APPENDIX 1

Land at Cwm Glo, Merthyr Tydfil

Grassland fungi survey





December 2015

Contents

1. Introduction 1
2. Survey method 1
3. Survey findings 2
4. Discussion and recommendations 8
5. Bibliography 11
Appendix 1. Photographs 12
Appendix 2. Location of survey findings 17
Appendix 3. Location of notable club fungi and earth-tongues 19
Appendix 4. Summary data comparison between 2005/7 and 2015 21

Document reference: C213/D2/V2

Cover photographs: *Hygrocybe cantharellus* (left), and grassland habitat at Area 5 (right).

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1. Introduction

Bioscan (UK) Ltd has commissioned Sturgess Ecology to undertake a survey of grassland fungi on land at Cwm Glo, Merthyr Tydfil (approx central Grid Reference SO038054), between September and December 2015. This survey forms part of a series of ecology surveys that Bioscan are carrying out as a part of a feasibility study for development of part of the site.

The area is already known to be amongst the best sites in the UK for grassland fungi, and this is one of the key factors for its designation as a Site of Special Scientific Interest (SSSI). However, the fungi records to date have been collected during just two previous surveys. Ray Woods and Scott Hand carried out a rather hurried overview during Autumn 2005 (Scott Hand, pers.comm.). This was followed by a more systematic survey by Shelley Evans and David Mitchel between 7th October and 1st November 2007 (Evans & Mitchel, 2007). The 2007 survey was limited to certain parts of the site that had been identified as good fungi areas in 2005, so did not involve a complete coverage. It also missed the early and late parts of the fungi fruiting season. Both of the previous studies highlighted the need for further surveys.

2. Survey method

The field work was carried out by Dr Peter Sturgess CEnv MCIEEM, an ecologist experienced in grassland fungi survey, and familiar with the types of habitats and terrain that occur on the site.

There are currently no standard survey protocols for fungi, and recording is mostly carried out using walk-over methods. In this case, because the area is so large, and fungi fruit over many months, the survey was limited to a sampling-based approach.

The surveys were spread out through the main fruiting period for grassland fungi. A total of 4 visits were carried out. Each visit was undertaken over a 3 day period, to allow reasonable coverage of the main grassland areas. The survey dates were as follows:

Visit 1: 2nd, 3rd and 4th September 2015.

Visit 2: 7th, 8th and 9th October 2015.

Visit 3: 28th and 29th October and 2nd November 2015.

Visit 4: 26th and 30th November and 2 December 2015.

The visits aimed to coincide with good conditions for fungi fruiting, and tried to avoid surveying during heavy rain. The final survey visit was also affected by weather, because there was frost between 20th and 22nd November. The fourth visit was delayed for a few days in the hope that some fungi might start to produce new fruiting bodies after the cold weather.

The survey was restricted to three target groups that are generally recognised as being good indicators of nature conservation value for grassland fungi. The primary focus was on the waxcap fungi (*Hygrocybe* spp.). Earth tongues (Geoglossaceae) and fairy clubs (Clavariaceae) were also recorded. *Entoloma* species are sometimes included in this type of survey, but were not attempted in this case. This is because the taxonomic and identification difficulties associated with *Entoloma* would have taken up a disproportionate amount of survey time, and omitting them meant that survey effort could be focussed on achieving a better coverage of the other groups across the site.

Each visit involved a walk-through of the site, targeting vegetation considered to be of highest potential value for grassland fungi. In particular, areas of unimproved, short-grazed pasture, and short heath which has developed on the old spoil heaps, and areas which have already been identified as good fungi habitat by previous surveys. Areas of dense scrub, woodland, marshy grassland, improved grassland and other longer grassland were generally screened out from the survey as they have much lower potential value for grassland fungi. It was not possible to survey every part of the site on every visit, but all of the larger areas of short grassland were surveyed on all 4 visits, and the smaller, more isolated patches of short grassland were surveyed on at least 2 or 3 occasions.

Within the areas of suitable grassland the search for fungi was carried out using an informal transect survey method, criss-crossing the area using approximately parallel lines. (In practice the survey lines were rarely straight because of the undulating topography of the tips, and the need to avoid wet areas or patches of scrub.) The locations where the waxcaps and other target species were fruiting were recorded onto an aerial photographic base map. No attempt was made to count the individual fruiting bodies; some were growing singly while others were found in groups. In either case, only the species and location was recorded on the map.

It was possible to identify many of the fungi species during the survey, but some had to be collected for confirmation using a microscope. All earth-tongues and the majority of fairy clubs had to be confirmed by microscopy.

3. Survey findings

The waxcap species recorded on the various survey visits are listed in Table 1.

Photographs of some of the key species mentioned in the text are presented in Appendix 1.

Table 2 summarises the locations where the various waxcap species were recorded (cumulatively for all visits). To enable comparison with previous surveys, the locations follow the numbered areas used in the 2005 and 2007 surveys (the boundary of these areas, as provided by NRW, is shown in Figure 1). In cases where fungi were found beyond these areas, they have been referred to the closest numbered area.

The locations where the fruiting bodies of waxcap species were observed are shown in Appendix 2, on an aerial photographic background. The 2007 boundaries are also shown on this figure to allow comparison with the former surveys. The symbols used do not distinguish between fungi seen growing individually or in groups, so do not show the exact numbers of fruiting bodies. The main purpose of the figures is not to provide precise detail for every species (especially because symbols often overlap one another where species were growing close together), but to show the overall distribution of the waxcap grassland habitats confirmed by the 2015 survey.

Table 3 summarises the earth-tongue and club fungi species recorded during the different survey visits. Table 4 summarises the areas where these species were recorded.

Appendix 3 presents the locations of several particularly uncommon earth-tongue and fairy club species. These are the Biodiversity Action Plan (BAP) species *Geoglossum atropurpureum* and *Clavaria zollingeri*, and *Clavaria greletii*, which is a Red Data Book species not previously recorded in Wales.

Table 1. 2015 Waxcap species summarised by survey visit.

Species	Visit 1	Visit 2	Visit 3	Visit 4
	2-4 Sept	7-9 Oct	28 Oct - 2 Nov	26 Nov - 2 Dec
Hygrocybe aurantiosplendens		✓		
Hygrocybe calyptriformis	✓	✓	✓	
Hygrocybe cantharellus	✓	✓	✓	
Hygrocybe ceracea		✓	✓	
Hygrocybe chlorophana	✓	✓	✓	✓
Hygrocybe citrinovirens	✓	✓		
Hygrocybe coccinea	✓	✓	✓	✓
Hygrocybe colemanniana	✓	✓	✓	
Hygrocybe conica	✓	✓	✓	✓
Hygrocybe flavipes	✓	✓	✓	
Hygrocybe fornicata		✓	✓	
Hygrocybe glutinipes	✓	✓		
Hygrocybe helobia	✓	✓		
Hygrocybe ingrata	✓			
Hygrocybe insipida	✓	✓	✓	✓
Hygrocybe intermedia	✓			
Hygrocybe irrigata	✓	✓	✓	✓
Hygrocybe laeta		✓	✓	✓
Hygrocybe miniata			✓	
Hygrocybe mucronella			✓	
Hygrocybe nitrata	✓	✓	✓	
Hygrocybe phaeococcinia	✓		✓	
Hygrocybe pratensis	✓	✓	✓	✓
Hygrocybe pratensis var pallida	✓	✓		
Hygrocybe psittacina	✓	✓	✓	✓
Hygrocybe punicea		✓	✓	✓
Hygrocybe quieta	✓	✓	✓	
Hygrocybe reidii	✓	✓	✓	✓
Hygrocybe russocoriacea		✓	✓	✓
Hygrocybe splendidissima			✓	
Hygrocybe virginea	✓	✓	✓	✓
Hygrocybe vitellina		✓	✓	
	22	26	25	12

A total of 31 waxcap species was observed (or 32 if counting *Hygrocybe pratensis* var *pallida.* This is counted as a species by some authorities). The list included two waxcap species not previously recorded on the site, namely *Hygrocybe helobia* and *H.vitellina.*

Two waxcap species that have been recorded at Cwm Glo in previous years were not re-found during the 2015 survey. These were *Hygrocybe ovina* and *H.acutoconica (H.persistens).*

Table 2. 2015 Waxcap records by area.

Area	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	27	28	29	30	31	32
Species																										
Hygrocybe aurantiosplendens	✓			✓																						
Hygrocybe calyptriformis		✓		✓	✓																					
Hygrocybe cantharellus				✓	✓		✓				✓			✓													
Hygrocybe ceracea	✓			✓	✓	✓									✓								✓			
Hygrocybe chlorophana	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
Hygrocybe citrinovirens				✓	✓		✓																		✓	
Hygrocybe coccinea	✓	✓		✓	✓		✓		✓	✓	✓		✓		✓	✓	✓		✓			✓		✓	✓	✓
Hygrocybe colemanniana	✓			✓	✓																			✓		
Hygrocybe conica	✓			✓	✓	✓	✓	✓	✓		✓		✓	✓		✓	✓	✓	✓				✓	✓	✓	✓
Hygrocybe flavipes	✓	✓		✓	✓	✓	✓	✓	✓			✓		✓	✓			✓					✓	✓	✓	
Hygrocybe fornicata					✓																				✓	
Hygrocybe glutinipes						✓									✓						✓					
Hygrocybe helobia				✓	✓		✓	✓	✓				✓	✓		✓		✓	✓			✓	✓	✓	✓	
Hygrocybe ingrata		✓																								
Hygrocybe insipida	✓	✓		✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓
Hygrocybe intermedia														✓	✓											
Hygrocybe irrigata	✓			✓	✓	✓	✓	✓			✓						✓	✓	✓	✓		✓	✓	✓	✓	
Hygrocybe laeta	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
Hygrocybe miniata													✓													
Hygrocybe mucronella						✓								✓												
Hygrocybe nitrata				✓	✓			✓										✓						✓		
Hygrocybe phaeococcinia					✓											✓							✓			
Hygrocybe pratensis	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
Hygrocybe pratensis var pallida				✓										✓	✓											
Hygrocybe psittacina	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
Hygrocybe punicea		✓		✓	✓		✓							✓												
Hygrocybe quieta	✓	✓		✓	✓	✓													✓							
Hygrocybe reidii	✓			✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
Hygrocybe russocoriacea		✓		✓	✓	✓	✓	✓				✓	✓	✓				✓	✓				✓	✓	✓	
Hygrocybe splendidissima					✓																					
Hygrocybe virginea	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	
Hygrocybe vitellina									✓																	

Figure 1. Location of 2005 and 2007 study areas (provided by NRW).

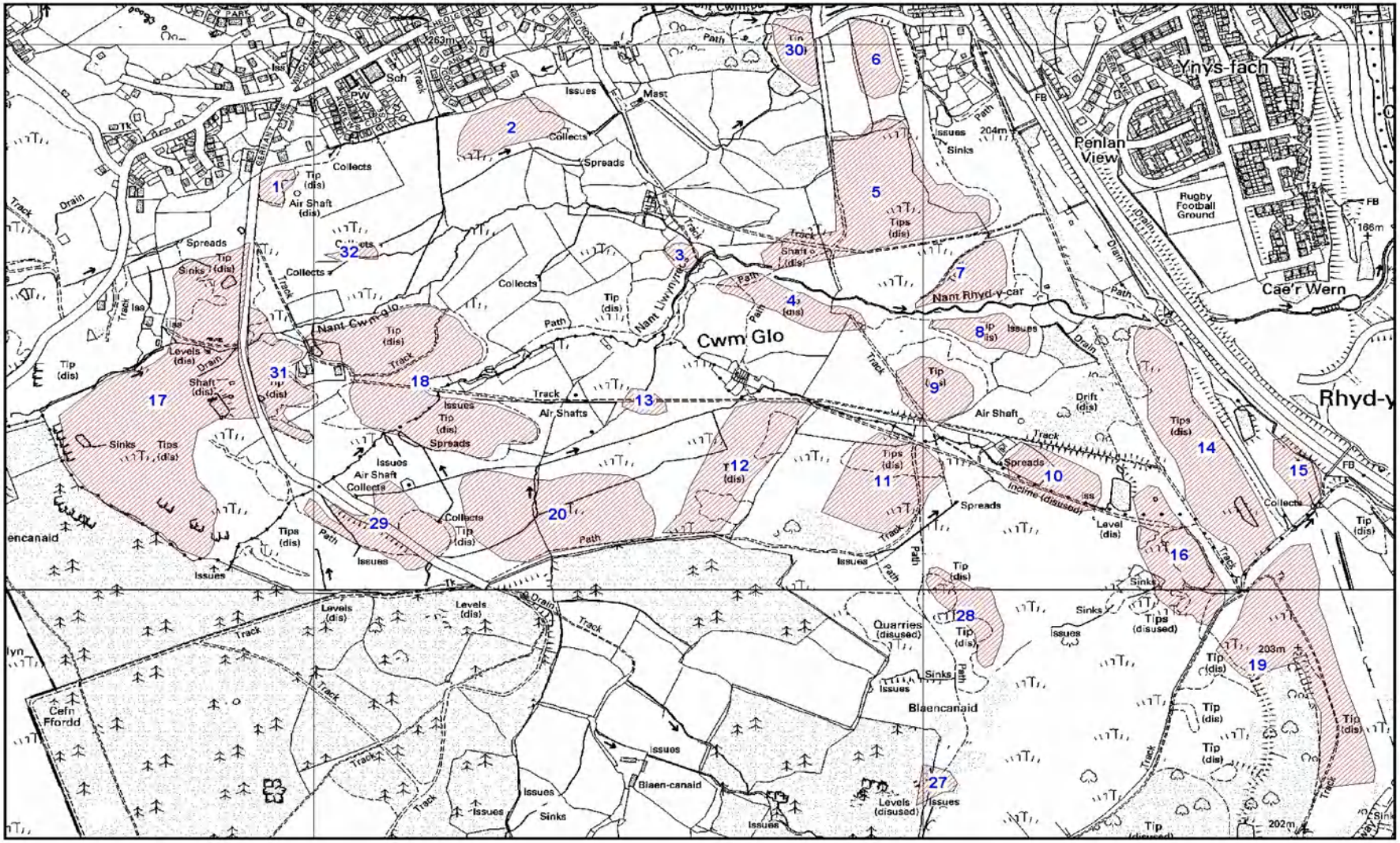


Table 3. 2015 Earth-tongue and club fungi summarised by survey visit.

Species	Visit 1	Visit 2	Visit 3	Visit 4
	2-4 Sept	7-9 Oct	28 Oct - 2 Nov	26 Nov - 2 Dec
Geoglossum atropurpureum		✓	✓	✓
Geoglossum cookeanum			✓	
Geoglossum fallax		✓	✓	✓
Geoglossum glutinosum		✓	✓	✓
Geoglossum umbratile		✓	✓	
Trichoglossum hirsutum			✓	✓
Trichoglossum walteri	✓		✓	
Clavaria acuta		✓	✓	
Clavaria fumosa	✓	✓	✓	
Clavaria greletii			✓	
Clavaria incarnata		✓		
Clavaria zollingeri	✓	✓		
Clavulinopsis corniculata		✓	✓	✓
Clavulinopsis fusiformis	✓	✓		
Clavulinopsis helvola	✓	✓	✓	
Clavulinopsis laeticolor		✓	✓	
Clavulinopsis luteoalba	✓	✓	✓	✓
Clavulinopsis umbrinella				✓
Macrotyphula juncea			✓	

The earth-tongue species mainly appeared in the last two visits, while the fairy clubs mostly appeared during the middle two visits.

One new earth-tongue species for the site list was recorded, namely *Trichoglossum walteri*, which was mostly seen in heavily grazed pasture. *Microglossum olivaceum*, which had previously been noted at 9 areas, was not re-found. The BAP species *Geoglossum atropurpureum* was locally frequent, and was seen in 5 areas where it had not been recorded before.

The most significant fairy club record was the discovery of a single fruiting body of *Clavaria greletii*. It is a nationally rare species with only 8 previous records in the UK, and this is its first record from Wales.

Several patches of *Clavaria zollingeri* were found in area 5, which is a new location for this species. It was not refound in Area 17 where it had been seen previously. Area 5 also supported *Clavulinopsis umbrinella*, which is a new species for Cwm Glo. *Clavaria argillacea, C.straminea* and *C.fragilis (vermicularis)* were not refound.

Table 4. 2015 Earth-tongue and club fungi records by area.

Area	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	27	28	29	30	31	32
Species																										
Geoglossum atropurpureum	✓				✓				✓				✓									✓	✓	✓		
Geoglossum cookeanum					✓																					
Geoglossum fallax	✓			✓	✓		✓	✓	✓	✓			✓	✓				✓					✓		✓	✓
Geoglossum glutinosum	✓	✓		✓	✓	✓		✓	✓				✓										✓	✓		
Geoglossum umbratile				✓	✓											✓						✓	✓			
Trichoglossum hirsutum				✓	✓	✓													✓				✓		✓	
Trichoglossum walteri					✓	✓																	✓			
Clavaria acuta	✓				✓							✓	✓										✓	✓		
Clavaria fumosa					✓																	✓				
Clavaria greletii													✓													
Clavaria incarnata																	✓									
Clavaria zollingeri					✓																					
Clavulinopsis corniculata					✓	✓							✓			✓	✓		✓				✓	✓		
Clavulinopsis fusiformis																						✓				
Clavulinopsis helvola				✓	✓	✓	✓		✓		✓	✓	✓			✓	✓		✓			✓	✓	✓		
Clavulinopsis laeticolor		✓			✓								✓						✓					✓		
Clavulinopsis luteoalba	✓	✓			✓	✓		✓	✓				✓		✓				✓			✓		✓		✓
Clavulinopsis umbrinella					✓																					
Macrotyphula juncea														✓												

4. Discussion and recommendations

The 2015 grassland fungi survey has confirmed that the site still supports an internationally important assemblage of grassland fungi. Although the study was largely focussed on waxcap species within the grassland habitats, the numbers of these easily exceed the SSSI selection criteria, which requires the presence of 18 or more waxcap species. Several of the individual grassland patches could meet this criterion if they were considered in isolation.

The observation of several new species for the Cwm Glo fungi list confirms that the data collected so far is unlikely to represent a full record of the species that are actually present. This is because fungi can remain unseen in the soil for many years and their appearance as fruiting bodies is very unpredictable. Some species may appear fairly regularly in an area year after year, while others species may only appear every few years. In some species many years can pass between fruiting appearances, and the probability of encountering such species during a single survey is extremely low.

The areas of greatest fungi abundance, as indicated by the distribution map in Appendix 2, generally correlate well with the areas of shortest grassland. The only exceptions being short wet grassland and areas of short grass that have been subject to disturbance within the past 30 years or so. For example, the northern part of area 19 is a large area of coal spoil with very few fungi, and this was largely reprofiled at the time of the A470 road construction (Perry Johnson, pers.comm.). The presence of waxcaps at the southern end of this area can be explained by this part not being subject to the same disturbance. This is borne out by an examination of old aerial photographs which show that the southern part has remained relatively unchanged since the 1940s. Similarly, an area of short grassland in the southern part of area 16 also supported no waxcaps. Aerial photographs show reprofiling works being carried out to the old workings in this area during 2008.

It is possible that the distribution plan may reflect some bias within the survey, simply because the areas of shortest grassland are easiest and safest to walk on and the easiest habitat to spot fungi growing in. Efforts were made to search for fungi in longer grass and heath, and on the tip sides, but relatively few fruiting bodies were seen in these locations and priority was given to searching the safer and more productive areas of relatively level short grassland where most species were observed. A notable exception to this general pattern is *Hygrocybe phaeococcinia*, which was only recorded on the sides of the tips, generally fruiting from areas where the turf had been broken by recent erosion or light trampling. This is a relatively uncommon species that was not recorded at any of the 48 Welsh waxcap grasslands surveyed by Griffiths *et al* (2013), and there are only 61 records of it in the Fungal Records Database of the British Isles. It is feasible that this species might be overlooked if it has a preference for the steeper slopes.

This year appears to have been a good year for recording certain species. The summer of 2015 was unusually wet, and waxcaps were observed on other colliery spoil heaps from late-June onwards (pers.obs.). It is therefore possible that some 'typically early' fungi (e.g. *Hygrocybe acutoconica*) could have finished fruiting before the surveys at Cwm Glo began in September. The addition of *Hygrocybe helobia* to the site list (in 14 separate areas) is almost certainly due to the timing of the first visit in September, when the majority of fruiting bodies were found. This species is usually found early in the season, which may explain why it was not recorded in previous surveys (Boertmann, 2010).

Other differences between this year's survey and previous ones include a surprisingly low number of *Hygrocybe quieta* records. This species has been found in 18 areas within the site in the past, but only 6 this year. Interestingly, it had not previously been seen at two of the sites where it was seen this year. Observations at other sites/ years indicates that this species is often subject to very wide fluctuations in its fruiting behaviour (pers.obs.) and this

does not appear to have been a particularly good year. *H.ceracea* has also been seen at 18 areas in the past, but only 6 this year.

This season appears to have been a good one for *Geoglossum atropurpureum* which was relatively plentiful in several areas of shorter grassland, including some where it had not been recorded before. However, it appears to have been a poor year for certain species that were relatively widespread in previous surveys. These include *Microglossum olivaceum*, which was not re-found, but had been seen in 9 areas in previous surveys; *Clavaria fumosa*, which had been seen in 10 areas but was only seen at 2 this year (including 1 new area); and *Clavaria straminea* which had been seen in 8 areas previously, but none this year (despite it apparently being a good year for this species at several other sites (pers.obs.).

Some of the differences between this year's survey findings and the two previous surveys are almost certainly attributable to changes in the site management, and the decline in grazing in particular. The changes in vegetation appear to be greatest in areas of damper grassland which have developed a cover by dense Purple Moor-grass, and on the steeper sides of the tips where there has been a succession to heath and scrub vegetation. Bratton (2003) identifies grazing or frequent mowing as being the best management for grassland fungi, he also states that allowing grass to grow long appears to inhibit them from fruiting, but it is not known how long their mycelium is able to persist in the soil without suitable management. Some of the areas where good numbers of fungi had been found in 2005 and 2007 now support long grass or heath with very few fungi fruiting bodies (and none at all in some cases). A few larger species, such as *Hygrocybe punicea*, were found fruiting amongst relatively tall heath and grasses, but only in very small numbers. It is likely that smaller species would not fruit in these conditions (and if they did fruit at low density they would probably not have been observed by the surveyor). In a few situations, fungi were found fruiting on top of ant-hills within otherwise long-grass habitat. It is likely that some species that have been found in previous surveys are still present, but were not recorded in the same locations this year because they did not produce fruiting bodies in the tall vegetation.

Despite the apparent general reduction in the extent of waxcap grassland, a few areas were found where there are concentrations of grassland fungi outside of the former known areas. The most significant are the clusters of waxcaps to the south-east of area 1, to the north of area 16, and the small field north-west of area 15. They are all areas of old grassland and it appears that they may simply have been missed in the initial 2005 survey and therefore not included in the 2007 survey. Despite their small size, these small pockets support some good waxcap diversity. The patch to the south-east of area 15 supports at least 10 species of waxcaps, including *Hygrocybe ingrata* and *H.punicea*. The patch to the north of area 16 was one of the few places that *H.phaeococcinea* was found, and the small field north-west of area 15 supported 6 species of waxcaps and was the only place where *H.intermedia* was found during the 2015 survey.

It is possible that another difference between this year's survey and the previous ones may have been due to mapping errors, or broad generalisations made during the original survey. For example, area 28 in the NRW figure does not appear to correlate with the area of short grassland on the top of the tip where most of the waxcaps were found this year. Another case might be the large area of relatively young coal spoil included within the north of area 19, which is unlikely to have supported many waxcaps in either 2005 or 2007 due to the recently disturbed nature of the ground.

An interesting observation in the south of Area 5 was a patch of heath and acid grassland in the south of the area that had been burned during the summer. No waxcaps were seen in any of the burned patch during the first 2 visits, unlike the unburned heathy patches nearby. Small numbers of fungi were not seen in the burned patch until the last two visits, showing

that the fire had not eliminated the fungi completely, but might have delayed this year's fruiting.

One feature noted in many of the areas where waxcaps were observed is the presence of scattered scrub, particularly Hawthorn. This appears to have a negative impact on fungi because the bushes are too large to be removed by grazing livestock, so that the presence of the bushes results in pockets of grassland remaining ungrazed even where livestock are present. Where the scrub is denser, it can result in relatively large areas being avoided by the animals, and greater trampling pressure in other areas where animals are channelled into certain parts. The effect of vegetation change appears especially evident in area 17. This supported the greatest diversity of fungi in the 2007 survey, including 17 waxcap species and the BAP species *Clavaria zollingeri, Geoglossum atropurpureum* and *Microglossum olivaceum*, but only 10 species of waxcaps (in very low numbers) and none of the BAP species were found in the current study. Much of area 17 now supports young Hawthorn trees, heath, tussocky grasses and Bracken, and many of the remaining grassland patches are heavily trampled by horses. There is a high probability that the grassland fungi are still present, but have not produced fruiting bodies due to the change in habitat.

This year's survey findings highlight how variable fungi observations can be from year to year, area to area, and even from visit to visit, and they show that there is likely to be a great deal more to be learned about the species present and the way that they are distributed within the site. Therefore further survey is strongly recommended to continue to build on what is already known.

The greater precision in the way that the waxcap data has been recorded this year appears to have been particularly helpful in clarifying the extent of key areas of waxcap grassland. (Although it would not have mapped areas where fungi are currently inhibited from fruiting by tall grass or scrub.) It would be beneficial to continue this form of survey over several years, to allow for the erratic nature of fungal fruiting, so that a more comprehensive distribution plan can be produced for different waxcap species, and areas of peak diversity can be highlighted.

The key management issue affecting the grassland fungi at present is the level of grazing. It is possible that succession to scrub and woodland could result in an irreversible loss of grassland fungi, as the mycelium in the soil is replaced by a different suite of fungi. (Waxcaps are sometimes found in woodlands, but rarely in large numbers.) At the moment the encroachment by scrub appears to be fairly light in many areas, and it should be relatively straightforward to restore the habitat to short grassland suitable for fungi simply by removing the scattered bushes to allow the full area of grassland to be grazed. The fungal mycelium is likely to still be present, and would be able to fruit again after the habitat is restored to short turf. This type of clearance would be a key recommendation for most of the well-drained grasslands where good numbers of waxcaps are still present.

The potential for restoring grassland areas that have been overgrown by scrub or long grass for longer periods is subject to much uncertainty. However, recent advances in soil DNA analysis at Aberystwyth University might be able to shed some light on this. It may be worth investigating whether researchers might be able to carry out tests in areas of recently colonised scrub to determine whether or not the waxcaps are persisting as a non-fruiting mycelium. If so, there might be potential to restore the habitat to favourable condition for grassland fungi by clearance of the bushes and re-establishing a suitable grazing regime.

The owners of the site are currently investigating potential for developing part of the site. No details are currently available but the key recommendation for minimising impacts on grassland fungi is to avoid the areas that have been highlighted as currently supporting them. Development of areas of dense scrub, Bracken or wet grassland would not have any impact on waxcaps. (NB. These habitats support other species that would also need to be evaluated in any ecological assessment).

There are currently no simple options for mitigating loss of waxcap grasslands, because they develop after decades of relatively consistent management, so cannot be re-created in the short term. The fungal mycelium within the soil is extremely vulnerable to disturbance and nutrient enrichment, and there is no evidence of any successful attempts to translocate them. Therefore the best mitigation is to avoid direct loss of habitat. In assessing any potential impacts on fungi the quality of the grassland should be prioritised according to the species it supports, so that areas supporting more species and rarer species of fungi are afforded a greater degree of protection.

If a proposed development were to affect an area of grassland that supports a good population of fungi there is nothing that can be done to translocate them. However, on this particular site, because there is a relatively large area of waxcap grassland that is currently in poor condition and undergoing succession to heath and scrub, there may be scope to offset some small-scale loss by restoration of waxcap grasslands on a wider scale, in other parts of the site. This should only be considered if assurances can be given that the site will be grazed appropriately in the long-term. The possibility of mitigation by this type of offsetting is potentially very controversial and would need the approval of NRW because of the site's SSSI status, and also because any changes in habitat management would also need to consider other species, such as rare plants and invertebrates. It is not recommended that any of the most diverse waxcap grassland areas should be treated in this way, but it may be suitable for offsetting the loss of small grassland patches which only support relatively common fungi species. In some cases the potential for restoring grassland habitat is very good, particularly where scrubby bushes still have grasses growing beneath, so that all that is needed is to remove the vegetation and reinstate grazing. The potential increase in area of waxcap grassland in some areas with patchy Hawthorn scrub could be 20% or more, and this could be relatively easy to achieve. The possibility of restoring larger areas from older scrub at the margins of waxcap grassland might also be feasible, but this should only be considered if soil DNA analysis has confirmed that there is still viable mycelium present that might be able to re-establish after grazing is reinstated. If this type of approach to restoration is attempted then it would be important that the work is carefully monitored and the results published, because if successful it could provide a useful precedent for restoration of other sites.

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Appendix 1. Photographs



Photograph 1. *Hygrocybe helobia*, not recorded at Cwm Glo in previous surveys.



Photograph 2. *Hygrocybe vitellina*, not recorded at Cwm Glo in previous surveys.



Photograph 3. *Hygrocybe phaeococcinea*, a relatively uncommon species found at two new areas on the sides of tips at Cwm Glo.



Photograph 4. *Clavaria zollingeri*, found at a new location at Cwm Glo during 2015.



Photograph 5. The nationally rare *Clavaria greletii*. The discovery of this species at Cwm Glo in 2015 is the first record of this species in Wales.



Photograph 6. *Geoglossum atropurpureum*, found at several new areas within Cwm Glo during 2015.



Photograph 7. Short grass with ant-hills in area 5. This area supported the highest densities of grassland fungi.



Photograph 8. Area 1, showing good waxcap grassland with anthills, with patchy scrub.



Photograph 9. Looking east across area 17, showing patchy Hawthorn scrub, heath and Bracken encroaching over much of the grassland area.



Photograph 10. Area 20, which has become dominated by long grass and patchy scrub and is currently unsuitable for grassland fungi to fruit.



Photograph 11. Recently reprofiled coal spoil with no grassland fungi, in area 16.



Photograph 12. Light scrub encroachment in area 29.



Photograph 13. Scrub encroachment in area 16.



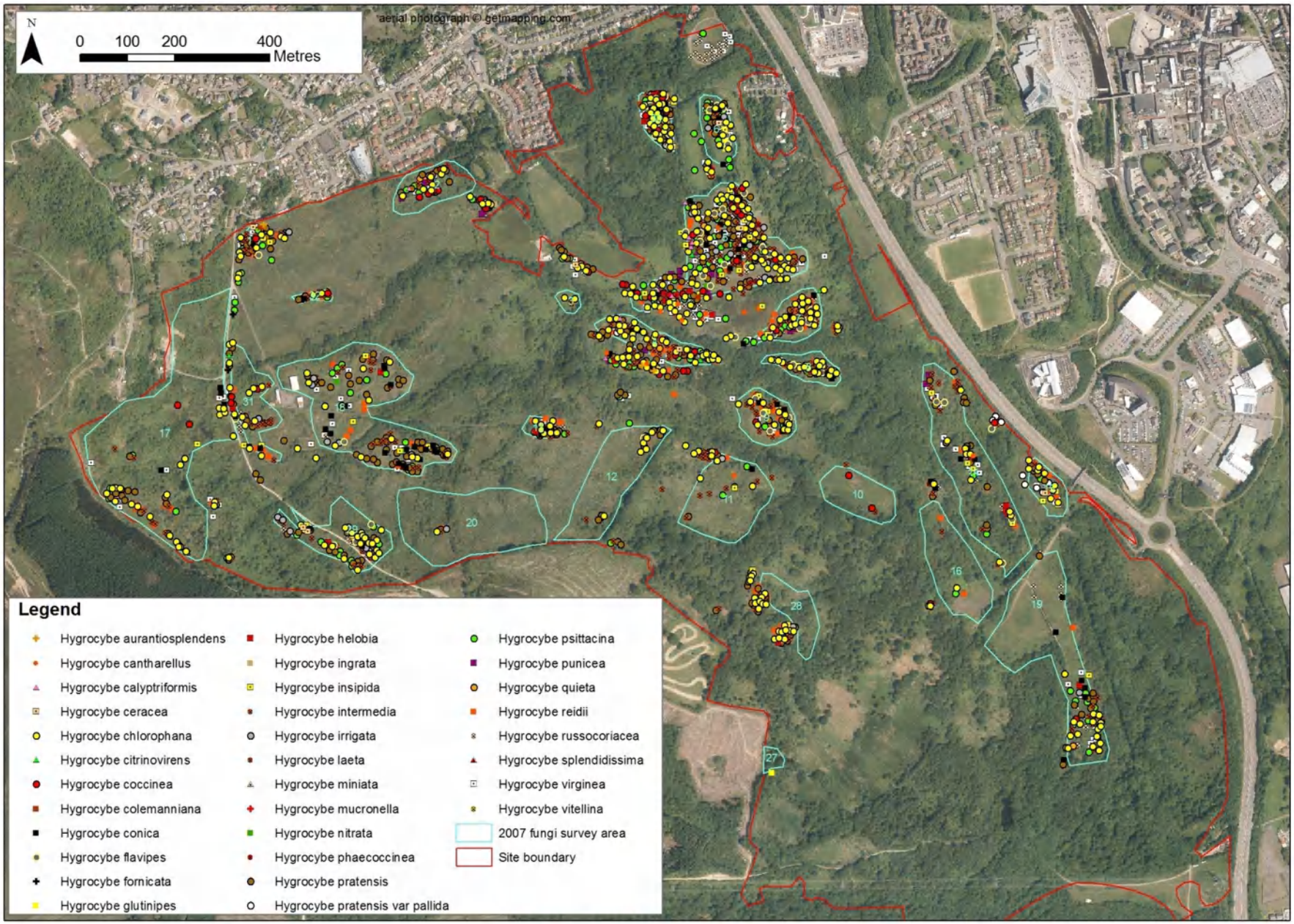
Photograph 14. Heath and tall grasses on coal spoil heap at area 18.



Photograph 15. Tips at area 28, showing dense scrub on the sloping sides, with short grass on the level tops.

Appendix 2. Location of survey findings

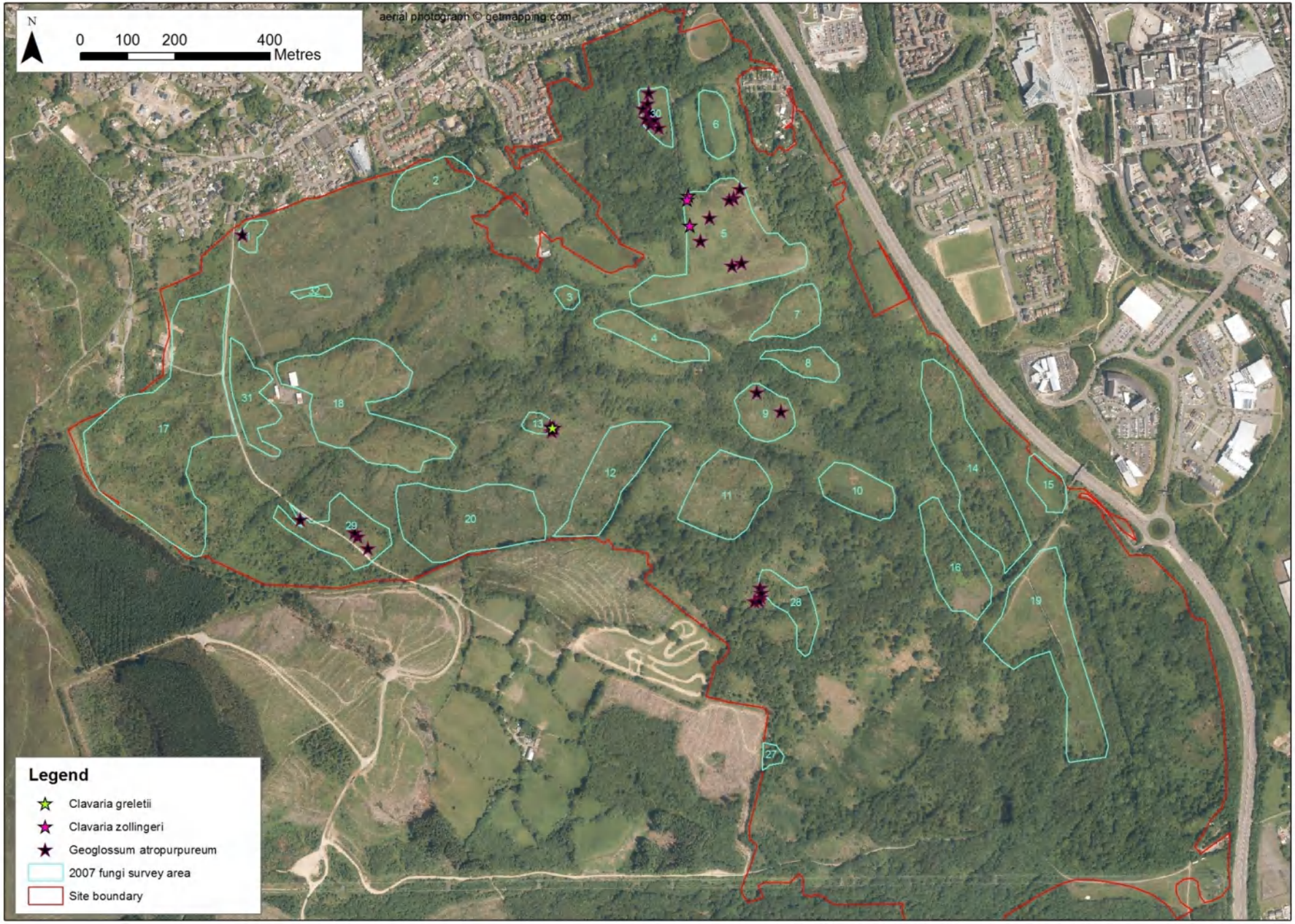
NB This figure is also available as a separate document. At the scale reproduced here it is not intended to be considered in detail because the symbols are very small and often overlapping. Its main reason for inclusion is simply to highlight the locations with the greatest concentrations of waxcaps.



Appendix 2. Cwm Glo fungi survey 2015. Distribution of waxcap species (all species combined).

Appendix 3. Location of notable club fungi and earth-tongues

This figure is only intended to highlight the locations of the three most notable club and earth-tongue species found during the 2015 survey. The locations of the more widespread species were not plotted precisely during the survey.



Appendix 3. Cwm Glo fungi survey 2015: notable club fungi and earth-tongues

Appendix 4. Summary data comparison between 2005/7 and 2015

The table shows the 2005 and 2007 data (combined) provided by NRW, compared area by area with the 2015 data, for the three target groups studied this year (earth-tongues, fairy clubs and waxcaps).

Symbols used:
✓ = Present in 2015 and 2005/2007
+ = Present in 2015 but not seen fruiting 2005/2007
x = Present in 2005/2007 but not seen fruiting in 2015

Earth-tongues

Site number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	27	28	29	30	31	32
Geoglossum atropurpureum	✓	x			✓				+				+			x	x					+	+	+		
Geoglossum cookeanum					+												x								x	
Geoglossum fallax	✓			✓	✓		+	+	✓	+		x	+	✓				+					+		+	+
Geoglossum glutinosum	+	+		✓	+	+		✓	+	x	x	x	+	x									+	+		
Geoglossum umbratile				+	✓											✓	x					+	+			
Microglossum olivaceum				x	x		x	x	x				x	x		x	x									
Trichoglossum hirsutum				+	x	+													+				+		+	
Trichoglossum walteri					+	+																	+			

Fairy Clubs

Site number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	27	28	29	30	31	32
Clavaria acuta	+	x		x	✓							✓	+	✓			x	x		x			✓	+	x	
Clavaria argillacea	x	x																								
Clavaria fragilis (vermicularis)		x			x				x			x	x				x	x	x							
Clavaria fumosa		x		x	✓			x			x	x	x		x		x					+			x	
Clavaria greletii													+													
Clavaria incarnata	x	x															+									
Clavaria straminea		x		x			x				x	x	x	x						x						
Clavaria zollingeri					+												x									
Clavulinopsis corniculata	x	x		x	✓	+			x				✓		x	+	✓	x	✓	x			✓	+	x	x
Clavulinopsis fusiformis	x											x										+				x
Clavulinopsis helvola	x	x	x	✓	✓	✓	+		✓	x	✓	✓	✓			✓	✓	✓	+	x		✓	+	+	x	
Clavulinopsis laeticolor	x	+		x	✓				x				✓				x		+					+	x	
Clavulinopsis luteoalba	+	✓			+	+		+	+			x	+		+		x	x	+			+		+		+
Clavulinopsis umbrinella					+																					
Ramariopsis kunzei								x																		
Macrotyphula juncea														+												

Waxcaps

Site number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	27	28	29	30	31	32
Hygrocybe acutoconica (persistens)		x		x							x						x	x								
Hygrocybe aurantiosplendens	+	x		✓			x		x											x						
Hygrocybe calyptriformis		✓		✓	✓						x	x			x		x	x					x			
Hygrocybe cantharellus	x	x		✓	✓		+				+	x	x	+			x	x					x		x	
Hygrocybe ceracea	✓			✓	✓	✓	x		x		x	x	x	x	✓	x	x			x			✓	x	x	x
Hygrocybe chlorophana	✓	✓	✓	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
Hygrocybe citrinovirens		x		✓	+		+					x	x				x						x		+	
Hygrocybe coccinea	+	✓		✓	✓		+		✓	✓	✓	x	✓	x	✓	+	✓	x	+	x		+		+	+	+
Hygrocybe colemanniana	+	x		✓	✓																			+		
Hygrocybe conica	✓	x		✓	✓	+	✓	✓	✓		✓	x	✓	✓	x	✓	✓	✓	✓	x		x	✓	+	✓	✓
Hygrocybe flavipes	✓	✓		✓	✓	+	✓	✓	✓	x	x	+	x	✓	+	x	x	✓				x	✓	+	✓	
Hygrocybe fornicata		x			✓										x		x						x		✓	
Hygrocybe glutinipes					x	+			x			x		x	+						+					
Hygrocybe helobia				+	+		+	+	+				+	+		+		+	+			+	+	+	+	
Hygrocybe ingrata		+															x									
Hygrocybe insipida	✓	✓		+	✓	+	+	+	✓		✓		✓	✓	✓	+	✓	✓	+	x		+	+	+	✓	+
Hygrocybe intermedia		x			x								x	+	✓		x									
Hygrocybe irrigata	✓	x		✓	✓	+	✓	✓	x	x	✓	x	x	x	x	x	✓	+	+	+		+	+	+	+	x
Hygrocybe laeta	✓	✓	+	✓	✓	+	✓	+	✓	+	✓	✓	✓	✓	✓	✓	✓	✓	+	✓		+	✓	+	✓	✓
Hygrocybe miniata	x			x	x		x	x					+				x	x								x
Hygrocybe mucronella						+								✓			x	x								
Hygrocybe nitrata				+	✓			+									x	+						+		
Hygrocybe ovina					x							x														
Hygrocybe phaeococcinia					+											+		x					+			
Hygrocybe pratensis	✓	✓		✓	✓	+	✓	✓	✓	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		+	✓	✓	✓	✓
Hygrocybe pratensis var pallida		x		+	x		x			x	x			✓	✓		x			x						
Hygrocybe psittacina	✓	✓	x	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		+	✓	✓	✓	+
Hygrocybe punicea		✓		✓	✓		✓		x	x				✓	x											
Hygrocybe quieta	✓	✓		✓	✓	+			x	x	x	x	x	x	x	x	x	x	+			x	x	x		x
Hygrocybe reidii	✓	x	x	✓	✓	+	✓	✓	✓	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	+	✓	+
Hygrocybe russocoriacea		+		+	✓	+	+	+				✓	+	✓		x	x	✓	+				✓	+	✓	
Hygrocybe splendidissima	x				+		x							x						x						
Hygrocybe virginea	✓	✓		✓	✓	✓	+	+	✓	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	x		+	✓	✓	+	
Hygrocybe vitellina									+																	
(Waxcap species total - all years)	18	24	4	25	28	15	21	14	18	12	17	18	19	22	18	16	25	21	13	14	1	13	19	17	17	12

APPENDIX 2

Land at Cwm Glo, Merthyr Tydfil

Grassland fungi survey





December 2020

Sturgess Ecology

Contents

1. Introduction....1
2. Survey method....1
3. Survey findings....2
4. Discussion....8
5. Recommendations....10
Appendix 1. Photographs....11
Appendix 2. Location of waxcap observations....15
Appendix 3. Location of non-waxcap observations....17
Appendix 4. Data comparison with previous surveys....19

Document reference: C213/D5/V1

Cover photographs: *Hygrocybe calyptriformis* (left), and grassland habitat at Area 14 (right).

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1. Introduction

Bioscan (UK) Ltd has commissioned Sturgess Ecology to undertake a survey of grassland fungi on land at Cwm Glo, Merthyr Tydfil (approx central Grid Reference SO038054), between September and December 2020. This survey forms part of a series of ecology surveys that Bioscan are carrying out at the site.

The area is designated as a Site of Special Scientific Interest (SSSI), partly because of its high value for grassland fungi. Previous fungi surveys have been carried out by Ray Woods and Scott Hand of the Countryside Council for Wales (CCW) in 2005 (Scott Hand, pers.comm.), Shelley Evans and David Mitchel for CCW in 2007[1] and Peter Sturgess for Bioscan in 2015[2].

2. Survey method

The survey was carried out by Dr Peter Sturgess CEnv MCIEEM, an ecologist experienced in grassland fungi survey, and already familiar with the site after his previous survey.

Fungi recording is mostly carried out using walk-over methods. In this case, because the area is so large, and fungi fruit over many months, the survey was limited to a sampling-based approach that was similar to that used in the previous surveys.

The surveys were spread out through the main fruiting period for grassland fungi. A total of 5 visits were carried out. Each visit was undertaken over a 2-day period, to allow reasonable coverage of the main grassland areas. The method was slightly modified from the 2015 survey which had taken 3 days for each visit, because the survey was focussed more closely within known areas of short grass (this was because the extent of the short-grass areas has reduced since 2015 following a reduction in grazing). The survey dates were as follows:

Visit 1: 26 September and 1 October 2020.

Visit 2: 13 and 15 October 2020.

Visit 3: 26 and 27 October 2020.

Visit 4: 13 and 16 November 2020.

Visit 5: 25 and 26 November 2020.

The visits aimed to coincide with good conditions for fungi fruiting and tried to avoid surveying during heavy rain. The first visit was delayed due to a prolonged period of dry weather in early September, which meant that very few grassland fungi were fruiting (pers.obs.). The final survey on 26 November was affected by frost; it was decided to continue because it was still possible to identify fungi, and it was likely that even fewer fungi would have been visible if the visit was deferred until December.

The survey was restricted to three target groups that are generally recognised as being good indicators of nature conservation value for grassland fungi. The primary focus was on the waxcap fungi (*Hygrocybe* spp.). Earth tongues (Geoglossaceae) and fairy clubs (Clavariaceae) were also recorded. *Entoloma* species were not attempted in this case because the taxonomic and identification difficulties would have taken up a disproportionate

[1] Evans, S. & Mitchel, D. (2007). Mycological Survey of Five Grassland Sites in Mid and South Glamorgan. CCW Tender No: Ser/2/06-07(E).

[2] Sturgess Ecology (2015). Land at Cwm Glo, Merthyr Tydfil. Grassland fungi survey. Unpublished report to Bioscan (UK) Ltd.

amount of survey time, and omitting them meant that survey effort could be focussed on achieving better coverage of the other groups.

Each visit involved a walk-through of the site, targeting vegetation considered to be of highest potential value for grassland fungi. In particular, areas of unimproved, short-grazed pasture, and short heath which has developed on the old spoil heaps, and areas which have already been identified as good fungi habitat by previous surveys. Areas of dense scrub, woodland, marshy grassland, improved grassland and other longer grassland were generally screened out from the survey as they have much lower potential value for grassland fungi. It was not possible to survey every part of the site on every visit, but all of the larger areas of short grassland were surveyed on every visit, and the smaller, more isolated patches of short grassland were surveyed on at least 2 occasions.

Within the areas of suitable grassland, the search for fungi was carried out using an informal transect survey method, criss-crossing the area using approximately parallel lines. (In practice the survey lines were rarely straight because of the undulating topography of the tips, the need to avoid wet areas or patches of scrub, and to target patches of short turf within much longer swards.) The locations where the waxcaps and other target species were fruiting were recorded onto an aerial photographic base map. No attempt was made to count the individual fruiting bodies; some were growing singly while others were found in groups. In either case, only the species and location were recorded on the map.

It was possible to identify many of the fungi species during the survey, but some had to be collected for confirmation by microscope. All earth-tongues and the majority of fairy clubs had to be confirmed by microscopy.

3. Survey findings

The waxcap species recorded on the various survey visits are listed in Table 1. The scientific names of some waxcap species have recently been reclassified and some are still undergoing taxonomic revision (mainly through DNA research), but for simplicity, and easy comparison with previous reports, names follow Boertmann[3] in this report.

Photographs of some of the key species and habitat features mentioned in the text are presented in Appendix 1.

Table 2 summarises the locations where the various waxcap species were recorded (cumulatively for all visits). To enable comparison with previous surveys, the locations follow the numbered areas used in the 2005 and 2007 surveys (the boundary of these areas, as provided by NRW, is shown in Figure 1). In cases where fungi were found beyond these areas, they have been referred to the closest numbered area.

The locations where the fruiting bodies of waxcap species were observed are shown in Appendix 2 on an aerial photographic background. The 2007 boundaries are also shown here to allow comparison with the former surveys. The symbols do not distinguish between fungi seen individually or in groups, so do not show the exact numbers of fruiting bodies. The main purpose of the figure is to show the overall distribution of the waxcap grassland habitats confirmed by the 2020 survey, rather than the detail for every species (especially because symbols often overlap where species were growing close together).

Table 3 summarises the earth-tongue and club fungi species recorded during the different survey visits. The approximate locations where they were seen are shown in Appendix 3. Table 4 summarises the areas where these species were recorded.

[3] Boertmann, D. (2010). The Genus Hygrocybe, Fungi of Northern Europe Vol.1, 2nd revised edition. Svampetryk.

Table 1. 2020 Waxcap species summarised by survey visit.

Species	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5
	26 Sept 1 Oct	13 Oct 15 Oct	26 Oct 27 Oct	13 Nov 16 Nov	25 Nov 26 Nov
Hygrocybe calyptriformis		✓	✓		
Hygrocybe cantharellus	✓	✓			
Hygrocybe ceracea			✓		✓
Hygrocybe chlorophana	✓	✓	✓	✓	✓
Hygrocybe citrinovirens		✓	✓		
Hygrocybe coccinea			✓	✓	✓
Hygrocybe conica	✓	✓	✓	✓	✓
Hygrocybe flavipes	✓	✓	✓		
Hygrocybe fornicata		✓			
Hygrocybe glutinipes	✓		✓		
Hygrocybe insipida			✓	✓	✓
Hygrocybe irrigata		✓	✓		✓
Hygrocybe lacmus			✓		
Hygrocybe laeta		✓	✓	✓	✓
Hygrocybe miniata			✓		✓
Hygrocybe mucronella		✓	✓	✓	✓
Hygrocybe nitrata	✓	✓			✓
Hygrocybe pratensis		✓	✓	✓	✓
Hygrocybe pratensis var pallida	✓	✓			
Hygrocybe psittacina	✓	✓	✓	✓	✓
Hygrocybe punicea			✓	✓	✓
Hygrocybe quieta	✓	✓		✓	
Hygrocybe reidii	✓	✓	✓	✓	✓
Hygrocybe russocoriacea		✓	✓	✓	✓
Hygrocybe splendidissima					✓
Hygrocybe virginea	✓	✓	✓	✓	✓
Hygrocybe vitellina		✓			

Table 2. 2020 Waxcap records by area.

Area	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	27	28	29	30	31	32
Species																										
Hygrocybe calyptriformis				✓	✓														✓							
Hygrocybe cantharellus					✓		✓												✓					✓		
Hygrocybe ceracea					✓								✓	✓			✓		✓							
Hygrocybe chlorophana			✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓				✓	✓		
Hygrocybe citrinovirens				✓	✓																					
Hygrocybe coccinea				✓	✓						✓		✓												✓	
Hygrocybe conica					✓	✓	✓	✓			✓		✓			✓	✓	✓	✓				✓	✓		
Hygrocybe flavipes				✓	✓		✓		✓										✓							
Hygrocybe fornicata					✓																					
Hygrocybe glutinipes															✓											
Hygrocybe insipida				✓	✓	✓	✓				✓		✓	✓	✓		✓		✓						✓	
Hygrocybe irrigata						✓											✓		✓							
Hygrocybe lacmus																		✓								
Hygrocybe laeta				✓	✓		✓		✓		✓						✓	✓	✓			✓		✓	✓	
Hygrocybe miniata					✓								✓													
Hygrocybe mucronella																		✓	✓							
Hygrocybe nitrata					✓																			✓		
Hygrocybe pratensis				✓	✓	✓	✓	✓	✓				✓	✓	✓		✓	✓	✓			✓		✓	✓	
Hygrocybe pratensis var pallida								✓							✓			✓	✓							
Hygrocybe psittacina				✓	✓	✓								✓			✓	✓	✓				✓	✓	✓	
Hygrocybe punicea				✓	✓								✓		✓		✓		✓							
Hygrocybe quieta																			✓							
Hygrocybe reidii				✓	✓		✓	✓	✓		✓		✓		✓		✓		✓			✓				
Hygrocybe russocoriacea					✓	✓	✓							✓				✓	✓					✓		
Hygrocybe splendidissima																	✓									
Hygrocybe virginea			✓	✓	✓	✓	✓		✓				✓	✓			✓	✓	✓				✓	✓		
Hygrocybe vitellina									✓																	

Figure 1. Location of 2005 and 2007 study areas (provided by NRW).

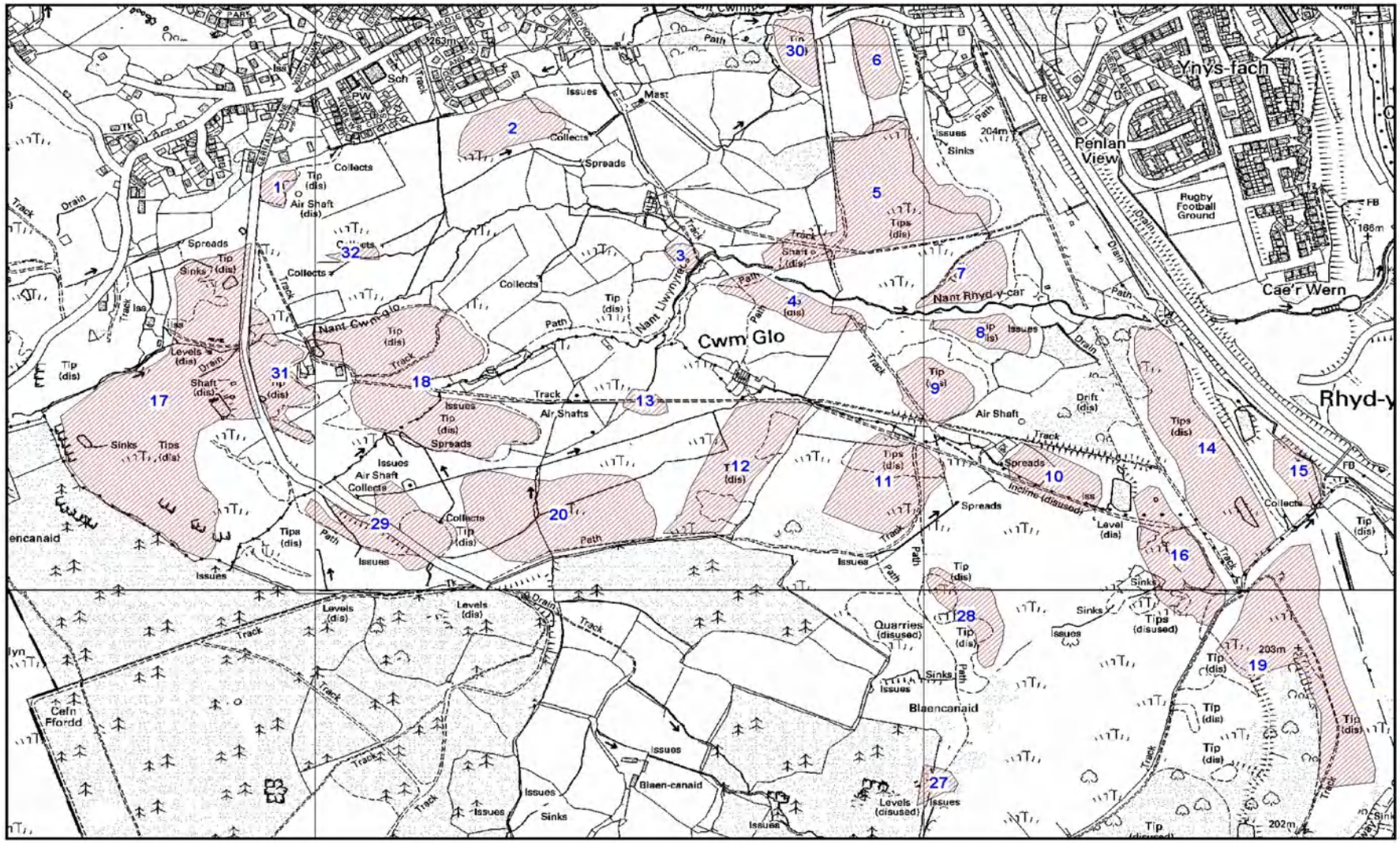


Table 3. 2020 Earth-tongue and club fungi summarised by survey visit.

Species	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5
	26 Sept-1 Oct	13-15 Oct	26 - 27 Oct	13-16 Nov	25-26 Nov
Geoglossum atropurpureum			✓		
Geoglossum fallax				✓	
Geoglossum glutinosum				✓	
Trichoglossum hirsutum				✓	
Clavaria acuta			✓	✓	✓
Clavulinopsis corniculata			✓	✓	✓
Clavulinopsis helvola			✓		
Clavulinopsis laeticolor			✓		✓
Clavulinopsis luteoalba			✓	✓	✓
Clavulinopsis umbrinella		✓			
Ramariopsis sp.		✓			

Table 4. 2020 Earth-tongue, club fungi and other non-waxcap fungi records by area.

Area	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	27	28	29	30	31	32
Species																										
Geoglossum fallax																			✓							
Geoglossum glutinosum																		✓								
Microglossum atropurpureum																								✓		
Trichoglossum hirsutum																								✓		
Clavaria acuta					✓								✓					✓								
Clavulinopsis corniculata					✓	✓												✓	✓							
Clavulinopsis helvola					✓								✓	✓	✓				✓					✓		
Clavulinopsis laeticolor					✓																					
Clavulinopsis luteoalba					✓		✓								✓											
Clavulinopsis umbrinella																		✓								
Ramariopsis sp.																									✓	
Camarophyllopsis schulzeri									✓																	
Dermoloma cuneifolium						✓																				

4. Discussion

A total of 26 waxcap species was observed. This would count as 27 if *Hygrocybe pratensis* var *pallida* is counted as a distinct taxon, as it is in the SSSI criteria that relate to waxcaps. This easily exceeds the revised SSSI threshold[4] of 19 species. However, the total is less than has been recorded in previous years (32 species in both 2007 and 2015).

Most of the waxcap species seen this year have been recorded on the site previously. Species that were not refound include *Hygrocybe acutoconica, H.aurantiosplendens, H.colemanniana, H.helobia, H.ingrata, H.intermedia, H.ovina* and *H.phaeococcinea. Hygrocybe lacmus* was found this year. This is a relatively uncommon species that was not seen in 2015. One species, *Hygrocybe lacmus*, found in Area 18, appears to be new to the site list.

The area by area species comparison (Appendix 4) shows that the fungi seen this year were generally recorded in areas they have been found before. There are a few cases where new species records have been added in some areas, most notably *Hygrocybe lacmus*. This highlights the unpredictability of fungi surveys, despite the mycelium probably being present for many years. In general, there were many more instances of fungi not reappearing where they have been recorded in the past. In some cases areas that have previously produced large numbers of fungi produced very few this year or even none at all (e.g. 24 species of waxcaps have been recorded from Area 2 in the past, but this year it produced none).

There were fewer species of non-waxcap grassland fungi too, and fruiting bodies were only seen in very small numbers. Only one specimen of the rare *Microglossum atropurpureum* was found this year.

Formal quantitative assessment of waxcap fruiting bodies was not undertaken, but as a broad comparison with the 2015 survey it was clear that the number of fruiting bodies was substantially lower this year. A comparison of the distribution maps for the 2015 and 2020 surveys shows that the distribution of high diversity waxcap areas has generally contracted.

It is difficult to account for the erratic appearance of fungi as they can vary a great deal from year to year, and some species may remain unseen for many years. The apparent decline in waxcap abundance this year is unlikely to be due to the weather, because 2020 has generally been a very good year for grassland fungi at other sites in south east Wales (pers.obs.). It is much more likely to be the result of a reduction in grazing at Cwm Glo. This has allowed areas that previously supported short grass to become dominated by tall grass, and in some cases scrub, Bracken or rushes. (In a few places short waxcap grassland has been replaced by abundant Devil's-bit Scabious, and now provides a habitat for the Marsh Fritillary Butterfly.)

The observed decline in abundance and diversity is most likely to be due to fungi fruiting being inhibited by the tall, dense vegetation. It is possible that some grassland fungi have been missed by the recent surveys, particularly where they occur in areas of tall grass or heath or under Bracken, or in woodland. However, although waxcaps and other 'grassland fungi' do occur in these habitats they generally only fruit in low numbers there.

The change in vegetation height may affect different fungi species in different ways. Most fungi appeared in much lower numbers, and very small species seemed to be affected most severely. This probably explains the substantial reduction in numbers of fairy clubs and earthtongues. Some fungi were limited to small 'islands' of short vegetation amidst areas of much longer grass, or at the sides of tracks where occasional trampling maintained a

[4] Bosanquet, S.D.S., Ainsworth, A.M., Cooch, S.P., Genney, D.R, and Wilkins, T.C. (2018). Guidelines for the Selection of Biological SSSIs. Part 2: Detailed Guidelines for Habitats and Species Groups. Chapter 14 Non-lichenised Fungi. Joint Nature Conservation Committee, Peterborough.

slightly shorter sward. The only specimen of *Microglossum atropurpureum* was a trampled specimen found at the edge of a track. *Hygrocybe chlorophana* and *H.pratensis* were the most abundant species in most waxcap areas, and being more robust species they may have coped better with the taller grass. One waxcap that appeared in greater numbers this year than in 2015 is *H.punicea*, which also has relatively large fruiting bodies.

The 2020 distribution of grassland fungi generally correlated well with areas of short grass. However, not all short grass areas produced fungi fruiting bodies. Some appear to have been subject to relatively recent ground disturbance (e.g. reprofiled areas at Areas 10 or 19). Others are very heavily grazed and damp (e.g. most of Area 15). Part of the west of the area (Areas 1 and 32) supported tall, dense vegetation during summer 2020, but became heavily grazed and trampled during the autumn and only one individual waxcap specimen was found here.

Some areas were so heavily grazed this autumn that the horses required supplementary feeding with hay (e.g. Areas 6 and 15). This seems unnecessary when so many nearby grassland areas are under-grazed. The heavily over-grazed areas did not produce many fungi; possibly because of disturbance and compaction of the upper layers of soil. It seems likely that waxcap mycelium can remain dormant for many years until suitable conditions for fruiting arise. One example of this is evident south-east of Area 19, which had been heavily over-grazed and with no fungi in the 2015 survey, but the reduced grazing pressure this summer produced a short sward in which several waxcaps appeared (although the ground became heavily poached again by the final survey).

Table 5 shows how the number of waxcap species varied through the survey period. The trend also broadly correlates with the numbers of fruiting bodies.

Table 5. Number of waxcap species through 2020 survey period.

	Visit 1 26 Sept 1 Oct	**Visit 2** 13 Oct 15 Oct	**Visit 3** 26 Oct 27 Oct	**Visit 4** 13 Nov 16 Nov	**Visit 5** 25 Nov 26 Nov
Total waxcap species	10	19	20	13	17

The fruiting season began with relatively low diversity after a dry spell in early September and built to a peak in late-October. The numbers fell in mid-November, probably due to frost. There was an increase in numbers in late November and this may be because the vegetation height had reduced in several areas that had previously supported tall grass. This late-season reduction in grass height is partly due to frost, heavy rain and slower grass growth. The low-density horse-grazing also makes more of a difference in the autumn as the animals move away from the shortest swards and start to browse areas of longer grass.

The delayed start to the survey, caused by the dry spell in September, may account for the lack of sightings of some species that tend to be found early in the season (.g. *Hygrocybe helobia, H.acutoconica* and *H.intermedia*). It is feasible that these, and perhaps other species, may have appeared during July or August, because the relatively wet July caused waxcaps to appear relatively early in some other locations in south east Wales this year (pers.obs.).

An area of heath on a wide south-facing slope in Area 5 had been burned shortly before the 2015 survey and produced very few fungi that year. In 2020 the area now supports a short, sparse acid grassland flora and supports several species of waxcaps, including being one of the few locations where *H.miniata* was recorded. The fire does not appear to have adversely affected the fungi population.

An examination of old aerial photographs shows that there has been a very substantial increase in the extent of scrub and young woodland right across the site during the last 20 years. Scrub encroachment continues to be a significant problem in several former waxcap

areas. Hawthorn and Bramble are the most prevalent species. Where the horse-grazing is only at a low density the scrub grows unchecked and the grassland beneath the bushes is gradually lost. Even where grazing is at a higher density the animals prefer to leave the scrub, so that pockets of grassland remain ungrazed and shaded. Some waxcap areas appear to have become effectively shut off from grazing after scrub has closed around them (e.g. in Areas 1, 8 and parts of 14). Some areas do not appear to have been grazed at all during the summer of 2020, apparently because the horses have not pushed their way through the scrub. A small amount of scrub was removed from a former track to access Area 8 at the start of the current survey, and since then the horses have adopted the same track and begun grazing it again.

5. Recommendations

This year's survey findings have highlighted a decline in the numbers of grassland fungi and a reduction in the extent of grassland in good condition for fungi. The following measures are recommended to address this.

- Increase the density of grazing livestock. Ideally using a combination of cattle and horses to restore a much shorter sward to the grassland areas and push back some of the encroaching scrub. This would also benefit other wildlife, including Marsh Fritillary butterflies and the diverse marshy grassland flora.
- Resume grazing in areas where livestock have been removed (e.g. west of Gernant Lane) to prevent further habitat deterioration.
- Consider allowing the horses in overgrazed fields (e.g. from Area 6) to access a wider area during the winter. (This should mean that supplementary feeding with hay is not necessary.)
- Carry out scrub control in all of the areas where waxcaps have been recorded in the recent surveys, to maintain the current grassland areas and restore the areas that have been lost to scrub encroachment.
- Winter-grazing by sheep could potentially be considered in some parts of the SSSI, subject to agreement from NRW that the flora and fauna would not be adversely affected (e.g. if sensitive areas are fenced off). Sheep-grazing at low density could be beneficial in the waxcap grassland areas and would be better than losing the grassland habitat completely if other grazing options are not possible.

It is likely that the former waxcap grasslands that have been overgrown by long grass and scrub still retain fungi mycelium, but little is currently known about how many years the fungi population remains viable in the soil. Cwm Glo could make a good site for soil DNA research to investigate the longevity of waxcap mycelium in areas no longer suitable for fungi fruiting. This in turn could lead to experimental scrub clearance and reinstatement of grazing to find out whether the current declines can be reversed.

Periodic resurveying of the fungi at Cwm Glo is recommended, to monitor which species are present in different years (as fruiting can be very variable) and to see how the fungi population is responding to any changes in grassland management.

Appendix 1. Photographs



Photograph 1. *Hygrocybe lacmus*, not recorded at Cwm Glo in previous surveys.



Photograph 2. *Hygrocybe vitellina*, not recorded at Cwm Glo in 2005 or 2007 but seen in small quantity in 2015 and 2020 (in Area 9 both times).



Photograph 3. *Hygrocybe nitrata*, a relatively uncommon species found in two areas during the 2020 survey.



Photograph 4. *Hygrocybe punicea*, found in several areas during 2020.



Photograph 5. *Trichoglossum hirsutum*. One of a very small number of earthtongues found during the 2020 survey.



Photograph 6. *Microglossum atropurpureum. The only example of this uncommon species seen during 2020 was this damaged specimen growing at the edge of a track.*



Photograph 7. Hygrocybe chlorophana. This was the most abundant waxcap species recorded during the 2020 survey.



Photograph 8. Part of Area 5, showing good waxcap grassland with anthills, grazed short by horses, with patchy heather and only a small amount of scrub.



Photograph 9. Part of Area 14, which does not appear to have been grazed for several months. It has long grass and patchy Hawthorn and Dog-rose scrub. No fungi were found in this area.



Photograph 10. Part of Area 17, which now supports tall grasses and scrub and Bracken. Only a small number of waxcaps were found in this area.



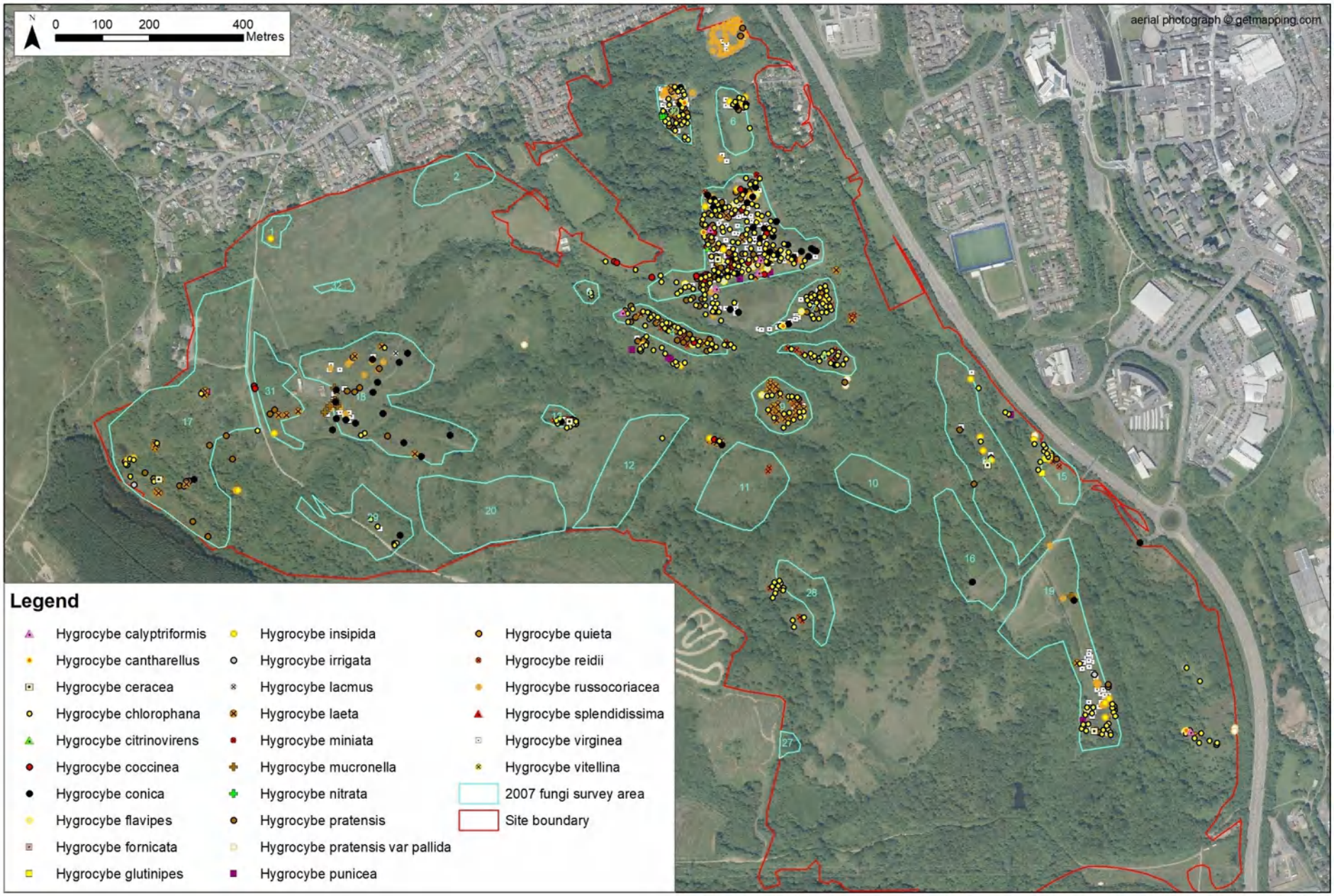
Photograph 11. Part of Area 8, showing Bramble and Blackthorn scrub, gradually spreading from the edge of the clearing and reducing the area of grassland.



Photograph 12. Over-grazed pasture at Area 6. The horses in this area needed supplementary feeding as there was not sufficient grass for them in the field.

Appendix 2. Location of waxcap observations

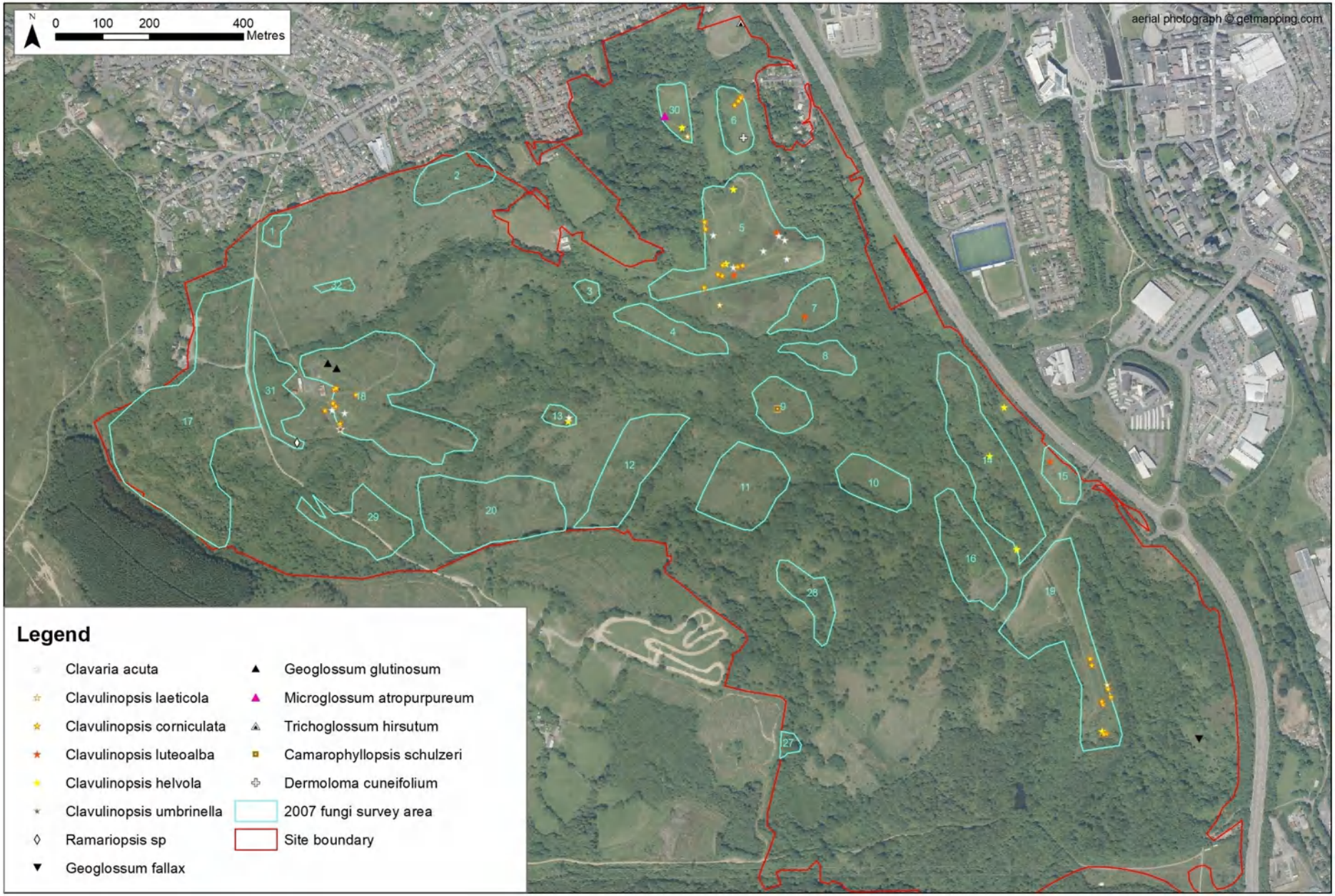
NB This figure is also available as a separate document. At the scale reproduced here it is not intended to be considered in detail because the symbols are very small and often overlapping. Its main reason for inclusion is simply to highlight the locations with the greatest concentrations of waxcaps.



Appendix 2. Cwm Glo fungi survey 2020. Distribution of waxcap species (all species combined)

Appendix 3. Location of non-waxcap observations

NB This figure is also available as a separate document. At the scale reproduced here it is not intended to be considered in detail because the symbols are very small and often overlapping. Its main reason for inclusion is simply to highlight the locations with the greatest concentrations of non-waxcap fungi observations.



Appendix 3. Cwm Glo fungi survey 2020. Distribution of non-waxcap species (combined)

Appendix 4. Data comparison with previous surveys

The table shows the 2020 survey data in the context of summary data for 2005, 2007 and 2015, for the three key target groups studied this year (earth-tongues, fairy clubs and waxcaps).

Symbols used:
✓ = present in 2020 and seen in this area during previous surveys.
+ = present in 2020 but not seen in this area during previous surveys.
x = Present in this area in previous surveys but not seen fruiting in 2020.

Earth-tongues

Site number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	27	28	29	30	31	32
Geoglossum atropurpureum	x	x			x				x				x			x	x					x	x	✓		
Geoglossum cookeanum					x												x								x	
Geoglossum fallax	x			x	x		x	x	x	x		x	x	x				x	+				x		x	x
Geoglossum glutinosum	x	x		x	x	x		x	x	x	x	x	x	x				+					x	x		
Geoglossum umbratile				x	x											x	x					x	x			
Microglossum olivaceum				x	x		x	x	x				x	x		x	x									
Trichoglossum hirsutum				x	x	x													x				x	+	x	
Trichoglossum walteri					x	x																	x			

Fairy Clubs

Site number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	27	28	29	30	31	32
Clavaria acuta	x	x		x	✓							x	✓	x			x	✓		x			x	x	x	
Clavaria argillacea	x	x																								
Clavaria fragilis (vermicularis)		x			x				x			x	x				x	x	x							
Clavaria fumosa		x		x	x			x			x	x	x		x		x					x			x	
Clavaria greletii													x													
Clavaria incarnata	x	x															x									
Clavaria straminea		x		x			x				x	x	x	x						x						
Clavaria zollingeri					x												x									
Clavulinopsis corniculata	x	x		x	✓	✓			x				x		x	x	x	✓	✓	x			x	x	x	x
Clavulinopsis fusiformis	x											x										x				x
Clavulinopsis helvola	x	x	x	x	✓	x	x		x	x	x	x	✓	+	+	x	x	x	✓	x		x	x	✓	x	
Clavulinopsis laeticolor	x	x		x	✓				x				x				x		x					x	x	
Clavulinopsis luteoalba	x	x			✓	x	+	x	x			x	x		✓		x	x	x			x		x		x
Clavulinopsis umbrinella					x													+								
Ramariopsis kunzei								x																		
Ramariopsis sp.																									+	

Waxcaps

Site number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	27	28	29	30	31	32
Hygrocybe acutoconica (persistens)		x		x							x						x	x								
Hygrocybe aurantiosplendens	x	x		x			x		x											x						
Hygrocybe calyptriformis		x		✓	✓						x	x			x		x	x	+				x			
Hygrocybe cantharellus	x	x		x	✓		✓				x	x	x	x			x	x	+				x	+	x	
Hygrocybe ceracea	x			x	✓	x	x		x		x	x	✓	✓	x	x	✓		+	x			x	x	x	x
Hygrocybe chlorophana	x	x	✓	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	✓	✓	x	✓	✓	✓	x		x	✓	✓	x	x
Hygrocybe citrinovirens		x		✓	✓		x					x	x				x						x		x	
Hygrocybe coccinea	x	x		✓	✓		x		x	x	✓	x	✓	x	x	x	x	x	x	x		x		x	✓	x
Hygrocybe colemanniana	x	x		x	x																			x		
Hygrocybe conica	x	x		x	✓	✓	✓	✓	x		✓	x	✓	x	x	✓	✓	✓	✓	x		x	✓	✓	x	x
Hygrocybe flavipes	x	x		✓	✓	x	✓	x	✓	x	x	x	x	x	x	x	x	x	+			x	x	x	x	
Hygrocybe fornicata		x			✓										x		x						x		x	
Hygrocybe glutinipes					x	x			x			x		x	✓						x					
Hygrocybe helobia				x	x		x	x	x				x	x		x		x	x			x	x	x	x	
Hygrocybe ingrata		x															x									
Hygrocybe insipida	x	x		✓	✓	✓	✓	x	x		✓		✓	✓	✓	x	✓	x	✓	x		x	x	x	✓	x
Hygrocybe intermedia		x			x								x	x	x		x									
Hygrocybe irrigata	x	x		x	x	✓	x	x	x	x	x	x	x	x	x	x	✓	x	✓	x		x	x	x	x	x
Hygrocybe lacmus																		+								
Hygrocybe laeta	x	x	x	✓	✓	x	✓	x	✓	x	✓	x	x	x	x	x	✓	✓	✓	x		✓	x	✓	✓	x
Hygrocybe miniata	x			x	✓		x	x					✓				x	x								x
Hygrocybe mucronella						x								x			x	✓	+							
Hygrocybe nitrata				x	✓			x									x	x						✓		
Hygrocybe ovina					x							x														
Hygrocybe phaeococcinea					x											x		x					x			
Hygrocybe pratensis	x	x		✓	✓	✓	✓	✓	✓	x	x	x	✓	✓	✓	x	✓	✓	✓	x		✓	x	✓	✓	x
Hygrocybe pratensis var pallida		x		x	x		x	✓		x	x			x	✓		x	+	+	x						
Hygrocybe psittacina	x	x	x	✓	✓	✓	x	x	x	x	x	x	x	✓	x	x	✓	✓	✓	x		x	✓	✓	✓	x
Hygrocybe punicea		x		✓	✓		x		x	x			+	x	✓		+		+							
Hygrocybe quieta	x	x		x	x	x			x	x	x	x	x	x	x	x	x	x	✓			x	x	x		x
Hygrocybe reidii	x	x	x	✓	✓	x	✓	✓	✓	x	✓	x	✓	x	✓	x	✓	x	✓	x		✓	x	x	x	x
Hygrocybe russocoriacea		x		x	✓	✓	✓	x				x	x	✓		x	x	✓	✓				x	✓	x	
Hygrocybe splendidissima	x				x		x							x			+			x						
Hygrocybe virginea	x	x	✓	✓	✓	✓	✓	x	✓	x	x	x	✓	✓	x	x	✓	✓	✓	x		x	✓	✓	x	
Hygrocybe vitellina									✓																	
(Waxcap species total - all years)	18	24	4	25	28	15	21	14	18	12	17	18	20	22	18	16	27	23	20	14	1	13	19	18	17	12

APPENDIX 3

VEGETATION SURVEY AND CONSERVATION ASSESSMENT OF CWM GLO AND ENVIRONS, MERTHYR TYDFIL

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2005

Terrestrial Science Group, Habitats Team
Countryside Council for Wales, HQ Bangor.
CCW Staff Science Report 05/3/2

CYNGOR CEFN GWLAD CYMRU
COUNTRYSIDE COUNCIL FOR WALES

CCW HABITATS TEAM

REPORT NUMBER: CCW Staff Science Report 05/3/2

PUBLICATION DATE: November 2005

TITLE: **Arolwg llystyfiant ac asesiad cadwraeth o Gwm Glo a'i amgylchedd, Merthyr Tudful**

Vegetation survey and conservation assessment of Cwm Glo and environs, Merthyr Tydfil

AUTHORS: S.D.S. Bosanquet & D.P. Stevens

RESTRICTION: None

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CONTENTS

		Page
CRYNODEB/SUMMARY		
1. INTRODUCTION		
1.1	Background	1
1.2	Aims and objectives	1
2. METHODS		
2.1	Field procedures	2
2.2	Data processing	3
2.3	Quality control	3
3. RESULTS		
3.1	Vegetation cover	4
3.2	UK Biodiversity Action Plan habitats	7
3.3	EC Habitats Directive Annex 1 habitats	8
4. DISCUSSION		
4.1	Conservation assessment	9
4.2	Comparison with *Baseline Ecological Report*	10
4.3	Links with historic landscape	10
4.4	Future management	11
4.5	Concluding remarks	11
5. ACKNOWLEDGMENTS		12
6. REFERENCES		13
ANNEXES		15

1. Summary of community areas and quadrats
2. Tabulated floristic data
3. SO00/1 Cwm-pant-bach: site description
4. SO00/2 Cwm-glo: site description
5. SO00/13 Aberganaid Slopes: site description
6. SO00/14 Cwm-glo SSSI Annex: site description
7. Additional areas: site description

MAPS after 80

1a. Cwm Glo and environs NVC map – north and central sections
1b. Cwm Glo and environs NVC map – south section
2. Cwm Glo and environs BAP priority habitats
3. Cwm Glo and environs Annex 1 habitats

CRYNODEB

Mae'r adroddiad hwn yn cyflwyno darganfyddiadau arolygon Cam II (cymuned planhigion) y Cyngor Cefn Gwlad o ardal o dir o amgylch Cwm Glo, Merthyr Tudful. Cyflawnwyd nifer o arolygon Cam II gan y Cyngor Cefn Gwlad rhwng 1994 a 2005, ac mae'r holl wybodaeth berthnasol am lefel cymunedau'r planhigion yn cael ei chasglu yma am y tro cyntaf. Canolbwyntiodd yr arolwg ar lystyfiant llysieuol a llwyni bychain; nid oes unrhyw wybodaeth fanwl am gymunedau planhigion y goedlan ar gael.

Y prif sbardun dros lunio'r adroddiad hwn oedd cyhoeddi ymchwiliad lleol cyhoeddus sydd i'w gynnal ym mis Ionawr 2006 i gais cynllunio ar gyfer datblygiad sy'n cynnwys y rhan fwyaf o'r ardal a arolygwyd. Un o'r amcanion allweddol oedd darparu arolwg ac asesiad cywir a chyfoes i'r ymchwiliad ynglŷn â'r cynefinoedd oedd yn bresennol o fewn ardal y cais cynllunio.

Mae'r ardal a arolygwyd yn cynnwys ardal helaeth o gynefin lled naturiol a ddatblygwyd mewn tirlun ôl-ddiwydiannol wedi ei gynefino yn dda, lle mae tomennydd glo yn ffurfio rhan allweddol o'r olygfa. Cofnodwyd amrywiaeth o gymunedau o laswelltir a rhostir, gyda llawer ohonynt wedi eu gosod o fewn ardaloedd helaeth o goedlan, prysg a rhedyn. Mae ychydig o ruthrau dŵr, nentydd a phyllau bychain wedi eu gwasgaru ar draws y safle.

Mae nifer o'r cymunedau o blanhigion a gofnodwyd yn cyfateb i gynefinoedd blaenoriaeth Cynllun Gweithredu Bioamrywiaeth y DU, cynefinoedd a gydnabyddir gan Lywodraeth Cynulliad Cymru fel rhai sydd o'r pwysigrwydd mwyaf yng Nghymru, a chynefinoedd a restrwyd yn Atodiad I Cyfarwyddeb Cynefinoedd y GE. Byddai ardaloedd helaeth o'r cynefinoedd hyn yn cael ei golli pe bai datblygiad 'Merthyr Village' yn derbyn caniatâd cynllunio.

Hysbyswyd rhan o'r ardal a arolygwyd fel SoDdGA Cwm Glo yn 2003; mae gweddill yr ardal a arolygwyd ar hyn o bryd yn un nad yw wedi cael ei hysbysu. Gwneir cymhariaeth fer gyda darganfyddiadau Benyon (2005a). Ystyrir hefyd y berthynas rhwng y cynefinoedd lled-naturiol a'r tirlun hanesyddol, a rheoli'r safle yn y dyfodol.

SUMMARY

This report presents the findings of CCW Phase II (plant community) surveys of an area of land around Cwm Glo, Merthyr Tydfil. Various Phase II surveys were carried out by CCW between 1994 and 2005, and all relevant plant community level information is compiled here for the first time. Survey effort focused on herbaceous and dwarf shrub vegetation; no detailed woodland plant community information is available.

The main impetus for compiling this report was the announcement of a public local inquiry to be held in January 2006 into a planning application for a development that includes most of the surveyed area. A key aim was to provide the inquiry with an accurate and up-to-date review and assessment of the habitats present within the planning application area.

The surveyed area includes an extensive area of semi-natural habitat developed in a well-naturalised post-industrial landscape, in which colliery spoil heaps form a key part of the scenery. A variety of grassland and heath communities were recorded, much of them set within extensive areas of woodland, scrub and bracken. A few flushes, streams and small pools are scattered across the site.

Several of the plant communities recorded correspond with UK Biodiversity Action Plan priority habitats, habitats recognised by the Wales Assembly Government as being of principal importance in Wales, and habitats listed in Annex 1 of the EC Habitats Directive. Large areas of these habitats would be lost if the proposed Merthyr Village development receives planning approval.

Part of the surveyed area was notified as Cwm Glo SSSI in 2003; the remainder of the surveyed area is currently un-notified. A brief comparison with the findings of Benyon (2005a) is made. The relationship between the semi-natural habitats and the historic landscape, and the future management of the site, are also considered.

1. INTRODUCTION

1.1 Background

This report presents the findings of Phase II (plant community) surveys of land around Cwm Glo, Merthyr Tydfil carried out by the Countryside Council for Wales (CCW). The surveyed area covers 282 ha of land situated on north-east and east facing slopes above the Afon Taff near Merthyr Tydfil in south Wales. Various surveys of the area were carried out by CCW between 1994 and 2005, and all relevant plant community level information is included here. The main impetus for compiling the report was the announcement in August 2005 of a public inquiry to be held in January 2006 into a planning application for a development known as Merthyr Village, which includes most of the surveyed area.

The Merthyr Village planning application area includes or overlaps with four sites covered during CCW's Lowland Grassland Survey of Wales: Cwm-pant-bach (SO00/1, surveyed 1994), Cwm-glo (SO00/2, 1994), Aberganaid Slopes (SO00/13, 1997) and Cwm Glo SSSI Annex (SO00/14, 2003); the latter site extends well to the south of the planning application area. The remaining unsurveyed land within the planning application boundary was visited by CCW officers in 2002 and 2005, so that the whole of the planning application area has now been surveyed. Cwm-pant-bach and the majority of Cwm-glo were notified with some adjoining areas as Cwm Glo SSSI in 2003. The remaining area is currently un-notified.

1.2 Aims and objectives

The main aim of this report is to provide the inquiry with an accurate and up-to-date review and assessment of the habitats present within the planning application area, including an assessment of the habitat losses that would occur should planning permission for the Merthyr Village development be granted. The survey also provides baseline information on habitat extent and composition for use in assessments of future habitat change.

Throughout the survey, attention has focused on open grassland, heath and mire vegetation; areas of woodland, scrub and bracken were mapped but not described in detail or sampled. Further information on the woodland habitats was derived from Latham (2005) and Benyon (2005a). No formal conservation assessment of plant and animal species interest is presented, although brief comments on notable species recorded during survey work are included.

Specific objectives of this report are to provide:

- a description of the vegetation types present within the surveyed area, focusing on herbaceous and dwarf shrub communities;
- a detailed map of the vegetation types present;
- cover data for each vegetation type recorded;
- representative quadrat data as vouchers for the community determinations;
- an appraisal of the impacts on semi-natural habitats of the proposed development;
- a brief comparison of the findings with those of the *Baseline Ecological Report* carried out by Humphries Rowell/White Young Green Environmental Ltd (HR/WYGE; Benyon, 2005a);
- comments on the association between semi-natural habitats, the historic landscape and land management.

Assessments of habitat loss in this report follow the approach of Benyon (2005b & c) in assuming that all habitats within the Phase 1 and 2 working areas will be lost through the planned development. If habitats are left untouched within those boundaries then the habitat losses will be correspondingly less than those estimated here. Without definitive plans it is impossible to adjust the loss figures accordingly.

2. METHODS

2.1 Field procedures

Permission from land owners/occupiers for surveyors to access the site was arranged by CCW's Regional staff. Access permission was not sought for an area of buildings in the north-western part of the survey site which was mapped from aerial photographs.

Attention during survey work was focused on the identification and description of grassland, heathland and mire communities. Homogeneous stands were identified, sampled and mapped, using the National Vegetation Classification (NVC; Rodwell, 1991-2000) as the basis for community definition. Additional forms of vegetation were informally recognised when floristic composition appeared to vary markedly from the descriptions given in the NVC. Field survey work, including mapping and sampling, took approximately 30 person days.

Vegetation was sampled selectively using 2 x 2 m quadrats, within which the abundance of each species of vascular plant, bryophyte and macro-lichen was estimated using the Domin scale. Associated variables, such as cover of bare ground and litter, were also noted. Several quadrats were recorded in each main stand type, especially in the more extensive and variable communities. In addition to quadrat records, estimates of the frequency and abundance of vascular plants were made using the DAFOR scale.

Accurate identification of plants encountered during floristic recording was considered to be essential, and particular care was taken to distinguish between closely allied species with distinct ecological preferences, such as *Festuca ovina* and *F. rubra*. Instances where tentative identifications were necessary due to non-flowering or depauperate material are qualified as such in the text and table, usually by adding a 'cf.' qualifier. Bryophytes and lichens of uncertain determination in the field were sampled and subjected to later microscopic identification, and any unusual specimens were passed to an expert for verification.

In surveys carried out from 2002, field vegetation maps were produced by marking up high-quality, recent, ortho-rectified, colour aerial photographs (Getmapping, flown July 2001) printed at 1:5000 scale. For the earlier surveys, field maps were developed by marking up Ordnance Survey 1:10,000 base maps photo-enlarged to 1:5,000 scale. The aim was to include all stands of vegetation covering about 0.02 ha or more. Vegetation boundaries were delineated as accurately as possible, except for fine-scale associations of different stand types, which were mapped as mosaics with the percentage cover of each vegetation type noted. From 2002, hand-held Global Positioning Systems (Garmin GPS III; stated accuracy usually < 5 m) were used to aid positional accuracy during vegetation mapping and quadrat recording. Some minor amendments were made to the original vegetation maps by J.P. Woodman in 2002, either because the vegetation could be seen to have changed since the original survey visits or to provide finer detail, but systematic re-survey of the previously surveyed areas was unfortunately not possible in the time available.

Notes on vegetation composition, structure and management were made at each quadrat sampling point and elsewhere where noteworthy features were observed. Observations on uncommon plant species were also made, with brief notes on frequency and distribution, but effort was concentrated on plant communities, and intensive searches for rarities were not undertaken.

2.2 Data processing

Field maps were digitised by members of the CCW survey team using a MapInfo Geographical Information System (GIS). Boundaries of the Merthyr Village planning application area, and the Phase 1 and 2 working areas, were digitised from Map 3 in Benyon (2005c).

Habitat cover statistics were produced for the survey site, and by overlay analyses for the planning application site and the area covered by the proposed first and second phases of development. Polygons representing vegetation mosaics were handled using a set of customised software tools developed by Dotted Eyes under contract to CCW. Vegetation maps produced by the various CCW Phase II surveys were collated and amalgamated, and a final version of the digital map was produced at 1:8000 scale.

The Phase II lowland grassland survey focused on open herbaceous and dwarf shrub vegetation, and wooded areas were mapped simply as woodland/scrub. For the present purposes, it is useful to distinguish between these habitats. Woodland and scrub polygons were therefore split into the two component habitats using the *Baseline Ecological Report* (Benyon, 2005a) for the planning application area, and using notes made in the field and aerial photographs for the surveyed area lying to the south of the planning area.

Translations between plant communities and UK Biodiversity Action Plan and EC Habitats Directive habitats were implemented using the definitions given in *Priority Habitats of Wales* (Jones *et al.*, 2003) and the Joint Nature Conservation Committee's (JNCC's) website, respectively.

Relevant quadrat data were tabulated in Excel spreadsheets for each component site.

Nomenclature generally follows Clapham, Tutin & Moore (1987) for vascular plants, Corley & Hill (1981) for bryophytes, and Hawksworth, James & Coppins (1980) for lichens. To avoid confusion, exceptions are made for species used in naming plant communities, when NVC nomenclature is followed.

2.3 Quality control

The following measures were implemented to ensure high-quality and consistent survey outputs:

- use of skilled field staff with extensive experience of vegetation survey and floristic recording through CCW's Lowland Grassland Survey of Wales;
- surveys carried out during summer months when critical plant species were most readily identifiable;
- an initial walk-over of several parts of the site by the vegetation surveyors to allow familiarisation with the vegetation and to ensure a consistent approach to mapping;
- use of up-to-date digital ortho-rectified aerial photography and GPS to aid mapping (from 2002);
- sustained on-site discussion between surveyors on community determination;
- confirmation of unusual lower plant records by experts;
- careful scrutiny of digital vegetation maps to ensure they match what was mapped in the field;
- checks on community determinations from scrutiny of tabulated quadrat data.

3. RESULTS

3.1 Vegetation cover

The planning application area covers 226 ha, within which 154 ha are included within the proposed Phase 1 and 2 working boundaries. The overall vegetation map comprises 1578 polygons, including 95 fine-scale vegetation mosaics, and is presented in Map 1. The vegetation map shows all vegetation and other polygons recorded during CCW's Phase II survey work, together with the locations of quadrat records. Polygons containing a mosaic of vegetation types are shown in a chequerboard fashion, with the grid squares coloured in proportion to the component types.

Community areas, derived by GIS analysis, are given in Annex 1, together with the identifiers for quadrats recorded from each community. In total, 69 quadrats were recorded (65 of them from the planning application area and 4 to the south), and these are tabulated alongside stand frequency/abundance estimates in Annex 2.

Most of the surveyed area is a well-naturalised post-industrial landscape, in which coal and ironstone spoil heaps form a key part of the scenery. These provide a free-draining substrate and are colonised mainly by acid grassland (NVC communities **U1**, **U4** & **U5**) and dry heath (**H12**). Where the ground is not covered by spoil, the drainage is more variable. In most open places it is impeded, supporting wet heath (**M15**) and marshy grassland (**M23**, **M24** & **M25**), often in complex patterns of ridges and runnels. At Cwm Glo SSSI and at scattered locations elsewhere, open areas with freer drainage support stands of dry grassland (**MG5** & **U4**). Some of the spoil heaps and areas of open semi-natural vegetation are set in clearings within a woodland matrix, which combines with scrub to cover nearly half of the surveyed area. Stands of bracken are also widespread, especially near the southern end of the planning application area. A few flushes, streams and small pools are scattered across the site.

The underlying geology is typical of this part of the coalfield: siltstones, mudstones and sandstones of the Coal Measures, with seams running roughly north-west to south-east bearing coal, ironstone and associated seat clays (Archaeological Investigations Ltd, 2004). There are localised patches of glacially deposited boulder clay. Drainage is via a series of small streams that flow eastwards into the Taff.

The uppermost section of the planning application area, in the north-west, is the most open part of the site, with few tall trees. It lies on sloping ground below the coniferised Pen Llwynmelyn and is dominated by large colliery tips. These support extensive areas of ***Calluna vulgaris* - *Vaccinium myrtillus*** **heath,** ***Galium saxatile* - *Festuca ovina*** **sub-community (H12c)**, amongst which lie stands of semi-natural grassland ***Festuca ovina – Agrostis capillaris – Galium saxatile*** **grassland,** ***Holcus lanatus* - *Trifolium repens*** **sub-community (U4b)** and ***Centaurea nigra* - *Cynosurus cristatus*** **grassland,** ***Lathyrus pratensis*** **sub-community (MG5a)**. Some of this dry grassland has also developed on the flat tops of spoil heaps, although the most species-rich forms are on natural soils. Wetter ground between the spoil heaps is suitable for rushes, and runnels of ***Juncus effusus/acutiflorus* - *Galium palustre*** **rush-pasture (M23)** have developed. Bracken is also locally abundant on the slopes and patches of *Ulex europaeus* gorse scrub are widespread. A track runs southwards and then south-eastwards at the bottom of this steep section.

One of the largest spoil heaps on the site spreads out eastwards from the road, topped by **H12c**, **U4** and, on particularly shallow soils, ***Festuca ovina* - *Agrostis capillaris* - *Rumex acetosella*** **grassland (U1)**. To the north of this lies Cwm Glo SSSI: two groups of enclosures in which wet grassland and wet heath form the bulk of the vegetation. ***Scirpus cespitosus* - *Erica tetralix*** **wet heath,** ***Vaccinium myrtillus*** **sub-community (M15d)** dominates the centre of one of the western enclosures, around which lie less heathy stands of ***Molinia caerulea* - *Potentilla erecta*** **mire (M25)**. Areas of species-rich ***Molinia caerulea* - *Cirsium dissectum*** **fen-meadow,** ***Juncus acutiflorus* - *Erica tetralix*** **sub-community (M24c)**, marked by the eponymous meadow thistle and the base-demanding sedge *Carex*

hostiana, are present in several places near the eastern end of the western part of SSSI. Meanwhile, a very sedge-rich intermediate form of **M24**, with affinities to the **Typical sub-community (M24b)**, dominates the eastern section of the SSSI, but insufficiently distinct for referral there and recorded as an intermediate form **M24b/c**. Drier ground across the SSSI supports **U4** and **MG5**, the latter occurring especially on ridges at Cwm-pant-bach and around a disused quarry at the eastern extremity of the western part of the SSSI.

South and east of the large spoil heaps are areas with a distinctive 'ffridd' feel to them. These hold an intricate mix of **M23** and **M25** on damp ground and **M15** and **U4** on slightly drier ground. A few small stands of **MG5** also occur. This area is again relatively open, but is surrounded to the north and east by tall hedges and woodland.

North-east from here, above the A470(T), colliery tips dominate the landscape again. Most have been landscaped to some extent and some have semi-improved vegetation on their tops, but **MG5** and **U4** are both locally dominant and **H12** has developed on the sides of many of the tips.

The southern half of the planning application area is dominated by woodland dominated by sessile oak and birch with stands of willow and alder on wetter soils (Latham, 2005). Heathland, marshy grassland and dry grassland are set amongst this in clearings of varying sizes. The largest clearing, near the planning application area's south-western corner, includes intimately intergrading **M15**, **M23**, **M24** and **M25**. The two enclosures surveyed as SO00/13 Aberganaid Slopes hold similar vegetation, with forb- and sedge-rich flushed forms of the ***Anthoxanthum odoratum* sub-community** of the latter **(M25b)** dominating. Among notable species, *Genista anglica* is particularly abundant in this part of the site, and *Carex montana* also occurs. Bracken is often prominent in the clearings, dominating large areas.

A series of fields along the eastern edge of the planning application area supports **MG5** and **M23** of rather variable quality, including a species-rich stand of the ***Danthonia decumbens* sub-community** of the former community **(MG5c)**.

South of the planning application area, **MG5** and **M23** occupy another group of enclosures above the A470 trunk road. One cluster on more acidic ground is dominated by **U4b** with associated stands of bracken. This area was covered by the SO00/14 Cwm Glo SSSI Annex survey site.

Full details of the vegetation composition of the four individual Phase II survey sites and additional areas are provided in Annexes 3-7. The locations of the individual survey sites are shown in Fig. 1 in relation to the planning boundaries.

