wound	*Plecotus auritus*	no desk study	y	y	y	n	n	n	dome	4	9	22	*314*	312	*Yes*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x46	*Quercus petraea*	x46	transverse-snap	*Plecotus auritus*	no desk study	n	y	n	n	n	n	flat	3	4	22	*288*	312		*yes*
N/A	Woodland / Broadleaved / Semi-natural	x49	*Alnus glutinosa*	x49	wound	*Barbastellea barbastellus*	no desk study	n	n	n	n	y	n	spire	44	5	0	*288*	1,076	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x49	*Alnus glutinosa*	x49	wound	*Myotis daubentonii*	no desk study	n	n	y	n	y	n	spire	44	5	0	*288*	1076	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x49	*Alnus glutinosa*	x49	wound	*Plecotus auritus*	no desk study	y	y	y	n	n	n	spire	44	5	0	*33,800*	312	*Yes*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x53a	*Alnus glutinosa*	x53a	woodpecker hole	*Myotis daubentonii*	no desk study	n	n	y	y	n	n	spire/chambered	100	26	0	*400*	1076	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x53b	*Alnus glutinosa*	x53b	woodpecker hole	*Myotis daubentonii*	no desk study	n	n	y	y	n	n	spire/chambered	100	2	100	*84*	1076	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x54	*Alnus glutinosa*	x54	tear-out	*Myotis daubentonii*	no desk study	n	n	n	y	y	n	spire	18	4	2	*84*	1076	*No*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	x54	*Alnus glutinosa*	x54	tear-out	*Plecotus auritus*	no desk study	n	y	y	n	n	n	spire	18	4	2	*7,321*	312	*Yes*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	Lake P. aur roost	*Quercus petraea*	Lake P. aur roost	wound	*Myotis nattereri*	no desk study	*n*	*y*	*y*	*n*	*n*	*n*	spire/chambered	121	11	0	*7,321*	912	*Yes*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	Lake P. aur roost	*Quercus petraea*	Lake P. aur roost	wound	*Plecotus auritus*	no desk study	y	n	n	n	n	y	spire/chambered	121	11	0	*7,321*	312	*Yes*	no
N/A	Woodland / Broadleaved / Semi-natural	Lake P. aur roost	*Quercus petraea*	Lake P. aur roost	wound	*Pipistrellus pipistrellus*	no desk study	n	*n*	*n*	*n*	*n*	*y*	spire/chambered	121	11	0	*7,321*	912	*Yes*	*yes*
N/A	Woodland / Broadleaved / Semi-natural	Lake P. aur roost	*Quercus petraea*	Lake P. aur roost	wound	*Pipistrellus pygmaeus*	no desk study	n	n	y	n	n	n	spire/chambered	121	11	0				

Bat species (recorded in the BTHK database to date)	Minimum internal volume (cm3) required for a maternity roost (BTHK 2018).
Barbastelle	979
Bechstein's bat	1,189
Daubenton's bat	1,076
Whiskered bat	678
Natterer's bat	912
Noctule	1,059
Leisler's bat	1598
Nathusius' pipistrelle	#VALUE!
Common pipistrelle	1,007
Soprano pipistrelle	#VALUE!
Brown long-eared bat	312
Lesser horseshoe-bat	#VALUE!

Greena Ecological Consultancy

Stage II bat assessment surveys

Cwm-Glo pit area

Troed y rhiw

Merthyr Tydfil

CT48 1DL

3rd November 2023

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Brief

This bat survey is to resurvey structures within the red line area by a combination of inspection and repeat bat activity surveys ascertained sufficient information to evaluate the situation adequately in preparation of the above-mentioned works. The information gathered will be necessary to comply with European regulations, which are connected with planning regulations and with The Wildlife and Countryside Directives and Habitat Regulations.

Summary

- Greena Ecological Consultancy was instructed by Dominic Woodfield, agent for this property, to undertake this survey to support a planning application.
- The survey site is comprised of a number of structures in wooded area over and around Cwm-Glo coal pit.
- The proposals are unspecified.
- The site was surveyed in August, September and October 2023.
- There were individual bats found in barrel type arches of a tunnel and two bridges (B6, B12 & B20).
- There were no signs of birds nesting.