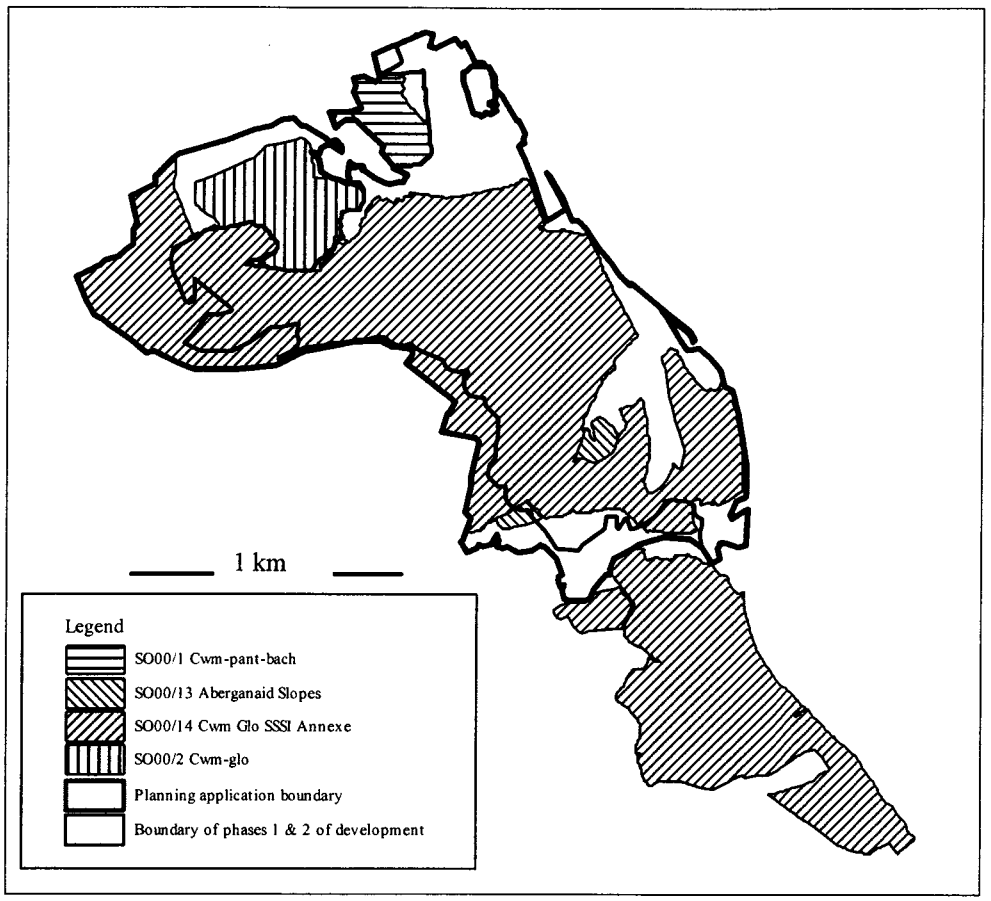


Fig. 1. Areas covered by the four CCW survey sites, superimposed on the boundaries of the Merthyr Village planning application and the proposed Phases 1 and 2 of development.

3.2 UK Biodiversity Action Plan habitats

Table 1 provides a summary of the potential impacts of the proposed development on UK Biodiversity Action Plan (BAP) priority habitats. Map 2 shows the distribution of these habitats within the planning application area. There are seven UK BAP priority habitats that collectively cover 77 % of the planning application area. Implementation of Phases 1 and 2 of the proposed development would result in the loss of 116 ha of these habitats.

All seven BAP priority habitats are included in the Wales Assembly Government's list of habitats of principal importance in Wales.

Table 1. UK BAP priority habitats, and other habitats, present within the Merthyr Village planning application area, and an assessment of prospective losses under Phases 1 and 2 of the development proposal.

Habitat (BAP priority habitats in bold)	**NVC communities/ other vegetation**	**Extent within planning application area (ha)**	**Extent within Phase 1 and 2 working area (ha)**	**Comments on vegetation that would be lost through Phases 1 and 2**
Lowland dry acid grassland	U1, U4, U5, *Nardus-Succisa,* other acidic	28.0	21.0	Dry closed acid grassland on natural substrates, intergrading with purple moor-grass & rush pasture and lowland wet heath, as well as closed and open, moss- and lichen-rich acid grassland on old spoil heaps.
Fen	M6, M10, S10, S12, S19, S22	0.5	0.2	Small areas of swamp adjacent to water bodies, runnels of acid flush in the southern part of the development area and a small base-rich flush in the north-west.
Lowland heathland	M15, H12	17.5	13.5	Wet heath with deergrass and, in many stands, bilberry on ridges associated with purple moor-grass & rush-pasture; also dry heath with locally well-developed ericoid, lichen and bryophyte elements, mostly on spoil heaps.
Lowland meadows	MG5	12.1	8.6	Partly species-rich with abundant bird's-foot trefoil but partly of lower quality with little black knapweed. Many stands, especially those on spoil, are unusually dry, with plentiful mouse-ear hawkweed. The best quality examples are on natural substrates.
Purple moor-grass & rush pastures	M23, M24, M25, other marshy	32.1	14.1	Widespread and varied in composition and structure, including some species-rich and good quality base-flushed purple moor-grass pasture. Several stands have a heathy appearance and intergrade with lowland wet heath.
Upland oakwoods*		c. 58.7	c. 40.8	Rather open woodland, comprising long-established areas with large old oaks mixed with early successional phase birch dominated areas. A fairly typical upland oakwood ground flora appears to be present. Varied history, with fluctuations in woodland boundaries in response to grazing and mining activities.
Wet woodland*		c. 25.2	c. 17.5	Distribution limited by edaphic conditions and often in intimate mosaics with upland oakwood. Stands locally of good quality.
Bracken		14.2	8.9	
Scrub		10.4	7.2	
Other habitats		27.0	22.3	
Total		**226**	**154**	

*Figures calculated from estimates of the percentage cover of priority woodland habitats in Latham (2005): 70 % Upland Oakwoods, 30 % Wet Woodland; comments based on same source.

3.3 EC Habitats Directive Annex 1 habitats

Table 2 provides a summary of the potential impacts of the proposed development on EC Directive Annex 1 habitats. Map 3 shows the distribution of these habitats within the planning application area. There are five Annex 1 habitats that collectively cover 35 % of the planning application area. Implementation of Phases 1 and 2 of the proposed development would result in the loss of 55 ha of these habitats.

Table 2. EC Habitats Directive Annex 1 habitats and other habitats within the Merthyr Village planning application area, and an assessment of prospective losses under Phases 1 and 2 of the development proposal.

Habitat (Annex 1 habitats in bold)	**NVC communities**	**Extent within planning application area (ha)**	**Extent within Phase 1 and 2 working area (ha)**	**Comments on vegetation that would be lost through Phases 1 and 2**
Alkaline fens	M10	<0.1	<0.1	One open runnel near the western end of the development area, marked by brown mosses and base-tolerant sedges.
European dry heaths	H12	12.3	10.3	Heather-dominated dry heath with abundant bilberry on colliery tips and quarry spoil, intergrading with open patches of dry acid grassland.
Molinia meadows on calcareous, peaty or clayey-silt-laden soils	M24	3.0	0.5	Present only near the southern end of the planning application area (and on the SSSI). These are species-rich stands with frequent base-tollerant sedges, fen bedstraw, meadowsweet and mosses.
North Atlantic wet heaths with Erica tetralix	M15	5.2	3.2	Most of the wet heath is a relatively dry form, with frequent bilberry and heath rush and rather patchy *Sphagnum*; other stands have a higher cover of *Sphagnum*. Deer-grass and cross-leaved heath are usually abundant.
Old oak woods with Ilex and Blechnum*		c. 58.7	c. 40.8	As Table 1.
Other woodland*		c. 25.2	c. 17.5	
Bracken		14.2	8.9	
Scrub		10.4	7.1	
Other habitats		96.7	65.7	
Total		**226**	**154**	

*Figures calculated from estimates of the percentage cover of Annex 1 woodland habitats in Latham (2005): 70 % Old Oak Woods, 30 % other woodland.

4. DISCUSSION

4.1 Conservation assessment

The surveyed area is an extensive and diverse patchwork of semi-natural habitats, most of which have developed spontaneously following historical working for coal and ironstone. These habitats support a variety of protected, rare and declining animal species, including mammals, amphibians, reptiles, birds and invertebrates (Benyon, 2005a). There is also a range of scarce and declining plant species, including two nationally scarce species: soft sedge, *Carex montana*, and the liverwort *Scapania paludicola* (Annexes 3-7). Recent survey has indicated that the acidic and neutral grasslands in particular support a mycological assemblage of considerable importance (Ray Woods, pers. comm., 2005).

The semi-natural habitats are composed of plant communities that vary in extent and frequency in England and Wales. Among the scarcer communities, **MG5** and **U1** cover less than an estimated 10,000 ha, while **M24** covers less than 1500 ha in grassland situations (Blackstock *et al.*, 1999). These three communities, together with **M10**, were recorded as threatened in Britain by Rodwell & Cooch (1998).

Cwm Glo SSSI was notified in 2003 as one of the best representative examples of unimproved neutral grassland (**MG5**) and marshy grassland (**M23, 24, 25**), with associated stands of wet heath (**M15**), in Mid & South Glamorgan, one of 12 Areas of Search (AoS) in Wales within which SSSIs are selected (NCC, 1989). The SSSI is included within the planning application area, but it is excluded from works proposed under Phases 1 and 2 of the proposed development. The proposed development does therefore not impinge directly on Cwm Glo SSSI, but would lead to the loss of semi-natural habitats in the other parts of the planning application area and potentially indirect effects on the SSSI itself.

Comments on habitat components are as follows.

- Unimproved Neutral Grassland (Lowland Meadows BAP habitat). The surveyed area includes over 15 ha of **MG5** grassland, including the second most extensive known area of **MG5c** grassland (4.4 ha) recorded from Mid & South Glamorgan during the Phase II Lowland Grassland Survey of Wales. The SSSI includes over half of the **MG5c** recorded from the surveyed area, including all of the larger (> 0.5 ha) stands apart from one which lies within an area of land already allocated for development near the A470(T). No **MG5a** is included within the SSSI; it is not all of high floristic quality, but it does provide important habitat for waxcap fungi (Ray Woods, pers comm.).

- Marshy Grassland and Wet Heath (Purple Moor-grass & Rush Pastures and part of Lowland Heathland BAP habitats). The surveyed area includes 46.6 ha of marshy grassland/wet heath (**M23, 24, 25, 15**), including 3 ha of the scarce **M24** community, the ninth largest area recorded from Mid & South Glamorgan during the Phase II Lowland Grassland Survey of Wales. The SSSI includes the most important part of the surveyed area for mixtures of base-enriched fen-meadow (**M24**), acidic purple moor-grass & rush pasture (**M23, M25**) and wet heath (**M15**) vegetation. Comparable mixtures occur in the south of the planning application area. These are of similar quality to the SSSI but cover a smaller area. These wet pastures were considered to be of probably similar value for nature conservation to those within Cwm Glo SSSI by Benyon (2005a, p. 37).

- Acidic grassland and dry heath (Lowland Dry Acidic Grassland and part of Lowland Heathland BAP habitat). The surveyed area includes 2.9 ha of **U1** grassland, including the only significant example recorded during the Lowland Grassland Survey of Wales in Mid & South Glamorgan. This community is likely to occur elsewhere in the AoS on predominantly

heathland sites, including re-vegetating coal spoil, that were not included in the lowland grassland survey, and also on some of the lower uneclosed uplands. The **U4** grasslands include stands transitional to **MG5** and provide important habitat for waxcap and associated macro-fungi (Ray Woods, pers. comm.). The dry heath comprises 12.3 ha of **H12**, developed entirely over secondary substrates. Further survey and assessment of the coal spoil heath vegetation is recommended to place the examples surveyed here in context. Virtually none of the dry heath (**H12**) or drought-prone acid grassland (**U1**) is included within the SSSI boundary, but some examples of bent-fescue grassland (**U4**), including stands transitional to neutral grassland, are encompassed by the SSSI boundary.

- Woodland, scrub and bracken (including Upland Oakwoods and Wet Woodland BAP habitats). Extensive stands of woodland occur within the surveyed area in association with patches of scrub and bracken. The historical development of woodland here has been reviewed by Latham (2005).

- Flushes, swamps, streams and ponds (including Fen BAP habitat). The flushes include a very small example of the **M10** community. The scattered ponds provide breeding habitat for great-crested newts.

4.2 Comparison with *Baseline Ecological Report*

As contractors for the developers, Merthyr Village Ltd, Benyon (2005a) collated and updated HR/WYGE's habitat and species survey information on the planning application area. This is based on five surveys carried out in 1997-98, supplemented by a Phase I survey in 2000, a further review in January 2002, and further surveys between then and the end of 2004.

The survey information presented in this report differs from that in Benyon (2005a) in that plant communities have been mapped, described and sampled, whereas the Benyon (2005a) survey was a wider review of broad (Phase I) habitats and associated biodiversity. The maps from the two surveys can be related, however, through an understanding of the relationships between Phase I habitats and NVC plant communities (JNCC, 2003, Appendix 8). It is clear that there is reasonably good agreement between the two surveys, although Benyon's (2005a) Map 1 treats some stands of short *Molinia* pasture as acid grassland rather than marshy grassland, and omits several stands of unimproved neutral grassland (**MG5**). The UK BAP priority habitats recognised as occurring at the site by Benyon (2005a) broadly agree with those described here, although the Lowland Meadow priority habitat was not specifically identified. EC Habitats Directive Annex 1 habitats were not considered by Benyon (2005a).

In terms of conservation assessment, Benyon (2005a) includes recognition of the importance of semi-natural habitats in a wider countryside context, including appreciation of the value of mosaics and connections between areas of greater nature conservation value (pp. 28-29), of the value of national and local BAP habitats (pp. 36-38), and of the wildlife interests of the site as a whole (p. 42). However, the conclusions in Table 5 of Benyon (2005a) do not fully reflect this value, because they omit reference to the full extent of UK BAP priority habitats (e.g. Lowland Heathland, Lowland Dry Acidic Grassland, Lowland Meadows). Moreover, the level of value accorded to some of the locations is not fully rationalised or does not follow published guidance, e.g. Cwm Glo SSSI (Cwm Glo and Cwm-pant-bach areas) is (as are all SSSIs) nationally not regionally important (Wales Assembly Government, 2002; IEEM, 2005).

4.3 Links with the historic landscape

There is a growing recognition of the nature conservation value of post-industrial habitats and the importance of these to local people for educational, recreational and cultural reasons (Tucker, Ash & Plant, 2005). The planning application area demonstrates the linkages between the historic industrial

landscape and development of semi-natural habitats very clearly. The area was extensively worked for coal and ironstone during the 18th and 19th centuries, supporting the development of the most productive ironworks in the world, and establishing Merthyr as the most important Welsh town of the industrial revolution (Cadw, 1998; Archaeological Investigations Ltd, 2004). Following a long period of decline from its heyday in 1875-81, the spoil heaps, where not landscaped, appear to have re-vegetated naturally with dry heath (**H12**) and various forms of acidic and neutral grassland (**U1, U4, MG5**).

Coal spoil vegetation in general varies from very open *Cladonia*-dominated vegetation on bare spoil with sparse ericoid cover through to closed-canopy *Calluna* heath with *Vaccinium myrtillus*. The progression from open to closed heath is not just a successional change, as many of the more open communities are found on older coal spoil and the open areas appear to be relatively stable. It appears that aspect, slope and hydrology are key factors in determining the type of heath or grassland vegetation that develops on the coal spoil. Further research and assessment of the coal spoil vegetation in south Wales is currently being promoted within CCW.

4.4 Future management

Grazing by cattle and ponies is the principal form of land-use on the grassland and heathland habitats, but some of the fields towards the southern end are unmanaged, in some cases following tree planting by the Forestry Commission. The herbaceous and dwarf shrub habitats that form the focus of the present report are plagioclimax vegetation types, and would scrub over in the absence of grazing. Maintenance of an appropriate grazing regime will therefore be essential for the conservation of these habitats and their associated biodiversity.

Successful maintenance of these habitats will also require low soil fertility conditions to prevent competitive exclusion of smaller species by competitive grasses and clovers. Most of the semi-natural grassland and heathland on the site shows little or no evidence of nutrient-enrichment from application of fertiliser or other agricultural treatments. However, some areas of improved and semi-improved grassland, especially near the eastern edge of the planning application area, appear to be nutrient-enriched and may receive inputs of inorganic fertiliser. The southernmost extremity of the site had clearly been re-seeded shortly before 2002 and a number of other improved areas on recently 'made' ground adjacent to the A470(T) are likely to have resulted from re-seeding rather than natural re-colonisation.

The north-western sector of the site is open to the general public and is used for a variety of recreational purposes, including dog-walking and use of motorcycles and four-wheel drive vehicles. Disturbance by vehicles could be damaging to the vegetation if their use were to become more frequent. The site also suffers locally (mainly on its eastern edge) from fly-tipping.

4.5 Concluding remarks

The surveyed area is an extensive and diverse patchwork of semi-natural vegetation types. It includes habitats listed as priorities in the UK Biodiversity Action Plan (and therefore in the Welsh Assembly Government's list of habitats of principal importance in Wales) and habitats listed in Annex 1 of the EC Habitats Directive. Large areas of these habitats would be lost if the proposed Merthyr Village development receives planning approval.

5. ACKNOWLEDGEMENTS

We are very grateful to Julian Woodman, Clare Mockridge and Sue Westwood for preparing Annexes 3, 4, 5 and 7, to Tim Blackstock, Stuart Smith, Jan Sherry, Jane Stevens and Jim Latham for helpful comments, and to Scott Hand (CCW South and East Region) for making access arrangements. We also thank Clare Somerville for entering much of the quadrat data into spreadsheets.

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Annex 1. Summary of community areas and quadrats

NVC code	NVC community name or other descriptor[1]	Surveyed area (ha)	Planning application area (ha)	Phase 1 and 2 working area (ha)	Quadrats				
					SO00/1	SO00/2	SO00/13	SO00/14	Other
H12c	*Calluna vulgaris* - *Vaccinium myrtillus* heath, *Galium saxatile* - *Festuca ovina* sub-community	12.3	12.3	10.3	-	-	-	5, 8	-
M6a	*Carex echinata* - *Sphagnum recurvum/auriculatum* mire, *Carex echinata* sub-community	0.1	0.1	0.0	-	6	-	-	-
M6c	*Carex echinata* - *Sphagnum recurvum/auriculatum* mire, *Juncus effusus* sub-community	0.2	0.2	<0.1	-	-	-	-	-
M6d	*Carex echinata* - *Sphagnum recurvum/auriculatum* mire, *Juncus acutiflorus* sub-community	0.2	0.2	0.1	-	-	-	-	-
M10a	*Carex dioica* - *Pinguicula vulgaris* mire, *Carex demissa* - *Juncus bulbosus/kochii* sub-community	<0.1	<0.1	<0.1	-	-	-	10	-
M15b/d	*Scirpus cespitosus* - *Erica tetralix* wet heath, b/d sub-community	1.0	1.0	1.0	-	-	-	19	-
M15	*Scirpus cespitosus* - *Erica tetralix* wet heath, not assigned to a sub-community	0.5	0.5	0.4	-	-	-	20	-
M15b	*Scirpus cespitosus* - *Erica tetralix* wet heath, Typical sub-community	<0.1	<0.1	<0.1	-	-	-	-	-
M15d	*Scirpus cespitosus* - *Erica tetralix* wet heath, *Vaccinium myrtillus* sub-community	3.7	3.7	1.8	-	12, 13	-	14, 32	-
M23a	*Juncus effusus/acutiflorus* - *Galium palustre* rush-pasture, *Juncus acutiflorus* sub-community	14.0	9.1	5.4	7	-	-	6, 22, 26, 33	-
M23b	*Juncus effusus/acutiflorus* - *Galium palustre* rush-pasture, *Juncus effusus* sub-community	5.3	3.2	1.1	-	-	-	-	23

[1] M24b/c and M15b/d are intermediate between fen-meadow and wet heath subcommunities respectively; see Blackstock *et al.* (1998) for a floristic and ecological analysis of the former (referred to there as 'M24x'). M25 species-poor includes often impoverished stands dominated by *Molinia* with no clear sub-community affinities. Other descriptors are self-explanatory.

S19a	*Eleocharis palustris* swamp, *E. palustris* sub-community	0.1	0.1	<0.1	-	-	-	-	-
S22	*Glyceria fluitans* water-margin vegetation	<0.1	<0.1	0.0	-	-	-	-	-
U1	*Festuca ovina - Agrostis capillaris - Rumex acetosella* grassland	2.9	2.9	2.8	-	-	-	11	-
U4a	*Festuca ovina - Agrostis capillaris - Galium saxatile* grassland, Typical sub-community	9.1	8.0	5.4	-	1, 11	-	1, 3, 12, 18	16, 17
U4b	*Festuca ovina - Agrostis capillaris - Galium saxatile* grassland, *Holcus lanatus - Trifolium repens* sub-community	16.5	12.6	8.6	-	-	-	7, 9, 25	15, 20
U4c	*Festuca ovina - Agrostis capillaris - Galium saxatile* grassland, *Lathyrus montanus - Stachys betonica* sub-community	0.1	0.1	0.0	-	-	-	-	-
U4e	*Festuca ovina - Agrostis capillaris - Galium saxatile* grassland, *Vaccinium myrtillus - Deschampsia flexuosa* sub-community	1.7	1.7	1.5	-	-	-	17	-
U5a	*Nardus stricta - Galium saxatile* grassland, Species-poor sub-community	0.4	0.4	0.4	-	-	-	-	-
U5d	*Nardus stricta - Galium saxatile* grassland, *Calluna vulgaris - Danthonia decumbens* sub-community	0.9	0.9	0.8	-	-	-	13	-
-	Access not obtained	0.7	0.5	0.5	-	-	-	-	-
-	Allotments	0.5	0.5	0.5	-	-	-	-	-
-	Bare / disturbed ground	0.2	0.2	0.1	-	-	-	-	-
-	Buildings / ruins	<0.1	<0.1	<0.1	-	-	-	-	-
-	Burnt heath	0.1	0.1	0.1	-	-	-	-	-
-	Cleared scrub	0.1	0.1	0.1	-	-	-	-	-
-	Colliery / quarry spoil	1.6	1.6	1.1	-	-	-	-	-
-	Damp semi-improved grassland	0.6	0.6	0.1	-	-	-	-	-
-	Dense bracken	18.8	14.2	8.9	-	-	-	-	-
-	Dense *Reynoutria japonica*	<0.1	<0.1	<0.1	-	-	-	-	-
-	Dense scrub	12.8	10.4	7.2	-	-	-	-	-
-	Exposed rock	0.1	0.1	0.0	-	-	-	-	-
-	Improved grassland	5.2	4.0	3.5	-	-	-	-	-
-	*Nardus stricta - Succisa pratensis* grassland	0.3	0.3	0.3	-	-	-	16	-
-	Open water	1.1	0.7	0.4	-	-	-	-	-

M24b	*Molinia caerulea - Cirsium dissectum* fen-meadow, Typical sub-community	<0.1	<0.1	0.0	-	-	-	-	-
M24b/c	*Molinia caerulea - Cirsium dissectum* fen-meadow, b/c sub-community	2.2	2.2	0.4	2, 4, 6, 8	8	1	21	-
M24c	*Molinia caerulea - Cirsium dissectum* fen-meadow, *Juncus acutiflorus - Erica tetralix* sub-community	0.8	0.8	<0.1	1	2, 4, 10	-	-	-
M25	*Molinia caerulea - Potentilla erecta mire*, species-poor	1.7	0.9	0.7	-	-	-	-	-
M25a	*Molinia caerulea - Potentilla erecta* mire, *Erica tetralix* sub-community	4.3	4.3	0.1	-	5, 14	-	-	18
M25b	*Molinia caerulea - Potentilla erecta* mire, *Anthoxanthum odoratum* sub-community	13.0	11.3	6.1	-	3, 7	3, 4	15, 28, 30, 31	-
M25c	*Molinia caerulea - Potentilla erecta* mire, *Angelica sylvestris* sub-community	0.1	0.1	<0.1	-	-	-	-	-
MG5a	*Cynosurus cristatus - Centaurea nigra* grassland, *Lathyrus pratensis* sub-community	10.7	7.6	6.9	-	-	-	4, 23, 27, 29	-
MG5c	*Cynosurus cristatus - Centaurea nigra* grassland, *Danthonia decumbens* sub-community	4.4	4.4	1.7	3, 5, 9	9	2	2, 24	19, 21, 22
MG6a	*Lolium perenne - Cynosurus cristatus* grassland, Typical sub-community	0.1	0.1	0.1	-	-	-	-	-
MG6b	*Lolium perenne - Cynosurus cristatus* grassland, *Anthoxanthum odoratum* sub-community	5.2	3.5	2.8	-	-	-	-	-
MG10a	*Holcus lanatus - Juncus effusus* rush-pasture, Typical sub-community	0.4	0.1	0.1	-	-	-	-	-
MG10c	*Holcus lanatus - Juncus effusus* rush-pasture, *Iris pseudacorus* sub-community	<0.1	0.0	0.0	-	-	-	-	-
OV24	*Urtica dioica - Galium aparine* community	0.2	0.2	0.2	-	-	-	-	-
OV27	*Epilobium angustifolium* community	<0.1	<0.1	<0.1	-	-	-	-	-
S10a	*Equisetum fluviatile* swamp, *E. fluviatile* sub-community	<0.1	<0.1	<0.1	-	-	-	-	-
S12a	*Typha latifolia* swamp, *T. latifolia* sub-community	<0.1	<0.1	<0.1	-	-	-	-	-

-	Other acid grassland	1.3	1.3	1.3	-	-	-	-	-
-	Other marshy grassland	0.3	0.3	0.2	-	-	-	-	-
-	Other neutral grassland	0.4	0.0	0.0	-	-	-	-	-
-	Other semi-improved grassland	11.2	10.7	9.5	-	-	-	-	-
-	Plantation woodland	1.1	1.1	1.1	-	-	-	-	-
-	Secondary dry grassland	0.2	0.2	0.0	-	-	-	-	-
-	Species-poor *Juncus effusus*	<0.1	<0.1	0.0	-	-	-	-	-
-	Tall ruderal vegetation	0.1	0.1	0.1	-	-	-	-	-
-	Track	4.6	2.7	2.1	-	-	-	-	-
-	Woodland	108.2	83.9	58.3	-	-	-	-	-

Annex 2. Tabulated floristic data[2]

Site SO 00/1 Cwm-pant-bach, Mid and South Glamorgan CCW HQ, 1994

Table of quadrat (2x2m) Domin values and sub-community DAFOR estimates from M23 rush-pasture

	M23a	M23a
	Q7	Stands
Juncus effusus	2	F
Holcus lanatus	1	O
Galium palustre	3	F
Lotus uliginosus	2	F
Juncus acutiflorus	7	A
Ranunculus acris	1	O
Carex panicea	2	O.F
Juncus bulbosus	2	O.F
Ranunculus flammula	3	F
Agrostis canina	2	F
Ranunculus repens	1	O
Calliergon cuspidatum	3	
Carex nigra	5	F
Equisetum fluviatile		R.F
Plantago lanceolata		R
Succisa pratensis	5	F
Caltha palustris		R
Senecio aquaticus	2	F
Carex echinata	3	F
Carex demissa	4	F
Veronica scutellata	1	R
Nardus stricta	1	O
Dactylorhiza fuchsii	1	R.O
Myosotis scorpioides		R.O
Triglochin palustre		R
Bryum pseudotriquetrum	2	
Drepanocladus exannulatus	2	
Glyceria plicata		R.F
Number of species/sample	23	
Total bryophyte cover	3	
Litter		
Bare ground		
Slope (Flat/Gentle/Mod./Steep)	G	
Aspect	E	
Management (Hay/Pasture/Burning/Unmngd.)	P	
Grazers (Sheep/Cattle/Horse)	H	
Vegetation height (cm)	10-40	

[2] Q indicates species present in quadrat with no Domin value; P indicates species present in sub-community with no DAFOR estimate; local DAFOR values are given after a point (.); DAFORs are generally not presented for bryophytes or lichens.

Table of quadrat (2x2m) Domin values and sub-community DAFOR estimates from M24 fen-meadow

	M24b/c				M24c	M24b/c	M24c
	Q2	Q4	Q6	Q8	Q1	Stands	Stand
Molinia caerulea	4	5		3	6	F.O	A
Potentilla erecta	1	2		3	2	F	F
Succisa pratensis	5	5	5	5	5	F	F
Cirsium dissectum	5	5	5	6	5	F.A	F
Lotus uliginosus	4		2	3	1	F.O	F
Carex panicea	5	5	5	5	4	F	F
Galium uliginosum						R	
Valeriana dioica						R	
Filipendula ulmaria							R
Campylium stellatum		4	3	3			
Holcus lanatus	2	1	2	2		F	
Anthoxanthum odoratum	3	2		2	1	F.R	O
Carex pulicaris		2				R.O	
Ranunculus acris		3	3	2	1	F	R
Pseudoscleropodium purum				3			
Festuca rubra		3	3	3		F	
Briza media		3				R.O	
Potentilla reptans		2				R	
Carex nigra	3		4	3	3	F.R	F
Trifolium pratense	2	1	2	2		F	
Leontodon taraxacoides			2			R.O	
Juncus articulatus		3	4	3	1	F.R	R.O
Dactylorhiza fuchsii						O	
Cerastium fontanum			1			R	
Juncus acutiflorus	5		5	4	3	F.R	F
Juncus conglomeratus	2			1		O	
Galium palustre	1					R	
Dactylorhiza maculata	1	1				O	
Juncus effusus					1		O
Serratula tinctoria		3		1		O.F	
Ranunculus flammula	1		4	4	1	F.R	O
Hypnum cupressiforme s.l.	1						
Achillea ptarmica		1			1	R	O
Agrostis canina	3			3	3	O.F	F
Sphagnum auriculatum					4		
Pedicularis sylvatica				Q	2		F
Senecio aquaticus	2					R	R
Thuidium tamariscinum				1			
Calliergon cuspidatum	2	3	3	2			
Mentha aquatica	2					R	
Carex hostiana		4				R.F	
Agrostis stolonifera		1				R	
Brachythecium cf. rutabulum	3	1		4			
Prunella vulgaris	1	2	4	2		F	
Deschampsia cespitosa					1		R
Plantago lanceolata		1	2	2		F	
Danthonia decumbens		3		2		O.F	
Anagallis tenella		1				R	R
Agrostis capillaris			3	3		O.F	
Ajuga reptans			3			P	
Atrichum undulatum		2		1			
Bellis perennis		1				R	

	M24b/c				M24c	M24b/c	M24c
	Q2	Q4	Q6	Q8	Q1	Stands	Stand
Bromus racemosus			1				
Bryum pseudotriquetrum			2		1		
Caltha palustris						R	
Carex demissa	2	2	1	2	2	F	F
Carex echinata	2				2	R.O	F
Carex flacca		2		4		O.F	
Carex ovalis	1		1		3	O	O.F
Carex pallescens						R.O	
Carum verticillatum			3	4		O.F	R.O
Chiloscyphus polyanthus		1		1			
Climacium dendroides					1		
Cratoneuron filicinum			3				
Ctenidium molluscum		2					
Cynosurus cristatus	3	3	3	3		F	
Dactylorhiza majalis ssp. praetermissa						R	
Drepanocladus exannulatus					1		
Festuca pratensis						R	
Fissidens adianthoides		3	3				
Iris pseudacorus						R	
Isolepis setacea			1		2	R	O
Juncus bufonius			1		1	O	R.O
Juncus bulbosus					2		O
Juncus squarrosus							R
Leontodon autumnalis		1	1	2		F	
Lolium perenne			2			P	
Lotus corniculatus		2	2			O.F	
Luzula campestris				1		P	
Mentha sp.						R	
Myosotis scorpioides			2			R	
Myosotis sp.				1			
Nardus stricta		2		2	4	O.F	F
Pellia sp.			1				
Philonotis fontana					2		
Poa trivialis						P	
Ranunculus repens	1		2	2	1	F.R	R
Rhytidiadelphus squarrosus	3	2			2		
Salix aurita							R
Scapania paludicola					Q		
Scapania undulata					Q		
Stachys betonica							R
Trifolium repens			2	1		O.R	
Number of species/sample	28	38	37	39	31		
Total bryophyte cover	3	4	4	4	4		
Bare ground	3	2	4		4		
Litter							
Slope (Flat/Gentle/Mod./Steep)	M	M	M	M	G		
Aspect	E	E	E	NE	E		
Management (Hay/Pasture/Burning/Unmngd.)	P	P	P	P	P		
Grazers (Sheep/Cattle/Horse/Rabbits/Goat)	H	H	H	H	H		
Vegetation height (cm)	10-20	5-15	5-30	5-30	5-10		

Table of quadrat (2x2m) Domin values and sub-community DAFOR estimates from MG5 grassland

	MG5c			MG5c
	Q3	Q5	Q9	Stands
Festuca rubra	4	5	5	F
Cynosurus cristatus	1		3	F.R
Lotus corniculatus	2		1	O.F
Plantago lanceolata	3	3	2	F
Holcus lanatus				R.F
Dactylis glomerata			1	R
Trifolium repens		1		R
Centaurea nigra	3	2	4	F.O
Agrostis capillaris	4	5	5	F
Anthoxanthum odoratum	2	4	3	F
Trifolium pratense				R
Bellis perennis				R
Achillea millefolium		2		R
Carex flacca	4		4	F.R
Agrostis stolonifera				R
Festuca ovina	1			R
Prunella vulgaris				R.F
Leontodon autumnalis			2	O.F
Luzula campestris	1	1		O
Danthonia decumbens	3	5		F.R
Potentilla erecta	5	4	3	F
Succisa pratensis	6	7	6	A
Stachys betonica	4	2		R.F
Carex caryophyllea	4	3	3	F
Conopodium majus				R
Ranunculus acris				R.F
Hypochoeris radicata			2	O.F
Taraxacum sp.			1	R
Cerastium fontanum		1		O
Leontodon hispidus				R
Briza media	2		2	R.F
Rhytidiadelphus squarrosus	2	3	3	
Calliergon cuspidatum	2	2	1	
Pseudoscleropodium purum	3		2	
Alchemilla filicaulis vestita	1			R.O
Alchemilla xanthochlora				R.O
Carex panicea	5		3	R.F
Juncus articulatus			1	R.F
Agrostis canina				
Bryum sp.			2	R.F
Calypogeia muelleriana			1	
Campylium stellatum			1	
Campylopus pyriformis			2	
Carex demissa		Q		
Carex hirta			3	R.F
Carex nigra				R
Carex pallescens				R
Dactylorhiza fuchsii	1			R.O
Dicranum scoparium	1			R.F
Equisetum arvense		2		
Euphrasia sp.	3			R.O
Fraxinus excelsior	1	1		R.O
Hieracium pilosella			1	
Hypnum cupressiforme s.l.	1			
	3		Q	

	MG5c			MG5c
	Q3	Q5	Q9	Stands
Juncus bufonius			2	R
Juncus cf. *acutiflorus*			1	R.F
Lophocolea bidentata s.l.	2	2		
Mnium hornum		1	Q	
Pedieularis sylvatica		1	1	O
Poa annua			1	R
Riccardia chamaedryfolia	3			
Sanguisorba officinalis	4			R.F
Scapania undulata	Q			
Serratula tinctoria			2	O
Thuidium tamariscinum	2		1	
Trifolium medium				R
Number of species/sample	32	22	35	
Total bryophyte cover	4	3	3	
Bare ground	4	3	4	
Litter				
Slope (Flat/Gentle/Mod./Steep)	M	G	M	
Aspect	N	NE	NE	
Management (Hay/Pasture/Burning/Unmngd)	P	P	P	
Grazers (Cattle/Sheep/Horse/Rabbit)	H	H	H	
Vegetation height (cm)	5-10	5-10	5	

Table of quadrat (2x2m) Domin values and sub-community DAFOR estimates from M6 mire .

	M6a	M6a
	Q6	Stand
Carex echinata	5	F
Polytrichum commune	2	O
Agrostis cf. *canina*	4	F
Potentilla erecta	4	F
Molinia caerulea	5	F
Sphagnum auriculatum var. *auriculatum*	8	A
Carex nigra	4	F
Carex panicea	5	F
Nardus stricta	1	O
Festuca ovina	4	F
Luzula cf. *multiflora*	2	F
Anthoxanthum odoratum	3	F
Rhytidiadelphus squarrosus	3	F
Narthecium ossifragum		R.F
Carex demissa	1	O.F
Aulacomnium palustre	2	O
Calliergon stramineum	Q	
Holcus lanatus	2	O
Briza media	1	R
Carex hostiana		R
Festuca rubra	1	R
Pedicularis sylvatica	1	O
Pseudoscleropodium purum	1	R
Sphagnum auriculatum var. *inundatum*	4	F
Thuidium tamariscinum	3	F
Number of species/sample	23	
Total bryophyte cover	9	
Litter		
Bare ground/open water		
Slope (Flat/Gentle/Mod./Steep)	M	
Aspect	NE	
Management (Hay/Pasture/Burning/Unmngd.)	P	
Grazers (Sheep/Cattle/Horse)	C,H	
Vegetation height (cm)	5-15	

Table of quadrat (2x2m) Domin values and sub-community DAFOR estimates from M15 wet heath

	M15d Q12	Q13	M15d Stands
Molinia caerulea	8	6	A
Potentilla erecta	3	5	F
Erica tetralix	3	3	F
Calluna vulgaris	5	5	F.A
Scirpus cespitosus	3	2	F.R
Carex panicea	4		O
Carex echinata	2		O
Succisa pratensis	2	4	O.F
Carex nigra		3	F.R
Euphrasia sp.		1	R
Carex demissa		1	O
Sphagnum auriculatum	4		
Hypnum cupressiforme s.l.	7	5	
Vaccinium myrtillus	2	2	O.F
Nardus stricta	3	3	F
Juncus squarrosus		4	F.R
Dicranum scoparium	Q	1	
Pleurozium schreberi	4	2	
Galium saxatile		2	O
Anthoxanthum odoratum	3	4	F
Polytrichum commune	2	2	
Festuca ovina	3	5	F
Luzula multiflora		2	F.R
Carex pilulifera		2	R.F
Polygala serpyllifolia		2	O
Agrostis canina	2		F
Aulacomnium palustre	2	2	
Pedicularis sylvatica	2	5	F
Carex binervis	3		R.F
Juncus conglomeratus	1	2	O.F
Rhytidiadelphus squarrosus		4	
Agrostis capillaris		3	O.F
Bryum pseudotriquetrum		1	
Campylopus introflexus	2		
Genista anglica	1		R
Lophocolea bidentata s.l.		3	
Quercus sp.	1		
Scapania gracilis	1		
Thuidium tamariscinum		Q	
Veronica officinalis		1	O
Number of species/sample	26	31	
Total bryophyte cover	8	6	
Litter			
Bare ground			
Lichens			
Slope (Flat/Gentle/Mod./Steep)	G	F	
Aspect	E	-	
Management (Hay/Pasture/Burning/Unmngd.)	P	P	
Grazers (Sheep/Cattle/Horse)	C,H	C,H	
Vegetation height (cm)		5-20	

Table of quadrat (2x2m) Domin values and sub-community DAFOR estimates from M24 fen-meadow

	M24b/c	M24c			M24b/c	M24c
	Q8	Q2	Q4	Q10	Stands	Stands
Molinia caerulea	4	7	5	7	F	A
Potentilla erecta	4	4	3	2	F	F
Succisa pratensis	7	4	3	4	A	F
Cirsium dissectum		6	5	5		F.A
Lotus uliginosus	1		2		O	R.O
Carex panicea	6	5	5	4	A	F
Holcus lanatus		1				R.O
Anthoxanthum odoratum		3		2		F.R
Carex pulicaris	4	3		1	F	O.F
Luzula cf. *multiflora*		1		1		O
Ranunculus acris	1				O	
Pseudoscleropodium purum	1					
Briza media	3				F	R
Carex nigra		3	3			F.R
Trifolium pratense					O	
Leontodon taraxacoides	2				F	
Juncus articulatus	3				F	
Juncus acutiflorus	3		4	2	F	O.F
Juncus conglomeratus			1			R
Erica tetralix		2		4		F.R
Calluna vulgaris				3		O.F
Juncus effusus		1				R
Serratula tinctoria	1	1		2	O	O
Aulacomnium palustre				1		
Ranunculus flammula			2			P
Hypnum cupressiforme s.l.		1		3		
Achillea ptarmica		1				R
Agrostis canina		4	2	4		F
Sphagnum auriculatum		1	7	2		
Salix repens		5				R.F
Pedicularis sylvatica	2	3		2	O	F.R
Thuidium tamariscinum		4		5		
Carex hostiana		3		3		F.R
Prunella vulgaris	1				O	
Plantago lanceolata	2				F	
Danthonia decumbens	3			3	F	O
Agrostis capillaris	2				F	
Anuera pinguis	3			1		
Bellis perennis					O	
Bryum pseudotriquetrum		1				
Bryum sp.	2					
Carex demissa	2	2	4	1	F	F
Carex echinata		2	4			O.F
Carex flacca	4				F	
Carex pilulifera				2		R.O
Carum verticillatum		4				R.F
Climacium dendroides	1					
Ctenidium molluscum	2					
Cynosurus cristatus	4	1			F	R.O
Festuca ovina	3	2		4	F	F.R
Fisidens adianthoides	4					
Genista anglica						R
Isolepis setacea	3				O.F	
Juncus bulbosus			1			P

	M24b/c	M24c			M24b/c	M24c
	Q8	Q2	Q4	Q10	Stands	Stands
Juncus squarrosus		1	1			O
Leontodon autumnalis	1				O	
Lotus corniculatus	2				F	
Nardus stricta	4	2	4	3	F	F
Philonotis fontana	3					
Polygala serpyllifolia				1		R
Rhytidiadelphus squarrosus		3		1		
Riccardia sp.	2					
Salix aurita						P
Scapania sp.	1					
Taraxacum sp.	1				O	
Trifolium repens	2				F	
Number of species/sample	36	30	17	27		
Total bryophyte cover	5	4	7	5		
Bare ground	2					
Litter						
Slope (Flat/Gentle/Mod./Steep)	G	VG	G	VG		
Aspect	NE	NE	NE	NE		
Management (Hay/Pasture/Burning/Unmngd.)	P	P	P	P		
Grazers (Sheep/Cattle/Horse/Rabbits/Goat)	C/H	C,H	C,H	C,H		
Vegetation height (cm)	5-10		5-30	10-15		

Table of quadrat (2x2m) Domin values and sub-community DAFOR estimates from M25 mire

	M25a Q5	Q14	M25b Q3	Q7	M25a Stands	M25b Stands
Molinia caerulea	7	8	7	7	A	A
Potentilla erecta	3	3	3	3	F	F
Erica tetralix	2	2			F	
Sphagnum auriculatum		Q	1			
Calypogeia fissa		1				
Polytrichum commune	3	4		4		
Aulacomnium palustre	3		2			
Hypnum cupressiforme s.l.	5		3			
Sphagnum papillosum		5				
Anthoxanthum odoratum	3		2	3	O.F	F
Holcus lanatus				2		O.F
Festuca rubra				2		O
Luzula multiflora	3	1	1	3	F	F
Danthonia decumbens			3			O
Serratula tinctoria	2				O	
Juncus effusus				2		R.F
Juncus acutiflorus				4		O.F
Succisa pratensis	2	1	5		O.F	F.R
Lotus uliginosus				1		O
Carex echinata			1	3	R.F	O
Carex panicea	2		5		O	O.F
Calluna vulgaris	2	4	1		F	O
Agrostis canina	2	2		4	F	F
Carex nigra	1	4	1	4	F	F
Rhytidiadelphus squarrosus			3	5		
Festuca ovina	4	5	4	5	F	F
Nardus stricta	3	2	3	2	F	F
Sphagnum subnitens	4					
Lophocolea bidentata s.l.			3			
Betula sp.						R
Calliergon stramineum		2				
Campylopus paradoxus	1					
Carex demissa			1		O	O
Carex ovalis				2		R.F
Carex pilulifera			2			R.F
Euphrasia sp.						R
Galium saxatile		1			O	
Juncus conglomeratus					O	O
Juncus squarrosus	4	3			F	
Lathyrus montanus					R	
Lotus corniculatus						R
Pedicularis sylvatica	3		3	2	F	F
Polygala serpyllifolia	1	1			F	
Polygala vulgaris						O
Quercus sp.		1			R	
Salix repens						R.F
Scapania nemorosa	4					
Thuidium tamariscinum			6			
Trifolium repens						R
Veronica officinalis						R
Number of species/sample	22	19	21	18		
Total bryophyte cover	7	6	7	6		
Litter		5		4		
Bare ground						

Slope (Flat/Gentle/Mod./Steep)	G	G	G	G
Aspect	NE	NW	NW	NE
Management (Hay/Pasture/Burning/Unmngd.)	P	P	P	P
Grazers (Sheep/Cattle/Horse)	C,H	C,H	C,H	C,H
Vegetation height (cm)	10-20	10-20	5-10	10-40

Table of quadrat (2x2m) Domin values and sub-community DAFOR estimates from MG5 grassland

	MG5c	MG5c
	Q9	Stand
Festuca rubra	3	F
Cynosurus cristatus	4	F
Lotus corniculatus	3	F.R
Plantago lanceolata	3	F
Holcus lanatus	3	F.R
Trifolium repens	3	R.F
Agrostis capillaris	4	F
Anthoxanthum odoratum	3	F
Trifolium pratense		R
Carex flacca	3	F
Festuca ovina	3	F
Prunella vulgaris	2	R.F
Luzula campestris	3	F
Danthonia decumbens	2	O
Potentilla erecta	3	F
Succisa pratensis	3	F
Carex caryophyllea	3	O.F
Briza media	4	F
Rhytidiadelphus squarrosus	3	
Calliergon cuspidatum	2	
Carex panicea	5	F
Carex binervis	1	O
Carex demissa	2	O.F
Carex echinata	2	R.F
Carex pulicaris	4	F
Cirsium palustre	2	O
Ctenidium molluscum	3	
Galium saxatile	1	R
Isolepis setacea		R
Juncus cf. *acutiflorus*		R
Juncus conglomeratus		R
Lophocolea bidentata s.l.	2	
Lotus uliginosus	2	O
Molinia caerulea		R
Nardus stricta	5	F
Pedicularis sylvatica	2	F
Pteridium aquilinum	2	O.F
Thuidium tamariscinum	4	
Veronica officinalis	Q	P
Number of species/sample	34	
Total bryophyte cover	5	
Bare ground	2	
Litter		
Slope (Flat/Gentle/Mod./Steep)	M	
Aspect	NE	
Management (Hay/Pasture/Burning/Unmngd)	P	
Grazers (Cattle/Sheep/Horse/Rabbit)	C,H	
Vegetation height (cm)	5-20	

Table of quadrat (2x2m) Domin values and sub-community DAFOR estimates from U4 grassland

	U4a Q1	Q11	U4a Stands
Agrostis capillaris	6	3	F.A
Anthoxanthum odoratum	3	3	F
Potentilla erecta	5	3	F.A
Festuca ovina	5	6	F.A
Galium saxatile	4		F
Holcus lanatus	2		O.R
Achillea millefolium	3	2	O.F
Trifolium repens			R.F
Cerastium fontanum			R
Cynosurus cristatus		1	R
Trifolium pratense			R
Lotus corniculatus		4	R.F
Succisa pratensis	1	5	R.F
Carex caryophyllea		4	R.F
Briza media		2	R.F
Agrostis canina	4		O.F
Carex panicea	1	2	R
Pleurozium schreberi	4		
Nardus stricta	3	3	F
Rhytidiadelphus squarrosus	5	4	
Luzula campestris	3	3	F
Festuca rubra	4	4	F.R
Hypnum cupressiforme s.l.	3	4	
Pseudoscleropodium purum		4	
Hylocomium splendens		Q	
Plantago lanceolata		4	R.F
Rumex acetosa	3		F
Danthonia decumbens	2	3	F
Carex pilulifera	1		R
Calluna vulgaris		4	R.F
Veronica officinalis	3		F.R
Euphrasia sp.		1	R.F
Molinia caerulea	3		R.F
Lophocolea bidentata s.l.	1		
Carex nigra			R
Centaurea nigra			R
Crataegus monogyna	1		R.F
Eurhynchium praelongum	2		
Hieracium pilosella		2	O
Pedicularis sylvatica	3	3	F
Quercus sp.			R
Sanguisorba officinalis			R
Serratula tinctoria	1		O.R
Number of species/sample	26	24	
Total bryophyte cover	6	5	
Litter			
Bare ground			
Slope (Flat/Gentle/Mod./Steep)	G	M	
Aspect	NE	SE	
Management (Hay/Pasture/Burning/Unmngd.)	P	P	
Grazers (Sheep/Cattle/Horse)	C,H	C,H	
Vegetation height (cm)	5-20	5	

Table of quadrat (2x2m) Domin values and sub-community DAFOR estimates from U4 grassland

	U4a Q1	Q11	U4a Stands
Agrostis capillaris	6	3	F.A
Anthoxanthum odoratum	3	3	F
Potentilla erecta	5	3	F.A
Festuca ovina	5	6	F.A
Galium saxatile	4		F
Holcus lanatus	2		O.R
Achillea millefolium	3	2	O.F
Trifolium repens			R.F
Cerastium fontanum			R
Cynosurus cristatus		1	R
Trifolium pratense			R
Lotus corniculatus		4	R.F
Succisa pratensis	1	5	R.F
Carex caryophyllea		4	R.F
Briza media		2	R.F
Agrostis canina	4		O.F
Carex panicea	1	2	R
Pleurozium schreberi	4		
Nardus stricta	3	3	F
Rhytidiadelphus squarrosus	5	4	
Luzula campestris	3	3	F
Festuca rubra	4	4	F.R
Hypnum cupressiforme s.l.	3	4	
Pseudoscleropodium purum		4	
Hylocomium splendens		Q	
Plantago lanceolata		4	R.F
Rumex acetosa	3		F
Danthonia decumbens	2	3	F
Carex pilulifera	1		R
Calluna vulgaris		4	R.F
Veronica officinalis	3		F.R
Euphrasia sp.		1	R.F
Molinia caerulea	3		R.F
Lophocolea bidentata s.l.	1		
Carex nigra			R
Centaurea nigra			R
Crataegus monogyna	1		R.F
Eurhynchium praelongum	2		
Hieracium pilosella		2	O
Pedicularis sylvatica	3	3	F
Quercus sp.			R
Sanguisorba officinalis			R
Serratula tinctoria	1		O.R
Number of species/sample	26	24	
Total bryophyte cover	6	5	
Litter			
Bare ground			
Slope (Flat/Gentle/Mod./Steep)	G	M	
Aspect	NE	SE	
Management (Hay/Pasture/Burning/Unmngd.)	P	P	
Grazers (Sheep/Cattle/Horse)	C,H	C,H	
Vegetation height (cm)	5-20	5	

Table of quadrat (2x2m) Domin values and sub-community DAFOR estimates from M24 fen-meadow

	M24b/c Q1	M24b/c Stand
Molinia caerulea	5	F
Potentilla erecta	3	F
Succisa pratensis	4	F
Cirsium dissectum		O.F
Lotus uliginosus	1	F
Carex panicea	5	A
Galium uliginosum		O.F
Holcus lanatus	2	F
Anthoxanthum odoratum		O
Carex pulicaris	4	F
Ranunculus acris		O.F
Festuca rubra	1	O
Briza media		O
Carex nigra	3	F
Trifolium pratense		O
Juncus articulatus	1	P
Dactylorhiza fuchsii		O
Cerastium fontanum		R.O
Juncus acutiflorus	3	F
Juncus conglomeratus	3	F
Juncus effusus	2	F
Serratula tinctoria	2	O
Ranunculus flammula	3	F
Agrostis canina	3	F
Salix repens		R
Cirsium palustre	1	O
Calliergon cuspidatum	4	
Carex hostiana	7	A
Prunella vulgaris	1	O
Plantago lanceolata	1	O
Anagallis tenella	3	F
Anuera pinguis	2	
Bryum pseudotriquetrum	2	
Carex demissa	4	F
Carex echinata	3	F
Carex flacca		O
Cynosurus cristatus		R.O
Dactylorhiza majalis ssp. *praetermissa x fuchsii*		O
Fissidens adianthoides	1	
Hypericum sp.		R
Juncus bulbosus	3	F
Nardus stricta	3	F.O
Quercus sp.		O
Rhytidiadelphus squarrosus	2	
Salix aurita		O
Taraxacum sp.		O
Number of species/sample	30	
Total bryophyte cover	4	
Bare ground		
Litter	2	
Slope (Flat/Gentle/Mod./Steep)	G	
Aspect	SE	
Management (Hay/Pasture/Burning/Unmngd.)	P	

Grazers (Sheep/Cattle/Horse/Rabbits/Goat)	H?
Vegetation height (cm)	10-18

Table of quadrat (2x2m) Domin values and sub-community DAFOR estimates from M25 mire

	M25b Q3	Q4	M25b Stand
Molinia caerulea	8	8	A
Potentilla erecta	4	5	F
Erica tetralix		1	R.O
Narthecium ossifragum			R
Sphagnum auriculatum		2	
Polytrichum commune		1	
Hypnum cupressiforme s.l.		3	
Anthoxanthum odoratum		3	F.O
Holcus lanatus			R
Luzula multiflora		3	F.R
Rumex acetosa			R
Danthonia decumbens	1	1	R.F
Pseudoscleropodium purum	3		
Serratula tinctoria	3	4	F.R
Luzula campestris			R
Cirsium palustre	1	1	F
Galium palustre			R
Juncus cf. acutiflorus	4	2	F
Succisa pratensis	3	5	F.R
Lotus uliginosus			R.F
Carex panicea	1		R
Calluna vulgaris	1		R.O
Agrostis canina	3	2	F
Dactylorhiza cf. maculata			R.O
Festuca ovina	3	4	F
Nardus stricta	2		R.F
Ranunculus acris			R.O
Centaurea nigra			R.O
Deschampsia cespitosa			R
Lophocolea bidentata s.l.		2	
Arrhenatherum elatius			R
Atrichum undulatum	2	1	
Briza media			R.F
Bryum sp.		1	
Calypogeia arguta		3	
Calypogeia fissa	1		
Carex caryophyllea			R.F
Carex flacca			R
Carex montana	3		R
Carex pallescens			R
Carex pilulifera	3	2	R
Cirsium dissectum			R
Dactylorhiza fuchsii			R
Dicranella heteromalla		3	
Digitalis purpurea			R
Galium saxatile	2		R.O
Genista anglica			R.F
Hypochoeris radicata			R
Juncus conglomeratus			R
Lathyrus montanus	3		R.F
Linum catharticum			R
Lotus corniculatus	2		R
Pedicularis sylvatica			R.F
Plantago lanceolata	2		R.F
	M25b		M25b

	Q3	Q4	Stand
Scirpus cespitosus			R.O
Stachys betonica	4		R
Thuidium tamariscinum	5	2	
Vaccinium myrtillus			R.F
Veronica officinalis			R
Number of species/sample	23	22	
Total bryophyte cover	5	4	
Litter	3		
Bare ground		2	
Slope (Flat/Gentle/Mod./Steep)	G	M	
Aspect	SE	E	
Management (Hay/Pasture/Burning/Unmngd.)	U	U/B	
Grazers (Sheep/Cattle/Horse)			
Vegetation height (cm)		10-20	

Table of quadrat (2x2m) Domin values and sub-community DAFOR estimates from MG5 grassland

	MG5c	MG5c
	Q2	Stand
Festuca rubra	5	F
Cynosurus cristatus	2	F
Lotus corniculatus	3	F
Plantago lanceolata	4	F
Holcus lanatus		O
Trifolium repens	3	F
Centaurea nigra	2	R.O
Agrostis capillaris	4	F
Anthoxanthum odoratum	4	F
Trifolium pratense	4	F
Lolium perenne		R
Bellis perennis	3	O.F
Achillea millefolium		R
Festuca ovina		R.F
Prunella vulgaris	4	F
Leontodon autumnalis	4	F
Luzula campestris	2	O
Danthonia decumbens	4	F
Potentilla erecta	4	F
Carex caryophyllea	5	F.A
Ranunculus acris		O
Hypochoeris radicata	5	F
Ranunculus bulbosus	1	R
Cerastium fontanum		F
Leontodon hispidus		R
Trifolium dubium	1	O
Rhytidiadelphus squarrosus	5	
Juncus effusus		R
Calliergon cuspidatum	4	
Calluna vulgaris		R
Cirsium palustre	1	F
Dicranum scoparium	2	
Euphrasia rostkoviana		R.F
Galium saxatile	3	O
Hieracium pilosella	1	R
Lotus uliginosus		R
Nardus stricta		O
Pedicularis sylvatica		R
Plagiomnium affine	2	
Number of species/sample	26	
Total bryophyte cover	5	
Bare ground		
Litter		
Slope (Flat/Gentle/Mod./Steep)	M	
Aspect	SE	
Management (Hay/Pasture/Burning/Unmngd)	P	
Grazers (Cattle/Sheep/Horse/Rabbit)	H?	
Vegetation height (cm)	2-5	

Table of quadrat (2x2m) Domin values from H12c heath

	Q5	Q8
Calluna vulgaris	8	7
Vaccinium myrtilus	4	5
Hypnum jutlandicum	2	2
Dicranum scoparium	2	2
Plcurozium schreberi	5	5
Deschampsia flexuosa	4	2
Ptilidium ciliare	3	3
Cladonia uncialis	2	
Potentilla erecta	2	3
Festuca ovina	4	5
Nardus stricta	2	4
Rhytidiadelphus squarrosus	2	2
Anthoxanthum odoratum		2
Agrostis capillaris	2	3
Lotus corniculatus		1
Lophocolea bidentata s.l.	1	
Lophozia ventricosa	2	1
Sorbus aucuparia seedling		1
Cladonia chlorophaea	2	
Cladonia gracilis	2	2
Cladonia ciliata	4	2
Cladonia sp.	2	3
Diplophyllum albicans		2
Eurhynchium praelongum	1	
Gymnocolea inflata	1	2
Hieracium sp.		1
Jungermannia gracillima		1
Luzula campestris	2	2
Pedicularis sylvatica		3
Peltigera sp.	1	2
Polytrichum juniperinum	1	1
Polytrichum piliferum		2
Quercus sp. seedling	1	
Racomitrium lanuginosum		2
Rumex acetosella	2	
Veronica officinalis	1	
Number of species/sample	27	29
Total bryophyte cover	5	6
Total lichen cover	4	3
Bare soil	4	4
Slope (Flat/Gentle/Moderate)	M	G
Aspect	N	NE
Management (Hay/Pasture/Burning/Unmanaged)	P	P
Grazers (Cattle/Sheep/Horse/Rabbit)	C/H	C/H
Vegetation height (cm)	5-20	5-15

Table of quadrat (2x2m) Domin values from M10a mire

	Q10
Ancura pinguis	2
Juncus articulatus	5
Bryum pseudotriquetrum	4
Campylium stellatum var. *protensum*	1
Carex hostiana	1
Carex pulicaris	3
Potentilla erecta	1
Carex nigra	6
Fissidens adianthoides	1
Anthoxanthum odoratum	3
Ranunculus acris	3
Cratoneuron filicinum	2
Carex demissa	4
Juncus bulbosus	3
Carex echinata	3
Prunella vulgaris	3
Calliergon cuspidatum	6
Pellia endiviifolia	4
Ranunculus flammula	1
Cirsium palustre	3
Cardamine pratensis	3
Juncus acutiflorus	1
Holcus lanatus	3
Galium palustre	3
Festuca rubra	1
Cerastium fontanum	1
Dactylorhiza majalis ssp. *praetermissa*	1
Hypericum tetrapterum	2
Isolepis setacea	2
Juncus effusus	4
Lychnis flos-cuculi	1
Philonotis fontana	4
Plagiomnium undulatum	2
Riccardia multifida	1
Number of species/sample	34
Total bryophyte cover	7
Bare ground/water	5
Slope (Flat/Gentle/Moderate)	G
Aspect	NW
Management (Hay/Pasture/Burning/Unmanaged)	P
Grazers (Sheep/Cattle/Horse)	C/H
Vegetation height (cm)	10-35

Table of quadrat (2x2m) Domin values from M15 wet heath

	M15d Q14	Q32	Stand with Q14	M15b/d Q19	M15 Q20
Molinia caerulea	7	7	A	7	6
Potentilla erecta	2	3	F	3	4
Erica tetralix	3	4	O.F	5	4
Calluna vulgaris	7	7	A	6	5
Scirpus cespitosus		2	O	2	
Carex panicea				4	
Succisa pratensis			O.F	2	3
Carex demissa					1
Sphagnum papillosum				5	
Sphagnum auriculatum					2
Campylopus paradoxus		1			
Vaccinium myrtillus	7	4	A.D		
Nardus stricta	2	4	F		4
Juncus squarrosus		1		3	
Dicranum scoparium		3		3	
Hypnum jutlandicum		6		5	5
Deschampsia flexuosa	2		O		
Pleurozium schreberi	2	4			
Galium saxatile	2		O.F		
Anthoxanthum odoratum				3	
Festuca ovina	4	3	F	4	4
Luzula multiflora	2		O.F		
Carex pilulifera	2		O		
Polygala serpyllifolia				1	2
Sphagnum subnitens				2	
Agrostis canina				2	
Hylocomium splendens	4				
Aulacomnium palustre				1	
Diplophyllum albicans				3	
Pedicularis sylvatica				3	
Carex binervis			O		
Juncus conglomeratus			O		
Rhytidiadelphus squarrosus	3				5
Danthonia decumbens				3	4
Agrostis capillaris	3		F		4
Campylopus introflexus				2	
Cephalozia bicuspidata				3	
Cladonia furcata		1			
Gymnocolea inflata				2	
Pseudoscleropodium purum					3
Quercus sp. seedling			R		
Scapania nemoroea				3	2
Serratula tinctoria					1
Number of species/sample	15	14		24	17
Total bryophyte cover	4	7		8	7
Litter	2	2		3	3
Bare soil		2		3	3
Bare rock	1				
Slope (Flat/Gentle/Mod./Steep)	M	G		G	M
Aspect	NE	NNE		SW	NE
Management (Hay/Pasture/Burning/Unmanaged)	P	P		P	P
Grazers (Sheep/Cattle/Horse/Rabbit)	C/H	C/H		C/H	C/H
Vegetation height (cm)	6-18	10-15		6-10	6-18

Table of quadrat (2x2m) Domin values
and sub-community DAFOR estimates from M23a rush-pasture

	Q6	Q22	Q26	Q33	Stand in field G
Juncus effusus	5		5	5	O.F
Holcus lanatus	2	3	3	3	F
Galium palustre	3		3	4	R.F
Lotus uliginosus	4	5	4	5	F
Juncus acutiflorus	8	5	4	7	F
Molinia caerulea	2		6	4	
Ranunculus acris		3			F
Potentilla erecta			1		
Achillea ptarmica	2	4			O.F
Equisetum palustre	2				
Carum verticillatum			3		
Aulacomnium palustre				1	
Stellaria alsine			1		
Deschampsia cespitosa	1				
Epilobium obscurum			1		
Eurhynchium praelongum	6		1	5	
Athyrium filix-femina					R
Cirsium palustre	1		3	3	R
Ranunculus flammula				3	O
Agrostis canina		5	7	3	F
Anthoxanthum odoratum		6			A
Mentha aquatica	2				
Rumex acetosa	2	3	1	3	F
Cardamine pratensis				2	
Ranunculus repens		4		4	F
Calliergon cuspidatum			2	5	
Angelica sylvestris					O
Epilobium palustre	2			3	O
Festuca rubra			2		
Agrostis capillaris		5	1		F
Rhytidiadelphus squarrosus			4	3	
Brachythecium rutabulum		3	3	4	
Lychnis flos-cuculi	1			2	
Succisa pratensis	2			3	
Senecio aquaticus	2			1	
Lophocolea bidentata s.l.	2			3	
Carex ovalis					O.F
Carex echinata				3	
Polygonum hydropiper	1				
Ajuga reptans	1				
Bryum pseudotriquetrum	1				
Pellia sp.	2			3	
Plagiomnium undulatum	3			3	
Thuidium tamariscinum			1	1	
Wahlenbergia hederacea			2		
Number of species/sample	23	11	21	26	
Total bryophyte cover	7	3	4	6	
Litter			5		
Slope (Flat/Gentle/Moderate/Steep)	G	G	G	G	
Aspect	NE	SE	E	NNE	
Management (Hay/Pasture/Burning/Unmanaged)	P	U	P	P	
Grazers (Sheep/Cattle/Horse)	H		H	C/H	
Vegetation height (cm)	20-60	20-40	15-60	30-65	

Table of quadrat (2x2m) Domin values from M24b/c fen-meadow

	Q21
Molinia caerulea	8
Potentilla erecta	3
Lotus uliginosus	3
Galium uliginosum	4
Holcus lanatus	3
Carex pulicaris	3
Pseudoscleropodium purum	4
Juncus acutiflorus	6
Galium palustre	3
Juncus effusus	2
Aulacomnium palustre	1
Agrostis canina	3
Thuidium tamariscinum	1
Eurhynchium praelongum	4
Cirsium palustre	3
Calliergon cuspidatum	4
Carex hostiana	4
Brachythecium rutabulum	4
Calypogeia fissa	3
Carex echinata	3
Cephalozia bicuspidata	3
Ctenidium molluscum	4
Festuca ovina	4
Fissidens adianthoides	2
Hypnum jutlandicum	4
Lophocolea bidentata s.l.	2
Plagiomnium undulatum	3
Poa subcaerulea	1
Rhizomnium punctatum	3
Rhytidiadelphus squarrosus	4
Number of species/sample	30
Total bryophyte cover	6
Litter	4
Bare soil	3
Slope (Flat/Gentle/Moderate/Steep)	G
Aspect	SE
Management (Hay/Pasture/Burning/Unmanaged)	P
Grazers (Sheep/Cattle/Horse/Rabbit)	C/H

Table of quadrat (2x2m) Domin values from M25b mire

	Q15	Q28	Q30	Q31
Molinia caerulea	8	6	4	6
Potentilla erecta	4	6	4	5
Sphagnum auriculatum				1
Polytrichum commune	1			
Hypnum jutlandicum				5
Anthoxanthum odoratum	3	3	3	2
Holcus lanatus	2			
Agrostis capillaris	3	3	2	4
Festuca rubra				2
Luzula multiflora	3			
Danthonia decumbens	3	3	1	3
Pseudoscleropodium purum	4	1		
Serratula tinctoria	1			
Cirsium palustre			1	
Juncus effusus			1	
Equisetum palustre		1		
Carum verticillatum		2		
Succisa pratensis	1		4	3
Lotus uliginosus	3	1		
Carex echinata			2	
Carex panicea	4	4	5	3
Calluna vulgaris		1		
Agrostis canina	4	6	7	5
Carex nigra	2	3		
Rhytidiadelphus squarrosus	5	5	3	4
Festuca ovina	5	4	4	5
Nardus stricta	3	4	4	4
Ranunculus acris				1
Ranunculus flammula			1	1
Calliergon cuspidatum		3		
Valeriana officinalis				2
Achillea ptarmica	Q			
Campylopus introflexus				3
Carex demissa			3	3
Carex pilulifera	2			2
Diplophyllum albicans				1
Euphrasia sp.	1			
Galium saxatile	3	1		4
Hypnum cupressiforme s.l.	3			
Juncus squarrosus			1	
Lotus corniculatus				1
Pedicularis sylvatica	3	3	1	3
Plagiomnium undulatum				3
Plantago lanceolata	1	1		2
Polygala serpyllifolia	3			3
Polytrichum formosum				2
Polytrichum juniperinum				1
Potentilla anserina				
Prunella vulgaris	1	1	2	3
Sphagnum recurvum	1			
Thuidium tamariscinum			3	
Trifolium repens	1			2
No. of species / sample	29	21	20	31
Total bryophyte cover	6	5	3	6
Litter	3		3	3
Bare soil				3

Slope (Flat/Gentle/Moderate/Steep)	G	G	G	G
Aspect	NE	E	E	NNE
Management (Hay/Pasture/Burning/Unmanaged)	P	P	P	P
Grazers (Sheep/Cattle/Horse/Rabbit)	C/H	H	C/H	C/H
Vegetation height (cm)	3-12	5-10	3-5	6-8

Table of quadrat (2x2m) Domin values from MG5 grassland

	MG5a				MG5c	
	Q4	Q23	Q27	Q29	Q2	Q24
Festuca rubra	6	4	4	4	4	5
Cynosurus cristatus	4	5	2	4	4	2
Lotus corniculatus	5	8	6	5	3	5
Plantago lanceolata	4	3	3	5	4	4
Holcus lanatus	1	4			2	4
Dactylis glomerata					1	
Trifolium repens	2	4	3	3	4	2
Centaurea nigra						5
Agrostis capillaris	4	5	5	8	6	6
Anthoxanthum odoratum	2	5	2		2	5
Trifolium pratense	2	5	3	2	1	3
Lolium perenne				1		1
Bellis perennis	1	3		4	2	
Achillea millefolium	3		Q	4	3	
Carex flacca	2	1				
Festuca ovina		2				
Prunella vulgaris	3	3	2	2	4	
Leontodon autumnalis	2	3	4	3	2	
Danthonia decumbens	2		3		2	
Potentilla erecta					3	2
Succisa pratensis					1	3
Carex caryophyllea	2			2	4	
Atrichum undulatum	1					
Brachythecium rutabulum		5		3	2	3
Calliergon cuspidatum					1	
Carex panicea					2	
Cerastium fontanum		2	1			
Cirsium palustre		3			1	
Cirsium vulgare				1		
Cladonia sp.			1			
Crepis capillaris					1	
Equisetum arvense		3				
Euphrasia sp.	2			2	2	4
Eurhynchium praelongum		2			1	
Hieracium pilosella	4		4			
Hypnum cupressiforme s.l.	2		2			
Hypochoeris radicata	1		4			
Leontodon taraxacoides	1		3	3	2	
Linum catharticum		3				
Lophocolea bidentata s.l.	2			2	1	
Luzula campestris			3	3	2	3
Nardus stricta			Q		1	
Odontites verna		2				
Peltigera sp.			2			
Phleum pratense ssp. *bertolonii*			2			
Plagiomnium undulatum	1					
Plantago major				2		
Poa subcaerulea			1			
Potentilla cf. *anglica*	1			1	1	
Potentilla sterilis			1			
Pseudoscleropodium purum		5				
Racomitrium ericoides			3	1		
Ranunculus acris	2	3			2	
Ranunculus bulbosus				3		
Ranunculus repens		2			1	
Rhytidiadelphus squarrosus	3	3	5		3	2

	MG5a				MG5c	
	Q4	Q23	Q27	Q29	Q2	Q24
Rumex acetosa		2				1
Rumex acetosella			1			
Sagina procumbens			1			
Taraxacum officinale agg.			2	2	2	1
Thymus praecox			2			
Veronica officinalis			2			
Viola riviniana					1	
Number of species/sample	27	26	31	24	35	19
Total bryophyte cover	3	6	5	3	3	3
Litter	3	3			3	
Bare soil	2	3		3	1	
Lichens			2			
Slope (Flat/Gentle/Moderate/Steep)	F	G	F	F	G	M
Aspect		S			E	S
Management (Hay/Pasture/Silage/Unmanaged)	P	P	P	P	P	P
Grazers (Sheep/Cattle/Horse/Rabbit)	C/H	H	C/H	C/H	C/H	C
Vegetation height (cm)	3	8-10	0-5	1-2	4	8-15

Table of quadrat (2x2m) Domin values and community DAFOR estimates for U1 grassland

	Q11	Q11 stand
Festuca ovina	6	A
Agrostis capillaris	5	F
Rumex acetosella	3	F
Dicranum scoparium	7	P
Cladonia impexa	2	P
Anthoxanthum odoratum	2	F
Lotus corniculatus		R
Quercus sp. seedling		R
Galium saxatile	2	O.F
Potentilla erecta		O.F
Hypochoeris radicata	2	F
Hieracium pilosella	4	F
Calluna vulgaris	2	O.F
Pseudoscleropodium purum	3	P
Rhytidiadelphus squarrosus	2	P
Luzula campestris	2	O
Danthonia decumbens	4	F
Veronica officinalis	2	O
Peltigera hymenina		O
Number of species/sample	15	
Total bryophyte cover	7	
Bare soil	5	
Litter	2	
Total lichen cover	2	
Slope (Flat/Gentle/Mod./Steep)	S	
Aspect	S	
Management (Hay/Pasture/Burning/Unmngd)	P	
Grazers (Sheep/Cattle/Horse/Rabbit)	C/H/R	
Vegetation height (cm)	2-5	

Table of quadrat (2x2m) Domin values from U4 grassland

	U4a				U4b			U4e
	Q1	Q3	Q12	Q18	Q7	Q9	Q25	Q17
Agrostis capillaris	5	6	6	5	5	6	5	5
Anthoxanthum odoratum	3	3	4		2	3	5	
Potentilla erecta	5	6	1			3	5	
Festuca ovina	4	6	7	7	4	4		6
Galium saxatile	4	4	5	4		1	4	5
Holcus lanatus					4	2	2	
Achillea millefolium				3				
Trifolium repens			1	2	5	5		
Cerastium fontanum			1		2			
Prunella vulgaris						2		
Cynosurus cristatus					3	4		
Dactylis glomerata	1						1	
Taraxacum officinale agg.						1		
Bellis perennis					2	2		
Trifolium pratense						2		
Lotus corniculatus			1	2	2	4	1	
Succisa pratensis						3		
Stachys betonica		2						
Carex caryophyllea	4	3				2	1	
Luzula multiflora								3
Thuidium tamariscinum	3	4				3	1	
Carex panicea	2							
Vaccinium myrtillus			Q					5
Pleurozium schreberi			2	4	2			5
Nardus stricta	5	1					3	5
Deschampsia flexuosa			2					4
Rhytidiadelphus squarrosus	3	3	2	6	6	2	6	4
Luzula campestris		2	2	3	3		3	
Festuca rubra		1			4	4	4	4
Dicranum scoparium			1	3	1			
Pseudoscleropodium purum			1					3
Hylocomium splendens		1						
Plantago lanceolata		1		2	2	3		
Rumex acetosa							2	
Danthonia decumbens	3	2	3		3	3	4	2
Ranunculus acris						2	2	
Carex pilulifera	1							3
Calluna vulgaris			Q	1				5
Veronica officinalis	1	1		1	1	1		
Carex binervis								1
Polygala serpyllifolia						1		
Euphrasia sp.	2	4				2	3	
Molinia caerulea	2					2		4
Juncus effusus		1						
Lophocolea bidentata s.l.			1		1			
Carex nigra	1							
Ranunculus repens						1		
Brachythecium rutabulum	2							
Calliergon cuspidatum							1	
Eurhynchium praelongum	1							
Geranium molle					2			
Hieracium pilosella			3	3	2	1		
Hypnum jutlandicum					1			5
Hypochoeris radicata			2		1			
Juncus conglomeratus			1				1	

	U4a				U4b			U4e
	Q1	Q3	Q12	Q18	Q7	Q9	Q25	Q17
Leontodon autumnalis			1	1		1		
Pedicularis sylvatica	2					1	2	
Peltigera lactucifolia				1				
Plagiomnium undulatum							2	
Polytrichum formosum								4
Ptilidium ciliare			2					
Quercus sp. seedling		1	1					
Rumex acetosella			2		2			
Serratula tinctoria	2							
Number of species/sample	21	19	25	16	23	29	21	18
Total bryophyte cover	4	4	8	7	6	3	6	7
Litter	3	3	4	2	3	3	2	3
Bare soil			1	2				
Total lichen cover				1				
Slope (Flat/Gentle/Moderate/Steep)	G	M	S	F	G	G	G	G
Aspect	E	NE	N		N	E	NE	NE
Management (Hay/Pasture/Burning/Unmanaged)	P	P	P	P	P	P	P	P
Grazers (Sheep/Cattle/Horse/Rabbit)	C/H	C/H	C/H	C/H	C/H	C/H	C/H	C/H
Vegetation height (cm)	4-10	4-10	6-12	4-7	5-15	4	3-7	10-20

Table of quadrat (2x2m) Domin values
and DAFOR estimates from U5d grassland

	Q13	Stand
Nardus stricta	8	D
Galium saxatile	3	F
Potentilla erecta	4	F
Festuca ovina	4	F
Agrostis capillaris	5	A.F
Rhytidiadelphus squarrosus	4	
Pleurozium schreberi	2	
Ptilidium ciliare	2	
Festuca rubra	2	O.F
Calliergon cuspidatum	Q	
Calluna vulgaris	4	O.F
Danthonia decumbens	2	F
Erica tetralix	1	O
Molinia caerulea	1	O
Vaccinium myrtilus	3	F
Carex binervis	2	O
Carex pilulifera	2	O
Juncus effusus	1	O
Pedicularis sylvatica		O
Succisa pratensis	2	F.O
Number of species/sample	20	
Total bryophyte cover	4	
Litter	4	
Slope (Flat/Gentle/Moderate)	G	
Aspect	NE	
Management (Hay/Pasture/Burning/Unmanaged)	P	
Grazers (Cattle/Sheep/Horse/Rabbit)	C/H	

Table of quadrat (2x2m) Domin values
and sub-community DAFOR estimates from '*Nardus stricta* - *Succisa pratensis* grassland'

	Q16	Stand
Agrostis capillaris	5	F
Agrostis canina	6	A
Anthoxanthum odoratum	5	F
Cynosurus cristatus	3	F
Danthonia decumbens	3	F
Deschampsia cespitosa	1	R
Festuca rubra	2	F
Nardus stricta	5	A.F
Achillea ptarmica	1	R
Bellis perennis	1	R
Calluna vulgaris		R
Carex echinata	2	F
Carex ovalis	3	F
Carex panicea	4	F
Carum verticillatum	1	O.F
Euphrasia cf. *nemorosa*		O.F
Euphrasia rostkoviana		O.F
Galium palustre		O
Juncus articulatus		O
Juncus conglomeratus		R
Leontodon autumnalis	5	F
Leontodon taraxacoides	2	F
Lotus corniculatus	3	O.F
Lotus uglinosus	4	F
Pedicularis sylvatica	4	F
Plantago lanceolata	2	F
Potentilla anglica	1	O
Potentilla erecta	4	F
Prunella vulgaris	3	F
Ranunculus acris	3	F
Ranunculus flammula		O
Ranunculus repens	2	O
Succisa pratensis	4	F
Taraxacum officinale agg.	3	F
Trifolium pratense	2	O
Trifolium repens	4	F
Aneura pinguis	1	
Atrichum undulatum	1	
Brachythecium rutabulum	3	
Calliergon cuspidatum	4	
Hypnum cupressiforme s.l.	1	
Rhytidiadelphus squarrosus	3	
Riccardia sp.	2	
Scapania sp.	2	
Thuidium tamariscinum	2	
Number of species/sample	38	
Total bryophyte cover	5	
Slope (Flat/Gentle/Moderate)	M	
Aspect	E	
Management (Hay/Pasture/Burning/Unmanaged)	P	
Grazers (Cattle/Sheep/Horse/Rabbit)	H	
Vegetation height (cm)	5-15	

Site SO00/2 Cwm-glo, additional quadrats from 2002 CCW HQ, 2002

Table of quadrat (2x2m) Domin values and sub-community DAFOR estimates from M23b rush-pasture

	Q23	Q23 stand
Juncus effusus	7	A
Holcus lanatus	3	F
Galium palustre		O
Lotus uliginosus	6	F.A
Ranunculus acris		R
Potentilla erecta	4	F
Deschampsia cespitosa	2	O
Luzula cf. *campestris*	1	R
Cirsium palustre		R
Ranunculus flammula		O
Agrostis canina	6	A
Rumex acetosa	3	O
Ranunculus repens		O
Epilobium palustre		R
Viola palustris		R
Carex nigra	2	F
Rhytidiadelphus squarrosus	3	
Succisa pratensis		R.O
Lophocolea bidentata s.l.	2	
Carex ovalis	1	O.F
Pellia sp.	3	
Number of species/sample	13	
Total bryophyte cover	4	
Bare ground		
Litter		
Open water		
Total lichen cover		
Slope (Flat/Gentle/Moderate/Steep)	G	
Aspect	E	
Management (Hay/Pasture/Burning/Unmanaged)	P	
Grazers (Cattle/Donkey/Goat/Horse/Sheep)	C/H/S	
Vegetation height (cm)	10-60	

Table of quadrat (2x2m) Domin values and sub-community DAFOR estimates from M25a mire

	Q18	Q18 stand
Molinia caerulea	6	F.A
Potentilla erecta	5	F.A
Erica tetralix	3	F
Sphagnum recurvum	1	
Narthecium ossifragum		R
Calypogeia fissa	2	
Polytrichum commune	2	
Aulacomnium palustre	1	
Hypnum cupressiforme s.l.	3	
Danthonia decumbens	1	O
Serratula tinctoria	2	O.F
Juncus effusus	1	O
Succisa pratensis	5	F
Carex echinata	2	O
Carex panicea	5	F
Calluna vulgaris	2	O.F
Agrostis canina	2	F
Carex nigra	4	F
Rhytidiadelphus squarrosus	4	
Festuca ovina	4	F
Plcurozium schreberi	3	
Nardus stricta	3	F
Lophocolea bidentata s.l.	2	
Carex pilulifera	2	F
Juncus conglomeratus		O
Juncus squarrosus	4	F
Pedicularis sylvatica	3	F
Polygala serpyllifolia		R
Vaccinium myrtillus	1	O
Diplophyllum albicans	1	
Scapania nemorea	2	
Thuidium tamariscinum	4	
Cladonia sp.	2	
Peltigera hymenina	2	
Number of species/sample	31	
Total bryophyte cover	5	
Bare soil	2	
Litter	3	
Open water		
Total lichen cover	3	
Slope (Flat/Gentle/Moderate/Steep)	G	
Aspect	E	
Management (Hay/Pasture/Burning/Unmanaged)	P	
Grazers (Sheep/Cattle/Horse/Rabbit)	C/H/S	
Vegetation height (cm)	2-8	

Table of quadrat (2x2m) Domin values and sub-community DAFOR estimates from MG5c grassland

	Q19	Q21	Q22	Q19 stand	Q21 stand	Q22 stand
Festuca rubra	3	5		F	F	
Cynosurus cristatus	4	4	5	F	F	F
Lotus corniculatus	5	6	5	F	A	F.A
Plantago lanceolata	3	4	4	F	F	F
Holcus lanatus	2		3	F		F
Dactylis glomerata			1			O
Trifolium repens	2	4	4	F	F	F
Agrostis capillaris	4	6	5	F	F.A	F
Anthoxanthum odoratum	3	3	5	F	F	F
Trifolium pratense		1		O	O	O
Lolium perenne				R		
Bellis perennis	1	1		O	O	O
Lathyrus pratensis				R.F		
Carex flacca	6	5	5	F.A	F	F
Prunella vulgaris	4	4	5	F	F	F.A
Leontodon autumnalis	3	3		F	F	
Luzula campestris	2		2	F		F
Danthonia decumbens	3	3	2	F	F	F
Potentilla erecta	5	3	2	F	F	F
Succisa pratensis	5		5	F		F
Carex caryophyllea		4			F	
Ranunculus acris	3			F		
Rumex acetosa						R
Hypochoeris radicata	2	4		F	F	
Taraxacum officinale agg.	2			O		
Brachythecium rutabulum	1	1				
Leontodon hispidus					R	
Trifolium dubium			1	O		O
Cirsium arvense				R		R
Rhytidiadelphus squarrosus	4		3			
Juncus effusus						R
Calliergon cuspidatum	2	2	2			
Pseudoscleropodium purum	1	1	2			
Agrostis canina	1			O		
Aira caryophyllea			1			O
Nardus stricta	5			O.F		O.F
Calluna vulgaris						O
Carex nigra	4			F		
Carex pilulifera	2	4	1	F	F	O
Carex pulicaris			4			F
Cirsium palustre			1			R
Crataegus monogyna seedling				R.O		
Equisetum arvense			1			O
Euphrasia sp.	1	4	3	P	P	F
Galium saxatile		1			O	
Hieracium pilosella		3		O	F.R	O.F
Isolepis setacea	1			R		
Juncus acutiflorus	2			O		
Juncus conglomeratus			2			O
Leontodon taraxacoides	3	5		F	F	
Linum catharticum			3	O	R	F
Pedicularis sylvatica	4			F		
Polygala serpyllifolia	1			O		
Polygala vulgaris		3			F	
Thymus praecox					R.F	

	Q19	Q21	Q22
Atrichum undulatum		1	
Calypogeia fissa			2
Ctenidium molluscum			5
Fissidens taxifolius			2
Homalothecium lutescens			1
Hypnum lindbergii	4	4	
Lophocolea bidentata s.l.	3	3	4
Plagiomnium affine		1	
Plagiomnium undulatum			1
Scapania irrigua	3		
Thuidium tamariscinum	3	3	
Number of species/sample	37	30	33
Total bryophyte cover	5	4	
Bare ground	1		
Bare rock			
Litter			
Total lichen cover			
Slope (Flat/Gentle/Moderate/Steep)	F	F	S
Aspect	-	-	N
Management (Hay/Pasture/Mowing/Unmanaged)	P	P	P
Grazers (Cattle/Goat/Horse/Rabbit/Sheep)	C/H/S	C/H/S	C/H/S
Vegetation height (cm)	2-5	2-5	5-8

Table of quadrat (2x2m) Domin values and sub-community DAFOR estimates from U4 grassland

	U4a			U4b		U4b lowland form	
	Q16	Q17	Q17 stand	Q15	Q15 stand	Q20	Q20 stand
Agrostis capillaris	4	7	A	2	F	7	A
Anthoxanthum odoratum	4	3	F	2	F	3	F
Potentilla erecta	7	7	A	6	A	6	A
Festuca ovina	4	5	F		R		
Galium saxatile	3	5	F	2	F	4	F
Holcus lanatus				2	O		
Achillea millefolium						Q	P
Trifolium repens			O	3	F	5	F
Prunella vulgaris				3	F		R
Taraxacum officinale agg.				2	O		
Trifolium pratense						1	O
Lotus corniculatus				3	F	5	F
Succisa pratensis		2	F		O	4	O.F
Deschampsia cespitosa				1	O	1	R
Thuidium tamariscinum	2	2		5			
Agrostis canina	2			4	F.A		
Carex panicea			R	6	F		
Carex echinata				3	F		
Vaccinium myrtillus	1						
Pleurozium schreberi	5						
Nardus stricta	4	2	F	4	F	2	O
Rhytidiadelphus squarrosus	5	4		2		5	
Luzula campestris	3	4	F	2	F		
Festuca rubra		3	F			5	F
Hypnum cupressiforme s.l.		5					
Plantago lanceolata				1	O	3	F
Danthonia decumbens	6	5	F	4	F	4	F
Ranunculus acris				2	F		
Carex pilulifera				3	O		
Veronica officinalis	2	2	F	1	R		
Polytrichum commune	2						
Polygala serpyllifolia	1						
Euphrasia officinalis agg.		1	F				
Juncus effusus			R.O	1	R		
Lophocolea bidentata s.l.						1	
Carex nigra	6			5	F		
Aira praecox		2	O				
Carex ovalis			R	2	O		
Hieracium pilosella		1	O			3	F
Hypochoeris radicata						4	F
Isolepis setacea				1	O		
Juncus bulbosus				1	O		
Leontodon autumnalis			R	1	O		
Leontodon taraxacoides				1	O		
Lotus uliginosus				2	O.F		
Pedicularis sylvatica	2			2	F		R
Polygala vulgaris				1	O		
Serratula tinctoria			O				
Euphrasia anglica						5	F
Number of species/sample	18	17		32		19	
Total bryophyte cover	7	6		5		5	
Bare soil				2			
Slope (Flat/Gentle/Moderate/Steep)	G	G		G		M	

9	Cwm Glo SSSI Annex	SO028053
10	Cwm Glo SSSI Annex	SO030051
11	Cwm Glo SSSI Annex	SO035053
12	Cwm Glo SSSI Annex	SO037055
13	Cwm Glo SSSI Annex	SO035052
14	Cwm Glo SSSI Annex	SO034052
15	Cwm Glo SSSI Annex	SO036052
16	Cwm Glo SSSI Annex	SO040053
17	Cwm Glo SSSI Annex	SO039051
18	Cwm Glo SSSI Annex	SO040048
19	Cwm Glo SSSI Annex	SO042046
20	Cwm Glo SSSI Annex	SO042046
21	Cwm Glo SSSI Annex	SO041046
22	Cwm Glo SSSI Annex	SO045041
23	Cwm Glo SSSI Annex	SO049040
24	Cwm Glo SSSI Annex	SO049047
25	Cwm Glo SSSI Annex	SO037054
26	Cwm Glo SSSI Annex	SO052033
27	Cwm Glo SSSI Annex	SO037056
28	Cwm Glo SSSI Annex	SO054034
29	Cwm Glo SSSI Annex	SO028053
30	Cwm Glo SSSI Annex	SO029055
31	Cwm Glo SSSI Annex	SO032051
32	Cwm Glo SSSI Annex	SO032052
33	Cwm Glo SSSI Annex	SO031052

Annex 3. SO00/1 Cwm-pant-bach: site description

The site comprises a group of small pastures located between areas of drift mining spoil and amenity grassland on the south-western outskirts of Merthyr Tydfil. The pastures are partially scrubbed over and heavily sheltered by mixed woodland. They slope gently to the north-east, at an altitude of 220-240m. Drainage is generally impeded and the majority of the site is covered by **M24** fen-meadow, but there are also patches of drier ground, some of which support **MG5** neutral grassland.

***Molinia caerulea* - *Potentilla erecta* mire (M24)** occurs in all except the most north-easterly enclosure (Qs 1,2,4,6 & 8). The community is short-grazed with frequent to abundant *Cirsium dissectum* and frequent *Succisa pratensis*. *Molinia* generally has a low cover and is rather sparse in the triangular, western enclosure (Qs 6 & 8). Rushes are common and sedges are well- represented, *Carex panicea*, *C. nigra* and *C. demissa* being frequent, and *C. flacca* locally frequent. The basiphilous sedges *Carex hostiana* and *C. pulicaris* are present but uncommon. Grasses and forbs more typical of mesotrophic grassland form a prominent floristic element; *Cynosurus cristatus*, *Festuca rubra*, *Holcus lanatus*, *Leontodon autumnalis*, *Plantago lanceolata*, *Prunella vulgaris* and *Trifolium pratense* are all frequent. *Ranunculus flammula*, *R. acris* and *R. repens* are also common. Parts of the stand in the triangular western-most field appear somewhat modified, with species such as *Lolium perenne* and *Cerastium fontanum* appearing in the sward (Q6). A small patch of **M24** vegetation in the corner of the central field (unsampled) includes frequent *Galium uliginosum* and *Valeriana dioica* and has been mapped as the **Typical sub-community (M24b)**. There are also two flushed, *Sphagnum*-rich areas which can be assigned to the ***Juncus acutiflorus* - *Erica tetralix* sub-community (M24c)** (Q1), although they lack *Erica tetralix*. The remainder of the **M24** has no convincing element of species preferential for either sub-community and has been mapped simply as **M24b/c**.

Small stands of marshy grassland dominated by rushes are referable to ***Juncus acutiflorus* - *Galium palustre* rush-pasture (M23a)** (Q7). Associates include frequent *Galium palustre*, *Lotus uliginosus*, *Ranunculus flammula* and *Senecio aquaticus*, and occasional *Holcus lanatus*. The community is relatively open and sedge-rich, grading locally into **M24**.

Most of the drier ground supports ***Centaurea nigra* - *Cynosurus cristatus* grassland, *Danthonia decumbens* sub-community (MG5c)** (Qs 3,5 & 9). Stands are floristically variable but *Agrostis capillaris*, *Anthoxanthum*, *Festuca rubra* and *Danthonia decumbens* are generally frequent, as are *Carex caryophyllea*, *Carex flacca*, *Plantago lanceolata*, *Potentilla erecta* and *Succisa*. Although the community does not show strong signs of agricultural modification, swards are often slightly atypical. The critical **MG5** forbs *Lotus corniculatus* and *Centaurea nigra*, and the **MG5** constant grass *Cynosurus cristatus* are frequent in most places, but all three become patchy in some stands and occur at a low cover. *Trifolium* spp. are uncommon. The stand of **MG5c** in the south-eastern corner of the site is heavily flushed, with abundant sedges, particularly *Carex flacca* and *Carex panicea*, frequent *Briza* and frequent *Sanguisorba officinalis* (Q3). Other stands are somewhat transitional to **U4b** (Qs 5 & 9) and some have only a low to moderate species density, particularly in the north-eastern field (Q5), where **MG5c** forms a mosaic with patches of nondescript ***Festuca* - *Agrostis* - *Galium* grassland, *Holcus lanatus* - *Trifolium repens* sub-community (U4b)**. Similar **U4b** also occurs in a corner of the central enclosure (unsampled).

A small area of semi-improved grassland occurs at the edge of the central western enclosure and a substantial proportion of the site is covered by woodland and scrub. An open pond lies in woodland at the north-eastern boundary; this contains emergent macrophytes such as *Sparganium erectum* and *Potamogeton natans*.

The most notable species encountered at Cwm-pant-bach is the nationally rare liverwort *Scapania paludicola*, which was recorded in flushed **M24c** in the south-east of the site (det. Martha Newton).

Although no particularly rare vascular plants were seen, two species are of some interest; *Carum verticillatum*, which is locally frequent in the **M24**, and *Ophioglossum vulgatum*, a small, very dense population of which occurs in a patch of damp **MG5c** in the central enclosure.

At the time of survey Cwm-pant-bach was used as extensive grazing, along with adjacent revegetated spoil. Several ponies were present on the site.

Cwm-pant-bach is considered to be of high conservation interest for its lowland grassland. The site includes a moderate area of **M24** fen-meadow, most of which appears relatively unmodified, and small, associated stands of **MG5c**, most of which are of reasonable floristic quality. The site exhibits good zonations between these two uncommon communities. It should be noted that this site lies close to another grassland site Cwm-glo (code SO 00/2) for which a separate survey report has been compiled.

Clare Mockridge, CCW HQ, 1994

Annex 4. SO00/2 Cwm-glo: site description

This site comprises a tract of rough pasture located between areas of drift mining spoil and amenity grassland on the south-western outskirts of Merthyr Tydfil. The site lies at the relatively high altitude of 250-290m, on an exposed and gently sloping, north-east facing hillside. The pastures are divided into three groups by two steep, oak-wooded stream courses. With the exception of one fenced-off hay-meadow, the boundaries between enclosures have long been defunct and the whole site is used as extensive grazing for cattle and horses, along with some surrounding despoiled land. The site boundary has been drawn where undisturbed ground apparently begins but much of the spoil is well over fifty years old and there is an ecological continuum from the semi-natural grassland to regenerated vegetation. The site supports extensive areas of *Molinia*-dominated swards assignable to **M25** or **M15** wet-heath and smaller stands of drier acid grassland assignable to **U4**. Some of this vegetation is of a rather upland margin character. However, scattered within the more acidic *Molinia* vegetation are small stands of flushed and slightly heathy **M24** fen-meadow and some of the **U4** grassland shows some floristic features convergent with more mesotrophic lowland grassland.

At a single community level, conservation interest is focused on the ***Molinia caerulea - Cirsium dissectum*** **fen-meadow (M24)** in pockets of mildly base-enriched ground across Cwm-glo (Qs 2,4 & 10). These occur in close association with other forms of *Molinia* vegetation or acid grassland. *Molinia* is abundant, accompanied by *Cirsium dissectum*, *Potentilla erecta*, *Carex panicea* and *Succisa pratensis*. Grasses such as *Nardus stricta*, *Festuca ovina* and *Anthoxanthum odoratum* are also generally frequent, as are the sedges *Carex demissa*, *Carex nigra* and, in many places, the midly base-demanding sedge *Carex hostiana*. Also present is a conspicuous heathy element comprising frequent *Erica tetralix* and *Calluna vulgaris*, as well as locally abundant *Sphagnum* spp., and the stands have been referred to the ***Juncus acutiflorus - Erica tetralix*** **sub-community (M24c)**. Other common associates are *Pedicularis sylvatica* and *Carex echinata*. One or two small stands lack *Cirsium dissectum*, but are marked out by the presence of basiphilous sedges.

One tiny stand of **M24** which occurs near the lower (northern) boundary of the site (Q8) lacks a convincing set of preferentials for **M24c**, or for the **Typical sub-community (M24b)**. The stand is sedge-rich and lacking in *Cirsium dissectum*, being defined by frequent *Carex pulicaris*. In common with the other stands of **M24** it has frequent *Festuca ovina* and occasional *Pedicularis sylvatica*, but also includes some more mesotrophic species such as *Cynosurus* and *Plantago lanceolata*. This vegetation has been mapped as **M24b/c**.

Most of the *Molinia* pasture is more acid and referable to communities which are common in Wales. In the south and east of the site it is generally assignable to ***Molinia caerulea - Potentilla erecta*** **mire (M25)** and in the north-west, to ***Scirpus cespitosus - Erica tetralix*** **wet heath (M15)**. The **M25** is quite variable: two sub-communities are represented; the ***Anthoxanthum odoratum*** **sub-community (M25b)** and the ***Erica tetralix*** **sub-community (M25a)**. **M25b** occurs in two forms: a short, flushed and slightly more diverse stand occurs around quadrat 3, and taller and more tussocky stands are found elsewhere (Q7). Associates frequent in all swards include the grasses *Anthoxanthum odoratum*, *Festuca ovina* and *Nardus stricta*, accompanied by *Luzula multiflora*, *Pedicularis sylvatica*, *Potentilla erecta*, *Succisa* and *Carex nigra*. In the flushed stand these species are joined by frequent *Carex panicea* and *Carex pilulifera*, and in the taller stands, by *Holcus lanatus*, *Juncus acutiflorus* and *J. effusus*.

Many **M25b** species, including some of the grasses characteristic of **M25b**, are also fairly common in the **M25a** at this site, but the **M25a** has an additional floristic component comprising frequent *Erica tetralix*, *Calluna vulgaris*, *Juncus squarrosus* and often a moderate cover of *Sphagnum* spp. (Qs 5 & 14). Stands of **M25a** are fairly uniform across the site. **M25a** shares many floristic characteristics to associated stands of **M15** wet heath. The boundary between the two communities occurs where

Scirpus cespitosus becomes frequent, or where the cover of dwarf ericoid shrubs becomes high (Qs 12 & 13). *Vaccinium myrtillus* is occasional to frequent in the **M15** and *Pleurozium shreberi* is also common, indicating that stands are probably referable to the ***Vaccinium myrtillus*** **sub-community (M15d).**

Also included in the *Molinia* grassland is the vegetation covering the hay-meadow in the centre of Cwm-glo. At the time of survey, a hay-cut had just been taken and there was little re-growth. However, it was apparent that *Molinia* was frequent to abundant and the stand is probably referable to **M25.** Sheelagh Kerry who conducted the Phase I survey of the area reported verbally that at the time of her visit to the site the enclosure supported rather modified *Molinia*-dominated grassland. Further survey is needed to confirm an NVC assignment and assess the floristic quality of the vegetation.

The two other wet semi-natural NVC communities which occur peripherally on the site are ***Juncus acutiflorus - Galium palustre*** **rush-pasture (M23a)** and ***Carex echinata - Sphagnum recurvum/auriculatum*** **mire (M6). M23a** is typically floristically unremarkable vegetation dominated by a mixture of *Juncus acutiflorus* and *J. effusus*, which is confined to drainage runnels (unsampled). The two small stands of **M6** flush occur in association with **M25a** and **M24c.** They are characterised by a carpet of *Sphagnum auriculatum*, accompanied by frequent *Carex echinata*, *C. nigra* and *C. panicea*. Grasses such as *Festuca ovina*, *Molinia*, and *Anthoxanthum* are also common and *Nardus* is occasional. The flushes appear to be close to the ***Carex nigra - Nardus stricta*** **sub-community (M6b),** but the sparse representation of *Nardus* precludes confident referral to this sub-community, and they have thus been assigned to the ***Carex echinata*** **sub-commuuity (M6a)** (Q6).

Peripheral patches of drier grassland range from species-poor acidic forms of ***Festuca ovina - Agrostis capillaris - Galium saxatile*** **grassland (U4)** through to mesotrophic ***Cynosurus cristatus - Centaurea nigra*** **grassland,** ***Danthonia decumbens*** **sub-community (MG5c),** a single, small stand of which is present in the east of the site.

U4 is commonest in the eastern part of Cwm-glo. Most of the community is relatively oligotrophic and assignable to the **Typical sub-community (U4a)** (Qs 1 & 11). *Agrostis capillaris* and *Festuca ovina* are the most abundant grasses, while *Nardus*, *Anthoxanthum*, *Danthonia* and *Festuca rubra* are frequent at low cover. Frequent forbs include *Galium saxatile*, *Potentilla erecta*, *Pedicularis sylvatica*, *Rumex acetosa* and *Veronica officinalis*; *Hieracium pilosella*, *Serratula tinctoria* and *Achillea millefolium* are occasional. Pleurocarpous mosses such as *Rhytidiadelphus squarrosus* form a moderate bryophyte layer. The stand of **U4a** on the slope around quadrat 11 has a greater prominence of species more characteristic of neutral grassland such as *Lotus corniculatus*, *Briza media* and *Plantago lanceolata*, but *Calluna vulgaris* and *Nardus stricta* also remain common in the sward. A similar floristic assemblage occurs in patches of the largest, most southerly stand of **U4a.**

Also present on the site are three small stands of more mesotrophic **U4** referable to the ***Holcus lanatus - Trifolium repens*** **sub-community (U4b).** These are marked out by the frequent presence of *Holcus lanatus*, and sometimes by *Trifolium repens*. *Festuca rubra* is more prominent in this sub-community and the grassland is less well characterised, with *Galium saxatile* and *Festuca ovina* becoming sparse in places (unsampled).

The small stand of **MG5c** is heavily flushed and rather atypical, with frequent sedges, particularly *Carex flacca*, *C. panicea* and *C. pulicaris* and frequent *Briza* (Q9). There are also scattered plants of *Festuca ovina* and frequent *Nardus stricta*, indicating a floristic approach to **U4.** The stand lacks the **MG5** forb *Centaurea nigra* and yellow composites are absent.

Unsampled vegetation includes some modified *Juncus*-infested damp grassland in the south-west of the site and a secondary swards covering a bank of spoil close to the north-western boundary. Stands

of dense bracken are common on the lowest ground in the east of the site, and there are small areas of scrub.

Two notable vascular plant species were recorded during the survey. *Carum verticillatum* is common in **M25b** and **M24c** at the far southern boundary of Cwm-glo and a few plants of *Genista anglica* were seen in **M15** wet heath. Additionally, a single Marsh Fritillary butterfly was seen on the site (see map) and, as the survey took place at the very end of the flying season, a further estimate of population needs to be made.

As already mentioned, the site is used as extensive grazing, along with adjacent land covered by old spoil. At the time of survey 15 head of cattle and 15 horses were present.

Cwm-glo is considered to be of at moderate to high conservation value for its grassland and related vegetation (evaluation of the **M15** wet heath lies outside the scope of this survey). At a single community level, interest is centred on the small stands of **M24** fen-meadow, most of which is well-characterised **M24c**. The site is also considered to be of value for its relatively extensive and apparently unmodified community mixtures and zonations which include stands of semi-natural grassland communities, particularly **M25** and **U4**. It should be noted that the site lies very close to another grassland site Cwm-pant-bach (code SO 00/1) for which there is a separate survey report.

Clare Mockridge, CCW HQ, 1994

Anuex 5. SO00/13 Aberganaid Slopes: site description

The site lies on the coalfield near Upper Aberganaid, on the eastern edge of Mynnydd Aberdar, which rises to the west of Merthyr Tydfil. It has survived within a complex of woodland, disused small-scale mineworkings and well-vegetated spoil tips, many of which date from early in the 20th century. The survey site two small areas of grassland, separated by a scrubbed-over, disused tip; one is enclosed and the other unfenced. This grassland lies near the limit of enclosure, at an altitude of 230-240m, and a more extensive area of typically upland-edge semi-natural acid *Molinia/Juncus* pasture occurs nearby; this vegetation was not included within the site. The site slopes gently to moderately with a south-east to easterly aspect. Drainage is mostly impeded and the main vegetation is *Molinia* marshy grassland (**M25**). There are also small patches of fen-meadow (**M24**) rush-pasture (**M23**) and an area of dry neutral and acid grassland (**MG5** and **U4**).

The vegetation of most interest in a lowland grassland context is **M24, *Molinia caerulea - Cirsium dissectum* fen-meadow**, a small area of which occurs in each field. The stand in the western field is sedge-dominated and relatively species-rich, with a closed sward (Q1). The basiphilous sedges *Carex hostiana* and *C. pulicaris* are frequent to abundant here. Other prominent species are *Carex panicea, C. demissa, C. echinata, C. nigra, Molinia, Succisa pratensis* and *Potentilla erecta. Cirsium dissectum* and *Galium uliginosum* are occasional to frequent in the stand and basiphilous bryophytes include *Bryum pseudotriquetrum* and *Aneura pinguis*. This species composition reflects a fairly high degree of localised base-rich flushing. The stand tends towards **M24b,** the **Typical sub-community**, but lacks a convincing representation of preferential species and is thus best described as **M24b/c, Typical/*Juncus acutiflorus* - *Erica tetralix* sub-community**. The small patch of **M24** in the eastern field can be referred to the more heathy **M24c** (unsampled). It is dominated by *Molinia*, with frequent *Cirsium dissectum, Serratula tinctoria, Potentilla erecta, Lathyrus montanus, Juncus acutiflorus, Danthonia decumbens, Festuca ovina* and *Hypnum cupressiforme s.l.*, with occasional *Carex pulicaris* and locally scattered plants of *Narthecium ossifragum* and *Carex montana.*

Acid *Molinia* grassland referable to **M25b, *Molinia caerulea - Potentilla erecta* mire, *Anthoxanthum odoratum* sub-community** is found in both fields. This vegetation is generally *Molinia*-dominated with frequent *Festuca ovina* and *Potentilla erecta*, and includes associates such as frequent *Agrostis canina, Juncus acutiflorus, Succisa pratensis* and *Serratula tinctoria* (Q3 and 4). The stand in the eastern field includes an area of relatively diverse sward which is similar to adjacent **M24c** but lacks *Cirsium dissectum* and basiphilous sedges (Q3). This vegetation is forb-rich and has an unusual floristic element indicative of mild base-enrichment. The sward includes frequent *Lathyrus montanus* and *Stachys betonica*, with locally frequent *Briza media, Carex flacca* and *Lotus corniculatus*, and rare to occasional *Linum catharticum.* This forb-rich **M25b** is the main locus for *Carex montana* on site; the population is small and clumps are frequent within an area of approximately 6x4m. This form of **M25b** grades quite suddenly into the more typical **M25b** which constitutes the majority of the **M25b** in both fields. In the western field the grass content is higher and the stand is somewhat drier, grading into **U4** in places. Small areas of rank nondescript `species-poor **M25'** have been mapped in the eastern field.

The **M24b/c** and **M25b** in the western field grade gently into slightly base-enriched **M23, *Juncus effusus/acutiflorus - Galium palustre* rush-pasture** (unsampled). The community is dominated by *J. acutiflorus*, with frequent *Molinia, Holcus lanatus, Ranunculus repens, Galium uliginosum, Lotus uliginosus, Dactylorhiza fuschii* and *Calliergon cuspidatum.* Occasional small runnels, with moving surface water, run through the stand.

The **M25b** in the western field grades into **U4a, *Festuca ovina - Galium saxatile* grasslaud, Typical sub-community**, as *Galium saxatile* becomes more frequent and *Molinia* less so. The **U4** has frequent *Festuca ovina, Galium saxatile, Agrostis capillaris, Hypochaeris radicata, Potentilla erecta* and

locally frequent *Nardus stricta* (unsampled). The **U4** in turn grades into a tiny stand of **MG5c, *Centaurea nigra - Cynosurus cristatus* grassland, *Danthonia decumbens* sub-community** (Q2), in which *Festuca rubra*, *Lotus corniculatus*, *Cynosurus cristatus*, *Danthonia decumbens* and *Potentilla erecta* are frequent, with *Festuca ovina* and *Galium saxatile* mainly confined to anthills. No *Lolium perenne* was recorded, although *Bellis perennis* is frequent at low cover, and *Centaurea nigra* is generally rare (possibly a reflection of the relativcly nutrient-poor soil). The western corner of the field supports damp semi-improved grassland which has similarities to the **MG5** and **U4**, but lacks key species. The forb-rich sward includes *Agrostis capillaris*, *Leontodon autumnalis*, *Bellis perennis*, *Carex panicea*, *Prunella vulgaris* and *Hypochoeris radicata*, with occasional *Galium saxatile* and *Danthonia decumbens* (unsampled).

Other vegetation present on the site includes very small patches of acid flush, **M6d, *Carex echinata - Sphagnum recurvum/auriculatum* mire, *Juncus acutiflorus* sub-community** and **M15b/d, *Scirpus cespitosus - Erica tetralix* wet heath, Typical/*Vaccinium myrtillus* sub-community**. A small amount of bracken and scrub is scattered across the site.

Notable species include the small population of the nationally scarce sedge *Carex montana* in **M25b** and **M24c** in the east of the site, and a small population of *Euphrasia rostkoviana*, which was recorded in **MG5c** and damp semi-improved grassland in the west. This species is also nationally scarce but is probably under-recorded. Also noteworthy are small populations of *Galium uliginosum* (in **M23**) and *Genista anglica* (in **M25b**).

The Phase I surveyor in 1994 reported evidence of sheep grazing but no stock were present at the time of the current survey, although there appeared to have been some light grazing of the western field, probably by horses. The eastern field is apparently unmanaged and the grassland tussocky; there is evidence of burning in some places. The western field was until recently larger than mapped but a new access road has been built across it, probably covering some **M24** fen-meadow.

Aberganaid Slopes supports small areas of a fairly wide range of NVC communities including patches of the uncommon grassland communities **MG5** and **M24**. However, the total area of these uncommon communities is very limited and the **MG5** is only moderately well-characterised. Additional interest is found in the mildly base-enriched **M23** and **M25**, and the small populations of two nationally scarce species. The site is thus considered to be of moderate conservation interest in a lowland grassland context. It should be noted that the selection of the two small areas of grassland for the current survey is somewhat artificial, as only those areas with lowland grassland communities were included. A more holistic view of the vegetation of the area would be given if the surrounding semi-natural vegetation, including upland edge grassland and vegetated tips were to be surveyed and evaluated. However this lies beyond the scope of the current survey. The site lies within the proposed Rhydycar West open-cast coal development. Three further Phase II sites lie nearby (SO 00/1, SO 00/2 and SO 00/11). South Wales Area staff are aware of this.

Sue Westwood, CCW HQ, 1997

Annex 6. SO00/14 Cwm Glo SSSI Annex: site description

Cwm Glo SSSI Annex is a large, sprawling site on north-east- and east-facing slopes above Merthyr Tydfil in Mid Glamorgan. It lies near to four other Phase II lowland grassland survey sites: Cwm-pant-bach (SO00/1), Cwm-glo (SO00/2), Blaen-canaid (SO00/11) and Aberganaid Slopes (SO00/13), abutting SO00/2 and SO00/11. SO00/1 and SO00/2 were notified as Cwm Glo SSSI in 2003.

Just over half of the survey site is an open area with a post-industrial landscape, in which colliery spoil heaps form a key part of the scenery. Woodland has developed over many of the spoil heaps at the eastern end of this northern section, leaving a large number of clearings that contain vegetated spoil or grassland communities. Historic boundaries and modern fences (many of which are defunct) do not always match up in this area and it was therefore recorded as a single enclosure and divided into 9 sub-units (labelled A1-A9 in Fig. 2) for the purpose of this site description. Three fields with a similar floristic make-up (B-D) on the edges of A are fenced separately. The remainder of the site, to the south, comprises 28 fields (E-ZF) in which the vegetation is less obviously affected by past industrial activity. The western end of the site (the upper edge of A1) lies at 370m above sea level, but here it slopes quite steeply down to a minor road at 310m a.s.l. The remainder of the site occupies gently sloping land that lies between this road or the Gethin forestry and the A470(T) at 200m a.s.l.

Almost the whole of Cwm Glo SSSI Annex overlies Carboniferous mudstones and siltstones of the Middle Coal Measures. Carboniferous sandstones of the Lower Pennant Series underlie fields P-X and ZC-ZF and are exposed in a number of quarry faces on the upper edge of A1. Colliery spoil heaps, which provide a free-draining substrate and are colonised mainly by acid grassland (**U1**, **U4** & **U5**) and dry-heath (**H12**), cover large parts of the site. Where the ground is not covered by spoil, the drainage is more variable: in most open areas places it is impeded, supporting wet-heath (**M15**) and marshy grassland (**M23**, **M24** & **M25**), often in complex patterns of ridges and runnels; in a few areas, especially at the site's southern end, it is free, evidenced by stands of dry grassland (**MG5** & **U4**). Woodland occupies almost half of the site, whilst bracken dominates many clearings and fringes the predominately acidic fields O-X.

Access was not sought to two areas of buildings: one surrounded by area AB and the other adjoining fields T and W.

Dry grassland

Dry grassland has developed over spoil and on natural substrates across the site. Five communities occur, two of them mesotrophic and three acidic. Unimproved neutral grassland is found as scattered stands or as a mosaic component on flat-topped spoil heaps, especially in A4, and more abundant on natural soils near to the site's eastern boundary. The presence of at least two of *Centaurea nigra*, *Lotus corniculatus* and *Trifolium pratense* at high frequency, in a sward that includes *Cynosurus cristatus*, marks this vegetation as ***Centaurea nigra* - *Cynosurus cristatus*** **grassland (MG5)**. A number of field edges, and also the bulk of field T, have mesotrophic swards from which *L. corniculatus* is absent and where *Lolium perenne* is frequent or abundant. This combination is typical of ***Lolium perenne* - *Cynosurus cristatus*** **grassland (MG6)**. Acidic grasslands in which *Agrostis capillaris* and *Festuca ovina* are the principal sward components are found on the tops of many spoil heaps across A and C and also in A6 and fields O-W. These have a very variable floristic make-up, but all are ***Festuca ovina* - *Agrostis capillaris* - *Galium saxatile*** **grasslaud (U4)**. *Nardus stricta* is abundant in stands of ***Nardus stricta* - *Galium saxatile*** **grassland (U5)** in A. A much more open form of acid grassland, ***Festuca ovina* - *Agrostis capillaris* - *Rumex acetosella*** **grassland (U1)**, marked by the presence of *R. acetosella* as a major sward compnent, is restricted to the steep sides of colliery spoil heaps.

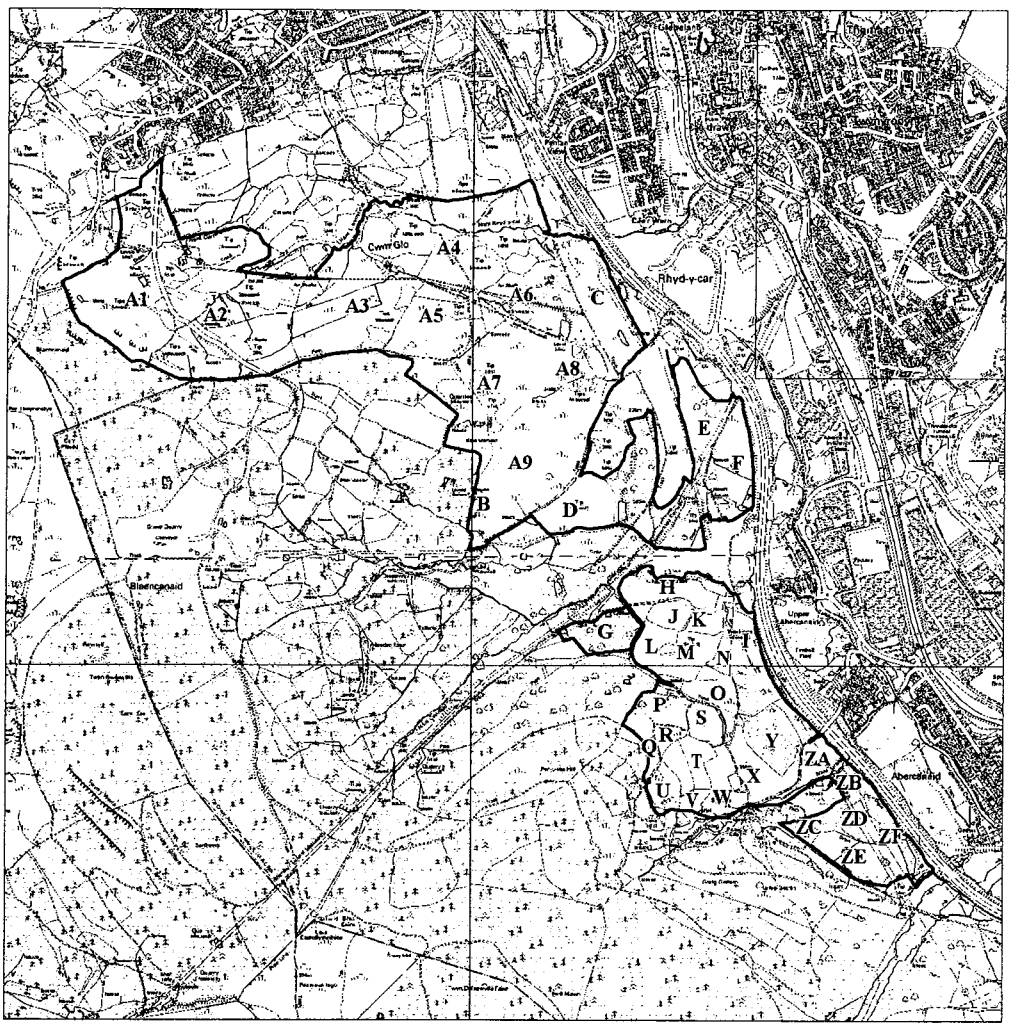


Fig. 2. Field codes for SO00/14 Cwm Glo SSSI Annex. OS base map reproduced with permission of HMSO. Crown copyright reserved. CCW licence no. 100018813.

Although the **MG5** at Cwm Glo SSSI Annex is highly variable, all stands hold frequent to abundant *Lotus corniculatus*, whilst those that support *Lolium perenne* do so at low frequency and cover. At the north-western end of the site (A-E), most of the **MG5** is found on spoil heaps, although a few small stands occupy more natural situations. Further south-east (F-ZA) **MG5** occurs on natural soils. All stands have a sward dominated by *Agrostis capillaris*, *Cynosurus cristatus* and *Festuca rubra*, often with *Anthoxanthum odoratum* or *Holcus lanatus*, in which a range of forbs are prominent. The most regular of these are *Hypochoeris radicata*, *Leontodon autumnalis*, *Plantago lanceolata*, *Trifolium repens* and the community constants *L. corniculatus* and *T. pratense*. Two sub-communities of **MG5** are present: three key sub-community preferentials - *Danthonia decumbens*, *Potentilla erecta* and *Succisa pratensis* - mark the ***Danthonia decumbens* sub-community (MG5c)** (Qs 2 & 24), whilst these species are absent from the ***Lathyrus pratensis* sub-community (MG5a)** (Qs 4, 23, 27 & 29).

MG5a is found on natural substrates in fields F-H, N (Q23) and ZA. This tends to be better characterised than its equivalent on spoil, most holding frequent to abundant *Centaurea nigra* in addition to *Lotus corniculatus* and *Trifolium pratense*. All three of these community constants are frequent in the stands in F, but much of the **MG5a** there shows signs of agricultural modification, including frequent *Cerastium fontanum* and *Lolium perenne* and locally abundant *Carex hirta*, *Potentilla reptans* and *Trifolium repens*. Rank **MG5a** in G and H holds scattered tussocks of *Juncus conglomeratus* and occasional *Lolium perenne* but is otherwise well characterised. The stand in N (Q23) is superficially flushed and includes frequent *Linum catharticum* and occasional *Carex flacca*; although *Centaurea nigra* is absent, the stand is diverse and was considered to be of reasonable floristic quality. The largest stand of **MG5a** on the site dominates field ZA; it shows few signs of agricultural modification and has a relatively diverse assemblage of forbs including frequent *Euphrasia* sp., *Leontodon autumnalis* and *Prunella vulgaris*. Rank patches within ZA, dominated by *Anthoxanthum odoratum*, *Dactylis glomerata* and *Holcus lanatus*, were recorded as 'other neutral grassland' (unsampled). None of the stands of **MG5a** on the site is exceptionally diverse, but they do cover a sizeable area collectively.

The **MG5a** on spoil (Qs 4, 27 & 29) is somewhat atypical of the community as it lacks *Centaurea nigra*, and holds rather patchy *Trifolium pratense*. This anomally is to be expected, given the unusual nature of the substrate and secondary development of the vegetation. *Lotus corniculatus* is generally abundant and *Lolium perenne* rare or absent so the stands were assigned to **MG5**. *Danthonia decumbens* is scattered through some of the stands, indicting affinities with **MG5c**. The well-drained nature of the spoil is probably the reason why *Hieracium pilosella*, a drought tolerant species, is frequent in many areas. Other constant forbs in the **MG5a** on spoil include *Achillea millefolium*, *Leontodon autumnalis*, *L. taraxacoides*, *Plantago lanceolata*, *Prunella vulgaris* and *Trifolium repens*. *Bellis perennis*, *Euphrasia* sp. and *Potentilla* cf. *anglica* are frequent in the **MG5a** in A1, whilst *Thymus praecox* is locally frequent in A4. Locally frequent *Plantago major* and occasional *Cirsium arvense*, *C. vulgare* and *Lolium perenne* suggest that much of the **MG5a** on spoil is slightly enriched and of rather low floristic quality (e.g. Q29). Clumps of the non-native *Anaphalis margaritacea* are scattered through the **MG5a** in field E.

Spoil heaps in area A4 and on the western side of A6 support a few patches of **MG5c**, but this sub-community is largely restricted to natural substrates in areas A1 (Q2), A2 and A6, as well as fields F (Q24) and X. The naturally occurring **MG5c** is mostly of quite good floristic quality, holding a wide range of forbs and showing few signs of agricultural modification. The sward is similar to that of the **MG5a**; the forb component includes *Euphrasia* sp., *Plantago lanceolata*, *Prunella vulgaris* and *Taraxacum* sp. in most stands. The **MG5c** at the northern end of A1 includes frequent *Danthonia decumbens* and *Potentilla erecta*, but *Succisa pratensis* is rather patchy. In A2 it occupies low ridges surrounded by marshy grassland and shows signs of superficial flushing, including locally frequent *Briza media*, *Carex flacca* and *Linum catharticum*. The stands in A6 are associated with **U4**, differing in the presence of *Cynosurus cristatus*, *Lotus corniculatus*, *S. pratensis* and *Trifolium pratense* and the absence of *Festuca ovina*; superficial flushing is evident in these stands as well. The ridge at the northern end of Field F is dominated by the largest stand of **MG5c** on the site (Q24). This ares is better characterised at both community and sub-community levels than most of the rest of the **MG5**: *Lotus corniculatus* is abundant, *Centaurea nigra* frequent to abundant and *T. pratense* frequent; *S. pratensis* is abundant, *P. erecta* frequent and *D. decumbens* locally frequent. Occasional *Lolium perenne* and rare *Cerastium fontanum* are the only indications of agricultural modification, but unfortunately *Betula* sp. scrub is invading the eastern half of the stand. Small areas of **MG5c** also occur on low mounds on the lower edge of X. They are well-characterised at both community and sub-community levels, although *T. pratense* is only occasional. The **MG5c** on spoil heaps is similar to the spoil heap form of **MG5a**, but holds frequent *D. decumbens* and *P. erecta*; in both areas where it occurs, this form of **MG5c** is of rather low floristic quality.

A stand of flushed grassland near to the western end of area A6 (Q16) has close affinities to **MG5c** but cannot be satisfactorily housed in that (sub-)community. The damp sward is composed of abundant *Agrostis canina* and *Nardus stricta* and frequent *A. capillaris*, *Anthoxanthum odoratum*, *Danthonia decumbens*, *Festuca rubra*, *Holcus lanatus*, *Carex echinata*, *C. ovalis* and *C. panicea*. The most abundant forb is *Succisa pratensis*, and this, combined with the abundance of *N. stricta*, allows referral to '*Nardus stricta* - *Succisa pratensis* grassland', a vegetation type that has been encountered elsewhere in Wales during Phase II grassland survey. Occasional *Lotus corniculatus* and *Trifolium pratense* indicate the relationship between this vegetation and **MG5c** and suggest that patches of **MG5** are present in the stand. Other frequent species in the vegetation include *Carum verticillatum*, *Leontodon autumnalis*, *L. taraxacoides*, *Pedicularis sylvatica*, *Plantago lanceolata* and *Potentilla erecta*. A small patch of similar vegetation was noted in field X.

Semi-improved and improved grasslands are of relatively limited extent on the site. Much of the **MG6** at Cwm Glo SSSI Annex is on the edges of the road that divides areas A1 and A2. It is relatively species-rich, with frequent *Anthoxanthum odoratum*, *Bellis perennis*, *Cynosurus cristatus*, *Hypochoeris radicata*, *Plantago lanceolata* and *Trifolium repens*, whilst patchy *Lotus corniculatus* and *Trifolium pratense* show affinities to **MG5**. The range of associates and frequent *A. odoratum* indicate placement in the ***Anthoxanthum odoratum*** **sub-community (MG6b)** (unsampled). Nearby, two very species-poor, strongly grass-dominated stands are the only representatives of the **Typical sub-community (MG6a)** (unsampled) on the site. Elsewhere, **MG6b** is found as scattered stands on natural substrates in area A6 and fields F, K, M, T and Z.

MG6 seems to be absent from the spoil heaps, being replaced by more anomalous semi-improved swards. Spoil heaps in areas A1 and A4-A6 and field C support parched 'other semi-improved grassland' (unsampled), comprising thin swards that lack *Cynosurus cristatus* and *Lolium perenne* but hold abundant *Trifolium repens* and locally abundant *Achillea millefolium*, *Bellis perennis*, *Medicago lupulina* and *Hieracium pilosella*. Recently disturbed ground on the eastern edge of A4 and in field I holds species-poor, grassy 'other improved grassland' (unsampled), where the lack of *L. perenne* precludes referral to **MG6a**.

Both spoil heaps and natural substrates support **U4**, and the community is distributed widely across the site. Two principal sub-communities occur with more-or-less equal frequency: the **Typical sub-community (U4a)** (Qs 1, 3, 12 & 18) and the ***Holcus lanatus* - *Trifolium repens*** **sub-community (U4b)** (Qs 7, 9 & 25). The ***Lathyrus montanus* - *Stachys betonica*** **sub-community (U4c)** (unsampled) and ***Vaccinium myrtillus* - *Deschampsia flexuosa*** **sub-community (U4e** (Q17) are restricted to a small number of stands on natural substrates.

U4a is typically a rather species-poor sub-community, composed of an acidic sward of *Agrostis capillaris*, *Anthoxanthum odoratum*, *Festuca ovina*, *F. rubra* and *Nardus stricta* with frequent to abundant *Galium saxatile* and *Potentilla erecta* but few other forbs. **U4a** lacks the suite of mesophytes, such as *Holcus lanatus*, *Achillea millefolium*, *Cerastium fontanum* and *Trifolium repens*, which mark **U4b**. On Cwm Glo SSSI Annex, the **U4a** often shows affinities to other sub-communities: some stands (Qs 1, 12 & 18) hold a few **U4b** preferentials at low cover, whilst others (Q3 and the stand in field Y) have a patchy representation of **U4c** species, such as *Stachys betonica* or *Succisa pratensis*. The most typical, species-poor **U4a**, which occurs above the quarries at the top of A1 and on spoil heaps across the site, was not sampled.

Most of the **U4b** on the site is well characterised at the sub-community level, and the community constants *Festuca ovina* and *Galium saxatile* are rather patchy in their occurrence. The majority of stands (Qs 7 & 9), both on spoil and natural substrates, hold frequent or abundant *Holcus lanatus* and *Trifolium repens* as well as a range of other mesophytes including *Bellis perennis*, *Cynosurus cristatus* and *Cerastium fontanum*. The distinction between **U4b** and **MG5c** on the site is not always clear: some stands of **U4b**, marked by frequent *F. ovina* and *G. saxatile*, hold frequent *C. cristatus*

and *Lotus corniculatus*, whilst others lack all four of these species and are marked only by frequent *Potentilla erecta* in an *Agrostis*-dominated sward. Most of the stands on natural soils in area A4 (Q25) are of the former type, lacking *F. ovina* but holding both *G. saxatile* and *L. corniculatus*; the latter species is an indication of a 'lowland' element that marks this **U4b** as being of reasonably good floristic quality. **U4b** dominates fields P-W, where bracken fringes grade into the acid grassland; one section of T shows more signs of improvement and lacks *P. erecta*, marking a transition from **U4b** to **MG6b**.

The only **U4c** recorded on Cwm Glo SSSI Annex is a stand on the north-western edge of area A1. It is floristically close to nearby **U4b**, but supports frequent *Succisa pratensis* and *Lotus corniculatus* and occasional *Stachys betonica*, as well as frequent *Festuca ovina* and *Galium saxatile*. The first three species allow placement in **U4c**, albeit a weakly marked form, whilst the second pair preclude referral to **MG5c**.

A constant low cover of *Calluna vulgaris* and *Vaccinium myrtillus* in a dry sward composed of *Agrostis capillaris*, *Deschampsia flexuosa* and *Festuca ovina* (in varying proportions) is typical of the site's **U4e** (Q17). The grass composition of the sward is diverse and, in different stands, includes *Danthonia decumbens*, *Festuca rubra*, *Nardus stricta* and, in damper patches, a low cover of *Molinia caerulea*. The sedges *Carex binervis* and *C. pilulifera* are usually present, as are the forbs *Galium saxatile* and *Potentilla erecta*; other vascular associates are rare. The bryophyte layer is typical of **U4**, composed mostly of *Pseudoscleropodium purum* and *Rhytidiadelphus squarrosus*, although locally abundant *Pleurozium schreberi* and *Hypnum jutlandicum* indicate the heathy affinities of the sub-community. **U4e** occurs principally in areas A3 and A5, both as a component of mosaics with other **U4** sub-communities and as discrete stands. There is a relatively large area of **U4e** above the quarries in A1, and a few smaller stands in A2.

Nardus stricta is frequent in the **U4e** but becomes abundant or dominant in stands of **U5** in areas A1, A3 and A5. Species-poor stands, supporting few species other than *N. stricta*, *Festuca ovina*, *G. saxatile* and *Potentilla erecta*, are restricted to the eastern end of A3 and represent the **Species-poor sub-community (U5a)**. The other sub-community on the site holds a greater range of species and is floristically close to **U4e**. Frequent or abundant *Calluna vulgaris*, *Danthonia decumbens* and *Vaccinium myrtillus*, combined with a bryophyte layer composed of pleurocarpous species and lacking *Racomitrium lanuginosum*, indicate placement in the ***Calluna vulgaris* - *Danthonia decumbens* sub-community (U5d)** (Q14). **U5d** occurs in A3 and A5 both as pure stands and as a mosaic component with **U4**. The cover of *Calluna* is locally very high in **U5d**, and in some places ericoids become so dominant, and grasses so subsidiary, that patches of ***Calluna vulgaris* - *Vaccinium myrtillus* heath (H12)** were recorded.

The remaining acid grassland community is restricted to the well-drained sides of colliery spoil heaps in area A and has a much more open structure than **U4** or **U5**. This **U1** (Q11) has a sward composed of abundant *Festuca ovina* and frequent *Agrostis capillaris*, *Anthoxanthum odoratum* and *Danthonia decumbens*, with many patches of bare spoil and bryophytes. Frequent *Rumex acetosella* is the principal marker of the community and this species is constant in all of the **U1** on the site. *Calluna vulgaris*, *Galium saxatile*, *Hieracium pilosella*, *Hypochoeris radicata* and *Potentilla erecta* are among a relatively small range of desiccation-tolerant forbs that are locally frequent in the **U1**. *Dicranum scoparium*, *Polytrichum formosum*, *Racomitrium ericoides* and *Rhytidiadelphus squarrosus* are frequent in most stands, whilst *Cladonia* spp. and *Peltigera* sp. are locally abundant in some of the **U1** in A4. Most of the **U1** on Cwm Glo SSSI Annex appears to belong to the ***Galium saxatile* - *Potentilla erecta* sub-community (U1e)**, but the presence in some stands of preferentials of other sub-communities, including *H. pilosella* and *H. radicata*, suggests that referral to a sub-community is not advisable. Although it is wholly confined to secondary situations, most of the **U1** at the site appears to be reasonably well characterised at the community level and contains a fair diversity of

species. This is a rare community on natural substrates in Welsh lowland grasslands. However, the extent of its occurrence on other secondary substrates in the Area of Search is not fully known.

Marshy grassland

Unlike the dry grassland, which has developed on colliery spoil heaps as well as well-drained natural soils, the site's marshy grassland is restricted to areas with damp natural substrates. Suitable conditions are present in a band stretching from the northern end of A1 to the southern extremity of ZE; only the spoil heaps of A4-A6, C and E and the dry fields O-W lack a significant marshy component. In A1, most of the marshy grassland occurs as rushy runnels between spoil heaps; these hold frequent poor-fen forbs and represent ***Juncus effusus/acutiflorus - Galium palustre*** **rush-pasture (M23a).** Areas A2, A3 and A7 hold mixtures of wet **M23** and damp ***Molinia caerulea - Potentilla erecta*** **mire (M25),** along with mounds of ***Scirpus cespitosus - Erica tetralix*** **wet-heath (M15).** A similar mosaic of **M23, M25** and **M15** is found in A9 and B, but here there are signs of base-enrichment as basiphilous sedges are locally frequent in stands of ***Molinia caerulea - Cirsium dissectum*** **fen-meadow (M24).** **M23** dominates in fields G-N, whilst X, ZD and ZE are co-dominated by **M23** and **M25.**

Juncus acutiflorus is frequent or abundant in most of the site's **M23,** indicating placement in the ***Juncus acutiflorus*** **sub-community (M23a)** (Qs 6, 22, 26 & 33). Typical **M23a** in area A (Qs 6 & 33) has a high cover of *J. acutiflorus*, with frequent tussocks of *J. effusus* and a good representation of poor-fen forbs, including *Cirsium palustre*, *G. palustre*, *Lotus uliginosus*, *Lychnis flos-cuculi*, *Mentha aquatica* and *Senecio aquaticus*. *Succisa pratensis* is widespread in the **M23a** in these fields, whilst *Carum verticillatum* is locally frequent. A bryophyte layer composed of abundant *Calliergon cuspidatum* and frequent *Philonotis fontana* is present in some of the **M23a** in A1, the latter suggesting a degree of flushing. Other flushed stands were noted at the western end of A2, where *Sphagnum squarrosum* and *S. subnitens* join the aforementioned mosses, and in A9 and B, where *Galium uliginosum* and *Carex nigra* are frequent. *Molinia caerulea* occurs at high cover in the **M23a** in ZD and ZE (Q26), but abundant rushes and frequent to abundant poor-fen forbs allow referral to **M23**; associated stands of **M25** are noticeably shorter. Most of the **M23a** on the site is of at least reasonable floristic quality. Exceptions are found in fields G-M (Q22), where the **M23** is very grassy and rather species-poor. Much of this **M23** lacks *J. acutiflorus* and is therefore the ***Juncus effusus*** **sub-community (M23b)** (unsampled). More species-rich **M23b** in F still has a grassy ground layer, but supports abundant *L. uliginosus*, frequent *G. palustre* and *M. aquatica*, and locally abundant *Equisetum fluviatile*.

A few areas of semi-improved rush-pasture were noted. Most are a grassy mix of *Juncus effusus* and grasses and represent ***Juncus effusus - Holcus lanatus*** **rush-pasture (MG10)** (unsampled). Stands in K, M and V hold few additional species and represent the **Typical sub-community (MG10a).** A small patch in W has co-dominant *Iris pseudacorus*, indicating placement in the ***Iris pseudacorus*** **sub-community (MG10c).** Other 'damp semi-improved grassland', with no NVC equivalent, occurs as small stands in three places. A dried-up pool in A8 supports a mix of *Agrostis capillaris*, *A. stolonifera*, *H. lanatus*, *Juncus bufonius*, *Ranunculus repens* and *Trifolium repens*; a hollow at the south end of F has a similar mix of grasses, combined with *R. repens*, *Odontites verna* and *Plantago lanceolata*; a small area of flushed grassland in ZA holds these three forbs in abundance in a sward of *A. capillaris* and *Anthoxanthum odoratum*.

M24, marked by frequent *Carex hostiana* and *C. pulicaris*, was only noted in area A9 (Q21), where four of its five stands are concentrated in a broad runnel near that area's south-western edge and a stand slightly further north. The community comprises a sward dominated by *Molinia caerulea*, with frequent sedges (including the basophiles mentioned above), *Juncus acutiflorus*, *Agrostis canina*, *Lotus uliginosus* and *Potentilla erecta*. Frequent *Galium uliginosum* and occasional *Ctenidium molluscum* and *Filipendula ulmaria* suggest placement in the **Typical sub-community (M24b),** but frequent *Festuca ovina* and *Hypnum jutlandicum* and occasional *Aulacomnium palustre* are indicative

of the ***Juncus acutiflorus - Erica tetralix*** **sub-community (M24c)**; the stands were therefore referred to an intermediate **b/c sub-community**.

Most of the **M25** on the site has a relatively open cover of *Molinia caerulea*, amongst which are various other grasses, sedges and forbs. The presence of frequent *Anthoxanthum odoratum* is sufficient for referral to **M25b** (Qs 13, 28, 30 & 31), in the absence of preferentials for either of the other **M25** sub-communities. **M25b** is a major component of the vegetation in areas A2, A3 and A7, and field ZE, and plays a more minor role in a number of other fields. The sub-community on the site has a relatively consistent complement of grasses: *Agrostis canina, A. capillaris, A. odoratum, Danthonia decumbens, Festuca ovina, F. rubra, Holcus lanatus* and *Nardus stricta* are frequent throughout. The sedge cover is variable, but *Carex demissa, C. echinata, C. nigra* and *C. panicea* are all locally frequent. The forb composition is more variable, but includes constant *Pedicularis sylvatica, Potentilla erecta, Prunella vulgaris* and *Succisa pratensis*, with locally frequent poor-fen forbs, such as *Lotus uliginosus*, or dry species, such as *Galium saxatile, Plantago lanceolata* and *Polygala serpyllifolia*. The **M25b** in ZE holds particularly abundant *S. pratensis*, making the field appear suitable for marsh fritillary butterflies. *Calluna vulgaris* is frequent to abundant in some parts of the **M25b** in A9 giving the stands a heathy appearance. Generally, these heathy patches lack *Erica tetralix*, but where it is present they represent the ***Erica tetralix*** **sub-community (M25a)**. **M25a** was also recorded in field X, where *E. tetralix* is frequent, and *Sphagnum auriculatum* occasional, in a non-tussocky *Molinia*-dominated sward.

Tall, tussocky **M25c** (unsampled), with frequent *Angelica sylvestris* and *Cirsium palustre*, is restricted to a small stand at the southern end of area A9 and scattered patches in the adjacent field B. The presence of frequent *Galium uliginosum* in the stand in A9 suggests affinities with **M24**. Tussocky *Molinia* with no sub-community preferentials was encountered at scattered localities across the site, often as a component of mosaics with **M25**; it was recorded as **M25** 'species-poor' (unsampled).

Soligenous mire

Despite the impeded drainage on several sections of the site, soligenous mires play a very minor role in the vegetation of Cwm Glo SSSI Annex. Two communities are present, distinguished from each other and from associated marshy grassland by the complement of bryophytes they support. Acidophilous *Sphagnum* species, including *S. auriculatum, S. fimbriatum, S. palustre* and *S. recurvum*, mark stands of ***Carex echinata - Sphagnum recurvum/auriculatum*** **mire (M6)**, whilst a basiphilous bryophyte layer is indicative of ***Carex dioica - Pinguicula vulgaris*** **mire (M10)**.

The site's **M6** is typical of the community: a mix of rushes and sedges above a *Sphagnum* carpet. It resembles **M23** in the abundance of rushes that it supports. Indeed, some flushed **M23a** holds frequent *Sphagnum squarrosum* and *S. subnitens*, but these species are less acidophilous than the typical **M6** sphagna and were not considered to point towards that community. Stands in which *Juncus effusus* is the dominant rush - often overwhelmingly so - represent the ***J. effusus*** **sub-community (M6c)**, whilst those in which *J. acutiflorus* dominates are examples of the ***J. acutiflorus*** **sub-community (M6d)** (both unsampled). The sedge component is better-marked in the **M6d**, with locally frequent *Carex echinata, C. nigra* and *C. panicea* amongst the *J. acutiflorus*; poor-fen forbs are often present in the **M6d** as well. There are small stands of **M6c** and **M6d** in areas A1 and A2, and a broad runnel of *Molinia*-infested **M6d** was noted in B. Otherwise, the community occurs as tiny *Sphagnum*-filled hollows, overtopped by rushes, at scattered locations across the site. *Drepanocladus exannulatus* and *Polytrichum commune* form part of the bryophyte layer in the **M6d** stands in A1.

A runnel of **M10** (Q10), indicated by frequent to abundant *Campylium stellatum*, frequent *Bryum pseudotriquetrum*, and occasional *Aneura pinguis, Fissidens adianthoides, Carex hostiana* and *C. pulicaris*, cuts through **M23a** on top of a spoil heap near the southern end of A1. The runnel is more open than the surrounding **M23** and the bryophyte layer and basiphilous sedges indicate that it is too

base-enriched for referral to that community, whilst the lack of *Molinia caerulea* precludes placement in **M24**. Sub-community placement is equivocal as the stand supports preferentials of both the ***Carex demissa - Juncus bulbosus/kochii*** **sub-community (M10a)** and the ***Briza media - Primula farinosa*** **sub-community (M10b)**: *J. bulbosus* and *Carex demissa* suggest the former, whilst *Ranunculus flammula* and *Festuca rubra* suggest the latter. Overall, **M10a** was considered the best placement.

Heath

Wet heath, in which *Erica tetralix*, *Scirpus cespitosus* and *Sphagnum* spp. are generally well-represented, is a major element of the vegetation in the more natural parts of area A (A2, A3 & A9). In contrast, dry heath, dominated by *Calluna vulgaris* with frequent to abundant *Vaccinium myrtillus*, is found primarily on those sections of the site that are dominated by the colliery spoil heaps on which it occurs. The wet heath is assignable to ***Scirpus cespitosus - Erica tetralix*** **wet heath (M15)**, whilst the dry heath is ***Calluna vulgaris - Vaccinium myrtillus*** **heath (H12)**.

All four forms of **M15** at Cwm Glo SSSI Annex have a *Molinia*-dominated sward, with a variable representation of other grasses and sedges, above which is a moderate to high cover of *Calluna vulgaris* and *Erica tetralix*. *Scirpus cespitosus* is somewhat patchy in its occurrence, but is frequent in many stands. The only other species that are shared by almost all stands are *Hypnum jutlandicum* and *Potentilla erecta*. Two sub-communities of **M15** are represented: the **Typical sub-community (M15b)** (unsampled) is marked by frequent *Sphagnum papillosum*, whilst the ***Vaccinium myrtillus*** **sub-community (M15d)** holds frequent *V. myrtillus*, *Juncus squarrosus* and various mosses, such as *Pleurozium schreberi*. Many stands show features of both sub-communities and were referred to an intermediate **M15b/d**, whilst a few areas lack sufficient sub-community preferentials to allow placement and were mapped simply as **M15**.

The most abundant form of **M15** on the site is **M15d** (Qs 15 & 32). This has a drier facies than the other forms, provided by frequent to abundant *Vaccinium myrtillus*, frequent *Juncus squarrosus*, *Agrostis capillaris*, *Festuca ovina* and *Nardus stricta*, occasional *Deschampsia flexuosa*, locally frequent *Galium saxatile*, a bryophyte layer that includes *Dicranum scoparium*, *Hypnum jutlandicum* and *Pleurozium schreberi* and scattered lichens, including locally frequent *Cladonia furcata*. **M15d** is most abundant in A2 and A3, where it occurs on low ridges bounded by **M23a** or **M25b**. The transition between the latter community and **M15d** is gradual, with *J. squarrosus* and *Calluna vulgaris* increasing in abundance in the **M25b** that adjoins stands of **M15**.

The intermediate (**b/d**) (Q19) and unassigned (Q20) forms of **M15** predominate in area A9 and field B. Both are marked by frequent *Erica tetralix* and *Scirpus cespitosus* and a high cover of *Calluna vulgaris* in a *Molinia*-dominated sward. The presence together of constant *Sphagnum papillosum* (a **b** sub-community preferential) and *Juncus squarrosus* (a **d** preferential) preclude referral of the **M15b/d** to either sub-community. The bryophyte layer includes *Aulacomnium palustre*, *Dicranum scoparium*, *Diplophyllum albicans*, *Gymnocolea inflata* and *Scapania nemorea* and is therefore quite different from the dry bryophyte component of **M15d**. Non-ericoid forbs are relatively poorly represented in the **M15b/d**, but include frequent *Potentilla erecta* and locally frequent *Pedicularis sylvatica*, *Polygala serpyllifolia* and *Succisa pratensis*. The forb composition in the unassigned **M15** is similar, but the bryophyte layer is scant. Two small stands of **M15b** (unsampled) in A9 hold abundant *Sphagnum papillosum* and lack *J. squarrosus* and other **M15d** preferentials.

H12 occupies both the sides and tops of the colliery spoil heaps; other stands were noted on quarry spoil at the top of A1. It often occurs in mosaic with **U1**, **U4** and bare spoil. Bushes of *Calluna vulgaris* dominate the stands of **H12**, whilst *Vaccinium myrtillus* is generally abundant, albeit at lower cover. Most of the vegetation is moderately species-poor, as is typical of the community, but includes open patches in which grasses, such as *Agrostis canina*, *Deschampsia flexuosa*, *Festuca ovina* and *Nardus stricta*, a few forbs, bryophytes and lichens occur. This combination allows referral to the ***Galium saxatile - Festuca ovina*** **sub-community (H12c)** (Qs 5 & 8). Although patchy, the

bryophyte/lichen layer is often rich, including *Dicranum scoparium*, *Diplophyllum albicans*, *Gymnocolea inflata*, *Hypnum jutlandicum*, *Lophozia ventricosa*, *Pleurozium schreberi*, *Polytrichum juniperinum*, *Ptilidium ciliare*, *Racomitrium lanuginosum*, *Cladonia chlorophaea*, *C. ciliata*, *C. gracilis* and *C. uncialis*. The *Cladonia* spp. and *P. ciliare* make some patches resemble the ***Vaccinium vitis-idaea - Cladonia impexa*** **sub-community (H12b)**, but all lack cowberry and cannot, therefore, be placed there. Scattered species-poor patches that are overwhelmingly dominated by *C. vulgaris* represent the ***Calluna vulgaris*** **sub-community (H12a)** (unsampled), but these were not a sufficiently major part of the vegetation to be mapped separately. An area of recently burnt dry heath was mapped in field D.

Other vegetation

A number of other vegetation types occur as very small stands.

Very wet swamp communities (unsampled), each with a single overwhelmingly dominant species, are found where the drainage is severely impeded and often occur in artificial situations. ***Equisetum fluviatile*** **swamp,** ***E. fluviatile*** **sub-community (S10a)** occupies a pool in A1 and a runnel through **M23b** in field F. The latter field also holds a patch of ***Carex vesicaria*** **swamp,** ***Mentha aquatica*** **sub-community (S11b)**, in which a range of poor-fen forbs are scattered amongst *C. vesicaria* plants, and a runnel of ***Eleocharis palustris*** **swamp,** ***E. palustris*** **sub-community (S19a)**. This species-poor sub-community also occurs in two pools near the upper edge of A1, in which the ***Litorella uniflora*** **sub-community (S19b)** is also present. The floor of these dried-up pools is a mosaic of **S19** and two vegetation types that would normally be submerged: the ***Myriophyllum alterniflorum*** **community (A14)** and the ***Litorella uniflora - Lobelia dortmana*** **community,** ***L. uniflora*** **sub-community (A22)**. The south-western of these pools also supports patches of 'species-poor *Juncus effusus*' (unsampled). Another pool half way down the slope of A1 has a carpet of ***Glyceria fluitans*** **water-margin vegetation (S22)**. Species-poor ***Typha latifolia*** **swamp,** ***T. latifolia*** **sub-community (S12a)** occupies both ends of a pool in A2. Open water was noted in several small ponds.

A patch of nettles on disturbed ground on the upper edge of area A1 was mapped as the ***Urtica dioica - Galium aparine*** **community (OV24)** (unsampled), whilst the ***Epilobium angustifolium*** **community (OV27)** occurs as a small stand in D. Dense bracken (unsampled) is a major component of the vegetation in clearings in areas A7-A9 and also occurs as broad fringes around fields O-W. Most of these areas of dense bracken have a very species-poor ground layer overwhelmed by bracken litter. Some hold a range of plants that occur intermixed with the bracken, including *Epilobium angustifolium*, *Galium aparine*, *Holcus lanatus* and *Rubus fruticosus* agg.

Bracken forms an understorey in some of the woodland in A7-A9, but for the most part, the woodland has a grassy ground layer. Sessile oak and birch are the principal trees in the large expanses of woodland in A7-A9, but elsewhere the tree composition is more varied. Alder and willow become prominent in wetter areas, especially in field Y, where water is backed up by a spoil heap. Dense scrub was not recorded separately from woodland; it is concentrated in A1, where *Ulex europaeus* is the principal species, but occurs widely. Tall hedges composed of a wide range of trees, including hawthorn and oak, are found throughout the site, whilst domestic apple and cobnut trees occur in the hedges in A5 and A6; these are signs of former farms and homes in the area. A patch of dense *Reynoutria japonica* was noted on the eastern edge of A8.

A few areas of bare and disturbed ground were mapped, some of them supporting a range of ruderal plants, including *Plantago major* and *Polygonum aviculare.* Colliery and quarry spoil were mapped separately from other bare ground as they support a very different range of plants including a much greater range of bryophytes and lichens. Rock faces in the old quarries at the top of A1 are poorly vegetated but support a range of common acidophile bryophytes, such as *Diplophyllum albicans* and *Racomitrium* spp., and lichens.

A rectangular foundation made of concrete in A1 and a collapsed building at the eastern end of A6 were recorded as ruined buildings; other ruins are hidden under tree cover. Tracks cross the site in several places. The road between A1 and A2 is tarmac, whilst most of the rest of the tracks are gravel.

Uncommon species

Several vascular plants of note were recorded during the survey. Most of these are typical of the rhôs pastures of the coalfield, but some are of particular interest. A previously unknown patch of the Nationally Scarce *Carex montana* and the first modern record of *C. vesicaria* from the SO00 10km square stand out. Notable vascular plants recorded were:

- Scattered plants of *Alchemilla filicaulis* ssp. *vestita* were seen on the upper edge of A2 and A3 and in **U4b** in A4.
- More than 200 plants of *Alchemilla xanthochlora* occupy taller patches of 'other neutral grassland' within the **MG5a** stand in ZA.
- A medium sized population of *Carum verticillatum* occurs in '*Nardus stricta* - *Succisa pratensis* grassland' in A6 and in **M23** and **M25** in A2, A3 and fields ZD & ZE.
- *Carex montana* (Nationally Scarce) was found in slightly flushed **U4b** in field A3 and **M24b/c** in A9. The colony in A9 had been found by J.P. Woodman in 2002, but that in A3 had not been seen previously.
- A patch of *Carex vesicaria* was noted in a swampy runnel cutting through **M23b** in field F.
- Two clumps of *Dryopteris carthusiana* were found in **M23a** in A1 and A2.
- A medium sized population of *Equisetum sylvaticum* grows in **M23a** in a gully near the top of A1.
- A medium sized population of *Genista anglica* is scattered through **M15** and **M25b** in A2, A3, A5, A9 and B, with the majority of plants in A9.
- A small population of *Sanguisorba officinalis* occurs in **U4a** in field O.
- A medium sized population of *Wahlenbergia hederacea* occurs in **M23** and **M25** in fields ZD & ZE.

Two noteworthy bryophytes were recorded:

- *Ephemerum serratum* var. *serratum* (Nationally Scarce) was collected from three dried up pools in A1 and A8. Small quantities of another *Ephemerum*, probably *E. sessile*, were found on damp ground by a stream in A7.
- *Fossombronia wondraczekii* (Rare in V-c 41) was found in the same dried up pools as *E. serratum* and also occurs on poached stream sides in A2 and A7.

Both species require microscopic examination of their spores for identification so are likely to have been overlooked elsewhere in the AoS.

One charophyte of local interest was noted:

- A *Nitella* sp. (probably *N. flexilis*) is abundant in the permanent pool in A2.

Management

Management varies across the site, although almost all areas receive some grazing.

- Area A, which makes up much of the northern part of the site, is open for extensive grazing by cattle and horses.
- Field B is fenced separately from A and there are no signs of recent grazing.
- Fields C and D are horse grazed. Part of D was burnt in early 2003.
- E and F are only separated by a derelict fence. Both fields are rather lightly grazed; no stock were present at time of survey, but old cattle dung was noted in F.
- There are no signs of recent grazing in fields G-H and J-S; G, H, J, L and P-S have ridges and furrows, remnants of previous ploughing by the Forestry Commission.

- Field I, which lies next to the A470(T), is rather heavily horse grazed.
- Fields T and V are sheep grazed.
- Field U is an amenity area, planted with trees.
- Fields W and X are horse grazed.
- Fields Y, Z, ZB, ZC and ZF are fenced separately and ungrazed.
- Field ZA is horse grazed.
- Fields ZD and ZE are horse grazed and show signs of previous ploughing by the Forestry Commission. Forest Enterprise staff were seen clearing birch scrub in ZE.

Evaluation

Cwm Glo SSSI Annex supports a relatively large area of good quality marshy grassland (mainly **M23** and **M25**) and wet heath (**M15**), along with stands of dry neutral (**MG5**) and acid (**U1** and **U4**) grassland. Mixtures of marshy and acidic grassland and wet heath occur elsewhere in the upland fringes of Mid and South Glamorgan Area of Search, for example at Treherbert and Cwm Bargoed, and further survey and assessment would be required to fully evaluate Cwm Glo SSSI Annex for these habitats. Of more significance in a lowland grassland context is the presence of a sizeable area of **MG5**, with both the **a** and **c** sub-communities represented. The stands occur both on the colliery spoil and over apparently natural substrates. The naturally occurring stands are quite well characterised. The artificial stands lack one of the key community markers, *Centaurea nigra*, but show minimal signs of enrichment and are reasonably species-rich, sometimes with an unusual prominence of drought-tolerant species, such as *Hieracium pilosella* and certain lichens. The stands of **U1** are sizable and are reasonably well characterised, although they are entirely restricted to artificial substrates. Small areas of the rare (sub-)communities **U4c**, **M10b** and **M24b/c** also occur. The semi-natural vegetation is somewhat fragmented by extensive areas of vegetated spoil and secondary woodland; however, these add to the biodiversity of the site and help to set it into an historic context. The presence of populations of several notable plant species adds to the site's conservation interest.

Sam Bosanquet, CCW HQ, 2003

Annex 7. Additional areas: site description

Detailed information on the grassland and associated vegetation on the four CCW Phase II survey sites is presented above. The remaining areas, comprising 59 ha, are covered as shown in Fig. 3.

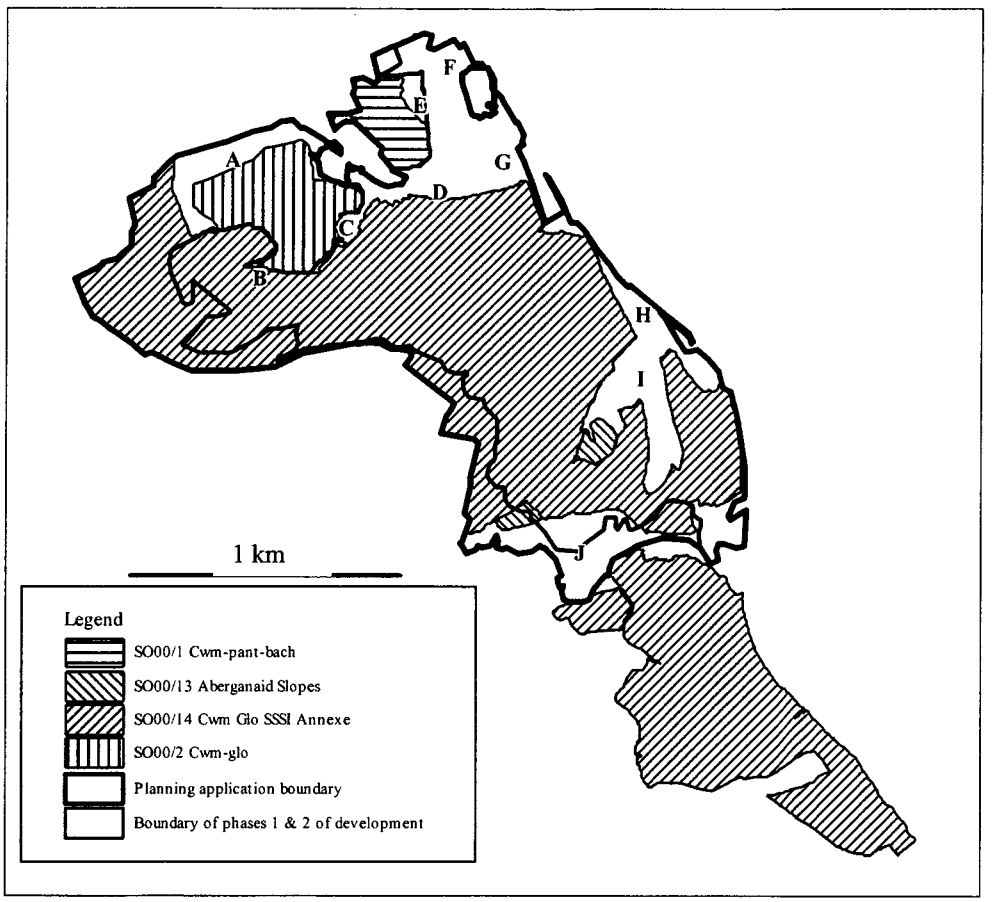


Fig. 3. Areas within the Merthyr Village planning application boundary surveyed by CCW in 2002 and 2005 (A-J), together with sites surveyed as part of the lowland grassland survey. The planning application boundary and the boundary of the area covered by phases 1 and 2 of development are shown.

A. semi-natural grassland north of SO00/2
B. a sliver of marshy grassland west of SO00/2
C. two clearings in woodland between the south-east side of SO00/2 and SO00/14
D. acid and neutral grassland on spoil heaps north of SO00/14
E. an enclosure of neutral grassland to the east of SO00/1
F. small enclosures at the northern end of the planning application area
G. allotments and associated land in the north-eastern part of the planning application area
H. a series of enclosures between SO00/14 and the A470(T)
I. a large flat-topped spoil heap supporting semi-improved grassland and heathland, adjoining SO00/13 and SO00/14
J. woodland and improved grassland between the northern and southern sections of SO00/14.

Dry grassland

Dry grassland occurs in all of the blocks identified above except for B. Three recognisable NVC communities occur: two of them mesotrophic (***Cynosurus cristatus* - *Centaurea nigra* grassland**

(**MG5**) & ***Lolium perenne - Cynosurus cristatus* grassland (MG6)**) and one acidic (***Festuca ovina - Agrostis capillaris - Galium saxatile* grassland (U4)**). Other semi-improved grassland not referable to an NVC community is also present. Unimproved neutral grassland with a closed sward is found as scattered stands and as a mosaic component on the tops and sides of some of the less drought-prone spoil heaps. Some of the stands that occur on areas of old spoil and quarry workings can be floristically similar to forms of acidic grassland on the site; the latter, typically **U4**, are marked by frequent *Galium saxatile* and/or *Festuca ovina*.

As with the rest of the site, the variability of **MG5** is reflected in the five areas A, C-F & H. *Lotus corniculatus* is a consistent component at moderate to high frequency, usually with *Agrostis capillaris* and *Festuca rubra* as the principal grasses. Another of the major community constants – *Trifolium pratense* – is occasional to frequent in all stands, but a third, *Centaurea nigra*, is more local in its occurrence on the site. *Lolium perenne* occurs only rarely in a small stand of flushed **MG5** in area A and is otherwise absent from the community in the recently surveyed areas. By far the largest block of **MG5** (covered by this report) occurs in enclosure E. This is an area of old mine spoil and, as with other **MG5** on spoil on the site, plants such as *Heiracium pilosella* and *Rumex acetosella* occur along with a significant lichen (*Cladonia* spp.) component where the vegetation is particularly drought prone and south facing. The main difference to the rest of **MG5** on spoil at Cwm Glo is the presence of frequent *Centaurea nigra*.

Within area A there are good quality, species-rich areas of the ***Danthonia decumbens* sub-community (MG5c)** that have developed over ridges and mounds of spoil and in old quarry workings. *Lotus corniculatus*, *Potentilla erecta* and *Succisa pratensis* are all frequent in a sward composed of *Agrostis capillaris*, *Cynosurus cristatus*, *Festuca rubra* and *Danthonia decumbens*. Most of this vegetation is superficially flushed, with *Carex flacca* at high cover and *Linum catharticum* occasional to frequent at lower cover (Qs 19, 21 & 22). In the stand sampled by Q22, *Carex pulicaris* is frequent and *Ctenidium molluscum* locally frequent.

Much of the **MG5c** is closely associated with, and floristically similar to, stands of **U4**. Here, though, *Galium saxatile* and/or *Festuca ovina* are present at moderate to high frequencies (Qs 15, 16, 17 & 20). Most of the **U4** in area A has a high cover of these two species and lacks *Holcus lanatus* and *Trifolium repens*, allowing referral to the **Typical sub-community (U4a)**. *Veronica officinalis* is unusually prominent in most of this **U4a** and *Vaccinium myrtillus*, a preferential of the ***Vaccinium myrtillus - Deschampsia flexuosa* sub-commuuity (U4e)**, is occasional in one stand. Most of the **U4** elsewhere in the additional areas, and a few stands in A, have *H. lanatus* and *T. repens* frequent or abundant, indicating placement in the ***Holcus lanatus - Trifolium repens* sub-community (U4b)**. Single stands of both sub-communities in area A hold abundant *Lotus corniculatus*, frequent *Trifolium pratense* and an abundance of other forbs, thus resembling **MG5** very closely. These 'lowland forms' of **U4** are of particular conservation value.

Species-poor, strongly grass-dominated stands are the only representatives of ***Lolium perenne - Cynosurus cristatus* grassland, Typical sub-community (MG6a)** (unsampled). This improved sub-community is the predominant type of grassland in the enclosures in area F.

MG6 seems to be absent from the spoil heaps in areas D & I, being replaced by more anomalous semi-improved swards without an NVC equivalent. These support parched 'other semi-improved grassland' (unsampled), comprising thin swards that lack *Cynosurus cristatus* and *Lolium perenne* but hold abundant *Trifolium repens* and locally abundant *Achillea millefolium*, *Bellis perennis*, *Medicago lupulina* and *Hieracium pilosella*. Half of the area of spoil top in Area I has been reworked in the recent past and was either reseeded or has developed a sward of species-poor, grassy 'other improved grassland' (unsampled), where the lack of *L. perenne* precludes referral to **MG6a**.

Marshy grassland

Marshy grassland is restricted to areas with damp natural substrates, usually due to impeded drainage. Suitable conditions are present in areas A & B, where they are contiguous with larger stands of marshy grassland mapped during the original survey of SO00/2. Stands in these two areas contain mixtures of wet ***Juncus effusus/acutiflorus - Galium palustre*** **rush-pasture (M23)** and damp ***Molinia caerulea - Potentilla erecta*** **mire (M25)**. The former community is represented by two sub-communities, dominated by their eponymous rushes: the ***J. acutiflorus*** **sub-commuuity (M23a)** and the ***J. effusus*** **sub-community (M23b)** (Q23). Poor-fen forbs, especially *Galium palustre* and *Lotus uliginosus*, are frequent to abundant in all of this **M23**; the grasses *Agrostis capillaris* and *Holcus lanatus* tend to be more abundant in the **M23b.**

Much of the **M25** also holds frequent to abundant small grasses, especially *Agrostis capillaris* and *Anthoxanthum odoratum*, in addition to the abundant to dominant *Molinia caerulea*. This indicates that the stands belong to the ***Anthoxanthum odoratum*** **sub-community (M25b)** (unsampled) The forbs *Potentila erecta* and *Succisa pratensis* are also frequent. In area B the **M25b** is associated with stands of **M23a** rush-pasture where the ground conditions are wetter. A few stands hold frequent *Erica tetralix* and *Calluna vulgaris*, making them resemble ***Scirpus cespitosus - Erica tetralix*** **wet heath (M15)**, a similarity enhanced by the presence of occasional *Vaccinium myrtillus*. However, the cover of these ericoids is low, and the **M15** constant *S. cespitosus* is absent, so they can be safely referred to the ***Erica tetralix*** **sub-community (M25a)** (Q18).

Soligenous mire

Small patches of ***Carex echinata - Sphagnum recurvum/auriculatum*** **mire,** ***Juncus effusus*** **sub-community (M6c)** occur in area A. These are characterised by the prominence of tall rushes and *Molinia caerulea* above a carpet of Sphagna.

Heath

Calluna vulgaris - Vaccinium myrtillus **heath (H12)** (unsampled) occupies both the sides and tops of the older colliery spoil heaps. Bushes of *Calluna vulgaris* dominate the stands, together with subordinate *Vaccinium myrtillus*. Most of the vegetation is moderately species-poor, as is typical of the community, but includes open patches in which grasses, such as *Agrostis canina, Deschampsia flexuosa, Festuca ovina* and *Nardus stricta*, and a few forbs, bryophytes and lichens occur

Other vegetation

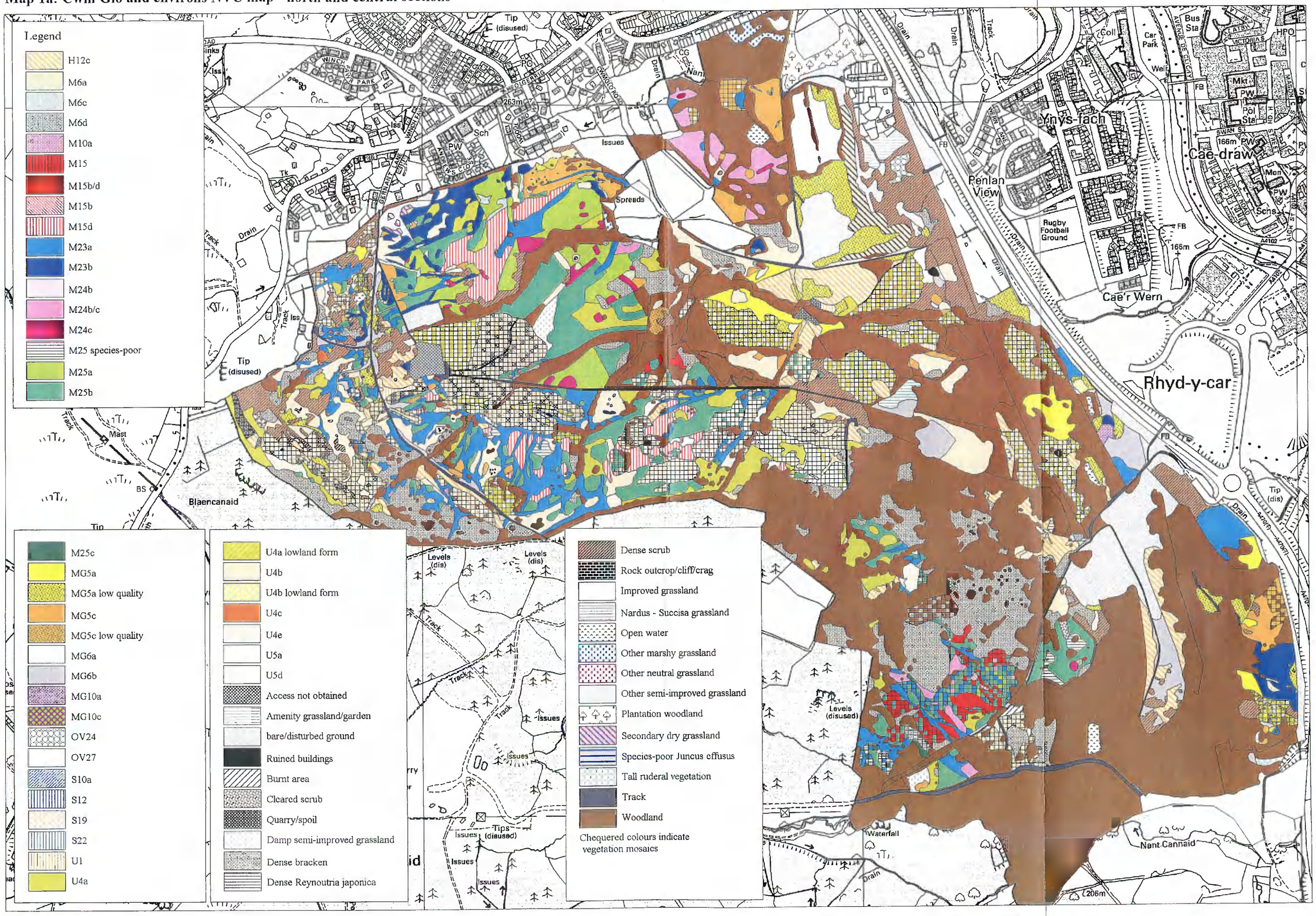
Anomalous vegetation on the steep side of a spoil heap in D was referred to 'other acid grassland' (unsampled). The vegetation here is very open, an abundance of lichens, the liverwort *Ptilidium ciliare* and the moss *Pseudoscleropodium purum*, amongst *Festuca ovina. Lotus corniculatus* and *Filago minima* are both frequent. The absence of *Rumex acetosella* precludes placement in ***Festuca ovina - Agrostis capillaris - Rumex acetosella*** **grassland (U1).**

Management

- Areas A, B & C: cattle and pony grazing all year round
- Enclosures in areas F, G & H: pony grazing all year round
- Areas around D and I: pony grazing all year round

Julian Woodman, CCW Cardiff and Sam Bosanquet, CCW HQ, 2005

Map 1a: Cwm Glo and environs NVC map - north and central sections



Mapped by CCW between 1994 and 2005

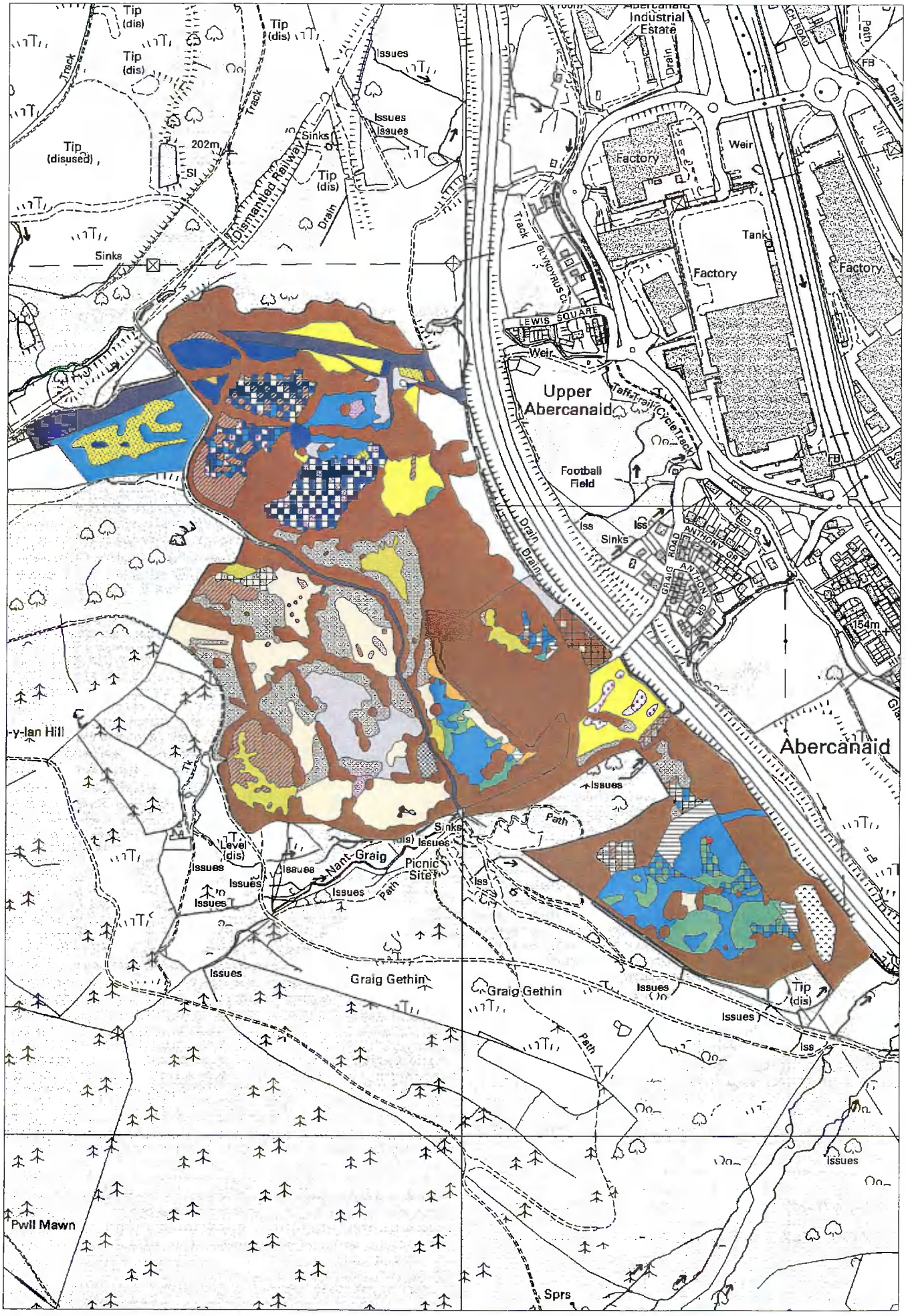
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Atgynhyrchir y map hwn o ddeunydd yr Arolwg Ordnans gyda chaniatâd Arolwg Ordnans ar ran Rheolwr Llyfrfa Ei Mawrhydi © Hawlfraint y Goron. Mae atgynhyrchu heb ganiatâd yn torri hawlfraint y Goron a gall hyn arwain at erlyniad neu achos sifil. Cyngor Cefn Gwlad Cymru, 100018813 2005

Cyngor Cefn Gwlad Cymru
Countryside Council for Wales

Map 1b: Cwm Glo and environs NVC map - south section



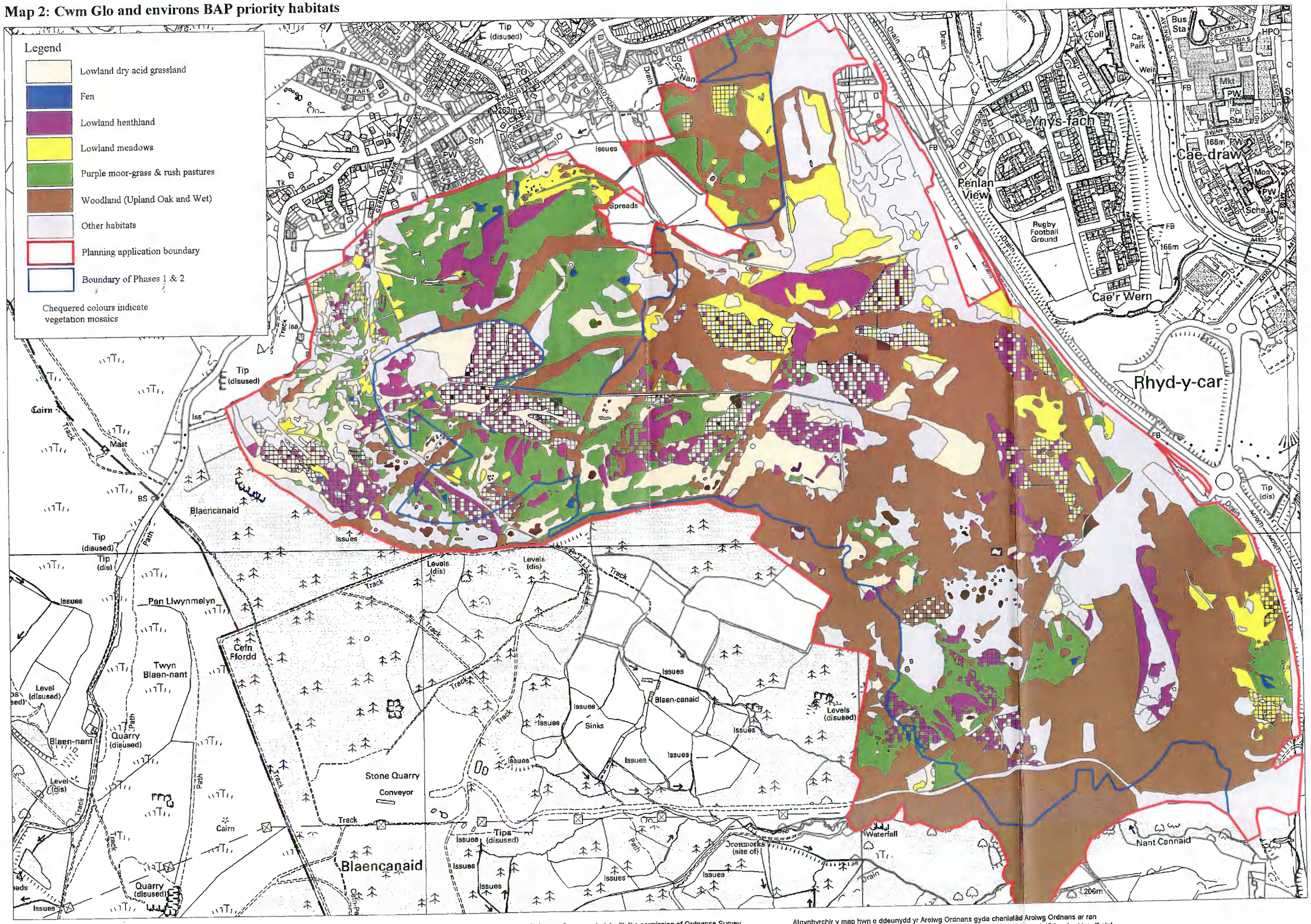
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Map 2: Cwm Glo and environs BAP priority habitats



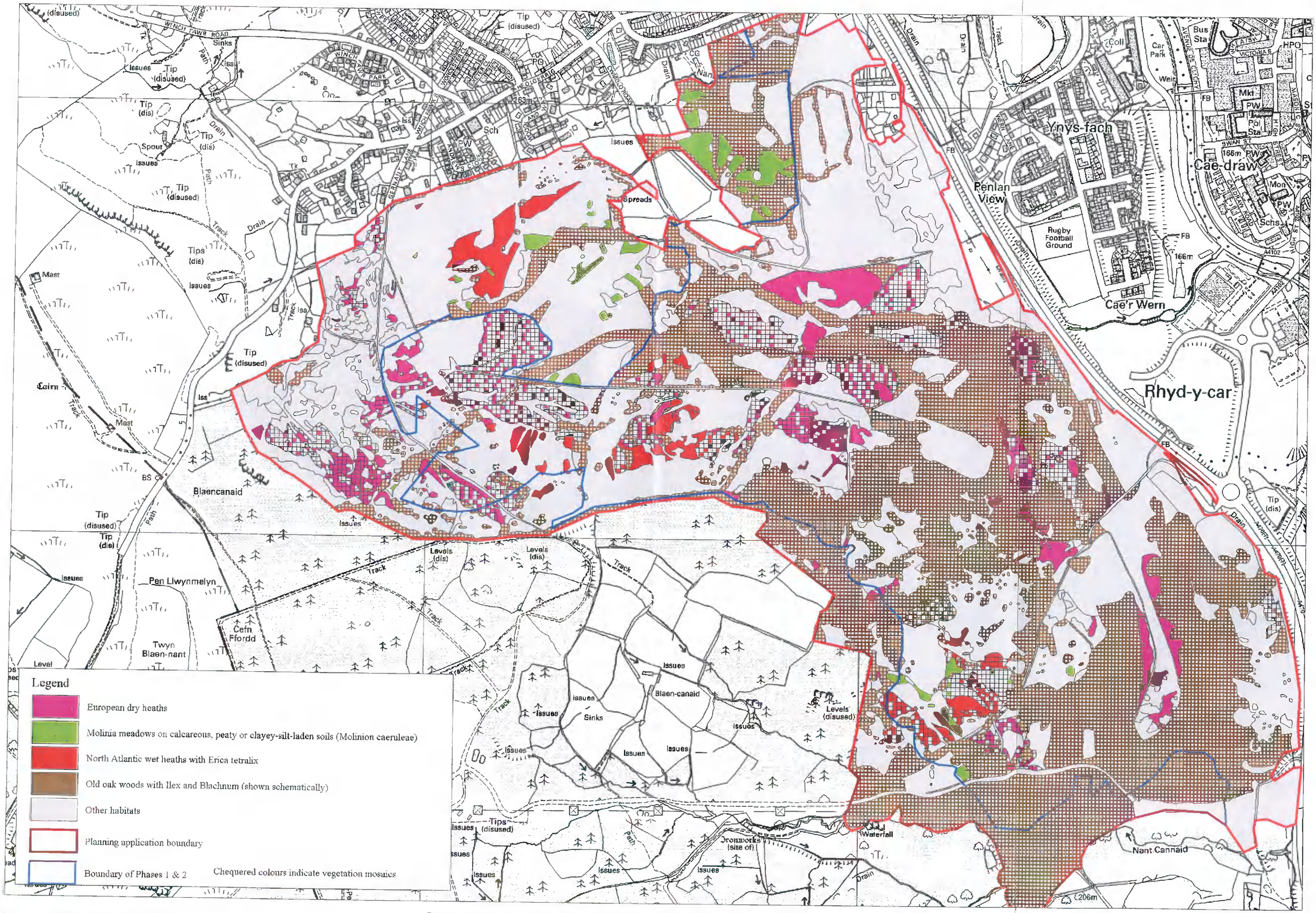
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Cyngor Cefn Gwlad Cymru, 100018813 2005

Map 3: Cwm Glo and environs Annex 1 habitats



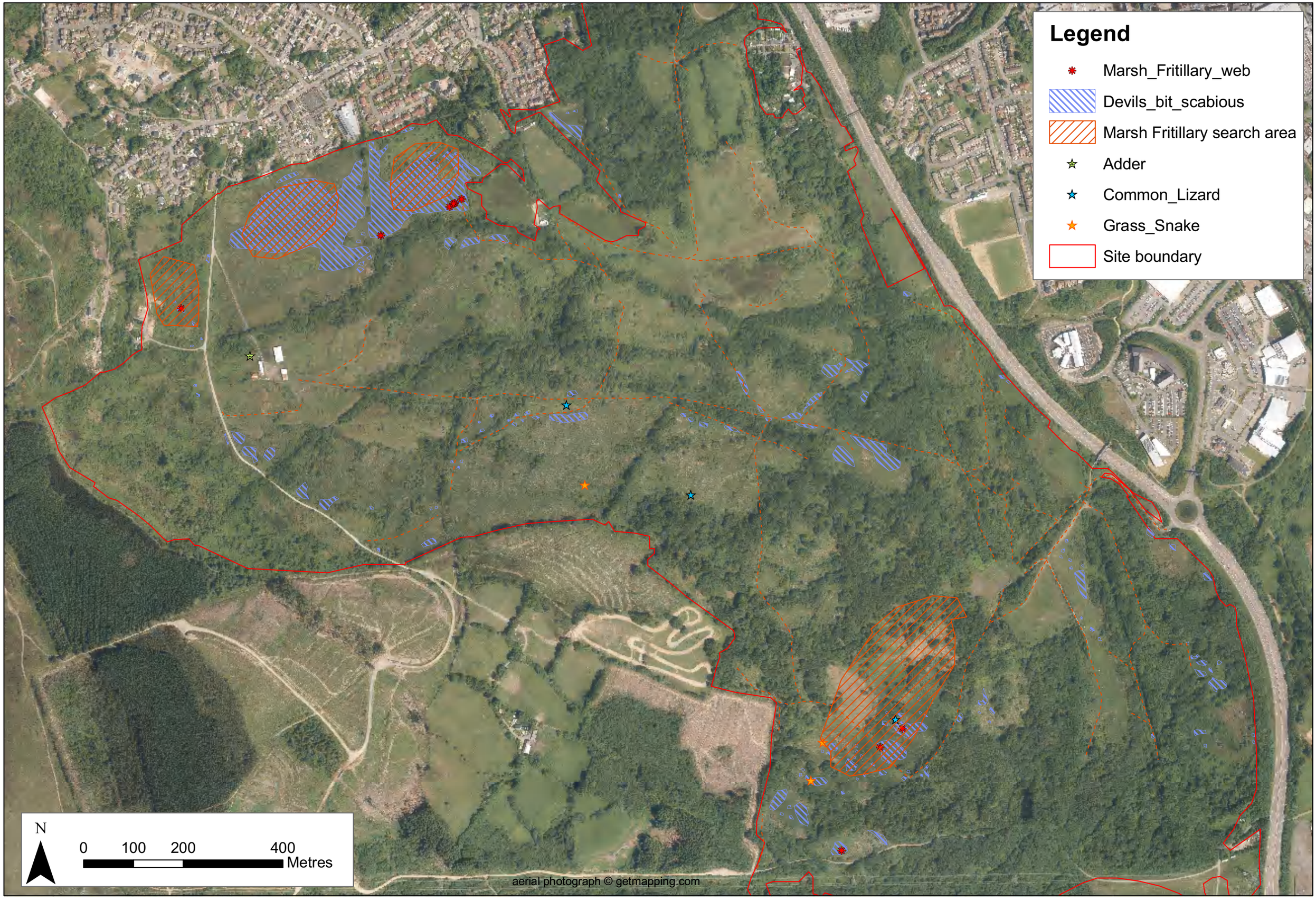
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Cyngor Cefn Gwlad Cymru. 100018813 2005

APPENDIX 4



Cwm Glo Marsh Fritillary surveys 2015 DRAFT - with reptile sightings

APPENDIX 5

Land at Cwm Glo, Merthyr Tydfil

Marsh Fritillary survey



September 2020

Sturgess Ecology

Contents

1. Introduction....1
2. Survey method....1
3. Survey findings....2
4. Discussion....2
Appendix 1. Photographs....3
Appendix 2. Location of survey findings....6

Document reference: C213/D4/V1

Cover photographs: Marsh Fritillary larval web (left), Devil's-bit Scabious (right).

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1. Introduction

Bioscan (UK) Ltd has commissioned Sturgess Ecology to undertake a survey for Marsh Fritillary (*Euphydryas aurinia*) larval webs on land at Cwm Glo, Merthyr Tydfil (approx central Grid Reference SO038054). The objective of the survey was to repeat similar studies that were carried out in 2015 and 2018; to find out if Marsh Fritillaries are still present and provide an indication of the current population size and distribution.

2. Survey method

The field work was carried out by Dr Peter Sturgess CEnv MCIEEM, an ecologist experienced in Marsh Fritillary surveys, and familiar with the type of habitats and terrain that occur on the site. He also carried out the surveys in 2015 and 2018. The survey was undertaken under a Natural Resources Wales (NRW) Marsh Fritillary survey licence (licence number SO87958/1).

The survey was undertaken over 4 days, between 7 and 15 September 2020. This coincided with warm, dry weather, and is at a time of year when larval webs are most likely to be visible. It is slightly later than the 2018 survey because the weather through much of July and August was unusually cold and wet, which would have held back development of the Marsh Fritillary larvae. The initial survey on 7 September found that the larvae were still relatively small and the webs were often difficult to find after being affected by bad weather, but it was decided not to delay the search for long, because further bad weather might have made the survey even more difficult.

The search for larval webs was carried out by a single surveyor, walking through the site and checking stands of Devil's-bit Scabious, which is the food-plant of the Marsh Fritillary caterpillars. The plants were searched for caterpillars in their communal larval webs, and the web locations were marked onto an aerial photographic plan. In some cases, where there were few landmarks, the locations were checked using a hand-held GPS recorder (to approximately 5m accuracy). In a few cases a few of the web locations shown on the plan have been displaced slightly, where they were found at very high density.

The approximate distribution of Devil's-bit Scabious was recorded in previous surveys, and this was used to provide a focus for the current survey. However, it soon became evident that the species has increased in extent following reduction in grazing pressure, so additional searching was made to update the distribution plan.

The survey is subject to a number of limitations. Many of the weather-beaten webs were scarcely detectable, so some will inevitably have been missed. The lack of grazing in some parts has also meant that the vegetation has become much taller and denser, with tall Purple Moor-grass obscuring the lower parts of the Devil's-bit Scabious (although these areas are less likely to be used for egg-laying by the female Marsh Fritillaries). In some areas where the Devil's-bit Scabious is being shaded by tall grass it appears to be becoming less frequent and in many cases the plants were small and not flowering, so transects through these patches may have missed many of them. Because of these limitations, the survey findings should be treated as a minimum count of larval webs. The actual number will be higher. However, the figure showing the web locations is likely to be a reasonable reflection of the main distribution within the site.

3. Survey findings

A total of 382 larval webs were counted during the survey Several photographs are given in Appendix 1. A location plan showing the web locations and distribution of Devil's-bit Scabious is given in Figure 1 and Appendix 2. The majority of the webs were seen in areas with a high density of Devil's-bit Scabious, particularly where the vegetation was relatively short and not becoming smothered by Purple Moor-grass. Sunny, sheltered areas and south-facing slopes appeared to be favoured more than shaded or north-facing habitats.

In general, the highest densities of webs were found in areas with short to medium height Devil's-bit Scabious, rather than tall, dense swards that have not been subject to recent grazing. South-facing slopes and areas of level ground were also preferred over north-facing slopes.

4. Discussion

The survey confirms that there is still a good population of Marsh Fritillary on the site. The distribution of webs shows that the population has expanded in some parts that were only sparsely occupied in 2018 (particularly in the centre of the site), and some new habitat patches have been colonised. An extended period of warm, sunny weather during April and early May probably benefited the Marsh Fritillary population this year and may have assisted the observed increase in range.

The continued reduction in grazing intensity appears to have had a key role in increasing the number and size of the Devil's-bit Scabious plants, especially in the northern half the site. Seedlings were able to establish easily in the previously short grass, and in the absence of grazing these plants have grown sufficiently large to support Marsh Fritillary webs. The numbers of seedlings continue to increase in many parts of the site, mainly in areas of trampled ground and short grass next to horse tracks. However, in some areas that were in favourable condition for Marsh Fritillaries in 2018 the reduction in grazing has meant that Devil's-bit Scabious has become smothered by tall grasses and scrub, and usage by the butterflies appears to have decreased. In some of these areas the Devil's-bit Scabious plants are now barely detectable and appear to be in decline. However, the plants are usually still present at low density, and would undoubtedly recover if appropriate grazing were to be reinstated.

It is interesting to observe that no webs were found in the south-eastern and north-eastern corners of the site, despite there being several potentially suitable patches of high-density Devil's-bit Scabious there. This may be due to the limited dispersal abilities of Marsh Fritillary butterflies, which tend to prefer remaining in open habitats and can be reluctant to cross wooded areas. It is still feasible that this part of the site will be colonised in the future, particularly as there are more stands of dense Devil's-bit Scabious developing in these areas and in the central part of the site.

Appendix 1. Photographs



Photograph 1. Marsh Fritillary larval web.



Photograph 2. Marsh Fritillary larval web. Much of the web is difficult to see due to recent bad weather.



Photograph 3. Marsh Fritillary larval web, barely visible on a leaf of Devil's-bit Scabious.



Photograph 4. A well-developed Marsh Fritillary larval web.



Photograph 5. A patch of dense Devil's-bit Scabious (with a larval web just visible).



Photograph 6. A large individual plant of Devil's-bit Scabious containing a larval web. (Isolated plants like this did not usually support webs.)



Photograph 7. Heavily horse-trampled ground with abundant Devil's-bit Scabious seedlings.

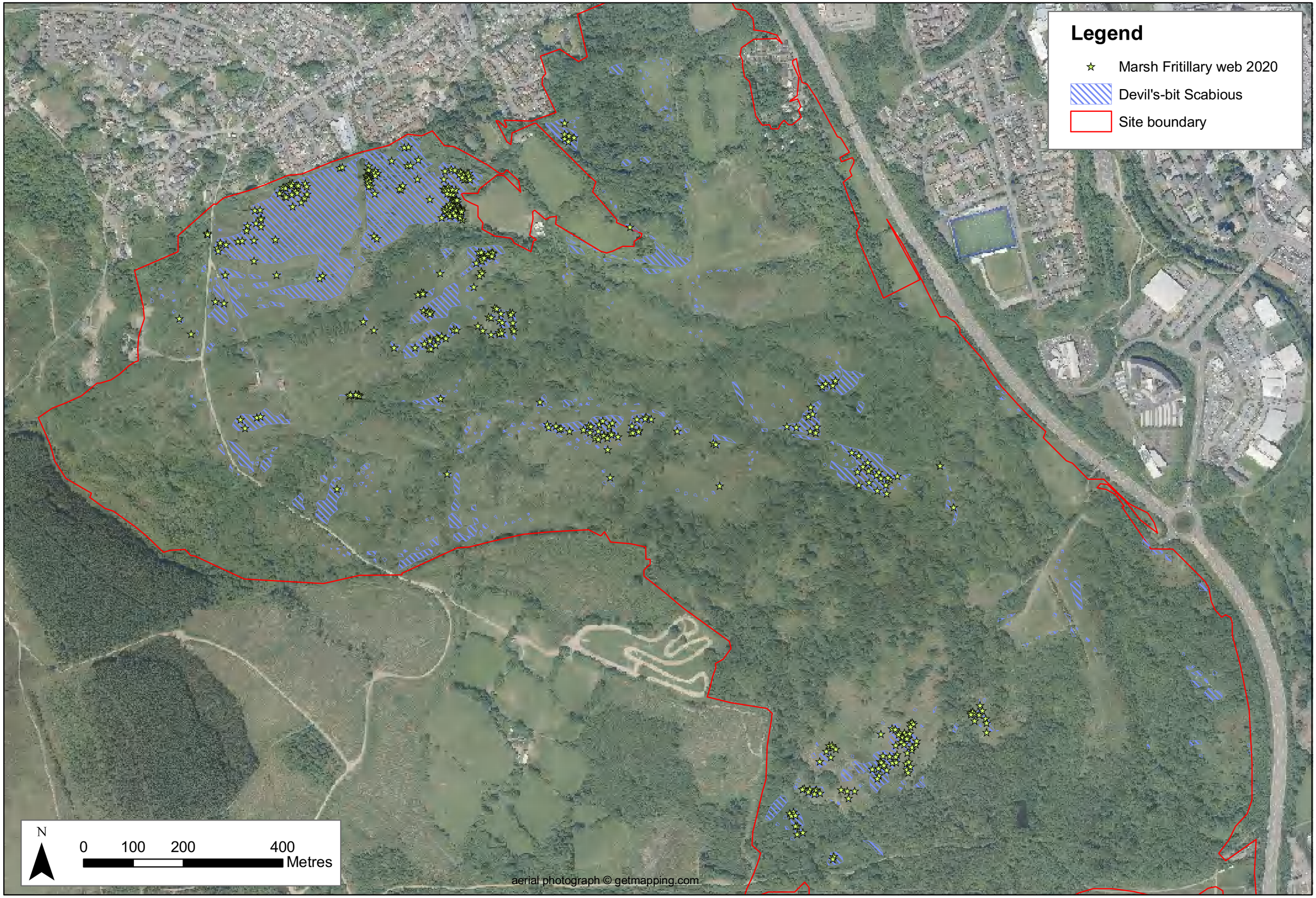


Photograph 8. Horse track with many young seedlings of Devil's-bit Scabious (and a few larger plants).



Photograph 9. Several Marsh Fritillary webs were found in this area in 2018 but in the absence of grazing it has become smothered by tall Purple Moor-grass.

Appendix 2. Location of survey findings



Cwm Glo Marsh Fritillary survey 2020. Location of Devil's-bit Scabious and larval web sightings

APPENDIX 6

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CWM GLO
MERTHYR TYDFIL

INVERTEBRATE
SURVEY
REPORT

Report number BS/2949/15

October 2015

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ACKNOWLEDGEMENTS

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1 INTRODUCTION

1.1 Introductory comments

1.1.1 **Colin Plant Associates (UK)** were commissioned by **Bioscan (UK)** to undertake a survey of invertebrate species at Cwm Glo, Merthyr Tydfil, Glamorganshire. The boundary of the surveyed area is indicated in Map 1.

1.1.2 Prolonged daytime visits to sample terrestrial invertebrates, with overnight moth recording sessions, were undertaken on 16th to 18th June, 23rd to 25th July, 19th to 20th August and 24th to 16th September 2015.

1.2 Invertebrate sampling methodology

1.2.1 Terrestrial invertebrate sampling involved both direct observation, including the searching for caterpillars of moths that fly on dates outside the available survey period, and active sampling using various methods, as follows:

- **Sweep-netting.** A stout hand-held net is moved vigorously through vegetation to dislodge resting insects. The technique may be used semi-quantitatively by timing the number of sweeps through vegetation of a similar type and counting selected groups of species.

- **Beating trees and bushes.** A cloth tray, held on a folding frame, is positioned below branches of trees or bushes and these are sharply tapped with a stick to dislodge insects. Black or white trays are used depending upon which group of invertebrates has been targetted for search. Insects are collected from the tray using a pooter – a mouth-operated suction device.

- **Suction Sampling** consists of using a converted leaf-blower to collect samples from grass and other longer ground vegetation. The sample is then everted into a net bag and the invertebrates removed with a pooter. The advantage of suction sampling is that it catches species, which do not fly readily or which live in deep vegetation.

- **MV light-trapping.** Mercury-vapour (mv) light bulbs are used to attract nocturnal insects - especially moths. These bulbs emit ultra-violet light at a wavelength which causes moths to be attracted, but the wavelength used is harmless to humans. The bulbs are mounted over catching chambers filled with cardboard egg-trays and moths entering the chambers settle on these trays and may be examined. Bulbs were powered from portable generators. Light trapping is the single most effective method of recording moths. It is also valuable for recording some other nocturnal insect groups.

- **Actinic light trapping.** Small size traps containing 8 watt actinic tubes as the light source and operated from 12-volt burglar-alarm batteries were left running from early evening to the following morning. These units are discrete because, whilst still having an output in the safe zone of the UV range, their light output in the visible part of the spectrum is reduced; thus, they can be tucked away in undergrowth at the side of a track without passers-by noticing them. For the same reasons of light emission, they attract moths and other insects from a much shorter distance and so the resultant catch is usually more representative of the habitat selected, in comparison with that in mercury vapour traps which attract flying species from a much wider area of the countryside.

1.2.2 Passive sampling is that which occurs in the absence of the surveyor. The use of a malaise trap for this purpose was regarded as highly desirable, but given the near constant presence of the general public on the site it was judged likely that the trap would probably not survive. Consequently, Malaise trapping was judged impractical.

1.2.3 Pitfall trapping was, however, used.

- **Pitfall trapping.** Vending-machine cups or similar are placed in the ground with the rim flush with, or slightly below, the surface. A fluid is added, containing ethylene glycol, sodium chloride and formalin with a little detergent to reduce surface tension. Traps may be covered or uncovered and are typically left in position for a month at a time. Holes made in the sides of the cups a couple of centimetres below the rim permit flood or rain water to drain without the traps over-flowing and the catch becoming lost. Invertebrates simply fall into the traps. This is the single most effective means of recording ground beetles (Carabidae) but is also effective for rove beetles (Staphylinidae), some other beetle groups, spiders and most non-insect soil-dwelling arthropods.

1.2.4 A small number of traps was set, randomly, in a number of potentially interesting locations across the site, mostly in grassland or other open areas, but the frequency of site visits indicated that an in depth pitfall project was inappropriate. Several traps were dug up by foxes or dogs.

1.3 Survey constraints

1.3.1 An analysis of any significant constraints placed upon the survey forms an integral part of any subsequent reporting.

1.3.2 Guidelines for invertebrate survey recommend survey visits from approximately May to September in order to obtain an adequate cross-seasonal representation of invertebrate species present. This level of coverage has not been fully achieved because sampling was not undertaken prior to June.

1.3.3 However, there has been no intention to obtain a complete invertebrate species inventory; such a task would require regular visits at intervals of around two weeks or so for the entire year and then with repeat sampling at the same intensity for at least one or two more years. The aim within any assessment of invertebrate significance is always to obtain a list that is fully *representative* of the overall assemblage of species. In our view, that has been achieved and the absence of spring species is not likely to significantly alter our overall conclusions drawn here, particularly since the weather during May 2015 was generally cold and with near constant rainfall.

1.3.3 It is also a requirement of effective survey that adequate time is spent on site on each occasion in suitable weather conditions. This aspect, too, has been satisfactorily achieved.

1.3.6 Consequently, we are of the opinion that no major constraints have applied and that, therefore, the results now presented are wholly adequate to permit a proper assessment of the overall invertebrate interest.

2 RESULTS OF INVERTEBRATE SAMPLING

2.1 Overview

2.1.1 A full list of all recorded invertebrate species is presented as Appendix 1. A total of 857 species is listed. This list includes 218 species of moths; for comparison with other sites where, in general, moth recording may not have been carried out, the total number of invertebrates minus the moths is 639.

2.1.2 The list is annotated with formal National Status codes where these are better than "nationally common"; these status codes are explained in Appendix 2.

2.1.3 The list is also annotated with the primary ecological associations of each species, where known. This allows species with differing primary habitat affinities to be immediately discerned.

2.2 Species of conservation interest

2.2.1 Several categories of invertebrates are of raised significance in an ecological assessment. These categories are explained in Appendix 2 and the corresponding species found on the two survey dates are now examined.

UK Biodiversity Action Plan (UK BAP) Priority Species/Section 41 Species

2.2.2 The UK list of Biodiversity Action Plan Priority Species remains an important reference source and has been used to help draw up statutory lists of priorities in England, Scotland, Wales and Northern Ireland. For England and Wales these statutory lists are currently presented in *The Natural Environment & Rural Communities Act, 2006*: Section 41. *List of Species of Principal Importance for Conservation of Biological Diversity in England* and Section 42: *List of Species of Principal Importance for Conservation of Biological Diversity in Wales*.

2.2.3 Four such species are recorded at the Cwm Glo site.

The Brown-banded Carder Bee (*Bombus humilis*) is a national BAP species on the basis of major declines across Britain. The East Thames Corridor and parts of South Wales support the most important remaining metapopulations in the UK. Populations appear to operate at a landscape scale and in the East Thames Corridor this implies dependency upon the entire remaining meta-habitat of post-industrial sites.

The availability of suitable forage (nectar and pollen) sources throughout the whole season from May to September is crucial. The queens require nectar early in the season to replenish diminished energy resources following hibernation. They then need pollen for stocking cells in newly established nests to enable the first workers to develop. Workers then require both nectar and pollen both for their own sustenance and to stock the developing nest. These resources need to be provided by an abundance of specific key plants all of which, significantly, have very long flowering seasons as well as long corolla tubes which correspond to the long tongues of the bumblebees. Important plant species used in early summer by queens include Fodder Vetch, Red Clover *Trifolium pratense* and Broad-leaved Everlasting-pea *Lathyrus latifolius*. Workers forage on the flowers of species such as bird's-foot trefoils *Lotus* spp., clovers, Black Horehound *Ballota nigra*, Lucerne *Medicago sativa* and Red Bartsia *Odontites verna*. Observations suggest that a small number of large patches of flowers are used more frequently and are much more important than a larger number of small patches.

At Cwm Glo we recorded this bee in area G1.

The Small Pearl-bordered Fritillary butterfly *Boloria selene* is a species of Wales, South-west and North-west England and much of Scotland. It is found in damp grassland including woodland clearings – the similar Pearl-bordered Fritillary (*Boloria euphrosyne*) tends to prefer drier habitats. The caterpillars feed on Dog Violet (*Viola riviniana*), Marsh Violet (*Viola palustris*) and sometimes other violet species. Although not officially under threat in mainland Europe is is afforded "medium" priority status in the UK Biodiversity Action Plan. Loss of habitat is probably the only factor of concern in terms of its decline.

At Cwm Glo, this attractive butterfly affects Compartments G3 and G4.

The Small Heath Butterfly *Coenonympha pamphilus* is a grassland species that has declined in recent years and which is formally regarded as being "Near Threatened". It was added to the UK BAP list at the end of 2007 though there are disagreements over the need for this action, and has been automatically included in Section 41 of the NERC Act. It appears to have declined more at inland sites than it has in coastal areas, though it remains present throughout at lower density than before. The presence of large numbers, indicating a thriving population, at an inland site is potentially more important than a similar discovery in a coastal locality.

At Cwm Glo it is widespread in low number across all grassland areas of the site.

The Marsh Fritillary *Euphydryas aurinia* is protected under the *Wildlife and Countryside Act, 1981*, *Countryside and Rights of Way Act, 2000* and other UK legislation. It is also a "High Priority" UK Biodiversity Action Plan species (added to the list in 1998) and was included in Section 41 of the Natural Environment & Rural Communities Act, 2006. The Marsh Fritillary Butterfly is also regarded as a species threatened with extinction throughout Europe and in recognition of this it is included in Annexe II of the *Berne Convention on the Conservation of European Habitats and Wildlife* and in Annexe II of the *European Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora* (known generally as the *European Habitats and Species Directive*). Planning authorities are required to ensure that Section 41 species are protected from the adverse effects of development, where appropriate, by using planning conditions or obligations. Planning authorities are advised to refuse permission where harm to the species or their habitats would result unless the need for, and benefits of, the development clearly outweigh that harm.

We have personally found the butterfly to be established as a resident in compartment G3 and have anecdotal evidence from others that it is also p[resent in wider grassland areas where the larval food plant of Devil's-bit Scabious is growing.

2.2.4 The original list of UK Biodiversity Action Plan Priority Species *of moths* was divided into two sections. In the first, a total of 81 species are afforded the status of UK BAP Priority Species; none of these is recorded in the surveyed area nor is any likely to be present. The second section is a list of 69 species that have declined in population strength by a significant amount in the past 25 years. These were defined as "not yet rare" and were flagged as UK BAP species "**for research only**".

2.2.5 It is unfortunate that this "Research Only" list has been incorporated into the current priority listing process and that these species are now, therefore, of statutory interest. Some bodies now specifically recommend that these species are excluded from an appraisal of Section 41 and Section 42 species (see, for example, Gwent Wildlife Trust, 2009) and this is a view with which we fully agree. Unfortunately, the species are not listed separately so that non-specialists are unable to discern them.

2.2.6 At Cwm Glo we have recorded 19 such "Research Only" moth species. These are listed in Table 1, below, together with their larval (caterpillar) foodplants below. Reference to Gilmore (2014) suggests that several others in this category are almost certainly present.

Table 1. List of recorded "Research Only" moths listed in Section 41 of the NERC Act, 2006

Species	English name	Caterpillar food plant	Where found					
			G1	G2	G3/4	G5	W1	W2
Acronicta psi	Grey Dagger	deciduous trees and bushes		x				
Acronicta rumicis	Knot Grass	polyphagous on deciduous shrubs and herbaceous plants	x				x	x
Agrochola helvola	Flounced Chestnut	grasses - feeding on the roots and stem bases					x	x
Allophyes oxyacanthae	Green Brindled Crescent	rosaceous trees and shrubs					x	x
Amphipoea oculea	Ear Moth	stems and roots of grasses and herbaceous plants					x	x
Apamea remissa	Dusky Brocade	grasses					x	x
Caradrina morpheus	Mottled Rustic	herbaceous plants		x			x	x
Diarsia rubi	Small Square-spot	herbaceous plants		x			x	x
Ecliptopera silaceata	Small Phoenix	willow herbs, enchanter's nightshade					x	x
Eugnorisma glareosa	Autumnal Rustic	polyphagous on herbaceous plants and grasses					x	x
Melanchra pisi	Broom Moth	widely polyphagous, including on bracken	x	x			x	x
Mythimna comma	Shoulder-striped Wainscot	grasses					x	x
Spilosoma lubricipeda	White Ermine	herbaceous plants	x	x			x	x
Spilosoma lutea	Buff Ermine	herbaceous plants and also trees and shrubs	x	x			x	x
Timandra comae	Blood-vein	Polygonaceae				x	x	x
Tyria jacobaeae	Cinnabar	Ragworts			x			
Xanthia icteritia	Sallow	sallow/willow catkins - then on herbaceous plants					x	
Xanthorhoe ferrugata	Dark-barred Twin-spot Carpet	herbaceous plants		x			x	x
Xestia castanea	Neglected Rustic	Heather (*Calluna*) and Heath (*Erica*)						x

Red Data Book Species

2.2.9 Two of the species recorded are listed in the British Red Data Books (Shirt, 1987; Bratton, 1991) or have been elevated to the status of Critically Endangered, Endangered, Nationally Vulnerable or Near Threatened (formerly Nationally Rare) by subsequent formal reviews were recorded during the survey (see Appendix 2 for definitions).