1. Background

Greena Ecological Consultancy was instructed by Dominic Woodfield, agent for this property, to undertake this survey to support a planning application.

Previous surveys of the structures and area by Bioscan were carried out between 2015 & 2022 found three species of small numbers of bats in summer and winter and at least nine species in flight.

The surrounding habitat offers high quality roosting and foraging opportunities for bats.

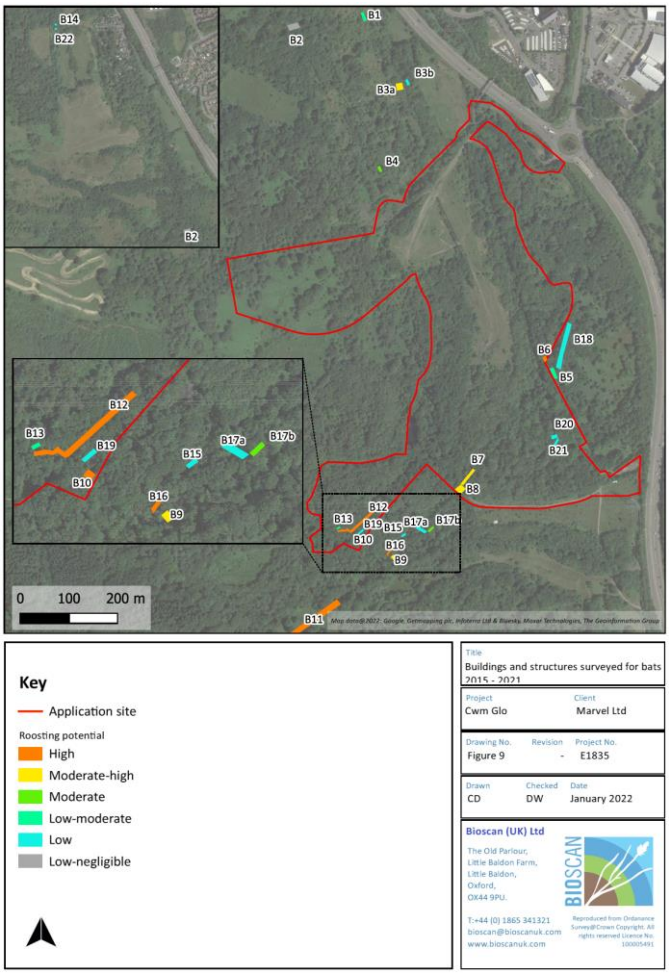
2. Aims and Objectives

The aim of the survey was to specifically resurvey 13 structures including bridges, culverts, walls, chimneys and tunnels previously surveyed between 2016 & 2022.

3. Site Description

The site is located on the west side of the A470 road west of Merthyr Tydfil around SO043047 (see Figure 1). The survey site is comprised of wooded area over part of Cwm-Glo disused coal pit, structures inside the red line area and within 100m of it were surveyed.

Figure 1 Survey area



4. Methods

Surveyors Geoff Billington MCIEEM Greena Ecological Consultancy (holder of bat survey licence S090974/1) and Rachel Denness Greena Ecological Consultancy undertook a daytime inspection of the structures on the 11th August 2023 with exception of metal bridge structure B6 abutment voids that were inspected on 3rd October 2023.

A re-assessment of structure bat roost potential was conducted triggering future survey requirements as shown below:

Table 1 Bat roost potential assessment and further survey methodology

Site and area	Bat roost potential	Inspection	Activity survey 1	Activity survey 2	Activity survey 2
B5 wall	Low	Y*	Y		
B6 bridge	Confirmed (2021)	Y	Y	Y	Y
B7 wall	Low	Y*	Y		
B8 bridge	Confirmed (2021)	Y* arch crevices 3x	Y	Y	Y
B10 chimney base & tunnel	Confirmed (2021)	Y*	Y	Y	Y
B12 wall face	Low	Y*	Y		
B12 wall 4x alcoves	Confirmed (2021)	Y 3x			
B13 wall face	Low	Y*	Y		
B13 wall alcove with chimney	High	Y 3x			
B15 culvert	Moderate	Y*	Y	Y	
B16 low culvert	Moderate	Y*	Y	Y	
B18 wall	Low	Y*	Y		
B19 vegetation covered wall	Negligible				
B20 culvert	Moderate	Y*	Y	Y	
B21 low culvert	Moderate	Y*	Y	Y	

*Not possible to fully inspect every potential roosting feature so activity survey(s) conducted

The structures were inspected with the aid of a high-powered torch, ladders and articulating endoscope to locate potential roosting sites, discover points of egress for bats or any signs of bats such as droppings, wear marks, staining and feeding remains.