The weevil *Pelenomus olssani* is known in older literature as *Phytobius olssani*. It was recognised as a new species in 1972, but rather little is known about its habits. Records emanate from bogs, upland marshes and other wetland habitats on base-poor substrates, but it is apparently absent from many areas and is genuinely rare. It is placed in Red Data Book category 3 (Nationally Rare). The larvae feeds on the leaves of Water Purslane *Lythrum portula.*

We found it in compartment G1 at Cwm Glo.

The weevil *Tachyerges pseudostigma* is associated with a range of broad-leaved deciduous tree species including sallows and willows, birches, Hazel and Alder. Its is usually found where these trees grow near water but is rarely encountered and appears to be rare. It is placed in Red Data Book category K – the indeterminate category.

At Cwm Glo we found it in trees at the edge of grassland in compartment G3/4 and in compartment W1. It is likely to be present in other site compartments as well.

Nationally Scarce Species

2.2.10 A total of 25 species recorded during the survey are designated as "Nationally Scarce".

2.2.11 Five of these Nationally Scarce species recorded features in the former Nationally Notable Na category (see Appendix 2).

The micro-moth *Chrysoclista linneella* presents an outstanding record for the county of Glamorgan, from where it has not been recorded in modern times until this survey; the last county record was made in 1936. The caterpillars feed in the bark of Lime (*Tilia*) trees. Nationally, it has an extremely restricted distribution.

At Cwm Glo, we recorded an example in compartment W1.

The Brooklime Weevil *Gymnetron beccabungae* is found in wet places, including damp woodland rides and at the edges of water bodies where it feeds mostly on Brooklime *Veronica beccabungae*. However, it may also be associated with other species of *Veronica*, since in Europe it has been found on Marsh Speedwell (*Veronica scutellata*). The larvae feed in the fruits and cause a gall, which takes the form of a swollen ovary within an un-opening flower.

The beetle was present at Cwm Glo in compartments G1 and G2.

The flea beetle *Longitarsus parvulus* is a member of the leaf-beetle tribe and is entirely vegetarian in habit. It appears to feed on a wide range of plant species and has become fairly widespread throughout much of south-east of England in recent years. It is now a familiar site on post-industrial habitat mosaics. Although perhaps no longer deserving its Nationally Scarce status in its own right, it does nevertheless serve as an indicator of open habitat mosaics and as such is of value in site assessment.

We found this species in compartment G5. Since its status is no longer warranted, we have included it amongst the modified scores in Table 4, below.

The water beetle *Noterus clavicornis* is found in a range of ponds and other still waterbodies, especially where these have a good growth of submerged macrophytes. It is probably far more widespread than its formal status indicates.

At Cwm Glo we found it in all of the ponds in compartment G1. Since its status is no longer warranted, we have included it amongst the modified scores in Table 4, below.

The weevil *Polydrusus splendidus* was formerly called *Polydrusus formosus* ad most older works will refer to it under that name. It is a polyphagous species, feeding on leaves of deciduous trees and shrubs, especially Hazel but not at all restricted to that species. It is widespread, but extremely locally distributed in the south of England only.

It is widespread on trees and bushes throughout the Cwm Glo site.

2.2.12 A further 20 of these Nationally Scarce species recorded feature in the former Nationally Notable Nb category (see Appendix 2). These are summarised below, in Table 2.

Table 2. List of Nationally Notable Nb species recorded at Cwm Glo in 2015

Species	English name	Main ecological associations	Where found					
			G1	G2	G3/4	G5	W1	W2
Agabus melanarius	a water beetle	shallow, spring-fed pools in woodland			xx			
Anthophagus alpinus	a rove beetle	associated with flowers in upland areas	x					
Bagous lutulentus	an amphibious weevil	ponds and lake edges, on *Equisetum fluviatile*				x		
Bembecia ichneumoniformis	Six-belted Clearwing moth	*Lotus*, *Anthyllis* and *Hippocrepis* - in the root		x	x			
Beris clavipes	a soldier fly	larvae feed in moss and detritus around pond margins			x			
Crambus pratella	a pyralid moth	roots of grasses, especially Deschampsia. "Hills above Merthyr Tydfil" are a known locality					x	x
Evergestis pallidata	a pyralid moth	cruciferous plants – especially *Barbarea vulgaris*			x		x	
Gymnetron veronicae	a weevil	associated with *Veronica* mainly *V. beccabunga*	x	x				
Helochares lividus	a water beetle	freshwater ponds and ditches	x					
Helochares punctatus	a water beetle	acid moorland waterbodies	x		xx			
Hydroglyphus geminus	a water beetle	silt ponds, peat cuttings, old fen ditches etc	x		xx			
Pammene fasciana	a tortrix moth	oak and sweet chestnut – feeding inside the fruit						
Pelenomus canaliculatus	an amphibious weevil	wet sites, on *Myriophyllum* on land, though adults can swim submerged	x					
Psacadina verbekei	a snail-killing fly	predator of snails in fens and mesotrophic wetlands	x		x			
Pseudomalus violaceus	a ruby-tailed wasp	a parasitoid of the larvae of small sized sphecid wasps				x		
Stenus butrintensis	a rove beetle	amongst litter and grass tufts in wetlands and at the edge of water bodies	x					
Stictonectes lepidus	a water beetle	well-oxygenated, base-poor streams and ponds	x					
Synanthedon spheciformis	White-barred Clearwing moth	Associated with Alder. This is the **first county record since 1910**				x		
Xylota jakutorum	a saproxylic hoverfly	larvae in tunnels of bark beetle Hylobius abietis	x		x		x	
Tephritis ruralis	a picture-winged fly	Mouse-ear Hawkweed (*Hieracium pilosella*)			x			

Nationally Local Species

2.2.7 Forty-four of the recorded species are listed formally as Nationally Local (see Appendix 2). These are listed below, with their associations, in Table 3:

Table 3. List of Nationally Local invertebrates recorded at Cwm Glo in 2015

Species	Main ecological associations	Where found					
		G1	G2	G3/4	G5	W1	W2
Agriphila latistria	grasses, especially Bromus species					x	
Agrypnus murinus	sandy places - the larvae feeding in grass roots				x		
Aphthona euphorbiae	widely polyphagous	x	x				
Apion rubens	sorrel and sheep's sorrel, in heathy habitats			x			
Archarius pyrrhoceras	oak - causing leaf galls					x	
Beris morrisii	woodland edge and hedgerows, etc				x		
Bruchus rufipes	larvae develop in the seeds of various Leguminosae				x		
Byrrhus pilula	associated with moss or rabbit-grazed turf, in open situations.	x	x				
Cassida vibex	knapweed, thistles etc				x		
Centrotus cornutus	oak, aspen and other sapling trees					x	x
Chalcosyrphus nemorum	larvae feed under decaying bark, especially of alder trees	x		x		x	x
Coccinella hieroglyphica	predatory on larvae of the Heather Leaf Beetle - Lochmaea suturalis			x			
Craniophora ligustri	ash, occasionally privet, alder and hazel					x	
Cryptocephalus pusillus	trees, especially birch, often sallow			x		x	x
Curculio glandium	Oak trees - in developing acorns					x	x
Cymus melanocephalus	associated with Juncus wherever it grows				x		
Cyphon hilaris	in moss, especially Sphagnum, in water and in wet places			x			
Donacia simplex	Sparganium erectum - the larvae feeding in the roots	x					
Eilema depressa	lichens and algae on trees					x	x
Epiphragma ocellaris	larvae in dead wood.	x				x	x
Eupeodes latifasciatus	Damp grassland	x	x	x			
Galerucella sagittariae	feeds on the leaves of various water plants			x			
Herina frondescentiae	damp grassland			x			
Hoplia philanthus	a saprophagous species	x	x	x			
Kosswigianella exigua	short grasses on well-drained substrates			x			
Micropeza corrigiolata	Larva feeds in root nodules of Pisum sativum, Trifolium pratense and Medicago sativa			x			
Mimumesa dahlbomi	nests in old beetle burrows in dead wood and also in bare ground; preys on froghoppers	x					
Muellerianella brevipennis	Deschampsia cespitosa in damp habitats			x			
Myrmica sabuleti	nests under stones in calcareous grassland	x	x				
Oedemera lurida	a common grassland species	x	x	x			
Olisthopus rotundatus	dry moors and heaths, coastal dunes etc			x			
Philonthus albipes	a detritus-feeding rove beetle	x					
Plagodis dolabraria	oak, birch and Salix are recorded					x	x
Platycheirus tarsalis	larvae prey on aphids			x			
Psylliodes chrysocephala	various Cruciferae	x	x				

Species	Main ecological associations	Where found					
		G1	G2	G3/4	G5	W1	W2
Rhopalus subrufus	St John's Wort (Hypericum perforatum)				x		
Scellus notatus	predatory species in woodland and scrub, the adults predatory					x	x
Sicus ferrugineus	parasitic fly on bumble bees			x	x		
Sitona lineellus	various legumes	x	x				
Stenus cicindeloides	usually in marshy places	x			x		
Tetheella fluctuosa	birch					x	x
Trichopsomyia flavitarsis	coastal landslips in the south; boggy areas in the north			x			
Xanthogramma pedisequum	larvae feed in ants nests			x			
Zicrona caerulea	low vegetation in open situations, often near water or marshes				x		

Other species of interest

2.2.8 Within the context of the county of Glamorgan, one of the moth species recorded is of outstanding interest.

The Scabious Longhorn ***Nemophora minimella*** is a small, metallic green moth that is associated with scabious plants (*Succisa* and *Scabiosa*). The caterpillar feeds initially on the ripening seeds then later on the lower (rosette) leaves. According to Gilmore *et al*, 2014), the only other Glamorgan record is from year 1920 and is in any event a rather dubious report.

At Cwm Glo it adults were found on Succisa flowers in compartments G3 and G4; it is probably widespread across the site.

3 ANALYSIS OF SPECIES DATA

3.1 Species Quality Index

3.1.1 In order to provide a "rough and ready" indication of site quality, an Invertebrate Index can be calculated. Using this method, invertebrates recorded are scored according to their national status as follows:

RDB species	100 points
Notable - Na species	50 points
Notable - Nb species	40 points
Notable - N species	40 points
Local species	20 points
Common species	no score

3.1.2 These scores are derived from Ball (1986) – see references in Section 5. Adding together the scores in each category provides the overall Invertebrate Index.

3.1.3 However, it is plain that increased effort at a site will increase the number of species recorded and in time the Invertebrate Index will also increase, rendering use of the Invertebrate Index alone of limited value unless all the sites in a comparison are thoroughly and equally recorded. In order to take account of the overall number of species recorded (as a measure of recording effort) in assessing the rarity value of a species assemblages, a **Species Quality Index (SQI)** may be calculated through simple division of the Invertebrate Index gained from a site by the number of species recorded at that site. In this way, SQI is effectively the average number of points which each recorded species is worth.

3.1.4 In order to accommodate changes to the fauna since 1986, and to the way it is interpreted, we have modified the invertebrate scores to be allocated to each category "Section 41" species are attributed the highest score since they are at least equivalent to Red Data Book taxa, but the Research Only moths are scored the same as Nationally Local species. Two of the species that are formally placed in status category Na, but which very clearly are now widespread and common throughout Britain and clearly no longer warrant that status. We have allowed for these by simply omitting them from the numerical totals of species.

3.1.5 Our revised scores are indicated in Table 4.

Table 4: Revised allocation of invertebrate scores and calculation of overall Species Quality Index

Status category	Score in Ball (1986)	Revised score	Number of taxa on this site	Total Score for site	SQI
S 41/UK BAP	-	100	4	400	
BAP(R)*	-	20	19	380	-
RDB 3	100	100	1	100	-
RDB K	100	100	1	100	-
NS(Na)	50	50	5 – 2 = 3	150	-
NS (Nb)	40	40	20	800	-
Local	20	20	44	880	-
Subtotal	-	-	94	2810	-
Common	0	0	763	0	-
Totals	**-**	**-**	**857**	**2810**	**3.28**

*specifically applicable to the species recorded in this present report only.

3.1.6 Consequently, the SQI value using all recorded invertebrate species recorded is 3.28.

3.1.7 Under the simple rules of mathematics, the SQI value will inevitably fall as the number of common invertebrates recorded increases. The vast majority of moths recorded in light traps are common species and it is a fact that for most sites, a study of moths is unlikely to have been undertaken to any significant degree. Consequently, the analysis of species data from Cwm Glo may not be directly comparable with other areas. For this reason, we have recalculated the SQI value using only invertebrate species other than moths.

3.1.8 Removing the 218 moths from the calculation and recalculating using only the remaining 639 non-moth invertebrates, a value of 3.42 is derived for the SQI as follows:

Table 5: Revised allocation of invertebrate scores & calculation of SQI without moths

Status category	Score in Ball (1986)	Revised score	Number of taxa on this site	Total Score for site	SQI
S 41/UK BAP	-	100	4	400	
BAP(R)*	-	20	0	0	-
RDB 3	100	100	1	100	-
RDB K	100	100	1	100	-
NS(Na)	50	50	4 – 2 = 2	100	-
NS (Nb)	40	40	15	600	-
Local	20	20	39	780	-
Subtotal	-	-	64	2080	-
Common	0	0	575	0	-
Totals	**-**	**-**	**639**	**2080**	**3.26**

3.1.9 Consequently, the SQI value using all recorded species *except* moths is 3.28.

3.1.10 The similarity of the two figures indicates that the level of species recording is sufficiently high to render the analysis accurate regardless.

3.2 Invertebrate Species-habitats Information System

3.2.1 The Invertebrate Species-habitats Information System (ISIS) is a tool introduced by Natural England and is used by them to undertake common standards monitoring (i.e. to monitor the condition of invertebrate assemblages), score them based on the invertebrate assemblage types present (similar to how the NVC is used to assess plant communities) and evaluate their conservation value *within context*.

3.2.2 The ISIS assemblage types are defined by lists of characteristic species that are generally found together in nature. Broad assemblage types (BATs) are a comprehensive series of assemblage types that are characterised by more widespread species. Specific assemblage types (SATs) are characterised by stenotopic (ecologically restricted) species of intrinsic nature conservation value.

3.2.3 In plain English this means that instead of approaching site assessment from a "questioning" viewpoint (e.g., a client asking us "How important is habitat x at this site?"), the software instead looks at *all* of the recorded species, including even the most common, then looks up their various habitat requirements (which may be multiple for some species) and finally concludes that "for this group of species to be here then the following habitat type *must* be present". It then continues by grading that habitat, with the highest category being determined on the basis of "if all of these

species are actually here then this particular habitat *must* actually be in an ideal (favourable) condition".

3.2.4 Using all of the 857 recorded invertebrate species in the analysis, ISIS has generated the following results:

3.2.5 The top *Broad* Assemblage Types identified as present are:

BAT code	BAT name	Representation (1-100)	Rarity score	Condition	BAT species richness
F2	grassland & scrub matrix	19	118		250
A1	arboreal canopy	9	125		119
W2	mineral marsh & open water	4	135		55
W3	permanent wet mire	4	147		47
F1	unshaded early successional mosaic	2	134		32
A2	wood decay	2	150		31
W1	flowing water	1	180	favourable	15
F3	shaded field & ground layer	1	142		13

3.2.6 The largest assemblage is associated with the grassland and scrub matrix; this is unsurprising since it is plain to see that overall this is indeed the primary structure of the site. Interestingly, however, it is not in "favourable" condition. This might normally reflect under-recording, but whilst we would not begin to pretend that the site is fully recorded we would not subscribe to the view that the species tally in inadequate for proper assessment. The logical conclusion is, therefore, that the "quality" of the mosaic is rather poor.

3.2.7 Within the mosaic however are units of significantly raised value to nature conservation. The moths alone indicate that some elements of the site are of high quality. The White-barred Clearing may be an enigma. in that it might be the only species of *real* value in what is essentially a monocultural alder woodland that has interest conferred upon it by the presence of birches, sallows and, in some areas oaks and Beech. That apart, other members of the moth assemblage include a raised number that have county importance, especially *Nemophora minimella*, *Chrysoclista linneella* and the Devon Carpet (*Lampropteryx otregiata*).

3.2.8 Of clear interest are the "wet" elements of the mosaic, with three broad categories identified by the recorded species assemblages. It should be noted, in this context, that W1: Flowing Water includes run-off, seepages and others where the water may be moving rather more slowly than the category indicates.

3.2.9 The most important *Specific* Assemblage Types identified as present within the species inventory are as follows:

SAT code	SAT name	No. spp.	Condition	Percentage of national species pool	Related BAT rarity score
A215	epiphyte fauna	4	favourable	20	150
F001	scrub edge	15	favourable	8	
F006	dung	8		8	
W211	open water on disturbed mineral sediments	3		8	135
W311	open water in acid mire matrix	1		5	147
F003	scrub-heath & moorland	18	favourable	5	
F112	open short sward	9		4	134
F002	rich flower resource	10		4	
W126	seepage	2		4	180
A212	bark & sapwood decay	17		3	150
W314	reedfen and pools	3		3	147
A211	heartwood decay	2		1	150
A213	fungal fruiting bodies	1		1	150
F221	montane & upland	1		1	
W312	Sphagnum bog	1		1	147

3.2.10 At this more specific level, three of the stenotopic units appear to be in favourable condition. At the same time there are no less than 15 identified types of stenotopic invertebrate assemblage. This is strong support for the existence of a mosaic of important habitats that combine to mutual advantage.

3.3 The level of ecological interest in context

3.3.1 The Guidelines for Ecological Impact Assessment in the United Kingdom, note that "In some EIAs (or other integrated assessments), the ecologist may be required to use other approaches to assigning levels of value (in order to be consistent across different technical subjects). In such cases, it is often helpful for the prescribed terms to be translated into the geographical scale that is set out above, so that the legal and policy consequences of any significant impact can be clearly understood by all ecologists".

3.3.2 Invertebrates qualify for such separate treatment. Colin Plant Associates (UK) put forward provisional invertebrate assessment criteria to CIEEM several years go; these can be found on the CIEEM website. They have been used by invertebrate specialists and at present form the only finite guidelines available. They are presented in Table 6, below, which has been modified to accommodate the provisions of the NERC Act of 2006.

3.3.3 In arriving at an allocation of significance level using these criteria, the site should always be considered in the context of other sites containing similar macro- and micro-habitats at the same geographical category level. Criteria below those for National and International significance should be regarded as flexible; in particular, geographical variations in the distributions of species should be taken into account as should real and semi-permanent changes in status that have taken place since the publication of status codings. Sites that do not meet these criteria may nevertheless be significant at the level stated for other reasons.

Table 6: Provisional criteria for site assessment based on the invertebrate fauna

Significance	Description	Minimum qualifying criteria
International	European important site	Internationally important invertebrate populations present **or** containing any species protected under European legislation **or** containing habitats that are threatened or rare at the European level (including, but not exclusively so, habitats listed on the EU *Habitats & Species Directive*)
National	UK important site	Achieving SSSI invertebrate criteria (NCC, 1989) **or** supporting sustainable populations of species that are listed as Critically Endangered **or** supporting sustainable populations of species listed in the *European Union Habitats and Species Directive* **or** supporting sustainable populations of species listed in and generally held to fairly belong within Red Data Book category 1 (Endangered) **or** supporting sustainable populations of any species protected under the UK Wildlife and Countryside Act, as amended **or** containing important invertebrate habitats that are actively threatened nationally (Great Britain)
Regional (for border sites, both regions must be taken into account)	Site with populations of invertebrates or invertebrate habitats considered scarce, rare or threatened in the region	Habitat that is scarce or threatened in the region, or which is well-represented in the region but is are or absent outside the region, and which has, or is reasonably expected to have, an assemblage of invertebrates that includes a combination of Nationally Rare Red Data book category 3) and Nationally Scarce (former Nationally Notable categories) species amounting to at Least ten such species in total **or** supporting sustainable populations of at least six "Section 41" species (excluding "research only" moths)
County (for border sites, both counties must be taken into account)	Site with populations of invertebrates or with invertebrate habitats considered scarce, rare or threatened in the county in question	Habitat that is scarce or threatened in the county **and either** contains or is reasonably expected to contain an assemblage of invertebrates including a combination of Nationally Rare Red Data book category 3) and Nationally Scarce (former Nationally Notable categories) species amounting at least five such species in total **or** which has viable populations of at least five species regarded as Regionally Scarce by the county records centres and/or field club

Significance	Description	Minimum qualifying criteria
		or which has viable populations of at least five species listed in Section 41 of the NERC Act (2006).
District (e.g., Unitary Authority, City, or Borough)	Site with populations of invertebrates or invertebrate habitats considered scarce or rare or threatened in the administrative District	A rather vague definition of habitats falling below county significance level, but which may be of greater significance than merely Local. They include sites for which Nationally Scarce species in the range from 1 to 4 examples are reasonably expected, but not yet necessarily recorded, sites that have 1 to 4 Section 41 species and sites that have an outstanding assemblage of "Research Only" Section 41 moths.
Local	Site with populations of invertebrates or invertebrate habitats considered scarce or rare or threatened in the affected and neighbouring Parishes (except Scotland, where the local area may best be defined as being within a radius of 5 kilometres	Habitats or species unique or of some other significance within the local area
Low significance	—	Although almost no area is completely without significance these are the areas with nothing more than expected "background" populations of common species and the occasional Nationally Scarce.

3.3.4 Within each of the geographical categorisations, the significance may be Moderate, High or Very High (there is no "Low Significance" category - such sites are already defined by the Evaluation Table). The application of Moderate, High or Very High significance at each geographical level is based on a wide number of factors and does not sit well with a table of pre-defined rules. Additionally, within a site of particular geographical significance, different component parts may have differing levels of actual significance. The allocation of the level of significance should always be performed by, or subsequently approved by, a qualified entomologist.

3.3.5 Using the adjusted totals in Table 4, above, to eliminate species that do not warrant their formal status, the numbers of species of conservation significance at Cwm Glo are:

Status category	Number of taxa
S 41/UK BAP	4
BAP(R)*	19
RDB 3	1
RDB K	1
NS(Na)	3
NS (Nb)	20
Local	44

3.3.6 Taken literally, these figures confer upon the Cwm Glo site *as a single habitat mosaic* an ecological value that is of County (Glamorgan) significance.

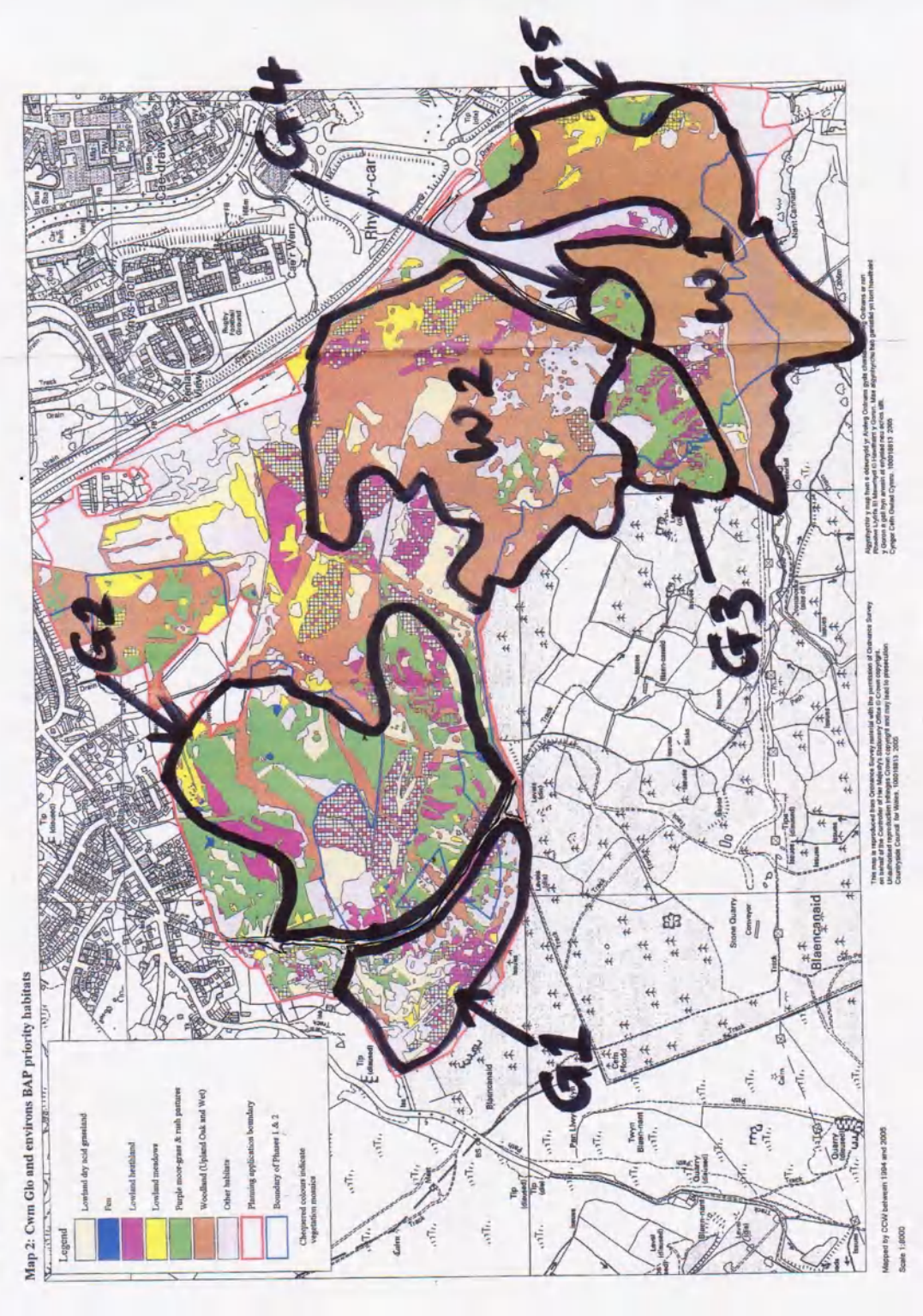
3.3.7 Whilst we do not necessarily disagree with this mechanical conclusion, we are not necessarily of the opinion that the site lies at the higher end of County Value. Our quite unscientific gut-feeling is that it falls somewhere in the Low to Medium area, but we would prefer the opportunity to compare with similarly well-recorded sites in The Valleys before we are able to draw conclusions that we would be prepared to defend in public.

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APPENDICES

MAP 1: THE AREA SURVEYED DURING 2015, SHOWING THE RECORDING COMPARTMENTS USED IN APPENDIX 1



APPENDIX 1: TERRESTRIAL INVERTEBRATE SPECIES RECORDED

National status codes are explained in Appendix 2.

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
ARACHNIDA	**SPIDERS**								
Pisauridae									
Pisaura mirabilis			more or less ubiquitous, but likes tall vegetation			x			
ACARI	**GALL MITES**								
Eriophyidae									
Aceria eriobia			causes galls on leaves of Field Maple					x	x
Aceria nalepai			Causes galls on leaves of Alder					x	x
Aculus laevis			larvae cause galls on sallows					x	x
COLEOPTERA	**BEETLES**								
Apionidae									
Apion rubens		Local	sorrel and sheep's sorrel, in heathy habitats			x			
Eutrichapion ervi			Lathyrus pratensis, and also on Viccia vetches			x			
Ischneroapion loti			Lotus corniculatus and L. tenuis, the larvae galling the seeds			x			
Ischneroapion modestum			restricted to Lotus uliginosus usually in damp habitats	x		x	x		
Ischneroapion virens			Trifolium - larvae feeding inside the stems	x	x	x			
Perapion curtirostre			Rumex, Acetosa and Acetosella species	x	x	x	x		
Perapion marchicum			dock plants; widespread but rather local			x			
Perapion violaceum			dock plants, the larvae mining the stems; widespread and common	x	x				
Protapion apricans			bird's-foot Trefoil and perhaps other legumes; widespread and common			x	x		
Protapion assimile			clover, especially red clover; widespread and common	x	x				
Protapion fulvipes			various clovers	x	x	x			

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
Stenopterapion tenue			larva feeds within stems of Medicago species			x			
Byrrhidae									
Byrrhus pilula		Local	associated with moss or rabbit-grazed turf, in open situations.	x	x				
Cytilus sericeus			mosses, roots of grasses and other damp microhabitats			x			
Byturidae									
Byturus tomentosus	the raspberry beetle		Brambles and raspberries			x	x	x	x
Cantharidae									
Cantharis cryptica			tall vegetation, especially at the woodland/grassland interface	x	x		x		
Cantharis nigra			lowland marsh, rushy pastures, damp hay meadows etc			x	x		
Cantharis nigricans			poorly known, perhaps likes rank grassland, especially if damp	x	x		x		
Cantharis pallida			widespread wetland species				x		
Cantharis rufa			lowland marsh habitats, including saltmarsh				x		
Cantharis rustica			lowland grassland - but always in association with scrub			x	x	x	
Cantharis thoracica			marshes, fens, reeds beds etc	x	x				
Malthodes marginatus			woodland throughout Britain	x			x	x	x
Malthodes minimus			woodland and scrub					x	
Malthodes mysticus			upland woodland in the north and west of Britain	x					
Rhagonycha fulva			tall, rank vegetation in lowland areas	x	x	x			
Rhagonycha lignosa			an arboreal species				x	x	x
Rhagonycha limbata			dry grasslands				x		
Rhagonycha testacea			wet woodland and scrubby marshes	x				x	x
Carabidae									
Abax parallelepipedus			mainly in woodlands, but also on moorland in the north			x		x	
Agonum fuliginosum			waterside habitats	x	x				
Agonum gracile			lake margins, bogs	x	x				

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
			and other wet places						
Bembidion mannerheimi			Damp grasslands and shaded habitats	x					
Bembidion properans			open ground in sunny situations, amongst litter, in tussocks, etc	x	x				
Bradycellus harpalinus			open sandy or peaty habitats and occasionally in woodland	x	x				
Olisthopus rotundatus		Local	dry moors and heaths, coastal dunes etc			x			
Paradromius linearis			dry tussocky grassland and coastal dunes				x		
Pterostichus madidus			ubiquitous	x	x				
Pterostichus melanarius			ubiquitous	x	x				
Pterostichus strenuus			most habitats that are not too dry	x					
Cerambycidae									
Clytus arietis			in dead wood - usually birch or willow, adults at flowers	x					x
Rhagium bifasciatum			dead wood of pines, especially stumps					x	
Chrysomelidae									
Altica lythri			Associated with various willow-herbs (Onagraceae)	x	x		x		
Altica palustris			widespread on many plant species				x		
Aphthona euphorbiae		Local	widely polyphagous	x	x				
Bruchus loti			Larvae on seeds of Lotus, Lathyrus & Vicia; adults at various flowers				x		
Bruchus rufipes		Local	larvae develop in the seeds of various Leguminosae				x		
Cassida flaveola			associated with Caryophyllaceae	x	x				
Cassida rubiginosa			various thistles, burdock and other Asteraceae				x		
Cassida vibex		Local	knapweed, thistles etc				x		
Cassida viridis			Mentha - especially Mentha aquatica. Damp habitats				x		
Chaetocnema hortensis			feeds on various grasses			x			
Chrysolina polita			Lamiaceae - especially species				x		

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
			of mint. Often found near water						
Crepidodera fulvicornis			Salix species	x		x	x		
Cryptocephalus labiatus			trees, especially birches			x		x	x
Cryptocephalus pusillus		Local	trees, especially birch, often sallow			x		x	x
Donacia simplex		Local	Sparganium erectum - the larvae feeding in the roots	x					
Galerucella lineola			Alder, Hazel and willows			x	x	x	x
Galerucella sagittariae		Local	feeds on the leaves of various water plants			x			
Gastrophysa viridula			larvae feed on dock leaves in damp meadows and elsewhere				x		
Gonioctena olivacea			On Broom, rarely Gorse or Dyer's Greenweed, feeding on stems and leaves			x	x		
Hippuriphila modeeri			associated with horsetail (Equisetum species)				x		
Hydrothassa marginella			Buttercups (Ranunculus) and Marsh Marigold (Caltha) usually in damp sites	x	x		x		
Lochmaea caprea			feeds on the leaves of willow trees	x					x
Lochmaea crataegi			Hawthorn - larvae mine the berries. Occasionally on Blackthorn or Rowan			x		x	x
Lochmaea suturalis			Heather			x			x
Longitarsus gracilis			on ragwort				x		
Longitarsus luridus			widely polyphagous	x	x	x	x		
Longitarsus melanocephalus			feeds on various species of plantain (Plantago species)			x	x	x	
Longitarsus parvulus		NS(Na)	feeds on many plant species				x		
Luperus longicornis			associated with a wide range of tree species			x	x		
Neocrepidodera transversa			polyphagous			x	x		
Oulema melanopa			feeds on grasses - very common				x		
Oulema obscura			feeds on a variety of grasses				x		
Phaedon armoraciae			on various water	x		x	x		

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
			plants						
Phaedon cochleariae			various Brassicaceae				x		
Phratora vulgatissima			willows and perhaps poplars and Aspen			x			
Phyllotreta atra			various Brassicaceae	x	x				
Phyllotreta diademata			various Brassicaceae	x	x				
Phyllotreta exclamationis			various Brassicaceae, especially Rorippa and Cardamine species	x	x				
Phyllotreta nigripes			various Brassicaceae	x	x				
Phyllotreta tetrastigma			Watercress but also on Cardamine species, mining the laves	x	x				
Plateumaris discolor			sedges, but occasionally Eriophorum, Glyceria and others	x		x	x		
Plateumaris sericea			reeds			x	x		
Psylliodes affinis			Solanaceae - especially S. dulcamara (woody nightshade)				x		
Psylliodes chrysocephala		Local	various Cruciferae	x	x				
Sphaeroderma testaceum			mainly on thistles			x			
Ciidae									
Cis bilamellatus			the larva tunnels within bracket within fungi growing on trees	x				x	
Coccinellidae									
Adalia bipunctata	2-spot ladybird		predatory on other insects	x	x				
Adalia decempunctata	10-spot ladybird		predatory on other insects			x		x	x
Anisostica novemdecimpunctata	19-spot ladybird		wetland habitats	x	x				
Calvia quattuordecimguttata	Cream-spot Ladybird		predatory on other insects				x		
Coccidula rufa	Spotless ladybird		reed beds and other marshy places				x		
Coccinella hieroglyphica	Hieroglyphic ladybird	Local	predatory on larvae of the Heather Leaf Beetle - Lochmaea suturalis			x			
Coccinella septempunctata	7-spot ladybird		predatory on other insects	x	x	x	x	x	x
Halyzia sedecimguttata	Orange ladybird		predatory on other			x		x	x

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
			insects						
Propylea quattuordecimpunctata	14-spot ladybird		predatory on other insects				x	x	x
Psyllobora vigintiduopunctata	22-spot ladybird		feeds on mildews	x	x				
Rhyzobius litura			predatory on other insects	x	x		x		
Scymnus frontalis			predatory on other insects in grassland and herbaceous vegetation			x			
Subcoccinella vigintiquattuorpunctata	24-spot ladybird		predatory on other insects	x	x				
Tytthaspis sedecimpunctata	16-spot ladybird		predatory on other insects	x	x			x	x
Cryptophagidae									
Telmatophilus typhae			a reed bed species	x			x		
Curculionidae									
Anthonomus brunnipennis			bogs, fens and other wet places on Potentilla			x			
Anthonomus pedicularis			larvae develop in hawthorn berries			x		x	x
Anthonomus rubi			flowers of brambles and raspberries	x	x	x	x		
Archarius pyrrhoceras		Local	oak - causing leaf galls					x	
Archarius salicivorus			birch, willow and other trees			x	x	x	x
Bagous lutulentus		NS(Nb)	ponds and lake edges, on Equisetum fluviatile				x		
Barypeithes araneiformis			ubiquitous amongst moss, litter, etc.	x	x				
Ceutorhynchus cochleariae			wet meadows and grassland on Cardam,ine, especially C. pratense	x					
Coeliodinus rubicundus			larvae in catkins of Betula pendula and B. pubescens in damp areas	x	x	x	x		
Coelositona cambricus			On Lotus, in ruderal and other habitats	x	x		x		
Curculio glandium		Local	Oak trees - in developing acorns					x	x
Datonychus melanostictus			on Mentha aquatica and/or Lycopus in waterside habitats	x			x		
Dorytomus taeniatus			the larvae feeds inside the female catkins of willow trees			x	x		
Euophryum confine			dead timber				x	x	x
Gymnetron beccabungae		NS(Na)	associated with Veronica spp.	x	x				

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
			mainly V. beccabungae galling the seeds)						
Gymnetron veronicae		NS(Nb)	associated with Veronica spp. mainly V. beccabungae galling the seeds)	x	x				
Hypera nigrirostris			Trifolium pratense - on the foliage	x	x				
Hypera plantaginis			Lotus species, in grasslands, verges, post-industrial sites and elsewhere			x			
Hypera rumicis			Rumex species (docks) - on the foliage				x		
Leiosoma deflexum			larvae feed on roots of Ranunculaceae, usually in damp places	x	x				
Mecinus pascuorum			larva on ripening seeds of Plantago lanceolata	x	x	x	x		
Mecinus pyraster			larva in stem base and root collar of Plantago lanceolata			x			
Micrelus ericae			on Calluna and Erica on heaths, bogs and acid peatlands			x			x
Nedyus quadrimaculatus			nettles - feeding on the flowers				x		
Orchestes pilosus			associated with oak foliage			x		x	x
Orchestes quercus			larvae mine the leaves of oak trees			x		x	x
Orchestes rusci			larva mines birch leaves			x	x	x	x
Otiorhynchus singularis			feeds on a variety of plant roots			x	x		
Pelenomus canaliculatus		NS(Nb)	wett habitats, on Myriophyllum on land, though adults can swim submerged	x					
Pelenomus olssoni		RDB 3	bogs and other acid wetlands, on leaves of Lythrum portula	x					
Phloeotribus rhododactylus			Leguminosae and Oleaceae				x		
Phyllobius argentatus			polyphagous on leaves of deciduous trees and shrubs			x		x	x
Phyllobius oblongus			polyphagous on broad-leaved trees and bushes	x			x	x	x

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
Phyllobius pyri			Larvae develop in the ground an adults feed on a variety of herbage and tree leaves	x	x	x		x	x
Polydrusus cervinus			trees and shrubs - feeding on the leaves			x	x	x	x
Polydrusus pterygomalus			polyphagous on broad-leaved trees, especially oak and hazel	x	x	x			x
Polydrusus splendidus		NS(Na)	polyphagous on leaves of deciduous trees and shrubs, especially Hazel			x	x	x	x
Rhamphus pulicarius			larva mines leaves of apple, birch and other trees			x	x	x	x
Sitona lineatus			various legumes	x	x	x		x	x
Sitona lineellus		Local	various legumes	x	x				
Sitona puncticollis			grassland, wasteland, open places etc on light or stony soils				x		
Sitona striatellus			n acidic soils feeding on Ulex and Cytisus species			x			
Sitona sulcifrons			larvae feed in the root nodules of leguminous plants			x			
Sitona suturalis			Lathyrus and Viccia in ruderal habitats			x			
Strophosomus melanogrammum	a weevil		feeds on the leaves of trees, especially hazel				x		x
Tachyerges pseudostigma		RDB K	sallows and alder, usually near water			x		x	
Tachyerges salicis			sallows and willows			x	x	x	x
Trichosirocalus troglodytes			Plantains, usually in grassy places	x	x	x	x		
Tychius picirostris			various Leguminosae			x	x		
Dermestidae									
Anthrenus verbasci			feeds on dead animal and plant matter, including dry carcasses				x		
Dryopidae									
Dryops luridus			in the marginal mud zone of reshwater habitats	x		xx			
Dytiscidae									
Acilius sulcatus			freshwater ponds etc			xx			
Agabus bipustulatus			freshwater ponds etc	x					

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
Agabus melanarius		NS(Nb)	shallow, spring-fed pools in woodland			xx			
Agabus montanus			upland water bodies			x			
Agabus sturmii			freshwater ponds etc			x			
Hydroglyphus geminus (= pusillus)		NS(Nb)	silt ponds, peat cuttings, old fen ditches etc	x		xx			
Hydroporus melanarius			acid ponds, specially with Sphagnum present	x					
Hydroporus memnonius			stagnant water with dead leaves (regarded as rare but just hard to find)			xx			
Hydroporus nigrita			acid flushes, small heathland ponds and similar			xx			
Hydroporus palustris			freshwater ponds etc	x		xx			
Hydroporus planus			most lowland freshwater bodies support this species	x					
Hydroporus pubescens			freshwater ponds etc	x		xx			
Hygrotus inaequalis			ponds, bays of lakes, usually in shallow water	x					
Hyphydrus ovatus			freshwater ponds or slow running water, always with vegetation	x					
Ilybius ater			many freshwater habitats	x					
Ilybius fuliginosus			many freshwater habitats	x					
Stictonectes lepidus		NS(Nb)	well-oxygenated, base-poor streams and ponds	x					
Elateridae									
Actenicerus sjaelandicus			upland marshes and wet woodland			x			
Agriotes lineatus			larvae feed on grass roots, often in damp areas				x		
Agriotes obscurus			larvae feed on grass roots, often in damp areas			x	x		
Agriotes pallidulus			larvae feed on grass roots				x		
Agrypnus murinus		Local	sandy places - the larvae feeding in grass roots				x		
Athous haemorrhoidalis			the larva feeds on the roots of grasses				x		
Ctenicera cuprea			larvae feed in dead	x		x		x	

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
			wood, including untreated fence posts, in upland areas						
Dalopius marginatus			Damp habitats			x			
Denticollis linearis			larvae feed in decaying wood	x	x				
Prosternon tesselatum			larvae feed on the roots of grasses in dry, well-drained sandy or chalky soils			x			
Geotrupidae									
Geotrupes stercorarius			associated with herbivore dung, especially cattle	x					
Gyrinidae									
Gyrinus substriatus			fresh, peaty and sometimes brackish waters	x					
Haliplidae									
Haliplus fulvus			large areas of water and bog pools	x					
Haliplus heydeni			small grassy ponds and ditches	x		xx			
Haliplus lineatocollis			mostly in slow running waters	x					
Haliplus ruficollis			ponds ditches and similar static water bodies	x					
Helophoridae									
Helophorus aequalis			grassy pools and ditches	x		xx	xx		
Helophorus brevipalpis			Ubiquitous - often in temporary pools	x		xx			
Helophorus minutus			a more or less ubiquitous water beetle	x					
Helophorus obscurus			a water beetle of muddy bottomed water bodies	x					
Hydrophilidae									
Anacaena globulus			mud and decaying vegetation at water's edge	x		xx			
Anacaena limbata			mud and decaying vegetation at water's edge			xx			
Anacaena lutescens			standing water, including puddles. A recent split from Anacaena limbata			xx			
Cercyon haemorrhoidalis			feeds in herbivore dung	x					
Cercyon ustulatus			wet mud at pond edges	x					
Coelostoma orbiculare			water beetle - also	x					

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
			lives in moss etc at sides of water bodies						
Cryptopleurum minutum			found in vegetable litter, moss and dung	x					
Helochares lividus		NS(Nb)	freshwater ponds and ditches	x					
Helochares punctatus		NS(Nb)	acid moorland waterbodies	x		xx			
Hydrobius fuscipes			a more or less ubiquitous water beetle	x		xx			
Laccobius bipunctatus			mud	x					
Megasternum concinnum			organic mud and wet (liquid) decaying vegetation			xx			
Sphaeridium lunatum			herbivore dung			x			
Hygrobiidae									
Hygrobia hermanni			silt ponds, detritus ponds etc	x					
Kateretidae									
Kateretes rufilabris			associated with tall, marshland vegetation	x	x	x	x		
Brachypterus urticae			Nettles				x		
Latridiidae									
Cartodere bifasciatus			litter, compost, tussocks etc - more or less ubiquitous	x	x				
Cartodere nodifer			leaf litter, vegetable detritus - more or less ubiquitous	x					
Corticaria pubescens			amongst plant litter	x	x				
Cortinicara gibbosa			amongst plant litter	x	x				
Leiodidae									
Catops morio			associated with fungi				x		
Malachiidae									
Malachius bipustulatus			grasslands	x	x				
Nitidulidae									
Glischrochilus hortensis			unknown association; adults usually in woodland	x				x	x
Meligethes aeneus			various flowers	x	x				
Meligethes atratus			various flowers, especially of trees and shrubs	x			x		
Meligethes flavimanus			various flowers				x		
Noteridae									
Noterus clavicornis		NS(Na)	still waters	x					
Oedemeridae									
Oedemera lurida		Local	a common grassland species	x	x	x			
Rhizophagidae									
Rhizophagus dispar			under bark of deciduous trees and	x				x	

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
			also in fungi						
Rhynchitidae									
Coenorhinus mannerheimii			birches, on moors and other wet places, the larvae mining leaves and petioles	x		x	x		x
Deporaus betulae			birch, alder and hazel, making conical leaf-rolls. Extremely common everywhere				x		x
Temnocerus coeruleus			in buds of Salix and Populus			x	x		x
Temnocerus longiceps			in the buds of birches, rarely Salix and Pyrus			x	x		x
Temnocerus nanus			develops in leaf buds of birches, occasionally in alder or Salix			x	x	x	x
Scarabaeidae									
Aphodius rufipes			larvae in herbivore dung	x	x				
Hoplia philanthus		Local	a saprophagous species	x	x	x			
Phyllopertha horticola			larvae feed amongst the roots of grasses			x			
Scirtidae	Marsh Beetle								
Cyphon coarctatus			usually amongst vegetation near water	x		x	x		
Cyphon hilaris		Local	in moss, especially Sphagnum, in water and in wet places			x			
Cyphon variabilis			breeds in wet mosses in acid mires etc. Adults common on emergent vegetation				x		
Elodes pseudominutula			larvae in damp areas, adults in tree foliage			x			
Scraptiidae									
Anaspis fasciata			larvae in twigs of oak and other trees; adults at hawthorn blossom			x	x		
Anaspis maculata			larvae in dead branches and twigs			x		x	x
Anaspis thoracica			associated with a range of deciduous trees			x		x	x
Silphidae	Sexton Beetle								
Nicrophorus humator			carrion	x					
Staphylinidae									
Aleochara intricata			ecology unclear,	x	x				

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
			probably saprophagous						
Aleochara lanuginosa			associated with herbivore dung	x					
Anthobium unicolor			usually in leaf litter in or near woods, also in flood refuse etc			x			
Anthophagus alpinus		NS(Nb)	associated with flowers in upland areas	x					
Autalia impressa			feeds on decaying gill fungi	x	x				
Autalia longicornis			probably saprophagous	x					
Cadaverota cadaverina			associated with decaying animal tissue			x			
Encephalus complicans			associated with mosses			x			
Gyrohypnus fracticornis			a detritus-feeder	x	x				
Lesteva sicula ssp. heeri			mostly found in damp habitats	x					
Mycetoporus lepidus			amongst low vegetation and litter			x			
Ochthephilum fracticorne			probably saprophagous	x					
Oxytelus laqueatus			associated with animal dung			x			
Philonthus albipes		Local	a detritus-feeding rove beetle	x					
Quedius fuliginosus			roots of grass, in dead leaves, moss, vegetable refuse etc	x					
Quedius lateralis			detritivorous	x					
Quedius maurorufus			leaf litter, carrion, dung and similar	x	x				
Stenus bifoveolatus			predatory on springtails in marshy places	x	x		x		
Stenus butrintensis		NS(Nb)	amongst litter and grass tufts in wetlands and at the edge of water bodies	x					
Stenus cicindeloides		Local	usually in marshy places	x			x		
Stenus clavicornis			disturbed grasslands	x	x				
Stenus flavipes			found in a wide range of habitats	x		x	x		
Stenus fulvicornis			damp habitat, especially grazed grassland with Juncus	x					
Stenus juno			a common species in wet habitats	x	x				

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
Stenus latifrons			damp habitats	x					
Stenus nanus			hay bales, silage, hedgerows etc	x					
Stenus nitidiusculus				x					
Stenus picipes			leaf litter, flood debris, tussocks etc, but mostly in woodlands	x	x				
Stenus providus			leaf litter etc	x					
Stenus pubescens				x					
Stenus solutus			wet habitats generally				x		
Stenus tarsalis			marshy places - more common in the south				x		
Tachyporus chrysomelinus			grass litter and tussocks	x	x	x			
Tachyporus solutus			leaf litter, carrion, dung and similar				x		
Xantholinus longiventris			leaf litter, grass tussocks and similar micro-habitats - very common			x			
Tenebrionidae	darkling beetle								
Cylindronotus laevioctostriatus			a nocturnal grazer of Pleurococcus algae on tree trunks					x	x
Isomira murina			dry sandy and post-industrial habitat, railway banks, heaths etc				x		
DERMAPTERA	**EARWIGS**								
Forficulidae									
Forficula auricularia	common earwig		generalist species	x	x	x	x		
DIPTERA	**TRUE FLIES**								
Agromyzidae									
Agromyza alnibetulae			larva mines the leaves of birch trees	x				x	x
Agromyza anthracina			larva makes mines in nettle leaves						x
Agromyza nana			Larva mines in Trifolium, Medicago and Melilotus	x	x				
Agromyza pseudoreptans			larvae mine the leaves of stinging nettle	x					
Agromyza reptans			larva makes mines in nettle leaves	x					
Chromatomyia syngenesiae			larva mines leaves of various plant species	x	x			x	x
Liriomyza strigata			larva mines leaves of Centaurea nigra	x	x				
Phytoliriomyza hilarella/pteridis			larval mines on Bracken					x	x
Phytomyza			larva mines the	x	x				

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
ranunculivora			leaves of Meadow Buttercup and Creeping Buttercup						
Phytomyza spondylii			mines leaves of Heracleum spondylium	x					
Anthomyiidae									
Chirosia histricina			larva mines the fronds of bracken	x	x				x
Pegomya bicolor			larva mines the leaves of docks and sorrels					x	x
Pegomya solennis			larva mines the leaves of dock plants					x	x
Bibionidae									
Dilophus febrilis			feeds in the roots of various plants	x	x				
Cecidomyiidae									
Dasineura urticae			forms stem galls on nettles					x	x
Conopidae									
Sicus ferrugineus		Local	parasitic fly on bumble bees			x	x		
Dolichopodidae									
Dolichopus claviger			associated with damp habitats	x					
Dolichopus plumipes			requires wet mud to breed			x			
Scellus notatus		Local	predatory species in woodland and scrub, the adults predatory					x	x
Dolichopus campestris			associated with damp habitats	x	x				
Dolichopus discifer			associated with damp habitats	x	x				
Empididae									
Empis caudatula			predatory on other flies	x	x				
Empis nuntia			predatory on other flies	x	x				
Empis praevia			predatory on other flies	x	x				
Empis livida			predatory on other flies	x	x	x			
Empis tesselata			predatory on other flies	x	x	x			
Empis digramma			grassland - widespread but rarely common			x			
Empis scutellata			predatory on other flies			x			
Empis stercorea			predatory on other flies			x			
Empis trigramma			predatory on other flies	x	x	x			

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
Limoniidae									
Austrolimnophila ochracea			woodland - even small ones- the larvae feeding in dead wood					x	x
Cheilotrichia cinerascens			damp places	x					
Dicranomyia autumnalis			marshland and carr habitats	x					x
Epiphragma ocellaris		Local	larvae in dead wood.	x				x	x
Molophilus appendiculatus			wet woodland, the larvae developing in the soil	x	x			x	x
Molophilus cinereifrons			wet woodland, the larvae developing in the soil						x
Rhipidia duplicata			various habitats, including woodland and grassland, the larvae feeding in animal dung	x				x	x
Rhipidia maculata			larvae feed in herbivore dung	x	x				
Micropezidae									
Micropeza corrigiolata		Local	Larva feeds in root nodules of Pisum sativum, Trifolium pratense and Medicago sativa			x			
Pediciidae									
Pedicia rivosa			larvae are predatory in bogs and marshes	x	x	x			
Platystomatidae									
Rivellia syngenesiae			larvae feed in wet, decaying litter	x	x	x			
Ptychopteridae									
Ptychoptera contaminata			Wetland habitats			x			
Ptychoptera lacustris			a wetland cranefly	x	x				
Rhagionidae									
Chrysopilus asiliformis			damp habitats	x					x
Chrysopilus cristatus			damp habitats	x	x	x	x	x	x
Rhagio lineola			woodland and scrub - especially at the edges	x		x		x	x
Rhagio scolopaceus			woodland edge and other wooded areas - in clearings and at edges	x			x	x	x
Rhagio tringarius			damp habitats	x		x			
Sciomyzidae									
Pherbina coryleti			predatory on water snails				x		
Tetanocera elata			predatory on slugs in a range of habitats	x	x				

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
Tetanocera hyalipennis			sallow and alder carr, preying on aquatic snails	x	x				x
Psacadina verbekei		NS(Nb)	predator of snails in fens and mesotrophic wetlands	x		x			
Sepsidae									
Nemopoda nitidula			shade-loving species, larvae in dung and carrion	x	x				
Sepsis cynipsea			Larvae feed in animal dung	x	x				
Sepsis flavimana			larvae feed in dung, especially of cattle	x	x				
Sepsis thoracica			larvae feed in dung	x	x				
Sepsis violacea			animal dung	x	x				
Themira annulipes			damp habitats, especially on organically enriched soils	x	x				
Stratiomyidae									
Beris clavipes		NS(Nb)	larvae feed in moss and detritus around pond margins			x			
Beris fuscipes			wet woodland in the south-west			x			x
Beris morrisii		Local	woodland edge and hedgerows, etc				x		
Beris vallata			saprophagous larvae	x	x	x			
Chloromyia formosa			ubiquitous			x		x	x
Chorisops tibialis			saprophagous larvae	x	x	x		x	x
Microchrysa flavicornis			larvae feed in decaying vegetable matter			x		x	
Microchrysa polita			larvae require decomposing organic matter			x			x
Syrphidae									
Chalcosyrphus nemorum		Local	larvae feed under decaying bark, especially of alder trees	x		x		x	x
Cheilosia albitarsis			larvae feed in the roots of Ranunculus repens	x	x	x	x		
Cheilosia proxima			larvae feed in the roots of Cirsium species of thistle, especially Cirsium palustre			x			
Chrysotoxum bicinctum			grassland species - associated with ants' nests	x	x	x			
Dasysyrphus tricinctus			aphid predator at woodland edge habitats			x			

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
Epistrophe eligans			mainly at edge habitats			x			
Episyrphus balteatus			ubiquitous species, partly immigrant, and a predator of aphids	x	x	x			
Eristalis arbustorum			Larvae require damp habitats but adults are more or less ubiquitous	x	x	x			
Eristalis pertinax			Larvae require damp habitats but adults are more or less ubiquitous			x			
Eristalis tenax			Larvae require damp habitats but adults are more or less ubiquitous	x	x	x			
Eupeodes corollae			Grassland			x			
Eupeodes latifasciatus		Local	Damp grassland	x	x	x			
Eupeodes luniger			Grassland	x	x	x			
Helophilus pendulus			Larvae require damp habitats but adults are more or less ubiquitous			x			
Leucozona glaucia			woodland edge habitats - feeding on aphids			x		x	
Melanogaster hirtella			larvae feed in mud amongst roots of emergent vegetation, mainly by running water	x	x	x			
Melanostoma mellinum			Grassland	x	x	x			
Melanostoma scalare			Grassland	x	x	x	x		
Myathropa florea			larvae are semi-aquatic			x			
Neoascia podagrica			edge-habitat species	x	x	x			
Neoascia tenur			reeds and similar emergent vegetation			x			
Pipizella viduata			Larvae feed on root aphids on Umbelliferae	x		x			
Platycheirus albimanus			ubiquitous - larvae prey on aphids	x	x	x			
Platycheirus angustatus			damp habitats	x					
Platycheirus clypeatus			Damp habitats			x			
Platycheirus granditarsus			wetland sites				x		
Platycheirus peltatus			aphid predator			x			
Platycheirus rosarum			shaded wetland and carr woodland	x	x		x		x
Platycheirus scutatus			an edge-habitat species			x			
Platycheirus tarsalis		Local	larvae prey on aphids			x			

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
Rhingia campestris			Cow dung			x			
Sericomyia silentis			acid wetlands, the aquatic larvae feeding in boggy pools	x	x	x			
Sphaerophoria interrupta			unimproved wet meadows and other wet grassy habitats	x	x	x			
Sphaerophoria scripta			Grassland - larvae prey on aphids	x	x	x			
Sphegina verecunda			wet shaded woodland, the larvae in sap runs						x
Syritta pipiens			larvae in decaying vegetation; adults at flowers			x			
Syrphus ribesii			larvae are aphid predators on trees and bushes	x	x			x	x
Syrphus torvus			larvae are aphid predators on trees and bushes			x		x	x
Syrphus vitripennis			larvae are aphid predators on trees and bushes	x	x	x		x	x
Trichopsomyia flavitarsis		Local	coastal landslips in the south; boggy areas in the north			x			
Volucella bombylans			inquiline in nests of bumble bees			x			
Xanthogramma pedisequum		Local	larvae feed in ants nests			x			
Xylota jakutorum		NS(Nb)	larvae in tunnels of bark beetle Hylobius abietis	x		x		x	
Xylota segnis			Damp, dead wood	x	x	x		x	x
Tabanidae									
Chrysops relictus			damp habitats - adult females are blood sucking horseflies			x		x	x
Haematopota pluvialis			damp habitats - adult females are blood sucking horseflies			x		x	x
Tachinidae									
Eriothrix rufomaculata			larva parasitises moth larvae			x		x	x
Tachina grossa			parasitic on caterpillars of large moths, especially the lasiocampids			x			x
Tephritidae	picture-winged fly								
Chaetostomella cylindrica			Seed heads of thistles; almost ubiquitous				x		
Tephritis conura			seeds heads of	x		x			

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
			Cirsium palustris and C. helenoides, causing a gall						
Tephritis ruralis		NS(N)	Mouse-ear Hawkweed (Hieracium pilosella)			x			
Terellia ruficauda			larvae gall the flowers of thistles			x			
Terellia serratulae			larvae gall the flowers of thistles			x			
Urophora cardui			larvae gall the flowers of thistles	x	x		x		
Urophora jaceana			larvae feed in the seed heads of Centaurea species			x	x		
Urophora stylata			larvae form galls on thistle stems			x			
Tipulidae									
Lunatipula lunata			damp woodland edges and hedges or similar			x			x
Nephrotoma appendiculata			open grassland	x		x			
Nephrotoma flavescens			grassland and other usually open habitats	x	x		x		
Nephrotoma flavipalpis			hedges and other wooded edge habitats			x		x	
Nephrotoma quadrifaria			common in woodlands, also in hedgerows, scrub and similar			x			
Nigrotipula nigra			Wetland	x	x				
Savtshenkia pagana			more or less ubiquitous	x	x	x			
Tipula oleracea			ubiquitous, larvae feeding on roots of grasses	x	x	x			
Tipula paludosa			ubiquitous, larvae feeding on roots of grasses	x	x	x	x		
Ulidiidae									
Herina frondescentiae		Local	damp grassland			x			
HET									
Acanthosomatidae									
Acanthosoma haemorrhoidale	hawthorn shield bug		hawthorn				x		x
Elasmostethus interstinctus	birch shield bug		birch			x			x
Elasmucha grisea			birch, occasionally alder						x
HET									
Anthocoridae									
Anthocoris nemoralis			trees and shrubs				x	x	x
Anthocoris nemorum			low vegetation			x	x	x	x

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
Corixidae									
Hesperocorixa castanea			Aquatic species.	x					
Gerridae									
Gerris lacustris			ponds, lakes and canals with abundant submerged vegetation.	x					
Hydrometridae	Water Measurer								
Hydrometra stagnorum			On the surface film of still or slow-flowing waters	x					
Lygaeidae									
Cymus glandicolor			marshy places, on sedges, reeds and similar plants	x			x		
Cymus melanocephalus		Local	associated with Juncus wherever it grows				x		
Kleidocerys resedae			trees and shrubs generally			x	x	x	x
Pachybrachius fracticollis						x	x		
Scolopostethus decoratus			associated with heather on heath and moor	x	x				
Scolopostethus thomsoni			usually on nettles			x	x		
Stygnocoris sabulosus			disturbed ground amongst ruderal plants			x			
Microphysidae									
Loricula pselaphiformis			predatory species on tree branches			x			
Miridae									
Amblytylus nasutus			grassland - especially on ruderal sites			x			
Apolygus spinolai			Polyphagous amongst low vegetation			x			
Atractotomus mali			hawthorn, apple and other trees			x			x
Blepharidopterus angulatus			predatory on a wide range of broad-leaved trees			x			
Bryocoris pteridis			associated with a wide range of species of ferns			x			
Calocoris roseomaculatus			grassland, on composites such as bird's-foot trefoil, restharrow, salad burnet and kidney vetch			x			
Campyloneura virgula			broad-leaved trees			x			

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
			and shrubs						
Capsus ater			Grassland	x	x				
Closterostomus norvegicus			polyphagous			x			
Deraeocoris flavilinea			predatory amongst trees and bushes			x			
Dicyphus epilobii			Epilobium hirsutum			x			
Grypocoris stysi			Nettles			x	x		
Heterocordylus tibialis			associated with Broom				x		
Leptoterna dolabrata			found in a wide range of grassland habitats				x		
Liocoris tripustulatus			stinging nettle				x	x	x
Lopus decolor			open grasslands, especially dry calcareous ones but also colonises ruderal sites			x			
Lygocoris pabulinus			Polyphagous amongst low vegetation			x			
Lygocoris rugicollis			Associated with sallows and willows			x	x		
Lygus rugulipennis			polyphagous - especially common in ruderal communities			x			
Lygus wagneri			polyphagous in meadows and flower-rich grasslands				x		
Mecomma ambulans			feeds on sap of sedges, rushes and other plants, as well as on animal matter			x			
Miris striatus			associated with oak				x	x	
Monalocris filicis			bracken - feeding on the sporangia			x			
Neolygus contaminatus			birch - less commonly on alder or other trees			x			x
Notostira elongata			grasslands			x			
Orthops basalis			associated with flower-heads of Umbelliferae				x		
Orthops campestris			flowers and seed heads of Umbelliferae - including wild carrot				x		
Orthotylus marginalis			willow trees, occasionally alder and apple trees			x			
Pachytomella parallella			upland grasslands			x	x		
Phytocoris longipennis			predatory in			x			

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
			deciduous trees						
Pinalitus cervinus			associated with trees - especially lime but also hazel, ash and ivy				x		
Pithanus maerkelii			grassy places - partly a predatory species			x			
Plagiognathus arbustorum			polyphagous, but usually associated with stinging nettles			x			
Plagiognathus chrysanthemi			polyphagous			x			
Polymerus palustris			associated with Galium palustre in wet habitats	x	x				
Psallus betuleti			birch - partly predatory			x	x		
Psallus perrisi			oak trees - an early season species			x			
Psallus varians			vegetarian species on oak trees				x		
Stenodema calcarata			grasslands	x	x		x		
Stenodema holsata			grasslands, usually damp. Mainly northern and western	x	x	x			
Stenodema laevigata			grasslands				x		
Stenotus binotatus			grasslands			x			
Trigonotylus ruficornis			grasslands and saltmarsh			x			
Nabidae	damsel bug								
Nabis limbatus			marshy places			x			
Nepidae	water Scorpion								
Nepa cinerea			a predatory freshwater species	x					
Pentatomidae									
Dolycoris baccarum			polyphagous species of dry habitats				x	x	
Palomena prasina			trees and shrubs			x		x	x
Pentatoma rufipes	The Forest Bug		tree-dwelling predator that often flies far from woodland				x	x	x
Piezodorus lituratus	Gorse Shieldbug		gorse, and occasionally other legumes				x		
Troilus luridus			a predator on broad leaved trees and occasionally on pines			x			
Zicrona caerulea		Local	low vegetation in open situations, often near water or marshes				x		
Rhopalidae									

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
Myrmis miriformis			grasslands - a grass feeding species			x			
Rhopalus subrufus		Local	St John's Wort (Hypericum perforatum)				x		
Saldidae									
Chartoscirta cincta			reeds and other tall vegetation at the water's edge	x					
Chartoscirta cocksii			Spagnum and grass tussocks in bogs and similar places	x					
Saldula saltatoria			predatory species of most damp habitats	x					
Scutelleridae									
Eurygaster testudinaria			rushes, sedges and other tall vegetation in damp places				x		
Tingidae									
Dictyla convergens			confined to Water Forget-me-not				x		
Tingis ampliata			creeping thistle				x		
Veliidae	Water Cricket								
Microvelia reticulata			at the well-vegetated margins of still and slow-flowing water	x					
Velia caprai			In small streams and some ponds if there is a flow. Often under deep shade.	x					
HOMOPTERA: AUCHENORHYNCHA	**PLANT HOPPERS**								
Aphrophoridae									
Aphrophora alni			larvae feed under froth on a wide range of trees and shrubs			x	x		
Neophilaenus campestris			dry, open grassland			x			
Neophilaenus exclamationis			grassland hillsides on chalk or grit-stones	x	x				
Neophilaenus lineatus			grasslands			x			
Philaenus spumarius	spittle-bug		larvae feed under froth on a wide range of herbaceous plants			x			
Cercopidae									
Cercopis vulnerata			woodland edge, other edge habitats and damp ditches	x	x			x	x
Cicadellidae									
Alebra albostriella			associated with oak trees			x			
Allygus mixtus			grasses			x			

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
Alnetoidea alneti			found on a range of deciduous trees			x			
Anoscopus serratulae			associated with grasses in grasslands and ruderal habitats			x			
Balclutha punctata			widespread on grasses etc - overwinters in conifer trees				x		
Cicadella viridis			grasses and rushes in marshy places			x	x		
Cicadula aurantipes			ecology unclear			x			
Cicadula quadrinotata			on Carex (sedges) in wet and dry locations				x		
Conosanus obsoletus			grassland in damp places, including saltmarshes			x			
Doratula stylata			open grassland, sandy or calcareous			x			
Edwardsiana crataegi			associated with hawthorns			x			
Edwardsiana geometrica			a distinctive species associated with Alder trees			x			
Eupteryx filicum			associated with ferns			x			
Eupteryx urticae			Usually on nettles				x		
Eupteryx vittata			wet meadows and open woods on various flowers	x	x				
Eurhadina concinna			oaks and sometimes other trees			x			
Eurhadina pulchella			oaks and sometimes other trees			x			
Euscelis incisus			grasses			x			
Evacanthus interruptus			grasses and bushes - a woodland edge species			x			
Iassus lanio			usually on oak, occasionally on other trees			x			
Idiocerus distinguendus			Associated with Populus			x			
Kybos smaragdula			Usually on Alder, but also on birches and Salix in Scotland			x			
Linnavuoriana sexmaculata			Salix			x			
Macrosteles horvathi			grassland habitats	x					
Macrosteles laevis			drier hillsides and disturbed ground			x			
Macrosteles viridigriseus			marshy areas, often at the margins of ponds			x	x		

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
Oncopsis alni			alder				x		
Oncopsis flavicollis			associated with birches	x		x	x		
Populicerus confusus			various trees and bushes			x			
Psammotettix confinis			grasses, including on post-industrial sites			x	x		
Psammotettix nodosus			grasses in various types of dry grassland			x			
Ribautiana tenerrima			brambles			x			
Speudotettix subfusculus			deciduous trees, especially oaks	x		x			
Thamnotettix confinis			deciduous trees and shrubs				x		
Thamnotettix dilutior			deciduous trees, especially oaks			x			
Ulopa reticulata			under heather (Erica and Calluna)	x					
Cixiidae									
Cixius nervosus			most frequent in woodlands				x	x	x
Tachycixius pilosus			grasses	x	x		x		
Delphacidae									
Conomelus anceps			Juncus species			x			
Dicranotropis hamata			grasses			x	x		
Ditropis pteridis			Bracken			x	x		
Florodelphax leptosoma			wetland habitats across the UK	x	x				
Javesella dubia			grasses, especially in woodland	x	x		x		
Javesella pellucida			grasses in a range of habitats			x			
Kosswigianella exigua		Local	short grasses on well-drained substrates			x			
Muellerianella brevipennis		Local	Deschampsia cespitosa in damp habitats			x			
Membracidae									
Centrotus cornutus		Local	oak, aspen and other sapling trees					x	x
HOMOPTERA: PSYLLOIDEA	**PLANT LICE**								
Psyllidae									
Arytaina genistae			associated with Broom				x		
Arytainilla spartiophila			associated with Broom				x		x
Chamaepsylla hartigii			associated with birch trees	x				x	x
Psylla alni			associated with Alder trees				x	x	x
HYMENOPTERA: ACULEATA	**BEES, WASPS AND ANTS**								
Apidae									

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
Apis mellifera	honey bee		flowers in general	x	x				
Bombus humilis	Brown-banded Carder Bee	S41	costal grasslands and similar	x					
Bombus hypnorum	The Tree Bee		A recent colonist, first seen in 2001 in Dorset, now spreading rapidly			x			
Bombus lapidarius	red-tailed bumble bee		ubiquitous	x	x				
Bombus monticola			upland species, strongly linked to Bilberry plants			x			
Bombus pascuorum	common carder bee		ubiquitous	x	x	x			
Bombus pratorum	a bumble bee		ubiquitous	x	x				
Halictus rubicundus			ground nesting solitary bee			x			
Lasioglossum calceatum			nests in burrows on steep sandy banks			x			
Megachile ligniseca			a leaf-cutter bee that nests in dead wood, excavating its own tunnel			x			
Chrysididae									
Pseudomalus violaceus		NS(Nb)	a parasitoid of the larvae of small sized sphecid wasps				x		
Eumenidae									
Symmorphus bifasciatus			nests in hollow plant stems and preys on the larvae of chrysomelid beetles	x	x				
Formicidae									
Lasius flavus	yellow ant		grassland. A high nest density indicates long term grassland continuity	x					
Myrmica ruginodis			typically nests in fallen dead wood. Also in grassland but rarely in dry open habitats	x	x				
Myrmica sabuleti		Local	nests under stones in calcareous grassland	x	x				
Sphecidae									
Crabro cribrarius			ground-nesting, in light, sandy soils			x			
Ectemnius continuus			nests in burrows in dead wood; preys on muscid and calliphorid flies			x			
Mimumesa dahlbomi		Local	nests in old beetle burrows in dead wood and also in bare ground; preys on froghoppers	x					

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
Vespidae									
Vespula germanica			ubiquitous	x	x				
HYPAR									
Cynipidae									
Andricus kollari			forms the oak marble gall					x	x
HYMENOPTERA: SYMPHYTA	**SAWFLIES**								
Cephidae									
Calameuta filiformis			larvae mine the stems of grasses in damp habitats	x	x				
Calameuta pallipes			a grassland sawfly				x		
Cephus cultratus			larvae mine the stems of grasses	x	x	x			
Cephus pygmaeus			larvae mine the stems of grasses	x	x	x	x		
Tenthredinidae									
Aglaostigma fulvipes			larvae feed on bedstraws				x		
Aneugmenus padi			widespread sawfly associated with Bracken			x		x	x
Athalia ancilla			larvae feed on Cruciferae			x			
Athalia cordata			ubiquitous sawfly species				x		x
Athalia lugens			usually found in wetlands			x			
Cladius pectinicornis			larvae feed on rose and also on Sanguisorba officinalis			x			
Dolerus aeneus			larvae feed on grasses			x			
Dolerus aericeps			larvae on Equisetum			x			
Dolerus cothurnatus			larvae probably on grasses				x		
Dolerus niger			larvae on grasses	x	x				
Endelomyia aethiops			larvae skeletonises the leaves of wild rose species			x			
Eutomastethus luteiventris			larvae feed internally in Juncus stems				x		
Eutomostethus ephippium			ubiquitous sawfly species				x		
Fenusia dohrnii			larvae mine leaves of alder trees					x	x
Heterarthrus nemoratus			larvae mine birch leaves				x		
Heterarthrus vagans			larva mines leaves of Alder					x	x
Macrophya annulata			larvae feed on Potentilla reptans				x		
Nematinus fuscipennis			ecology unclear			x			

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
Nematus oligospilus			larvae feed on leaves				x		
Nematus polyspilus			larvae on Alder				x		
Nesoselandria morio			larval ecology unknown			x			
Pontania bridgmannii			larva causes galls on sallow leaves					x	x
Profenusa pygmaea			larva mines the leaves of oak trees					x	x
Rhogogaster punctulata			larvae feed on a variety of trees			x			
Rhogogaster scalaris			predatory species			x			
Rhogogaster viridis			larvae on a variety of plant species			x	x		
Selandria morio			larvae on grasses	x					
Selandria serva			grasses, sedges and rushes in marshy places			x	x		
Strongylogaster multifasciata			larvae feed on leaves			x			
Tenthredo arcuata			larvae feed on Trifolium repens leaves	x	x		x		
Tenthredo brevicornis			larval ecology unknown			x			
Tenthredo mesomelas			larvae on a variety of plant species				x		
Tenthredopsis coquebertii			larvae feed on various grasses	x		x			
Tenthredopsis litterata			Larvae on grasses, especially Dactylis glomerata				x		
Tenthredopsis nassata			larvae feed on grasses			x	x		
LEPIDOPTERA 1:	**BUTTERFLIES**								
Hesperiidae									
Ochlodes faunus	Large skipper		grassland			x			
Thymelicus sylvestris	Small skipper		grassland			x			
Lycaenidae									
Polyommatus icarus	Common blue		various legumes, especially Bird's-foot Trefoil	x		x			
Nymphalidae									
Aglais urticae	Small tortoiseshell		larvae feed on Stinging Nettle				x		
Aphantopus hyperantus	Ringlet		woodland edge and clearings, hedges and other edge habitats		x	x			x
Boloria selene	Small Pearl-bordered Fritillary	S 41	*Dog Violet, Marsh Violet and sometimes other violet species*			x			
Coenonympha pamphilus	Small Heath	S 41	grassland	x	x		x		
Euphydryas aurinia	Marsh Fritillary	S 41	Succisa pratensis in boggy meadows or			x			

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
			chalk grassland						
Maniola jurtina	Meadow brown		grassland species	x	x	x			
Pararge aegeria	Speckled wood		grasses in light woodland or scrub		x		x	x	x
Pieridae									
Pieris napi	Green-veined white		ubiquitous	x	x		x		
Pieris rapae	Small white		ubiquitous			x			
LEPIDOPTERA 2:	**MOTHS**								
Agonoxenidae									
Chrysoclista linneella		NS(Na)	on Lime (bark)					x	
Arctiidae									
Eilema depressa	Buff Footman	Local	lichens and algae on trees					x	x
Eilema griseola	Dingy Footman		lichens					x	x
Spilosoma lubricipeda	White Ermine	BAP(R)	herbaceous plants	x	x			x	x
Spilosoma lutea	Buff Ermine	BAP(R)	herbaceous plants and also trees and shrubs	x	x			x	x
Tyria jacobaeae	Cinnabar	BAP(R)	Ragworts			x			
Choreutidae									
Anthophila fabriciana	Nettle-tap		nettles	x	x				
Coleophoridae									
Coleophora flavipennella			oak					x	x
Coleophora serratella			deciduous tree leaves	x					
Drepanidae									
Cilix glaucata	Chinese Character		blackthorn, hawthorn and other rosaceous bushes					x	x
Drepana falcataria	Pebble Hook-tip		birch, alder					x	x
Falcaria lacertinaria	Scalloped Hook-tip		birch					x	x
Elachistidae									
Elachista argentella			grasses of several species		x				
Eriocraniidae									
Eriocrania salopiella			larva mines leaves of birch	x					
Gelechiidae									
Bryotropha affinis			mosses		x				
Bryotropha terrella			mosses		x				
Scrobipalpa acuminatella			caterpillar mines leaves of thistles and knapweeds		x				
Syncopacma taeniolella			Lotus corniculatus, Trifolium, Medicago			x			
Geometridae									
Alcis repandata	Mottled Beauty		deciduous trees and herbaceous plants					x	x
Biston betularia	Peppered Moth		deciduous trees and herbaceous plants					x	x
Cabera exanthemata	Common Wave		Salix species and aspen					x	x
Cabera pusaria	Common White Wave		deciduous trees					x	x
Campaea margaritata	Light Emerald		deciduous trees		x			x	x

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
Camptogramma bilineata	Yellow Shell		herbaceous plants		x				
Chloroclysta truncata	Common Marbled Carpet		deciduous trees and herbaceous plants		x			x	x
Chloroclystis v-ata	V-Pug		herbaceous plants					x	x
Colostygia pectinataria	Green Carpet		bedstraws					x	x
Cosmorhoe ocellata	Purple Bar		bedstraws					x	x
Crocallis elinguaria	Scalloped Oak		deciduous trees					x	x
Ecliptopera silaceata	Small Phoenix	BAP(R)	willow herbs, enchanter's nightshade					x	x
Electrophaes corylata	Broken-barred Carpet		deciduous trees					x	x
Ennomos alniaria	Canary-shouldered Thorn		deciduous trees					x	x
Epirrhoe alternata	Common Carpet		bedstraws		x			x	x
Euchoeca nebulata	Dingy Shell		alder					x	x
Eulithis testata	Chevron		Salix species, aspen and birch					x	x
Eupithecia centaureata	Lime-speck Pug		various flowers		x				
Eupithecia icterata	Tawny-speckled Pug		yarrow - on the flowers and seeds					x	
Eupithecia pulchellata	Foxglove Pug		Foxglove						x
Eupithecia vulgata	Common Pug		herbaceous plants		x				
Hydriomena furcata	July Highflier		Salix species					x	x
Idaea aversata	Riband wave		herbaceous plants - especially bedstraws		x				
Idaea biselata	Small Fan-footed Wave		dandelion, plantain, Polygonum etc					x	x
Idaea subsericeata	Satin Wave		dandelion and plantains					x	x
Lomaspilis marginata	Clouded Border		sallow, willow, poplar - rarely hazel					x	x
Lomographa bimaculata	White-pinion Spotted		Blackthorn						x
Lomographa temerata	Clouded Silver		rosaceous trees					x	x
Odontopera bidentata	Scalloped Hazel		deciduous and coniferous trees					x	x
Opisthograptis luteolata	Brimstone Moth		deciduous trees					x	x
Pasiphila rectangulata	Green Pug		Prunus, Malus and Pyrus flowers					x	x
Petrophora chlorosata	Brown Silver-line		bracken					x	x
Plagodis dolabraria	Scorched Wing	Local	oak, birch and Salix are recorded					x	x
Pseudoterpna pruinata	Grass Emerald		gorse and broom	x	x				x
Pterapherapteryx sexalata	Small Seraphim		Sallows (Salix species)					x	x
Scotopteryx luridata	July Belle		Associated with Gorse and Genista anglica					x	
Selenia dentaria	Early Thorn		deciduous trees					x	x
Selenia tetralunaria	Purple Thorn		deciduous trees					x	x
Thera firmata	Pine Carpet		Scots Pine					x	x
Thera obeliscata	Grey Pine Carpet		scots pine, spruce					x	x
Timandra comae	Blood-vein	BAP(R)	Polygonaceae				x	x	x

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
Xanthorhoe designata	Flame Carpet		Brassica napus					x	x
Xanthorhoe ferrugata	Dark-barred Twin-spot Carpet	BAP(R)	herbaceous plants		x			x	x
Xanthorhoe fluctuata	Garden Carpet		Cruciferae		x				
Xanthorhoe montanata	Silver-ground Carpet		herbaceous plants - especially bedstraws						x
Xanthorhoe spadicearia	Red Twin-spot Carpet		herbaceous plants - especially bedstraws		x			x	
Glyphipterigidae									
Glyphipterix simpliciella			on the seeds of Dactylis and Festuca species of grasses	x	x				
Glyphipterix thrasonella			foodplant unknown, probably Juncus	x	x				
Gracillariidae									
Caloptilia betulicola			birch						x
Caloptilia falconipennella			mines leaves of alder						x
Caloptilia stigmatella			sallow and poplar					x	x
Phyllonorycter kleemannella			mines leaves of alder					x	x
Phyllonorycter stettinensis			mines leaves of alder					x	x
Phyllonorycter ulmifoliella			mines leaves of birch					x	x
Hepialidae									
Hepialus fusconebulosa	Map-winged Swift		bracken		x				x
Hepialus lupulinus	Common Swift		roots of grasses and herbaceous plants		x			x	x
Hepialus sylvina	Orange Swift		roots of herbaceous plants and ferns					x	
Incurvariidae									
Nemophora minimella			*Succisa* and *Scabiosa*, on the seeds then lower leaves			x			
Lymantriidae									
Calliteara pudibunda	Pale Tussock		deciduous trees	x				x	x
Lymantria monacha	Black Arches		oak, sometimes other trees					x	x
Lyonetiidae									
Lyonetia clerkella			mines leaves of rosaceous bushes and trees, birch etc					x	x
Micropterigidae									
Micropterix calthella			herbaceous plants	x	x				
Momphidae									
Mompha divisella			Willow-herbs - mining the leaves		x				
Mompha raschkiella			Rosebay Willow-herb - mining the leaves					x	x
Nepticulidae									

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
Ectoedemia heringi			larva mine the leaves of oak trees					x	x
Stigmella anomalella			mines leaves of rose					x	x
Stigmella aurella			mines leaves of bramble					x	x
Stigmella microtheriella			mines leaves of hazel and hornbeam					x	x
Stigmella sakhalinella			larva mines the leaves of birch						x
Stigmella salicis			mines leaves of rough-leaved Salix (Sallows)						x
Noctuidae									
Acronicta alni	Alder Moth		birch, alder and other deciduous trees					x	x
Acronicta leporina	Miller		alder and birch, occasionally on oak, poplar or Salix species					x	x
Acronicta psi	Grey Dagger	BAP(R)	deciduous trees and bushes		x				
Acronicta rumicis	Knot Grass	BAP(R)	polyphagous on deciduous shrubs and herbaceous plants	x				x	x
Agrochola helvola	Flounced Chestnut	BAP(R)	grasses - feeding on the roots and stem bases					x	x
Agrotis clavis	Heart and Club		polyphagous on various herbaceous plants					x	x
Agrotis exclamationis	Heart and Dart		herbaceous plants	x	x			x	x
Agrotis ipsilon	Dark Sword-grass		immigrant from overseas					x	x
Agrotis puta	Shuttle-shaped Dart		herbaceous plants		x			x	x
Agrotis segetum	Turnip Moth		roots of herbaceous plants		x			x	x
Allophyes oxyacanthae	Green Brindled Crescent	BAP(R)	rosaceous trees and shrubs					x	x
Amphipoea oculea	Ear Moth	BAP(R)	stems and roots of grasses and herbaceous plants					x	x
Anaplectoides prasina	Green Arches		polyphagous, but especially honeysuckle					x	x
Apamea crenata	Clouded-bordered Brindle		grasses		x				
Apamea epomidion	Clouded Brindle		grasses		x			x	x
Apamea lithoxylaea	Light Arches		grasses		x				
Apamea monoglypha	Dark Arches		grasses		x			x	x
Apamea remissa	Dusky Brocade	BAP(R)	grasses					x	x
Apamea sordens	Rustic Shoulder-knot		grasses	x	x			x	x
Aporophyla nigra	Black Rustic		grasses and herbaceous plants					x	x
Autographa gamma	Silver Y		nettles and other		x			x	x

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
			herbaceous plants - rarely surviving winter. Immigrants from Europe are regular						
Caradrina morpheus	Mottled Rustic	BAP(R)	herbaceous plants		x			x	x
Cerapteryx graminis	Antler Moth		grasses, especially Narduus stricta and Festuca ovina					x	x
Colocasia coryli	Nut-tree Tussock		deciduous trees and bushes					x	x
Cosmia trapezina	Dun-bar		deciduous trees		x			x	x
Craniophora ligustri	Coronet	Local	ash, occasionally privet, alder and hazel					x	
Diarsia mendica	Ingrailed Clay		shrubs and herbaceous plants	x	x				
Diarsia rubi	Small Square-spot	BAP(R)	herbaceous plants		x			x	x
Euclidia glyphica	Burnet Companion		Medicago, Trifolium and Lotus corniculatus	x	x		x		
Eugnorisma glareosa	Autumnal Rustic	BAP(R)	polyphagous on herbaceous plants and grasses					x	x
Euplexia lucipara	Small Angle Shades		bracken and other ferns					x	x
Hada plebeja	Shears		various Compositae					x	x
Herminea grisealis	Small Fan-foot		trees and bushes, but also on nettles					x	x
Hoplodrina alsines	Uncertain		herbaceous plants		x				
Hoplodrina ambigua	Vines Rustic		herbaceous plants - especially dandelions		x				
Hypena crassalis	Beautiful Snout		Bilberry - in open woodlands and in edge habitats					x	x
Hypena proboscidalis	Snout		nettles					x	x
Ipimorpha retusa	Double Kidney		Salix, especially Salix cinerea					x	x
Lacanobia oleracea	Bright-line Brown-eye		herbaceous plants	x	x			x	x
Lacanobia thalassina	Pale-shouldered Brocade		deciduous trees, shrubs and herbaceous plants					x	
Luperina testacea	Flounced Rustic		grasses		x				
Melanchra pisi	Broom Moth	BAP(R)	widely polyphagous, including on bracken	x	x			x	x
Mesapamea didyma	Lesser Common Rustic		grasses					x	x
Mesapamea secalis	Common Rustic		grasses					x	x
Mythimna comma	Shoulder-striped Wainscot	BAP(R)	grasses					x	x
Mythimna ferrago	Clay		grasses					x	x
Mythimna impura	Smoky Wainscot		grasses		x			x	x
Mythimna pallens	Common Wainscot		grasses		x			x	x

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
Mythimna pudorina	Striped Wainscot		grasses, especially Mollinia, and also Cyperaceae and Juncaceae					x	
Noctua comes	Lesser Yellow Underwing		herbaceous plants		x			x	x
Noctua interjecta	Least Yellow Underwing		shrubs and herbaceous plants					x	x
Noctua janthe	Lesser Broad-bordered Yellow U		herbaceous plants		x			x	x
Noctua pronuba	Large Yellow Underwing		herbaceous plants		x			x	x
Ochropleura plecta	Flame Shoulder		herbaceous plants	x	x			x	x
Oligia fasciuncula	Middle-barred Minor		grasses	x	x			x	x
Oligia latruncula	Tawny Marbled Minor		grasses					x	
Oligia strigilis	Marbled Minor		grasses		x			x	x
Omphaloscelis lunosa	Lunar Underwing		grasses					x	x
Paradrina clavipalpis	Pale Mottled Willow		grasses		x				
Plusia festucae	Gold Spot		herbaceous plants and grasses, especially those characteristic of marshy places					x	
Protodeltote pygarga	Marbled White Spot		grasses, especially Molinia caerulea	x	x			x	x
Rivula sericealis	Straw Dot		grasses - especially Brachypodium species			x			
Rusina ferruginea	Brown Rustic		herbaceous plants	x	x			x	x
Xanthia icteritia	Sallow	BAP(R)	sallow/willow catkins - then on herbaceous plants					x	
Xanthia togata	Pink-barred Sallow		catkins of willow and poplar - then on herbaceous plants					x	x
Xestia castanea	Neglected Rustic	BAP(R)	Heather (Calluna) and Heath (Erica)						x
Xestia c-nigrum	Setaceous Hebrew Character		herbaceous plants					x	x
Xestia sexstrigata	Six-striped Rustic		herbaceous plants					x	x
Xestia xanthographa	Square-spot Rustic		grasses and herbaceous plants then trees in the spring					x	x
Xylena vetusta	Red Sword-grass		polyphagous on trees and herbs			x			
Zanclognatha tarsipennalis	Fan-foot		withered leaves						x
Nolidae									
Nola confusalis	Least Black Arches		lime, holm oak, beech and blackthorn					x	x
Notodontidae									
Notodonta	Iron Prominent		birch, occasionally					x	x

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
dromedarius			alder or hazel						
Notodonta ziczac	Pebble Prominent		poplars and sallows/willows					x	x
Phalera bucephala	Buff-tip		deciduous trees	x				x	x
Pheosia gnoma	Lesser Swallow Prominent		birch						x
Pterostoma palpina	Pale Prominent		poplars and sallows/willows		x			x	x
Ptilodon capucina	Coxcomb Prominent		deciduous trees					x	x
Stauropus fagi	Lobster Moth		beech and oak, occasionally on birch or hazel					x	x
Oecophoridae									
Carcina quercana	The Flat Cooper		deciduous trees and bushes			x			
Pterophoridae									
Stenoptilia bipunctidactyla			Knautia species of scabious				x	x	
Pyralidae									
Agriphila latistria		Local	grasses, especially Bromus species					x	
Agriphila selasella			grasses	x	x				
Agriphila straminella			grasses			x		x	x
Agriphila tristella			grasses	x	x	x		x	x
Catoptria margaritella			boggy heaths and moors - foodplant & caterpillar unknown	x	x	x		x	
Catoptria pinella			grasses			x		x	x
Chrysoteuchia culmella			grasses	x	x	x	x	x	x
Crambus lathoniellus			grasses	x	x	x		x	x
Crambus pascuella			grasses			x		x	x
Crambus perlella			grasses					x	
Crambus pratella		NS(Nb)	roots of grasses, especially Deschampsia					x	x
Eudonia mercurella			mosses on trunks, walls etc		x			x	x
Evergestis pallidata		NS(Nb)	cruciferous plants - especially Barbarea vulgaris			x		x	
Nomophila noctuella			immigrant from overseas					x	
Pleuroptya ruralis			nettles					x	x
Scoparia ambigualis			thought to feed amongst mosses		x			x	x
Scoparia pyralella			decaying plant material		x				
Trachycera advenella			hawthorn, occasionally rowan					x	x
Sesiidae									
Synanthedon spheciformis	White-barred Clearwing	NS(Nb)	Alder				x		
Bembecia ichneumoniformis	Six-belted Clearwing	NS(Nb)	Lotus, Anthyllis and Hippocrepis - in the rootstock		x	x			
Sphingidae									

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
Deilephila elpenor	Elephant Hawk-moth		rosebay willow-herb	x				x	x
Deilephila porcellus	Small Elephant Hawk-moth		bedstraws	x	x			x	x
Laothoe populi	Poplar Hawk-moth		poplars and sallows/willows					x	x
Smerinthus ocellata	Eyed Hawk-moth		sallow, apple			x		x	
Thyatiridae									
Ochropacha duplaris	Common Lutestring		birch, occasionally on oak, hazel or alder					x	x
Tetheella fluctuosa	Satin Lutestring	Local	birch					x	x
Thyatira batis	Peach Blossom		bramble					x	x
Tortricidae									
Acleris rhombana			deciduous trees and shrubs					x	x
Agapeta hamana			thistles - in the roots					x	x
Apotomis betuletana			birch					x	x
Apotomis turbidana			birch						x
Celypha lacunana			herbaceous plants	x	x	x		x	x
Cochylis atricapitana			ragwort			x			
Cydia nigricana			Lathyrus, Vicia and also on cultivated peas - feeding inside the seed pods		x				
Cydia pomonella			fruits of rosaceous trees, especially apple					x	x
Cydia splendana			oak					x	x
Epiblema cynosbatella			shoots of rose and bramble					x	x
Epiblema scutulana			thistles - in the root and lower stem						x
Epinotia bilunana			Birch - feeding in the catkins				x	x	x
Eupoecilia angustana			various flowers, including Yarrow, plantain and others					x	
Grapholita compositella			Trifolium and Lotus	x	x		x		
Grapholita lunulana			feeds on Lathyrus vetches and pea plants	x					
Lathronympha strigana			St John's-wort				x		
Pammene fasciana		NS(Nb)	oak and sweet chestnut - feeding inside the fruit						
Pandemis corylana			deciduous trees and shrubs					x	x
Tortrix viridana	Green Oak Tortrix		oak					x	x
Yponomeutidae									
Argyresthia brockeella			birch and alder				x		
Yponomeuta evonymella			Prunus padus - but also an immigrant from overseas					x	
Zygaenidae									
Zygaena filipendulae	Six-spot Burnet		Lotus corniculatus			x			

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
MECOPTERA	**SCORPION FLIES**								
Panorpidae									
Panorpa communis			edge habitats	x	x	x	x	x	x
Panorpa germanica			edge habitats				x	x	x
NEUROPTERA	**LACEWINGS**								
Chrysopidae									
Chrysopa perla			aphid predator amongst herbage		x	x	x		
Chrysoperla carnea			aphid predator of trees and bushes	x	x	x		x	x
Chrysopidia ciliata			predatory on aphids in tree foliage				x	x	x
Dichochrysa prasina			aphid predator on various plant species	x					
Hemerobiidae									
Hemerobius micans			oak					x	x
Micromus variegatus			probably a predator of root aphids	x	x		x		
Psectra diptera			probably predatory on root aphids	x					
Wesmaelius nervosus	a brown lacewing		larvae are aphid predators on trees and bushes			x			x
ODONATA	**DRAGONFLIES AND DAMSELFLIES**								
Coenagriidae									
Coenagrion puella	Azure Damselfly		well-vegetated water bodies, the adults flying from May to August	x		x			
Pyrrhosoma nymphula	Large Red Damselfly		found in most slow-moving and static water bodies from April to September			xx			
Lestidae									
Lestes sponsa	Emerald Damselfly		static water-bodies fringed with rushes, the adults flying from late June to September			xx			
Libellulidae									
Libellula depressa	Broad-bodied Chaser		water-bodies with abundant emergent vegetation			xx			
Sympetrum striolatum	Common Darter dragonfly		water-bodies with emergent vegetation, flying mid June to October and often wandering	x					
ORTHOPTERA	**GRASSHOPPERS AND CRICKETS**								
Acrididae									
Chorthippus brunneus	Field grasshopper		grassland			x			

Group / species	English name	National Status	Main ecological associations	Location on site					
				G1	G2	G3/4	G5	W1	W2
Chorthippus parallelus	Meadow grasshopper		grassland			x			
Myrmeleotettix maculatus	Mottled Grasshopper		short turf with bare ground and maximum sunshine - especially on chalk			x			
Omocestus viridulus	Common Green Grasshopper		tall, undisturbed calcareous grassland				x		
PLECOPTERA	**STONEFLIES**								
Nemouridae									
Nemoura cambrica			flowing waters				xx		
Nemurella picteti			flowing waters				xx		
TRICHOPTERA	**CADDISFLIES**								
Beraeidae									
Beraea pullata			unshaded springs, marshes and stream margins				xx		
Leptoceridae									
Adicella reducta			impoverished waters, flowing often among tree roots.	x					
Limnephilidae									
Limnephilus centralis			uplands trickles, small, usually temporary ditches and pools	x					

APPENDIX 2: INVERTEBRATE STATUS CODES

Earlier published reviews of scarce and threatened invertebrates employed the Red Data Book criteria used in the British Insect Red Data Book (Shirt 1987) with the addition of the category RDBK (Insufficiently Known) after in 1983. In addition, the status category Nationally Notable (now termed Nationally Scarce) was used from 1991. The original criteria of the International Union for the Conservation of Nature (IUCN – now called the World Conservation Union) for assigning threat status used in these publications had the categories *Endangered*, *Vulnerable*, and *Rare*, which were defined rather loosely and without quantitative parameters. The application of these categories was largely a matter of subjective judgment, and it was not easy to apply them consistently within a taxonomic group or to make comparisons between groups of different organisms. The deficiencies of the old system were recognised internationally, and in the mid-1980s proposals were made to replace it with a new approach which could be more objectively and consistently applied. In 1989, the lUCN's Species Survival Commission Steering Committee requested that a new set of criteria be developed to provide an objective framework for the classification of species according to their extinction risk. The first, provisional, outline of the new system was published in 1991. This was followed by a series of revisions, and the final version adopted as the global standard by the IUCN Council in December 1994. The guidelines were recommended for use also at the national level. In 1995, the Joint Nature Conservation Committee (JNCC) endorsed their use as the new national standard for Great Britain, and subsequent British Red Data Books have used these revised IUCN criteria. These criteria are used in this present report and are as follows:

EXTINCT (EX) A species is *Extinct* when there is no reasonable doubt that the last individual has died.

EXTINCT IN THE WILD A species is *Extinct* in the wild when it is known to survive only in cultivation, in captivity or as a naturalised population (or populations) well outside the past range.

CRITICALLY ENDANGERED
A species is *Critically Endangered* when it is facing an extremely high risk of extinction in the wild in the immediate future, as defined by any of the following criteria:

A. Population reduction in the form of either of the following:

1. An observed, estimated, inferred or suspected reduction of at least 80% over the last 10 years or three generations, whichever is the longer, based on direct observation, an index of abundance appropriate for the species, a decline in area of occupancy, extent of occurrence and/or quality of habitat, actual or potential levels of exploitation or the effects of introduced species, hybridisation, pathogens, pollutants, competitors or parasites.
2. A reduction of at least 80%, projected or suspected to be met within the 10 years or three generations, whichever is the longer, based any of these parameters.

B. Extent of occurrence estimated to be less than 100 Km^2 or areas of occupancy estimated to be less than 10 Km^2 and estimates indicating any <u>two</u> of the following:

1. Severely fragmented or known to exist at only a single location.
2. Continuing decline, observed, inferred or projected, in any of the following: a. extent of occurrence b. area of occupancy c. area, extent and/or quality of habitat d. number of locations or sub-populations e. number of mature individuals
3. Extreme fluctuations in extent of occurrence, area of occupancy, number of locations or sub-populations or number of mature individuals.

C. Population estimated to number less than 250 mature individuals and either:

1. An estimated continuing decline of at least 25% within 3 years or one generation, whichever is longer or
2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either severely fragmented *(i.e.* no sub-population estimated to contain more than 50 mature individuals) or all individuals are in a single sub-population

D. British population estimated to number less than 50 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild of at least 50% within 10 years or 3 generations, whichever is the longer.

ENDANGERED (Formerly RDB category 1)

A species is Endangered when it is not *Critically Endangered* but is facing a very high risk of extinction in the wild in the near future, as defined by any of the following criteria:

A. Population reduction in the form of either of the following:

1. An observed, estimated, inferred or suspected reduction of at least 50% over the last 10 years or three generations, whichever is the longer, based on direct observation, an index of abundance appropriate for the species, a decline in area of occupancy, extent of occurrence and/or quality of habitat, actual or potential levels of exploitation or the effects of introduced species, hybridisation, pathogens, pollutants, competitors or parasites.
2. A reduction of at least 50%, projected or suspected to be met within the 10 years or three generations, whichever is the longer, based any of these parameters.

B. Extent of occurrence estimated to be less than 5,000 Km^2 or areas of occupancy estimated to be less than 10 Km^2 and estimates indicating any <u>two</u> of the following:

1. Severely fragmented or known to exist at no more than five locations.
2. Continuing decline, observed, inferred or projected, in extent of occurrence, area of occupancy, area, extent and/or quality of habitat, number of locations or sub-populations or the number of mature individuals.

C. Population estimated to number less than 2500 mature individuals and either:

1. An estimated continuing decline of at least 20% within 5 years or 2 generations, whichever is longer or
2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either severely fragmented *(i.e.* no sub-population estimated to contain more than 250 mature individuals) or all individuals are in a single sub-population

D. British population estimated to number less than 250 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild of at least 20% within 20 years or 5 generations, whichever is the longer..

VULNERABLE (Formerly RDB category 2)

A species is *Vulnerable* when it is not *Critically Endangered or Endangered but* is facing a high risk of extinction in the wild in the medium-term future, as defined by any of the following criteria (A to E):

A. Population reduction in the form of either of the following:

1. An observed, estimated, inferred or suspected reduction of at least 20% over the last 10 years or three generations, whichever is the longer, based on direct observation, an index of abundance appropriate for the species, a decline in area of occupancy, extent of occurrence and/or quality of habitat, actual or potential levels of exploitation or the effects of introduced species, hybridisation, pathogens, pollutants, competitors or parasites.
2. A reduction of at least 20%, projected or suspected to be met within the 10 years or three generations, whichever is the longer, based any of these parameters.

B. Extent of occurrence estimated to be less than 20,000 Km^2 or areas of occupancy estimated to be less than 20,000 Km^2 and estimates indicating any <u>two</u> of the following:

1. Severely fragmented or known to exist at no more than ten locations. Continuing decline, observed, inferred or projected, in extent of occurrence, area of occupancy, area, extent and/or quality of habitat, number of locations or sub-populations or the number of mature individuals.
2. Extreme fluctuations in extent of occurrence, area of occupancy, number of locations or sub-populations or number of mature individuals.

C. Population estimated to number less than 10,000 mature individuals and either:

1. An estimated continuing decline of at least 10% within 10 years or 3 generations, whichever is longer or
2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either severely fragmented *(i.e.* no sub-population estimated to contain more than 1000 mature individuals) or all individuals are in a single sub-population

D. Population very small or restricted in the form of either of the following:

1. Population estimated to number less than 1,000 mature individuals.
2. Population is characterised by an acute restriction in its area of occupancy (typically less than 100 km) or in the number of locations (typically less than 5). Such a species would thus be prone to the effects of human activities (or stochastic events whose impact is increased by human activities) within a very short period of time in an unforeseeable future, and is thus capable of becoming *Critically Endangered* or even *Extinct* in a very short period.

E. Quantitative analysis showing the probability of extinction in the wild of at least 10% within 100 years.

LOWER RISK (Formerly RDB category 3)
A species is Lower Risk when it has been evaluated but does not satisfy the criteria for any of the categories *Critically Endangered, Endangered* or *Vulnerable.* Species included in the Lower Risk category can be separated into three sub-categories:

• **Conservation Dependent** species which are the focus of a continuing species -specific or habitat-specific conservation program targeted towards the species in question, the cessation of which would result in the species qualifying for one of the threatened categories above within a period of five years.

• **Near Threatened** Species which do not qualify for *Lower Risk (Conservation Dependent),* but which are close to qualifying for *Vulnerable.*

• **Least Concern**
Species which do not qualify for *Lower Risk (Conservation Dependent)* or *Lower Risk (Near Threatened).*

DATA DEFICIENT A species is *Data Deficient* when there is inadequate information to make a direct or indirect assessment of its risk of extinction based on its distribution and/or population status. A species in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. *Data Deficient* is therefore not a category of threat or Lower Risk.

LOWER RISK (NATIONALLY SCARCE – FORMERLY NATIONALLY NOTABLE)
Species which are not included within the IUCN threat categories and are estimated to occur less than 100 hectads of the Ordnance Survey national grid in Great Britain. It should be noted that Lower Risk (Nationally Scarce) is not a threat category, but rather an estimate of the extent of distribution of these species. Lower Risk species are subdivided as follows:

Na species estimated to occur within the range of 16 to 30 10-kilometre squares of the National Grid System.

Nb species estimated to occur within the range 31 to 100 10-kilometre squares of the National Grid System.

N Diptera (flies) not separated, falling into either category Na or Nb.

NATIONALLY LOCAL (L)
Species which, whilst fairly common, are evidently less widespread than truly common species, but also not qualifying as Nationally Notable having been recorded from over one hundred, but less than three hundred, ten-kilometre squares of the UK National Grid.

ASSOCIATED DEFINITIONS

Extent of occurrence
Extent of occurrence is defined as the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence of a species, excluding cases of vagrancy. This measure may exclude discontinuities or disjunctions within the overall distributions of species (e.g. large areas of obviously unsuitable habitat) (but see 'area of occupancy'). Extent of occurrence can often be measured by a minimum convex polygon (the smallest polygon in which no internal angle exceeds 180 degrees and which contains all the sites of occurrence).

Area of occupancy
Area of occupancy is defined as the area within its 'extent of occurrence' (see definition) which is occupied by a species, excluding cases of vagrancy. The measure reflects the fact that a species will not usually occur throughout the area of its extent of occurrence, which may, for example, contain unsuitable habitats. The area of occupancy is the smallest area essential at any stage to the survival of existing populations of a species *(e.g.* colonial nesting sites, feeding sites for migratory species). The size of the area of occupancy will be a function of the scale at which it is measured, and should be at a scale appropriate to relevant biological aspects of the species. The criteria include values in km^2, and thus to avoid errors in classification, the area of occupancy should be measured on grid squares (or equivalents) which are sufficiently small.

APPENDIX 7

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Cwm Glo a Glyndrys SSSI

Merthyr Tydfil

INVERTEBRATE SURVEY REPORT

September 2018

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1.0 INTRODUCTION

1.1 Introductory comments

Colliery Spoil Biodiversity Initiative was commissioned by **Bioscan (UK)** to undertake an invertebrate survey at Cwm Glo a Glyndrys SSSI, Merthyr Tydfil, South Wales. The boundary of the surveyed area is indicated in **Map 1**.

This report details the results of that survey, which was conducted over several daytime visits between June and September 2018. This survey aimed to build upon the previous invertebrate work undertaken by Colin Plant Associates (UK) Consultant Entomologists in 2015 (**Report number BS/2949/15**) and address current 'gaps' in invertebrate knowledge at Cwm Glo a Glyndrys SSSI.

It is anticipated that the results presented in this report will be used to inform the Environmental Impact Assessment (EIA) for the proposed development at Cwm Glo a Glyndrys SSSI.

1.2 Invertebrate sampling methodology

Terrestrial invertebrates were sampled using several different active sampling techniques including:

- **Aerial netting** - a lightweight 40cm diameter net mounted on a meter long pole was used to catch flying insects as and when encountered.
- **Beating trees and bushes** - a beating tray, consisting of a white cloth sheet supported by a frame, was positioned below branches of trees and bushes which were subsequently tapped with a stick to dislodge insects within the foliage. Target taxa were then selectively removed using an aspirator (or pooter).
- **Hand searching** - this involved sieving leaf litter, bark peeling, looking under/inside rotting logs, and looking under stones/boulders for invertebrates that may be feeding, resting or sheltering.
- **Suction-sampling** (i.e. vacuum sampling) - a modified leaf-blower was used to collect invertebrates from habitats that would otherwise be difficult to sample from using a sweep net (e.g. very short or very long vegetation). This method is particularly effective at catching species which do not fly readily or which live in deep vegetation. Samples were emptied into a sturdy sweep net and target taxa selectively removed using an aspirator.
- **Sweep netting** - a sturdy 40cm diameter net mounted on a meter long pole was moved vigorously through long vegetation and over bushes and tree foliage to dislodge invertebrates. Target invertebrates were then selectively removed from the sweep net using an aspirator.

1.3 Target groups

Principal target groups for the survey were:

- **Arachnida** → Araneae (spiders) , Opiliones (harvestmen) and Pseudoscorpiones (pseudoscorpions)
- **Hymenoptera** → Aculeata (bees, wasps and ants)
- **Isopoda** (woodlice)
- **Mollusca** (slugs and snails)
- **Myriapoda** → Chilopoda (centipedes) and Diplopoda (millipedes)

These groups were selected as they have been under-represented in previous invertebrate surveys at Cwm Glo a Glyndrys SSSI. By targeting these groups, a more balanced overview of the invertebrate fauna present will be achieved.

Areas considered to be of greatest value to invertebrates were targeted in suitable weather conditions in order to achieve coverage of the target groups. This included damp, wooded habitats for many of the non-insect invertebrate groups (e.g. isopods, molluscs and myriapods), and flower-rich open habitats for aculeates (especially bees and wasps). Floristically-rich areas were searched regularly during the day so as to record any flower-visiting insects. Bare and sparsely vegetated ground, particularly south-facing slopes, were also readily observed for nesting aculeates, and species hand netted where seen.

Incidental records of other groups were also recorded when encountered. Where practical, invertebrates were identified in the field. Where necessary, specimens were collected and later identified using a x20 binocular microscope. Most samples were stored dry and later pinned to aid identification, with the exception of arachnids, collembola, diplurans, isopods and myriapods which were stored in 70 to 90% alcohol. Invertebrate identification was to species level wherever possible. Fieldwork, and the subsequent identification of samples, was undertaken by Liam Olds and Christian Owen using the appropriate identification keys and confirmed using verified voucher material.

1.4 Survey limitations

Guidelines for invertebrate survey recommend survey visits from approximately May to September in order to obtain an adequate cross-seasonal representation of invertebrate species present. This level of coverage has not been fully achieved because sampling was not undertaken prior to June. This may explain the fewer than anticipated solitary bee species encountered during the survey, a proportion of which are spring-flying *Andrena* and *Nomada* species. However, as the majority of our target taxa were active throughout the survey period, we are of the opinion that the absence of a spring survey is not likely to significantly alter our overall conclusions drawn here.

2.0 RESULTS

2.1 Overview

At total of **268** terrestrial invertebrate species were positively identified through our survey at Cwm Glo a Glyndrys SSSI (hereinafter referred to simply as Cwm Glo) - a full list of all

recorded invertebrate species is presented in **Appendix 1**. The list is annotated with formal National Status codes, where applicable. These status codes are explained in **Appendix 2**. Where National Status is blank, species are considered to be common and widespread.

With reference to the invertebrate species list compiled by Colin Plant Associates (UK) Consultant Entomologists in 2015 (**Report number BS/2949/15**), it appears that **174** of the 268 species have not been previously recorded at Cwm Glo and are thus **'new'** to the site.

Please note that to avoid the duplication of information, only species considered 'new' to Cwm Glo are hereinafter discussed - with the exception of Marsh fritillary butterfly (*Euphydryas aurinia*) which was included because our additional records could prove useful given its legal protection. The reader should refer to Colin Plant Associates (UK) Consultant Entomologists (Report number BS/2949/15) should they require information on 'species of conservation interest' not discussed in this report.

2.2 Species of conservation interest

Of the **174** 'new' species to be added to the Cwm Glo invertebrate species list, just **14** are deemed to be of conservation interest (i.e. species considered to be nationally local, scarce or rare, and/or are listed under Section 7 of the Environment (Wales) Act 2016 as Species of Principal Importance in Wales). The distribution of these species at Cwm Glo, excluding National Local species, is shown in **Map 2**.

2.2.1 Species of Principal Importance in Wales under Section 7 of the Environment (Wales) Act 2016

Section 7 of the Environment (Wales) Act 2016 includes a statutory list of species deemed to be "*of principal importance for the purpose of maintaining and enhancing biodiversity in relation to Wales*". This replaces Section 42 of the Natural Environment and Rural Communities (NERC) Act 2006 and places a duty on Welsh Ministers to take all reasonable steps to maintain and enhance the living organisms and types of habitat included in any list published under this section, and encourage others to take such steps.

A total of **3** invertebrate species recorded during the survey are listed under Section 7 of the Environment (Wales) Act 2016.

The Dingy skipper (*Erynnis tages*) is listed under Section 7 of the Environment (Wales) Act 2016 as a Species of Principle Importance in Wales because it has experienced a severe decline in its UK distribution since the 1970s. It is also considered 'Vulnerable' in The Butterfly Red List for Great Britain (Fox, Warren & Brereton, 2010). It can be found in a variety of habitats including dunes, sea cliffs, heathland and woodland glades, however the largest colonies occur on sunny, south-facing downland slopes. The main larval foodplant is Common bird's-foot-trefoil (*Lotus corniculatus*), but Greater bird's-foot-trefoil (*L. pedunculatus*) and Horseshoe vetch (*Hippocrepis comosa*) is also used. Dingy skipper requires its larval foodplants close to areas of bare ground, which provide warm conditions

for egg development. At Cwm Glo, this species was recorded in the early-successional grasslands at SO046051 and SO047051, a typical habitat for this species.

The Marsh Fritillary (*Euphydryas aurinia*) is regarded as a species threatened with extinction throughout Europe and in recognition of this it is included in Annexe II of the Berne Convention on the Conservation of European Habitats and Wildlife and in Annexe II of the European Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (known generally as the European Habitats and Species Directive). In the UK, it is protected under the Wildlife and Countryside Act (1981), Countryside and Rights of Way Act (2000), and other UK legislation. It is also listed on Section 7 of the Environment (Wales) Act 2016 as a Species of Principle Importance in Wales and considered 'Vulnerable' in The Butterfly Red List for Great Britain (Fox, Warren & Brereton, 2010).

The Marsh fritillary was once widespread in Britain but declined severely during the twentieth century. Populations are highly volatile and the species requires extensive habitats or habitat networks for its long term survival. The larvae feed on Devil's-bit scabious (*Succisa pratensis*) growing in marshy grassland or rhôs pasture. At Cwm Glo, at least 15 Marsh fritillary larval webs were found in the purple moor-grass and rush pasture fields around SO041046 – please see **Map 2** for further details regarding the location of these records. These larval webs were discovered on 9th August 2018. From discussions with other invertebrate records, we are under the impression that Marsh fritillary is also present in wider grassland areas at Cwm Glo where Devil's-bit scabious is growing. Please note that we did not undertake targeted surveying of Marsh fritillary at Cwm Glo and these records were merely observations made when recording other invertebrates in the same habitat.

The Grayling (*Hipparchia semele*) is listed under Section 7 of the Environment (Wales) Act 2016 as a Species of Principle Importance in Wales because it too has experienced a severe decline in its UK distribution since the 1970s. It is also considered 'Vulnerable' in The Butterfly Red List for Great Britain (Fox, Warren & Brereton, 2010). The main habitat requirement for this butterfly is sheltered, sunny and dry sites with sparse vegetation and bare ground. As such, this butterfly particularly thrives on free-draining, sparsely-vegetated colliery spoil tips - the habitat upon which it is also evidently utilising at Cwm Glo. The main larval foodplants are Bristle bent (*Agrostis curtisii*), Early hair-grass (*Aira praecox*), Red fescue (*Festuca rubra*) and Sheep's-fescue (*F. ovina*). Adults feed on Common bird's-foot-trefoil, bramble, Carline thistle (*Carlina vulgaris*), heathers (*Calluna vulgaris* and *Erica*), Marjoram (*Origanum vulgare*), Red clover (*Trifolium pratense*) and Teasel (*Dipsacus fullonum*). At Cwm Glo, this species was recorded on the south-facing slopes of the colliery spoil tip at SO040055. It is anticipated that this species is also utilising other similar spoil tips within the survey area.

2.2.2 Nationally Scarce species

A total of **5** invertebrate species recorded during the survey are designated as 'Nationally Scarce'.

The **Cat's-ear mining bee (*Andrena humilis*)** is a solitary bee found in a variety of habitats featuring compacted soils including heathland and acid grassland, soft rock cliffs, coastal grassland, open heathy woodland, sandpits and sandy brownfield sites. Pollen is gathered entirely from yellow hawkish composites such as Cat's-ear (*Hypochaeris radicata*), Mouse-ear hawkweed (*Hieracium pilosella*), hawk's-beards, hawkbits and dandelions. Nesting is usually in sandy ground, especially footpaths but slopes and vertical banks are also used. Nesting can occur in large and dense aggregations. At Cwm Glo, this species was recorded foraging on yellow composites in coal spoil grassland at SO045050.

The **millipede *Brachychaeteuma melanops*** often occurs in synanthropic sites but is also found in semi-natural habitats. It is most frequently recorded from calcareous soils. At Cwm Glo, this species was largely found under rocks and deadwood in woodland, especially around the stream at SO042054, though also along the wooded railway line at SO043054.

The **weevil *Glocianus punctiger*** is associated with *Taraxacum* dandelions where the larvae feed on seeds in the flower heads. At Cwm Glo, this species was recorded near the ditch at SO044050.

The **millipede *Leptoiulus belgicus*** is associated with a wide range of different habitats with no particular preference evident. At Cwm Glo, this species was found throughout the site in leaf litter and under rocks.

The **centipede *Lithobius macilentus*** is a species which is characteristic of rural, semi-natural woodland, but it has been reported from other habitats also. At Cwm Glo, this species was largely found under rocks and deadwood in woodland, especially around the stream at SO042054, though also along the wooded railway line at SO043054.

A further **2** invertebrate species recorded during the survey are not currently listed as 'Nationally Scarce', though are likely to qualify for such designation should the a status review of the taxon group in question be undertaken in the near future.

The **spider-hunting wasp *Ceropales maculata*** is found in sandy habitats such as heathlands, coastal dunes and sand pits where it is a cleptoparasite on other spider-hunting wasps of the genera *Priocnemis*, *Pompilus*, *Agenioideus*, *Arachnospila*, *Anoplius*, *Episyron* and *Auplopus*. It appears to have undergone a dramatic decline during the second half of the twentieth century in many areas, although the Welsh populations are believed to remain strong. This species is not listed in either Shirt (1987) or Falk (1991), however it has been suggested that its status be reviewed. At Cwm Glo, this species was found on the south-facing slopes of the colliery spoil tip at SO039055.

The **plant bug *Hoplomachus thunbergii*** is associated with Mouse-ear hawkweed growing in dry grassland habitats. It is widespread but scarce and is likely to be considered 'Nationally Scarce' in the next status review (T. Bantock, pers. comm.). At Cwm Glo, this species was found on Mouse-ear hawkweed growing in the coal spoil grassland at SO046049.

2.2.3 Nationally Local species

A total of **3** invertebrate species recorded during the survey are designated as 'Nationally Local'.

The **leaf beetle *Crepidodera plutus*** is associated with willows (*Salix*) in wetland habitats, the adult feeding on the leaves. At Cwm Glo, this species was swept from willows around the ditch at SO044050.

The **leaf beetle *Hydrothassa glabra*** is associated with Ranunculaceae, especially Meadow Buttercup (*Ranunculus acris*) and Creeping Buttercup (*R. repens*). At Cwm Glo, this species was swept from buttercups in the coal spoil grassland at SO046050.

The **plant bug *Kleidocerys ericae*** is associated with heathland where they feed on heathers (*Calluna vulgaris* and *Erica*). This record is significant in a Welsh context as very few records exist for this species in Wales, and just one of these is in the vice-county of Glamorgan (VC41). At Cwm Glo, this species was swept from heather at SO04520505.

2.2.4 Other species of interest

Two invertebrate species recorded at Cwm Glo are important in a **UK** context.

The **millipede *Typhlopsychrosoma sp. nov.*** was first discovered near Newbridge, South Wales, in October 2015 by Christian Owen and deemed to be a new species (Jörg Spelda, pers. comm.). The discoverey of this small, pure white millipede at Cwm Glo represents just the **second known UK (and global) site** for this as yet unnamed species. At Cwm Glo, several adults were found on disturbed ground made up of ash and slag along the stream embankment at SO042054.

The **two-pronged bristletail *Campodea sp.*** was first found under stones/boulders along the former railway line (SO043054), but was then subsequently found to be widespread amongst adjacent woodland within the SSSI boundary. These two-pronged bristletails are believed to be a species within the *Campodea* genus, though seemingly not a current British species. As such, it is believed that these **represent a species as yet unknown from Britain**, though a species 'new to science' is a possibility. Specimens have been forwarded to a European specialist and we are currently awaiting the outcome of his examination.

3.0 ANALYSIS OF SPECIES DATA

3.1 Pantheon

Our list of **268** invertebrate species was entered into the novel invertebrate assemblage analysis online tool **Pantheon** (see description below). This allowed for analysis of the invertebrate species assemblages to determine information such as the habitats present and specific assemblage types (SATs). Please note that ISIS (Invertebrate Species-habitat Information System), which was previously used for recognising invertebrate assemblage types in species lists, has now been replaced by Pantheon.

What is Pantheon? – Pantheon is an analytical tool developed by Natural England and the Centre for Ecology and Hydrology (CEH) to assist invertebrate nature conservation. Users import lists of invertebrates into Pantheon, which can then be used to analyse the species, associated habitats and resources, conservation statues and other data.

Of the 268 species entered into Pantheon, 249 had habitat scores meaning they could subsequently be analysed. We used Pantheon to identify the *Habitat* assemblage types (characterised by more widespread species) and *Specific* assemblage types (SATs) (characterised by ecologically restricted species of intrinsic nature conservation value) present at Cwm Glo. It should be noted that the *Broad* assemblage types (BATs) used in ISIS have been replaced with *Habitats* in Pantheon, which have the same function but include more species than the original BATs.

Using the 249 invertebrate species, Pantheon has generated the following results:

3.1.1 Habitat

The *Habitat* assemblage types identified as present are:

Broad biotope	Habitat	No. of species	% representation of national species pool	Species Quality Index (SQI)
open habitats	tall sward & scrub	106	4	103
open habitats	short sward & bare ground	35	3	108
tree-associated	shaded woodland floor	26	2	131
tree-associated	arboreal	14	1	121
tree-associated	decaying wood	10	<1	100
wetland	marshland	10	1	100
wetland	peatland	10	<1	100
wetland	running water	6	<1	100
wetland	lake	1	<1	100
wetland	wet woodland	1	<1	100
tree-associated	wet woodland	1	<1	100
open habitats	upland	1	<1	100

The largest assemblage (106 species) is associated with 'tall sward and scrub' habitat; this is unsurprising given that such habitats (e.g. heathland, tall sward grassland, scattered scrub, woodland edge) make up the primary structure of the site. The second (35 species) and third (26 species) largest assemblages are associated with 'short sward and bare ground' and 'shaded woodland floor' respectively. Again, this is unsurprising given the widespread occurrence of open, early-successional colliery spoil tips and mature, broadleaf woodland at Cwm Glo. A mosaic of habitats is clearly evident at Cwm Glo with no less than 12 habitats present. Such habitat mosaics are important for invertebrates, many of which require two or more habitats to complete their lifecycle.

3.1.2 Specific Assemblage Types (SATs)

The *Specific* Assemblage Types (SATs) identified as present are:

SAT Code	SAT name	No. of species	% representation of national species pool	Condition	Species Quality Index (SQI)
F002	rich flower resource	21	9	Favourable	100
F003	scrub-heath & moorland	12	3	Favourable	100
F001	scrub edge	8	3	Unfavourable	100
F112	open short sward	4	2	Unfavourable	100
F111	bare sand & chalk	3	<1	Unfavourable	100
A211	heartwood decay	3	2	Unfavourable	100
A212	bark & sapwood decay	2	<1	Unfavourable	100

Pantheon identified no less than 7 types of stenotopic (ecologically restricted) invertebrate assemblages. This is strong support for the existence of a mosaic of important habitats that combine to mutual advantage. The largest assemblage (21 species) is associated with 'rich flower resource', highlighting the importance of the flower-rich habitats at Cwm Glo. We deem the various grasslands (acid grassland and other circumneutral grassland) and purple moor grass and rough pastures (with their abundant Devil's-bit scabious) to be particularly important in this respect. The location of these grassland habitats, and other key habitats at Cwm Glo, is shown in **Map 3**.

The second largest assemble (12 species) is associated with 'scrub-heath and moorland'. Much of this habitat has developed on former coal tips, highlighting the importance of retaining such features. Both of these stenotopic units -'rich flower resource' and 'scrub-heath and moorland' - are sufficiently species-rich to be deemed to be of **favourable** condition status. Caution must be taken however in interpreting the confidence in this condition given the use of non-compliant data here (i.e. sample data gained from entirely

unstructured and open-ended collecting - not standardised). The remaining SATs are seemingly in unfavourable condition.

4.0 DISUCUSSION

It is evident from the results presented here that Cwm Glo supports a complex mosaic of different habitats supporting no less than 7 types of stenotopic (ecologically restricted) invertebrate assemblages. Of particular importance is the rich flower-rich resource, which supports the largest stenotopic invertebrate assemblage at Cwm Glo. The conservation of such flower-rich habitats should thus be a priority. Where proposed development is likely to negatively impact such habitats, appropriate mitigation should be ensured.

We positively identified a total of **268** terrestrial invertebrate species during our survey at Cwm Glo, **174** of which have not seemingly been recorded at Cwm Glo previously and are thus deemed 'new' to the site. While these stand-alone figures are unimpressive, when combined with the species list compiled by Colin Plant Associates (UK) Consultant Entomologists in 2015, taking into account duplicate species across both surveys, the total number of individual invertebrate species present at Cwm Glo now stands at **1031**. This figure includes **90** species of conservation interest (~9% of the total), which includes:

- 6 x **Section 7** species;
- 2 x **Red Data Book (RDB)** species;
- 32 x **Nationally Scarce** species;
- 47 x **Nationally Local** species; and
- 3 x **other species of conservation interest**.

On the basis of our results presented here, our experience with similar habitats in South Wales, and in light of the figures presented above, we are of the opinion that Cwm Glo a Glyndrys SSSI is of **County (Glamorgan) significance for invertebrates**. This also matches the conclusion reached by Colin Plant Associates (UK) Consultant Entomologists in Report number BS/2949/15.

5.0 IDENTIFICATION KEYS

The following identification keys were used to identify invertebrate specimens collected at Cwm Glo, in addition to unpublished keys sourced from organisers of national recording schemes:

Arachnida

- Hillyard, P.D. & Sankey, J.H.P. (1989). Harvestmen. Synopses of the British Fauna (New Series) 4 (2nd edition). London: Linnean Society of London.
- Roberts, M. J. (2001). Collins Field Guide to the Spiders of Britain and Northern Europe. London: HarperCollins Publishers Ltd.

Coleoptera

- Duff, A. G. (2016). Beetles of Britain and Ireland, Volume 4: Cerambycidae to Curculionidae. A. G. Publishing.
- Luff, M. L. (2007). The Carabidae (ground beetles) of Britain and Ireland. RES Handbook Volume 4, Part 2 (2nd edition). Shrewsbury: Field Studies Council.

Collembola

- Hopkin, S. P. (2007). A key to the Collembola (Springtails) of Britain and Ireland. Shrewsbury: Field Studies Council.

Diptera

- Belshaw, R. (1993). Tachinid flies. Diptera: Tachinidae. Handbooks for the identification of British insects 10(4ai): 1-169. Keys to British species.
- Stubbs, A. E. & Drake, M. (2001). British soldierflies and their allies: an illustrated guide to their identification and ecology. British Entomological and Natural History Society.
- Stubbs, A. E. & Falk, S. (2002). British hoverflies, an illustrated identification guide. Second edition. Reading: British Entomological and Natural History Society.
- White, I. M. (1988). Handbooks for the Identification of British Insects. Tephritid Flies, Diptera: Tephritidae, 1-134. Vol. X, Part 5(a). Royal Entomological Society London.

Hemiptera

- Biedermann, R. & Niedringhaus, R. (2009). The Plant- and Leafhoppers of Germany – Identification key to all species. Wissenschaftlich Akademischer Buchvertrieb-Fründ, Scheeßel.
- Southwood, T. R. E. & Leston, D. (1959). Land and Water Bugs of the British Isles. Frederick Warne & Co. Ltd.
- Wilson, M., Stewart, A., Biederman, R., Nickel, H. and Niedringhaus, R. (2015). The Planthoppers and Leafhoppers of Britain and Ireland - Identification keys to all families and genera and all British and Irish species not recorded from Germany. Wissenschaftlich Akademischer Buchvertrieb-Fründ, Scheeßel.

Hymenoptera

- Falk, S. J. (2015). Field Guide to the Bees of Great Britain and Ireland. British Wildlife Field Guide. London: British Wildlife Publishing.
- Skinner, G. J. & Allen, G. W. (1996). Naturalists Handbooks 24: Ants. Richmond Publishing Co. Ltd.
- Yeo, P. F. & Corbet, S. A. (1995). Naturalists' Handbooks 3: Solitary Wasps. Richmond Publishing Co. Ltd.

Isopoda

- Hopkin, S. P. (1991). A key to the woodlice of Britain and Ireland. Field Studies 7, 599–650.

Myriapoda

- Barber, A. D. (2009). Centipedes. Synopses of the British Fauna (New Series) 58. Shrewsbury: Field Studies Council.
- Blower, J. G. (1985). Millipedes. Synopses of the British Fauna (New Series) 35. London: The Linnean Society of London.

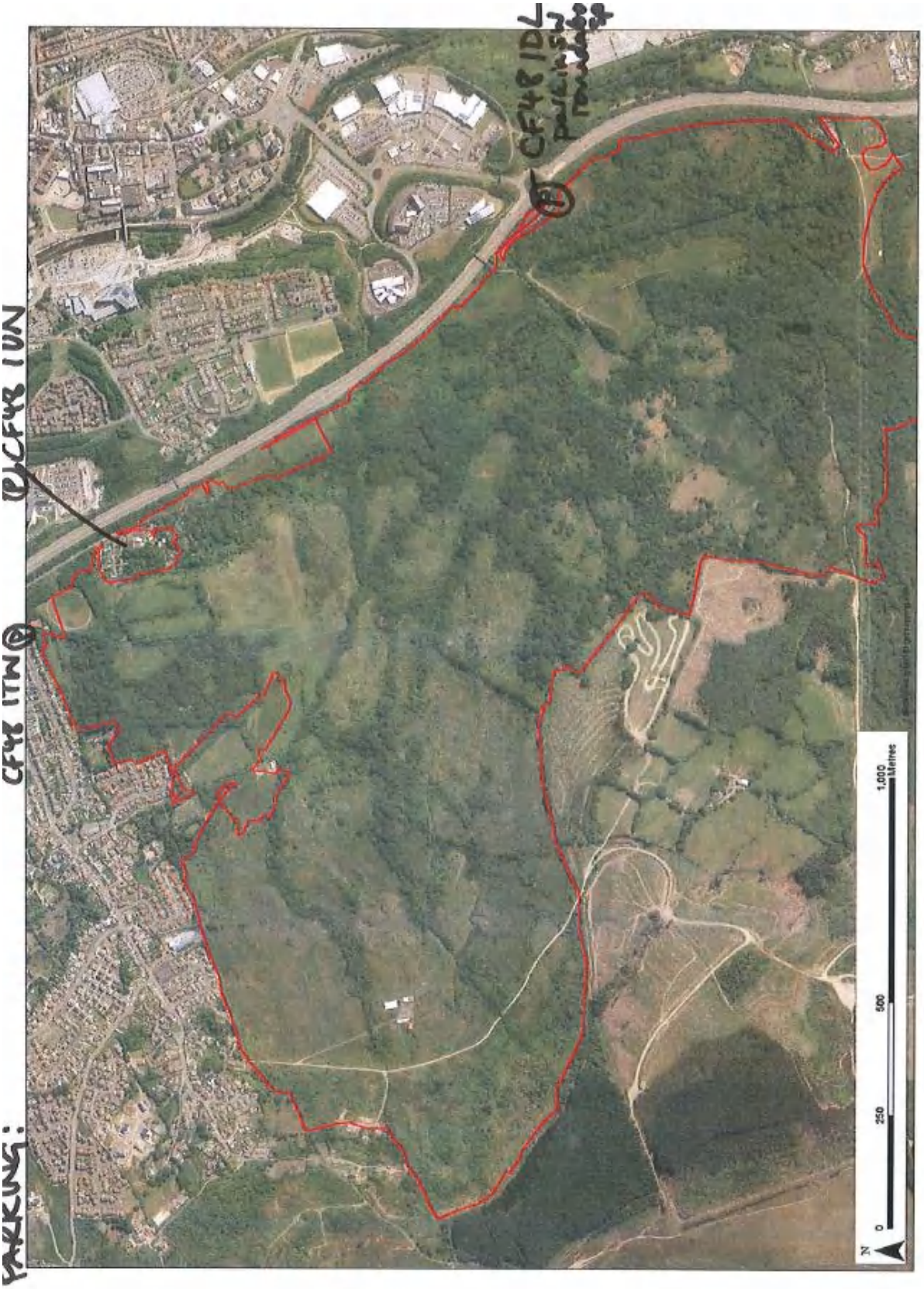
6.0 REFERENCES

Falk, S. J. (1991) A review of the scarce and threatened bees, wasps and ants of Great Britain. Research and Survey in Nature Conservation No. 35. Nature Conservancy Council, Peterborough.

Fox, R., Warren, M. S., and Brereton, T. M. (2010). A new Red List of British Butterflies, *Species Status* 12; 1-32. Joint Nature Conservation Committee, Peterborough.

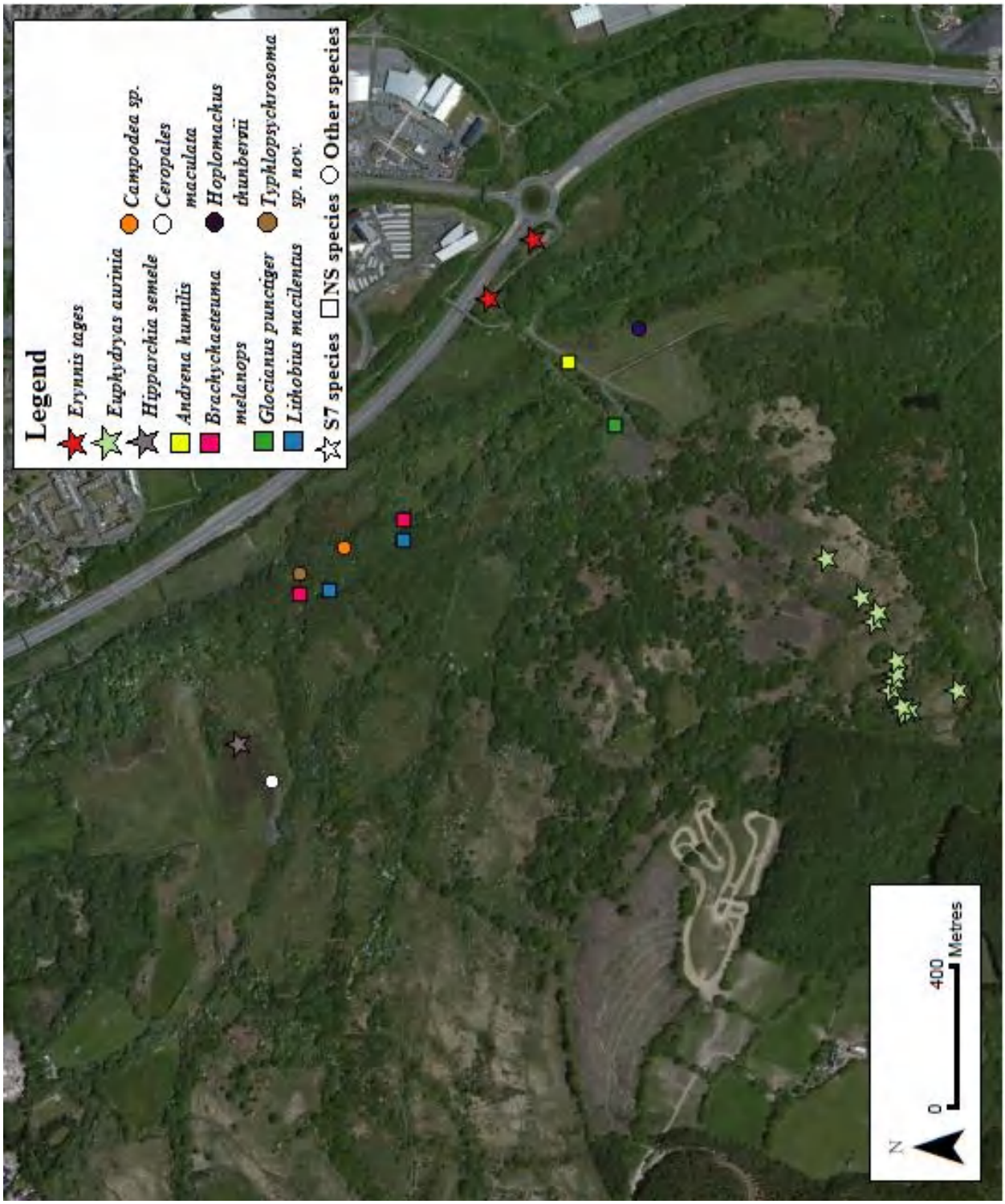
Shirt, D. B. (ed.). (1987). British Red Data Books: 2. Insects. Nature Conservancy Council.

MAP 1: Aerial photograph of Cwm Glo a Glyndrys SSSI showing the boundary of the area surveyed in 2018 (outlined in red). Aerial photograph © getmapping.com.

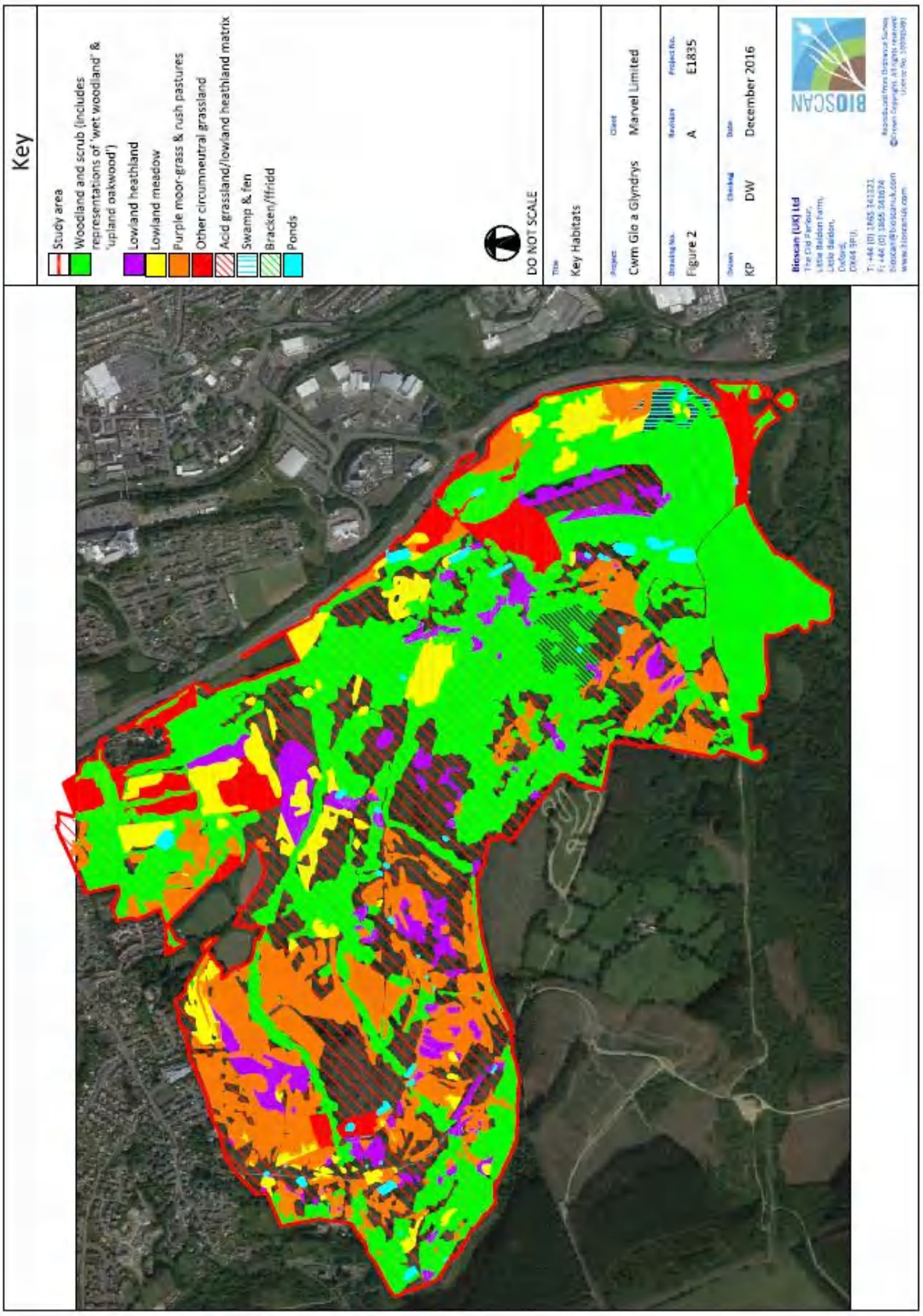


MAP 2: Aerial photograph of Cwm Glo showing the recorded locations of Section 7 (S7), Nationally Scarce (NS), and other invertebrate species of conservation interest. Aerial photograph © 2018 Microsoft Corporation, © 2018 DigitalGlobe, © CNES (2018) Distribution Airbus US.

Please note that the Nationally Scarce millipede *Leptoiulus belgicus* is not included in this map as it was found throughout the site and thus its inclusion would cause confusion.



MAP 3: Aerial photograph of Cwm Glo showing the location of key habitats © Crown Copyright.



APPENDIX 1: List of invertebrate species positively identified during the survey at Cwm Glo a Glyndrys SSSI in 2018. National status codes are explained in Appendix 2.

Group/Family/Species	English (common) name	National Status	Species new to site (Y = yes)
ARACHNIDA	**SPIDERS, HARVESTMEN & PSEUDOSCORPIONS**		
ARANEAE	**SPIDERS**		
Amaurobiidae			
Coelotes atropos			Y
Araneidae			
Agalenatea redii			Y
Araneus quadratus			Y
Clubionidae			
Clubiona reclusa			Y
Linyphiidae			
Linyphia triangularis			Y
Pisauridae			
Pisaura mirabilis			
Tetragnathidae			
Metellina merianae			Y
Pachygnatha degeeri			Y
Theridiidae			
Enoplognatha ovata			Y
Thomisidae			
Xysticus cristatus			Y
OPILIONES	**HARVESTMEN**		
Nemastomatidae			
Nemastoma bimaculatum			Y
Phalangiidae			
Leiobunum blackwalli			Y
Leiobunum rotundum			Y
Mitopus morio			Y
Phalangium opilio			Y
Platybunus triangularis			Y
Sabaconidae			
Sabacon viscayanum subsp. ramblaianum			Y
PSEUDOSCORPIONES	**PSEUDOSCORPIONS**		
Chthoniidae			
Chthonius ischnocheles			Y
Chthonius tenuis			Y
Neobisiidae			

Neobisium carcinoides			Y
CHILOPODA	**CENTIPEDES**		
Cryptopidae			
Cryptops hortensis			Y
Cryptops parisi			Y
Geophilidae			
Geophilus truncorum			Y
Himantariidae			
Haplophilus subterraneus			Y
Lithobiidae			
Lithobius forficatus			Y
Lithobius macilentus		**NS**	Y
Lithobius microps			Y
Lithobius variegatus			Y
CLITELLATA	**EARTHWORMS**		
Lumbricidae			
Allolobophora chlorotica			
COLEOPTERA	**BEETLES**		
Apionidae			
Ischnopterapion loti			
Protapion apricans			
Cantharidae			
Cantharis nigra			
Rhagonycha limbata			
Carabidae			
Abax parallelepipedus			
Agonum gracile			
Asaphidion curtum			Y
Bembidion deletum			Y
Bembidion tetracolum			Y
Cicindela campestris			Y
Cychrus caraboides			Y
Leistus fulvibarbis			Y
Loricera pilicornis			Y
Nebria brevicollis			Y
Notiophilus biguttatus			Y
Paranchus albipes			Y
Poecilus versicolor			Y
Pterostichus madidus			
Pterostichus niger			Y
Pterostichus strenuus			

Chrysomelidae			
Crepidodera fulvicornis			
Crepidodera plutus		**Local**	Y
Donacia simplex		**Local**	
Galerucella lineola			
Hydrothassa glabra		**Local**	Y
Oulema obscura			
Plateumaris discolor			
Coccinellidae			
Chilocorus renipustulatus			Y
Coccinella hieroglyphica		**Local**	
Coccinella septempunctata			
Propylea quattuordecimpunctata			
Curculionidae			
Anthonomus rubi			
Barypeithes araneiformis			
Glocianus punctiger		**NS (Nb)**	Y
Polydrusus cervinus			
Polydrusus splendidus		**NS (Na)**	
Sitona suturalis			
Tachyerges salicis			
Trichosirocalus troglodytes			
Elateridae			
Agriotes lineatus			
Agriotes pallidulus			
Hydrophilidae			
Cercyon melanocephalus			Y
Coelostoma orbiculare			
Cryptopleurum minutum			
Helophorus aequalis			Y
Helophorus brevipalpis			Y
Helophorus obscurus			Y
Sphaeridium scarabaeoides			Y
Oedemeridae			
Oedemera lurida		**Local**	
Rhynchitidae			
Temnocerus nanus		**Local**	
Scarabaeidae			
Aphodius rufipes			
Aphodius sphacelatus			Y
Aphodius sticticus			Y
Onthophagus similis			Y
Phyllopertha horticola			
Silphidae			

Nicrophorus vespilloides			Y
Staphylinidae			
Scaphidium quadrimaculatum			Y
COLLEMBOLA	**SPRINGTAILS**		
Dicyrtomidae			
Dicyrtomina ornata			Y
Entomobryidae			
Entomobrya intermedia			Y
Orchesella villosa			Y
Isotomidae			
Isotoma viridis			Y
Sminthuridae			
Sminthurus viridis			Y
Tomoceridae			
Pogonognathellus longicornis			Y
Tomocerus minor			Y
DIPLOPODA	**MILLIPEDES**		
Blaniulidae			
Archiboreoiulus pallidus			Y
Blaniulus guttulatus			Y
Brachychaeteumatidae			
Brachychaeteuma melanops			Y
Chordeumatidae			
Chordeuma proximum			Y
Craspedosomatidae			
Nanogona polydesmoides			Y
Glomeridae			
Glomeris marginata			Y
Julidae			
Cylindroiulus britannicus			Y
Cylindroiulus punctatus			Y
Leptoiulus belgicus		**NS**	Y
Ommatoiulus sabulosus			Y
Ophyiulus pilosus			Y
Tachypodoiulus niger			Y
Macrosternodesmidae			
Macrosternodesmus palicola			Y
Ophiodesmus albonanus			Y
Polydesmidae			
Brachydesmus superus			Y
Polydesmus angustus			Y
Vandeleumatidae			

Typhlopsychrosoma sp. nov.		**Unknown**	Y
DIPLURA	**TWO-PRONGED BRISTLETAILS**		
Campodeidae			
Campodea sp.		**Unknown**	Y
DIPTERA	**TRUE FLIES**		
Asilidae			
Leptogaster cylindrica			Y
Machimus atricapillus			Y
Limoniidae			
Epiphragma ocellare		**Local**	
Micropezidae			
Micropeza corrigiolata		**Local**	
Platystomatidae			
Rivellia syngenesiae		**Local**	
Rhagionidae			
Chrysopilus cristatus			
Sciomyzidae			
Ilione albiseta			Y
Limnia unguicornis			Y
Pherbina coryleti			
Tetanocera elata			
Stratiomyidae			
Beris fuscipes/geniculata			
Syrphidae			
Chrysotoxum festivum			Y
Criorhina berberina			Y
Eristalis intricarius			Y
Eupeodes luniger			
Ferdinandea cuprea			Y
Leucozona glaucia			
Myathropa florea			
Scaeva pyrastri			Y
Sericomyia (Arctophila) superbiens			Y
Syrphus ribesii			
Volucella bombylans			
Volucella pellucens			Y
Tachinidae			
Nowickia ferox			
Tachina grossa			Y
Tephritidae			
Urophora jaceana			

HEMIPTERA: AUCHENORRHYNCHA	**PLANTHOPPERS & LEAFHOPPERS**		
Aphrophoridae			
Aphrophora alni			
Neophilaenus lineatus			
Philaenus spumarius			
Cicadellidae			
Cicadella viridis			
Cicadula aurantipes			
Conosanus obsoletus			
Euscelis incisus			
Delphacidae			
Criomorphus albomarginatus			Y
Javesella dubia			
Kelisia vittipennis			
HEMIPTERA: HETEROPTERA	**TRUE BUGS**		
Acanthosomatidae			
Elasmostethus interstinctus			
Coreidae			
Coreus marginatus			Y
Lygaeidae			
Chilacis typhae			Y
Drymus sylvaticus			Y
Kleidocerys ericae		**Local**	Y
Kleidocerys resedae			
Pachybrachius fracticollis			
Miridae			
Acetropis gimmerthalii			Y
Adelphocoris lineolatus			Y
Calocoris roseomaculatus			
Capsus ater			
Closterotomus fulvomaculatus			Y
Closterotomus norwegicus			
Compsidolon salicellum			Y
Dicyphus stachydis			Y
Grypocoris stysi			
Hoplomachus thunbergii		**Scarce**	Y
Leptopterna dolabrata			
Leptopterna ferrugata			Y
Liocoris tripustulatus			
Lygocoris rugicollis			
Lygus cf. pratensis			Y
Mecomma ambulans			Y

Notostira elongata			
Orthotylus ericetorum			Y
Orthotylus marginalis			
Phytocoris varipes			Y
Pithanus maerkelii			
Plagiognathus arbustorum			
Plagiognathus chrysanthemi			
Platycranus bicolor			Y
Polymerus palustris		**Local**	
Stenotus binotatus			
Trigonotylus ruficornis			
Nabidae			
Himacerus mirmicoides			Y
Nabis limbatus			
Nabis ericetorum			Y
Pentatomidae			
Palomena prasina			
Picromerus bidens			Y
Piezodorus lituratus			
Saldidae			
Saldula saltatoria			
Scutelleridae			
Eurygaster testudinaria			
HYMENOPTERA: ACULEATA	**BEES, WASPS & ANTS**		
Andrenidae			
Andrena bicolor			Y
Andrena chrysosceles			Y
Andrena cineraria			Y
Andrena humilis		**NS (Nb)**	Y
Andrena minutula			Y
Andrena subopaca			Y
Andrena wilkella			Y
Apidae			
Bombus hortorum	Garden bumblebee		Y
Bombus hypnorum	Tree bumblebee		
Bombus jonellus	Heath bumblebee		Y
Bombus lapidarius	Red-tailed bumblebee		
Bombus monticola	Bilberry bumblebee		
Bombus pascuorum	Common carder bee		
Bombus pratorum	Early bumblebee		
Bombus terrestris	Buff-tailed bumblebee		Y
Nomada flavoguttata			Y
Colletidae			

Colletes succinctus			Y
Crabronidae			
Ectemnius continuus			
Formicidae			
Formica fusca			Y
Lasius flavus			
Lasius fuliginosus			Y
Lasius mixtus			Y
Lasius niger			Y
Myrmica ruginodis			
Myrmica scabrinodis			Y
Halictidae			
Halictus rubicundus			
Halictus tumulorum			Y
Lasioglossum albipes			
Lasioglossum morio			Y
Lasioglossum rufitarse			Y
Sphecodes gibbus			Y
Sphecodes monilicornis			Y
Pompilidae			
Ceropales maculata		**Scarce**	Y
ISOPODA	**WOODLICE**		
Armadillidiidae			
Armadillidium nasatum			Y
Oniscidae			
Oniscus asellus ssp. asellus			Y
Philosciidae			
Philoscia muscorum			Y
Porcellionidae			
Porcellio scaber			Y
Trichoniscidae			
Androniscus dentiger			Y
Haplophthalmus mengii sensu lato			Y
Trichoniscus pusillus sensu lato			Y
LEPIDOPTERA	**BUTTERFLIES**		
Hesperiidae			
Erynnis tages	Dingy skipper	**VU; S7**	Y
Euphydryas aurinia	Marsh fritillary	**VU; S7**	
Ochlodes sylvanus	Large skipper		Y
Lycaenidae			
Polyommatus icarus	Common blue		
Nymphalidae			

Aphantopus hyperantus	Ringlet		
Coenonympha pamphilus	Small heath	**NT; S7**	
Hipparchia semele	Grayling	**VU; S7**	Y
Pieris rapae	Small white		
LEPIDOPTERA	**MOTHS**		
Erebidae			
Euclidia glyphica	Burnet companion		
Geometridae			
Ematurga atomaria	Common heath		Y
Noctuidae			
Autographa gamma	Silver Y		
MOLLUSCA	**SLUGS & SNAILS**		
Agriolimacidae			
Deroceras invadens			Y
Deroceras reticulatum			Y
Arionidae			
Arion ater			Y
Arion circumscriptus silvaticus			Y
Arion distinctus			Y
Arion flagellus			Y
Arion hortensis			Y
Arion intermedius			Y
Arion owenii			Y
Arion subfuscus			Y
Boettgerillidae			
Boettgerilla pallens			Y
Helicidae			
Cepaea hortensis			Y
Cepaea nemoralis			Y
Cornu aspersum			Y
Limacidae			
Limacus maculatus			Y
Limax maximus			Y
Oxychilidae			
Aegopinella nitidula			Y
Oxychilus alliarius			Y
Oxychilus cellarius			Y
Oxychilus navarricus subsp. helveticus			Y
Patulidae			
Discus rotundatus			Y
Tateidae			
Potamopyrgus antipodarum			Y

Vitrinidae			
Vitrina pellucida			Y
NEMERTEA	**NEMERTINE WORMS**		
Prosorhochmidae			
Argonemertes sp. (c.f. *A. dendyi*)			Y
ORTHOPTERA	**GRASSHOPPERS & CRICKETS**		
Acrididae			
Chorthippus brunneus			
Myrmeleotettix maculatus			
PLATYHELMINTHES	**FLATWORMS**		
Rhynchodemidae			
Microplana scharfii			Y
Microplana terrestris			Y
Rhynchodemus sylvaticus			Y

APPENDIX 2: Invertebrate Status Codes

EXTINCT (EX) A species is *Extinct* when there is no reasonable doubt that the last individual has died.

EXTINCT IN THE WILD A species is *Extinct* in the wild when it is known to survive only in cultivation, in captivity or as a naturalised population (or populations) well outside the past range.

CRITICALLY ENDANGERED

A species is *Critically Endangered* when it is facing an extremely high risk of extinction in the wild in the immediate future, as defined by any of the following criteria:

A. Population reduction in the form of either of the following:

1. An observed, estimated, inferred or suspected reduction of at least 80% over the last 10 years or three generations, whichever is the longer, based on direct observation, an index of abundance appropriate for the species, a decline in area of occupancy, extent of occurrence and/or quality of habitat, actual or potential levels of exploitation or the effects of introduced species, hybridisation, pathogens, pollutants, competitors or parasites.
2. A reduction of at least 80%, projected or suspected to be met within the 10 years or three generations, whichever is the longer, based any of these parameters.

B. Extent of occurrence estimated to be less than 100 Km^2 or areas of occupancy estimated to be less than 10 Km^2 and estimates indicating any <u>two</u> of the following:

1. Severely fragmented or known to exist at only a single location.
2. Continuing decline, observed, inferred or projected, in any of the following: a. extent of occurrence b. area of occupancy c. area, extent and/or quality of habitat d. number of locations or sub-populations e. number of mature individuals
3. Extreme fluctuations in extent of occurrence, area of occupancy, number of locations or sub-populations or number of mature individuals.

C. Population estimated to number less than 250 mature individuals and either:

1. An estimated continuing decline of at least 25% within 3 years or one generation, whichever is longer or
2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either severely fragmented *(i.e.* no sub-population estimated to contain more than 50 mature individuals) or all individuals are in a single sub-population

D. British population estimated to number less than 50 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild of at least 50% within 10 years or 3 generations, whichever is the longer.

ENDANGERED (Formerly RDB category 1)

A species is Endangered when it is not *Critically Endangered* but is facing a very high risk of extinction in the wild in the near future, as defined by any of the following criteria:

A. Population reduction in the form of either of the following:

1. An observed, estimated, inferred or suspected reduction of at least 50% over the last 10 years or three generations, whichever is the longer, based on direct observation, an index of abundance appropriate for the species, a decline in area of occupancy, extent of occurrence and/or quality of habitat, actual or potential levels of exploitation or the effects of introduced species, hybridisation, pathogens, pollutants, competitors or parasites.
2. A reduction of at least 50%, projected or suspected to be met within the 10 years or three generations, whichever is the longer, based any of these parameters.

B. Extent of occurrence estimated to be less than 5,000 Km^2 or areas of occupancy estimated to be less than 10 Km^2 and estimates indicating any <u>two</u> of the following:

1. Severely fragmented or known to exist at no more than five locations.
2. Continuing decline, observed, inferred or projected, in extent of occurrence, area of occupancy, area, extent and/or quality of habitat, number of locations or sub-populations or the number of mature individuals.

C. Population estimated to number less than 2500 mature individuals and either:

1. An estimated continuing decline of at least 20% within 5 years or 2 generations, whichever is longer or
2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either severely fragmented *(i.e.* no sub-population estimated to contain more than 250 mature individuals) or all individuals are in a single sub-population

D. British population estimated to number less than 250 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild of at least 20% within 20 years or 5 generations, whichever is the longer.

VULNERABLE (VU) (Formerly RDB category 2)

A species is *Vulnerable* when it is not *Critically Endangered or Endangered but* is facing a high risk of extinction in the wild in the medium-term future, as defined by any of the following criteria (A to E):

A. Population reduction in the form of either of the following:

1. An observed, estimated, inferred or suspected reduction of at least 20% over the last 10 years or three generations, whichever is the longer, based on direct observation, an index of abundance appropriate for the species, a decline in area of occupancy, extent of occurrence and/or quality of

habitat, actual or potential levels of exploitation or the effects of introduced species, hybridisation, pathogens, pollutants, competitors or parasites.

2. A reduction of at least 20%, projected or suspected to be met within the 10 years or three generations, whichever is the longer, based any of these parameters.

B. Extent of occurrence estimated to be less than 20,000 Km^2 or areas of occupancy estimated to be less than 20,000 Km^2 and estimates indicating any <u>two</u> of the following:

1. Severely fragmented or known to exist at no more than ten locations. Continuing decline, observed, inferred or projected, in extent of occurrence, area of occupancy, area, extent and/or quality of habitat, number of locations or sub-populations or the number of mature individuals.
2. Extreme fluctuations in extent of occurrence, area of occupancy, number of locations or sub-populations or number of mature individuals.

C. Population estimated to number less than 10,000 mature individuals and either:

1. An estimated continuing decline of at least 10% within 10 years or 3 generations, whichever is longer or
2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals and population structure in the form of either severely fragmented *(i.e.* no sub-population estimated to contain more than 1000 mature individuals) or all individuals are in a single sub-population

D. Population very small or restricted in the form of either of the following:

1. Population estimated to number less than 1,000 mature individuals.
2. Population is characterised by an acute restriction in its area of occupancy (typically less than 100 km) or in the number of locations (typically less than 5). Such a species would thus be prone to the effects of human activities (or stochastic events whose impact is increased by human activities) within a very short period of time in an unforeseeable future, and is thus capable of becoming *Critically Endangered* or even *Extinct* in a very short period.

E. Quantitative analysis showing the probability of extinction in the wild of at least 10% within 100 years.

LOWER RISK (Formerly RDB category 3)

A species is Lower Risk when it has been evaluated but does not satisfy the criteria for any of the categories *Critically Endangered, Endangered* or *Vulnerable.* Species included in the Lower Risk category can be separated into three sub-categories:

• **Conservation Dependent** species which are the focus of a continuing species -specific or habitat-specific conservation program targeted towards the species in question, the cessation of which would result in the species qualifying for one of the threatened categories above within a period of five years.

• **Near Threatened** Species which do not qualify for *Lower Risk (Conservation Dependent),* but which are close to qualifying for *Vulnerable.*

• **Least Concern** Species which do not qualify for *Lower Risk (Conservation Dependent)* or *Lower Risk (Near Threatened).*

DATA DEFICIENT A species is *Data Deficient* when there is inadequate information to make a direct or indirect assessment of its risk of extinction based on its distribution and/or population status. A species in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. *Data Deficient* is therefore not a category of threat or Lower Risk.

<u>LOWER RISK (NATIONALLY SCARCE – FORMERLY NATIONALLY NOTABLE)</u>

Species which are not included within the IUCN threat categories and are estimated to occur less than 100 hectads of the Ordnance Survey national grid in Great Britain. It should be noted that Lower Risk (Nationally Scarce) is not a threat category, but rather an estimate of the extent of distribution of these species. Lower Risk species are subdivided as follows:

Na species estimated to occur within the range of 16 to 30 10-kilometre squares of the National Grid System.

Nb species estimated to occur within the range 31 to 100 10-kilometre squares of the National Grid System.

N species not separated, falling into either category Na or Nb.

NATIONALLY LOCAL (L)

Species which, whilst fairly common, are evidently less widespread than truly common species, but also not qualifying as Nationally Notable having been recorded from over one hundred, but less than three hundred, ten-kilometre squares of the UK National Grid.

ASSOCIATED DEFINITIONS

Extent of occurrence

Extent of occurrence is defined as the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence of a species, excluding cases of vagrancy. This measure may exclude discontinuities or disjunctions within the overall distributions of species (e.g. large areas of obviously unsuitable habitat*)* (but see 'area of occupancy'). Extent of occurrence can often be measured by a minimum convex polygon (the smallest polygon in which no internal angle exceeds 180 degrees and which contains all the sites of occurrence).

Area of occupancy

Area of occupancy is defined as the area within its 'extent of occurrence' (see definition) which is occupied by a species, excluding cases of vagrancy. The measure reflects the fact that a species will not usually occur throughout the area of its extent of occurrence, which may, for example, contain unsuitable habitats. The area of occupancy is the smallest area essential at any stage to the survival of existing populations of a species *(e.g.* colonial nesting sites, feeding sites for migratory species). The size of the area of occupancy will be a function of the scale at which it is measured, and should be at a scale appropriate to relevant biological aspects of the species. The criteria include values in km^2, and thus to avoid errors in classification, the area of occupancy should be measured on grid squares (or equivalents) which are sufficiently small.

APPENDIX 8

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Cwm Glo a Glyndrys SSSI

Merthyr Tydfil

UPDATE INVERTEBRATE SURVEY REPORT

June 2021

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Table of Contents

1.0	INTRODUCTION	3
1.1	Introductory comments	3
1.2	Site description	3
1.3	Survey limitations	3
2.0	SAMPLING	4
2.1	Survey dates	4
2.2	Sampling methodology	5
2.3	Target groups	6
2.4	Sample areas	6
3.0	RESULTS	11
3.1	Overview	11
3.2	Species of conservation interest	11
	3.2.1 Section 7 species	12
	3.2.2 Vulnerable species	13
	3.2.3 Nationally Rare species	14
	3.2.4 Nationally Scarce species	15
	3.2.5 Nationally Local species	16
	3.2.6 Other species of conservation interest	17
4.0	DISCUSSION	18
5.0	IDENTIFICATION KEYS	18
6.0	REFERENCES	20

APPENDIX

Appendix 1. Aerial photograph of Cwm Glo a Glyndrys SSSI showing the site boundary.
Appendix 2. List of invertebrate species identified at Cwm Glo a Glyndrys SSSI in 2021.

1.0 INTRODUCTION

1.1 Introductory comments

Liam Olds (**Colliery Spoil Biodiversity Initiative**) was commissioned by **Bioscan (UK)** to undertake an invertebrate survey of land at Cwm Glo a Glyndrys SSSI, Merthyr Tydfil, South Wales, in 2021. The primary aim of these surveys were to build upon and update previous invertebrate survey work undertaken by Colin Plant Associates (UK) Consultant Entomologists in 2015 (Report number BS/2949/15) and Colliery Spoil Biodiversity Initiative in 2018 (Olds, 2018) and address any 'gaps' in the taxonomic coverage of invertebrates at Cwm Glo a Glyndrys SSSI.

This report details the results of that survey, which was conducted over two daytime visits in April and May 2021. All invertebrate sampling and specimen identification was undertaken by the authors of this document. It is anticipated that the results presented in this report will be used to inform any future development proposals affecting Cwm Glo a Glyndrys SSSI.

1.2 Site description

Cwm Glo a Glyndrys SSSI is situated on the northeast and east facing slopes to the west of the town of Merthyr Tydfil, South Wales. Covering an area of 203.1 hectares (ha), it is a large site supporting a diverse mix of habitats. These habitats include (but are not limited to): marshy grassland; species-rich neutral grassland; acid grassland; woodland; colliery spoil and other brownfield land; wetlands; and scrub.

Cwm Glo a Glyndrys SSSI was designated as a Site of Special Scientific Interest (SSSI) in 2008 following a significant extension south-east and west to the original Cwm Glo SSSI (designated in 2003). The boundary of the Cwm Glo a Glyndrys SSSI (hereinafter referred to as 'Cwm Glo'), and thus the survey area, is shown in **Appendix 1**.

1.3 Survey limitations

Guidelines for invertebrate survey recommend survey visits from approximately May to September in order to obtain an adequate cross-seasonal representation of invertebrate species present. This level of coverage has not been fully achieved as part of this survey because sampling was only undertaken in April and May. Given that extensive invertebrate survey work has already been delivered at Cwm Glo, and that the purpose of this survey was only to provide additional invertebrate information to update and enhance this previous work, the short sampling period in 2021 is not considered to be a significant issue.

The main limitation to the invertebrate surveys in 2021 was the weather. April 2021 proved to be unseasonably cool in Wales, with mean temperatures provisionally 1.5 °C below average; minimum temperatures were particularly far below average, with numerous frosts throughout the month (Met Office, 2021a). It is anticipated that this cool weather, and in particular the frequent frosts, will have resulted in the delayed emergence of some invertebrates and smaller populations than would be 'typical' for that month. This likely

resulted in fewer invertebrate species being encountered during the April survey visit. It was, however, a predominantly dry and sunny month, with 19% of average rainfall and 150% of average sunshine (provisionally the sunniest April in a series from 1919). This sunny weather will have likely benefited some invertebrates (e.g. solitary bees), assuming their food plants were not negatively affected by the weather conditions.

May 2021 was again cool, with mean temperatures provisionally 1.4 °C below average (Met Office, 2021b). In contrast to April, however, May was very wet with 245% of average rainfall, making it the wettest May for Wales in a series from 1862. Settled weather only arrived during the course of the final week of May. It is anticipated that these cool and wet conditions again delayed the emergence of some invertebrates and resulted in smaller invertebrate populations than would be 'typical' for that month. Like April, the weather conditions experienced in May 2021 likely resulted in fewer invertebrate species being encountered during the survey visit.

Despite the atypical weather conditions experienced throughout the sampling period of April and May 2021, all invertebrate sampling at Cwm Glo was undertaken during the best available weather conditions, these being dry and sunny conditions. As such, we believe the results presented here are the best they could possibly be under the circumstances.

2.0 SAMPLING

2.1 Survey dates

Invertebrate surveys at Cwm Glo were conducted over two visits in April and May 2021 – the first of these visits was made on 19th April, and the second on 19th May; on both occasions, invertebrate sampling was undertaken by both authors (Liam Olds and Christian Owen). An additional visit was also made prior to these sample days on 2nd April, during which both authors scoped the site and identified 'sample areas' for targeted invertebrate sampling. Though limited, some invertebrate sampling was also undertaking during this scoping exercise.

Surveying was conducted during dry and sunny conditions – it is during this time that invertebrates are generally most active. Given the unseasonably cool conditions (especially in April), it was not always possible to sample in warm weather however; this may have limited some invertebrates, especially warmth-loving invertebrates such as many pollinating insects.

Average survey time for each visit was 6 hours and 15 minutes, however this also included the time taken to walk from our parked vehicles to the sample areas and also between individual sample areas. Weather conditions on the survey dates, and the activities undertaken, are provided in **Table 1**. The sampling techniques deployed at Cwm Glo are discussed in Section 2.2.

Table 1. Weather conditions on the survey dates at Cwm Glo in 2021.

Survey Date	Survey Time	Activity	Weather conditions
2nd April 2021	Not recorded	Familiarisation with habitats present by walking around the survey area. Limited invertebrate sampling undertaken in some areas.	Dry and sunny conditions. Maximum air temperature of 12°C. Moderate breeze, with wind speeds of 14-16 MPH (miles per hour) coming from a easterly direction.
19th April 2021	6 hours, 20 mins	A variety of sampling techniques deployed in order to sample for as many invertebrate taxa as possible.	Dry and sunny conditions. Maximum air temperature of 15°C. Occasional light breeze with wind speeds of 7 MPH coming from an east to south-easterly direction.
19th May 2021	6 hours, 10 mins	A variety of sampling techniques deployed in order to sample for as many invertebrate taxa as possible.	Dry with sunny intervals. Maximum air temperature of 13°C. Occasional breeze with wind speeds of 12 MPH coming from a westerly direction.

2.2 Sampling methodology

Terrestrial invertebrates were sampled using several different active sampling techniques including:

- **Aerial netting** – a lightweight 40cm diameter net mounted on a meter long pole was used to catch flying insects as and when encountered.
- **Beating trees and bushes** – a beating tray, consisting of a white cloth sheet supported by a frame, was positioned below branches of trees and bushes which were subsequently tapped with a stick to dislodge insects within the foliage. Target taxa were then selectively removed using an aspirator (or pooter).
- **Hand searching** – this involved sieving leaf litter, sieving dung, bark peeling, looking under/inside rotting logs, and looking under stones/boulders for invertebrates that may be feeding, resting or sheltering.
- **Suction-sampling** (i.e. vacuum sampling) – a modified leaf-blower was used to collect invertebrates from habitats that would otherwise be difficult to sample from using a sweep net (e.g. very short or very long vegetation). This method is particularly effective at

catching species which do not fly readily or which live in deep vegetation. Samples were emptied into a sturdy sweep net and target taxa selectively removed using an aspirator.

- **Sweep netting** – a sturdy 40cm diameter net mounted on a meter long pole was moved vigorously through long vegetation and over bushes and tree foliage to dislodge invertebrates. Target invertebrates were then selectively removed from the sweep net using an aspirator.
- **Visual searching** – insects were observed foraging, basking, nesting, hunting, mating etc. in their associated habitats without the need to deploy other sampling techniques (e.g. sweep netting).

2.3 Target groups

Principal target groups for the survey were Coleoptera (beetles) and Hymenoptera (bees, wasps and ants), though other invertebrate taxa were also recorded when encountered. These groups were selected as we believed that these groups included families which may have been under-represented in previous invertebrate surveys at Cwm Glo and so an opportunity exists to locate additional invertebrate species not previously recorded at Cwm Glo. By targeting these groups, a more balanced overview of the invertebrate fauna present will be achieved.

Areas considered to be of greatest value to invertebrates were targeted in suitable weather conditions (as much as possible) in order to achieve coverage of the target groups. Sampling targeted six areas scattered across the east and north east of Cwm Glo. These sample areas are discussed in Section 2.4 and included a diverse mix of habitats including marshy grassland, acid grassland, neutral grassland, heath, scrub, ponds, ditches and bare ground. By targeting locations supporting a mosaic of habitats, it was anticipated that these locations would support the greatest diversity of species, especially amongst the target groups.

Where practical, invertebrates were identified in the field using a x10 or x20 hand lens. Where identification was not possible in the field, representative specimens were collected and later identified using a binocular microscope. Samples were either stored dry and later pinned to aid identification (e.g. aculeates and flies), or stored in 70 to 90% isopropyl alcohol (e.g. many beetles). Invertebrate identification was to species level wherever possible. All fieldwork, and the subsequent identification of specimens, was undertaken by Liam Olds and Christian Owen using the appropriate identification keys and confirmed using verified reference material wherever possible.

2.4 Sample areas

Due to the large size of Cwm Glo (203.1 ha), it was not possible to sample the entire site. Instead, invertebrate sampling focussed on six major areas (areas 1 to 6) collectively supporting an almost complete representation of the habitats found at Cwm Glo. These sample areas are located across the east, south-east and north-east of Cwm Glo. A variety of active sampling techniques were deployed in these areas including hand searching (e.g.

sieving dung and leaf litter), visual searching (e.g. insects on flowers), aerial netting, sweep netting and suction-sampling.

Area 1 (National Grid Reference centred at SO047047)

This sample area is situated on an old colliery spoil tip located in the south-east of Cwm Glo. This spoil tip runs in a north-west to south-east direction and has a plateaued top supporting multiple habitats (**Figure 1**). A mosaic of grassland types, dry heathland and scattered scrub (such as European gorse *Ulex europaeus*) dominate this plateau; this plateau is grazed by horses. Between these grassland and heathland habitats, areas of bare ground are evident; these have been created by off-road motorcycles. To the east, the plateau drops steeply downwards in a north-east direction; this slope is dominated by lichen heath habitat, with broadleaved woodland becoming progressively dominant towards the base. To the west, the plateau drops steeply downwards in a south-west direction into wet woodland habitat. Various active sampling techniques were deployed in this sample area including hand searching (e.g. searching dung), visual searching (e.g. flying insects on flowers), aerial netting, sweep netting and suction-sampling.

Area 2 (NGR SO044049)

This sample area is situated on an old colliery spoil tip located in the south-east of Cwm Glo. This spoil tip runs in a north-east to south-west direction and supports multiple habitat types. Much of the sample area occupies a north-east facing slope, which at its greatest elevation supports lichen heath habitat and open bare ground; moving down the slope in a north-easterly direction, this lichen heath habitat grades into broadleaved scrub (predominately *Salix spp.*). At the base of the slope, a ditch supporting *Salix* scrub and marginal vegetation separates the slope from a plateau supporting sparse grassland and bare ground (**Figure 2**). Much bare ground is evident in the sample area; this been created by off-road motorcycles. Various active sampling techniques were deployed in this sample area including hand searching (e.g. sieving leaf litter), visual searching (e.g. flying insects on flowers), aerial netting, sweep netting and suction-sampling.

Area 3 (NGR SO04610515)

This sample area is situated in the south-east of Cwm Glo and comprises a small area of marshland located in the south-west corner of a horse-grazed paddock (**Figure 3**). This area supports plants typical of marsh including Meadow-sweet (*Filipendula ulmaria*) and rushes (*Juncus spp*.). Suction-sampling and sweep netting was undertaken in this sample area.

Area 4 (NGR SO045051)

This sample area is situated in the south-east of Cwm Glo and comprises a large pond running in a north-west to south-east direction (**Figure 4**). Broadleaved trees (especially *Salix spp.*) and marginal aquatic vegetation occupy the edges of this pond, beyond which acid

grassland and broadleaved woodland are the dominant habitat types (to the north-east and south-west respectively). Pond dipping, sweep netting and suction-sampling was undertaken in this sample area in an effort to locate aquatic or semi-aquatic invertebrates within the water body or near the edges, or terrestrial species which occupy the transition between wetland and terrestrial habitats.

Area 5 (NGR SO039056 and SO040056)

This sample area is situated on an old colliery spoil tip located towards the north-east of Cwm Glo. This steep sided spoil tip runs in a north-east to south-west direction and has a plateaued top (**Figure 5**); the tip is evidently grazed by livestock. Dry, short-sward grassland and bare ground occupies the steep south-facing slopes, with more marshy grassland occupying the flat ground beneath this tip. Various active sampling techniques were deployed in this sample area including visual searching (e.g. aculeate nesting locations in bare ground), aerial netting, sweep netting and suction-sampling.

Area 6 (NGR SO042052)

This sample area is situated in east of Cwm Glo and is dominated by rhôs pasture with Devi's-bit scabious (*Succisa pratensis*) and acid grassland, with broadleaved scrub (especially *Salix spp.*) around the margins (**Figure 6**). Suction-sampling and sweep netting was undertaken in this sample area.



Figure 1. View looking north-west across the plateaued top of Sample Area 1; photographed on 19th April 2021.



Figure 2. View looking north-east across the lower section of Sample Area 2; photographed on 19th April 2021.



Figure 3. View looking north-east across Sample Area 3; photographed on 19th April 2021.



Figure 4. View looking south-east across Sample Area 4; photographed on 19th April 2021.



Figure 5. View looking north-east across Sample Area 5; photographed on 19th May 2021.



Figure 6. View looking south-east across Sample Area 6; photographed on 19th May 2021.

3.0 RESULTS

3.1 Overview

A total of **275** invertebrate species were identified through our survey at Cwm Glo in 2021 – a full list of all recorded invertebrate species is presented in **Appendix 2**. The list is annotated with formal National Status codes, where applicable.

With reference to the invertebrate species lists compiled by Colin Plant Associates (UK) Consultant Entomologists in 2015 (Report number BS/2949/15) and Colliery Spoil Biodiversity Initiative (Olds, 2018), it appears that **114** of the 275 species have not been previously recorded at Cwm Glo and are thus **'new'** to the site – these species are highlighted in yellow in **Appendix 2**.

3.2 Species of conservation interest

Of the 275 invertebrate species recorded at Cwm Glo in 2021, **18** (~7%) are deemed to be of conservation interest (i.e. species considered to be Nationally Local, Scarce or Rare, and/or are listed under Section 7 of the Environment (Wales) Act 2016 as species of 'principal importance for the conservation of biological diversity in Wales'. These 'priority species' are discussed below.

3.2.1 Section 7 species

Section 7 of the Environment (Wales) Act 2016 includes a statutory list of species deemed to be "*of principal importance for the purpose of maintaining and enhancing biodiversity in relation to Wales*". This replaces Section 42 of the Natural Environment and Rural Communities (NERC) Act 2006 and places a duty on Welsh Ministers to take all reasonable steps to maintain and enhance the living organisms and types of habitat included in any list published under this section, and encourage others to take such steps.

A total of **2** invertebrate species recorded during the survey are listed under Section 7 of the Environment (Wales) Act 2016.

Dingy skipper (*Erynnis tages*) is listed under Section 7 of the Environment (Wales) Act 2016 as a Species of Principle Importance in Wales because it has experienced a severe decline in its UK distribution since the 1970s. It is also considered 'Vulnerable' in The Butterfly Red List for Great Britain (Fox, Warren & Brereton, 2010). It can be found in a variety of habitats including dunes, sea cliffs, heathland and woodland glades, however the largest colonies occur on sunny, south-facing downland slopes. The main larval foodplant is Common bird's-foot-trefoil (*Lotus corniculatus*), but Greater bird's-foot-trefoil (*L. pedunculatus*) and Horseshoe vetch (*Hippocrepis comosa*) is also used. Dingy skipper requires its larval foodplants close to areas of bare ground, which provide warm conditions for egg development. At Cwm Glo, Dingy skipper was recorded in Sample Area 5 (SO039056 and SO040056), Sample Area 6 (SO042052) and on the old colliery spoil tip between these locations at SO03970558. Dingy skipper was also recorded during surveys in 2018 where it was recorded in the early-successional grasslands at SO046051 and SO047051 (Olds, 2018).

Marsh Fritillary (*Euphydryas aurinia*) is regarded as a species threatened with extinction throughout Europe and in recognition of this it is included in Annexe II of the Berne Convention on the Conservation of European Habitats and Wildlife and in Annexe II of the European Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (known generally as the European Habitats and Species Directive). In the UK, it is protected under the Wildlife and Countryside Act (1981), Countryside and Rights of Way Act (2000), and other UK legislation. It is also listed on Section 7 of the Environment (Wales) Act 2016 as a Species of Principle Importance in Wales and considered 'Vulnerable' in The Butterfly Red List for Great Britain (Fox, Warren & Brereton, 2010).

Marsh fritillary was once widespread in Britain but declined severely during the twentieth century. Populations are highly volatile and the species requires extensive habitats or habitat networks for its long term survival. The larvae feed on Devil's-bit scabious (*Succisa pratensis*) growing in marshy grassland or rhôs pasture. At Cwm Glo, numerous caterpillars were observed basking in Sample Area 6 (SO042052) on 19th April 2021 (**Figure 7**). Marsh fritillary was also recorded during surveys in 2018 when numerous larval webs were found in the purple moor-grass and rush pasture fields around SO041046 on 9th August 2018 (Olds, 2018). Please note that we did not undertake targeted surveying of Marsh fritillary at Cwm Glo and these records were merely observations made when recording other invertebrates in the same habitat.



Figure 7. Marsh fritillary butterfly caterpillar, one of numerous individuals seen in Sample Area 6; photographed on 19th April 2021.

3.2.2 Vulnerable species

A total of **3** invertebrate species recorded during the survey are designated as 'Vulnerable'. Two of these species (Dingy skipper and Marsh Fritillary are also listed under Section 7 of Environment (Wales) Act 2016 and are discussed above.

Broad-banded nomad bee (*Nomada signata*) is a scarce cuckoo bee that uses the Tawny mining bee (*Andrena fulva*) as its only host. It is listed as Vulnerable (RDB2) in the last published status review of bees, wasps and ants in Britain (Falk, 1991). It has never been a common bee in Britain, though there has been a slight indication of an increase in southern England over recent decades. Like its host, it is found in a wide variety of open habitats including open grassland and clearings in broad-leaved woodland (Falk, 2015). It is known to forage on dandelions, willows and Wood spurge (*Euphorbia amygdaloides*). The flight period extends from early April to late May. At Cwm Glo, a female was recorded foraging on Greater stitchwort (*Stellaria holostea*) along the footpath at the edge of Sample Area 6 (**Figure 8**). Its host (Tawny mining bee) was observed on multiple occasions in Sample Area 5 and on the old colliery spoil tip around NGR SO039055; as such, Broad-banded nomad bee is expected to also exist elsewhere at Cwm Glo.



Figure 8. Broad-banded nomad bee female; photographed on 19th May 2021.

3.2.3 Nationally Rare species

A total of **3** invertebrate species recorded during the survey are designated as 'Nationally Rare'.

The millipede ***Ceratosphys amoena subsp. confusa*** was first discovered new to Britain in September 2014 from Bargoed, South Wales. Relatively little information is available on this species in Britain, however it has subsequently been found to be fairly common in the South Wales Valleys occurring in a range of different habitats. It has been found by sieving leaf-litter, turning over logs and stones, bark peeling, and by torchlight searching at night. At present it is known only from Glamorgan (VC41) and Monmouthshire (VC35) in Britain, and is considered Nationally Rare in Lee (2015). At Cwm Glo, this millipede was found at Sample Area 2 (SO044049); it is expected to be in woodland throughout much of Cwm Glo.

The mirid bug ***Lygus pratensis*** was once confined to southern heaths and considered Rare (RDB3) in the last published status review of Heteroptera (Kirby, 1992), but in recent decades this bug has undergone a dramatic range expansion. It is now widespread throughout much of southern Britain and is much commoner than its RDB3 status suggests. At Cwm Glo, it was found by sweeping vegetation in the meadow at SO044052.

Lathbury's nomad bee (*Nomada lathburiana*) is a cuckoo bee that uses the Ashy mining bee (*Andrena cineraria*) and Grey-backed mining bee (*A. vaga*) as its hosts. It is listed as Rare (RDB3) in in the last published status review of bees, wasps and ants in Britain (Falk, 1991). Recent range expansions suggest that this status should be downgraded however.

Widespread but patchily distributed in Britain, it is usually associated with large host colonies on gorse-clad hillsides, sandy heathland paths and the vertical faces of sandpits (Falk, 2015). It will visit various spring-blossoming shrubs, dandelions and Germander speedwell (*Veronica chamaedrys*). The flight period extends from April to July. At Cwm Glo, individuals were recorded in Sample Area 5 (SO039056 and SO040056) and on the old colliery spoil tip at NGR SO03970558.

3.2.4 Nationally Scarce species

A total of **4** invertebrate species recorded during the survey are designated as 'Nationally Scarce'.

Cat's-ear mining bee (*Andrena humilis*) (**Figure 9**) is a solitary bee found in a variety of habitats featuring compacted soils including heathland and acid grassland, soft rock cliffs, coastal grassland, open heathy woodland, sandpits and sandy brownfield sites (Falk, 2015). It is listed as Nationally Scarce (Nb) in the last published status review of bees, wasps and ants in Britain (Falk, 1991). Pollen is gathered entirely from yellow hawkish composites such as Cat's-ear (*Hypochaeris radicata*), Mouse-ear hawkweed (*Hieracium pilosella*), hawk's-beards, hawkbits and dandelions. Nesting is usually in sandy ground, especially footpaths but slopes and vertical banks are also used. Nesting can occur in large and dense aggregations. The flight period extends from early May to mid-July.



Figure 9. Cat's-ear mining bee female; photographed on 19th May 2021.

At Cwm Glo, both sexes of this species were recorded foraging on Mouse-ear Hawkweed on the south-facing slopes of the colliery spoil tip in Sample Area 5 (SO039056 and SO040056).

Cat's-ear mining bee was also recorded during surveys in 2018 (Olds, 2018) when several individuals were recorded visiting yellow composites in coal spoil grassland at SO045050 (close to Sample Areas 1 and 2).

Cassida hemisphaerica is a small (3.5-5.4mm) tortoise beetle, mostly associated with various species of Caryophyllaceae (e.g. campions), though it has also been collected from oaks. Found in a range of habitats, it apparently favours open sunny habitats such as forest clearings, pastures etc. At Cwm Glo, one specimen was found by suction sampling various plants in a wet flush at the base of the colliery spoil tip in Sample Area 5 at SO03970563.

Chaetarthria simillima is a minute (1.3-1.7mm) Hydrophilid beetle. A cryptic species recently separated from *C. seminulum*, it can only be safely identified via examination of the male genitalia. This recent recognition from *C. seminulum* means that little information is currently available on its habitat preferences, though moss by fresh water has been suggested, which certainly holds true for Cwm Glo. At Cwm Glo, several beetles were recorded by suction sampling moss in the wetter areas of Sample Area 1 (SO047047), Sample Area 2 (SO044049) and Sample Area 5 (SO03970563).

Leptoiulus belgicus is a millipede associated with a wide range of different habitats with no particular preference evident. At Cwm Glo, this species was found at several locations throughout the site in leaf litter and under rocks, as it was during surveys in 2018 (Olds, 2018).

One further invertebrate species recorded during the survey is not currently listed as 'Nationally Scarce', though is believed to likely qualify for such designation should a status review of the taxon group in question be undertaken in the near future.

The **plant bug *Hoplomachus thunbergii*** is associated with Mouse-ear hawkweed growing in dry grassland habitats. It is widespread but scarce and is likely to be considered 'Nationally Scarce' in the next status review (T. Bantock, personal communciation). At Cwm Glo, this species was found on Mouse-ear hawkweed growing on the colliery spoil tip in Sample Area 5 (SO039056 and SO040056); it was also recorded at Cwm Glo in 2018 in colliery spoil grassland at SO046049 (Olds, 2018).

3.2.5 Nationally Local species

A total of **6** invertebrate species recorded during the survey are designated as 'Nationally Local'.

Crepidodera plutus is a leaf beetle associated with willows (*Salix*) in wetland habitats, the adult feeding on the leaves (Duff, 2016). At Cwm Glo, this species was found by suction sampling in a wet flush at the base of the colliery spoil tip in Sample Area 5 at SO03970563. This species was also recorded in 2018 when it was swept from willows around the ditch at SO044050 (Olds, 2018).

Hydrothassa glabra is a leaf beetle associated with Ranunculaceae, especially Meadow Buttercup (*Ranunculus acris*) and Creeping Buttercup (*R. repens*) (Duff, 2016). At Cwm Glo, this species was swept from buttercups in Sample Area 1 (colliery spoil grassland) at SO047047. This species was also recorded in 2018 when it was swept from buttercups at SO046050.

Platycheirus tarsalis is a widespread and locally common hoverfly usually found in and around woodland in late spring and early summer (Falk, 2021). The larvae are presumed to be aphidophagous, but little seems to be known of their precise requirements. At Cwm Glo, several males were swept from Greater Stitchwort along the footpath at the edge of Sample Area 6 (SO042052).

Plinthisus brevipennis is a ground bug found locally across much of southern Britain. It favours open, sparsely-vegetated habitats such as dry grasslands, heaths, quarries and sand dunes (British Bugs, 2021a). This species is classified as 'Local' in the British Heteroptera checklist (2021), available at https://www.britishbugs.org.uk/systematic_het.html. At Cwm Glo, specimens were suction-sampled from lichen-heath habitat in Sample Area 1 (SO047047), Sample Area 2 (SO044049) and Sample Area 5 (SO039056).

Scolopostethus puberulus is a ground bug with a widespread but localised distribution. It is found in fens, wet grasslands and generally much damper habitats than other *Scolopostethus* species (British Bugs, 2021b). This species is classified as 'Local' in the British Heteroptera checklist (2021), available at https://www.britishbugs.org.uk/systematic_het.html. At Cwm Glo, specimens were suction-sampled from rhôs pasture habitat in Sample Area 6 (SO042052).

Lasius sabularum is a yellow ant often found in parks and gardens, though it has also been found in agricultural land and meadows (BWARS, 2020). Scattered records exist for this species across England, Wales and Ireland. Nests are founded by taking over a nest of *Lasius niger* and probably other *Lasius* ant species. They forage underground on small invertebrates and tend root-feeding aphids. At Cwm Glo, specimens were collected from a nest in meadows at SO045051.

3.2.6 Other species of conservation interest

The Saxon Wasp (*Dolichovespula saxonica*) is listed as of uncertain status (i.e. RDB category K) in the last published status review of bees, wasps and ants in Britain (Falk, 1991). A relatively recent colonist that was first recorded in Britain from Surrey in 1987, it has since become well established over much of Britain. In view of the recent range expansion, its status should be revised. At Cwm Glo, a female was recorded foraging on the colliery spoil tip at SO039055.

4.0 DISUCUSSION

We identified a total of **275** invertebrate species during our survey at Cwm Glo in spring 2021, **114** (~41%) of which have not seemingly been recorded at Cwm Glo previously and are thus deemed 'new' to the site. While these stand-alone figures are unimpressive, when combined with the species list compiled by Colin Plant Associates (UK) Consultant Entomologists in 2015 (Report number BS/2949/15) and Colliery Spoil Biodiversity Initiative in 2018 (Olds, 2018) an once duplicate species have been removed, the total number of individual invertebrate species recorded at Cwm Glo now stands at **1145**. This figure includes **99** species of conservation interest (~9% of the total), which includes:

- 6 x **Section 7** species;
- 1 x **Vulnerable** species;
- 4 x **Nationally Rare** or **Red Data Book (RDB)** species;
- 34 x **Nationally Scarce** species;
- 50 x **Nationally Local** species; and
- 4 x **other species of conservation interest**.

On the basis of our results presented here, our experience with similar habitats in South Wales, and in light of the figures presented above, we are of the opinion that Cwm Glo a Glyndrys SSSI is of **County (Glamorgan) significance for invertebrates**. This also matches the conclusion reached by Colin Plant Associates (UK) Consultant Entomologists in Report number BS/2949/15 and Colliery Spoil Biodiversity Initiative in 2018 (Olds, 2018).

5.0 IDENTIFICATION KEYS

The following identification keys were used to identify invertebrate specimens collected at Cwm Glo, in addition to unpublished keys sourced from organisers of national recording schemes:

Arachnida

- Hillyard, P.D. & Sankey, J.H.P. (1989). Harvestmen. Synopses of the British Fauna (New Series) 4 (2nd edition). London: Linnean Society of London.
- Roberts, M. J. (2001). Collins Field Guide to the Spiders of Britain and Northern Europe. London: HarperCollins Publishers Ltd.

Coleoptera

- Duff, A. G. (2012). Beetles of Britain and Ireland, Volume 1: Sphaeriusidae to Silphidae. A. G. Publishing.
- Duff, A. G. (2016). Beetles of Britain and Ireland, Volume 4: Cerambycidae to Curculionidae. A. G. Publishing.
- Levey, B. (2005). Some British records of *Chaetarthria simillima* Vorst & Cuppen, 2003 and *C. seminulum* (Herbst) (Hydrophilidae), with notes on their differentiation. The Coleopterist 14(3): 97.

- Luff, M. L. (2007). The Carabidae (ground beetles) of Britain and Ireland. RES Handbook Volume 4, Part 2 (2nd edition). Shrewsbury: Field Studies Council.

Collembola

- Hopkin, S. P. (2007). A key to the Collembola (Springtails) of Britain and Ireland. Shrewsbury: Field Studies Council.

Diptera

- Belshaw, R. (1993). Tachinid flies. Diptera: Tachinidae. Handbooks for the identification of British insects 10(4ai): 1-169. Keys to British species.
- Stubbs, A. E. & Drake, M. (2001). British soldierflies and their allies: an illustrated guide to their identification and ecology. British Entomological and Natural History Society.
- Stubbs, A. E. & Falk, S. (2002). British hoverflies, an illustrated identification guide. Second edition. Reading: British Entomological and Natural History Society.
- White, I. M. (1988). Handbooks for the Identification of British Insects. Tephritid Flies, Diptera: Tephritidae, 1-134. Vol. X, Part 5(a). Royal Entomological Society London.

Hemiptera

- Biedermann, R. & Niedringhaus, R. (2009). The Plant- and Leafhoppers of Germany – Identification key to all species. Wissenschaftlich Akademischer Buchvertrieb-Fründ, Scheeßel.
- Southwood, T. R. E. & Leston, D. (1959). Land and Water Bugs of the British Isles. Frederick Warne & Co. Ltd.
- Wilson, M., Stewart, A., Biederman, R., Nickel, H. and Niedringhaus, R. (2015). The Planthoppers and Leafhoppers of Britain and Ireland - Identification keys to all families and genera and all British and Irish species not recorded from Germany. Wissenschaftlich Akademischer Buchvertrieb-Fründ, Scheeßel.

Hymenoptera

- Falk, S. J. (2015). Field Guide to the Bees of Great Britain and Ireland. British Wildlife Field Guide. London: British Wildlife Publishing.
- Skinner, G. J. & Allen, G. W. (1996). Naturalists Handbooks 24: Ants. Richmond Publishing Co. Ltd.
- Yeo, P. F. & Corbet, S. A. (1995). Naturalists' Handbooks 3: Solitary Wasps. Richmond Publishing Co. Ltd.

Isopoda

- Hopkin, S. P. (1991). A key to the woodlice of Britain and Ireland. Field Studies 7, 599–650.

Myriapoda

- Barber, A. D. (2009). Centipedes. Synopses of the British Fauna (New Series) 58. Shrewsbury: Field Studies Council.
- Blower, J. G. (1985). Millipedes. Synopses of the British Fauna (New Series) 35. London: The Linnean Society of London.

6.0 REFERENCES

British Bugs. (2021a). *Plinthisus brevipennis*. Available at: https://www.britishbugs.org.uk/heteroptera/Lygaeidae/plinthisus_brevipennis.html [Accessed 14 June 2021].

British Bugs. (2021b). *Scolopostethus puberulus*. Available at: https://www.britishbugs.org.uk/heteroptera/Lygaeidae/scolopostethus_puberulus.html [Accessed 14 June 2021].

BWARS (Bees, Wasps and Ants Recording Society). (2020). *Lasius sabularum*. [online] Available at: https://www.bwars.com/ant/formicidae/formicinae/lasius-sabularum [Accessed 14 June 2021].

Falk, S. J. (1991). A review of the scarce and threatened bees, wasps and ants of Great Britain. Research and Survey in Nature Conservation No. 35. Nature Conservancy Council, Peterborough.

Fox, R., Warren, M. S., and Brereton, T. M. (2010). A new Red List of British Butterflies, *Species Status* 12; 1-32. Joint Nature Conservation Committee, Peterborough.

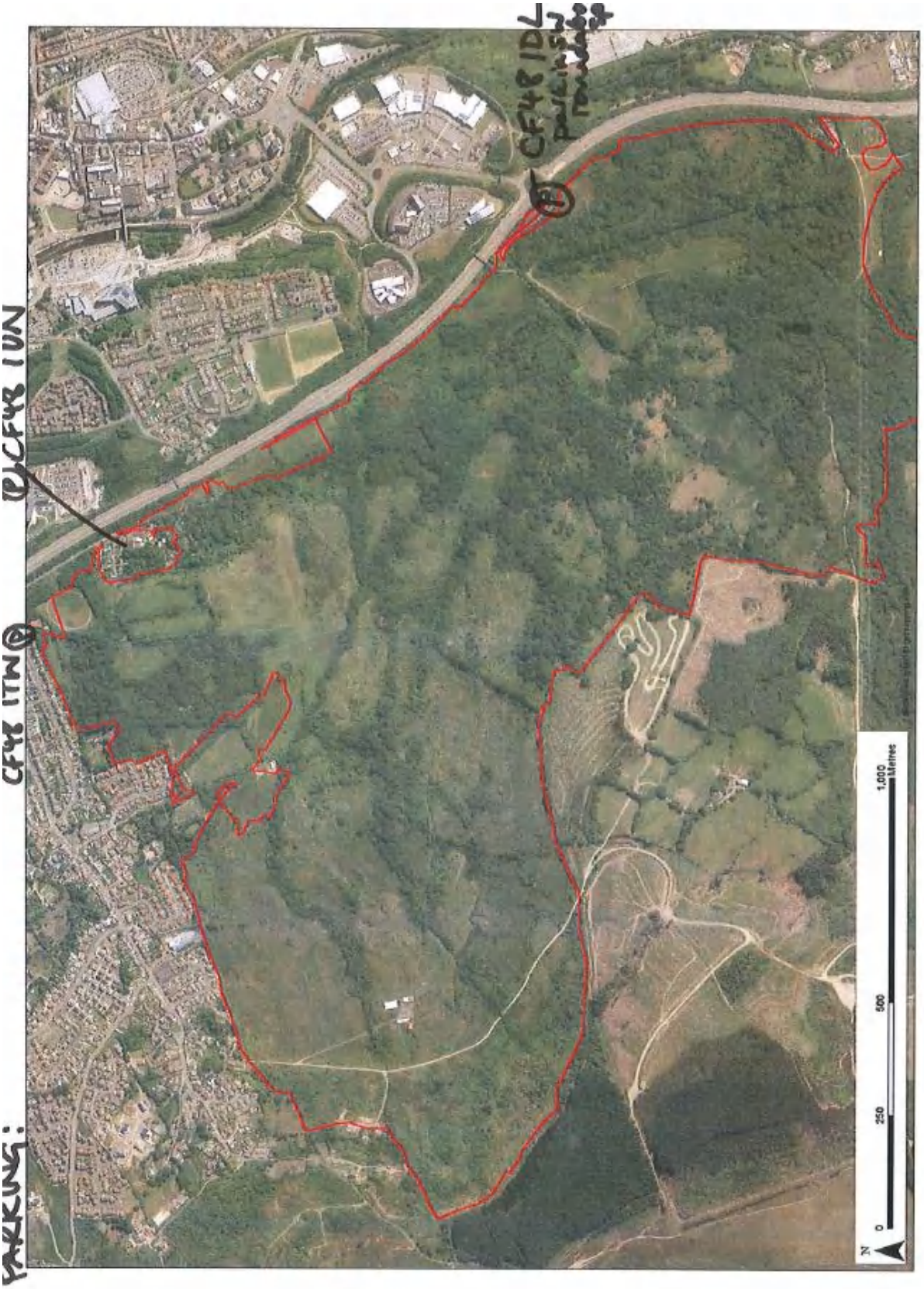
Lee, P. (2015). A review of the millipedes (Diplopoda), centipedes (Chilopoda) and woodlice (Isopoda) of Great Britain. Natural England Commissioned Report NECR186 Species Status No. 23.

Met Office (2021a). NCIC Monthly Summary: April 2021. [online] Available at: https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/summaries/uk_monthly_climate_summary_202104.pdf [Accessed 14 June 2021].

Met Office (2021b). NCIC Monthly Summary: May 2021. [online] Available at: https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/summaries/uk_monthly_climate_summary_202105.pdf [Accessed 14 June 2021].

Olds, L. T. (2018). Cwm Glo a Glyndrys SSSI, Merthyr Tydfil – Invertebrate survey report. Colliery Spoil Biodiversity Initiative.

Appendix 1: Aerial photograph of Cwm Glo a Glyndrys SSSI showing the entire site boundary (outlined in red). Aerial photograph © getmapping.com.



Appendix 2: List of invertebrate species identified during the survey at Cwm Glo a Glyndrys SSSI in 2021. National status codes are explained below. Species considered 'new' to the site are highlighted in yellow.

- **Local** = Species which, whilst fairly common, are evidently less widespread than truly common species, but also not qualifying as Nationally Scarce having been recorded from over 100, but less than 300, ten-kilometre squares of the British National Grid system since 1970.
- **Nationally Rare (NR) or RDB3** = Taxa with small populations which are not at present endangered or vulnerable but which are at risk. These are species which are estimated to occur in 15 or fewer ten-kilometre squares of the British National Grid system since 1970.
- **Nationally Scarce (NS)** = Species occurring within the range of 16 to 100 ten-kilometre squares of the British National Grid system since 1970.
- **Near Threatened (NT)** = Species which do not qualify for Critically Endangered, Endangered or Vulnerable now but are close to qualifying for, or are likely to qualify for, a threatened category in the near future.
- **Section 7** = Species listed under Section 7 of Environment (Wales) Act 2016 as 'species of principal importance for conservation of biological diversity in Wales'.
- **Unknown or RDBK** = Species that are suspected but not definitely known to belong to any of the following categories (Endangered, Vulnerable, Near Threatened, Rare) because of the lack of information.
- **Vulnerable (VU) or RDB2** = Species considered to be facing a high risk of extinction in the wild.
- Where Status is blank, this species is considered to be common and widespread.