5. RESULTS

INSPECTION SURVEYS

Inspections of all structures were carried on 11th August except for B6 voids that were inspected on 3rd October.
Follow up inspections were carried out on every visit of: B8 arch barrel crevices B10 alcoves, B12 alcoves and flues, B13 alcove and flue.

B5 Pair of parallel retaining walls

- West Wall 1. 75cm deep.
- West Wall 2. 75cm deep.
- West Wall 3. 30cm deep.
- West Wall 4. 30 cm deep. Crevice style.
- West Wall Hole 5. 30cm deep. No crevices.
- East wall. 15cm deep. Not fully enclosed.

Low potential, except west wall 4 moderate.

B6 Steel deck bridge

- Higher drain holes checked. Top of abutment cavities inspected on 3rd October.
- Several drain holes (60cm – 3.5m). Low potential.
- Confirmed bat roost in abutment voids previously.

High potential/confirmed roost.

B7 Retaining wall

- Drain holes:
- 1 – very wet.
- 2 – uneven corner in hole. Scoped. Medium potential as deep and convoluted.
- 3 – 1+m deep. Slightly open in character.
- 4 – 90cm. Open character.

Low potential, except drain hole 2 moderate.

B8 Stone bridge

- West Wall 1. 75cm deep.
- North end, top of the arch in the middle 2 feet deep.
- South (to West of centre). crevice 30cm deep.
- Confirmed bat roost in arch barrel voids previously.

High potential/confirmed roost.

B10 Chimney base and subterranean flue tunnel

- East side. Couple crevices 20cm deep.
- South Side. All shallow gaps in wall. Limited in alcove.
- West Side. Some deeper crevices.
- Flu tunnel. Extensive void unknown extent not entered as assessed as a confined space so requires specific RAM, entrance covered in activity surveys.

High potential/confirmed roost.

B12 Long retaining wall containing flue tunnel, culvert and shallow alcoves

- Deepest alcove/flue tunnel most southerly
    - SW facing
    - Where the back wall is an old flue extending 1m upwards. Empty upon August inspection, 20+ Lesser horseshoe bat droppings beneath it in September and 1x Lesser horseshoe bat (and droppings beneath) in October.
- Middle alcoves
    - SW facing

    - Two joints up in the roof going about 90cm and 60cm. Empty upon inspection.
    - High potential but unoccupied.
    - Wide joint crevice at rear held Lesser horseshoe bat in October.
- Small, ground based alcove most northerly
    - 10+m long SE facing. 12m then blocked/dead end
    - Brick lined
    - Couple of cavities extending 20cm but unoccupied.
    - Moderate potential. Hibernation potential. Unoccupied.

Wall is low potential and alcoves moderate/high/confirmed.

B13 Kiln with flue

- Wall all shallow crevices less than 5cm deep.
- Alcove N facing.
- Could be good for lesser horseshoes.
- Chimney 2m tall dead ended.
- Unoccupied
- Chimney high potential. High hibernation potential

Wall is low potential and alcove/flue moderate/high.

B15 Stone culvert

- 12m long.
- Lots of crevices. Most shallow. Few more than 25cm deep.

Moderate potential.

B20 Stone bridge

- Shallow crevices on West end.
- Shallow crevices outside West end. Unoccupied.
- Up to 60cm on West end North facing

Moderate potential

B21 Low stone culvert

- 25/30m long
- Low tunnel
- Hibernation potential
- Few crevices on W end going up 30cm.
- Rest of it appears to be solid brick work.
- Moderate winter potential.

Low summer potential.