Species	Family	Order	Conservation status	Habitat
Agalenatea redii	Araneidae	Araneae		
Dictyna arundinacea	Dictynidae	Araneae		tall sward & scrub
Zelotes latreillei	Gnaphosidae	Araneae		tall sward & scrub
Microlinyphia pusilla	Linyphiidae	Araneae		tall sward & scrub
Alopecosa pulverulenta	Lycosidae	Araneae		tall sward & scrub; upland
Pardosa amentata	Lycosidae	Araneae		peatland
Pardosa monticola	Lycosidae	Araneae		tall sward & scrub
Pardosa nigriceps	Lycosidae	Araneae		tall sward & scrub
Pardosa prativaga	Lycosidae	Araneae		tall sward & scrub
Pardosa pullata	Lycosidae	Araneae		tall sward & scrub
Heliophanus flavipes	Salticidae	Araneae		tall sward & scrub
Metellina mengei	Tetragnathidae	Araneae		
Pachygnatha degeeri	Tetragnathidae	Araneae		
Episinus	Theridiidae	Araneae		
Xysticus cristatus	Thomisidae	Araneae		
Ceratosphys amoena	Opisthocheiridae	Chordeumatida	NR	

subsp. confusa				
Aphodius prodromus	Aphodiidae	Coleoptera		tall sward & scrub
Aphodius sphacelatus	Aphodiidae	Coleoptera		tall sward & scrub
Catapion seniculus	Apionidae	Coleoptera		tall sward & scrub
Ceratapion onopordi	Apionidae	Coleoptera		tall sward & scrub
Exapion ulicis	Apionidae	Coleoptera		
Perapion violaceum	Apionidae	Coleoptera		tall sward & scrub
Protapion apricans	Apionidae	Coleoptera		tall sward & scrub
Protapion assimile	Apionidae	Coleoptera		tall sward & scrub
Cantharis rustica	Cantharidae	Coleoptera		tall sward & scrub
Abax parallelepipedus	Carabidae	Coleoptera		shaded woodland floor
Acupalpus dubius	Carabidae	Coleoptera		peatland
Agonum emarginatum	Carabidae	Coleoptera		marshland
Bembidion biguttatum	Carabidae	Coleoptera		marshland
Bembidion guttula	Carabidae	Coleoptera		marshland
Bembidion lunulatum	Carabidae	Coleoptera		marshland
Bembidion mannerheimii	Carabidae	Coleoptera		peatland; shaded woodland floor; wet woodland
Bembidion properans	Carabidae	Coleoptera		short sward & bare ground
Bembidion tibiale	Carabidae	Coleoptera		running water
Bradycellus harpalinus	Carabidae	Coleoptera		tall sward & scrub
Cicindela campestris	Carabidae	Coleoptera		short sward & bare ground
Cychrus caraboides	Carabidae	Coleoptera		tall sward & scrub
Nebria brevicollis	Carabidae	Coleoptera		tall sward & scrub
Ocys tachysoides sens.str.	Carabidae	Coleoptera		
Poecilus cupreus	Carabidae	Coleoptera		short sward & bare ground
Pterostichus diligens	Carabidae	Coleoptera		peatland
Pterostichus madidus	Carabidae	Coleoptera		tall sward & scrub
Pterostichus rhaeticus	Carabidae	Coleoptera		
Pterostichus strenuus	Carabidae	Coleoptera		tall sward & scrub
Trechus obtusus	Carabidae	Coleoptera		tall sward & scrub
Cassida flaveola	Chrysomelidae	Coleoptera		tall sward & scrub
Cassida hemisphaerica	Chrysomelidae	Coleoptera	NS	tall sward & scrub
Cassida rubiginosa	Chrysomelidae	Coleoptera		tall sward & scrub
Cassida vibex	Chrysomelidae	Coleoptera		short sward & bare ground
Chaetocnema hortensis	Chrysomelidae	Coleoptera		tall sward & scrub
Crepidodera plutus	Chrysomelidae	Coleoptera	Local	arboreal
Hydrothassa glabra	Chrysomelidae	Coleoptera	Local	tall sward & scrub
Hydrothassa marginella	Chrysomelidae	Coleoptera		tall sward & scrub
Lochmaea suturalis	Chrysomelidae	Coleoptera		
Phyllotreta exclamationis	Chrysomelidae	Coleoptera		tall sward & scrub

Coccinella septempunctata	Coccinellidae	Coleoptera		
Rhyzobius litura	Coccinellidae	Coleoptera		tall sward & scrub
Micrambe ulicis	Cryptophagidae	Coleoptera		
Andrion regensteinense	Curculionidae	Coleoptera		
Barynotus obscurus	Curculionidae	Coleoptera		tall sward & scrub
Glocianus distinctus	Curculionidae	Coleoptera		short sward & bare ground
Hypera plantaginis	Curculionidae	Coleoptera		tall sward & scrub
Leiosoma deflexum	Curculionidae	Coleoptera		tall sward & scrub
Mecinus pascuorum	Curculionidae	Coleoptera		tall sward & scrub
Mecinus pyraster	Curculionidae	Coleoptera		tall sward & scrub
Micrelus ericae	Curculionidae	Coleoptera		
Rhamphus pulicarius	Curculionidae	Coleoptera		arboreal
Rhinoncus leucostigma	Curculionidae	Coleoptera		tall sward & scrub
Sitona sulcifrons	Curculionidae	Coleoptera		tall sward & scrub
Sitona suturalis	Curculionidae	Coleoptera		tall sward & scrub
Trichosirocalus troglodytes	Curculionidae	Coleoptera		tall sward & scrub
Agabus sturmii	Dytiscidae	Coleoptera		marshland
Hydroporus erythrocephalus	Dytiscidae	Coleoptera		marshland
Hygrotus inaequalis	Dytiscidae	Coleoptera		marshland
Hyphydrus ovatus	Dytiscidae	Coleoptera		marshland
Agriotes lineatus	Elateridae	Coleoptera		tall sward & scrub
Prosternon tessellatum	Elateridae	Coleoptera		
Zorochros minimus	Elateridae	Coleoptera		running water
Anacaena globulus	Hydrophilidae	Coleoptera		marshland
Anacaena limbata	Hydrophilidae	Coleoptera		marshland
Cercyon haemorrhoidalis	Hydrophilidae	Coleoptera		tall sward & scrub
Cercyon impressus	Hydrophilidae	Coleoptera		tall sward & scrub
Cercyon melanocephalus	Hydrophilidae	Coleoptera		tall sward & scrub
Chaetarthria simillima	Hydrophilidae	Coleoptera	NS	peatland
Coelostoma orbiculare	Hydrophilidae	Coleoptera		peatland
Cryptopleurum minutum	Hydrophilidae	Coleoptera		tall sward & scrub
Helophorus obscurus	Hydrophilidae	Coleoptera		marshland
Megasternum concinnum	Hydrophilidae	Coleoptera		tall sward & scrub
Sphaeridium bipustulatum	Hydrophilidae	Coleoptera		tall sward & scrub
Sphaeridium scarabaeoides	Hydrophilidae	Coleoptera		tall sward & scrub
Catops coracinus	Leiodidae	Coleoptera		
Meligethes aeneus	Nitidulidae	Coleoptera		
Noterus clavicornis	Noteridae	Coleoptera		marshland
Cephennium gallicum	Scydmaenidae	Coleoptera		
Anotylus rugosus	Staphylinidae	Coleoptera		marshland
Anthobium atrocephalum	Staphylinidae	Coleoptera		shaded woodland floor

Bisnius fimetarius	Staphylinidae	Coleoptera		tall sward & scrub
Drusilla canaliculata	Staphylinidae	Coleoptera		tall sward & scrub
Lathrobium terminatum	Staphylinidae	Coleoptera		peatland
Lesteva sicula	Staphylinidae	Coleoptera		marshland
Myllaena infuscata	Staphylinidae	Coleoptera		marshland
Oxytelus laqueatus	Staphylinidae	Coleoptera		tall sward & scrub
Philonthus varians	Staphylinidae	Coleoptera		tall sward & scrub
Quedius schatzmayri	Staphylinidae	Coleoptera		tall sward & scrub
Reichenbachia juncorum	Staphylinidae	Coleoptera		peatland
Rugilus erichsonii	Staphylinidae	Coleoptera		peatland
Stenus bifoveolatus	Staphylinidae	Coleoptera		peatland
Stenus cicindeloides	Staphylinidae	Coleoptera		peatland
Stenus clavicornis	Staphylinidae	Coleoptera		tall sward & scrub
Stenus flavipes	Staphylinidae	Coleoptera		shaded woodland floor; wet woodland
Stenus fulvicornis	Staphylinidae	Coleoptera		tall sward & scrub
Stenus latifrons	Staphylinidae	Coleoptera		peatland
Stenus lustrator	Staphylinidae	Coleoptera		peatland
Stenus nanus	Staphylinidae	Coleoptera		tall sward & scrub
Stenus ossium	Staphylinidae	Coleoptera		tall sward & scrub
Stenus picipes	Staphylinidae	Coleoptera		tall sward & scrub
Stenus providus	Staphylinidae	Coleoptera		marshland
Stenus tarsalis	Staphylinidae	Coleoptera		marshland
Tachinus marginellus	Staphylinidae	Coleoptera		tall sward & scrub
Tachinus rufipes	Staphylinidae	Coleoptera		tall sward & scrub
Tachyporus dispar	Staphylinidae	Coleoptera		tall sward & scrub
Forficula auricularia	Forficulidae	Dermaptera		
Bibio johannis	Bibionidae	Diptera		tall sward & scrub
Bibio marci	Bibionidae	Diptera		shaded woodland floor; tall sward & scrub
Bombylius major	Bombyliidae	Diptera		tall sward & scrub
Geomyza tripunctata	Opomyzidae	Diptera		shaded woodland floor; tall sward & scrub
Sepsis cynipsea	Sepsidae	Diptera		tall sward & scrub
Sepsis flavimana	Sepsidae	Diptera		tall sward & scrub
Sepsis orthocnemis	Sepsidae	Diptera		tall sward & scrub
Cheilosia urbana	Syrphidae	Diptera		tall sward & scrub
Dasysyrphus tricinctus	Syrphidae	Diptera		arboreal
Melanostoma mellinum	Syrphidae	Diptera		tall sward & scrub
Melanostoma scalare	Syrphidae	Diptera		tall sward & scrub
Platycheirus tarsalis	Syrphidae	Diptera	Local	shaded woodland floor
Sphaerophoria interrupta	Syrphidae	Diptera		tall sward & scrub
Gonia picea	Tachinidae	Diptera		
Gymnocheta viridis	Tachinidae	Diptera		

Tachina ursina	Tachinidae	Diptera		
Cyphoderus albinus	Cyphoderidae	Entomobryomorpha		
Entomobrya multifasciata	Entomobryidae	Entomobryomorpha		
Orchesella cincta	Entomobryidae	Entomobryomorpha		
Orchesella villosa	Entomobryidae	Entomobryomorpha		
Isotomurus palustris	Isotomidae	Entomobryomorpha		
Pogonognathellus longicornis	Tomoceridae	Entomobryomorpha		
Geophilus easoni	Geophilidae	Geophilomorpha		shaded woodland floor
Schendyla nemorensis	Schendylidae	Geophilomorpha		tall sward & scrub
Anthocoris nemoralis	Anthocoridae	Hemiptera		arboreal
Anthocoris nemorum	Anthocoridae	Hemiptera		
Berytinus (Berytinus) minor	Berytidae	Hemiptera		short sward & bare ground
Berytinus (Berytinus) signoreti	Berytidae	Hemiptera		short sward & bare ground
Euscelis incisus	Cicadellidae	Hemiptera		tall sward & scrub
Tachycixius pilosus	Cixiidae	Hemiptera		
Criomorphus albomarginatus	Delphacidae	Hemiptera		tall sward & scrub
Javesella pellucida	Delphacidae	Hemiptera		tall sward & scrub
Stenocranus minutus	Delphacidae	Hemiptera		tall sward & scrub
Hydrometra stagnorum	Hydrometridae	Hemiptera		marshland
Cymus melanocephalus	Lygaeidae	Hemiptera		tall sward & scrub
Drymus (Sylvadrymus) sylvaticus	Lygaeidae	Hemiptera		tall sward & scrub
Kleidocerys resedae	Lygaeidae	Hemiptera		arboreal
Peritrechus geniculatus	Lygaeidae	Hemiptera		tall sward & scrub
Plinthisus brevipennis	Lygaeidae	Hemiptera	Local	short sward & bare ground
Scolopostethus decoratus	Lygaeidae	Hemiptera		
Scolopostethus puberulus	Lygaeidae	Hemiptera	Local	tall sward & scrub
Hoplomachus thunbergii	Miridae	Hemiptera	Scarce	short sward & bare ground
Liocoris tripustulatus	Miridae	Hemiptera		tall sward & scrub
Lygus pratensis	Miridae	Hemiptera	RDB 3	
Stenodema (Brachystira) calcarata	Miridae	Hemiptera		tall sward & scrub
Stenodema (Stenodema) laevigata	Miridae	Hemiptera		tall sward & scrub
Nabis (Nabis) ericetorum	Nabidae	Hemiptera		
Notonecta (Notonecta) glauca	Notonectidae	Hemiptera		marshland
Dolycoris baccarum	Pentatomidae	Hemiptera		tall sward & scrub
Chartoscirta cincta	Saldidae	Hemiptera		marshland
Saldula saltatoria	Saldidae	Hemiptera		marshland
Dictyla convergens	Tingidae	Hemiptera		marshland
Microvelia (Microvelia)	Veliidae	Hemiptera		marshland

reticulata				
Andrena bicolor	Andrenidae	Hymenoptera		short sward & bare ground
Andrena cineraria	Andrenidae	Hymenoptera		short sward & bare ground
Andrena clarkella	Andrenidae	Hymenoptera		short sward & bare ground
Andrena fulva	Andrenidae	Hymenoptera		short sward & bare ground
Andrena haemorrhoa	Andrenidae	Hymenoptera		short sward & bare ground
Andrena humilis	Andrenidae	Hymenoptera	NS (Nb)	short sward & bare ground
Andrena minutula	Andrenidae	Hymenoptera		short sward & bare ground
Andrena praecox	Andrenidae	Hymenoptera		short sward & bare ground
Andrena subopaca	Andrenidae	Hymenoptera		short sward & bare ground
Bombus hortorum	Apidae	Hymenoptera		tall sward & scrub
Bombus hypnorum	Apidae	Hymenoptera		shaded woodland floor; tall sward & scrub
Bombus jonellus	Apidae	Hymenoptera		
Bombus lapidarius	Apidae	Hymenoptera		tall sward & scrub
Bombus lucorum sensu lato	Apidae	Hymenoptera		
Bombus pascuorum	Apidae	Hymenoptera		tall sward & scrub
Bombus pratorum	Apidae	Hymenoptera		shaded woodland floor; tall sward & scrub
Nomada fabriciana	Apidae	Hymenoptera		short sward & bare ground
Nomada lathburiana	Apidae	Hymenoptera	NR (RDB 3)	short sward & bare ground
Nomada signata	Apidae	Hymenoptera	Vulnerable (RDB 2)	short sward & bare ground
Formica fusca	Formicidae	Hymenoptera		
Lasius flavus	Formicidae	Hymenoptera		short sward & bare ground
Lasius fuliginosus	Formicidae	Hymenoptera		decaying wood
Lasius niger	Formicidae	Hymenoptera		short sward & bare ground
Lasius sabularum	Formicidae	Hymenoptera	Local	short sward & bare ground; tall sward & scrub
Myrmica rubra	Formicidae	Hymenoptera		tall sward & scrub
Myrmica ruginodis	Formicidae	Hymenoptera		shaded woodland floor
Myrmica sabuleti	Formicidae	Hymenoptera		short sward & bare ground
Myrmica scabrinodis	Formicidae	Hymenoptera		tall sward & scrub

Halictus tumulorum	Halictidae	Hymenoptera		short sward & bare ground
Lasioglossum morio	Halictidae	Hymenoptera		short sward & bare ground
Lasioglossum villosulum	Halictidae	Hymenoptera		short sward & bare ground
Sphecodes ephippius	Halictidae	Hymenoptera		short sward & bare ground
Sphecodes geoffrellus	Halictidae	Hymenoptera		short sward & bare ground
Osmia bicornis	Megachilidae	Hymenoptera		shaded woodland floor; tall sward & scrub
Arachnospila anceps	Pompilidae	Hymenoptera		tall sward & scrub
Platycampus luridiventris	Tenthredinidae	Hymenoptera		
Dolichovespula saxonica	Vespidae	Hymenoptera	Unknown (RDB K)	arboreal
Dolichovespula sylvestris	Vespidae	Hymenoptera		arboreal
Asellus (Asellus) aquaticus	Asellidae	Isopoda		marshland
Oniscus asellus	Oniscidae	Isopoda		
Philoscia muscorum	Philosciidae	Isopoda		
Porcellio scaber	Porcellionidae	Isopoda		
Androniscus dentiger	Trichoniscidae	Isopoda		
Haplophthalmus mengii	Trichoniscidae	Isopoda		shaded woodland floor
Trichoniscus pusillus	Trichoniscidae	Isopoda		
Archiboreoiulus pallidus	Blaniulidae	Julida		tall sward & scrub
Blaniulus guttulatus	Blaniulidae	Julida		tall sward & scrub
Proteroiulus fuscus	Blaniulidae	Julida		decaying wood
Cylindroiulus britannicus	Julidae	Julida		decaying wood
Cylindroiulus punctatus	Julidae	Julida		shaded woodland floor
Leptoiulus belgicus	Julidae	Julida	NS	shaded woodland floor
Ommatoiulus moreleti	Julidae	Julida		
Ommatoiulus sabulosus	Julidae	Julida		shaded woodland floor
Ophyiulus pilosus	Julidae	Julida		shaded woodland floor
Tachypodoiulus niger	Julidae	Julida		
Erynnis tages	Hesperiidae	Lepidoptera	Section 7 Priority Species; VU	tall sward & scrub
Polyommatus icarus	Lycaenidae	Lepidoptera		short sward & bare ground
Micropterix calthella	Micropterigidae	Lepidoptera		arboreal
Aglais io	Nymphalidae	Lepidoptera		tall sward & scrub
Aglais urticae	Nymphalidae	Lepidoptera		tall sward & scrub
Euphydryas aurinia	Nymphalidae	Lepidoptera	Legal Protection; Section 7 Priority Species; VU	tall sward & scrub

Polygonia c-album	Nymphalidae	Lepidoptera		tall sward & scrub
Anthocharis cardamines	Pieridae	Lepidoptera		tall sward & scrub
Pieris napi	Pieridae	Lepidoptera		
Ancylis badiana	Tortricidae	Lepidoptera		
Grapholita jungiella	Tortricidae	Lepidoptera		tall sward & scrub
Lithobius (Lithobius) calcaratus	Lithobiidae	Lithobiomorpha		tall sward & scrub
Lithobius (Lithobius) forficatus	Lithobiidae	Lithobiomorpha		
Lithobius (Lithobius) variegatus	Lithobiidae	Lithobiomorpha		shaded woodland floor
Lithobius (Sigibius) microps	Lithobiidae	Lithobiomorpha		shaded woodland floor
Nemastoma bimaculatum	Nemastomatidae	Opiliones		shaded woodland floor
Sabacon viscayanum subsp. ramblaianum	Sabaconidae	Opiliones		shaded woodland floor
Tetrix subulata	Tetrigidae	Orthoptera		peatland
Tetrix undulata	Tetrigidae	Orthoptera		tall sward & scrub
Siphonoperla torrentium	Chloroperlidae	Plecoptera		running water
Nemoura cinerea	Nemouridae	Plecoptera		marshland
Polydesmus angustus	Polydesmidae	Polydesmida		
Chthonius ischnocheles	Chthoniidae	Pseudoscorpiones		
Deroceras (Deroceras) invadens	Agriolimacidae	Pulmonata		
Deroceras (Deroceras) laeve	Agriolimacidae	Pulmonata		marshland
Deroceras (Deroceras) reticulatum	Agriolimacidae	Pulmonata		tall sward & scrub
Arion (Arion) flagellus	Arionidae	Pulmonata		tall sward & scrub
Arion (Arion) rufus	Arionidae	Pulmonata		
Arion (Carinarion) circumscriptus silvaticus	Arionidae	Pulmonata		tall sward & scrub
Arion (Carinarion) fasciatus	Arionidae	Pulmonata		tall sward & scrub
Arion (Kobeltia) distinctus	Arionidae	Pulmonata		tall sward & scrub
Arion (Kobeltia) hortensis	Arionidae	Pulmonata		tall sward & scrub
Arion (Mesarion) subfuscus	Arionidae	Pulmonata		tall sward & scrub
Trochulus (Trochulus) striolatus	Hygromiidae	Pulmonata		tall sward & scrub
Zenobiellina subrufescens (J. S. Miller, 1822)	Hygromiidae	Pulmonata		shaded woodland floor
Limax maximus	Limacidae	Pulmonata		tall sward & scrub
Aegopinella nitidula	Oxychilidae	Pulmonata		tall sward & scrub
Oxychilus (Oxychilus) alliarius	Oxychilidae	Pulmonata		woodland habitat
Oxychilus (Oxychilus) cellarius	Oxychilidae	Pulmonata		tall sward & scrub
Oxychilus (Oxychilus)	Oxychilidae	Pulmonata		tall sward & scrub

draparnaudi				
Vertigo (Vertigo) pygmaea	Vertiginidae	Pulmonata		tall sward & scrub
Arianta arbustorum		Pulmonata		tall sward & scrub
Cryptops hortensis	Cryptopidae	Scolopendromorpha		
Microplana terrestris	Rhynchodemidae	Seriata		
Dicyrtomina saundersi	Dicyrtomidae	Symphypleona		

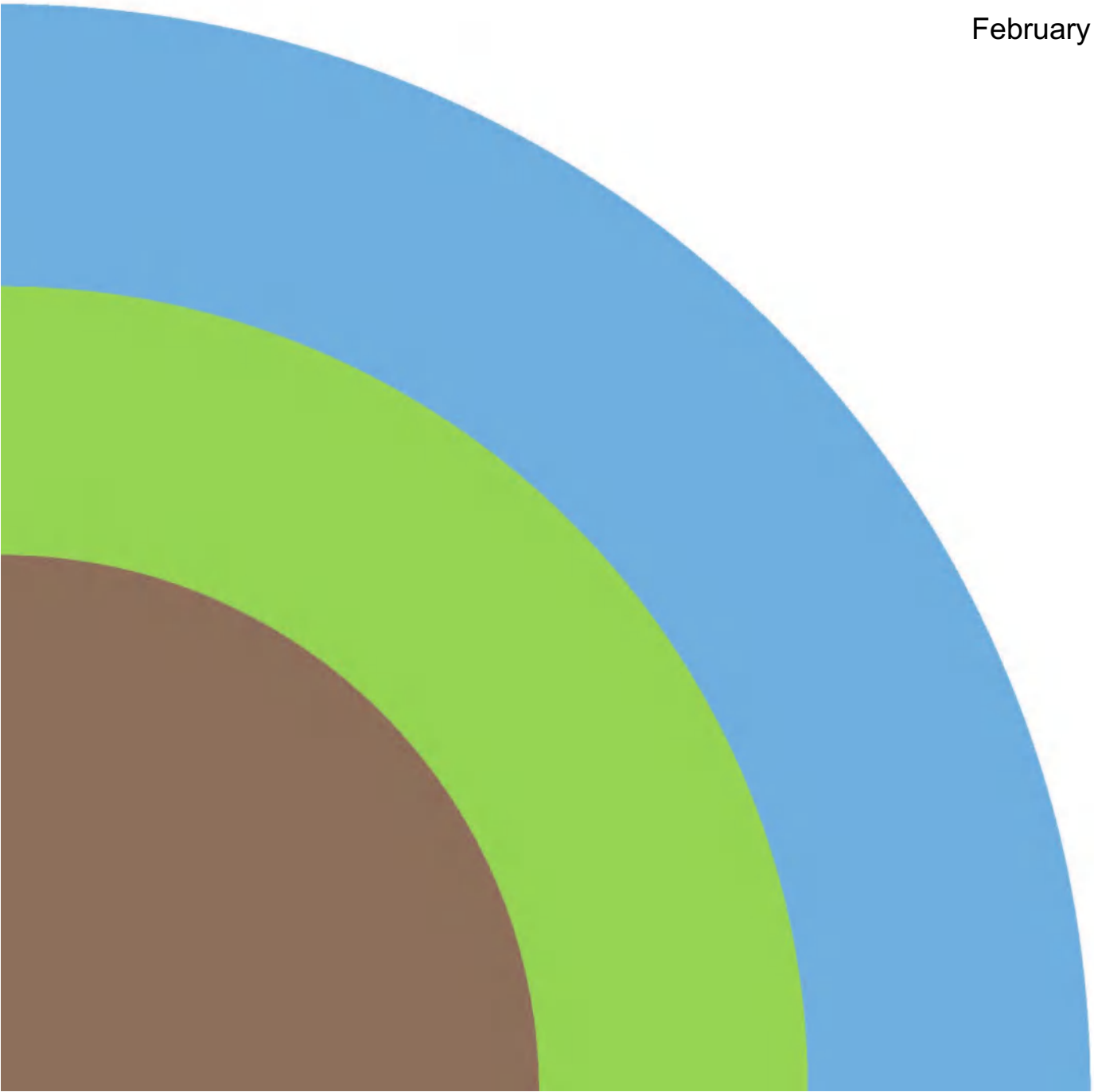
APPENDIX 9

Cwm Glo a Glyndyrys, Merthyr Tydfil

Species Survey Report:

Birds

February 2022



COMMISSIONED BY
Marvel Ltd

Written by: *Ben Carpenter*

Approved by: *Dominic Woodfield*

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

February 2022

Bioscan Report No.
E1835-BIRD-R1

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CONTENTS

1 INTRODUCTION 1

1.1 Background 1

2 SURVEY METHODOLOGY 2

2.1 Desk Study and background data 2

2.2 Bird surveys 2

3 RESULTS 8

3.1 Desk Study 8

3.2 Breeding bird survey 9

3.3 Wintering bird survey 12

3.4 Willow tit survey 13

4 EVALUATION 14

FIGURES

Figure 1. Breeding Bird Territory Mapping 2021

1 INTRODUCTION

1.1 Background

1.1.1 This report sets out the results of bird surveys carried out in 2015, 2016, 2018 and 2021, by Bioscan on the Marvel Ltd landholding at Cwm Glo a Glyndyrys, Rhyd-y-car West, Merthyr Tydfil.

1.1.2 The surveys form a component of a broader suite of ecological and other surveys carried out at the site during the course of 2015, 2016, 2018 and 2021, to inform the design and ultimately assessment of the proposals to redevelop parts of the site.

1.1.3 As some bird species are afforded protection under UK legislation and are Species of Principal Importance further to the provisions of Section 7 of the Environment (Wales) Act 2016, their presence and distribution within a proposed development site is a material consideration in the determination of a planning application. Marvel Ltd. is consulting on a proposed planning application for leisure development within the red-line shown on **Figure 1**. Nevertheless, areas outside of this prospective application site have also been surveyed, with a much larger area covered in the initial survey years. The survey area has becoming progressively more focused in successive years as the design process has settled on the current application site. The bird records from outside of the application site are nevertheless included as supplementary information, as they aid in placing the results from within the application site into a local context.

1.1.4 The purpose of the surveys has been to assess what bird species are present within the application site; their numbers; their breeding status; and evaluate the importance of the application site for birds to inform masterplanning and subsequent impact assessments and planning determination, with reference to applicable industry standards.

2 SURVEY METHODOLOGY

2.1 Desk Study and background data

2.1.1 A data request was submitted to the South East Wales Biodiversity Records Centre (SEWBReC) for records of protected and/or notable species within 5km from the centre of the application site on 17th May 2021.

2.1.2 To aid in placing the results of the bird surveys into historical context, a bird report[1] produced in 2008 by the Countryside Council for Wales (CCW) for a proposed extension to the Cwm Glo Site of Special Scientific Interest (SSSI) was reviewed. This report provided details of an investigation on the possibility of including the scrubland breeding bird assemblage as a feature of the SSSI. The data were sourced at that time from multiple parties (including BirdTrack and the Glamorgan Bird Club) to investigate the breeding bird assemblage; however, no specific surveys of the study area were undertaken to inform the report.

2.1.3 During the bird breeding season of 1997, the southern and central sections of the study area were subject to a Common Birds Census (CBC) in support of a previous planning application. In 2007, a further CBC was carried out of the south-western part of the study area. These previous surveys were also reviewed to assess if there were any bird records of note.

2.2 Bird surveys

2.2.1 The following paragraphs set out the methodology of the bird surveys undertaken by Bioscan on the site since 2015, along with the timings and details of each suite of surveys.

Breeding Bird Surveys

2.2.2 Breeding bird surveys of the application site were undertaken in 2015, 2018 and 2021. The methodology for these surveys was in each instance based upon the application of the territory mapping technique as forms the basis of the British Trust for Ornithology's (BTO) Common Bird Census[2] approach. The surveyor/s attended the site just after sunrise and walked the site as a continuous transect taking in all field boundaries, and concentrations of scrub, as well as the more open aspects. During the transect walk, all visual and aural observations of birds present were noted onto a large-scale map using standard BTO notation and included annotations of behaviour to assist with determining breeding status. The start and end point, and direction of travel along the transect routes were varied between visits to avoid sequential bias.

[1] Facey, R. (2008) Potential Scrubland Breeding Bird Assemblage Feature at the Cwm Glo A Glyndyrys SSSI: An Appraisal. Countryside Council for Wales

[2] Bibby, C. J., N.D. Burgess, D.A. Hill, and S.H. Mustoe. 2000. *Bird census techniques*. 2nd ed. Academic Press, London and San Diego, Calif. 302 p.

2.2.3 Surveys were only carried out during suitable weather conditions; i.e. avoiding conditions that could suppress bird activity or otherwise compromise the effectiveness of the technique (e.g. strong wind, rain).

2.2.4 Each species recorded during the survey was assigned into one of the following categories[3] to assess the likelihood of breeding within the application site. The highest category observed over the most recent surveys was used to provide the breeding assessment for each species. **Table 1** below provides the breeding status and the survey evidence used in this assessment.

Table 1. Breeding bird status categories

Breeding status category	Survey evidence
Confirmed breeding	Recently fledged young in suitable nesting habitat Adults entering or leaving a nest site Adult carrying a faecal sac or food Nest with eggs Nest with young
Probable breeder	Pair present in suitable nesting habitat Territory present between survey visits Courtship/ displaying Visiting probable nest Agitated behaviour from a parent bird Nest building
Possible breeder	Species observed in suitable nesting habitat Singing male in suitable nesting habitat
Non-breeding	Flying over Feeding on site only (likely to be breeding off-site) Winter migrant

2.2.5 At the completion of the surveys for each year, the visit maps were subject to a territory mapping exercise, based on the analysis guidelines outlined in the CBC methodology. The number of apparently-held territories were then counted to produce an approximate territory number for the study area. The study area contracted between survey years and became more focused on the current application site as the location of the development proposals became settled (see **Figure 1**). Where appropriate, a range in the number of territories for some species is given due to some territories appearing to partially fall within the current application site. In respect of the 2015 and 2018 breeding bird surveys the maps were re-analysed in order to extrapolate comparative territory numbers for these years for the current study area and application site.

2.2.6 Although access to some areas was difficult due to the presence of dense vegetation and steep slopes (e.g. spoil mounds), it is considered that the majority of the site was able to be covered from the adjoining accessible land. Consequently, it is considered that there were no significant limitations to the survey, and confidence in the results is high.

[3] Derived from the methodology of the UK Breeding Bird Atlas 2007-11

Breeding Bird Survey- 2015

2.2.7 Three sets of breeding bird survey visits were undertaken between May and June 2015. No visits were undertaken in April of that year due to the date of the survey commission; instead, two visits were undertaken in May. **Figure 1** provides the area surveyed in 2015. Due to its large size, the area was divided into two broadly equal halves, which were then covered by two surveyors during one morning, or by one surveyor covering each half over two mornings. **Table 2** below provides the survey dates, timings and weather.

Table 2. Details of 2015 breeding bird survey

Breeding bird visit number	1st		2nd	3rd	
Date	12/05/2015	15/05/2015	27/05/2015	24/06/2015	25/06/2015
Start time	05:15	05:25	05:17	04:45	05:40
End time	12:00	11:30	13:00	11:45	11:05
Start temperature (°C)	8	8	5	8	12
End temperature (°C)	14	14	7	20	21
Sunrise time	05:26	05:21	05:06	04:56	04:57
Wind	Brisk south-westerly wind, gusting to 5 later	None	Slight south-easterly breeze	None	None
Cloud	8/8	6/8	3/8	5/8	8/8
Number of surveyors	1	1	2	1	1
Notes	Drizzly at start, clearing to scattered showers			Sunny spells	Slight drizzle at times

Breeding Bird Survey- 2018

2.2.8 A somewhat reduced study area was subject to a further three breeding bird survey visits in 2018 (see **Figure 1**). These were undertaken between April and June 2018. **Table 3** below provides the survey dates, timings and weather.

Table 3. Details of 2018 breeding bird survey

Date	25/04/2018	18/05/2018	15/06/2018
Start time	05:55	05:10	04:53
End time	14:00	12:50	12:05
Start temperature (°C)	9	6	8
End temperature (°C)	12	16	16.5
Sunrise time	06:00	05:20	04:57
Wind	Occasional light breeze	None	None/little
Cloud	8/8	0/8-7/8	3/8-5/8
Notes	Two brief squalls of rain. Occasional sunny periods		Light rain shower for 5 minutes

Breeding Bird Survey- 2021

2.2.9 The 2021 study area was focused on the current application site and adjoining parts of the landholding (see **Figure 1**). Four visits were undertaken between April and June 2021. **Table 4** below provides the survey dates, timings and weather. The April visit was split into two sections, with the southern part of the study area surveyed during the first visit, and the second visit covering the northern third. To aid in producing the territory species maps, the results from a wintering bird survey visit carried out in March 2021, were used (this is particularly useful for species which typically cease singing in the latter part of the breeding bird season, e.g. great tit, robin).

Table 4. Details of 2021 breeding bird survey

Survey Visit	1		2	3
Date	22/04/2021	30/04/2021	18/05/2021	16/06/2021
Start time	05:57	05:57	05:13	05:00
End time	12:00	09:00	13:24	13:17
Start temperature (°C)	3	3	7	12
End temperature (°C)	14	5	15	22
Sunrise time	06:06	05:50	05:19	04:57
Wind	None	None	Little/none	None
Cloud	0/8	8/8-5/8	7/8-8/8	2/8-6/8
Notes			Occasional light showers	

Wintering Bird Surveys

2.2.10 The methodology for these surveys essentially replicates the territory mapping technique used for the breeding surveys as set out in section 2.2.2 above. In summary, this involved the surveyor attending the site around sunrise on each visit and walking the site as a continuous transect taking in all field boundaries and concentrations of scrub, as well as more open habitats, and recording all visual and aural registrations of birds present onto a large-scale map using standard species identification and activity notation.

Wintering Bird Survey- 2015/16

2.2.11 Three sets of continuous transect winter bird survey visits of the 2015 study area (for which see **Figure 1**) were undertaken between November 2015 and February 2016. Due to its large size, the study area was divided into two broadly equal halves, which were then covered by two surveyors during one morning, or by one surveyor covering each half over two mornings (as per the 2015 breeding bird survey).

2.2.12 Due to the presence of perceived high quality foraging habitat for owls, such as short-eared owl *Asio flammeus* and barn owl *Tyto alba*, in the form of rough grassland, and suitable habitat for roosting owls, such as long-eared owl *Asio otus*, in the form of dense

tall scrub, early morning (pre-dawn) and dusk/evening surveys were undertaken during each of the three survey sessions. This survey element comprised two parts; vantage point (VP) surveying and transects. The VP survey involved watching a suitable foraging area from either 20 minutes prior to dawn or from sunset to approximately 50 minutes after sunset (when it became too dark to be able to see effectively). The transect survey element was undertaken during darkness and involved walking through areas considered suitable for owls in order to detect calling individuals. In respect of the current application boundary, these surveys were focussed on the large area of open grassland in the north-west.

2.2.13 **Table 5** below provides the survey timings, and weather during each survey visit.

Table 5. Survey details of 2015/16 wintering bird survey

Winter visit number	1st		2nd		3rd	
Date	23/11/2015	07/12/2015	19/01/2016	20/01/2016	28/02/2016	29/02/2016
Start time	07:18	08:00	07:50	07:50	06:55	06:37
End time	14:00	14:48	16:00	14:30	15:00	12:20
Start temperature (°C)	-1.5	5	0	-5	2.5	-3
End temperature (°C)	5.5	11	0.5	2	7	1
Sunrise	07:43	08:03	08:08	08:07	07:01	06:59
Sunset	16:14	16:05	16:39	16:40	17:50	17:52
Wind	None	None	None	Still during most of day, increasing slightly towards end	Occasional westerly breeze	None/little
Cloud	3/8 to 8/8	6/8	0/8	0/8	6/8	0/8 to 8/8
Notes	Ground frost and small amounts of snow on ground. Sunny spells during day		Ground frost and small amounts of snow on ground. Sunny spells during day	Sunny		Frost in morning
Dusk Survey						
Start time	15:45	15:45	17:00	-	17:45	-
End time	17:00	16:48	18:35	-	18:45	-
Notes	Outside of Application site to north. Lightly spitting					

Wintering Bird Survey- 2020/21

2.2.14 Due to the date of commission of the wintering bird surveys, the visits were undertaken in the latter part of the winter (February and March 2021). The area surveyed comprised the same area as per the 2018 breeding bird survey area (for which see **Figure 1**). As per

the 2015/16 wintering bird surveys, visits were timed to commence or to be completed at dawn and dusk in order to cover the times when nocturnal species, primarily owls, would be more detectable, with this element of the survey focussed on open grassland in the south-west of the site. **Table 6** below provides the survey details of the wintering bird survey visits.

Table 6. Survey details of the wintering bird survey visits

Survey Visit	1st	2nd
Date	01/02/2021	02/03/2021
Start time	07:20	06:40
End time	17:46	16:35
Start temperature (°C)	2	1
End temperature (°C)	4	11
Sunrise	07:56	07:00
Sunset	17:06	17:59
Wind	Little/none	None
Cloud	8/8	0/8
Notes	Snow on ground in places at start of survey- melted by end of survey	

Willow Tit Survey- 2021

2.2.15 Due to the known presence of willow tit *Poecile montanus*, an increasingly scarce species, a targeted willow tit survey was undertaken during suitable weather conditions of the study area on the 12th March 2021. The survey methodology was based upon the 'Willow Tit National Survey Methods 2020[4]' and was conducted whilst walking to the various structures on the site to undertake a bat building hibernation inspection. The survey involved walking through areas considered suitable for willow tit (i.e. mainly the wooded areas), whilst playing a recording of the willow tit (two-minute file downloaded from the survey page of the Rare Breeding Birds Panel[5]). Stops were made along the route to listen for any responding birds.

Other

Incidental sightings of birds were also noted whilst undertaking other ecological surveys within the application site, and these records are referenced below where relevant.

[4] Downloaded via: https://rbbp.org.uk/willow-tit-2019-21/
[5] Downloaded via: https://rbbp.org.uk/willow-tit-2019-21/

3 RESULTS

3.1 Desk Study

3.1.1 A total of 171 records of more notable bird species (e.g. Schedule 1 species[6], Red and Amber list birds) were provided by SEWBReC. These records were analysed in order to determine which species, based on their autecology and the record location, were likely to relate to the application site or wider landholding. This initial analysis revealed that 50 species records appear to relate to the site or within close proximity based on the provided grid references. A further sieve analysis was undertaken of this resulting dataset, whereby species of elevated interest of relevance were extracted. **Table 7** below provides these species, the number of records, and the date of the most recent record.

Table 7. Additional details of species of elevated interest encountered on or in close proximity to the application site

Species	Scientific name	Conservation status +	Number of records	Last date recorded	Notes
Barn Owl	*Tyto alba*	Sch1	2	2005	Grid reference too coarse to understand exact location of records
Dipper	*Cinclus cinclus*	Amber	6	2016	
Goshawk	*Accipiter gentilis*	Sch1	5	2016	Grid reference too coarse to understand exact location of records
Grasshopper Warbler	*Locustella naevia*	SPI/Red	4	2020	
Marsh Tit	*Poecile palustris*	SPI/Red	1	1997	
Nightingale	*Luscinia megarhynchos*	Red	1	1951	
Nightjar	*Caprimulgus europaeus*	SPI/Amber	6	2016	
Pied Flycatcher	*Ficedula hypoleuca*	Amber	1	1997	
Redstart	*Phoenicurus phoenicurus*	Amber	3	2007	
Whitethroat	*Sylvia communis*	Amber	2	2005	
Willow Tit	*Poecile montanus*	SPI/Red	2	2015	
Wood Warbler	*Phylloscopus sibilatrix*	SPI/Red	5	2018	

+ **Sch1**: Species subject to special protection due to inclusion on Schedule 1 of the Wildlife & Countryside Act 1981 (as amended).
+ **Red/Amber**: Species having undergone a decline of >50% in the 25 years to 2021 (Red List) or a 25-49% decline over the same period (Amber List) (After Stanbury et al., 2021)
+ **SPI**: Species of Principal Importance further to s.7 of the Natural Environment & Rural Communities Act 2006.

3.1.2 It should be noted that some of the above records originate from BirdTrack[7] and relate to the bird surveys of the site undertaken in 2015.

[6] Schedule 1 species are specially protected under Part 1 of the Wildlife and Countryside Act 1981 (as amended)
[7] BirdTrack is a BTO-run web-based database that provides facilities for observers to store and manage their own personal records as well as using these to support species conservation at local, regional, national and international scales.

3.1.3 Other relevant background records for birds include a number of species noted on the citation for the Cwm Glo a Glyndyrys SSSI[8], which states:

"A number of bird species are found at Cwm Glo a Glyndyrys and, including [sic] *nightjar Caprimulgus europaeus, cuckoo Cuculus canorus, tree pipit Anthus trivialis, whinchat Saxicola rubetra, wood warbler Phylloscopus sibilatrix and redstart Phoenicurus phoenicurus."*

3.1.4 The report on the scrubland breeding bird assemblage within the SSSI[9] reported the presence of species such as blackcap *Sylvia atricapilla*, cuckoo, garden warbler *Sylvia borin*, linnet *Linaria cannabina*, nightjar and tree pipit within the (then proposed) SSSI extension. Other species noted to be present, based on submitted records rather than a specific surveys, were bullfinch *Pyrrhula pyrrhula*, woodcock *Scolopax rusticola*, lesser redpoll *Acanthis cabaret*, marsh tit, pied flycatcher, reed bunting *Emberiza schoeniclus*, tawny owl *Strix aluco*, willow tit, and wood warbler. Species that were noted in close proximity to the site include barn owl, common crossbill, goshawk, stonechat, whinchat and whitethroat.

3.1.5 The report concluded that the scrubland breeding bird assemblage did not meet the qualifying level for inclusion as a new feature for the proposed SSSI. Nevertheless, the report did state the proposed SSSI had a diverse avian community, and one that warranted further investigation.

3.1.6 The 1997 Common Bird Census of the southern and central sections of the study area identified the presence of 50 species, with 38 of these assessed to be holding a breeding territory. The report stated that common and widespread bird species were noted, with wood warbler and pied flycatcher the most notable. The breeding bird survey in 2007 of the south-western part of the study area recorded the following notable species: song thrush *Turdus philomelos*, linnet, bullfinch, grey partridge *Perdix perdix*, skylark *Alauda arvensis*, reed bunting, marsh tit and cuckoo.

3.2 Breeding bird survey results 2015-2021

3.2.1 A total of 54 bird species have been recorded within the study area over the three years of breeding bird surveys carried out by Bioscan (2015, 2018 and 2021). In respect of the application site, a total of 34 bird species have been recorded. **Table 8** below contains the full species list for the study area for the three years of surveying, each species' conservation status, their current breeding status within the application site as at 2021, and the estimated number of territories for the application site and study area (note that the number of territories given for the study area include those within the application site). **Figure 1** provides the approximate territory locations of the species assessed to have bred within the study area during 2021, with the figure identifying the approximate

[8] Date notified: 17/07/2008

[9] Facey, R. (2008) Potential Scrubland Breeding Bird Assemblage Feature at the Cwm Glo A Glyndyrys SSSI: An Appraisal. Countryside Council for Wales

territory centres rather than the specific sizes of each breeding territory (this is in order not to present false precision in territory sizes which can change throughout a season, and are always subject to high margins of error even in intensive territory mapping studies).

Table 8. List of bird species recorded in the application site and study area during breeding bird surveys undertaken in 2015, 2018 and 2021

Common Name	Conservation status +	Estimated number of territories- 2021		Estimated number of territories- 2018		Estimated number of territories- 2015		Highest breeding status in application site in 2021
		Application site	Study area	Application site	Study area	Application site	Study area	
Blackbird		3-4	9-11	2-4	8-9	4-6	16-18	Probable breeder
Blackcap		9-11	36-39	7-9	22-24	5-7	24-26	Probable breeder
Blue Tit		2-3	11-12	4-5	9-10	3-4	9-10	Confirmed breeding
Bullfinch	SPI/Amber	1-2	5-6	1-2	5-6	1-2	3-4	Possible breeder
Buzzard		P	2	P	FO	P	0-1	Not present
Canada goose		P	P	-	-	-	-	Not present
Carrion Crow		P	P	P	P	P	P	Possible breeder
Chaffinch		3-4	8-9	1-3	5-6	2-3	7-8	Probable breeder
Chiffchaff		4-6	25-27	3-4	9-10	4-6	15-17	Probable breeder
Coal Tit		1-2	7-9	3-4	7-8	1-2	3-5	Probable breeder
Crossbill	Sch1	-	-	P	FO	-	-	Not present
Cuckoo	SPI/Red	-	Outside	P	0-1	P	0-1	Not present
Dunnock	SPI/Amber	5-7	15-17	0-1	4-5	1	10-12	Probable breeder
Garden Warbler		0-1	1-2	1-2	1-3	0-1	7-8	Probable breeder
Goldcrest		2-3	6-7	3-4	6-8	3-4	11-12	Probable breeder
Goldfinch		P	P	0-1	0-1	P	0-1	Not present
Great Spotted Woodpecker		0-1	2-3	1-2	2-3	P	1-2	Probable breeder
Great Tit		3-4	9-10	1-3	6-8	1-2	5-6	Confirmed breeding
Green Woodpecker		P	2-3	-	-	1-2	1-2	Not present
Greenfinch	Red	1-2	2-3	-	-	-	-	Confirmed breeding
Grey heron		-	-	P	P	P	P	Not present
Grey Wagtail	Amber	P	1-2	P	1	P	FO	Not present
House martin	Red	-	-	-	-	P	FO	Not present
Jay		0-1	4-5	0-1	1-2	0-1	1-2	Possible breeder
Lesser Redpoll	SPI/Red	P	P	P	FO	P	FO	Not present
Lesser spotted woodpecker	SPI/Red	-	-	-	-	P	0-1	Not present
Long-tailed Tit		1-2	7-8	1-2	3-4	0-1	1-2	Probable breeder
Magpie		P	P	P	P	-	-	Not present
Mallard	Amber	P	0-1	P	P	-	-	Not present
Meadow Pipit	Amber	-	-	-	-	FO	FO	Not present
Mistle Thrush	Red	1-2	3-5	0-1	2-3	1	1	Possible breeder
Nightjar	SPI/Amber	P	0-2	-	-	-	-	Not present
Nuthatch		1-2	4-5	1-2	3-4	1-2	2-3	Probable breeder

Common Name	Conservation status +	Estimated number of territories- 2021		Estimated number of territories- 2018		Estimated number of territories- 2015		Highest breeding status in application site in 2021
		Application site	Study area	Application site	Study area	Application site	Study area	
Raven		P	0-1	P	FO	P	P	Not present
Red Kite	Sch1	-	-	-	-	P	FO	Not present
Reed Bunting	SPI/Amber	-	-	P	0-1	-	-	Not present
Robin		13-16	55-58	4-6	10-11	4-5	17-19	Probable breeder
Sand martin		P	P	-	-	-	-	Not present
Siskin		P	P	P	P	P	FO	Not present
Skylark	SPI/Red	P	0-1	-	-	FO	0-1	Not present
Song Thrush	SPI/Amber	6-7	18-20	1-2	3-5	2-3	16-18	Probable breeder
Sparrowhawk	Amber	P	FO	-	-	P	FO	Not present
Spotted flycatcher	SPI/Red	0-1	1-2	P	0-1	0-1	2-3	Possible breeder
Stonechat		0-1	1	-	-	-	-	Possible breeder
Swallow		P	P	-	P	FO	FO	Not present
Swift	Red	-	-	P	P	P	FO	Not present
Tawny Owl	Amber	1-2	2-3	-	-	P	1-2	Confirmed breeding
Tree Pipit	SPI/Red	0-1	1	0-1	1	0-1	2	Probable breeder
Treecreeper		3-4	13-14	2-3	5-6	3-5	6-7	Probable breeder
Willow tit	SPI/Red	P	1-2	-	-	-	-	Not present
Willow Warbler	Amber	5-6	24-26	3-5	16-18	6-8	28-30	Probable breeder
Woodpigeon	Amber	P	P	P	P	P	P	Probable breeder
Wood warbler	SPI/Red	-	-	P	Outside	P	0-1	Not present
Wren	Amber	21-23	70-74	6-8	26-28	23-26	76-80	Probable breeder

+ **Sch1**: Species subject to special protection due to inclusion on Schedule 1 of the Wildlife & Countryside Act 1981 (as amended).

+ **Red/Amber**: Species having undergone a decline of >50% in the 25 years to 2021 (Red List) or a 25-49% decline over the same period (Amber List) (After Stanbury et al., 2021)

+ **SPI**: Species of Principal Importance further to s.7 of the Natural Environment & Rural Communities Act 2006.

P: Present but not considered breeding

FO: Flying over

3.2.2 Nightjar was recorded just outside the application site to the north/north-west during the great crested newt and bat activity surveys undertaken during the spring and summer in both 2015 and 2021. Individuals were heard churring and were subsequently seen, both within the study area, and just outside, during visits in June and July. Juvenile tawny owls were also recorded during the nocturnal visits to the site, with these records sporadically located throughout the study area in June and July 2021. Finally, a dipper was observed flying over the grassland in the south-west of site during a reptile survey in September 2021, with this individual likely moving between two river catchments.

3.2.3 During the 2021 breeding bird survey, 28 species were recorded within the application site, with four of these species confirmed to be breeders, 18 as probable breeders and six as possible breeders.

3.3 Wintering bird survey

3.3.1 A total of 39 bird species have been recorded within the study area over the two winters of surveying (2015/16, and 2021). In respect of the application site, a total of 30 bird species have been recorded. **Table 9** below contains the species list for the application site and the study area for the two winters.

Table 9. List of bird species recorded in the application site and study area during wintering bird surveys undertaken in 2015/16 and 2021

Species	Conservation Status	Winter 2015/16						Winter 2020/21			
		07/12/2015		19/01/2016		28/02/2016		01/02/2021		02/03/2021	
		Application site	Study area	Application site	Study area	Application site	Study area	Application site	Study area	Application site	Study area
Blackbird		9	41	11	39	13	45	12	41	8	31
Blue Tit		3	21	11	35	8	43	12	50	19	51
Bullfinch	SPI/Amber	2	21	6	18	3	12	3	17	5	17
Buzzard		0	2	0	1	0	3	1	1	0	1
Carrion Crow		0	4	0	2	0	5	0	1	0	0
Chaffinch		0	2	1	5	3	5	4	5	3	6
Chiffchaff		0	0	0	0	0	0	0	0	0	1
Coal Tit		0	15	2	12	6	23	5	19	6	23
Crossbill	Sch1	0	0	0	0	0	0	0	0	3	3
Dipper	Amber	0	2	0	0	0	0	0	1	0	0
Dunnock	SPI/Amber	0	6	2	4	3	7	4	6	2	10
Goldcrest		4	18	0	4	2	8	0	4	3	6
Goldfinch		2	8	0	3	0	2	0	0	0	0
Great Spotted Woodpecker		1	2	1	4	0	0	1	4	3	3
Great Tit		1	13	7	22	10	25	4	25	5	25
Green Woodpecker		0	1	2	3	0	1	0	0	0	1
Greenfinch	Red	0	0	0	0	0	0	0	0	2	2
Grey Wagtail	Amber	0	1	1	5	0	1	1	1	1	1
Jay		5	14	3	7	3	4	3	7	0	3
Lesser Redpoll	SPI/Red	0	8	0	1	1	1	1	1	0	0
Long-tailed Tit		3	21	0	22	10	11	3	14	5	9
Magpie		0	3	0	1	0	0	0	0	0	0
Mallard	Amber	0	0	2	2	0	0	0	0	0	0
Mistle Thrush	Red	2	3	2	4	2	3	1	1	1	2
Nuthatch		0	3	1	6	3	7	2	5	3	5
Peregrine	Sch1	0	1	0	0	0	0	0	0	0	0

Species	Conservation Status	Winter 2015/16						Winter 2020/21			
		07/12/2015		19/01/2016		28/02/2016		01/02/2021		02/03/2021	
		Application site	Study area	Application site	Study area	Application site	Study area	Application site	Study area	Application site	Study area
Pied wagtail		0	0	0	0	0	1	0	0	0	0
Raven		0	4	0	2	1	3	0	1	0	1
Redwing	Sch1/Amber	0	0	0	7	0	3	0	0	4	4
Reed Bunting	SPI/Amber	0	3	0	23	0	1	0	1	0	0
Robin		3	37	16	48	26	45	17	55	28	87
Siskin		1	61	1	3	2	5	2	4	0	3
Song Thrush	SPI/Amber	2	12	7	15	12	31	8	18	7	23
Sparrowhawk	Amber	0	0	0	1	0	0	0	0	0	0
Treecreeper		2	9	1	13	6	14	5	15	8	19
Willow tit	SPI/Red	0	2	1	1	0	1	0	0	0	1
Woodcock	Red	1	1	1	3	0	4	1	5	1	2
Woodpigeon	Amber	0	1	0	3	0	3	0	4	0	0
Wren	Amber	7	41	11	28	14	29	13	37	8	27

[+] **Sch1**: Species subject to special protection due to inclusion on Schedule 1 of the Wildlife & Countryside Act 1981 (as amended).
[+] **Red/Amber**: Species having undergone a decline of >50% in the 25 years to 2021 (Red List) or a 25-49% decline over the same period (Amber List) (After Stanbury et al., 2021)
[+] **SPI**: Species of Principal Importance further to s.7 of the Natural Environment & Rural Communities Act 2006.
P: Present but not considered breeding
FO: Flying over

3.3.2 During the targeted owl surveys undertaken during the winter bird survey visits no owls or other nocturnal/ crepuscular species were noted within the current study area.

3.4 Willow tit survey

3.4.1 One willow tit was recorded during the willow tit survey undertaken in March 2021. This individual, responding to the playback recording, was located in the south of the study area (location shown on **Figure 1**).

4 EVALUATION

4.1.1 Twelve of the 54 species encountered within the study area during all three breeding bird survey years are on the Red List of Birds of Conservation Concern (BoCC); these species are: cuckoo, greenfinch, house martin, lesser redpoll, lesser spotted woodpecker, mistle thrush, skylark, spotted flycatcher, swift, tree pipit, willow tit and wood warbler. Fourteen species are on the Amber List of BoCC; these are: bullfinch, dunnock, grey wagtail, mallard, meadow pipit, nightjar, reed bunting, song thrush, sparrowhawk, tawny owl, willow warbler, woodpigeon and wren. In respect of the wintering bird assemblage, five of the 39 species encountered within the study area are on the Red List of BoCC; these species are greenfinch, lesser redpoll, mistle thrush, willow tit and woodcock. Eleven species appear on the Amber List of BoCC, and these comprise: bullfinch, dipper, dunnock, grey wagtail, mallard, redwing, reed bunting, song thrush, sparrowhawk, woodpigeon and wren.

4.1.2 In order to assess the ornithological interest of the site the Fuller (1980) method[10] was used. This method assesses the importance of a site based on the population size and rarity of species recorded, in addition to the diversity of species on a site. There are inherent issues with the Fuller method as a result of a number of factors that it does not take into account (but does acknowledge), including: a) the phenomenon of 'species accumulation curves' whereby the number of visits made to a site can artificially inflate its value using such techniques (e.g. the more visits that are made to a site the more likely it is that more bird species would be recorded); b) unequal bias between comparators due to varying proficiency of the surveyors (an inexperienced surveyor would detect fewer species); and c) the size of a site (the larger the site the more likely it is that more species would be recorded). Nevertheless, the Fuller method is used here to aid in providing a comparative assessment of the ornithological interest of the site.

4.1.3 Thirty-nine species are assessed to have bred (possible, probable and confirmed breeders) within the study area over three years that the breeding bird survey was undertaken. Based on the criteria within Fuller the study area would fall within the 'Local' level of importance (with 'local' ranging between 25 and 49 species). In respect of wintering birds, the same number of species were noted (as compared with the number of birds assessed to be breeding; although not the same species), and again the study area would fall within the 'Local' level of importance (with the 'local' category ranging between 25 and 54 for the winter period). In regards to the breeding community quality (whereby the national abundance for each species is placed into a category- with rarer species affording higher scores) the resulting score is 14 which places the site at the mid-range of the 'local' level category (with 'local' ranging between 10 and 19). Both these assessment methods therefore suggest that the site is of only local (e.g. District) importance for its breeding bird assemblage.

[10] Fuller, R.J. (1980) A Method for Assessing the Ornithological Interest of Sites for Conservation. *Biological Conservation* 17, pp.229-239.

4.1.4 Assessing the breeding bird assemblage against the SSSI selection criteria[11] for scrub and woodland birds reveals that for scrub the value is 9.5 (below the threshold of 14.5, although it should be noted that the criteria states the threshold '*does not readily apply to Wales*…'), and for woodland the value is 43.5 (above the threshold score of 37). Excluding the values for species that were assessed not to be breeding within the study area (e.g. grey heron, red kite, wood warbler) reduces the value to 26.5, which is below the threshold value. This would place the site value at a level consistent with the Fuller approach. Evidently the study area is of some value for woodland birds, and to a lesser extent birds associated with scrub.

4.1.5 Finally, the species list for the study area was assessed against the requirement for record submission by Glamorgan Rarities Committee[12]. This revealed that no species found within the study area are considered to be British, Welsh or county rarities. One bird encountered within the study area is listed on the Rare Breeding Birds Panel (RBBP) for species to be monitored: this being willow tit. The abundance category on the RBBP's website[13] states that this species is 'less scarce'.

4.1.6 Ten species were assessed to have eleven or more breeding territories within the study area, with these comprising (in descending order of abundance): wren (with between 70 and 74 territories present), robin (55-58), blackcap (36-39), willow warbler (24-26), chiffchaff (25-27), song thrush (18-20), dunnock (15-17), treecreeper (13-14), blue tit (11-12), and blackbird (9-11). All ten of these species are recognised as woodland species[14], with these comprising six generalist species (i.e. those species that can be found in woodland as well as other habitats), and four specialist woodland species (blackcap, chiffchaff, treecreeper and willow warbler). Taking into account all the species recorded during the three years of breeding bird surveys reveals that 11 are generalist woodland species (out of 12 species listed by DEFRA), and 19 are specialist woodland species (out of 25 species listed by DEFRA; however, it should be noted that some species listed by DEFRA are very unlikely to be encountered on the site in the present day, such as capercaillie and nightingale).

4.1.7 Running the wintering bird survey species list through the same analysis reveals the presence of 12 woodland specialist species and 10 woodland generalists.

4.1.8 Overall, the breeding bird assemblage in 2021 is typical of the site's geographic location and the habitats present, with the species considered to be of most note comprising nightjar, spotted flycatcher, stonechat, tree pipit, and willow tit, with high numbers of willow warbler, wren, robin and blackcap territories also of note. Species of note recorded during the winter surveys include dipper, willow tit and woodcock, with high numbers of bullfinch, robin, wren, coal tit, and blackbird present. Notable species known

[11] Drewitt, A.L., Whitehead, S. and Cohen, S. (2020). Guidelines for the Selection of Biological SSSIs. Part 2: Detailed Guidelines for Habitats and Species Groups. Chapter 17 Birds (version 1.1). Joint Nature Conservation Committee, Peterborough.

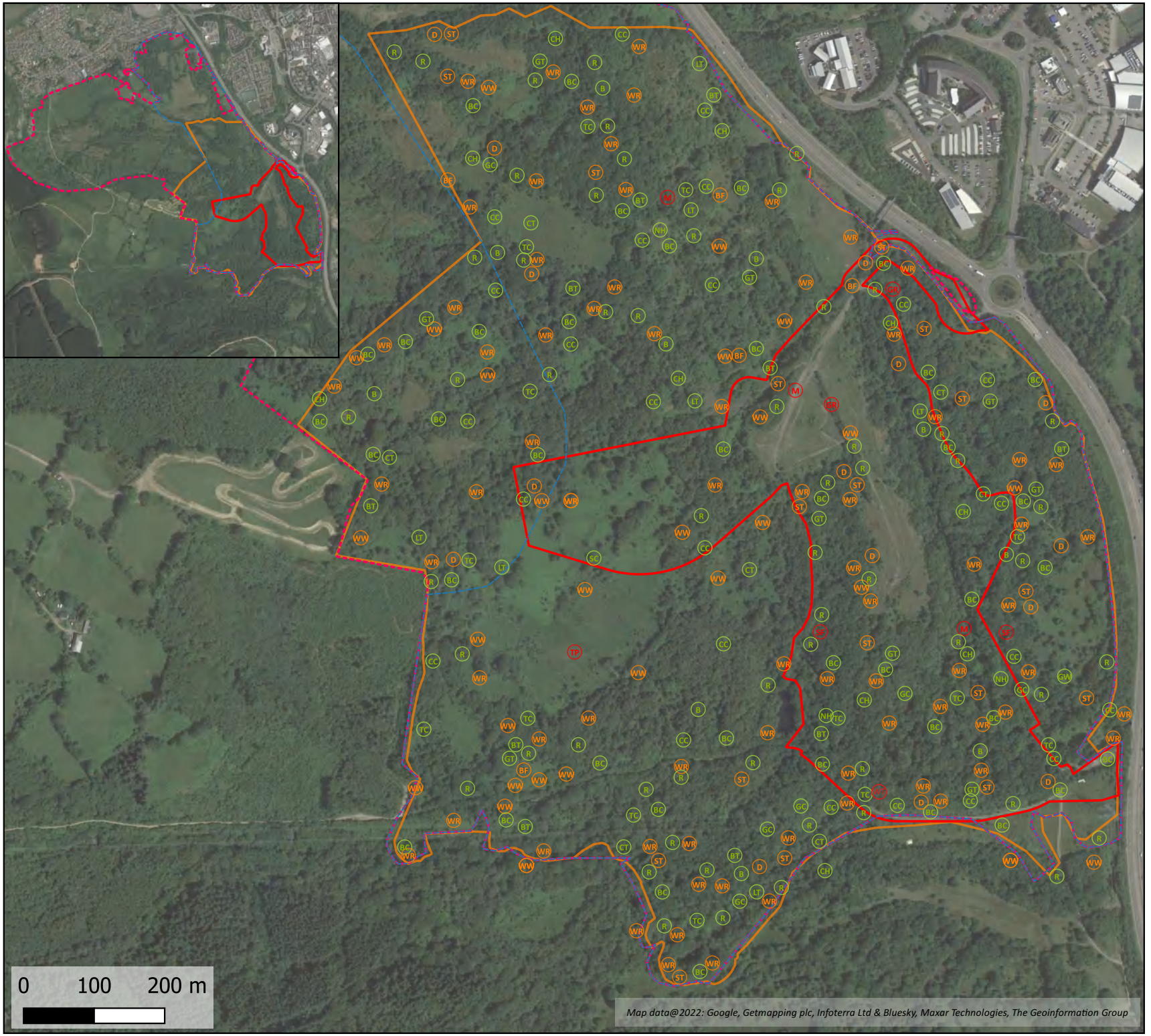
[12] https://glamorganbirds.org.uk/records-of-unusual-species-requiring-descriptions/ [accessed: 20/10/2021]

[13] https://rbbp.org.uk/list-of-species-currently-reported-on-by-rbbp/ [accessed: 20/10/2021]

[14] Defra (2020) *Wild bird populations 1970 to 2019- Annual Statistical Release.* Defra

in recent years from the wider landholding, including in particular nightjar and wood warbler, do not appear to breed on the site.

Figure 1
Breeding Bird Territory Mapping- 2021



Key

- Application site
- 2021 survey area
- 2018 survey area
- 2016 survey area

Birds of Consevation Concern

- Red list species
- Amber list species
- Non-listed (green) species

Species

B: Blackbird	M: Mistle thrush
BC: Blackcap	NH: Nuthatch
BF: Bullfinch	R: Robin
BT: Blue tit	SC: Stonechat
CC: Chiffchaff	SF: Spotted flycatcher
CH: Chaffinch	ST: Song thrush
CT: Coal tit	TC: Treecreeper
D: Dunnock	TP: Tree pipit
GC: Goldcrest	WR: Wren
GT: Great tit	WT: Willow tit
LT: Long-tailed tit	WW: Willow warbler

Title

Breeding bird survey results 2021

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 1	-	E1835

Drawn	Checked	Date
CD	BC	January 2022

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APPENDIX 10

Cwm Glo a Glyndyrys, Merthyr Tydfil

Species Survey Report:

Great Crested Newt

February 2022

COMMISSIONED BY
Marvel Ltd

Written by: *Christina Derrick*

Approved by: *Dominic Woodfield*

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

February 2022
Bioscan Report No.
E1835-GCN-R1

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CONTENTS

1 INTRODUCTION 1

1.1 Background 1

2 METHODOLOGY 2

2.2 Desk Study 2

2.3 Habitat Suitability Index 2

2.4 Presence/absence and population assessment surveys 3

2.5 Environment DNA (eDNA) sampling 3

3 SUMMARY OF SURVEY TECHNIQUES EMPLOYED 2015-2021 4

3.1 Background 4

3.2 2015 Surveys 4

3.3 2017 Surveys 4

3.4 2018 Surveys 5

3.5 2021 surveys 5

3.6 Limitations 6

4 SURVEY CONDITIONS 8

5 RESULTS 3

5.1 Desk Study 3

5.2 Habitat Suitability Index Results 4

5.3 eDNA results 4

5.4 Presence/absence and population assessment results 4

6 DISCUSSION AND CONCLUSIONS 7

FIGURES

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		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	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.

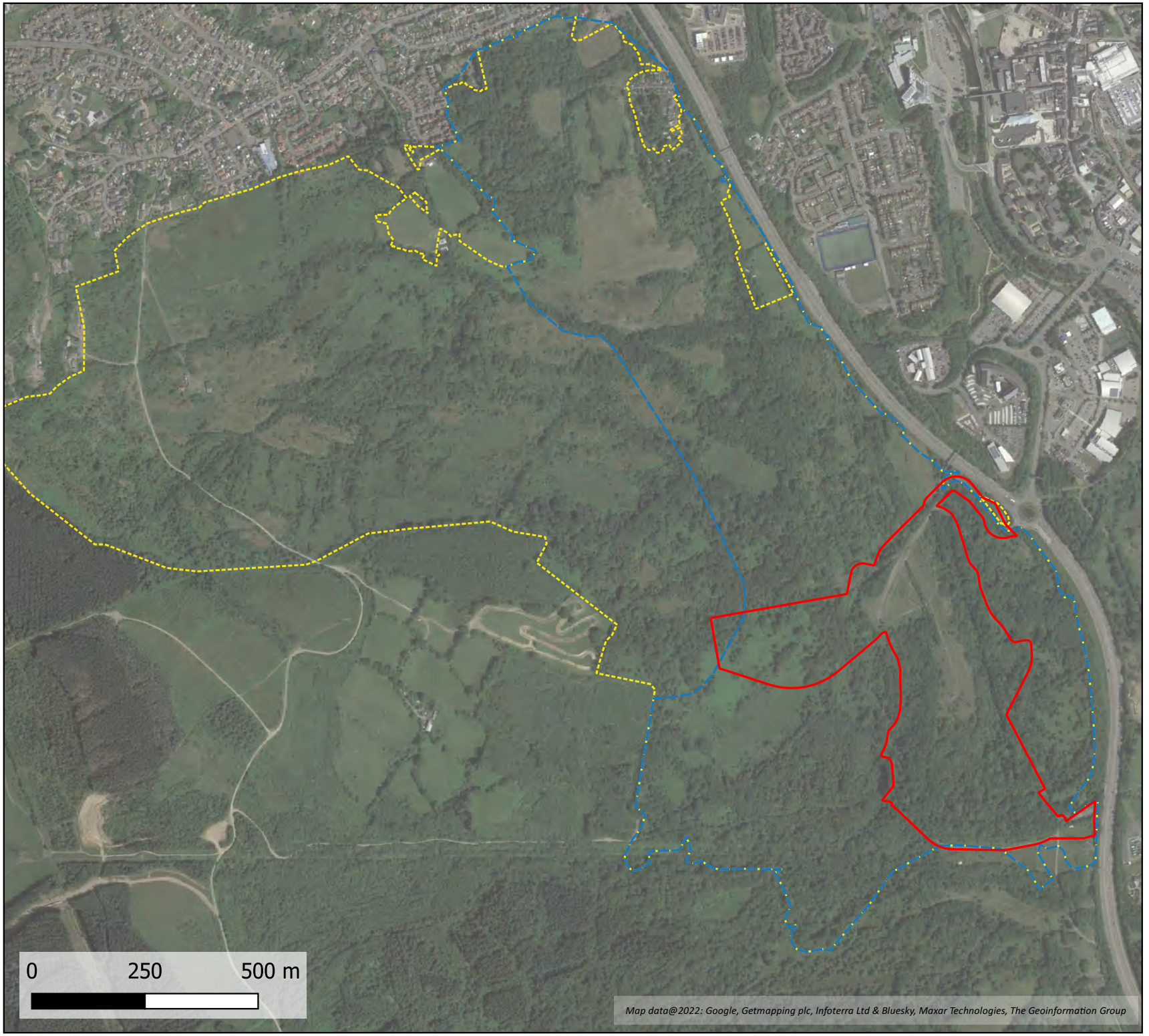
6.1.3 The data suggests that a former reservoir, P11 (around 240m to the north of the application site) may be used transiently by GCN during the breeding season but does not support a breeding population itself. Single GCN were found here in 2017 (female), 2018 (male) and 2021 (female), though breeding 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	-	E1835

Drawn	Checked	Date
CD	DW	January 2022

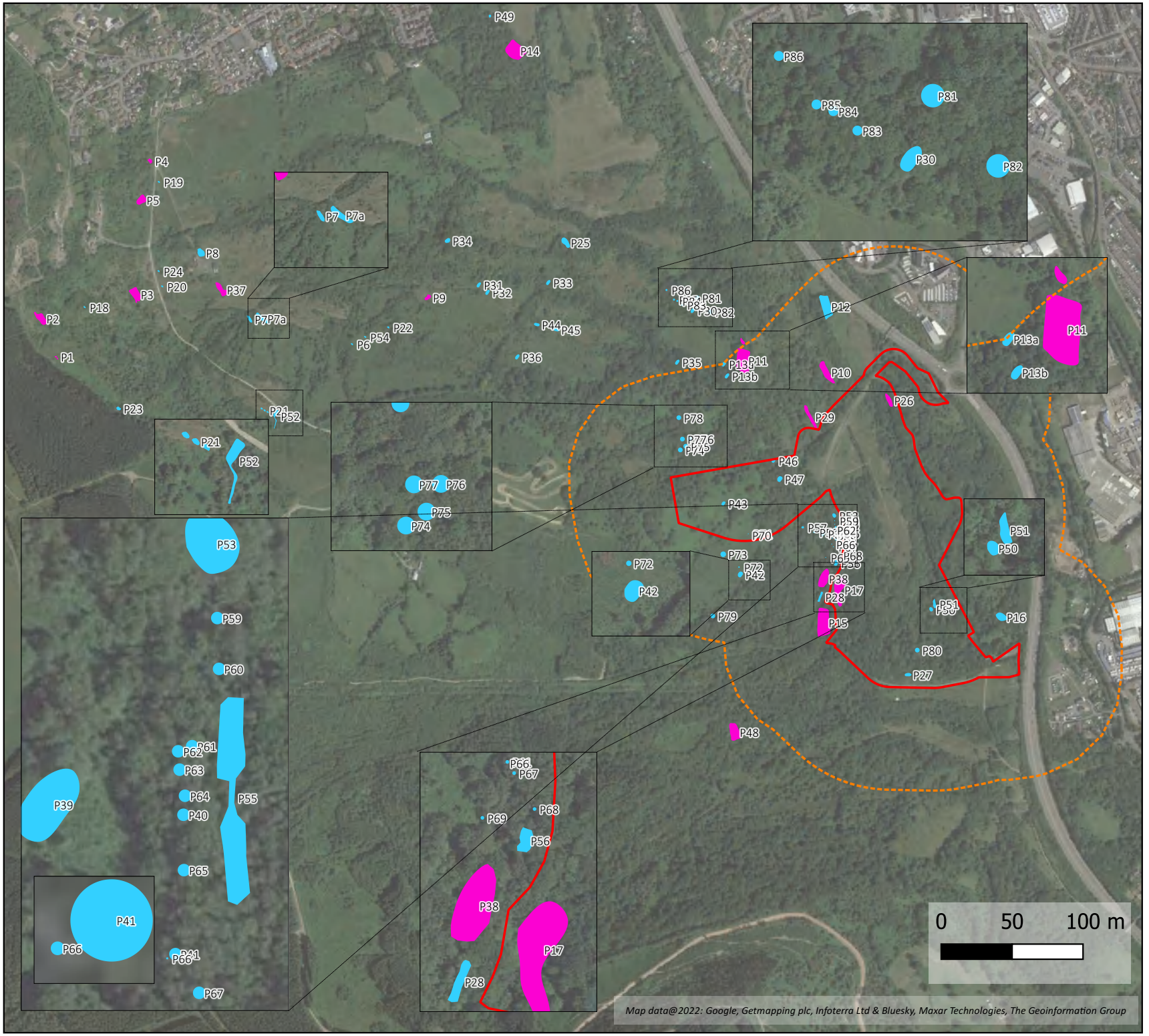
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Figure 2
GCN survey results 2015-2021



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 appropriate 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	January 2022

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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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DNA Analysis Report - Commercial in Confidence

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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DNA Analysis Report - Commercial in Confidence

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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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**

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 11

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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CONTENTS

1 INTRODUCTION 5

1.1 Background 5

1.2 Site Location & Study Area 5

1.3 Report Purpose 5

2 METHODOLOGY 6

2.1 Background Records & Desk Study 6

2.2 Activity Transect Surveys 6

2.3 Automated Bat Surveys 11

2.4 Autumn Swarming Surveys: 2015 15

2.5 Emergence/Re-entry surveys: 2016 16

2.6 Built Structure Inspections 17

2.7 Preliminary Tree Roost Inspections 18

3 RESULTS 19

3.1 Background Records & Desk Study 19

3.2 Bat Activity Surveys 20

3.3 Automated/Static Detector Surveys 30

3.4 Autumn swarming surveys: 2015 results 44

3.5 Emergence/ re-entry surveys: 2016 results 46

3.6 Inspection of buildings/structures for hibernating and roosting bats: February 2016, September 2016 and March 2021 47

3.7 Preliminary tree roost inspection surveys: 2021 47

4 DISCUSSION & CONCLUSIONS 49

4.1 Summary of Bat Interest at the Site 49

4.2 Assigning a Value to the Assemblage of Bats at the Site 52

FIGURES

Figure 1. Application site location and pre-2021 survey areas

Figure 2a-f. Bat transect survey results - 2015

Figure 3a-d. Bat transect survey results - 2016

Figure 4a-k. Bat transect survey results - 2018

Figure 5. Pre-2021 Collated bat transect survey results

Figure 6a-m. Bat transect survey results - 2021

Figure 7. 2021 collated bat transect survey results

Figure 8. Automated detector locations – 2015 to 2021

Figure 9. Buildings and structures surveyed for bats – 2015 to 2021

Figure 10. Preliminary tree roost assessment survey results –2021

Figure 11. Confirmed/suspected bat roosts within or near site

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. 13ºC. 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. 13ºC. No wind.
			T2				
Jun-18	6/14/2018	Dusk	T1	21:33	23:40	21:33	Cloud - 0/8. 12.5ºC. No wind.
			T2				
	26/06/2018	Dusk	T1	21:36	11:36	21:36	Cloud - 1/8. 24-21ºC. Very light breeze, dry.
			T2				
Jul-18	07/12/2018	Dusk	T1	21:30	23:40	21:30	Cloud - 6/8. 18.5ºC. No wind.
			T2				
	7/18/2018	Dusk	T1	21:24	23:37	21:26	Cloud - 0/8. 17.5ºC. No wind.
			T2				
Aug-18	08/09/2018	Dusk	T1	20:48	22:50	20:48	Cloud - 1/8. 13ºC. No wind.
			T2				
	8/20/2018	Dusk	T1	20:30	22:35	20:30	Cloud - 8/8. 20ºC. No wind, light drizzle showers.
			T2				
	8/21/2018	Dawn	T1	04:05	06:10	06:11	Cloud - 8/8. 16ºC.No wind, light drizzle showers.
			T2				
Sep-18	13/09/2018	Dusk	T1	19:32	21:32	19:32	13-14ºC. No wind, light drizzle at 21:00.
			T2				
	27/09/2018	Dusk	T1	19:00	21:01	19:00	Cloud - 0/8. 15ºC. 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

Bat Activity Survey Results: 2018

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) Species	Total number 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.

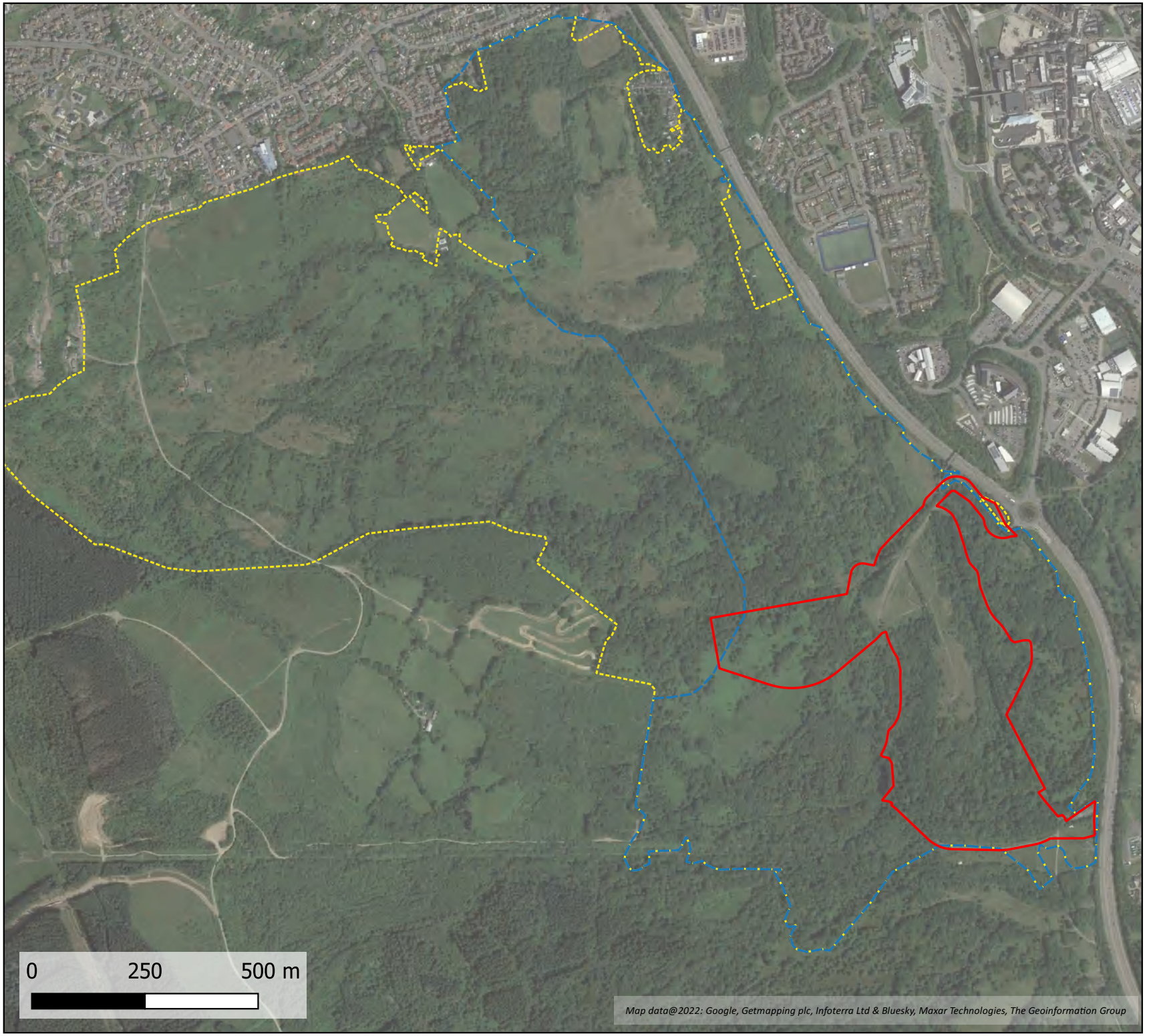
potential for roosts in and near to a site; however, it is considered that it can still provide a helpful alternative indication of the overall value of a site. It should also be noted that the value of the site to bats is not uniform across the application site, with some areas not likely to be graded 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	-	E1835

Drawn	Checked	Date
CD	DW	January 2022

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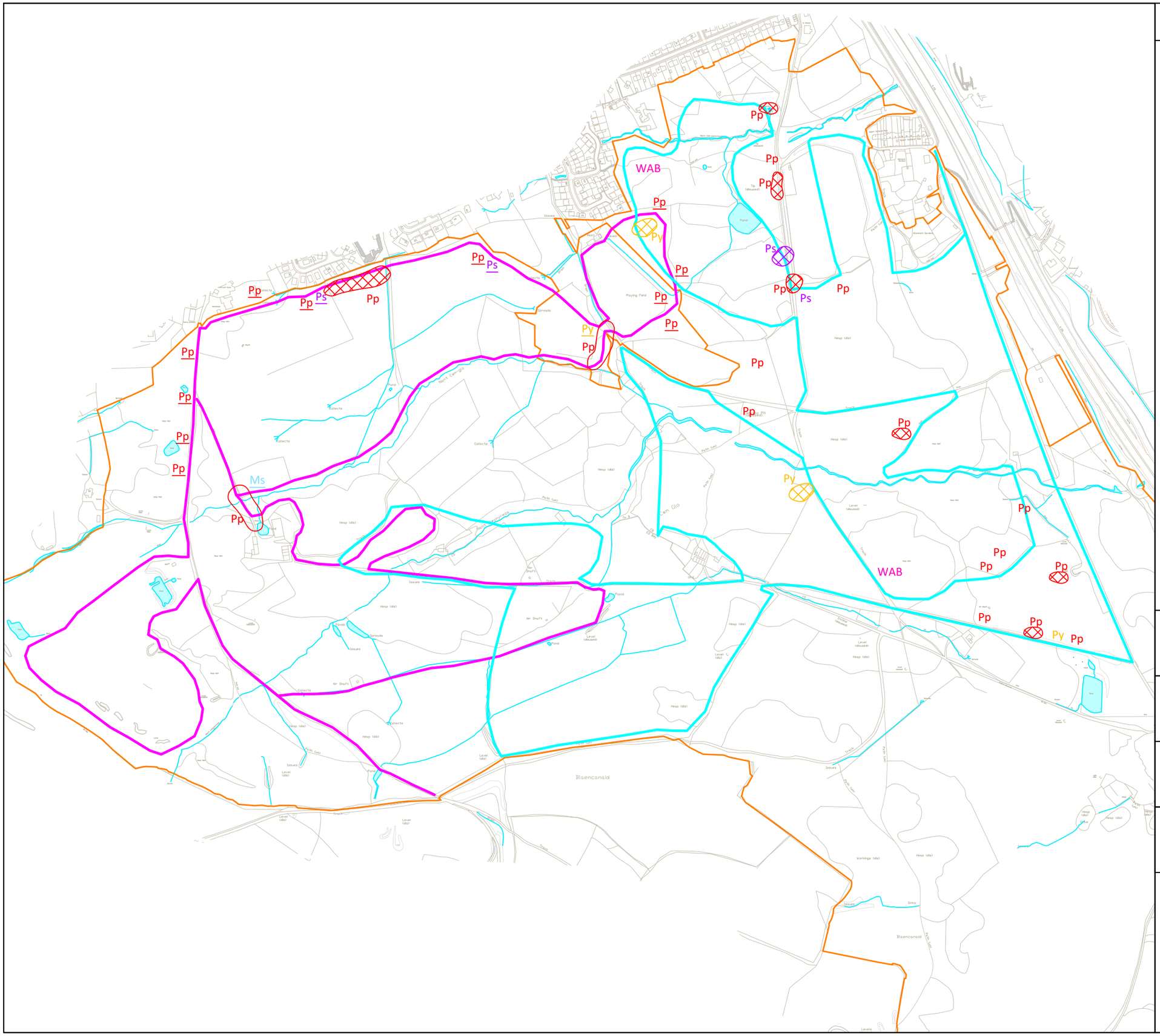
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Figure 2a-f

Bat transect survey results - 2015



Key

- 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.

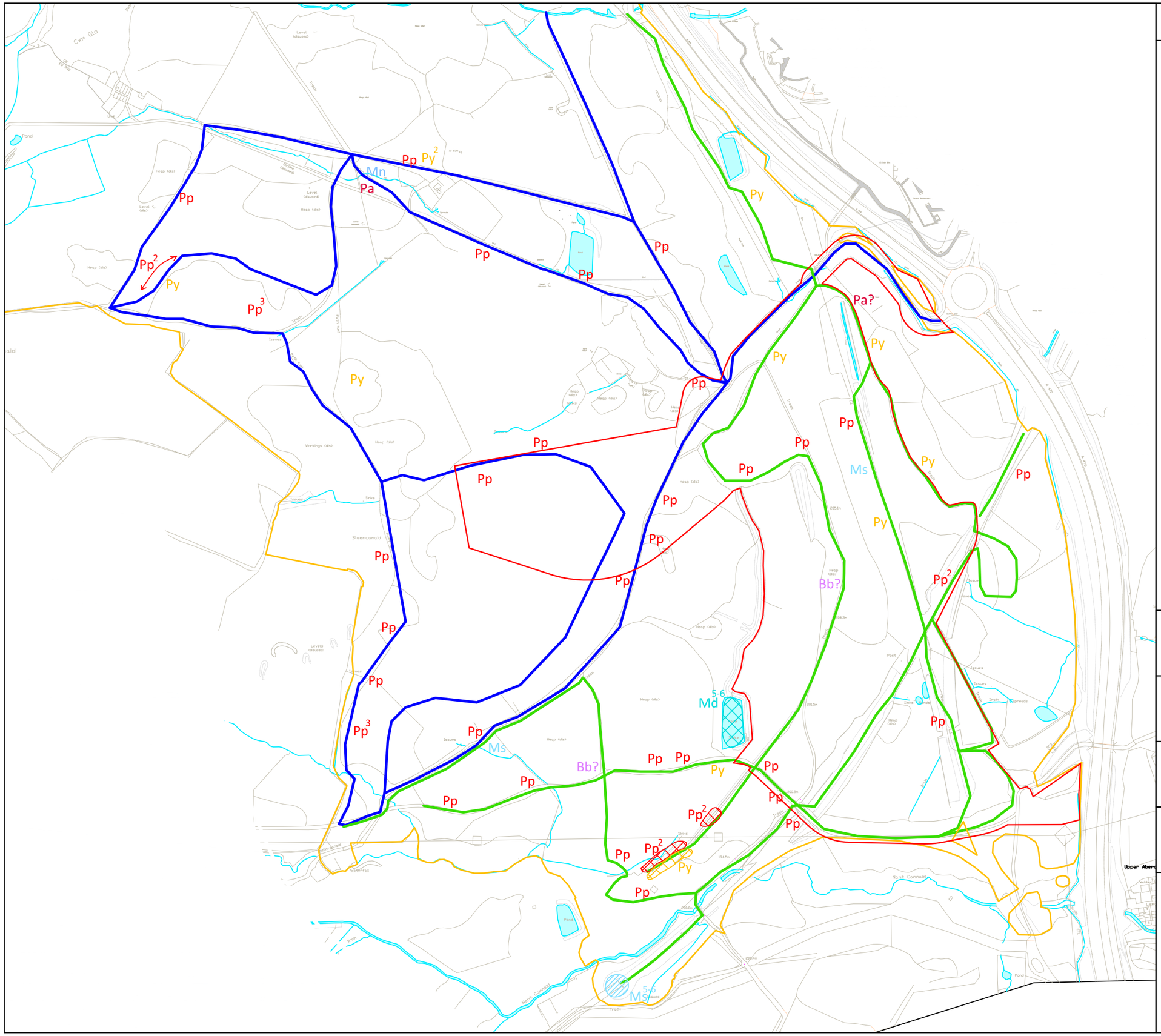
Drawing No.	Revision	Project No.
Figure 2a		E1835

Drawn	Checked	Date
FM	BC	December 2021

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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.

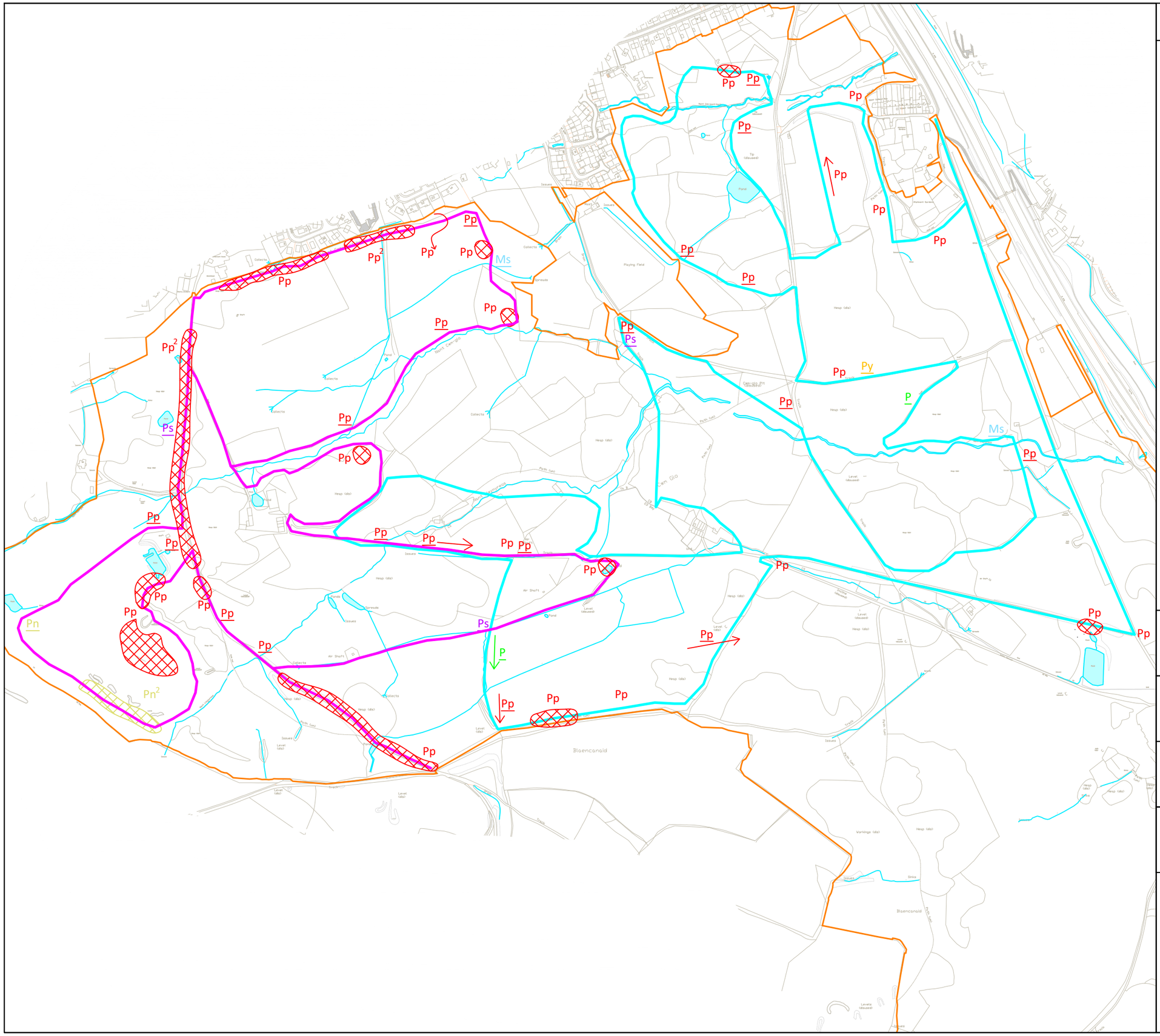
Drawing No.	Revision	Project No.
Figure 2b		E1835

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Key

- 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.

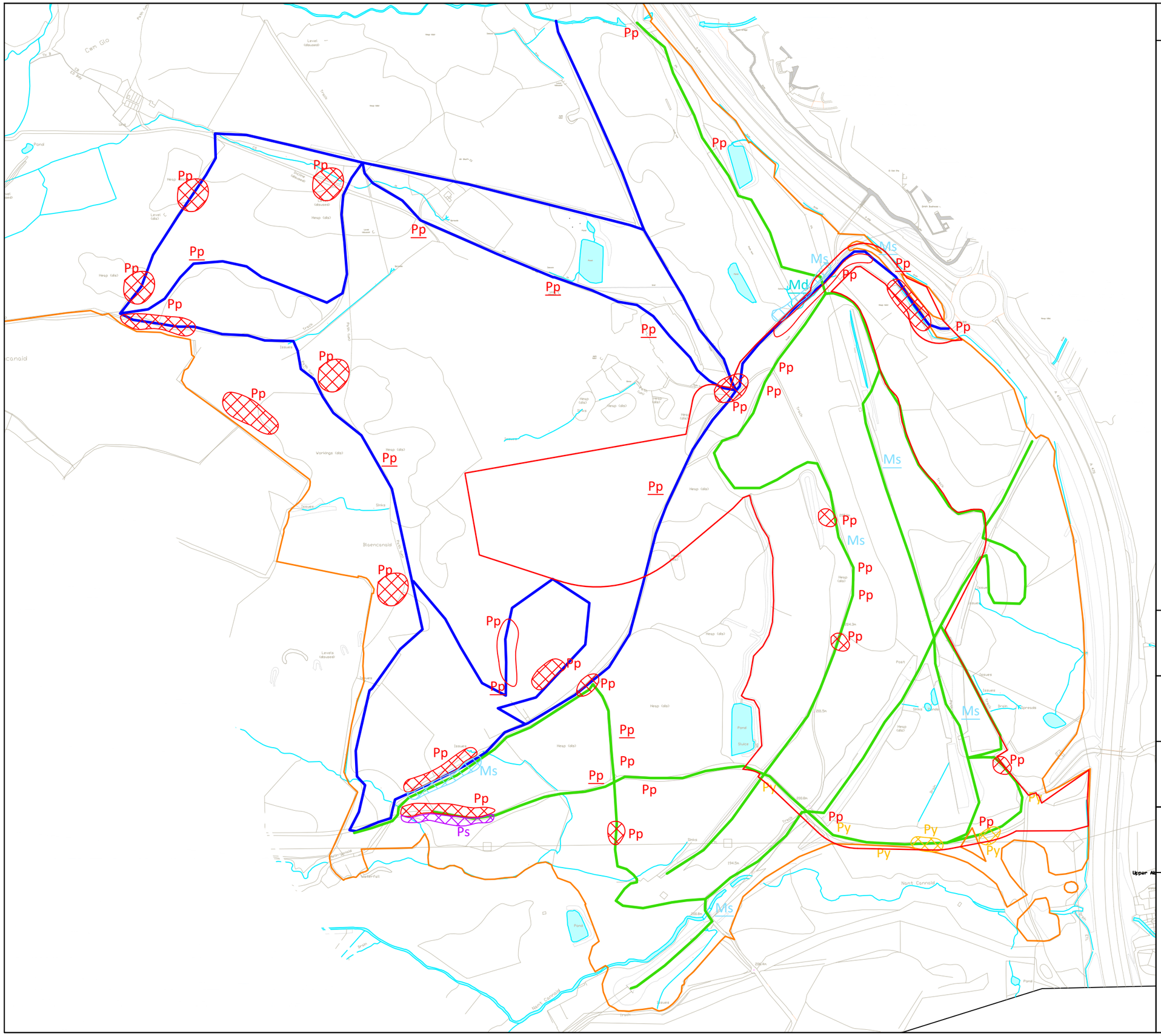
Drawing No.	Revision	Project No.
Figure 2c		E1835

Drawn	Checked	Date
FM	BC	December 2021

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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.

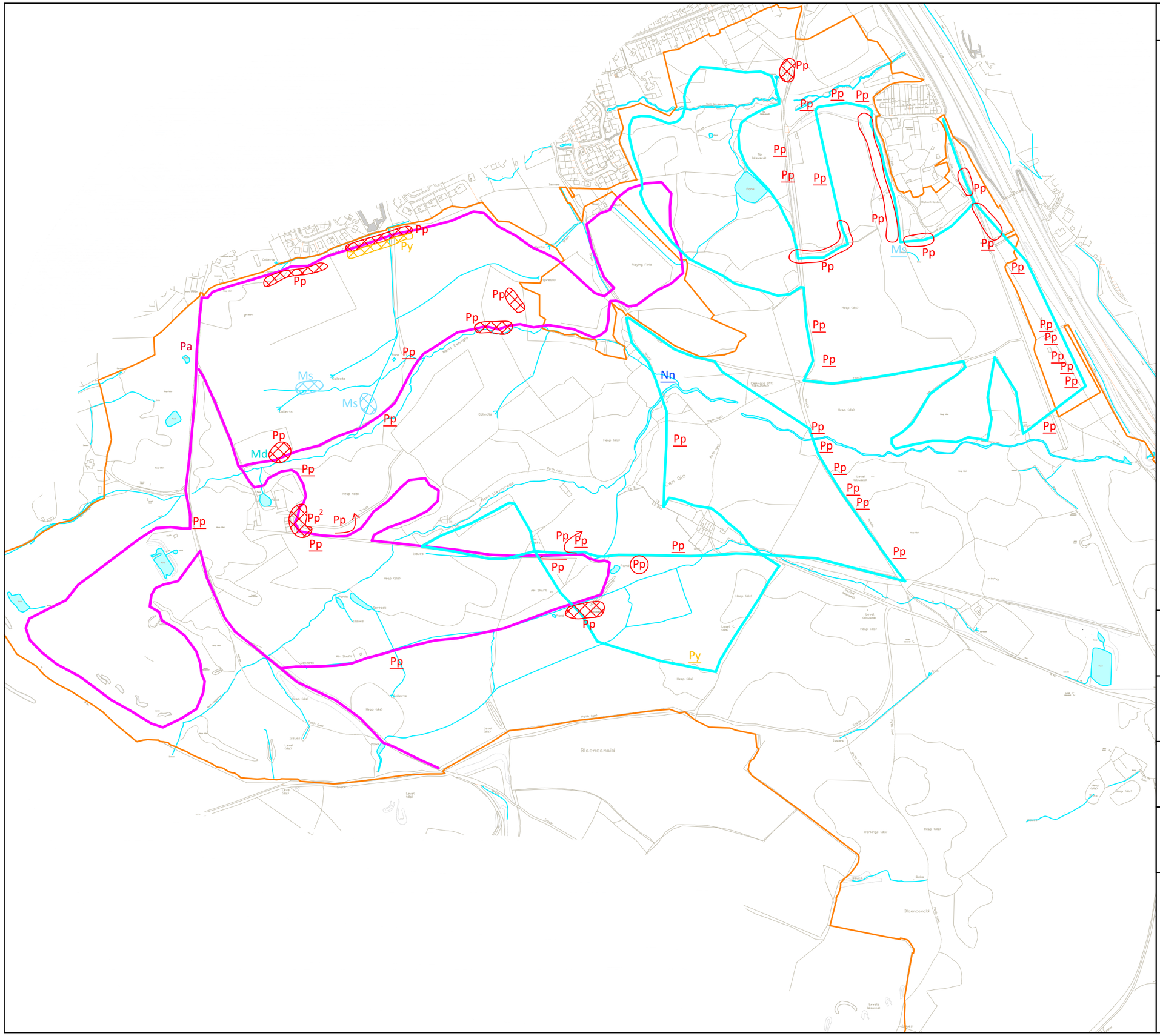
Drawing No.	Revision	Project No.
Figure 2d		E1835

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Key

- 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.

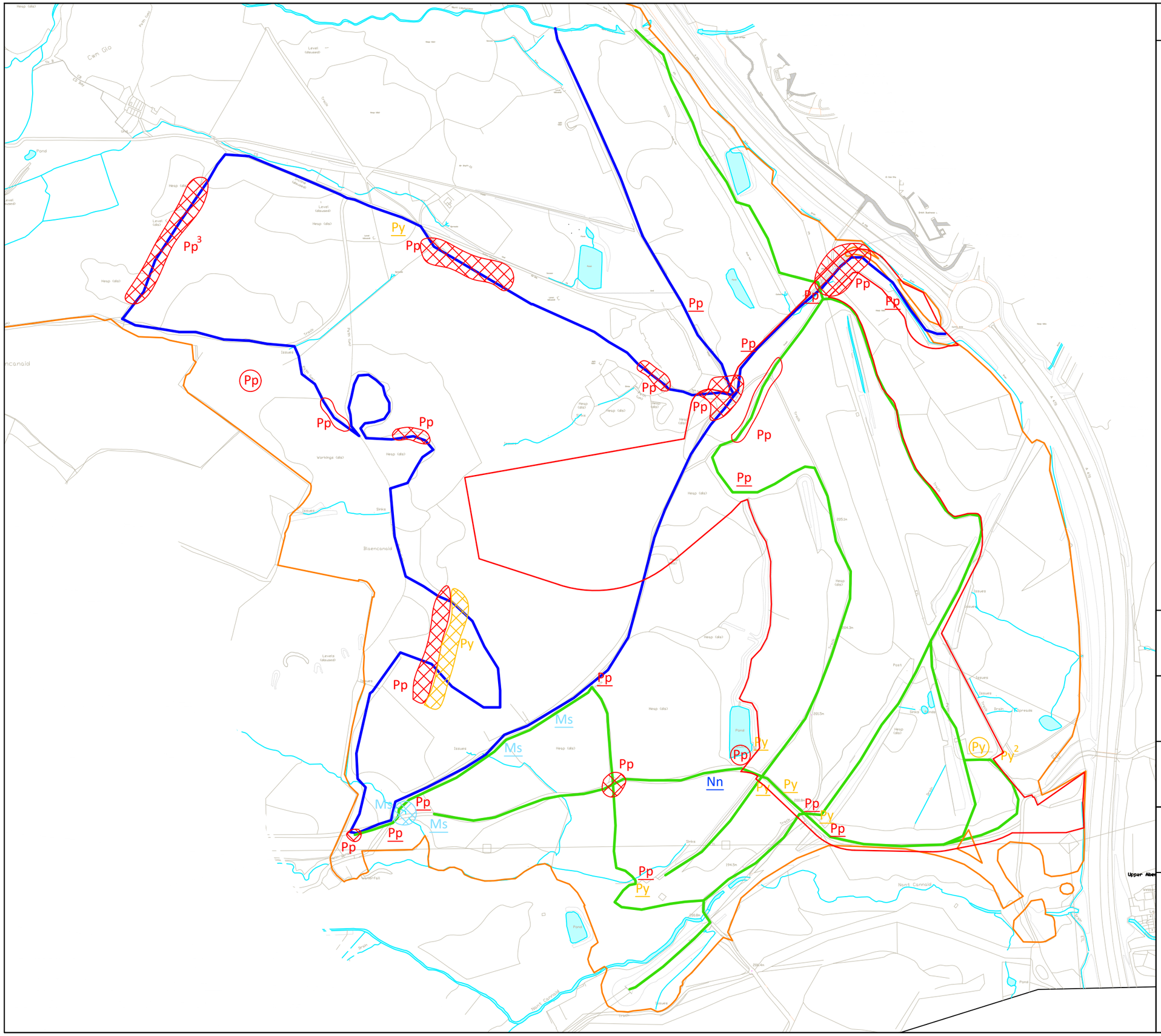
Drawing No.	Revision	Project No.
Figure 2e		E1835

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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

Drawn	Checked	Date
FM	BC	December 2021

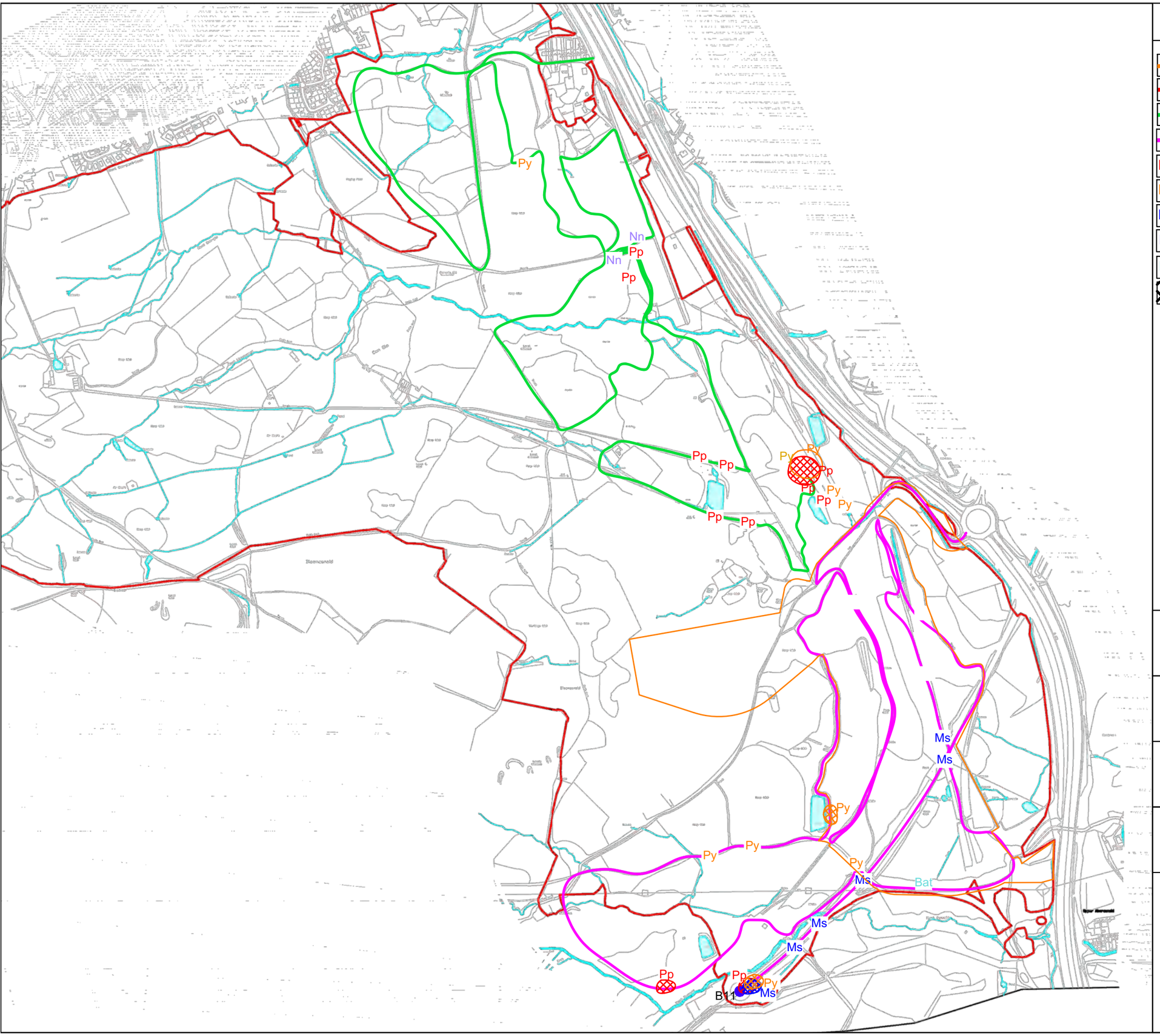
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Figure 3a-d

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

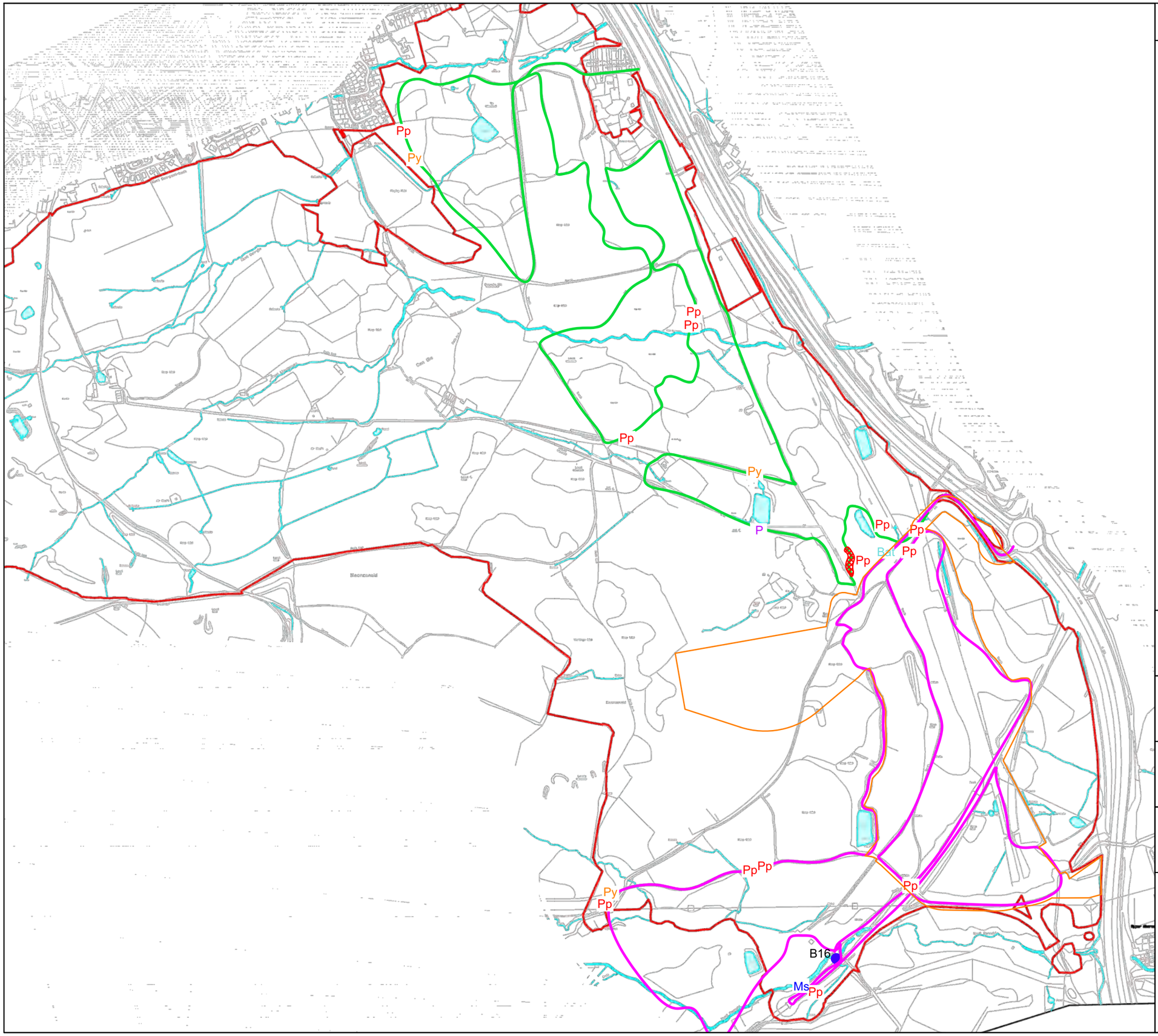
Drawing No.	Revision	Project No.
Figure 3a	-	E1835

Drawn	Checked	Date
CD	DW	December 2021

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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.