ACTIVITY SURVEYS

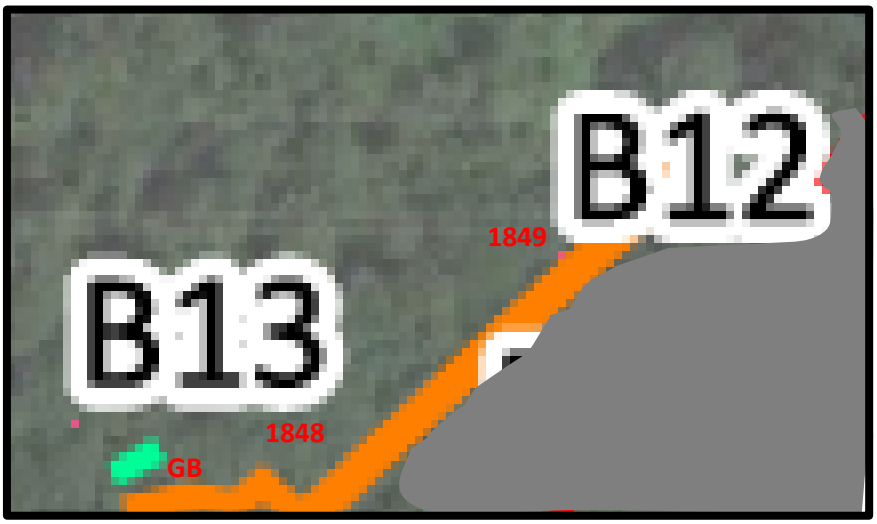
11th August

Survey was conducted between 2008 & 2207 (sunset 2044)
Weather

	Temp.	Cloud	Rainfall	Wind
Start	18C	80%	0	1
End	17C	60%	0	1

Weather conditions on the survey were highly suitable for the time of year for bats to be active and complied with BCT Survey Guidelines on seasonal timings and weather suitability

Figure 2 B12 & B13 survey locations



B12 wall

North section & B13 wall

Geoff Billington

time	species	Behaviour
2112	45P	Past
2115	Daub	Past
2120	45P	Past
2128	45P	Past
2137	45P	Past
2138	45P 3x	Circling
2140	45P	Foraging

45P – Common pipistrelle, Daub – Daubenton's
No bats emerged

South section

1848 south of wall
Batcorder records

time	species
2114	Natt

2118-2126	45P 6x
2132	Myt
2134-2141	45P 40x

45P – Common pipistrelle, Myt – Myotis, Natt – Natterer's

North section

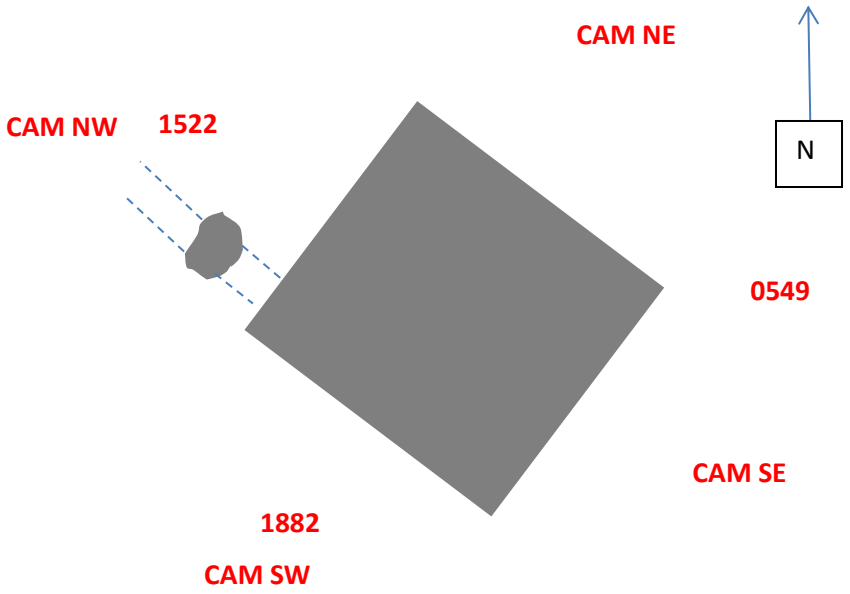
1849 north of wall
Batcorder records

time	species
2117	55P
2138-2143	45P 17x

45P – Common pipistrelle, 55P – Soprano pipistrelle

B10 chimney base and flue

Figure 3 B10 chimney base and flue tunnel survey locations



1882 SW
Batcorder records

time	species
2137-2143	45P
2207	55P

45P – Common pipistrelle, 55P – Soprano pipistrelle

CAM SW
No bats emerged

1522 NW
Batcorder records
No files recorded

CAM NW
No bats emerged

0549 E (NE & SE)
Batcorder records

time	species
2136+2142	45P 2x

45P – Common pipistrelle

CAM NE
No bats emerged

CAM SE
No bats emerged

B6 Steel deck bridge

North

Batcorder records

21:31	2x 45P

Video Results
No bats emerged.

South

Batcorder records
No calls recorded.

Video Results
No bats emerged.

B5 Wall south of bridge

Rachel Denness

time	species	Behaviour
2101	45P	Heard
2109	45P	Heard
2118	45P	Heard
2126	45P	Heard
2139	55P	Heard

45P – Common pipistrelle, 55P – Soprano pipistrelle
No bats emerged

South

Batcorder records

time	species
2100	45P
2108-2014	32x 45P
2113-2114	6x 55P
2115	Myt

2117-2120	6x 55P
2118	1x Myt + 7x 45P
2120-2124	11x 45P
2126-2155	92x 45P
2127	55P
2129-2133	6x 55P
2136-2147	13x 55P
2154	2x 55P
2157-2201	12x 55P

45P – Common pipistrelle, 55P – Soprano pipistrelle, Myt - Myotis

Video Results

time	species
2111-2112	1x circling under bridge
2113	1x flying from bridge – S
2118	1x flying S – N under bridge
2121	1x flying N – S under bridge
2125	2x circling under bridge
2127	1x flying S from trees to E

No bats emerged.

North

Batcorder records

time	species
2057	45P
2101	2x 45P
2108	2x 45P
2114	55P
2116	Myt
2118	2x 45P
2121-2122	7x 55P
2124-2127	2x 55P + 10x 45P
2130-2156	83x 45P
2130	2x 55P
2132-2134	4x 55P
2136-2138	3x 55P
2141-2143	6x 55P
2145-2148	5x 55P
2153-2155	8x 55P + 1x Myt
2158	55P

45P – Common pipistrelle, 55P – Soprano pipistrelle. Myt - Myotis

Video Results

time	species
2110	1x flying N – S under bridge
2114	1x flying N – S under bridge
2123	1x flying S – N under bridge

No bats emerged.

B8 Stone bridge

North

Batcorder records

time	species
2201	45P

45P – Common pipistrelle

Video Results

time	species
2101	1x W-E
2117	1x E-W
2118	1x NE-SW
2119	1x W-E
2122	1x S-N, 1x E-W
2123	1x S-N, 1x E-W

No bats emerged.

B15 Stone culvert

North

Batcorder records
No calls recorded.

Video Results
No bats emerged.

South

Batcorder records

time	species
2201	45P

45P – Common pipistrelle

Video Results
No bats emerged.

13th September

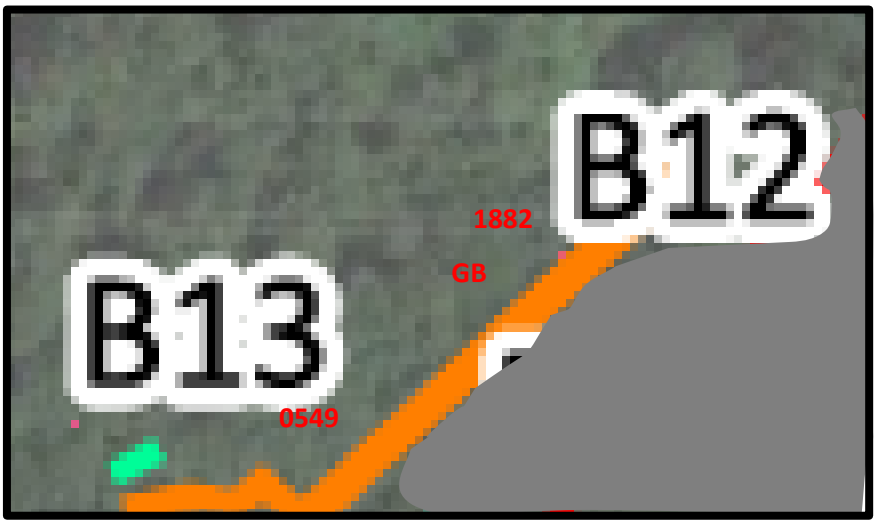
Survey was conducted between 1915 & 2042 (sunset 1933)
Weather