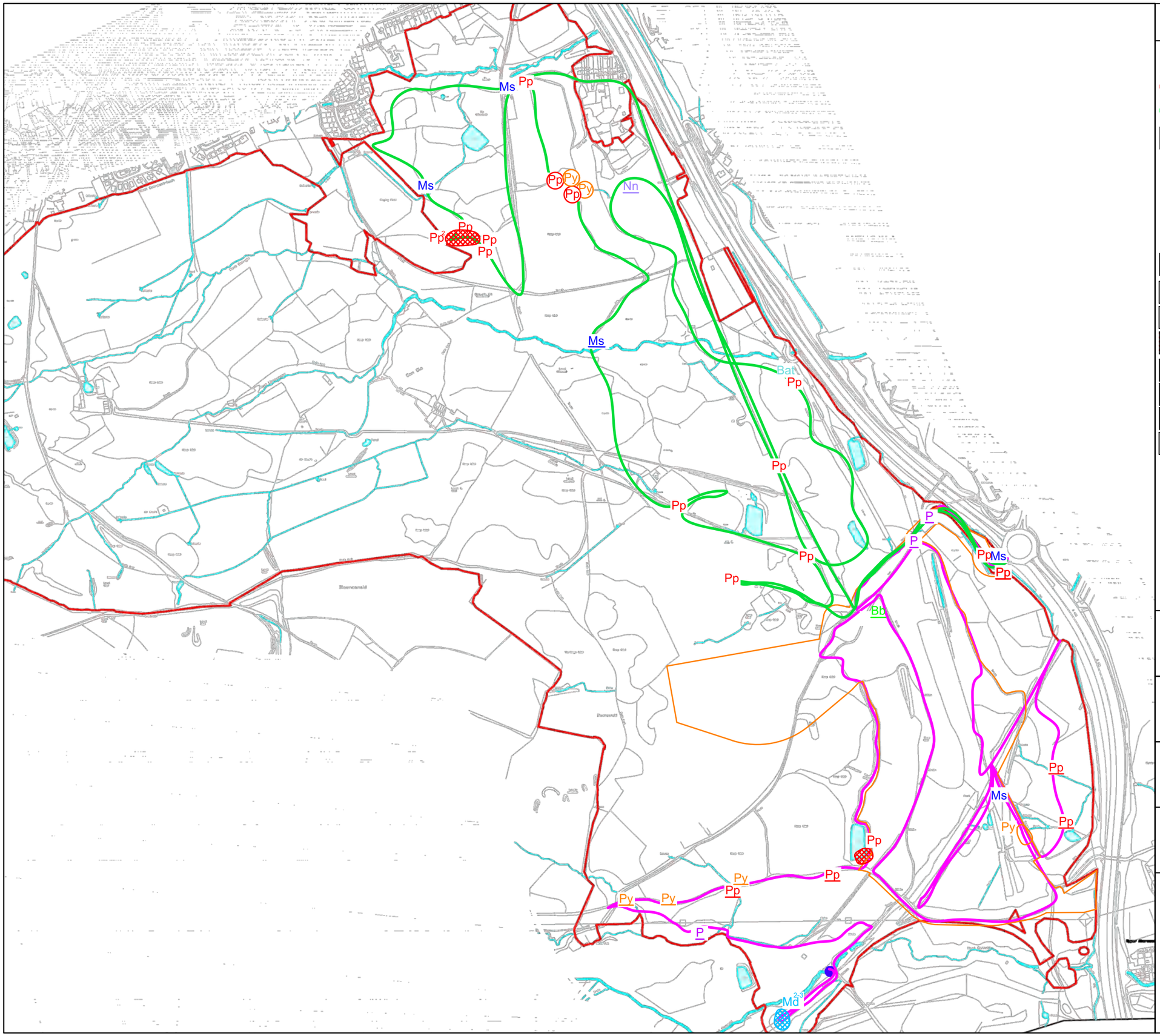
Drawing No.	Revision	Project No.
Figure 3b	-	E1835

Drawn	Checked	Date
CD	DW	December 2021

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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

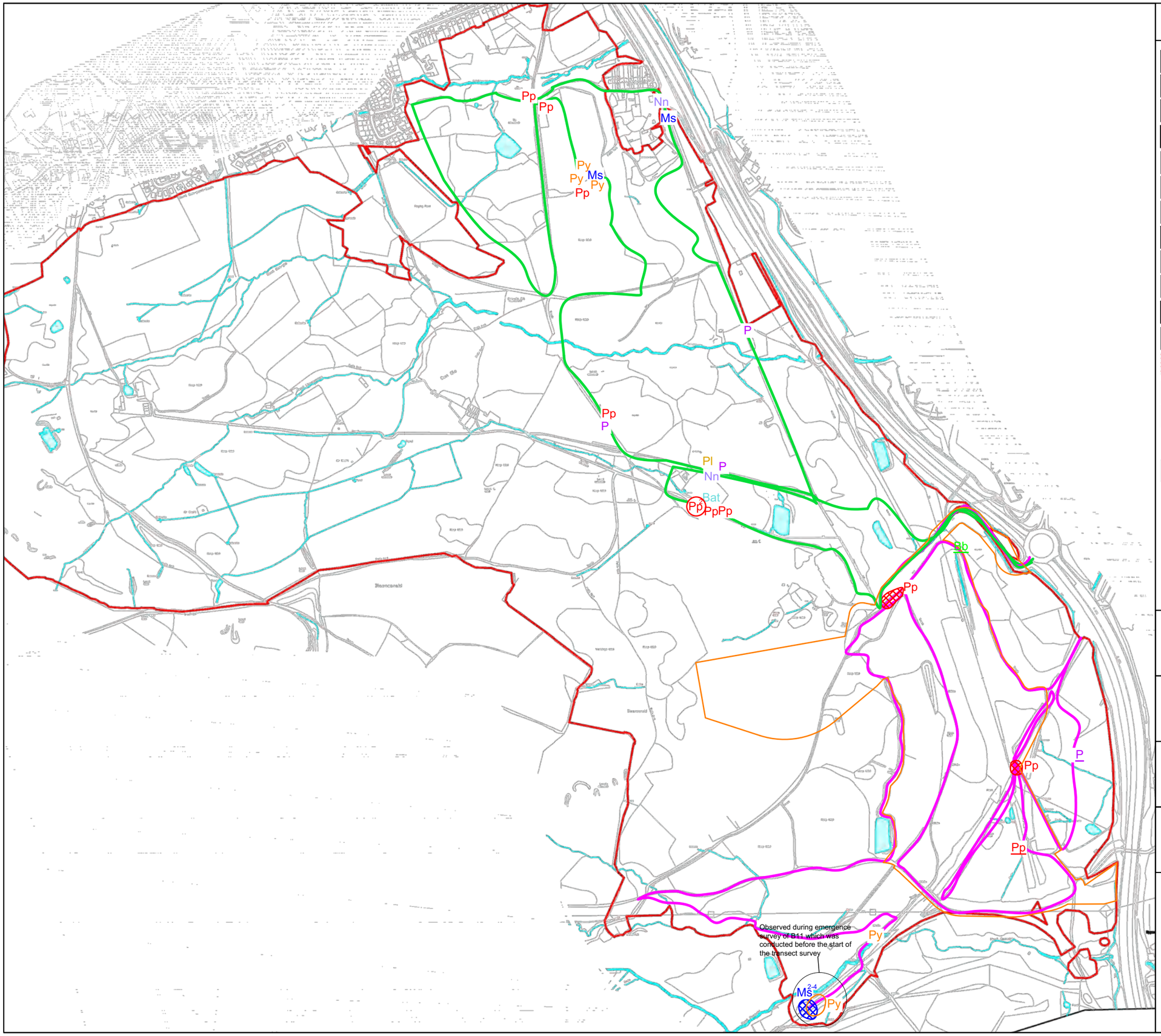
Drawing No.	Revision	Project No.
Figure 3c	-	E1835

Drawn	Checked	Date
CD	DW	December 2021

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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

Drawn	Checked	Date
CD	DW	December 2021

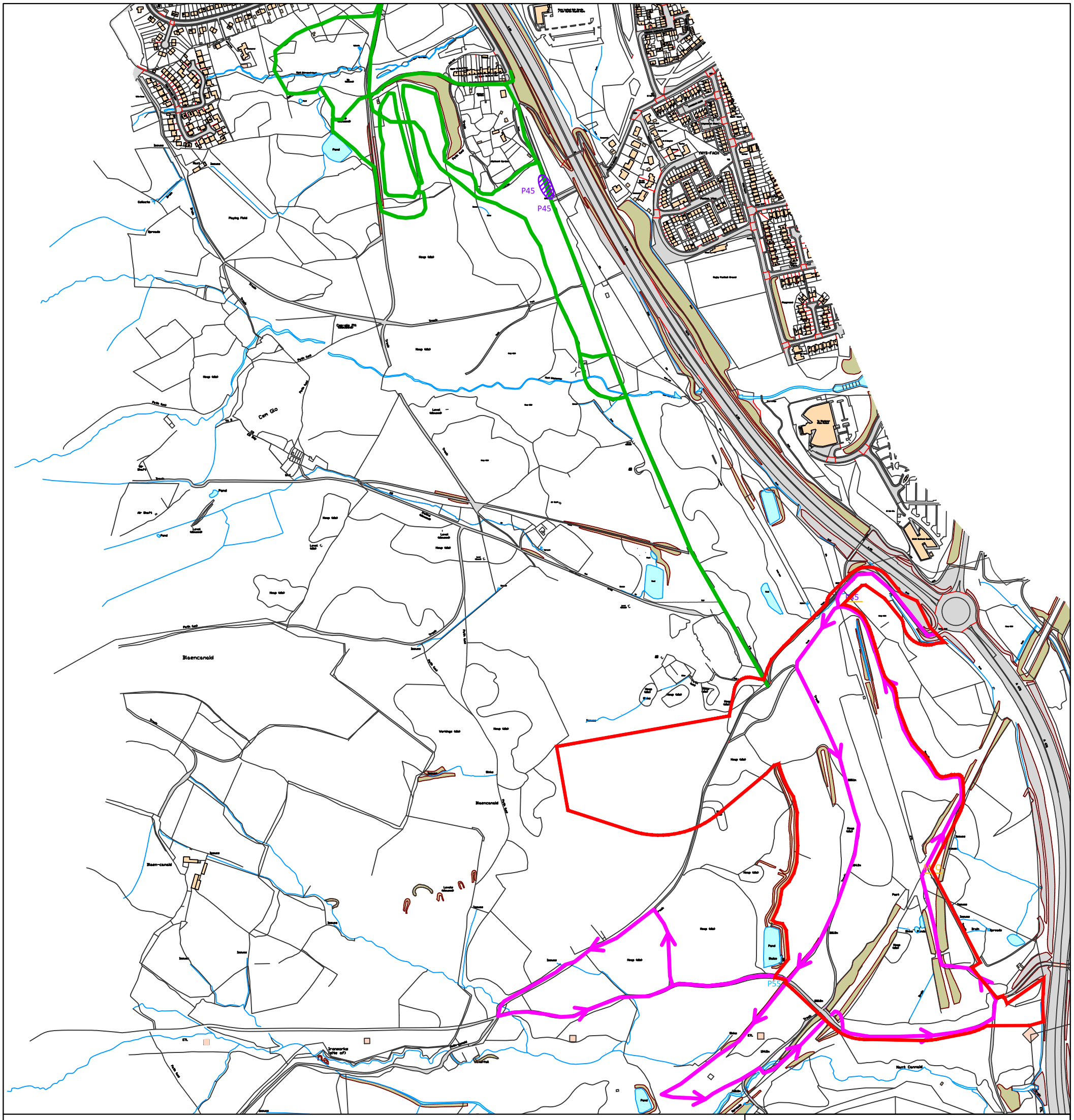
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Figure 4a-k

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
CD	DW	December 2021

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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	December 2021

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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

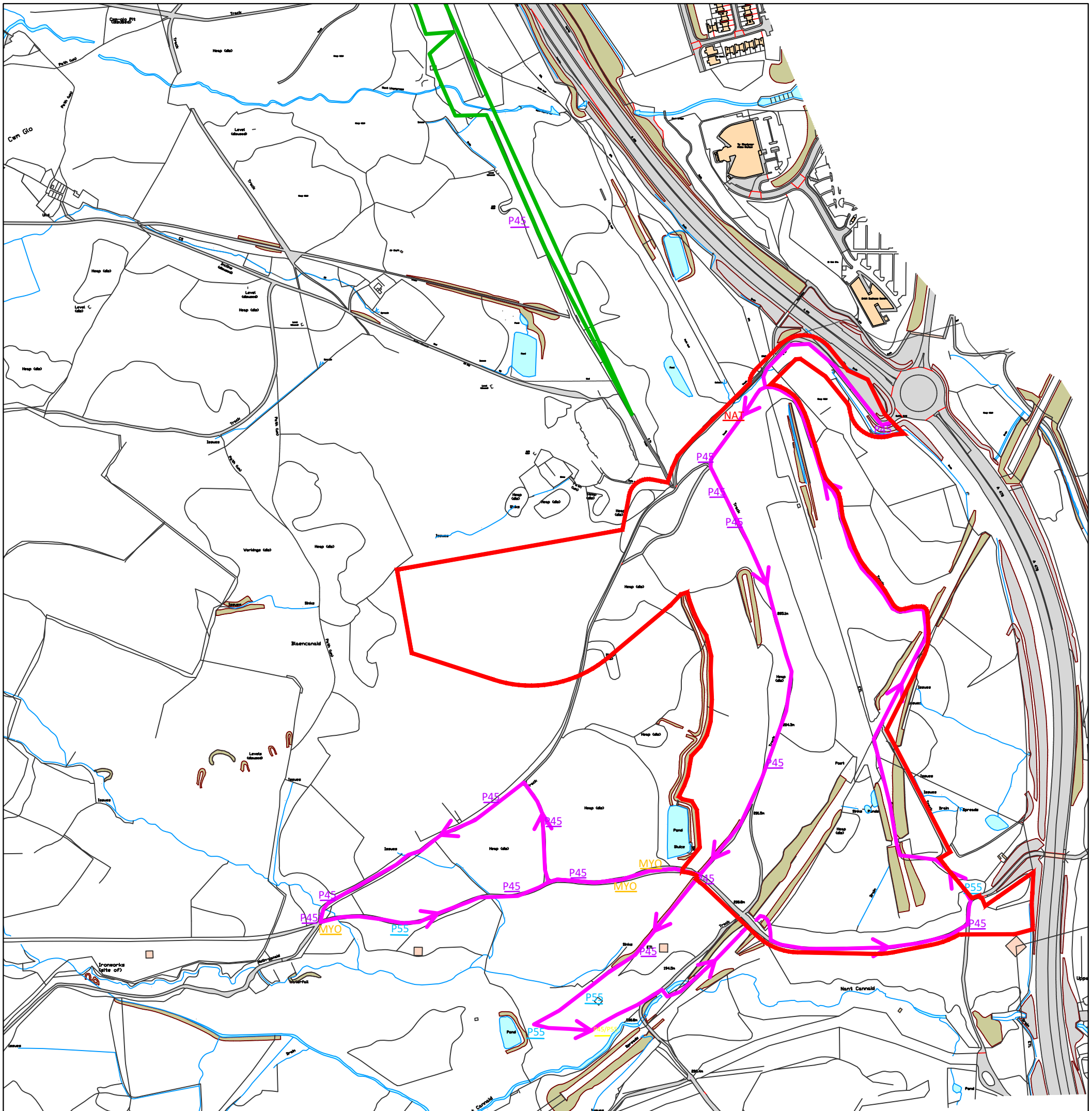
Drawing No.	Revision	Project No.
Figure 4c	-	E1835a

Drawn	Checked	Date
CD	DW	December 2021

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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
- Bat² Two bats
- Bat Bat passing by

DO NOT SCALE

Title

Bat activity transect results 26.06.2018

Project	Client
Cwm Glo	Marvel Ltd

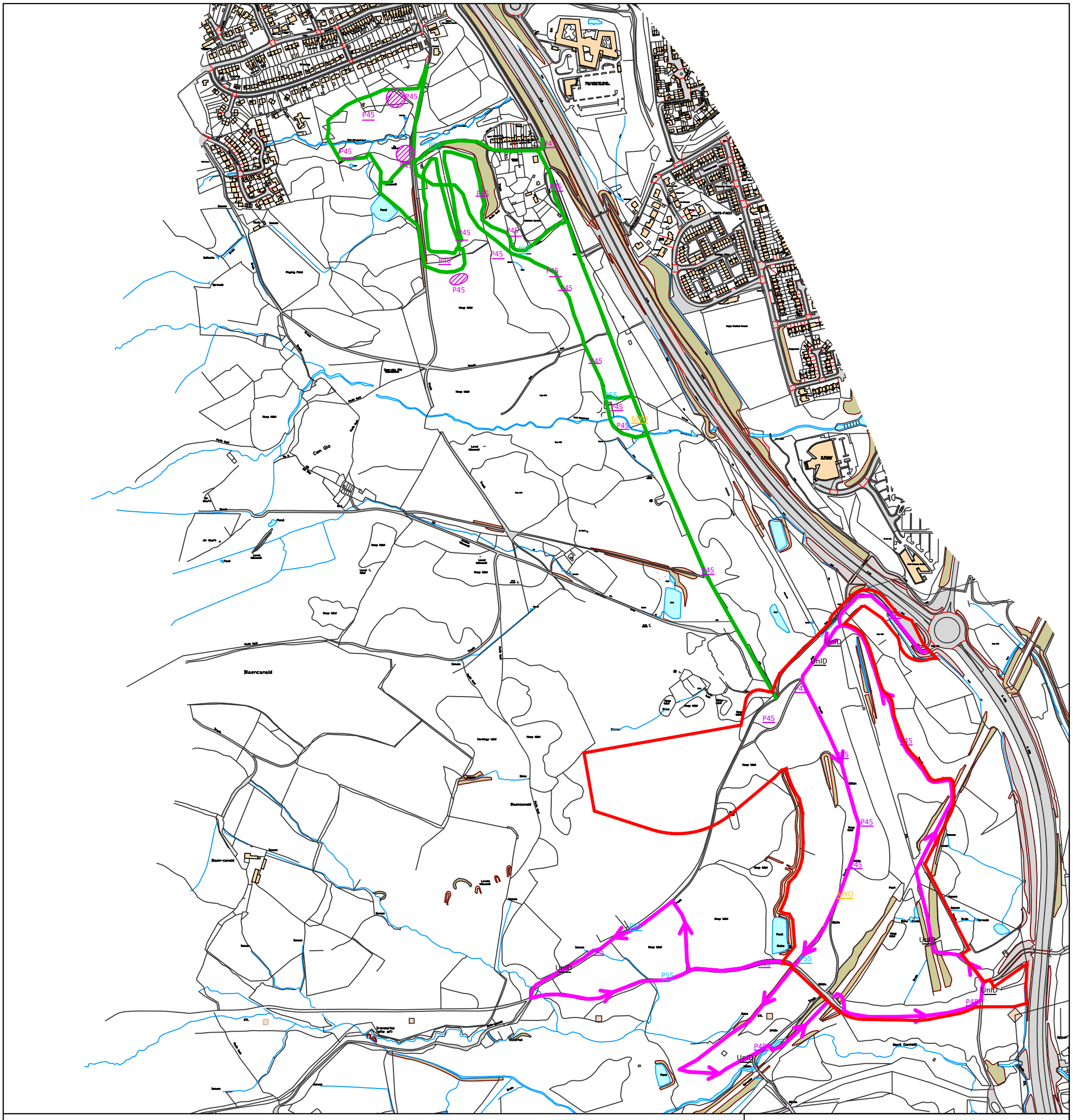
Drawing No.	Revision	Project No.
Figure 4d		E1835

Drawn	Checked	Date
CD	DW	December 2021

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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
CD	DW	December 2021

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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	December 2021

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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

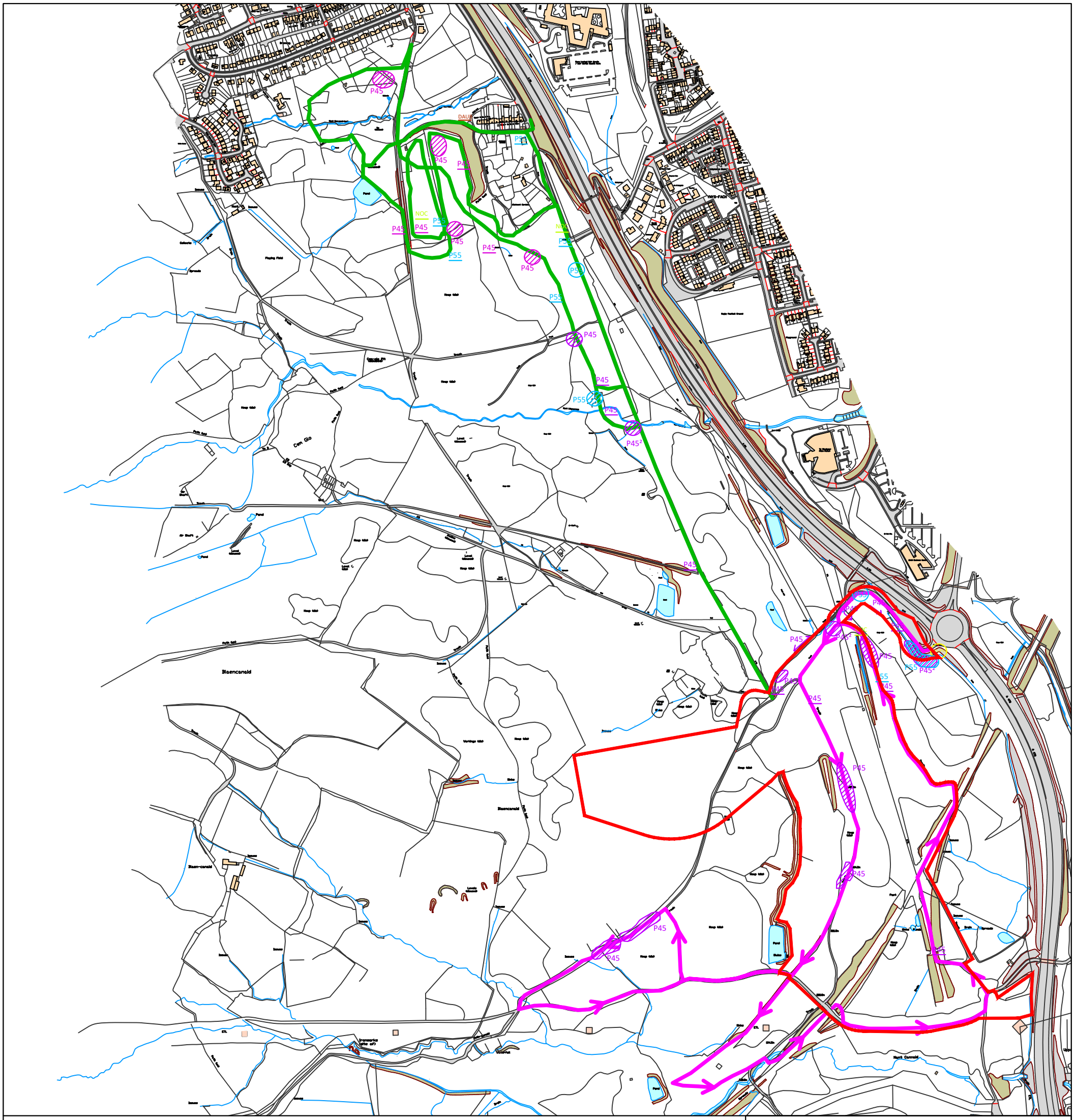
Drawing No.	Revision	Project No.
Figure 4g	-	E1835

Drawn	Checked	Date
CD	DW	December 2021

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Key

DO NOT SCALE

Title
Bat activity transect results 20.08.18

Project	Client
Cwm Glo	Marvel Ltd

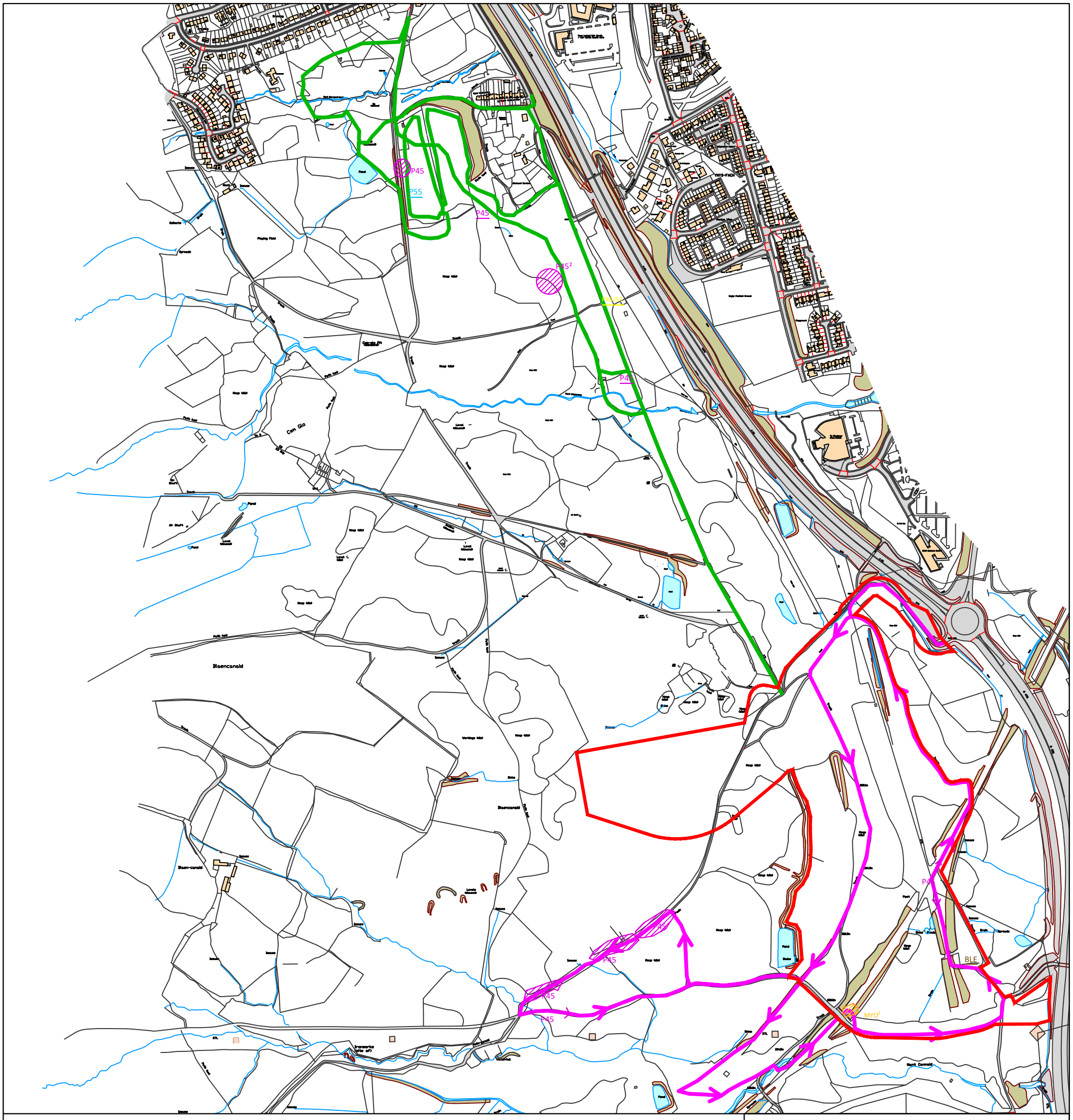
Drawing No.	Revision	Project No.
Figure 4h	-	E1835

Drawn	Checked	Date
CD	DW	December 2021

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Key

- Application site
- Transect 1
- Transect 2
- P45 Common Pipistrelle
- Myo Myotis
- BLE Brown long-eared bat
- P55 Soprano pipistrelle
- P45/P55 Common/soprano pipistrelle
- Foraging area
- BAT Bat passing by
- BAT² Two bats
- Commuting

DO NOT SCALE

Title

Bat activity transect (dawn) results 21.08.18

Project	Client
Cwm Glo	Marvel Ltd.

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

Drawn	Checked	Date
CD	DW	December 2021

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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 j	-	E1835

Drawn	Checked	Date
CD	DW	December 2021

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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	December 2021

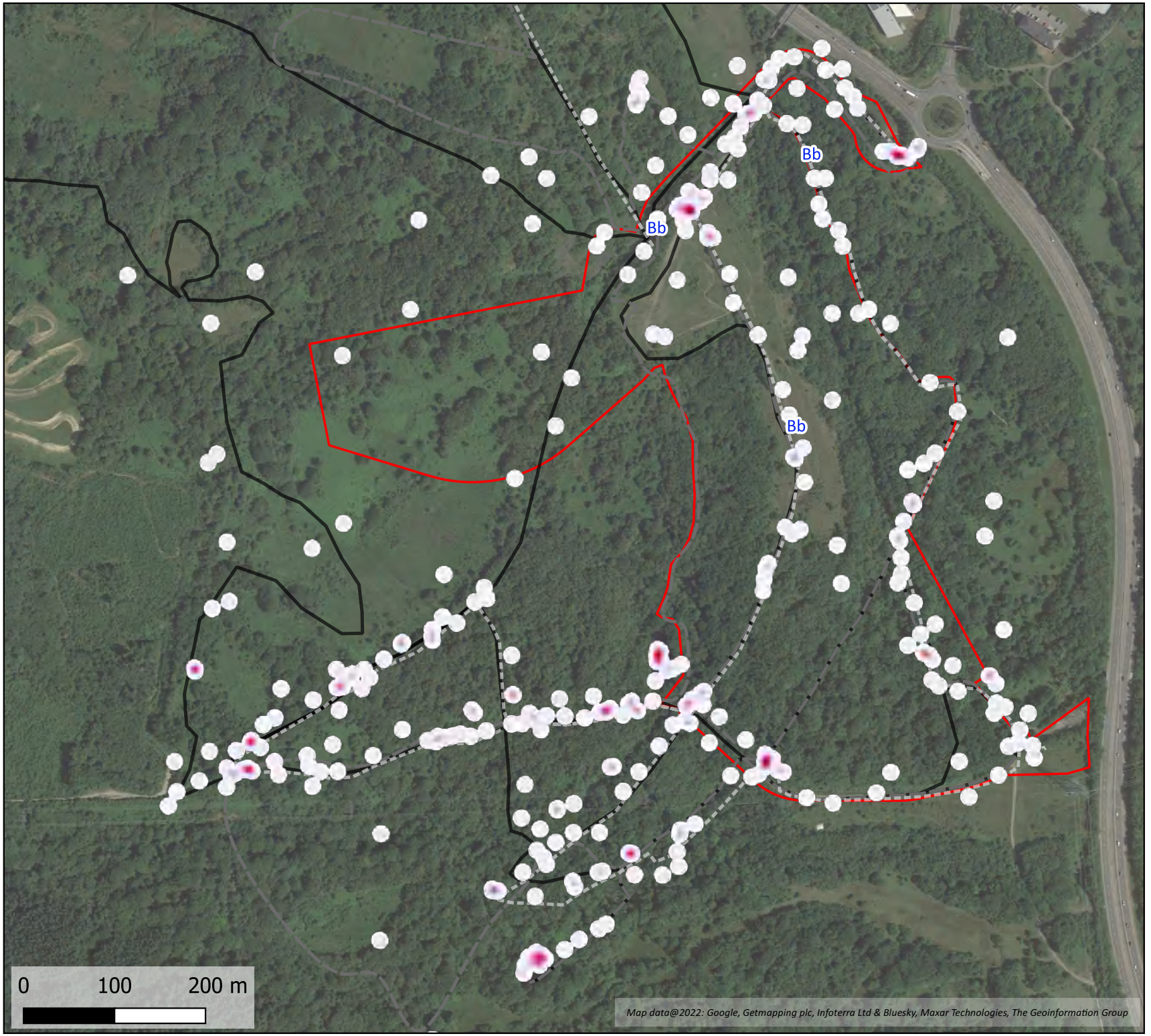
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Figure 5

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
CD	DW	January 2022

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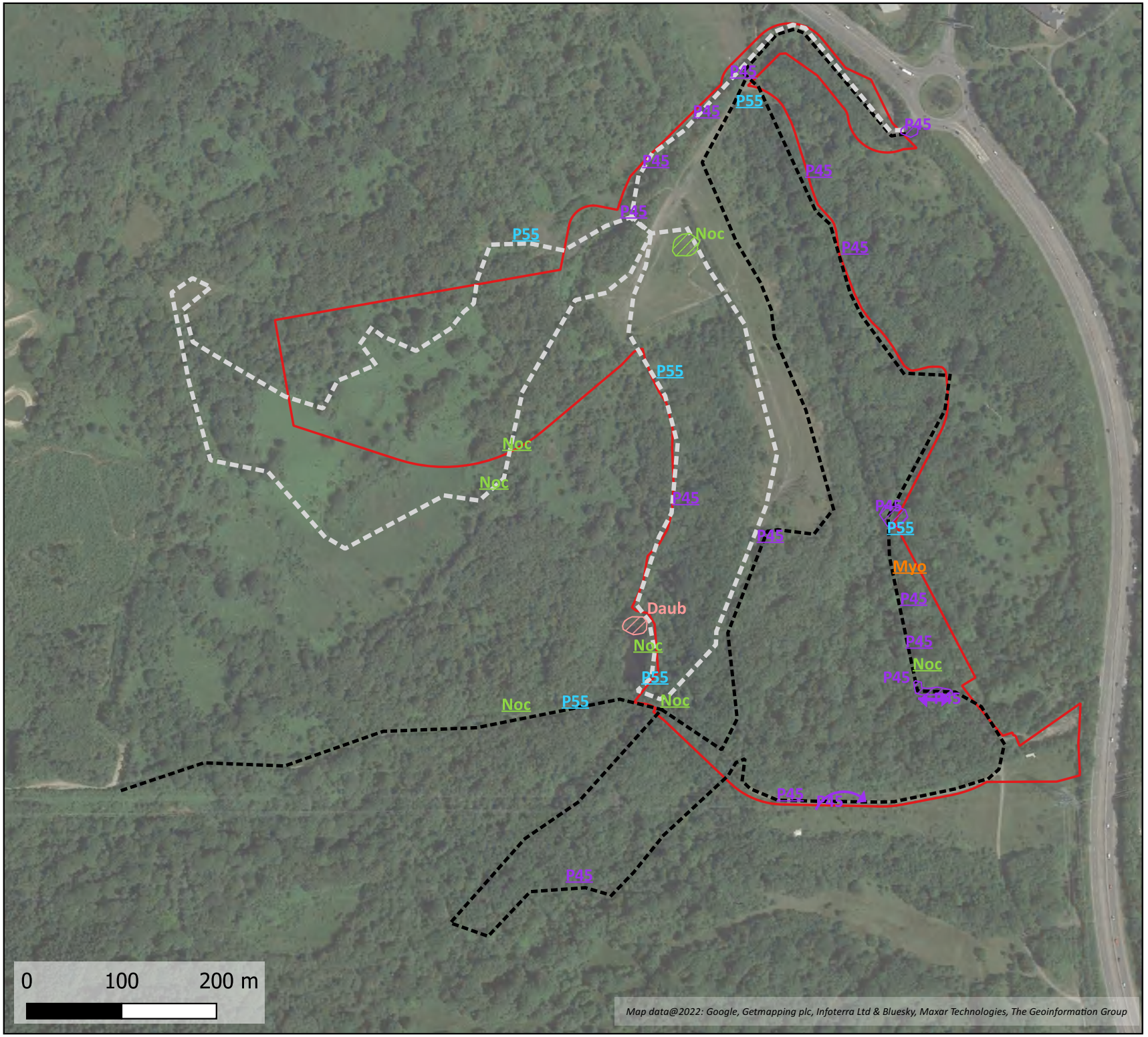
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Figure 6a-m

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

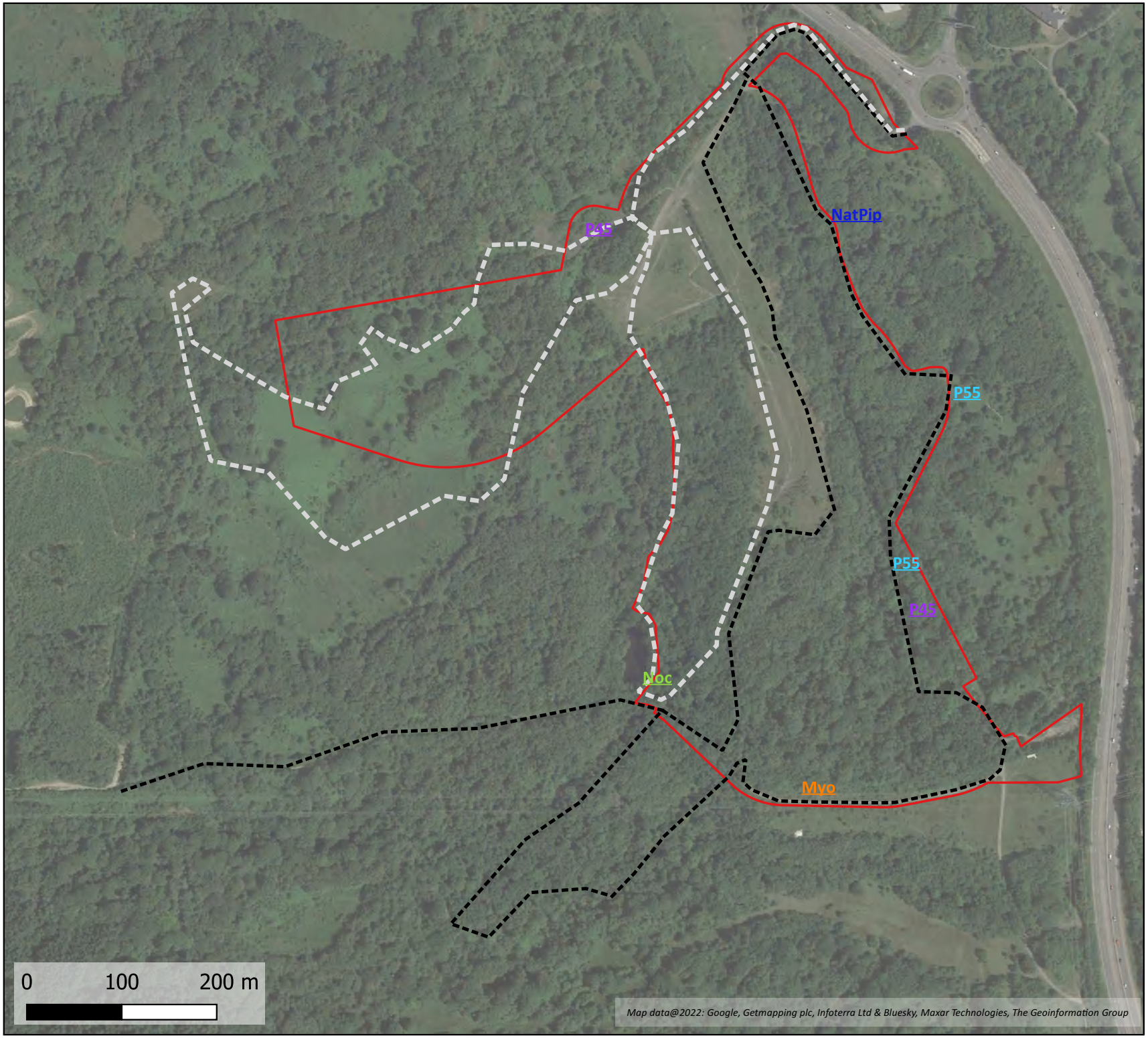
Drawn	Checked	Date
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Key

- 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

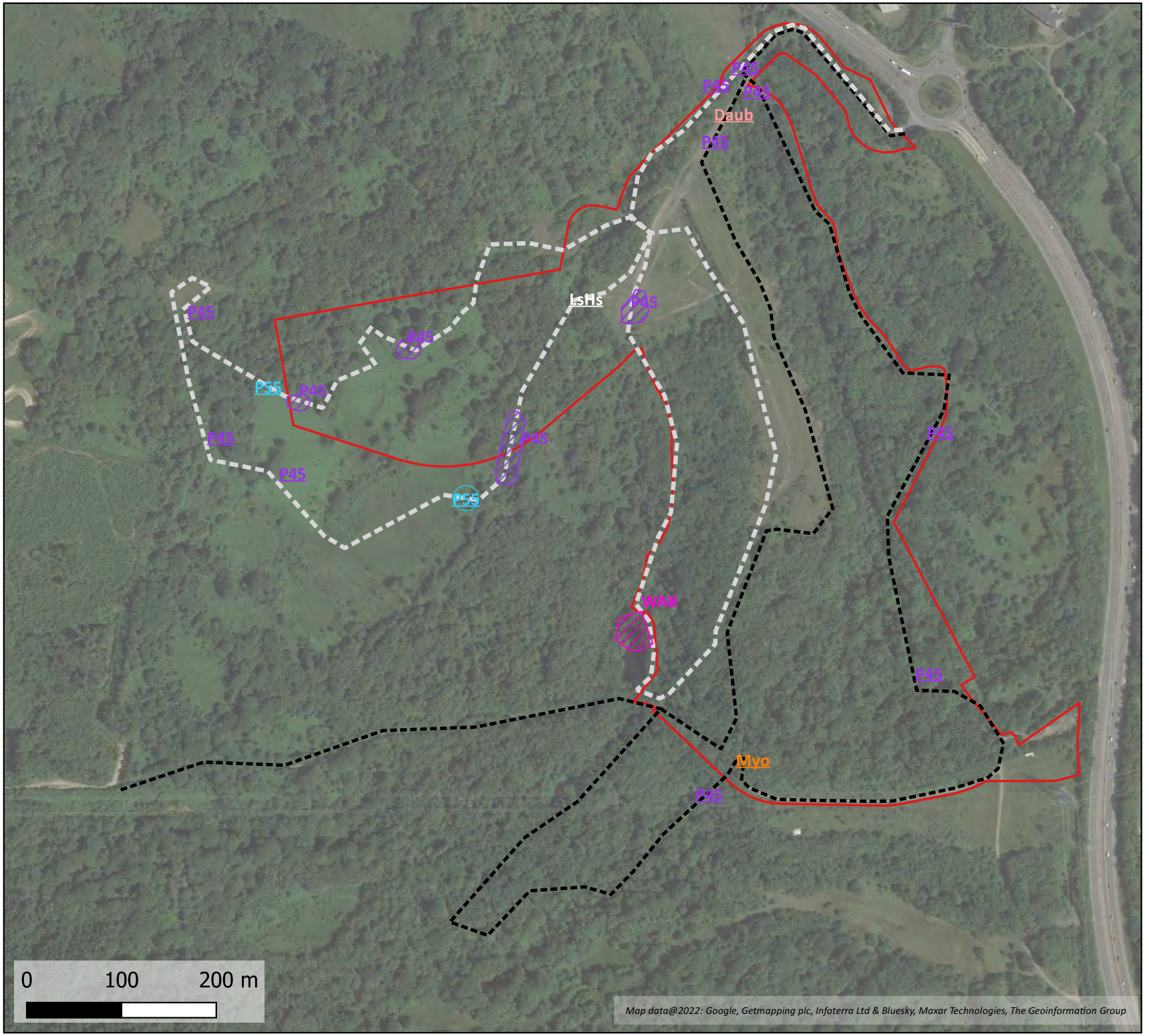
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CD	DW	January 2022

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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
- LsHs Lesser horseshoe

Title

Bat activity transect results 17.05.2021

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 6c		E1835

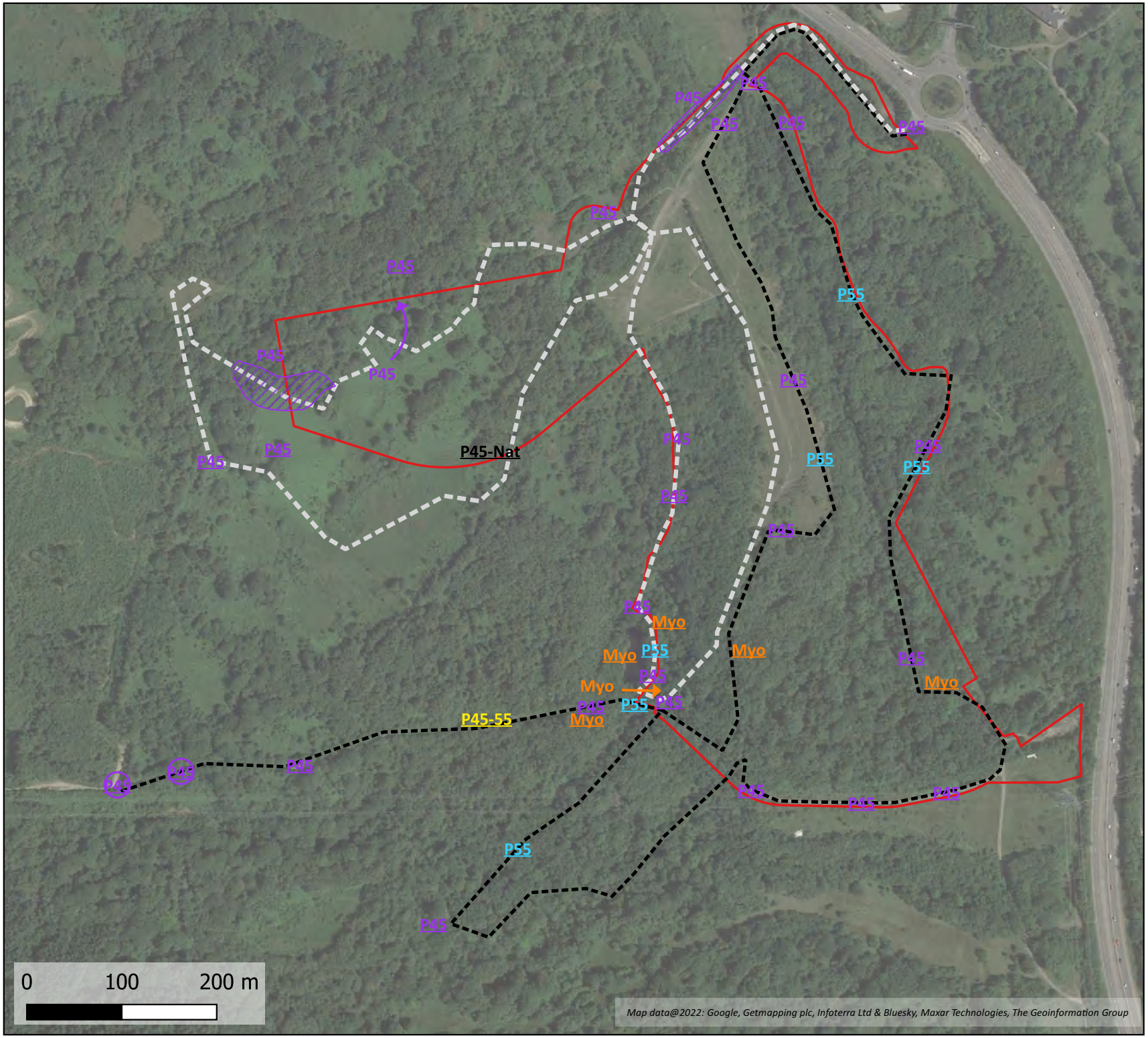
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Key

- 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

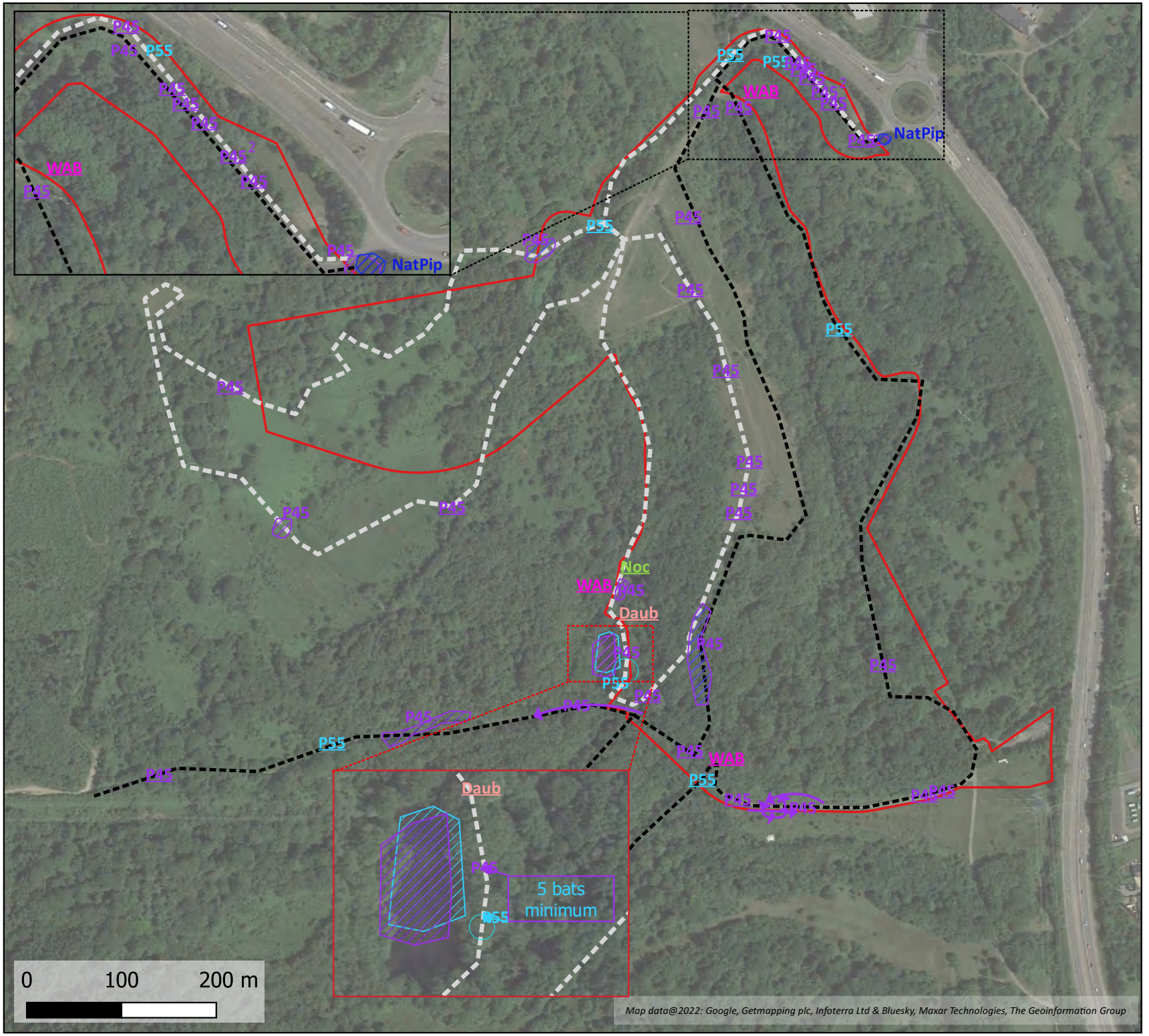
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CD	DW	January 2022

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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
- 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

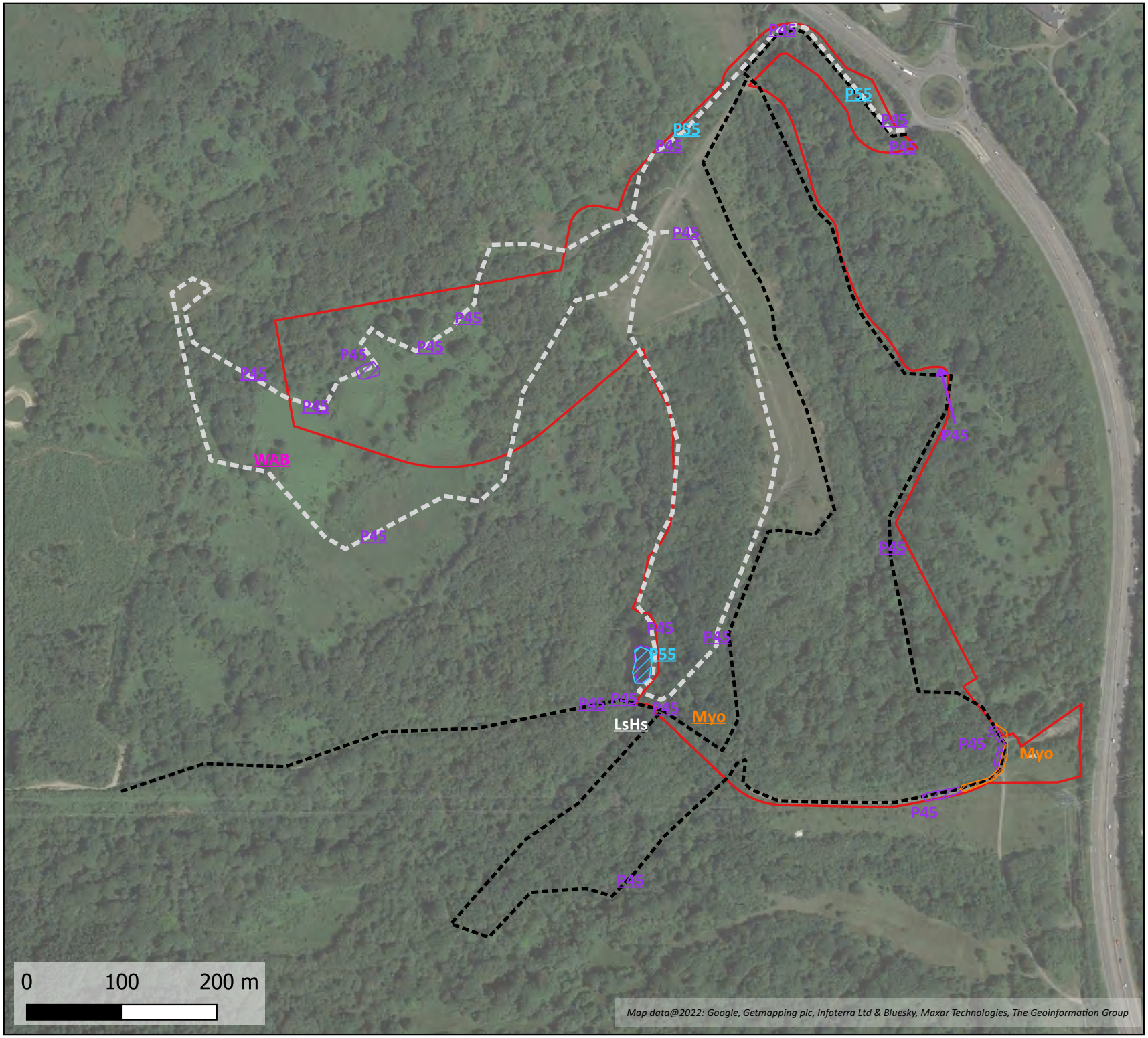
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CD	DW	January 2022

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Key

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

Title

Bat activity transect results 28-29.06.2021

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 6f		E1835

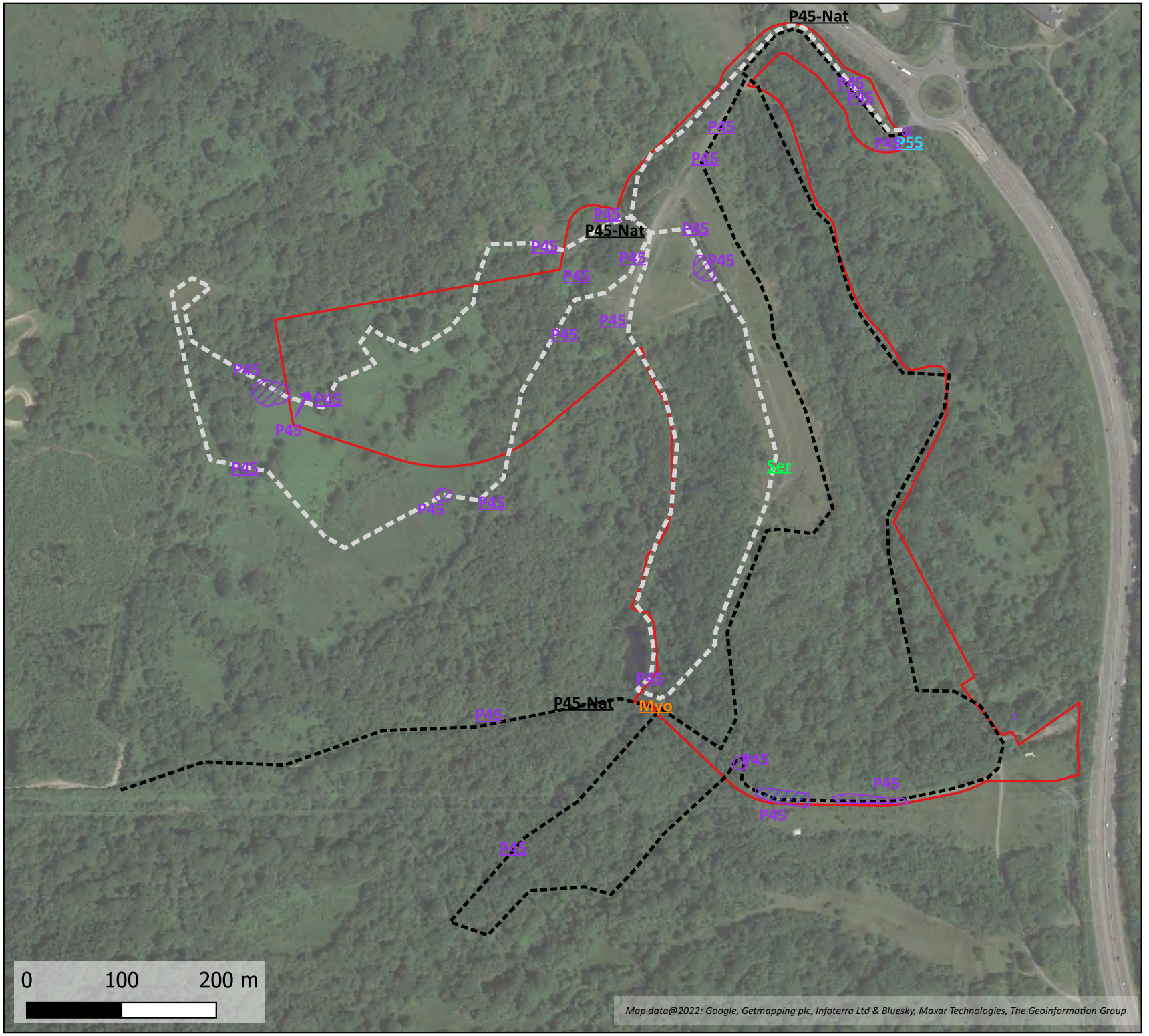
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Key

- 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-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

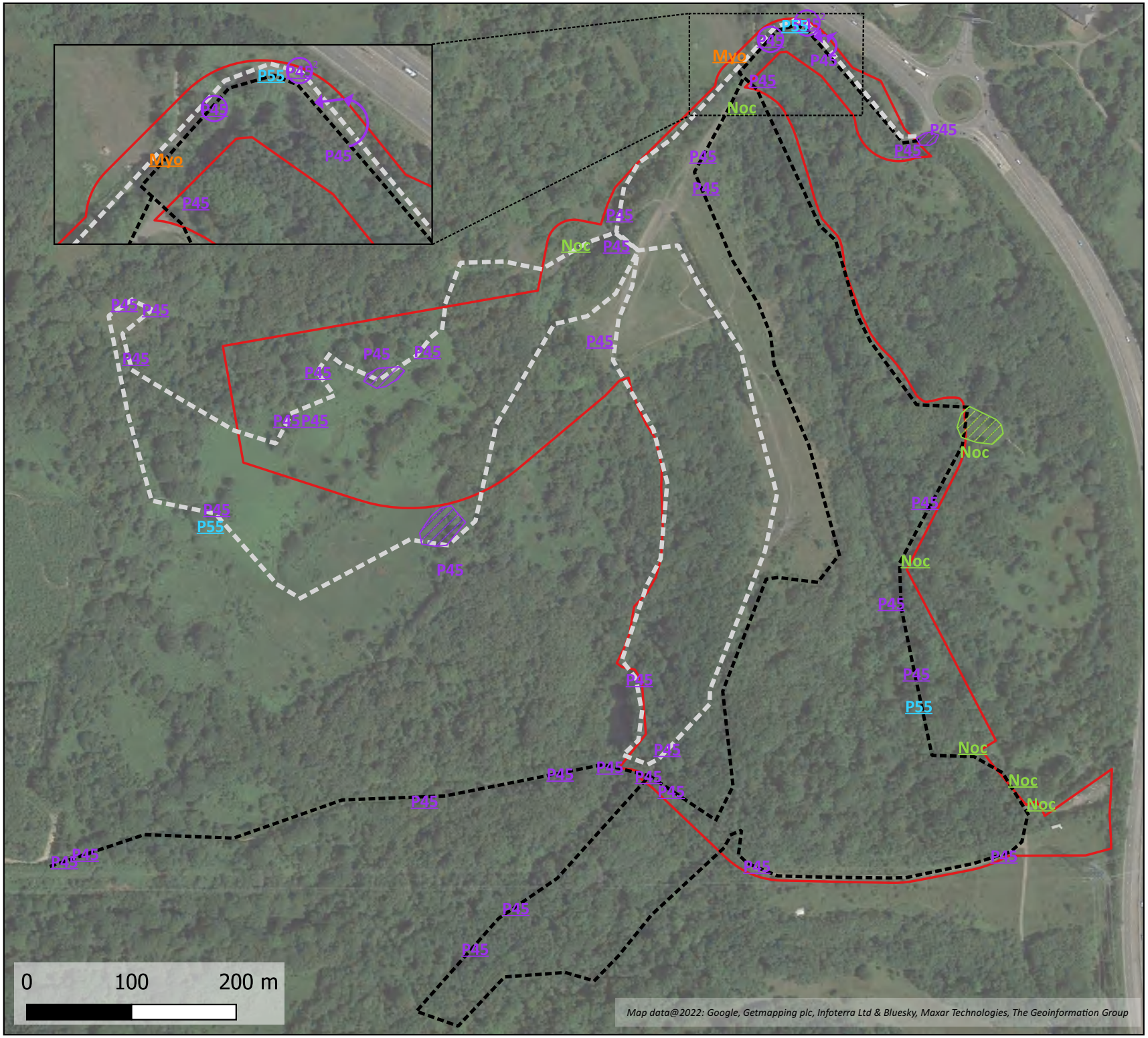
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Key

- 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

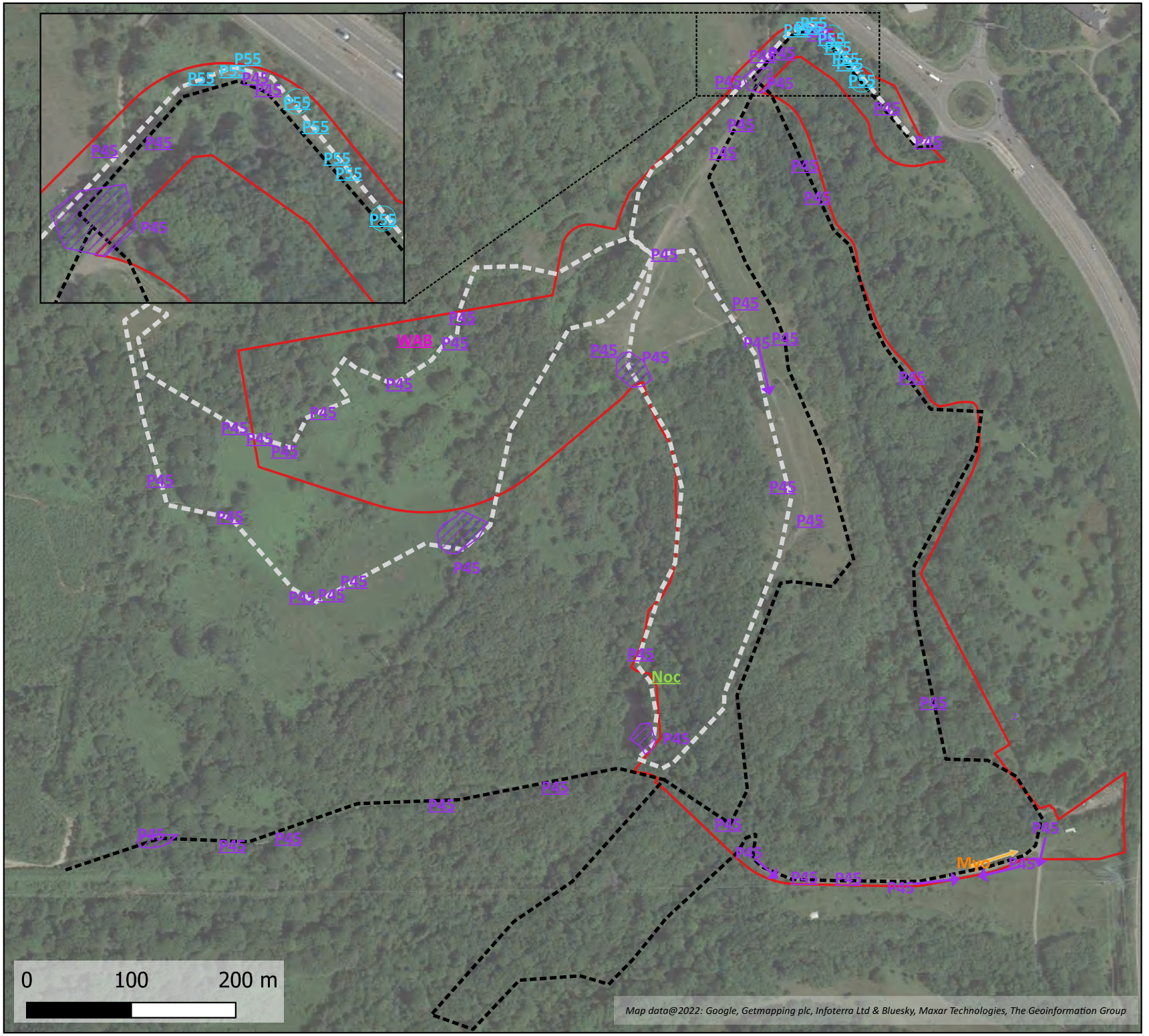
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Key

- 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

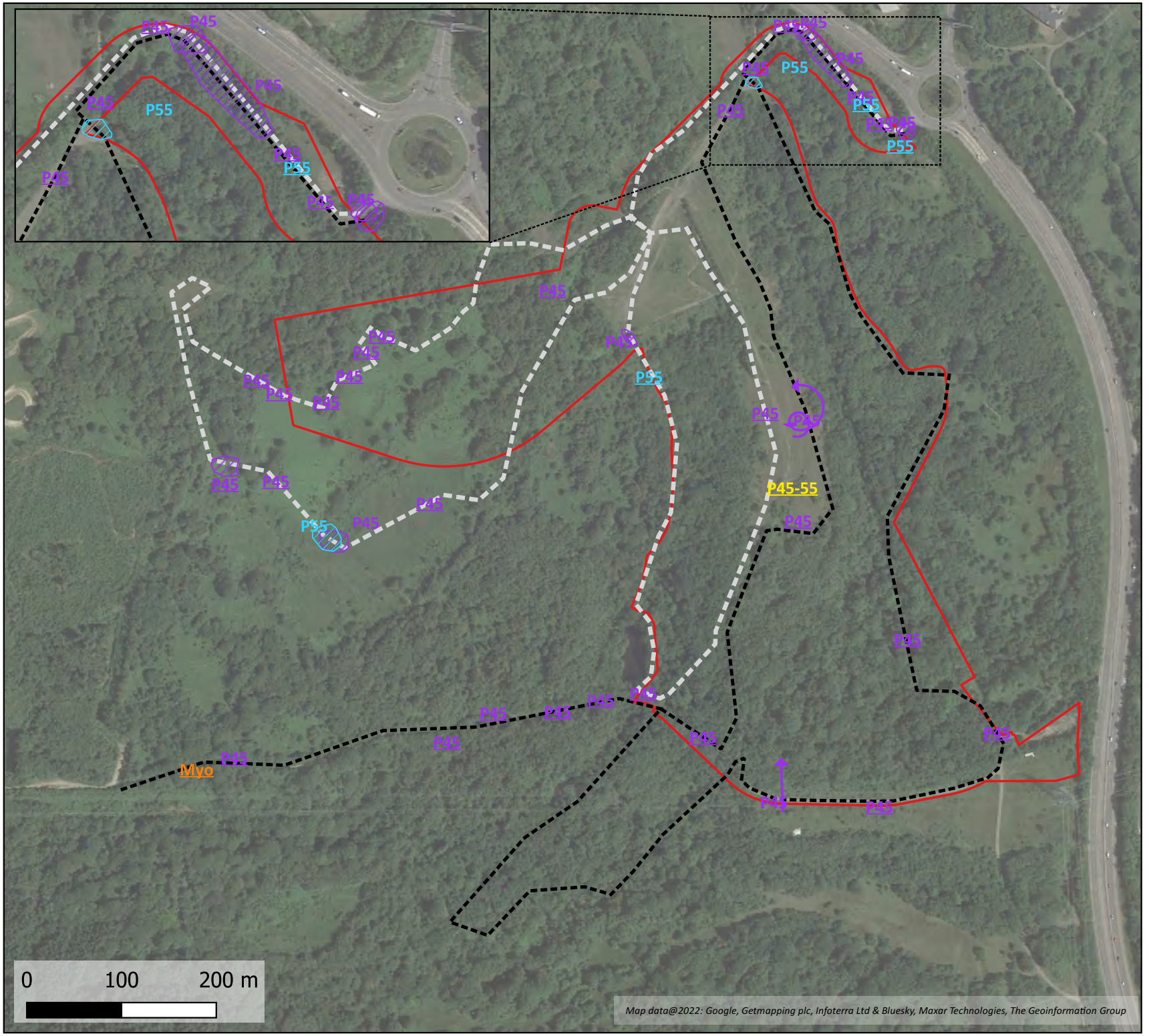
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Key

- 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

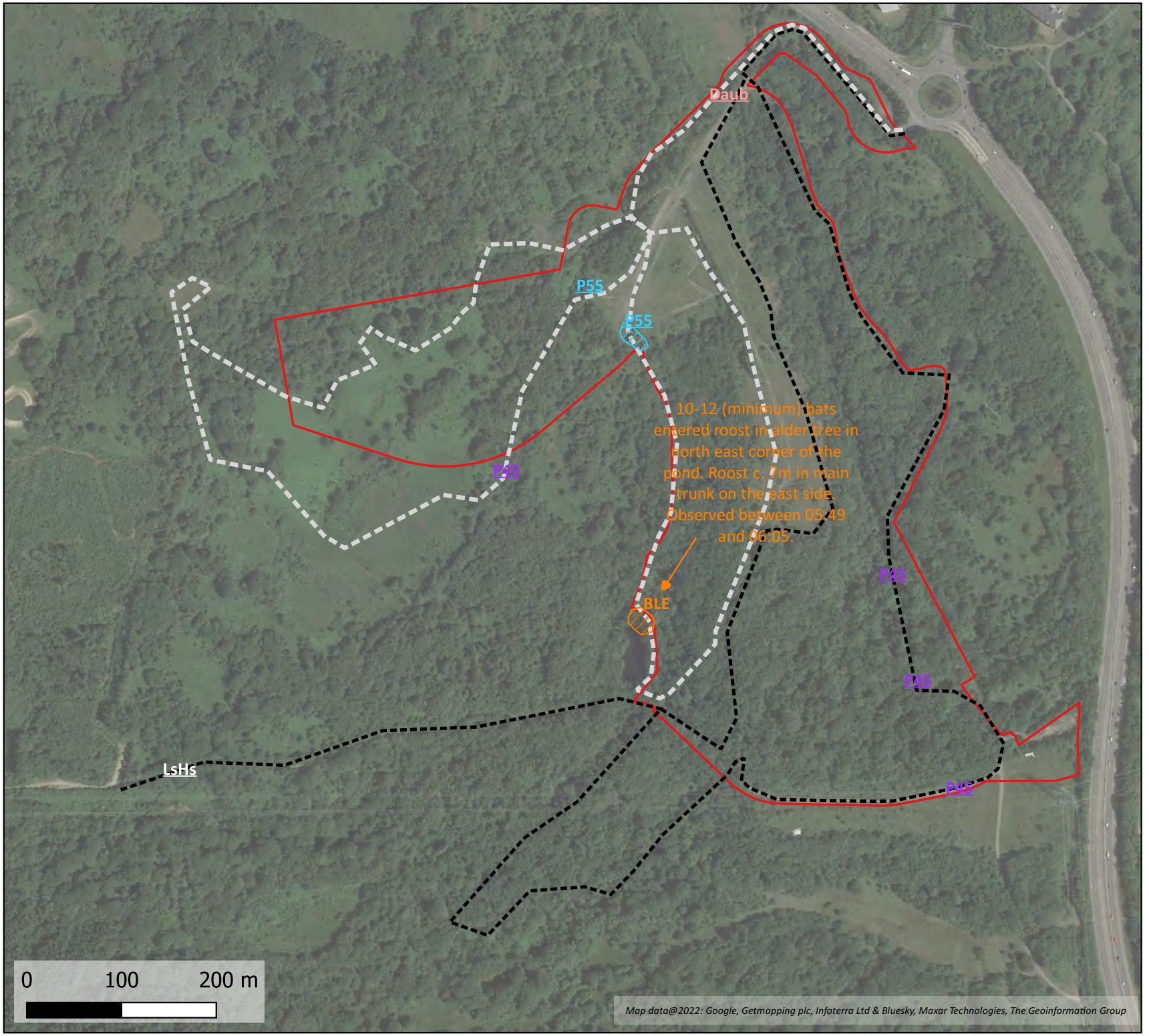
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Key

- 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 horshoe

Title
Bat activity transect results 27.05.2021

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 6k		E1835

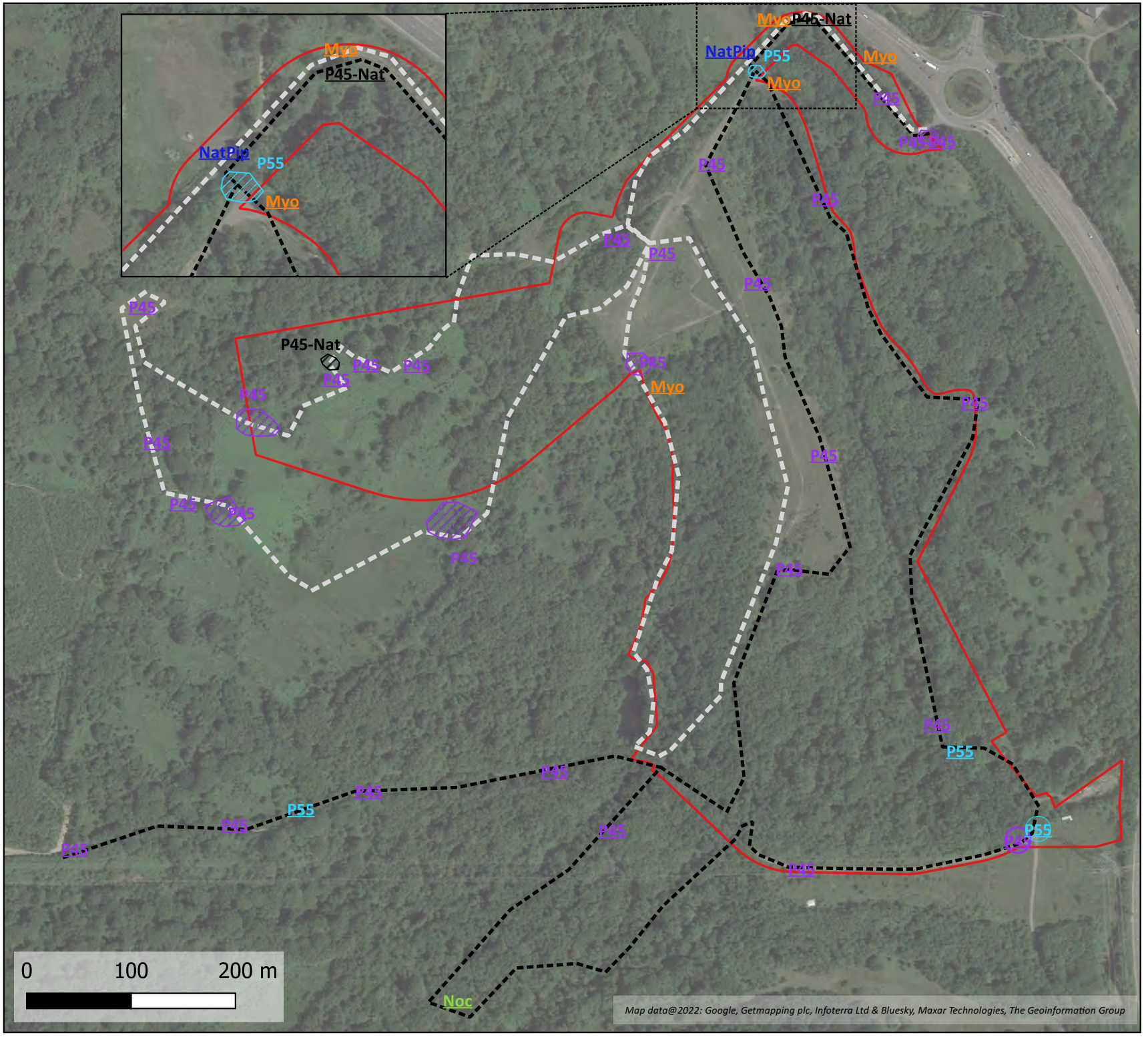
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Key

- 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*
Noc	Common noctule
NatPip	Nathusius' pipistrelle
P45-Nat	Common/Nathusius' pipistrelle

Title

Bat activity transect results 15.09.2021

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 6l		E1835

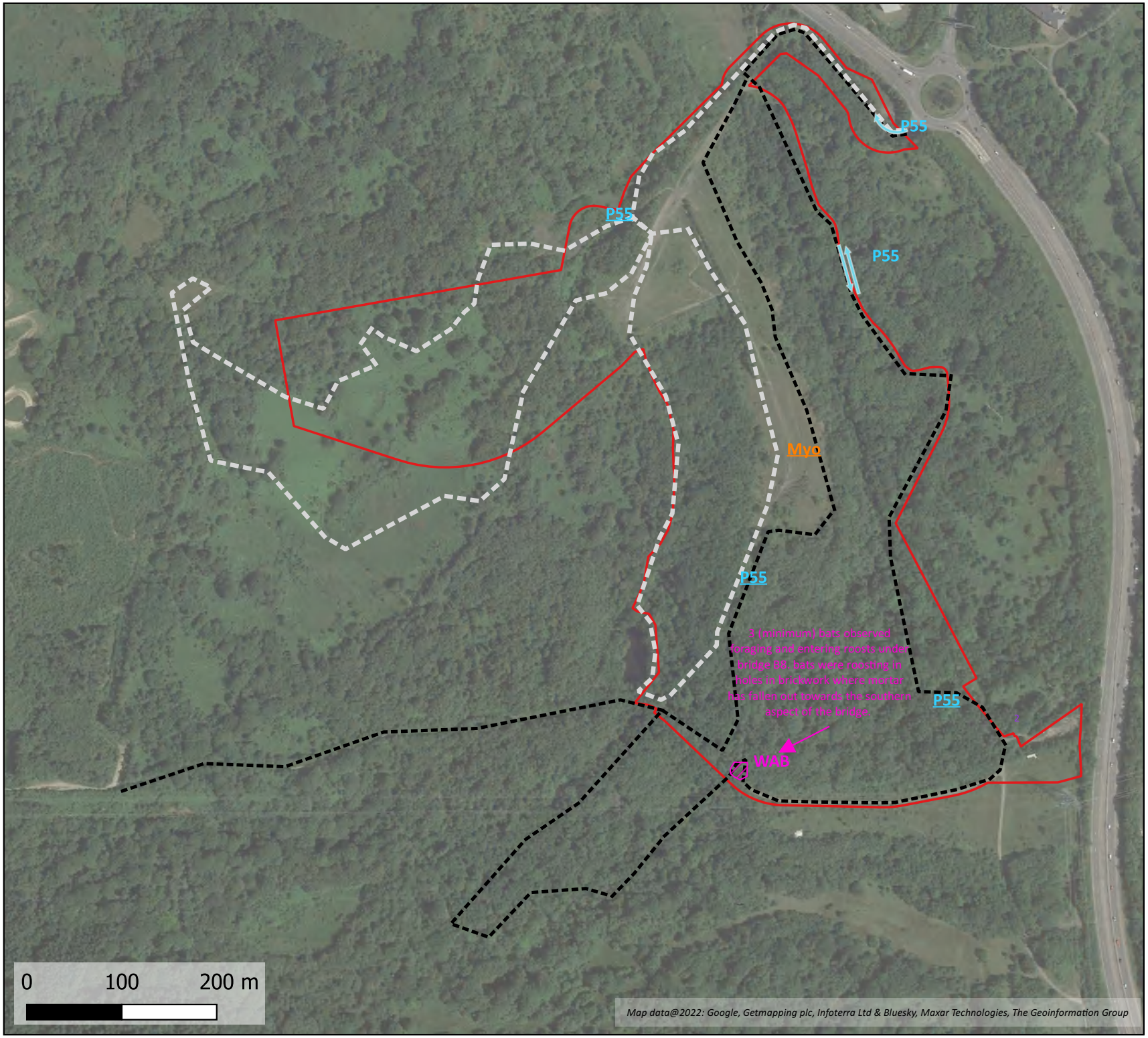
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Key

- 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

Title

Bat activity transect results 27.09.2021

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 6m		E1835

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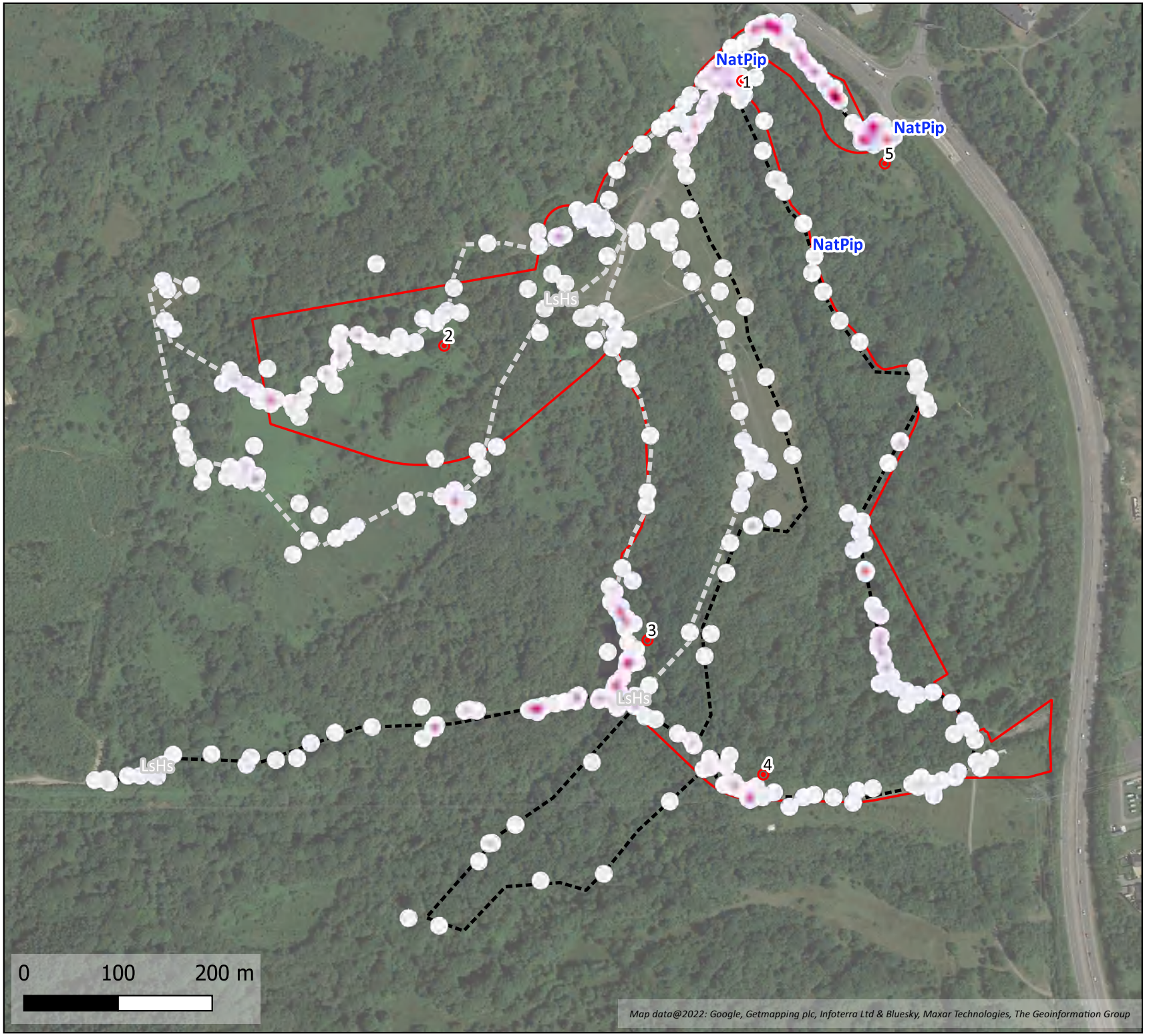
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Figure 7

2021 collated bat transect survey results



Key

Application site 2021

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

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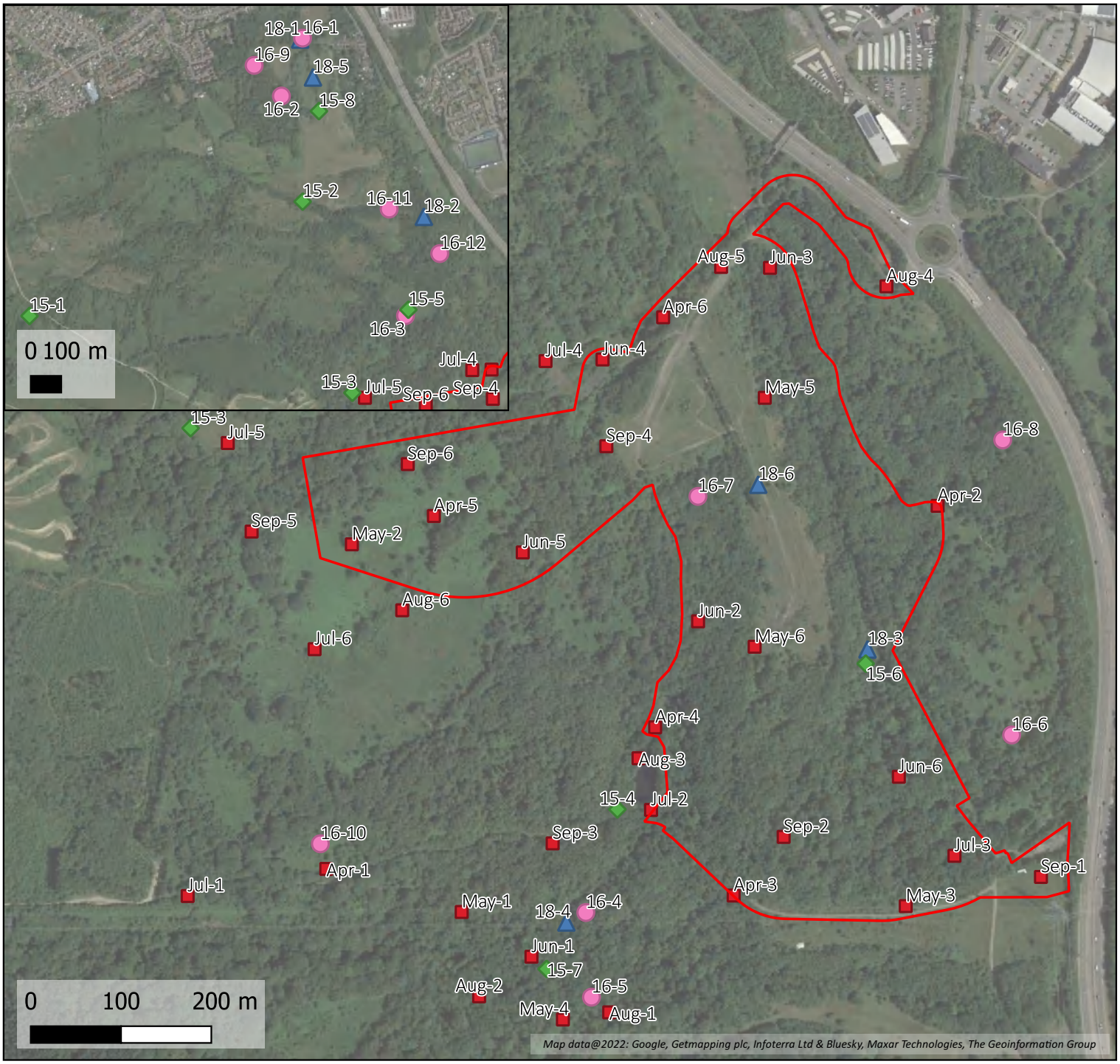
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Figure 8

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
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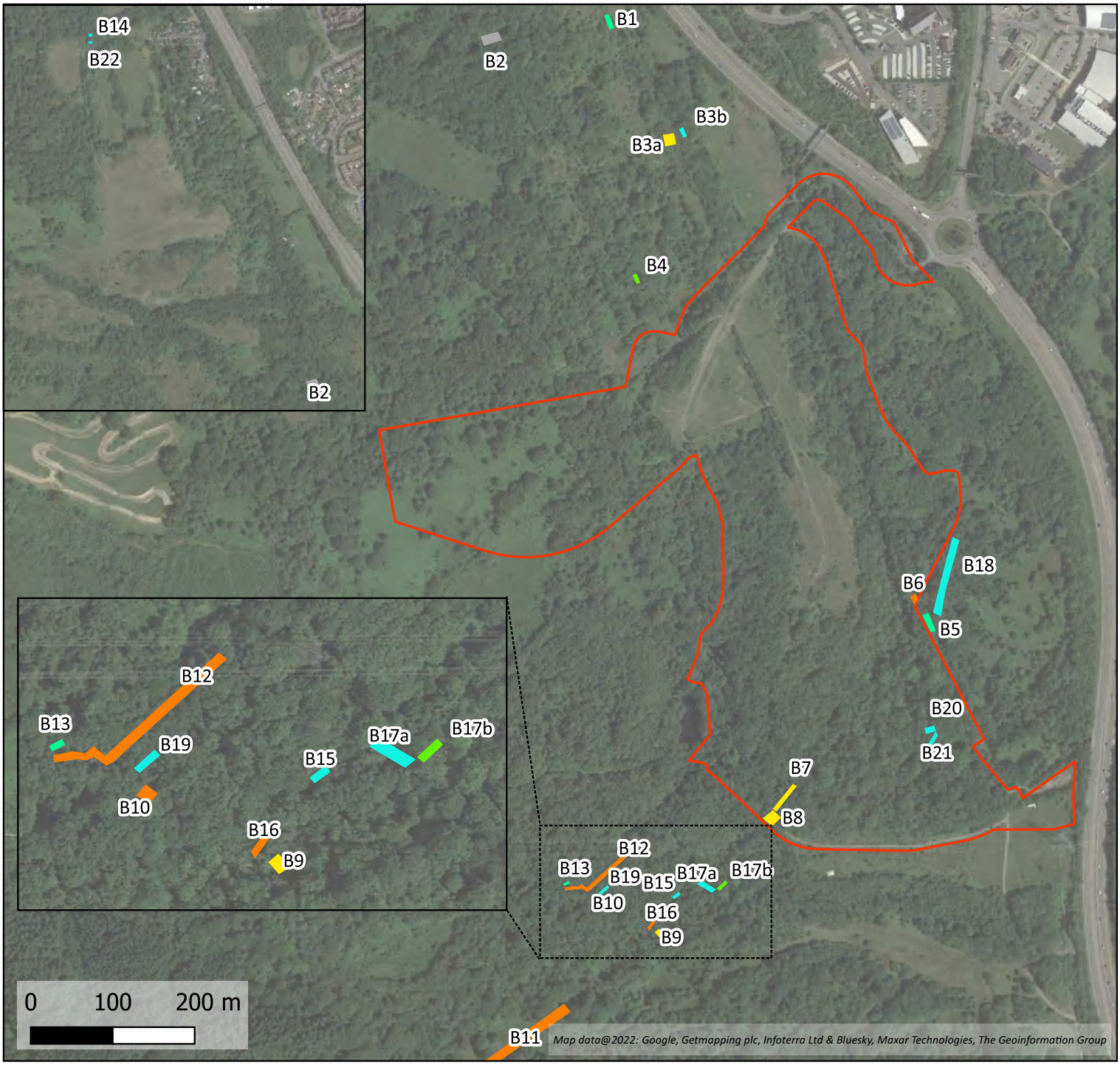
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Figure 9

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

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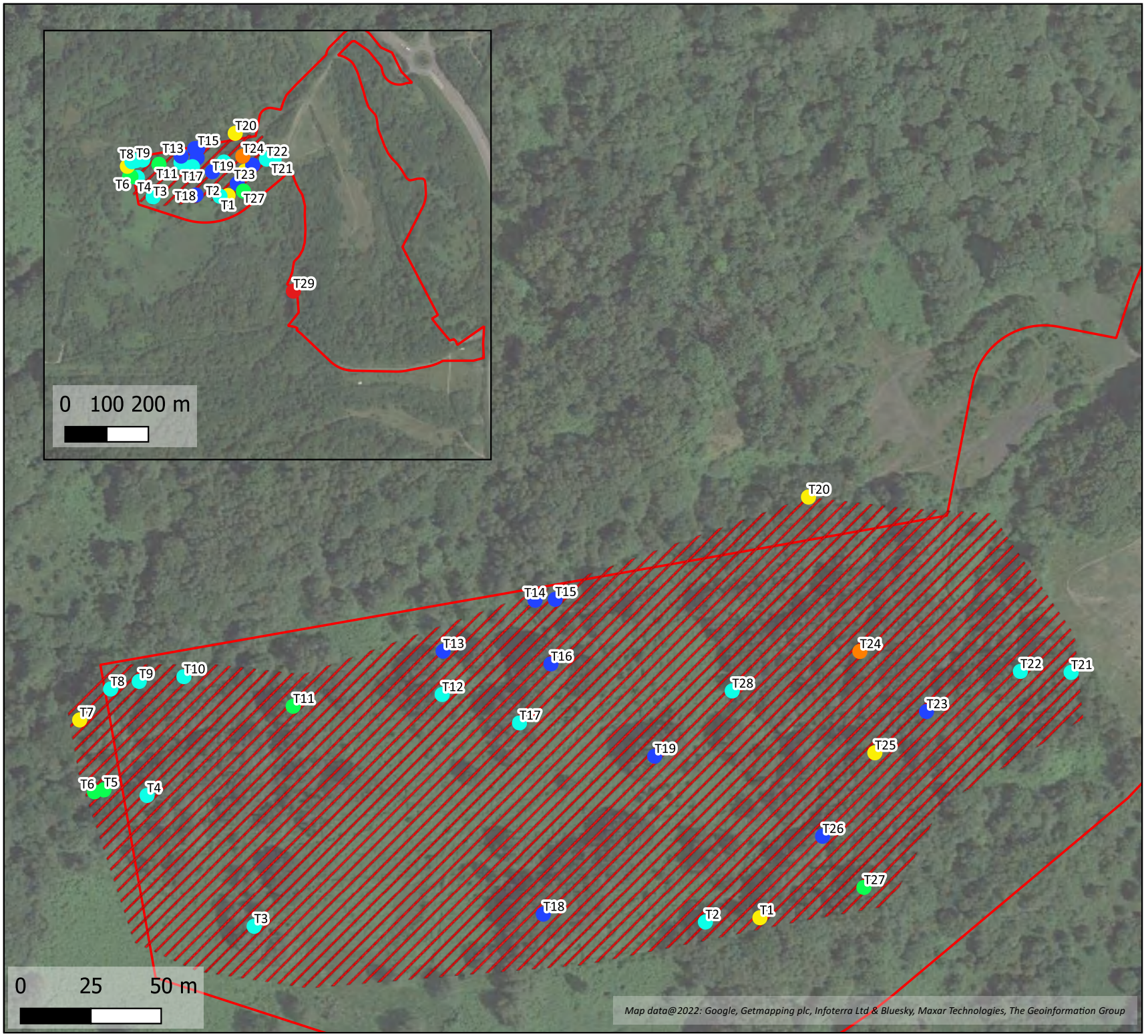
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Figure 10

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
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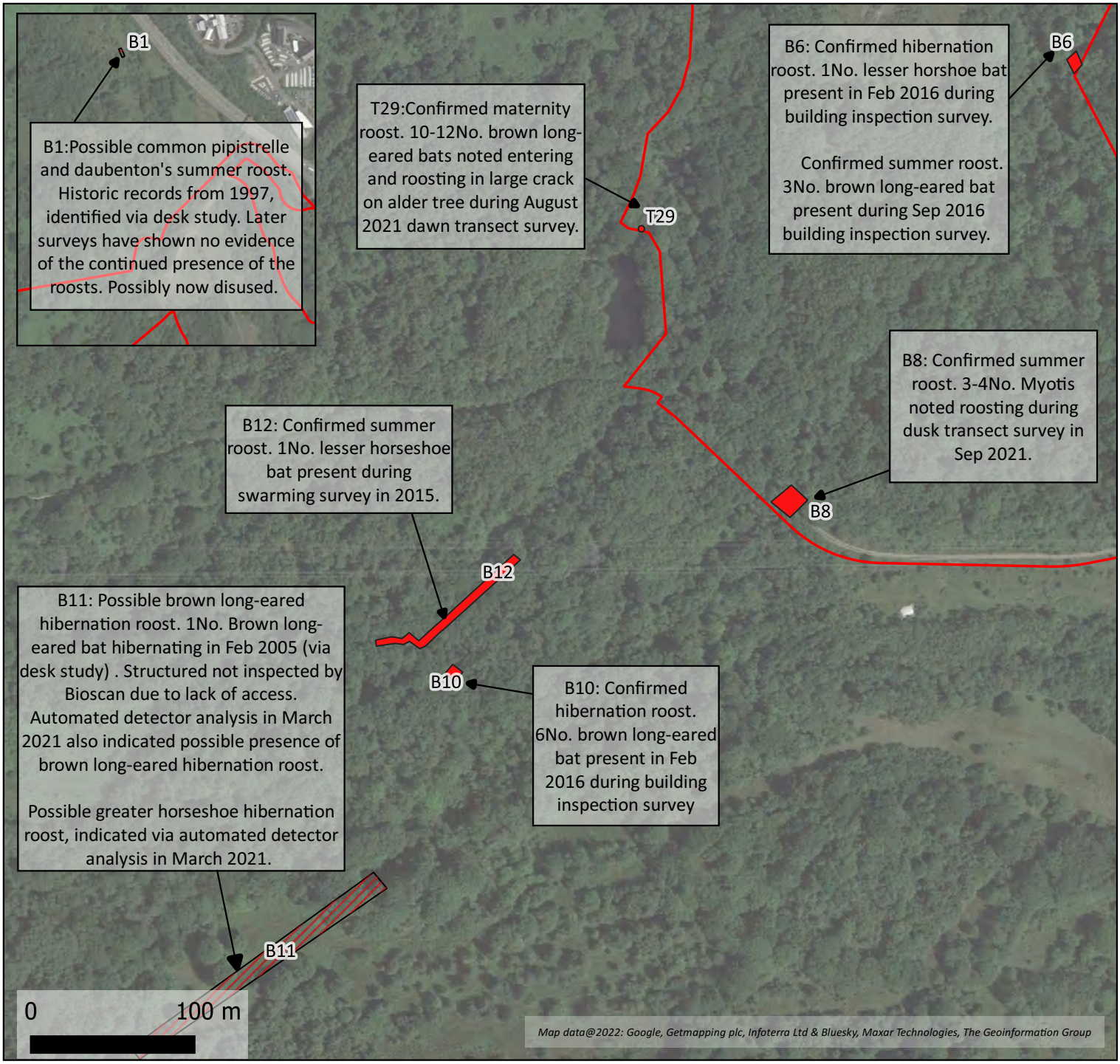
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Figure 11

Confirmed/suspected bat roosts within or near site



Key

- Application site
- Structure 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

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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. <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.	<u>Autumn swarming survey</u> (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 <u>Static detector survey</u> (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 <u>Static detector survey</u> (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. 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 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	Dusk emergence survey (23rd August 2016): No bats observed emerging during dusk survey. Dawn re-entry survey (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):

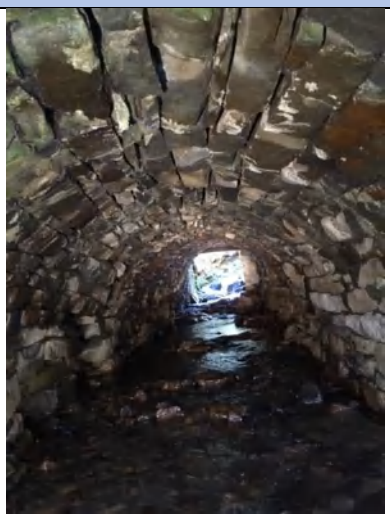
Building/Structure Reference Nº & Photographs	Building description	Potential bat hibernation/ roosting features & evidence of bats	Results of activity surveys
 Structure Reference GM 606	at various locations along that length.		- Common pipistrelle - *Myotis* sp. - Soprano pipistrelle - Long-eared bat 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

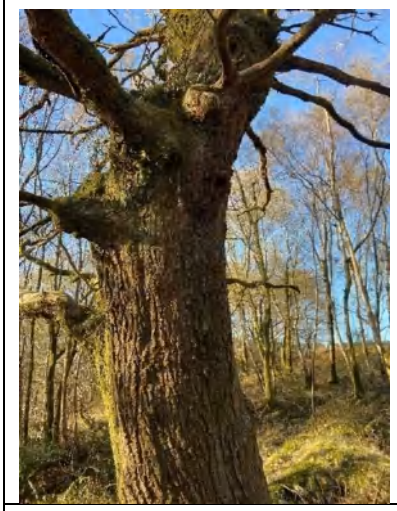
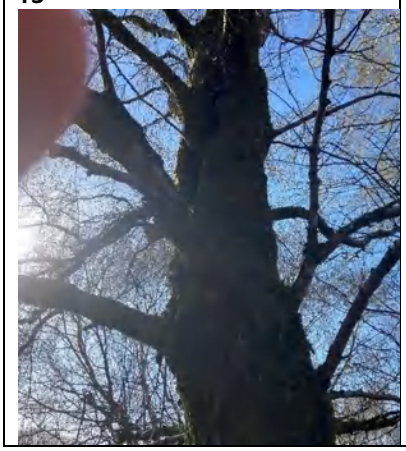
Building/Structure Reference Nº & Photographs	Building description	Potential bat hibernation/ roosting features & evidence of bats	Results of activity surveys
B18- Long supporting wall 	East-facing wall with earth banked up to western side. Stonework interstices mostly quite shallow with a few larger 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

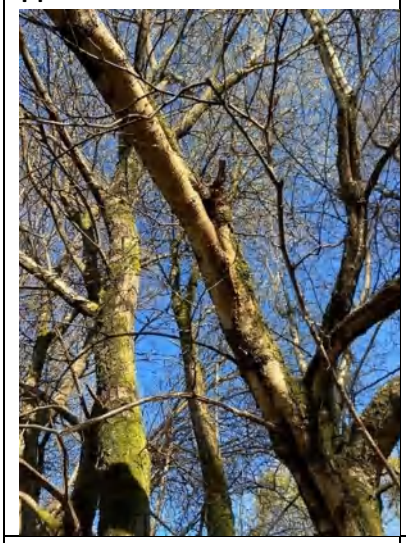
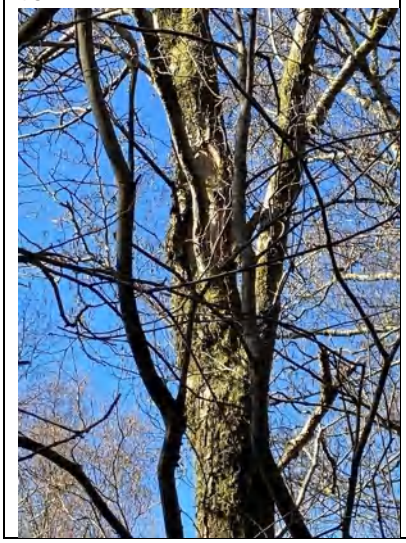
Building/Structure Reference Nº & Photographs	Building description	Potential bat hibernation/ roosting features & evidence of bats	Results of activity surveys
B21- Low stone culvert 	Long and low brick-lined tunnel with low height above silted floor. Too restricted to access. Any gaps likely to be rodent-vulnerable.	Low bat hibernation/roost potential. Structure inspection (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. Structure inspection (DATE): DW to confirm Structure inspection (25th February 2020): No evidence of bats found. Not surveyed in 2021.	Not surveyed

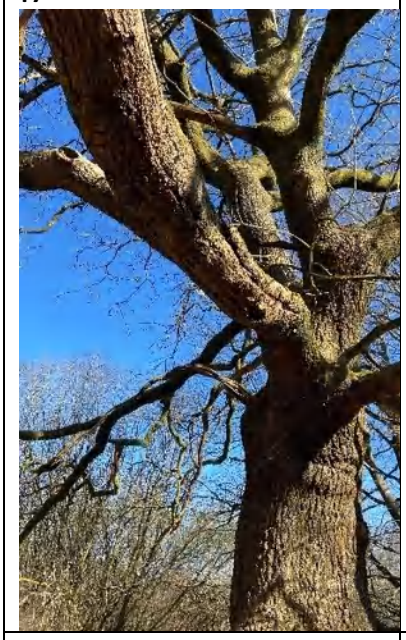
Appendix 2

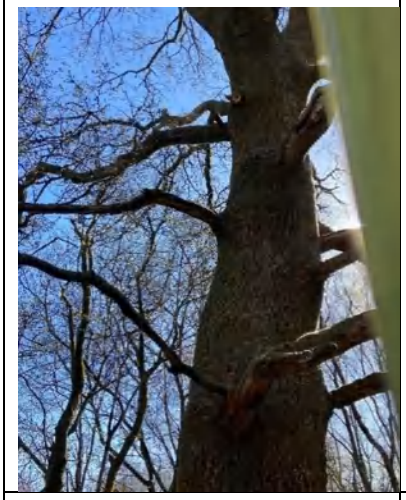
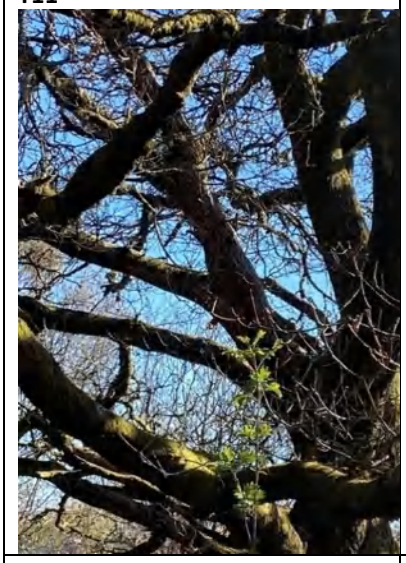
Preliminary tree roost assessment survey results and details of confirmed tree roost

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

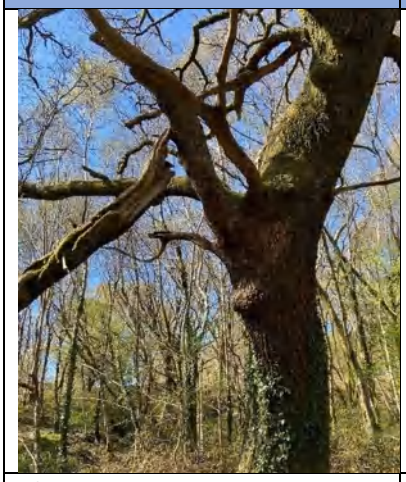
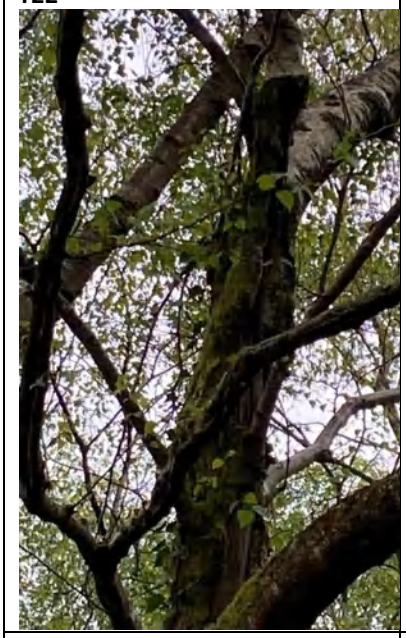
Tree reference number & photo	Description	Potential Roosting Features	Roosting potential
T4 	Multi-stemmed silver birch not far from southern edge of woodland.	Broken branch and adjoining crack in bark on S aspect at ~ 2.5m. Not possible to assess how deep it is from the ground.	Low-Moderate
T5 	Large 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

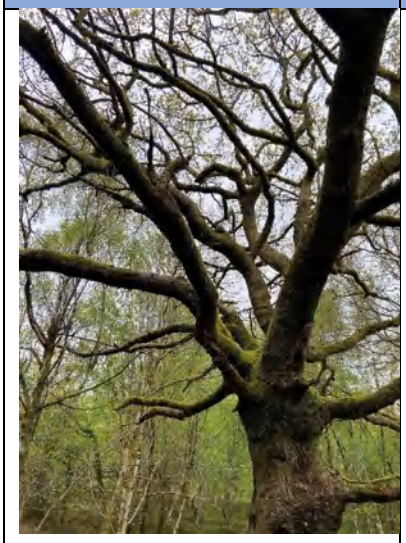
Tree reference number & photo	Description	Potential Roosting Features	Roosting potential
T7 	A large oak, largest of a group of 3 huge and sprawling trees. The branches on this oak are so long they touch the ground.	2No. large splits on N aspect of 2 branches on W aspect of the tree at ~ 2.5m. Loose 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

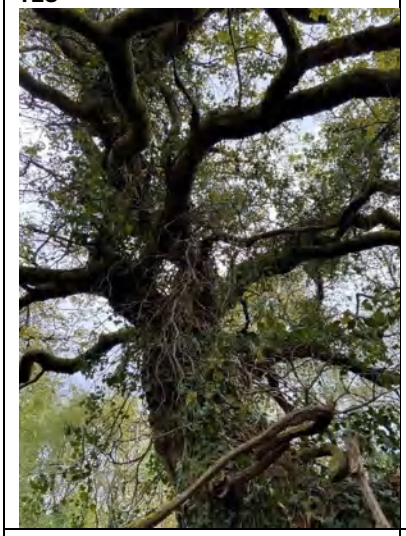
Tree reference number & photo	Description	Potential Roosting Features	Roosting potential
T10 	Large oak.	Crack at base of branch on W side at ~2-3m. Loose bark on SE branch.	Low-Moderate
T11 	Huge oak with branches drooping close to the ground, surrounded by dense bracken & bramble, near the edge of 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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APPENDIX 12

Cwm Glo a Glyndyrys, Merthyr Tydfil

Species Survey Report:

Reptiles

February 2022

COMMISSIONED BY
Marvel Ltd

Written by: *Christina Derrick*

Approved by: *Dominic Woodfield*

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

January 2022

Bioscan Report No.
E1835-REPT-R1

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CONTENTS

1 INTRODUCTION 3

1.1 Background 3

2 METHODOLOGY 4

2.1 Desk Study and Background Data 4

2.2 Reptile Survey 4

3 RESULTS 6

3.1 Desk Study and Background Data 6

3.2 Reptile Survey Results 6

4 DISCUSSION & CONCLUSIONS 10

4.1 Status of Reptile Populations 10

FIGURES

Figure 1. Reptile Survey Results 2021

1 INTRODUCTION

1.1 Background

1.1.1 This report sets out the results of reptile surveys carried out during 2021 by Bioscan on the Marvel Ltd landholding at Cwm Glo a Glyndyrys, Rhyd-y-car West, Merthyr Tydfil.