	Temp.	Cloud	Rainfall	Wind
Start	15C	40%	0	1
End	16C	90%	0	1

Weather conditions on the survey were suitable for the time of year for bats to be active and complied with BCT Survey Guidelines on seasonal timings and weather suitability

B12 Wall central section

Figure 4 B12 survey locations



Geoff Billington
No bats emerged

See below for detector records

0549 south of wall
Batcorder records

time	species
2008-2017	55P 5x
2028-2030	Myt 8x

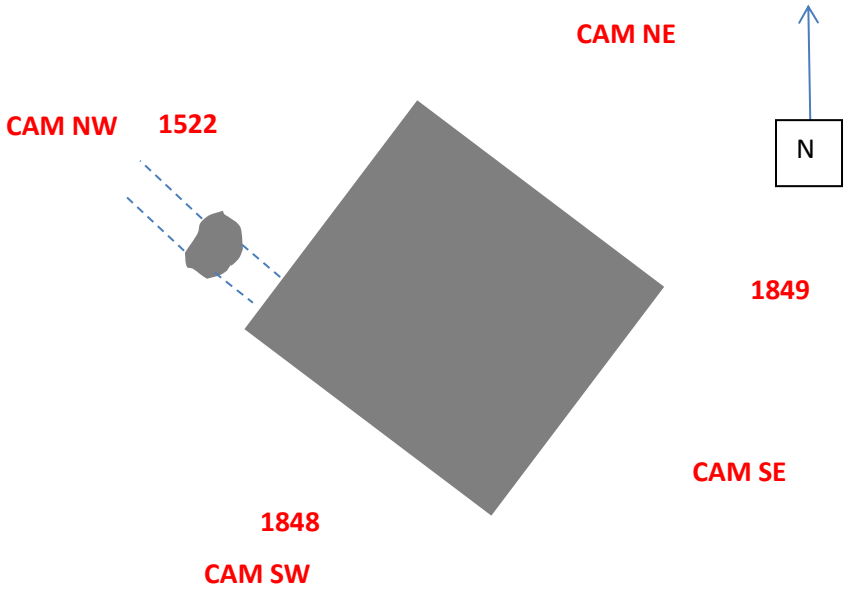
55P – Soprano pipistrelle, Myt – Myotis

1882 north of wall
Batcorder records

time	species
1946-1950	55P 4x
2030-2031	Natt 2x

55P – Soprano pipistrelle, Natt – Natterer's

Figure 5 B10 chimney base and flue tunnel survey locations



1848 SW
Batcorder records

time	species
1935-1947	55P 13x
1947	Natt 8x

55P – Soprano pipistrelle, Natt – Natterer's

CAM SW
No bats emerged

1522 NW
Batcorder records

time	species
1937-1947	55P 7x

55P – Soprano pipistrelle

CAM NW
No bats emerged

1849 E (NE & SE)
Batcorder records

time	species
2147-2148	55P 10x

55P – Soprano pipistrelle

CAM NE
No bats emerged

CAM SE
No bats emerged

B6 Steel deck bridge

North

Batcorder records

time	species
2040	45P

45P – Common pipistrelle

Video Results
No bats emerged.

South

Batcorder records

time	species
2018-2021	Myt 32x
2024-2025	Myt 6x
2028	Myt 2x
2032	Myt 2x
2041-2047	Myt 56x

Myt – Myotis

Video Results

time	notes
2018	1x entering bridge abutment void, 2x flying under bridge S - N
2024	1x flying S, 1x flying N under bridge
2042	2x flying S – N under bridge
2043-2044	1x flying N – S – N under bridge

No bats emerged one Myotis entered into abutment roost

Figure 6 B6 bridge bat entry point

B20 Stone bridge & B21 Culvert

East

Batcorder records

time	species
1926-1931	55P 33x
1959	Myt 4x
2013	Myt
2023	Myt 3x
2026	Myt

Myt – Myotis

Video Results

time	notes
1927	1x Myt emerged from B20 & W over top of bridge
1931	1x Myt emerged from B20
1959	1x flying under B20 bridge E-W
2023	1x flying under B20 bridge to E

Two Myotis emerged from B20

B15 Low culvert

East

Batcorder records
No calls recorded.

Video Results
No bats emerged.

West

Batcorder records
No calls recorded.

Video Results
No bats emerged.

B8 Stone bridge

South

Batcorder records

time	species
1938	55P 2x
1946-1947	Sert 1x & 55p 11x
1950	45P 4x
1957-1958	45P 4x
2000-2001	45P 3x + 55P 2x
2008-2009	45P 8x

2014-2020	45P 15x + Myt 1x
2022-2025	55P 11x
2024-2026	45P 4x
2029	55P 2x
2033	45P
2035-2036	45P 3x

45P – Common pipistrelle, 55P – Soprano pipistrelle, Myt – Myotis

Video Results

time	notes
1946-1947	1x circling in tunnel

North

Batcorder records

time	species
1938	55P
1946	55p
1949	55P 3x
1958	45P
2005	55P
2007	55P
2007	45P 15x + Myt 1x
2008-2009	45P 12x
2009	55P
2011	45P 2x+ 55P 1x
2012-2020	45P 41x
2018	Myt
2020	Myt 2x
2024-2033	45P 18x
2025	55P
2029	55P 3x
2035-2036	45P 8x

45P – Common pipistrelle, 55P – Soprano pipistrelle, Myt – Myotis

Video Results
No bats emerged.

3rd October

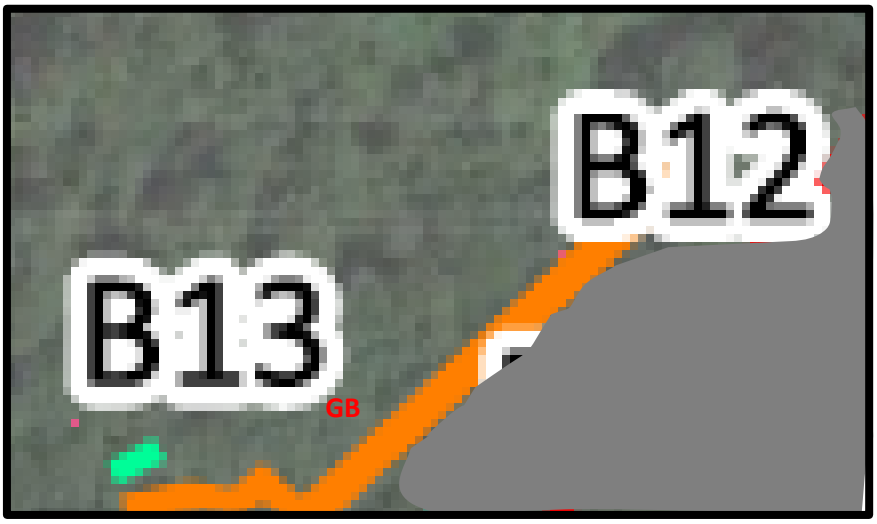
Survey was conducted between 1835 & 1953 (sunset 1847)
Weather

	Temp.	Cloud	Rainfall	Wind
Start	15C	90%	0	1
End	14C	60%	0	0

Weather conditions on the survey were highly suitable for the time of year and followed a protracted mild spell for bats to be active and complied with BCT Survey Guidelines on seasonal timings and weather suitability.