1.1.2 The surveys form a component of a broader suite of ecological and other surveys carried out at the site during the course of 2015, 2016, 2018 and 2021, to inform the design and ultimately assessment of proposals to redevelop parts of the site.

1.1.3 The purpose of the surveys has been to establish the current distribution and relative abundance of reptile species across the application site and in adjoining and likely affected areas to an extent sufficient to inform masterplanning and subsequent impact assessments and planning determination, with reference to applicable industry standards.

2 METHODOLOGY

2.1 Desk Study and Background Data

2.1.1 Initially a desk-based exercise was undertaken involving review of previous Environmental Statements and other reports where available. In addition, a data request was submitted to South East Wales Biodiversity Records Centre (SEWBReC) for records of protected and/or notable species within 5km from the centre of the application site on 17th May 2021.

2.1.2 The main source of data preceding Bioscan's involvement in the site from 2015 was the following:

- **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 Reptile Survey

2.2.1 The methodology used was based on current best practice guidance[1] and involved the distribution of 169 artificial reptile refugia (1m x 0.5m bitumen or roofing felt sheets) in four areas of the site which were assessed to be of elevated suitability to support reptiles. These suitable areas comprised coarse grassland, south and east-facing slopes and 'edge' habitats (e.g. the interface of grassland with scrub).

2.2.2 In total, the surveyed locations comprised an area of around 9.7 hectares of potentially suitable reptile habitat (to varying degrees of quality) (N.B. ~3.6 hectares of this survey area are outside the application site redline, but were included in the survey as they comprise contiguous habitat). This equates to approximately 17 refugia per hectare of suitable habitat, measured as a site-wide average (which significantly exceeds the standard recommended densities of between 5 and 10 refugia per hectare[2]). **Figure 1** shows the location of these reptile refugia within the site, and the survey areas. The remaining parts of the application site were assessed to have lower suitability to support reptile populations, with much of the site being heavily overshaded by trees.

2.2.3 The refugia were positioned on 18th August 2021 and were left for a period of 13 days to bed-in prior to the first survey visit. Subsequently, the refugia were checked on seven occasions spread between 31st August and 29th September 2021. On each visit the surveyors checked not only the artificial refugia but also any natural refugia found within the site, and any reptiles found were identified to species level and sexed where possible. Wherever possible the surveys were conducted during suitable conditions for reptiles in

1 Froglife (1999). Reptile survey: an introduction to planning, conducting and interpreting surveys for snake and lizard conservation. Froglife Advice Sheet 10. Froglife, Halesworth.

2 Froglife (1999). *Reptile survey: an introduction to planning, conducting and interpreting surveys for snake and lizard conservation.* Froglife Advice Sheet 10. Froglife, Halesworth. Pg. 4.

accordance with standard guidelines[3], i.e., on sunny (or intermittently sunny) days with a temperature of between 9˚C and 18˚C, and without heavy rain, though the surveys were also deliberately carried out through a range of conditions and times of day to give the greatest possible chance of detecting reptiles. **Table 1** details the prevailing survey conditions.

Table 1. Reptile survey timings and weather conditions

Visit	Date	Time		Temperature °C		Cloud Cover	Wind (Beaufort)	Weather description
		Start	Finish	Start	Finish			
1	31/08/2021	09:10	11:45	12	14	100%	1	Overcast, but warm
2	15/09/2021	15:40	17:40	19	20	30%	0-1	Intermittent sun
3	16/09/2021	10:00	11:15	15	18	60%	1	Overcast then sunny. Warm and humid
4	17/09/2021	07:51	14:31[4]	15	17/18	0%	1	Sunny and increasingly warm, early mist which cleared
5	20/09/2021	10:50	12:00	16.5	18	0%	1 -2	Hot and dry
6	27/09/2021	15:00	16:30	13	13	50-80%	2	Intermittent sun and rain showers
7	29/09/2021	13:00	13:45	13.5	14	40%	1	Intermittent sun and cloud.

3 Froglife (1999). *Reptile survey: an introduction to planning, conducting and interpreting surveys for snake and lizard conservation.* Froglife Advice Sheet 10, Froglife, Halesworth. Pg. 3.

4 Reptile survey carried out concurrently with other ecological surveys throughout the day in suitable conditions.

3 RESULTS

3.1 Desk Study and Background Data

3.1.1 **Table 2** below summarises the results of surveys known to have previously been undertaken on the site as well as the results of the data search:

Table 2. Summary of background records

Year	Type	Results
2008	Reclamation Scheme, Land at Rhydycar, Merthyr Tydfil ES	Adder, common lizard and grass snake noted as being present at various locations within the wider study site for this proposal, which includes the current application site as well as the greater landholding to the north and west.
2021	SEWBReC data search	Two records of grass snake within the current application site (both 1994) were returned as well as two additional grass snake records, three common lizard and two slow worm records with 2km of the application site boundary. Records ranged from 1993 to 2017.

3.1.2 Further, incidental records of common lizard, grass snake and slow-worm have been noted on various occasions by Bioscan whilst carrying out other ecological surveys including the current application site (in 2015, 2016 and 2018).

3.1.3 In summary, all three common species of reptile namely grass snake, common lizard and slow worm have been recorded in or near to the current application site. Adder have also been recorded within the wider landholding but it is unclear whether this species has historically been recorded within the current application site.

3.2 Reptile Survey Results

3.2.1 **Table 3** below provides the study site-wide summary of species and their numbers recorded during each survey visit, while **Table 4** details the species recorded in each area (see **Figure 1** for the area extents).

Table 3. Summary reptile survey results

Visit	Date	Species									
		Common Lizard			Slow Worm				Grass Snake		
		Ad	Sa	Jv	M	F	Sa	Jv	Ad	Sa	Jv
1	31/08/2021	20	0	5	0	6	0	0	1	0	0
2	15/09/2021	36	5	5	0	4	0	0	0	0	0
3	16/09/2021	19	10	4	0	3	3	0	0	0	0
4	17/09/2021	13	9	19	0	1	0	5	0	0	0
5	20/09/2021	4	0	0	0	3	0	0	1	0	0
6	27/09/2021	8	0	7	1	0	0	0	0	0	0
7	29/09/2021	1	0	5	0	1	0	0	0	0	0
Peak count for any one survey (excl. Jv)		**41**			**6**				**1**		

Ad = adult, Sa = sub-adult, Jv = juvenile, M = male, F = female

Table 4. Reptile survey results by area[5]

Area A: 70 refugia											
Visit	Date	Species									
		Common Lizard			Slow Worm				Grass Snake		
		Ad	Sa	Jv	M	F	Sa	Jv	Ad	Sa	Jv
1	31/08/2021	12	0	2	0	1	0	0	1	0	0
2	15/09/2021	23	4	3	0	0	0	0	0	0	0
3	16/09/2021	8	9	3	0	0	0	0	0	0	0
4	17/09/2021	5	6	18	0	0	0	0	0	0	0
5	20/09/2021	0	0	0	0	0	0	0	0	0	0
6	27/09/2021	4	0	4	0	0	0	0	0	0	0
7	29/09/2021	0	0	1	0	0	0	0	0	0	0
Peak count for any one survey (excl. Jv)		**27**			**1**				**1**		
Area B: 63 refugia											
Visit	Date	Species									
		Common Lizard			Slow Worm				Grass Snake		
		Ad	Sa	Jv	M	F	Sa	Jv	Ad	Sa	Jv
1	31/08/2021	1	0	0	0	4	0	0	0	0	0
2	15/09/2021	9	1	1	0	3	0	0	0	0	0
3	16/09/2021	7	1	1	0	3	3	0	0	0	0
4	17/09/2021	6	1	0	0	1	0	4	0	0	0
5	20/09/2021	2	0	0	0	3	0	0	1	0	0
6	27/09/2021	4	0	3	1	0	0	0	0	0	0
7	29/09/2021	1		3	1	0	0	0	0	0	0
Peak count for any one survey (excl. Jv)		**10**			**6**				**1**		

5 See Figure 1 for areas

Area C: 10 refugia											
Visit	Date	Species									
		Common Lizard			Slow Worm				Grass Snake		
		Ad	Sa	Jv	M	F	Sa	Jv	Ad	Sa	Jv
1	31/08/2021	0	0	0	0	0	0	0	0	0	0
2	15/09/2021	0	0	0	0	1	0	0	0	0	0
3	16/09/2021	0	0	0	0	0	0	0	0	0	0
4	17/09/2021	1	0	0	0	0	0	1	0	0	0
5	20/09/2021	0	0	0	0	0	0	0	0	0	0
6	27/09/2021	0	0	0	0	0	0	0	0	0	0
7	29/09/2021	0	0	1	0	0	0	0	0	0	0
Peak count for any one survey (excl. Jv)		**1**			**1**				**0**		
Area D: 25 refugia											
Visit	Date	Species									
		Common Lizard			Slow Worm				Grass Snake		
		Ad	Sa	Jv	M	F	Sa	Jv	Ad	Sa	Jv
1	31/08/2021	4	0	1	0	1	0	0	0	0	0
2	15/09/2021	4	0	1	0	0	0	0	0	0	0
3	16/09/2021	4	0	0	0	0	0	0	0	0	0
4	17/09/2021	1	1	0	0	0	0	0	0	0	0
5	20/09/2021	2	0	0	0	0	0	0	0	0	0
6	27/09/2021	0	0	0	0	0	0	0	0	0	0
7	29/09/2021	0	0	0	0	0	0	0	0	0	0
Peak count for any one survey (excl. Jv)		**4**			**1**				**0**		

Ad = adult, Sa = sub-adult, Jv = juvenile, M = male, F = female

3.2.2 Overall, common lizards were by far the most commonly recorded reptile species with a site-wide peak count (excluding juveniles) of 41. Site-wide peak counts of six slow-worms, and one grass snake were also recorded during the course of the survey. In addition, juveniles of common lizard and slow worm were also recorded throughout which confirms breeding within the site.

3.2.3 All three species and the greatest number of reptiles, in particular common lizard (peak adult count of 27) were found in area A, an area of coarse grassland surrounded by dense bracken and woodland edge, that dominates the hillside in the far north-west of the site. All three species were also found in area B which comprises interconnected areas of variably sized open hillside in the centre of the site. It is heavily grazed, and eroded by

motorbike trails, in some parts but bordered with areas of denser grassland transitioning into scrub, heath and/or woodland edge. The greatest numbers of slow worms were found in area B with a peak count of 6.

3.2.4 Fewer species and numbers of reptiles were found in (the smaller) areas C and D. With peak counts of one slow worm and common lizard in area C, which is a small patch of grassland in the far north-east of the site bordered by a narrow band of trees with the A470 and a tarmac path directly to east, west and south. Common lizard and slow worm were also present in area D (peak counts of 4 and 1 respectively), an area of variably dense grassland in the south-east corner of the current application site. Patches of gorse scrub are present within the area which is bordered by woodland and separated by a footpath.

3.2.5 No adders were recorded during the course of the survey.

4 DISCUSSION & CONCLUSIONS

4.1 Status of Reptile Populations

4.1.1 Taken as a whole the current application site is assessed to support an 'exceptional'[6,7] population of common lizard (predominantly within area A) and 'low' populations of slow worm and grass snake, based on site-wide[8] peak counts of forty-one, six, and one respectively. Juveniles of common lizard and slow worm indicate that the site is used for breeding. No adders were recorded on the application site during the survey, despite there being records of this species within the wider area. Given the abundance of suitable (and often contiguous) reptile habitat in the immediate vicinity of the application site boundary it is highly likely that the reptile population present within the site is part of a wider population within the greater landscape.

4.1.2 Common reptile species are subject to partial protection under the Wildlife & Countryside Act 1981 (as amended), and are Species of Principal Importance under Section 7 of the Environment (Wales) Act 2016.

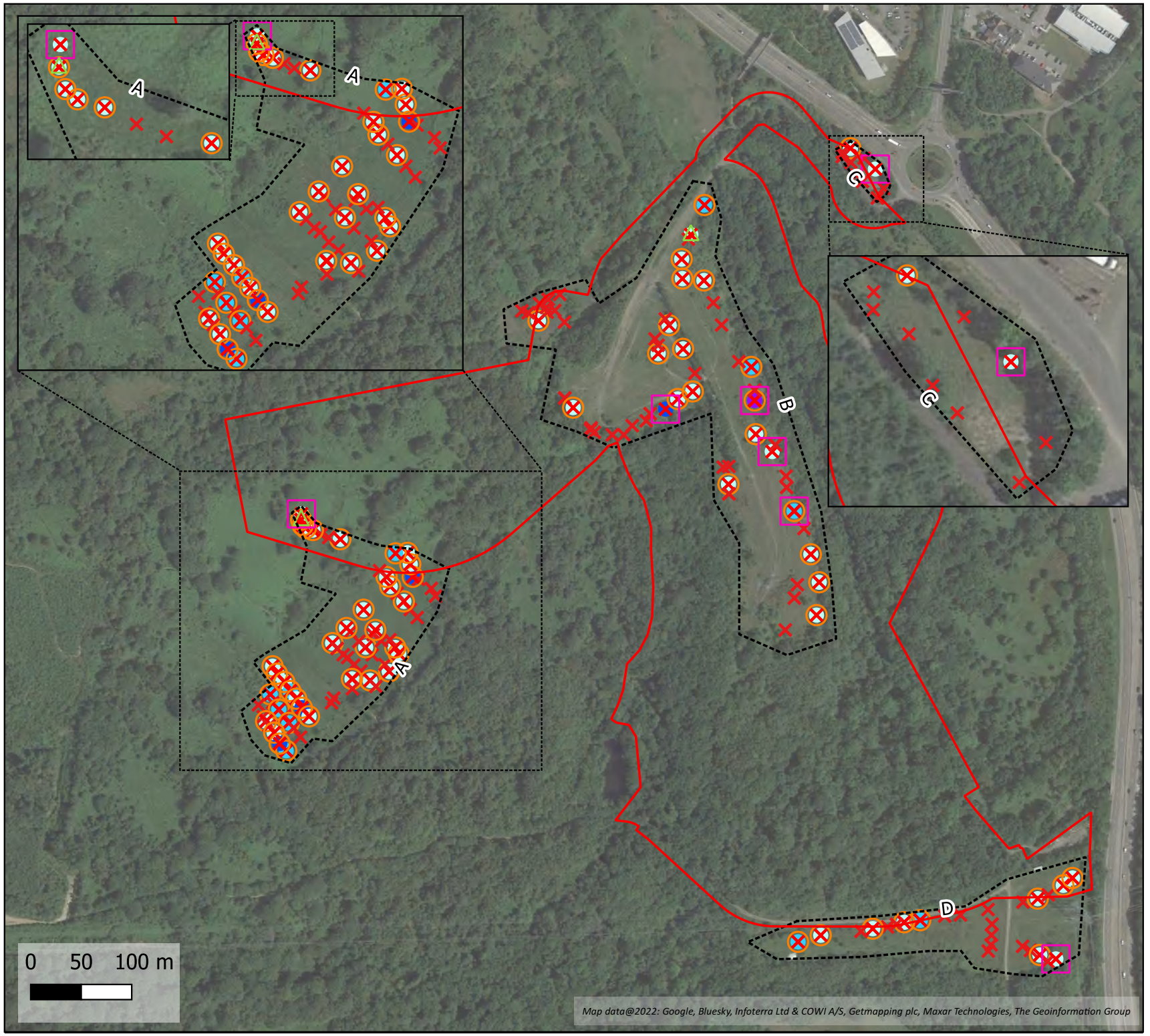
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6 Froglife (1999). *Reptile survey: an introduction to planning, conducting and interpreting surveys for snake and lizard conservation.* Froglife Advice Sheet 10. Froglife, Halesworth.

7 Population size class estimates were calculated by adjusting peak adult counts to reflect expected peak counts at a refugia density of 10ha-1. This was to allow comparison between observed peak counts and threshold peak counts quoted in the guidance table on pg. 9 of Froglife (1999). As an example, the population size class estimate for common lizard was calculated as follows; peak count =41, density of refugia = 17ha-1, peak count adjusted for a density of 10ha-1 = 41/17x10 = 24 individuals. The threshold peak count for an 'exceptional' population of common lizard is >20 individuals.

8 Although areas A-D have been differentiated in the above text with a breakdown of peak counts provided for each species, this is mainly to provide context for potential development impacts at a sub-site level rather than demarcating distinct populations per say. While areas A-D consisted of higher quality habitat particularly suited to a reptile refugia survey, the habitat surrounding these areas would not necessarily preclude migration of reptiles (though in some cases it may inhibit it). As such site-wide peak counts were used to calculate population size class so as not to draw artificial population boundaries.

Figure 1
Reptile survey results 2021



Key

- Application site
- Reptile refugia
- Common lizard
- Slow worm
- Grass snake

Total number of reptiles found under refugia across 7 surveys

- 1 - 2
- 3 - 4
- 5 - 6
- 15

Approximate extent of areas surveyed *

** Approximate extents of areas surveyed extended beyond the current application site boundaries in some cases due to the presence of contiguous suitable habitat.*

Title

Reptile survey results 2021

Project	Client
Cwm Glo	Marvel Ltd.

Drawing No.	Revision	Project No.
Figure 1	-	E1835

Drawn	Checked	Date
CD	DW	January 2022

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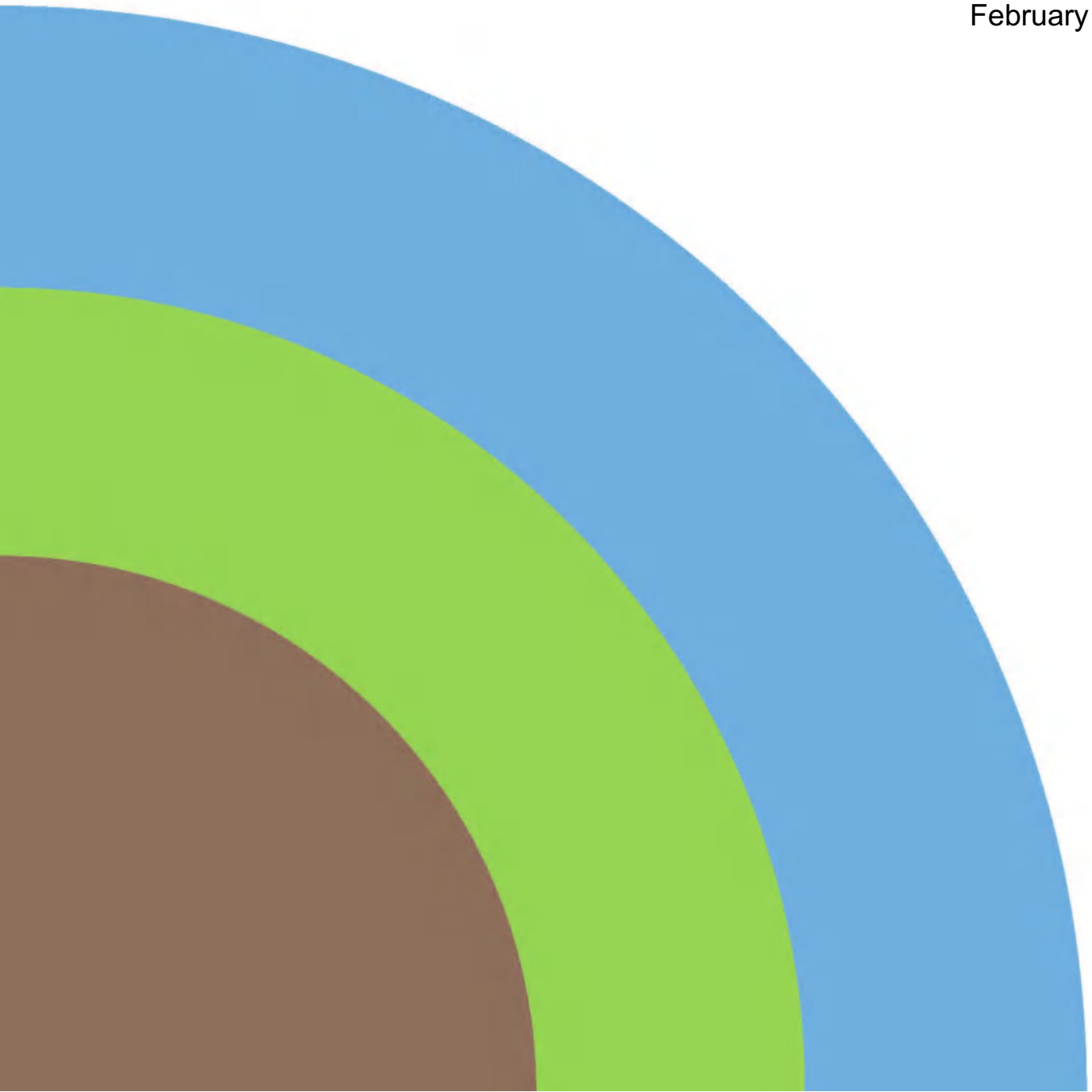
APPENDIX 13

Cwm Glo a Glyndyrys, Merthyr Tydfil

Species Survey Report:

Mammals (excluding bats)

February 2022



COMMISSIONED BY
Marvel Ltd

Written by: *Christina Derrick*

Approved by: *Dominic Woodfield*

Cwm Glo a Glyndyrys, Merthyr Tydfil
Species Survey Report: Mammals (excluding bats)

This report contains sensitive information on the location of badger setts. This information should be kept confidential, and/or redacted before publishing this report within a public forum.

January 2022
Bioscan Report No.
E1835-MAMM-R1

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CONTENTS

1 INTRODUCTION 3

1.1 Background 3

2 METHODOLOGY 4

2.1 Desk study and background data 4

2.2 Dormouse survey 4

2.3 Badger surveys 5

2.4 Water vole and otter surveys 6

2.5 Other species 6

3 RESULTS 7

3.1 Desk Study and background data 7

3.2 Dormouse Survey Results 8

3.3 Badger Survey Results 8

3.4 Water Vole and Otter Survey Results 9

3.5 Other species 9

4 CONCLUSIONS 10

4.1 Dormouse 10

4.2 Badger 10

4.3 Water Vole and Otter 10

4.4 Other species 10

FIGURES

Figure 1. Mammal Survey Results 2015-2021

1 INTRODUCTION

1.1 Background

1.1.1 This report sets out the results of surveys for mammals (excluding bats, and specifically including dormouse, badger, otter and water vole), carried out during 2021 by Bioscan on the Marvel Ltd landholding at Cwm Glo a Glyndyrys, Rhyd-y-car West, Merthyr Tydfil.

1.1.2 The surveys form a component of a broader suite of ecological and other surveys carried out at the site during the course of 2015, 2016, 2018 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 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 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 included as supplementary information.

1.1.4 The purpose of the surveys has been to establish the likely presence and/or current distribution of protected mammal species (dormouse, badger, water vole and otter) across the site to an extent sufficient to inform masterplanning and subsequent impact assessments and planning determination, with reference to applicable industry standards.

2 METHODOLOGY

2.1 Desk study and background data

2.1.1 Initially a desk-based exercise was undertaken involving review of previous Environmental Statements and other reports where available. In addition, data requests were submitted to South East Wales Biodiversity Records Centre (SEWBReC) for records of protected and/or notable species within 5km from the centre of the application site on 17th May 2021.

2.1.2 The main source of data preceding Bioscan's involvement in the site from 2015 was the following:

- **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 Dormouse survey

2.2.1 Two dormouse survey campaigns have been carried out since Bioscan's commission in 2015. The first was in 2015, and a repeat survey was conducted in 2021. The scope and methodology for these surveys was based on the guidelines set out in the Dormouse Conservation Handbook[1], and adapted at times to suit site specific conditions (see below). All dormouse surveys were conducted by Geoff Moxon under Natural Resources Wales licence No. S087813/1.

2015 Survey

2.2.2 Given the large survey area during 2015, and its health and safety constraints, it was not deemed feasible to place dormouse tubes at a density of one tube per 20m throughout the site's woodlands. Instead, dormouse tubes were sited to target and sample those areas of habitat assessed to have the greatest potential suitability for occupation by dormice. These mostly comprised areas of broadleaved woodland, though in places also incorporated scrub interface and tree lines. The dormouse tubes were spread throughout all the main suitable areas of habitat in order to give a wide coverage. Within the majority of the key areas targeted by the survey, and wherever possible, dormouse tubes were installed at an approximate density of one tube per 20m.

2.2.3 **Figure 1** shows the location of the eleven lines of dormouse tubes installed during the 2015 survey period (labelled A-K). With the exception of line F (9 dormouse tubes), each of the lines comprised between 18 and 30 dormouse tubes. Initially 144 tubes were installed on 6-8 May 2015 (lines A-F) to get the survey underway. As familiarity with the site increased, a further 39 dormouse tubes were installed on 13-14 May 2015 (lines G & H), together with

1 Bright, Morris & Mitchell Jones (2006). *Dormouse Conservation Handbook, 2nd edn.* English Nature Publications.

40 more dormouse tubes on 21-22 May 2015 (lines I & J) and 21 more dormouse tubes on 28 May 2015 (line K). Thus, in total, 244 dormouse tubes were deployed in 2015.

2.2.4 The dormouse tubes were checked at intervals of 1-2 months, with the specific dates being 28 May 2015, 15-16 July 2015, 10 September 2015, 1 October 2015 and 2-3 December 2015, with the tubes removed on cessation of the final survey.

2021 Survey

2.2.5 Following several refinements of the proposed development boundary, surveys in this year were concentrated in the south east corner of the wider landholding encompassing the putative application site (**Figure 1**). As in 2015, dormouse tubes were preferentially situated in habitat judged to be of the greatest suitability for dormouse, and wherever possible they were installed at an approximate density of one tube per 20m.

2.2.6 **Figure 1** shows the location of the dormouse tubes installed during the 2021 survey period. Initially 137 tubes were deployed on 10 and 11 May 2021, with an additional 56 tubes and two nest boxes subsequently installed on 30 June 2021. Thus, in total, 183 dormouse tubes and two nest boxes were deployed in 2021. They were checked at an interval of 1-2 months on 6 June 2021, 31 August 2021, 29 September 2021 and 10 December 2021, with the tubes and boxes removed on cessation of the final survey.

Limitations

2.2.7 The 2015 survey campaign was subject to significant disturbance to the dormouse tubes, with 20 dormouse tubes noted to be missing on 28 May 2015 (mostly along line B[2]). A further 60 dormouse tubes were noted to be missing on 15-16 July 2015, with the worst hit areas being lines B & E (along which the majority of dormouse tubes had been removed) and lines A & D (along which approximately half of the dormouse tubes had been removed). For dormouse welfare reasons, the decision was made not to replace dormouse tubes in areas in which it became apparent there were high levels of disturbance. Nonetheless, the survey was completed with a total of 164 dormouse tubes remaining in place.

2.2.8 In 2021 levels of disturbance were considerably lower. 11 dormouse tubes were noted to be missing during the course of the survey, 4 of which were replaced and 7 of which were not replaced so as not to risk additional impacts to tubes in more exposed areas. As such the survey was completed with a total of 176 dormouse tubes and 2 dormouse boxes.

2.3 Badger surveys

2.3.1 Given the scale and complexity of habitats present, definitively comprehensive surveys of the entirety of the landholding, including the application site, have not been possible. Instead, special focus has been given to areas of the application site which would be affected directly by the proposed development. The area affected by the proposed ski

2 With reference to Figure 1

slope was specifically searched for evidence of badger, including setts, latrines and 'push-throughs', in April 2021, while the rest of the site was covered concurrent with other ecological surveys during the course of 2021.

2.4 Water vole and otter surveys

2.4.1 A walkover of streams and other watercourses known to run through or near the application site was conducted on 9th September 2021 to search for evidence of water vole and/or otter (see **Figure 1** for locations). The survey was conducted by Dominic Woodfield, of Bioscan, and involved searches for evidence of water vole droppings, feeding remains and holes, and otter spraints and footprints, particularly under tunnels and on features projecting into the stream (e.g., tree stumps). Previous surveys of stream courses for these species were conducted ancillary to habitat and botanical surveys in 2015 and 2016 and no evidence of either was found.

2.5 Other species

2.5.1 Any incidental observations of other mammal fauna noted during the various survey visits was also recorded.

3 RESULTS

3.1 Desk Study and background data

3.1.1 **Table 1** below summarises the results of surveys known to have previously been undertaken on the site as well as the results of the data search:

Table 1. Summary of background records

Year	Type	Results
2008	Reclamation Scheme, Land at Rhydycar, Merthyr Tydfil ES	• A single entrance badger sett was noted to have been present in the south west of the Reclamation Scheme Application site (coterminous with the wider landholding boundary) in 1997. However, further surveys failed to find evidence of badgers within the application site and the sett was assumed to be inactive. • No other protected or priority mammal species (excluding bats) were recorded during surveys.
2021	SEWBReC data search	No records of protected or priority mammal species were provided within the application site boundary, however the following species were recorded within a 2km search radius of the application site: • Water vole: 3No. records between 2002 and 2007. One is from a sighting c. 1.6km north of the application site near Nant Rhyd-y-car. While the other two records relate to surveys conducted by David Clements Ecology in 2005 and 2007 as part of the Rhydycar West and Cwm Glo SINCs assessments, where water vole were recorded near the Nant Llwynyreos (c. 1km north of the application site), and near another stream course that runs parallel to the western boundary of the application site (c. 20m west of the application site). However, the SINC assessment reports[3,4] themselves detail that no evidence of water vole was found during surveys conducted at the time. Instead, they were assumed to be potentially still present on the basis of historic records. • Otter: 20No. records between 1992 and 2010, most of which relate to the river Taff. The closest record is c.173m east of the application site. • Badger: 5No. records between 1972 and 2018 within Cwm Glo and Rhyd-y-car West SINCs. The closest of which is c. 350m south of the application site. • Polecat: 3No. records between 1997 and 2017. Two records (2008 and 2017) are from photographed individuals located c.1km and 1.6km south of the application site in/near the river Taff and woodland surrounding Abercanaid. The third is a field record c.80m from the south eastern corner of the application site, in woodland to the east of the A470. • Hedgehog: 14No. records between 2005 and 2020. Most of these relate to dead animals recorded along the A470 or residential areas to the north east of the application site, the closest of which being c. 80m north east of the application site. • Brown hare: 7No. records between 1973 and 2008, located to the south and west of the application site within Cwm Glo and Rhy-y-

3 **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.

4 **David Clements Ecology Ltd (2006**). Merthyr Tydfil County Borough Sites of Importance for Nature Conservation (SO 00SW/2: Rhydycar West) Survey & Assessment for SINC Designation.

Year	Type	Results
		car West SINCs. The closest of which is c. 0.6km south west of the application site.

3.1.2 No records of dormouse were noted within a 2km search radius of the application site from background record sources or SEWBReC.

3.2 Dormouse Survey Results

3.2.1 No dormice, or evidence of dormouse, were found within the application site or wider landholding during surveys conducted in 2015 and 2021. **Table 2** below provides the details of each survey visit conducted.

Table 2. Summary dormouse survey results

Date	No. of Dormouse Nests	Dormice Observed in Nest?	Other/Notes
6/7/8/13/14/21/22/28 May 2015	N/A	N/A	Tubes out (244). 144 tubes out on 6/7/8 May, so survey underway. 39 more tubes on 13/14 May. 40 more tubes on 21/22 May. 21 more tubes on 28 May.
28 May 2015	0	0	C 20 tubes destroyed, mostly in SE part of the site (especially area B).
15-16 July 2015	0	0	Total 80 tubes gone. Worst hit areas B and D (most tubes gone), then A and D (approx half tubes gone).
10 September 2015	0	0	No significant further loss of dormouse tubes noted.
1 October 2015	0	0	-
2-3 December 2015	0	0	Tubes in.
10-11 May 2021	N/A	N/A	Tubes out (137)
30 June 2021	0	0	Survey, & extra tubes out (+ 56 tubes + 2 boxes).
31 August 2021	0	0	-
29 September 2021	0	0	-
10 December 2021	0	0	Tubes in.
Total	**0**	**0**	

3.3 Badger Survey Results

3.3.1 Evidence of badger have been found in several areas in the vicinity of the application site, including latrines, tracks, snuffle holes and a sett. **Table 3** summarises the results below, while **Figure 1** shows their approximate locations.

Table 3. Badger survey results

Year	Type	Comments
2015	Latrine	A single latrine noted in woodland at the north western corner of the application site.
2016	Latrine snuffle hole, and tracks	A single latrine, snuffle hole and badger tracks noted in locations within woodland/woodland edge c.95-110m west of the application site.
2021	Sett, and tracks	Badger tracks c. 160m and 180m noted in woodland west of the application site. Two-entrance sett noted c. 400m west of the application site. The sett showed evidence of likely being active, as a trail of bedding/dead grass was noted leading into the sett from the surrounding grassland/bank.

3.4 Water Vole and Otter Survey Results

3.4.1 **Figure 1** shows the streams and watercourses searched; no evidence of either species was recorded during the 2021 survey, or during any previous surveys dating back to 2015.

3.5 Other species

3.5.1 A single polecat was observed c.50m east of the application site during bat surveys in 2015 in woodland contiguous with the application site. See **Figure 1** for the location. Roe deer, grey squirrel, hedgehog, brown hare, rabbit, red fox, common shrew, bank vole, field vole and woodmouse have all been recorded incidentally to other surveys.

4 CONCLUSIONS

4.1 Dormouse

4.1.1 Despite the ostensibly suitable nature of the woodland and scrub habitats within the site, no evidence of dormice was noted during the course of either of the surveys conducted in 2015 and 2021. Additionally, no records were found within 2km of the application site from data provided by SEWBReC. The survey effort expended and the balance of local evidence suggests it is unlikely that this species is present within the application site.

4.2 Badger

4.2.1 A single sett was found approximately 400m west of the application site in 2015 and it remains present and occupied in 2021. Badgers are also known to be present in the wider landscape from SEWBReC data records. As such, while no setts have been identified within the current application site, it remains possible some may be present in densely vegetated areas of the site that could not be comprehensively searched e.g. the east-facing slopes of the former Glyndyrys Pit tips). It can be assumed that badgers actively forage and commute within the current application site as part of a wider home range as evidence of this has been found in habitat that is contiguous with the application site.

4.2.2 Badgers receive specific protection under the Protection of Badgers Act 1992.

4.3 Water Vole and Otter

4.3.1 Otter are known to be present along the River Taff which is c.0.5km east of the application site and connected to the wider landscape around the application site by a few streams. In addition, water vole has been historically recorded in the area too. However, no surveys conducted within the application site or wider landholding, by Bioscan or other consultancies, have confirmed either species as present within the application site.

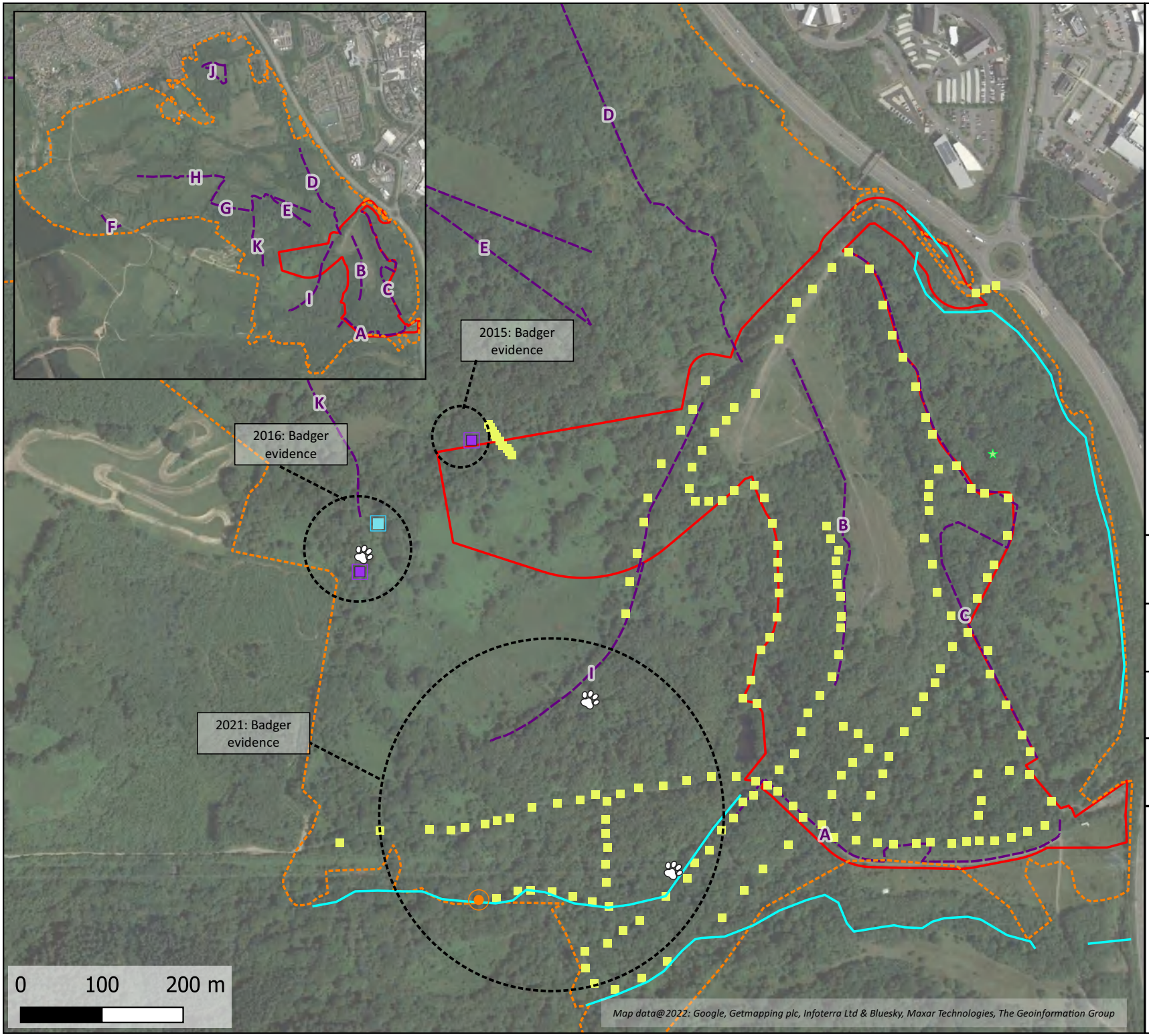
4.3.2 As such, while otter and (to a lesser extent) water vole may be present in the wider landscape and could potentially make occasional use of waterways within the application site, it is considered unlikely that they dwell within, or make extensive use of, any waterways within the application site.

4.4 Other species

4.4.1 Polecat was confirmed close to the application site and the species is probably resident in the locality and potentially within the application site.

4.4.2 Polecats are a Species of Principal Importance under Section 7 of the Environment Act (Wales) 2016.

Figure 1:
Mammal survey results 2015-2021



Key

- Application site
- 2015 survey area
- Dormouse tube location (2021)
- Dormouse tube locations and reference numbers (2015)
- Badger footprint
- Badger sett
- Latrine
- Snuffle holes
- Location of polecat sighting
- Water courses searched for otter and water vole in 2021

Title
Mammal (ex. bats) survey results 2015-2021

Project	Client
Cwm Glo	Marvel Ltd

Drawing No.	Revision	Project No.
Figure 1		E1835

Drawn	Checked	Date
CD	DW	January 2022

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APPENDIX 14

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

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	n	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 and 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**

Tree ref	PRF ID	Inspection result	Bat species	Roost usage: only one species (o1s), more than one species but on different days (m1dd), more than one species on same day (m1sd)	Site name	County	Day	Month	Year	Season	Grid reference	Species	Alive/dead	Phase 1 habitat	Phase 1 code	Stem/limb	Tree height (m)	PRF height (m)	Facing	Form	Enlarged	DBH (cm)	DPH (cm)	PRF has more than one entrance to the same void	Entrance height (cm)	Entrance width (cm)	Internal height (cm)	Internal width (cm)	Internal depth (cm)
CG1	CG1	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0468705071	*Corylus avellana*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	11	5	N	transverse-snap	N/A	31	24.6	N/A	N/A	N/A	N/A	N/A	N/A
CG2	CG2a	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0466905039	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	9	4.21	NE	transverse-snap	N/A	67	18.6	N/A	N/A	N/A	N/A	N/A	N/A
CG2	CG2b	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0466905039	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	9	4.54	SSE	shearing-crack	n	67	20	n	28	1.2	0	4	0
CG3	CG3	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0466905029	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	7	5.39	SE	wound	n	60	18.3	n	7	3	19	2	0
CG4	CG4	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0467105018	*Fraxinus excelsior*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	12	1.2	E	butt-rot	n	98.5	98.5	n	15	5	21	5	0
CG5	CG5	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0469405030	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	9	3.5	SW	knot-hole	N/A	46.5	35.4	N/A	N/A	N/A	N/A	N/A	N/A
CG6	CG6	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0472104994	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	7	4	NW	wounds	N/A	16	11	N/A	N/A	N/A	N/A	N/A	N/A
CG7	CG7a	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0474004972	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	10	5	ENE	tear-out	N/A	41	39.2	N/A	N/A	N/A	N/A	N/A	N/A
CG7	CG7b	impossible to access safely	N/A	N/A	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0474004972	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	9	8	N	wound	n	41	?	?	?	?	?	?	?
CG7	CG7c	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0474004972	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	10	4.44	W & N	wound	n	30	24.5	y	6 & 30	2 & 4	46	7	10
CG8	CG8	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0472004944	*Betula pubescens*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	6	3	NE	transverse-snap	n	16.6	N/A	n	N/A	N/A	N/A	N/A	N/A
CG9	CG9	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0469004960	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	13	4	W	transverse-snap	n	99	26.4	N/A	N/A	N/A	N/A	N/A	N/A
CG10	CG10	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0471704922	*Fraxinus excelsior*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	13	8	NE	wound	N/A	47	34.2	N/A	N/A	N/A	N/A	N/A	N/A
CG11	CG11	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0474604919	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	13	8	S	wound	n	63	20.3	n	10	4	12	6	0
CG12	CG12	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0473604914	*Alnus glutinosa*	dead	Broadleaved semi-natural woodland	A1.1.1	stem	5	1.2	N	bark-plates	n	23.5	23.5	N/A	N/A	N/A	N/A	N/A	N/A
CG13	CG13a	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0475004832	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	9	2	S	weld	n	28	21.5	n	10	3	10	3	0
CG13	CG13b	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0475004832	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	9	1.4	S	weld	n	28	28	n	13	7	13	3	0
CG14	CG14	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0482804805	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	9	5	S	wound	n	21.5	16.8	n	N/A	N/A	N/A	N/A	N/A
CG15	CG15	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0481304727	*Salix* sp.	alive	Broadleaved semi-natural woodland	A1.1.1	limb	10	5.92	N & S	hazard-beam	n	122	19.5	y	20	3	16	15	18
CG16	CG16	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0475804672	*Betula pubescens*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	9	1.2	E	knot-hole	n	35	35	n	N/A	N/A	N/A	N/A	N/A
CG17	CG17	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0481204640	*Fraxinus excelsior*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	13	1.2	E & W	compression-fork	n	53	53	n	56	2.3	0	37	3
CG18	CG18a	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	8	11	2022	autumn-flux	SO0484304603	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	15	6.71	W	woodpecker-hole	n	89.5	34.1	n	5	5	10	18	12
CG18	CG18b	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	8	11	2022	autumn-flux	SO0484304603	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	15	6.25	NE	woodpecker-hole	n	89.5	36.4	n	7	6	9	19	22
CG18	CG18c	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	8	11	2022	autumn-flux	SO0484304603	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	15	4.34	N	woodpecker-hole	n	89.5	41.3	n	1.7	1.5	5	15	0
CG18	CG18d	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	8	11	2022	autumn-flux	SO0484304603	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	15	1.13	SSW & W	butt-rot	n	89.5	89.5	y	49	7	99	42	58
CG19	CG19a	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	8	11	2022	autumn-flux	SO0484804575	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	12	6.25	NNW	knot-hole	n	60.2	42.6	n	33	13	102	40	47
CG19	CG19b	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	8	11	2022	autumn-flux	SO0484804575	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	12	4	WSW	woodpecker-hole	y	60.2	46.3	y	N/A	N/A	N/A	N/A	N/A
CG20	CG20	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	8	11	2022	autumn-flux	SO0484604556	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	12	5.1	N & S	hazard-beam	n	75.9	31.2	y	4	74	20	15	32
CG21	CG21	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	8	11	2022	autumn-flux	SO0484504545	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	13	5.8	NNW	tear-out	n	110.9	37.3	n	6	2	8	9	9
CG22	CG22	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	8	11	2022	autumn-flux	SO0486804548	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	13	4.87	NNW	knot-hole	n	87.5	74.6	n	N/A	N/A	N/A	N/A	N/A
CG23	CG23	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	8	11	2022	autumn-flux				Broadleaved semi-natural woodland	A1.1.1	limb	11	3.15	ENE	transverse-snap	n	91.9	26.8	n	N/A	N/A	N/A	N/A	N/A
CG24	CG24	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0486704498	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	8	5.1	S & down	transverse-snap	n	27	18.1	n	N/A	N/A	N/A	N/A	N/A
CG25	CG25	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0488204457	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	4	4	up	transverse-snap	n	30	26.8	n	N/A	N/A	N/A	N/A	N/A
CG26	CG26	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	8	11	2022	autumn-flux	SO0483404436	*Fraxinus excelsior*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	14	8.2	ESE	transverse-snap	n	58.7	21	n	N/A	N/A	N/A	N/A	N/A
CG27	CG27a	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0481004413	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	12	9.5	N	knot-hole	n	62.2	31.4	y	6	6	8	20	90
CG28	CG28	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0479704429	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	18	9.2	W	transverse-snap	n	105	26	n	N/A	N/A	N/A	N/A	N/A
CG29	CG29	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0478504428	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	12	4	NE	shearing-crack	n	65.9	17.1	n	N/A	N/A	N/A	N/A	N/A
CG30	CG30a	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	8	11	2022	autumn-flux	SO0477304439	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	13	4.38	W	shearing-crack	n	59.2	43.8	n	1.5	67	0	11	39
CG30	CG30b	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	8	11	2022	autumn-flux	SO0477304439	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	13	2.9-5.1	NNE & SSW & up and down	shearing-crack	n	59.2	53.8	n - multiple individual pockets	multiple	multiple	multiple	multiple	multiple
CG31	CG31	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	8	11	2022	autumn-flux	SO0478004439	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	11	2.16	WNW	knot-hole	n	38.7	40.6	y	9	6	29	28	107
CG32	CG32	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	8	11	2022	autumn-flux	SO0477804438	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	7	2.29	SSW	knot-hole	n	35.2	26.9	n	N/A	N/A	N/A	N/A	N/A
CG33	CG33	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	8	11	2022	autumn-flux	SO0476404443	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	12	6.65	ESE	tear-out	n	53.5	19.7	n	N/A	N/A	N/A	N/A	N/A
CG34	CG34	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	8	11	2022	autumn-flux	SO0476004451	*Fraxinus excelsior*	dead	Broadleaved semi-natural woodland	A1.1.1	stem	11	5.42	SSW	woodpecker-hole	n	74.6	49	n	8	6	?	26	12
CG35	CG35	N/A	N/A	N/A	Cwm Glo	Merthyr Tydfil	8	11	2022	autumn-flux	SO0468204436	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	9	2.23	up	wound	n	85.5	63.8	n	N/A	N/A	N/A	N/A	N/A
CG36	CG36	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0424004482	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	13	5.28	NE	bark-plates	n	75.5	22	n	N/A	N/A	N/A	N/A	N/A
CG37	CG37	impossible to access safely	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0480604552	*Fraxinus excelsior*	dead	Broadleaved semi-natural woodland	A1.1.1	stem	14	multiple	multiple	bark-plates	n	?	?	?	?	?	?	?	?
CG38	CG38	impossible to access safely	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0479404568	*Fraxinus excelsior*	dead	Broadleaved semi-natural woodland	A1.1.1	stem	10	multiple	multiple	bark-plates	n	?	?	?	?	?	?	?	?
CG39	CG39	impossible to access safely	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0478704574	*Fraxinus excelsior*	dead	Broadleaved semi-natural woodland	A1.1.1	stem	10	multiple	multiple	wounds	n	?	?	?	?	?	?	?	?
CG40	CG40	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0476204572	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	9	3.38	S	knot-hole	n	49.8	32.9	n	N/A	N/A	N/A	N/A	N/A
CG41	CG41	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	8	11	2022	autumn-flux	SO0473904554	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	3	1.7	S	bark-plates	n	29.8	31.6	n	52	1.5	0	14	0
CG42	CG42	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0471304540	*Fraxinus excelsior*	dead	Broadleaved semi-natural woodland	A1.1.1	stem	6	4.77	S	knot-hole	n	65.2	34.1	n	N/A	N/A	N/A	N/A	N/A
CG43	CG43	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	8	11	2022	autumn-flux	SO0464604486	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	8	2.17	S	wound	n	28.7	21.3	n	32	6	> 200	12	98
CG44	CG44	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	8	11	2022	autumn-flux	SO0464504478	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	10	6	S	wound & knot-hole	n	?	?	y	?	?	?	?	?
CG45	CG45	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0445604371	*Betula pubescens*	dead	Broadleaved semi-natural woodland	A1.1.1	stem	6	1.89-3.69	E	bark-plates	n	33	23.3	n	4	13	33	3-5	0
CG46	CG46	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0447004343	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	4.5	4.32	WNW	transverse-snap	n	16.5	14.4	n	N/A	N/A	N/A	N/A	N/A
CG47	CG47	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0444204353	*Alnus glutinosa*	dead	Broadleaved semi-natural woodland	A1.1.1	stem	6	2.53	WNW	tear-out	n	41.6	27.4	y	6	5	35.5	5	0
CG48	CG48	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0436804303	*Betula pubescens*	dead	Broadleaved semi-natural woodland	A1.1.1	stem	5	2	E	bark-plates	n	33.1	32	n	3	11	29	3	0
CG49	CG49	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0435104469	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	9	3.26	NNE	wound	n	36.6	34.2	n	8	2.5	24	3	0
CG50	CG50	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0458804713	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	9	5.27	W	knot-hole	n	33.5	27.4	n	N/A	N/A	N/A	N/A	N/A
CG51	CG51	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0463104814	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	8	4.4	E	woodpecker-hole	n	45	27.8	n	6	7	28	15	48
CG52	CG52a	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0447904804	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	12	1.81	ESE	lightning-strike	n	101.4	161	n	18	6	57	6	0
CG52	CG52b	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0447904804	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	12	1.81	ESE	lightning-strike	n	101.4	161	n	3	2	64	3	0
CG53	CG53	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0443604829	*Betula pubescens*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	9	2.28	NW	wound	n	15.7	12.4	n	108	4	8	3	0
CG54	CG54	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0438204788	*Quercus robur*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	12	2.28	W	squirrel-hole	n	89	98	n	6.5	7.5	46.5	12	25
CG55	CG55	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0437904805	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	12	1.83	NNW	lightning-strike	n	71.4	56	n	183	10	19	4	0

PRF ID	Smooth	Bobbly	Bumpy	Rough	Clean	Waxy	stained / discoloured	Polished	messy	Dusty	Debris	Sludgy	Dry	Damp	Wet	Dome	Spire	Peak/ wedge	Flat	Chambered	Tube	Competitors visible (y/n)	woodlice	dusky slug	yellow slug	unidntified slug	garden snail	lipped snail	unidentified snail
CG1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG2a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG2b	n	n	y	y	n	n	n	n	y	n	y	y	n	n	y	n	n	y	n	n	n	y	y	n	n	n	n	n	n
CG3	n	n	y	y	y	y	n	n	n	n	n	n	y	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n
CG4	n	n	n	y	n	n	n	n	y	n	y	n	y	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n
CG5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG7a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG7b	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
CG7c	n	n	y	y	y	y	n	n	n	n	n	n	y	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n
CG8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG11	n	n	n	y	y	n	n	n	y	n	y	n	n	y	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n
CG12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG13a	n	n	y	n	y	n	n	n	n	n	n	n	n	y	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n
CG13b	n	n	y	n	y	n	n	n	n	n	n	n	n	y	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n
CG14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG15	n	n	n	y	n	n	n	n	y	y	y	n	y	n	n	n	n	y	n	n	n	y	y	n	n	n	n	n	n
CG16	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG17	n	n	y	y	n	n	n	n	y	n	y	n	n	n	y	n	n	n	n	n	y	y	n	y	n	n	n	n	n
CG18a	y	n	y	y	y	y	n	n	n	n	n	n	n	y	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n
CG18b	y	n	y	y	y	y	n	n	n	n	n	n	n	y	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n
CG18c	y	n	n	n	y	n	n	n	n	n	n	n	n	y	n	n	n	n	y	n	n	y	n	y	n	n	n	n	n
CG18d	y	n	y	n	y	y	y	n	n	n	n	n	y	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n
CG19a	y	n	y	n	y	y	n	n	n	n	n	n	y	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n
CG19b	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG20	y	n	y	n	y	y	y	y	n	n	n	n	y	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n
CG21	y	n	n	n	y	n	n	n	n	n	n	n	n	n	y	n	y	n	n	n	n	n	n	n	n	n	n	n	n
CG22	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG23	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG24	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG27a	y	n	n	n	y	y	n	n	n	n	n	n	y	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n
CG28	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG29	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG30a	y	n	n	n	y	y	y	n	n	n	n	n	y	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n
CG30b	y	n	n	n	y	n	n	n	n	n	n	n	y	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n
CG31	y	n	y	y	y	y	y	n	n	n	n	n	y	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n
CG32	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG33	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG34	y	n	n	n	y	y	n	n	n	n	n	n	y	n	n	?	?	?	?	?	n	y	n	n	n	n	n	n	n
CG35	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG36	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG37	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
CG38	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
CG39	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
CG40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG41	y	n	n	n	y	n	n	n	n	n	n	n	y	n	n	n	n	y	n	n	n	y	n	n	n	n	n	n	n
CG42	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG43	y	n	y	n	y	y	y	n	n	n	n	n	y	n	n	n	y	n	n	y	n	n	n	n	n	n	n	n	n
CG44	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	y	n	n	n	n	n	n	n
CG45	y	n	n	n	y	n	n	n	n	n	n	n	y	y	n	n	n	y	n	n	n	y	n	n	n	n	n	n	n
CG46	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG47	n	n	y	y	n	n	n	n	y	y	y	n	y	n	n	n	n	n	n	n	y	y	n	n	n	n	n	n	n
CG48	y	y	y	y	n	n	n	n	y	n	y	n	y	y	y	n	n	y	n	n	n	y	n	n	n	y	n	n	n
CG49	y	n	y	y	y	y	n	n	y	y	y	n	y	y	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n
CG50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG51	n	n	y	y	n	n	n	n	y	n	y	y	n	n	y	n	y	n	n	y	n	n	n	n	n	n	n	n	n
CG52a	n	n	n	y	y	n	n	n	y	y	n	n	y	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n
CG52b	y	n	n	y	y	y	y	n	n	n	n	n	y	n	n	n	y	n	n	y	n	n	n	n	n	n	n	n	n
CG53	n	y	n	n	y	n	n	n	n	n	n	n	n	y	n	n	y	n	n	n	n	y	y	n	n	n	n	n	n
CG54	y	n	y	n	y	y	y	n	n	n	n	n	y	y	y	n	y	n	n	n	n	y	n	n	n	n	n	n	n
CG55	n	n	y	y	y	n	n	n	n	n	n	n	y	n	n	n	y	n	n	y	n	y	n	n	y	n	n	n	n

PRF ID	cave spider	harvestman	unidentified spider	spider's web	spider egg-sac	flies	harlequin ladybird(s)	bat-fly pupae	wood ants	unidentified ants	wasp(s)	wasp-nest	hornet(s)	hornets-nest	honey bees	tree bumblebee (s)	unidentified bee(s)	beetle(s)	earwig(s)	millipede(s)	centipede(s)	worm(s)	butterfly(s)	moth(s)	toad	blue tit(s)	great tit(s)	wren(s)	nuthatch(es)
CG1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG2a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG2b	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG3	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG4	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG7a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG7b	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
CG7c	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG11	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG13a	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG13b	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG15	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG16	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG17	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG18a	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG18b	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG18c	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG18d	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG19a	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG19b	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG20	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG21	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG22	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG23	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG24	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG26	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG27a	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG28	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG29	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG30a	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG30b	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG31	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG32	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG33	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG34	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG35	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG36	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG37	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
CG38	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
CG39	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
CG40	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG41	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG42	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG43	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG44	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG45	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG46	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG47	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG48	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG49	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CG51	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG52a	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG52b	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG53	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG54	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CG55	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n

eyelash mat	jackson22	green woodpecker tie	great spotted woodpecker (v	turn cold2	bird in zapnap	bird feathers / down	bird nest	grey squirrel-adult	grey squirrel grazing	grey squirrel nest	thermostat / dentist	farmhouse roof	windowsoul / windows	windowsoul dust	Other (x: name present, y: something is present, name it)	photo	Fire Recorder	Second Recorder	Area present	Comments	Number of Rats	Fifteen (y), below (n) or in-side (y) of entrance	Approximate dist-ance from entrance (cm)	Smell: Description	Smell: Rank	Smell: Present	Smell:	Smell: Location of Nuisance	Ulcer Accept	TB2	TB2	Tuffthread Sutures: Did we release the materials / sealing group
N/A	N/A	N/A	N/A	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	Henry Andrews	Lee Greyfear	N/A	Exposed, silke no-protection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			no - 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	Henry Andrews	Lee Greyfear	N/A	Exposed, silke no-protection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			no - no
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Henry Andrews	Lee Greyfear	N/A	PB2	N/A	N/A	N/A	rot wood	n	n	y	n			yes - no
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Henry Andrews	Lee Greyfear	N/A	PB2	N/A	N/A	N/A	rotten	n	n	y	n			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	Henry Andrews	Lee Greyfear	N/A	dissatisfactory silke no-protection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			no - 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	Henry Andrews	Lee Greyfear	N/A	dissatisfactory silke no-protection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			no - 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	Henry Andrews	Lee Greyfear	N/A	dissatisfactory silke no-protection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			no - no
?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	y	Henry Andrews	Lee Greyfear	N/A	Unsafe to access by affected clothing, wood mayne MUST	?	?	?	?	?	?	?	?			? - ?
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	Henry Andrews	Lee Greyfear	N/A	PB2	N/A	N/A	N/A	n	n	n	n	n			yes - no - 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	Henry Andrews	Lee Greyfear	N/A	Exposed, silke no-protection	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	Henry Andrews	Lee Greyfear	N/A	Exposed, silke no-but there is an old bird nest in the hook	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	Lee Greyfear	Henry Andrews	N/A	No PB2, look of the light	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			no - N/A
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	Lee Greyfear	Henry Andrews	N/A	PB2	N/A	N/A	N/A	rot stone	n	n	y	n			yes - no
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	Henry Andrews	N/A	Entrance to the wood	N/A	N/A	N/A	rot stone	n	n	y	n			yes - no
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	Henry Andrews	N/A	PB2	N/A	N/A	N/A	N/A	n	n	n	n			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	Henry Andrews	Lee Greyfear	N/A	Very dramatic, body dissatisfactory	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			no - N/A
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	Lee Greyfear	Henry Andrews	N/A	PB2	N/A	N/A	N/A	mess	n	n	y	n			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	Henry Andrews	Lee Greyfear	N/A	dissatisfactory silke no-protection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			no - N/A
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	none	y	Henry Andrews	Lee Greyfear	N/A	PB2, but ok's in	N/A	N/A	N/A	rot wood	n	n	y	n			yes - no
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	Lee Greyfear	Henry Andrews	N/A	PB2	N/A	N/A	N/A	N/A	n	n	n	n			yes - no
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	Lee Greyfear	Henry Andrews	N/A	PB2	N/A	N/A	N/A	N/A	n	n	n	n			yes - no
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	Lee Greyfear	Henry Andrews	N/A	PB2	N/A	N/A	N/A	n	n	n	n	n			yes - no
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	Henry Andrews	N/A	Lots of bees - close personnel, but they are not here	N/A	N/A	N/A	urine	n	n	y	?			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	Lee Greyfear	Henry Andrews	N/A	Exposed, silke no-protection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			no - N/A
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	Henry Andrews	Lee Greyfear	N/A	PB2	N/A	N/A	N/A	mess	n	n	y	n			yes - yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	Henry Andrews	Lee Greyfear	N/A	PB2	N/A	N/A	N/A	mess	n	n	y	n			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	Henry Andrews	Lee Greyfear	N/A	open dominated facing aspect	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	Henry Andrews	Lee Greyfear	N/A	facing aspect open dominated	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	Henry Andrews	Lee Greyfear	N/A	facing aspect open dominated	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	Henry Andrews	Lee Greyfear	N/A	open aspect open upward	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	Henry Andrews	Lee Greyfear	N/A	open, lot of wood litter	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	Lee Greyfear	Henry Andrews	N/A	open dominated facing dailyw	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			no - N/A
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	Lee Greyfear	Henry Andrews	N/A	several holes leading into on long cylinde	N/A	N/A	N/A	fire and litter urine	n	n	y				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	Henry Andrews	Lee Greyfear	N/A	dissatisfactory facing dailyw	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	Lee Greyfear	Henry Andrews	N/A	No PB2, look of the light	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			no - N/A
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Henry Andrews	Lee Greyfear	N/A	PB2, and dream close personnel, but they are not here	N/A	N/A	N/A	N/A	y	n	n	n			yes - yes - mating
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	Henry Andrews	N/A	Moderate of PB2 in the one sensitive and dream need	N/A	N/A	N/A	N/A	y	n	n	n			yes - no
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	Henry Andrews	N/A	? the but wood, potential on wire	N/A	N/A	N/A	N/A	y	n	n	n			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	Henry Andrews	Lee Greyfear	N/A	Exposed, silke no-protection	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	Henry Andrews	Lee Greyfear	N/A	Exposed, silke no-protection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			no - N/A
n	n	n	n	n	n	y	y	y	n	n	n	n	n	n	n	n	Lee Greyfear	Henry Andrews	N/A	Entrance to the wood, ? or dove entrance	N/A	N/A	N/A	N/A	y	n	n	n			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	Henry Andrews	Lee Greyfear	N/A	dissatisfactory silke no-protection	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	Henry Andrews	Lee Greyfear	N/A	all bark has fallen	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			no - N/A
?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	y	Henry Andrews	Lee Greyfear	N/A	Unsafe to access by affected clothing and to mayne MUST to access	?	?	?	?	?	?	?	?			? - ?
?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	y	Henry Andrews	Lee Greyfear	N/A	Unsafe to access by affected clothing and to dust wave	?	?	?	?	?	?	?	?			? - ?
?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	y	Henry Andrews	Lee Greyfear	N/A	Unsafe to access by affected clothing and to dust wave	?	?	?	?	?	?	?	?			? - ?
N/A	N/A	N/A	N/A	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	Henry Andrews	Lee Greyfear	N/A	Exposed, silke no-protection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			no - N/A
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	Henry Andrews	Lee Greyfear	N/A	PB2	N/A	N/A	N/A	n	n	n	n	n			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	Henry Andrews	Lee Greyfear	N/A	dissatisfactory silke no-protection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			no - N/A
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Henry Andrews	Lee Greyfear	N/A	Not PB2, but mayne mice, rats rabbit	N/A	N/A	N/A	N/A	n	n	n	n			yes - no
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	Henry Andrews	Lee Greyfear	N/A	PB2	N/A	N/A	N/A	?	?	?	?	?			? - ?
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Henry Andrews	Lee Greyfear	N/A	mainly PB2 all ofbroadly the same size and dream	N/A	N/A	N/A	N/A	y	n	n	n			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	Henry Andrews	Lee Greyfear	N/A	Exposed, silke no-protection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			no - N/A
n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	y	Henry Andrews	Lee Greyfear	N/A	PB2, but ok's in	N/A	N/A	N/A	dump wood	n	n	y	n			yes - yes - mating
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Henry Andrews	Lee Greyfear	N/A	open to nice figures but mobile to dry	N/A	N/A	N/A	rot wood	n	n	y	n			yes - no
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	Henry Andrews	Lee Greyfear	N/A	PB2	N/A	N/A	N/A	rot wood	n	n	n	n			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	Henry Andrews	Lee Greyfear	N/A	Exposed, silke no-protection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			no - N/A
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Henry Andrews	Lee Greyfear	N/A	PB2	N/A	N/A	N/A	N/A	n	n	n	n			yes - yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Henry Andrews	Lee Greyfear	N/A	PB2	N/A	N/A	N/A	N/A	n	n	n	n			yes - yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Henry Andrews	Lee Greyfear	N/A	shelf, but mice-shelter	N/A	N/A	N/A	N/A	n	n	n	n			yes - yes - mating
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Henry Andrews	Lee Greyfear	N/A	PB2	N/A	N/A	N/A	N/A	n	n	n	n			yes - no
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Henry Andrews	Lee Greyfear	N/A	PB2	N/A	N/A	N/A	ok wood	n	n	n	n			yes - yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Henry Andrews	Lee Greyfear	N/A	PB2	N/A	N/A	N/A	ok wood	n	n	n	n			yes - yes - mating

								SEASON													
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	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	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	**y**	**n**	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	y	n	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	y	n	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	y	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	y	n	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	y	n	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	y	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	y	y	y	n
Ash	**Ash**	***Fraxinus excelsior***	Cankers	**Cankers**	y	n	n	n	n	n	n	n	n	y	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**	n	n	n	y	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	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	n	n	n	y	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	y	n	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	n	n	y	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	y	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	n	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	n	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	y	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	y	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	y	n	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 and 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**

Tree ref	PRF ID	Inspection result	Bat species	Roost usage: only one species (o1s), more than one species but on different days (m1dd), more than one species on same day (m1sd)	Site name	County	Day	Month	Year	Season	Grid reference	Species	Alive/dead	Phase 1 habitat	Phase 1 code	Stem/limb	Tree height (m)	PRF height (m)	Facing	Form	Enlarged	DBH (cm)	DPH (cm)	PRF has more than one entrance to the same void	Entrance height (cm)	Entrance width (cm)	Internal height (cm)	Internal width (cm)	Internal depth (cm)	Smooth	Bobbly	Bumpy	Rough	Clean	Waxy	stained / discoloured	Polished	messy	Dusty	Debris	Sludgy	Dry	Damp	Wet	Dome	Spire	Peak/ wedge	Flat	Chambered	Tube	Competitors visible (y/n)	woodlice	dusky slug	yellow slug	unidntified slug	garden snail	lipped snail	unidentified snail	cave spider	harvestman	unidentified spider	spider's web	spider egg-sac	flies	harlequin ladybird(s)	bat-fly pupae	wood ants	unidentified ants	wasp(s)	wasp-nest	hornet(s)	hornets-nest	honey bees	tree bumblebee (s)	unidentified bee(s)	beetle(s)	earwig(s)	millipede(s)	centipede(s)	worm(s)	butterfly(s)	moth(s)	toad	blue tit(s)	great tit(s)	wren(s)	nuthatch(es)
CGx1	CGx1	positive - bats but no droppings	*Plecotus auritus*	o1s	Cwm Glo	Merthyr Tydfil	6	10	2022	mating	SO0468105142	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	6	1.7	NNE	wound	y	30.2	30.3	n	25	10	83	5	0	y	n	y	n	y	y	n	y	n	n	n	n	y	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx1	CGx1	positive - bats but no droppings	*Plecotus auritus*	o1s	Cwm Glo	Merthyr Tydfil	8	10	2022	mating	SO0468105142	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	6	1.7	NNE	wound	y	30.2	30.3	n	25	10	83	5	0	y	n	y	n	y	y	n	y	n	n	n	n	y	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx1	CGx1	nil	N/A	o1s	Cwm Glo	Merthyr Tydfil	26	10	2022	mating	SO0468105142	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	6	1.7	NNE	wound	y	30.2	30.3	n	25	10	83	5	0	y	n	y	n	y	y	n	y	n	n	n	n	y	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx1	CGx1	positive - bats but no droppings	*Plecotus auritus*	o1s	Cwm Glo	Merthyr Tydfil	28	10	2022	mating	SO0468105142	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	6	1.7	NNE	wound	y	30.2	30.3	n	25	10	83	5	0	y	n	y	n	y	y	n	y	n	n	n	n	y	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx1	CGx1	positive - bats but no droppings	*Plecotus auritus*	o1s	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0468105142	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	6	1.7	NNE	wound	y	30.2	30.3	n	25	10	83	5	0	y	n	y	n	y	y	n	y	n	n	n	n	y	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx1	CGx1	positive - bats but no droppings	*Plecotus auritus*	o1s	Cwm Glo	Merthyr Tydfil	8	11	2022	autumn-flux	SO0468105142	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	6	1.7	NNE	wound	y	30.2	30.3	n	25	10	83	5	0	y	n	y	n	y	y	n	y	n	n	n	n	y	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx1	CGx1	positive - bats but no droppings	*Plecotus auritus*	o1s	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0468105142	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	6	1.7	NNE	wound	y	30.2	30.3	n	25	10	83	5	0	y	n	y	n	y	y	n	y	n	n	n	n	y	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx1	CGx1	positive - bats but no droppings	*Plecotus auritus*	o1s	Cwm Glo	Merthyr Tydfil	10	11	2022	autumn-flux	SO0468105142	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	6	1.7	NNE	wound	y	30.2	30.3	n	25	10	83	5	0	y	n	y	n	y	y	n	y	n	n	n	n	y	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx1	CGx1	positive - bats but no droppings	*Plecotus auritus*	o1s	Cwm Glo	Merthyr Tydfil	11	11	2022	autumn-flux	SO0468105142	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	6	1.7	NNE	wound	y	30.2	30.3	n	25	10	83	5	0	y	n	y	n	y	y	n	y	n	n	n	n	y	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx1	CGx1	positive - bats but no droppings	*Plecotus auritus*	o1s	Cwm Glo	Merthyr Tydfil	15	11	2022	autumn-flux	SO0468105142	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	6	1.7	NNE	wound	y	30.2	30.3	n	25	10	83	5	0	y	n	y	n	y	y	n	y	n	n	n	n	y	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx1	CGx1	positive - bats but no droppings	*Plecotus auritus*	o1s	Cwm Glo	Merthyr Tydfil	16	11	2022	autumn-flux	SO0468105142	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	6	1.7	NNE	wound	y	30.2	30.3	n	25	10	83	5	0	y	n	y	n	y	y	n	y	n	n	n	n	y	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx2	CGx2a	positive - bats but no droppings	*Plecotus auritus*	o1s	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0467205145	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	8	1.75	SSW	tear-out	n	27	26.7	n	8	2.5	34	3.5	0	n	n	y	y	y	y	n	n	n	n	n	n	y	n	n	n	y	n	n	n	n	y	y	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx2	CGx2a	positive - bats but no droppings	*Plecotus auritus*	o1s	Cwm Glo	Merthyr Tydfil	8	11	2022	autumn-flux	SO0467205145	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	8	1.75	SSW	tear-out	n	27	26.7	n	8	2.5	34	3.5	0	n	n	y	y	y	y	n	n	n	n	n	n	y	n	n	n	y	n	n	n	n	y	y	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx2	CGx2a	positive - bats but no droppings	*Plecotus auritus*	o1s	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0467205145	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	8	1.75	SSW	tear-out	n	27	26.7	n	8	2.5	34	3.5	0	n	n	y	y	y	y	n	n	n	n	n	n	y	n	n	n	y	n	n	n	n	y	y	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx2	CGx2a	nil	N/A	o1s	Cwm Glo	Merthyr Tydfil	10	11	2022	autumn-flux	SO0467205145	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	8	1.75	SSW	tear-out	n	27	26.7	n	8	2.5	34	3.5	0	n	n	y	y	y	y	n	n	n	n	n	n	y	n	n	n	y	n	n	n	n	y	y	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx2	CGx2a	positive - bats but no droppings	*Plecotus auritus*	o1s	Cwm Glo	Merthyr Tydfil	11	11	2022	autumn-flux	SO0467205145	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	8	1.75	SSW	tear-out	n	27	26.7	n	8	2.5	34	3.5	0	n	n	y	y	y	y	n	n	n	n	n	n	y	n	n	n	y	n	n	n	n	y	y	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx2	CGx2a	nil	N/A	o1s	Cwm Glo	Merthyr Tydfil	15	11	2022	autumn-flux	SO0467205145	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	8	1.75	SSW	tear-out	n	27	26.7	n	8	2.5	34	3.5	0	n	n	y	y	y	y	n	n	n	n	n	n	y	n	n	n	y	n	n	n	n	y	y	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx2	CGx2a	nil	N/A	o1s	Cwm Glo	Merthyr Tydfil	16	11	2022	autumn-flux	SO0467205145	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	8	1.75	SSW	tear-out	n	27	26.7	n	8	2.5	34	3.5	0	n	n	y	y	y	y	n	n	n	n	n	n	y	n	n	n	y	n	n	n	n	y	y	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx2	CGx2b	positive - bats but no droppings	*Plecotus auritus*	o1s	Cwm Glo	Merthyr Tydfil	6	10	2022	mating	SO0467205145	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	8	1.08	SSW	wound	n	27	27	n	16	5	?	?	?	y	n	n	n	y	y	n	n	n	n	n	n	y	n	n	?	?	?	?	?	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx2	CGx2b	positive - bats but no droppings	*Plecotus auritus*	o1s	Cwm Glo	Merthyr Tydfil	8	10	2022	mating	SO0467205145	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	8	1.08	SSW	wound	n	27	27	n	16	5	?	?	?	y	n	n	n	y	y	n	n	n	n	n	n	y	n	n	?	?	?	?	?	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx2	CGx2b	positive - bats but no droppings	*Plecotus auritus*	o1s	Cwm Glo	Merthyr Tydfil	26	10	2022	mating	SO0467205145	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	8	1.08	SSW	wound	n	27	27	n	16	5	?	?	?	y	n	n	n	y	y	n	n	n	n	n	n	y	n	n	?	?	?	?	?	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx2	CGx2b	positive - bats but no droppings	*Plecotus auritus*	o1s	Cwm Glo	Merthyr Tydfil	28	10	2022	mating	SO0467205145	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	8	1.08	SSW	wound	n	27	27	n	16	5	?	?	?	y	n	n	n	y	y	n	n	n	n	n	n	y	n	n	?	?	?	?	?	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx2	CGx2b	positive - bats but no droppings	*Plecotus auritus*	o1s	Cwm Glo	Merthyr Tydfil	7	11	2022	autumn-flux	SO0467205145	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	8	1.08	SSW	wound	n	27	27	n	16	5	?	?	?	y	n	n	n	y	y	n	n	n	n	n	n	y	n	n	?	?	?	?	?	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx2	CGx2b	positive - bats but no droppings	*Plecotus auritus*	o1s	Cwm Glo	Merthyr Tydfil	8	11	2022	autumn-flux	SO0467205145	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	8	1.08	SSW	wound	n	27	27	n	16	5	?	?	?	y	n	n	n	y	y	n	n	n	n	n	n	y	n	n	?	?	?	?	?	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx2	CGx2b	positive - bats but no droppings	*Plecotus auritus*	o1s	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0467205145	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	8	1.08	SSW	wound	n	27	27	n	16	5	?	?	?	y	n	n	n	y	y	n	n	n	n	n	n	y	n	n	?	?	?	?	?	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx2	CGx2b	positive - bats but no droppings	*Plecotus auritus*	o1s	Cwm Glo	Merthyr Tydfil	10	11	2022	autumn-flux	SO0467205145	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	8	1.08	SSW	wound	n	27	27	n	16	5	?	?	?	y	n	n	n	y	y	n	n	n	n	n	n	y	n	n	?	?	?	?	?	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx2	CGx2b	positive - bats but no droppings	*Plecotus auritus*	o1s	Cwm Glo	Merthyr Tydfil	11	11	2022	autumn-flux	SO0467205145	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	8	1.08	SSW	wound	n	27	27	n	16	5	?	?	?	y	n	n	n	y	y	n	n	n	n	n	n	y	n	n	?	?	?	?	?	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx2	CGx2b	positive - bats but no droppings	*Plecotus auritus*	o1s	Cwm Glo	Merthyr Tydfil	15	11	2022	autumn-flux	SO0467205145	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	8	1.08	SSW	wound	n	27	27	n	16	5	?	?	?	y	n	n	n	y	y	n	n	n	n	n	n	y	n	n	?	?	?	?	?	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx2	CGx2b	positive - bats but no droppings	*Plecotus auritus*	o1s	Cwm Glo	Merthyr Tydfil	16	11	2022	autumn-flux	SO0467205145	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	8	1.08	SSW	wound	n	27	27	n	16	5	?	?	?	y	n	n	n	y	y	n	n	n	n	n	n	y	n	n	?	?	?	?	?	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx3	CGx3	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	10	11	2022	autumn-flux	SO0477104853	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	10	7.29	NE	wound	n	35.8	25	n	25	1	10	2	0	y	n	y	n	y	y	y	n	n	n	n	n	y	n	n	n	y	n	n	n	n	y	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx4	CGx4	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	10	11	2022	autumn-flux	SO0477104858	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	10	6.66	WSW	wound	n	29.5	24	n	37	2	17	3	0	y	n	n	n	y	n	n	n	n	n	n	n	y	n	n	n	y	n	n	n	n	y	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx5	CGx5	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0477304832	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	10	2.13	S	wound	n	24.8	25.4	n	32	4	12	4	10	n	n	y	y	y	n	n	n	n	n	n	n	y	n	n	n	y	n	n	n	n	y	y	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx6	CGx6	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0476604794	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	9	3.05	ESE	transverse-snap	n	23.9	23.1	n	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CGx7	CGx7	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0481604829	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	9	7.6	SSE	wound	n	80.1	19.5	n	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CGx8	CGx8	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	15	11	2022	autumn-flux	SO0481504522	*Fraxinus excelsior*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	7	1.28	SSE & NNW	transverse-snap	n	13.6	13.6	y	35	1.5	10	9	10	y	n	n	y	y	n	n	n	y	n	y	n	y	y	n	n	n	y	n	n	n	y	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx9	CGx9	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	15	11	2022	autumn-flux	SO0484604510	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	10	1.26	SSW	wound	n	87.7	87.7	n	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CGx10	CGx10	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	11	11	2022	autumn-flux	SO0484004528	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	11	8.1	W & E	bark-plates	n	77.4	21.1	y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CGx11	CGx11	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	15	11	2022	autumn-flux	SO0484704530	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	10	0.5	NW	knot-hole	n	58.1	68.2	n	42	9	60	16	0	y	n	y	n	y	n	n	n	y	n	y	n	y	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx12	CGx12	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	15	11	2022	autumn-flux	SO0482904599	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	10	7.2	NE	knot-hole	n	73.2	34	n	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CGx13	CGx13	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	15	11	2022	autumn-flux	SO0483804584	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	10	7.8	W	knot-hole	n	61.2	48.1	n	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CGx14	CGx14	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	15	11	2022	autumn-flux	SO0482604550	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	7	5.88	SSW	hazard-beam	n	41.5	23.2	n	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CGx15	CGx15	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	11	11	2022	autumn-flux	SO0493304455	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	9	3.1	ENE	wound	n	55.6	33.5	n	22	4	12	4	0	n	n	n	y	y	n	n	n	n	n	n	n	n	y	n	n	y	n	n	n	n	y	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx16	CGx16	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	11	11	2022	autumn-flux	SO0482204458	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	12	8.3	ESE	tear-out	n	53.9	17.7	n	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CGx17	CGx17	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	15	11	2022	autumn-flux	SO0484104417	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	4	3.1	W	transverse-snap	n	22	23	n	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CGx18	CGx18	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	11	11	2022	autumn-flux	SO0485604419	*Salix caprea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	9	7	NNW & SSE	hazard-beam	n	19.8	19.4	y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CGx19	CGx19	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	15	11	2022	autumn-flux	SO0483604414	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	11	2.46	SSW	knot-hole	n	28.9	32.1	n	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CGx20	CGx20	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	15	11	2022	autumn-flux	SO0478904452	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	9	2.75	SSE	knot-hole	y	49.2	41.3	y	11	9	101	8	0	n	y	y	n	y	y	y	n	n	n	n	n	n	y	n	n	y	n	n	n	n	y	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx21	CGx21	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	11	11	2022	autumn-flux	SO0481804459	*Fraxinus excelsior*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	14	8.5	E	wound	n	80.4	27.6	n	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CGx22	CGx22	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	15	11	2022	autumn-flux	SO0478804464	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	9	4.2	N	tear-out	n	26.7	22.8	n	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CGx23	CGx23	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	10	11	2022	autumn-flux	SO0471304423	*Fraxinus excelsior*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	9	8.11	E	transverse-snap	n	80.3	17.2	n	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CGx24	CGx24	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	10	11	2022	autumn-flux	SO0467604438	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	7	5.56	E	wound	n	49.2	38.2	n	41	4	30	6	0	y	y	n	y	n	n	n	n	y	y	y	n	y	y	n	n	y	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx25	CGx25	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	10	11	2022	autumn-flux	SO0467604427	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	9	7.56	ENE	transverse-snap	n	80.4	18.1	n	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CGx26	CGx26	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	10	11	2022	autumn-flux	SO0466504426	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	10	6.22	E	knot-hole	n	69.5	42	n	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CGx27	CGx27	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	10	11	2022	autumn-flux	SO0468404443	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	11	4.36	ESE & WNW	hazard-beam	n	77	24.2	y	5	26	57	14	25	y	n	n	y	y	n	n	n	n	n	n	n	y	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx28	CGx28	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	15	11	2022	autumn-flux	SO0470204468	*Crataegus monogyna*	dead	Broadleaved semi-natural woodland	A1.1.1	stem	7	2.8	NW	flute	n	37	31.7	n	38	2	0	9	0	y	n	y	n	y	n	n	n	n	n	n	n	n	y	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx29	CGx29	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	11	11	2022	autumn-flux	SO0472004476	*Alnus glutinosa*	dead	Broadleaved semi-natural woodland	A1.1.1	stem	6	5.1	NNW	woodpecker-hole	y	45.9	?	n	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
CGx30	CGx30	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	15	11	2022	autumn-flux	SO0472904503	*Crataegus monogyna*	dead	Broadleaved semi-natural woodland	A1.1.1	stem	6	1.44	SW	lightning-strike	n	19.5	19.5	n	8	5	35	3	0	y	n	y	n	y	y	n	n	n	n	n	n	y	n	n	n	y	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx31	CGx31	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	11	11	2022	autumn-flux	SO0477404487	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	9	various	various	tear-out	n	65.6	47	n	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CGx32	CGx32	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	15	11	2022	autumn-flux	SO0476604437	*Betula pubescens*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	7	1.9	S	tear-out	n	27	23.2	n	7	6	85	6	0	y	n	y	n	y	y	n	n	n	n	n	n	y	n	n	n	y	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx33	CGx33a	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	15	11	2022	autumn-flux	SO0477904505	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	11	2.88	WSW	knot-hole	y	63.2	20.6	n	5	5	0	12	0	y	n	y	y	y	y	n	n	n	n	n	n	y	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx33	CGx33b	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	15	11	2022	autumn-flux	SO0477904505	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	11	2.68	WSW	knot-hole	y	63.2	20.6	y	4	4	39	20	0	n	n	y	n	y	y	n	n	n	n	n	n	y	n	n	n	y	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx33	CGx33c	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	15	11	2022	autumn-flux	SO0477904505	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	11	2.68	WSW	knot-hole	y	63.2	20.6	y	4	4	6	10	20	n	n	y	n	y	y	n	n	n	n	n	n	y	n	n	n	n	n	y	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx34	CGx34	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	15	11	2022	autumn-flux	SO0477204510	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	8	3.19	SSE	wound	n	36.2	16	n	1	1	11	1	0	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	n	y	n	n	n	n	y	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx35	CGx35	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	11	11	2022	autumn-flux	SO0478704518	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	8	various	various	tear-out	n	46.3	24.8	n	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CGx36	CGx36	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	11	11	2022	autumn-flux	SO0478004590	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	13	6	SSE	woodpecker-hole	y	69.5	?	n	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
CGx37	CGx37	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	15	11	2022	autumn-flux	SO0475404559	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	9	2.9	ESE	tear-out	n	44.4	28	n	83	4	35	6	0	n	n	y	y	y	y	n	n	n	n	n	n	y	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx38	CGx38	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	15	11	2022	autumn-flux	SO0476104562	*Alnus glutinosa*	dead	Broadleaved semi-natural woodland	A1.1.1	stem	8	4.06	WSW	woodpecker-hole	n	44.5	36.1	n	6.5	6.5	3	23	2	n	n	y	y	y	y	y	n	n	n	n	n	y	n	n	y	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	y	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx39	CGx39	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0470604517	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	9	2.57	NE	wound	n	38.3	31.6	n	102	2	51	13.5	0	n	n	n	y	n	n	n	n	y	y	y	n	y	n	n	n	y	n	n	y	n	y	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx40	CGx40	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	10	11	2022	autumn-flux	SO0458504576	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	11	2.06	WSW & ESE	hazard-beam	n	15.2	18.2	y	68	4	16	8	0	y	n	y	n	y	y	n	n	n	n	n	n	y	n	n	n	n	y	n	n	n	y	y	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx41	CGx41a	positive - bat but no droppings	*Myotis daubentonii*	o1s	Cwm Glo	Merthyr Tydfil	10	11	2022	autumn-flux	SO0459404589	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	7	3.15	NNE	wound	n	18.1	20.4	n	19	1.6	?	4	8	n	n	y	n	y	y	y	n	n	n	n	n	y	n	n	?	?	?	?	?	n	y	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx41	CGx41b	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	10	11	2022	autumn-flux	SO0459404589	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	7	2.43	SW	wound	n	18.1	24	n	5	1.8	32	6	0	y	n	y	n	y	y	y	n	n	n	n	n	y	n	n	n	y	n	n	n	n	y	y	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx42	CGx42	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	10	11	2022	autumn-flux	SO0460104587	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	10	2.31	W	tear-out	n	67.2	57.7	n	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CGx43	CGx43	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0458304485	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	10	5.62	E & W	hazard-beam	n	71.2	18.7	y	10	30	15	15	0	n	n	y	y	y	n	n	n	n	n	n	n	y	y	n	n	n	y	n	n	n	y	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx44	CGx44a	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0457604490	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	11	1.14	SSE	wound	n	25.2	39.6	n	9	2.5	4	9	22	n	y	y	n	y	y	y	n	n	n	n	n	n	y	n	y	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx44	CGx44b	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0457604490	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	11	0.73	SSE	butt-rot	n	25.2	36.3	n	73	9.5	8	5.5	0	n	y	y	y	y	n	n	n	n	n	n	n	n	y	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx45	CGx45	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	10	11	2022	autumn-flux	SO0471904954	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	11	3.33	ENE	knot-hole	n	96	44	n	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CGx46	CGx46	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	10	11	2022	autumn-flux	SO0471104984	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	13	4.31	SSE	transverse-snap	n	60.3	17.7	n	5	4	3	4	22	y	n	yy	y	n	n	n	n	n	n	n	n	y	n	n	n	n	n	y	n	n	y	y	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx47	CGx47	?	?	?	Cwm Glo	Merthyr Tydfil	10	11	2022	autumn-flux	SO0455404663	*Betula pubescens*	dead	Broadleaved semi-natural woodland	A1.1.1	stem	6	5	E	woodpecker-hole	y	32	?	y	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?
CGx48	CGx48	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	10	11	2022	autumn-flux	SO0458304719	*Betula pubescens*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	11	3.21	ENE	knot-hole	n	47.3	42	n	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CGx49	CGx49	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	10	11	2022	autumn-flux	SO0457804565	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	9	1.98	WNW	wound	n	27.4	25.8	n	59	1.4	44	5	0	n	y	y	n	y	n	n	n	y	n	n	y	n	n	y	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx50	CGx50	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	10	11	2022	autumn-flux	SO0455804599	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	16	1.34	multiple	butt-rot	n	57.4	57.4	y	63	11	108	17	0	n	y	y	y	y	y	n	n	n	n	n	n	y	y	y	n	y	n	n	n	n	y	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx51	CGx51	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	10	11	2022	autumn-flux	SO0455004601	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	12	2.37	WSW	squirrel-hole	y	39.4	36.2	n	7	5.5	1	13	26	n	n	y	y	y	y	y	n	n	n	n	n	y	n	n	n	n	n	y	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx52	CGx52	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	15	11	2022	autumn-flux	SO0454804562	*Quercus petraea*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	13	4.12	NNE	wound	n	74.3	25.7	n	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CGx53	CGx53	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	15	11	2022	autumn-flux	SO0472404432	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	15	3.18	ENE	woodpecker-hole	n	47.1	42.7	n	6	6	> 100	26	0	y	n	y	n	y	y	n	n	n	n	n	n	y	n	n	n	y	n	n	y	n	y	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx53	CGx53	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	15	11	2022	autumn-flux	SO0472404432	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	stem	15	2.35	ENE	woodpecker-hole	n	47.1	39.5	n	4	5	> 100	2	> 100	y	n	y	n	y	y	n	n	n	n	n	n	y	n	n	n	y	n	n	y	n	y	y	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CGx54	CGx54	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	16	11	2022	autumn-flux	SO0472404432	*Alnus glutinosa*	alive	Broadleaved semi-natural woodland	A1.1.1	limb	15	8.4	NE	tear-out	n	69.2	21.7	n	24	1	18	4	2	y	n	n	n	y	n	n	n	n	n	n	n	n	y	n	n	y	n	n	n	n	y	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
Lake P. aur roost	Lake P. aur roost	nil	N/A	N/A	Cwm Glo	Merthyr Tydfil	9	11	2022	autumn-flux	SO0453404572	*Quercus petraea*	alive	Broadleaved semi-natural woodland / Standing water	A1.1.1 / G1	stem	15	6.69	ESE	wound	n	59.6	45.3	y	6 & 32	2 & 5	121	11	0	y	n	y	n	y	y	y	n	n	n	n	n	y	y	n	n	y	n	n	y	n	y	n	n	n	n	n	n	n	n	n	n	n	n	y	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n

saltmarsh mud	pickleweed2	green woodpecker bar	great spotted woodpecker bar	burn ovalS2	bird id zigzagS	bird feathers / down	bird nest	grey squirrel colony	grey squirrel grazing	grey squirrel nest	dive mussels / dacridae	dive mouse mud	woodmouse / voleMouse	woodmouse nest	Other (in name present, if something is present, name it)	photo	First Recorder	Second Recorder	Also present	Comments	Number of Nests	Pillaris (y), Bellied (n) or scale (1-4)? entrance	Approximate dist acro from entrance (cm)	Crook: Description	Crook: burn	Crook: Present	Length	Crook: entrance (y) Narrow	Ulnck Accept	TAG	PRF	%ofTotal: Number of nests in volume / volume / number of nests / mating / group
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	N/A	N/A	smooth red four boundary / bare ground	2	n	15	N/A	y	n	n	n		yes	yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	N/A	N/A	smooth red four boundary / bare ground	3	n	15	N/A	y	n	n	n		yes	yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	N/A	N/A	smooth red four boundary / bare ground	N/A	N/A	N/A	N/A	y	n	n	n		yes	yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	N/A	N/A	smooth red four boundary / bare ground	1	n	15	N/A	y	n	n	n		yes	yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	Hasty Andrews	N/A	smooth red four boundary / bare ground	2	n	15	N/A	y	n	n	n		yes	yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	Hasty Andrews	N/A	smooth red four boundary / bare ground	1	n	15	N/A	y	n	n	n		yes	yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	Hasty Andrews	N/A	smooth red four boundary / bare ground	2	n	15	N/A	y	n	n	n		yes	yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	Hasty Andrews	N/A	smooth red four boundary / bare ground	1	n	15	N/A	y	n	n	n		yes	yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	Hasty Andrews	N/A	smooth red four boundary / bare ground	N/A	N/A	N/A	N/A	y	n	n	n		yes	yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	Hasty Andrews	N/A	smooth red four boundary / bare ground	1	n	15	N/A	y	n	n	n		yes	yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	Hasty Andrews	N/A	smooth red four boundary / bare ground	1	n	2	mostly	n	n	y	n		yes	no
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	Hasty Andrews	N/A	smooth red four boundary / bare ground	1	n	2	mostly	n	n	y	n		yes	no
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	Hasty Andrews	N/A	smooth red four boundary / bare ground	1	n	2	mostly	n	n	y	n		yes	no
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	Hasty Andrews	N/A	smooth red four boundary / bare ground	N/A	N/A	N/A	N/A	y	n	n	n		yes	no
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	Hasty Andrews	N/A	smooth red four boundary / bare ground	1	n	2	mostly	n	n	y	n		yes	no
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	Hasty Andrews	N/A	smooth red four boundary / bare ground	N/A	N/A	N/A	N/A	y	n	n	n		yes	no
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	N/A	N/A	smooth red four boundary / bare ground	1	n	15	N/A	y	n	n	n		yes	yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	N/A	N/A	smooth red four boundary / bare ground	3	n	15	N/A	y	n	n	n		yes	yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	N/A	N/A	smooth red four boundary / bare ground	4	n	15	N/A	y	n	n	n		yes	yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	N/A	N/A	smooth red four boundary / bare ground	4	n	15	N/A	y	n	n	n		yes	yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	Hasty Andrews	N/A	smooth red four boundary / bare ground	4	n	15	N/A	y	n	n	n		yes	yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	Hasty Andrews	N/A	smooth red four boundary / bare ground	9	n	15	N/A	y	n	n	n		yes	yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	Hasty Andrews	N/A	smooth red four boundary / bare ground	9	n	15	N/A	y	n	n	n		yes	yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	Hasty Andrews	N/A	smooth red four boundary / bare ground	4	n	15	N/A	y	n	n	n		yes	yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	Hasty Andrews	N/A	smooth red four boundary / bare ground	4	n	15	N/A	y	n	n	n		yes	yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	Hasty Andrews	N/A	smooth red four boundary / bare ground	3	n	15	N/A	y	n	n	n		yes	yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Hasty Andrews	Lee Greyfear	N/A	**Retouch: Part of bank is disconnected**	N/A	N/A	N/A	damp wood	n	n	y	n		yes	no
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Hasty Andrews	Lee Greyfear	N/A	PRF	N/A	N/A	N/A	wet wood	n	n	y	n		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	Lee Greyfear	Hasty Andrews	N/A	PRF	N/A	N/A	N/A	wet wood	n	n	y	n		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	Hasty Andrews	Lee Greyfear	N/A	exposed, silks/ old nest or hole	N/A	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	Hasty Andrews	Lee Greyfear	N/A	exposed, silks/ no protection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	no	N/A
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	Hasty Andrews	N/A	PRF	N/A	N/A	N/A	N/A	n	n	y	n		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	Hasty Andrews	Lee Greyfear	N/A	exposed, silks/ old nest or hole, bank is gone and there is	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	no	N/A
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Lee Greyfear	Hasty Andrews	N/A	PRF	N/A	N/A	N/A	N/A	n	n	n	n		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	Hasty Andrews	Lee Greyfear	N/A	exposed, silks/ no protection	N/A	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	Hasty Andrews	Lee Greyfear	N/A	exposed, silks/ no protection	N/A	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	Hasty Andrews	Lee Greyfear	N/A	exposed, silks/ no protection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	no	N/A
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Hasty Andrews	Lee Greyfear	N/A	PRF	N/A	N/A	N/A	N/A	n	n	n	n		yes	yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Hasty Andrews	Lee Greyfear	N/A	moderately exposed soil with some roots, material	N/A	N/A	N/A	dry moss	n	n	y	n		yes	no
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Hasty Andrews	Lee Greyfear	N/A	**Retouch: Part of bank is disconnected**	N/A	N/A	N/A	wet moss	n	n	y	n		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	Hasty Andrews	Lee Greyfear	N/A	exposed, silks/ no protection	N/A	N/A	N/A	wet moss	n	n	y	n		yes	yes - mating
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Hasty Andrews	Lee Greyfear	N/A	potential bat droppings collected	N/A	N/A	N/A	wet wood	n	n	y	n		yes	yes - mating
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Hasty Andrews	Lee Greyfear	N/A	Shaly skin mud	N/A	N/A	N/A	N/A	y	n	n	n		yes	no
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Hasty Andrews	Lee Greyfear	N/A	thin woodiness in the apex	N/A	N/A	N/A	mainly	n	n	y	n		yes	yes - mating
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Hasty Andrews	Lee Greyfear	N/A	Retouch: Bank removed to have entirely left of location	N/A	N/A	N/A	mainly	n	n	y	n		yes	no
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Hasty Andrews	Lee Greyfear	N/A	Retouch: Bank disconnection, silks no protection	N/A	N/A	N/A	N/A	y	n	n	n		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	Hasty Andrews	Lee Greyfear	N/A	exposed, silks/ no protection	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	no	N/A
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Hasty Andrews	Lee Greyfear	N/A	not oddly exposed	n	n	n	n	n	n	n	n	n	n	n
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Hasty Andrews	Lee Greyfear	N/A	PRF	N/A	N/A	N/A	N/A	n	n	n	n		yes	yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Hasty Andrews	Lee Greyfear	N/A	PRF	N/A	N/A	N/A	N/A	n	n	n	n		yes	yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Hasty Andrews	Lee Greyfear	N/A	PRF	N/A	N/A	N/A	N/A	n	n	n	n		yes	yes - both
n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	y	Hasty Andrews	Lee Greyfear	N/A	Kareen Planter: aterior nest	N/A	N/A	N/A	N/A	y	n	n	n		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!



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