B12 Wall

Figure 7 B12 surveyor south location



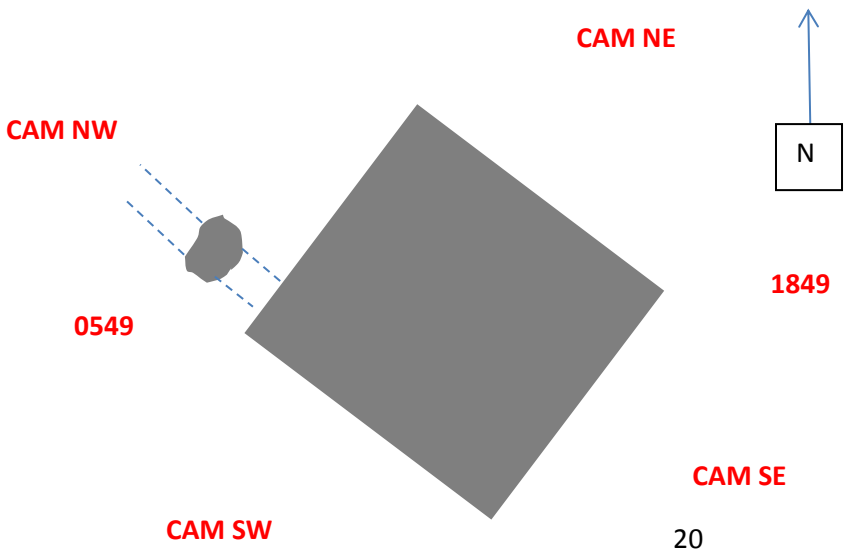
Geoff Billington

time	species	Behaviour
1919	45P	Past
1921	Natt & 45P	Past
1923-1925	Natt 2x	Foraging
1925-1928	Natt	Foraging
1931	Natt	Heard
1935-1947	Natt	Foraging

45P – Common pipistrelle, Natt – Natterer's
No bats emerged

B10 Chimney base and flue

Figure 7 B10 chimney base and flue tunnel survey locations



1849 East (NE & SE)

Batcorder records

time	species
1913+1916	55P 2x
1919	45P 82x
1920	Daub
1922-1923	45P 6x
1944-1951	55P 4x + social calls

45P – Common pipistrelle, 55P – Soprano pipistrelle, Daub – Daubenton's

CAM SE
No bats emerged

CAM NE
No bats emerged

0549 West (NW & SW)
Batcorder records

time	species
1854-1858	55P 7x
1905	Natt 2x
1910-1915	55P 8x
1919	Daub
1921-1922	45P 3x
1930-1950	55P 20x + lots social calls

45P – Common pipistrelle, 55P – Soprano pipistrelle, Natt – Natterer's, Daub – Daubenton's

CAM NW
No bats emerged

CAM SW
No bats emerged

B20 Stone bridge

Batcorder records

time	species
1920	Myt
1924	Myt
1927	Myt 5x
1930	Myt
1941	Myt 4x

Myt - Myotis

Video Results
No bats emerged.

B6 Steel deck bridge

North

Batcorder records

time	species
1920	55P 2x
1927	55P
1929	45P
1936	55P

45P – Common pipistrelle, 55P – Soprano pipistrelle

Video Results
No bats emerged.

South

Batcorder records

time	species
1920-1922	Myt 12x
1925-1926	Myt 6x

Myt - Myotis

Video Results
No bats emerged.

B8 Stone bridge

North

Batcorder records

time	species
1911-1912	45P 3x
1930	45P 2x
1939	45P 2x
1944	45P
1946-1949	55P 4x

45P – Common pipistrelle, 55P – Soprano pipistrelle

Video Results
No bats emerged.

South

Batcorder records

time	species
1910-1911	45P 2x
1929	45P
1938	45P
1943-1945	45P 10x

1945-1946	55P 4x
1948	55P 4x

45P – Common pipistrelle, 55P – Soprano pipistrelle

Video Results
No bats emerged.

6. CONCLUSIONS

Table 2 Confirmed bat roost roosts during these 2023 surveys

Structure	Date	Record
B6	13-09-23	1x Myotis emerged
B12 alcoves	13-09-23	LHS droppings in southern alcove
	03-10-23	1x LHS bat in southern alcove
	03-10-23	1x LHS bat in central alcove
B20	13-09-23	3x Myt emerged

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