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BAT ACTIVITY SURVEY

At

Plot 3A

Wrexham Industrial Estate
Bryn Lane
Wrexham
LL13 9UT

NGR: SJ 339340 350457

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A handwritten signature in black ink that reads 'K James'.

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EXECUTIVE SUMMARY

This report is written by Robert Mooney MSc, Graduate Ecologist at United Environmental Services Ltd (UES). It provides an assessment of the potential impacts on bats as a result of the proposed development at Plot 3A, Wrexham Industrial Estate, Wrexham. The development proposals include the construction of three large industrial units with associated parking and infrastructure.

The majority of the site is composed of dense scrub and semi-improved grassland, which provides moderate quality habitat for foraging and commuting bats. In addition, the site contains pockets of higher quality habitat including unimproved grassland, ponds, hedgerows and woodland.

Due to the size of the site, and presence of pockets of moderate and high-quality habitat for bats, UES were commissioned to conduct bat activity surveys in April - October 2022. The objective of the surveys was to assess the bat species and number of bats that are using the site, and determine the importance of the site for foraging and commuting bats.

Across all survey methods, a minimum of six species of bat were recorded: common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus*, brown long-eared bat (BLE) *Plecotus auritus*, noctule *Nyctalus noctula*, Daubenton's *Myotis daubentonii* and a *Myotis* species. Soprano pipistrelles were the most abundant species during the transect surveys, accounting for approximately 63% of all transect recordings. Common pipistrelle, soprano pipistrelle and *Myotis* sp bats accounted for 34%, 24% and 37% of all static detector recordings respectively. Noctule, Daubenton's and BLE were recorded to a lesser extent.

Overall, moderate levels of bat activity were recorded during the surveys, with bats exhibiting foraging and commuting behaviours. Bat activity was recorded across the entire site but was generally highest along the woodland, tree lines, hedgerows and lines of scrub along the site and field boundaries. The woodland and tree lines associated with the ponds in the centre of the site provided a hotspot of activity.

The proposed level of habitat retention, creation and enhancement including the retention of wildlife corridors at the site boundaries will ensure that connectivity to offsite habitats and sufficient foraging opportunities will remain available for bats currently using the site. Furthermore, the ecological compensation area within the eastern section of the site will be enhanced to provide higher quality foraging opportunities through woodland planting, pond creation, conversion of agricultural grassland to both species-rich wildflower grassland and tussocky rough grassland and the creation of a small orchard area.

The implementation of a wildlife friendly lighting plan will reduce the potential operational impacts of the development on bats to the lowest practicable level and will ensure that suitable foraging habitats and commuting corridors across the site will remain undisturbed and functional.

The report should be read in conjunction with appendices 1 to 8, which give visual representations of the survey results, and the following reports:

- Preliminary ecological appraisal (UES03448/01 V3)
- Bat ground-level tree assessment (UES03448/06 V2)
- Bat aerial tree assessment and presence / absence surveys (UES03448/16 V2)

1 INTRODUCTION

1.1 Author, surveyors and qualifications

This report is compiled and written by Robert Mooney, UES Graduate Ecologist. Other surveyors include:

- Toby Hart BSc MCIEEM PIEMA, UES Managing Director. Toby is licensed by Natural Resources Wales to disturb, take and handle all species of bat, other than greater horseshoe *Rhinolophus ferrumequinum* or lesser horseshoe *Rhinolophus hipposideros*, under licence number S086508/01. Toby is also trained in tree climbing and aerial rescue to CS38 level.
- Mark Halliwell MBIol, UES Ecologist. Mark is listed as an accredited agent on the bat survey licence of Toby Hart. Mark has been deemed capable by the licence holder to disturb (including using an endoscope) and to handle all species of bat other than greater or lesser horseshoe. Mark is also trained in tree climbing and aerial rescue to CS38 level.
- Alasdair Grubb BSc, UES Ecologist. Alasdair is listed as an assistant on the bat survey licence of Toby Hart. Alasdair has been deemed capable by the licence holder to disturb (including using an endoscope) and to handle all species of bat other than greater or lesser horseshoe, whilst under the direct supervision of Toby Hart or an accredited agent. Alasdair is also trained in tree climbing and aerial rescue to CS38 level.
- Daniel Smith BSc MScRes, UES Ecologist. Daniel is listed as an assistant on the bat survey licence of Toby Hart. Daniel has been deemed capable by the licence holder to disturb (including using an endoscope) and to handle all species of bat other than greater or lesser horseshoe, whilst under the direct supervision of Toby Hart or an accredited agent. Daniel is also trained in tree climbing and aerial rescue to CS38 level.
- Noah Fulton BSc, UES Graduate Ecologist.
- Jacob Miller BSc, UES Graduate Ecologist.
- Paul Cassidy, UES Sub-contractor. Paul is licensed by Natural Resources Wales to disturb, take and handle all species of bats, other than greater horseshoe and lesser horseshoe, under licence number S088256/1.
- Mark Jeffries, UES Sub-contractor.
- Tilly Edwards, UES Sub-contractor.
- James Stubbs BSc, UES Sub-contractor

All surveyors have the knowledge, skills and experience identified within CIEEM's "Competencies for Species Survey: Bats" (2013), or were under the supervision of a surveyor with the required competencies.

1.2 Survey objectives

UES was commissioned to conduct site surveys which include the following activities:

- Conduct activity surveys to assess the quality of habitat for bats
- Assess the bat species and numbers that are using the site
- Assess the relative importance of areas and habitats within the site for bat activity
- Recommend appropriate mitigation and compensation, if applicable



1.3 Proposed development

The applicant seeks to secure outline planning permission for the construction of three industrial units with associated parking and access roads.

1.4 Structure of the report

This report sets out the methodology, results, and recommendations in relation to a specific bat survey. Recommendations are in line with statutory legislation and planning policy objectives.

The report should be read in conjunction with appendices 1 to 8, which give visual representations of the survey results, and the following reports:

- Preliminary ecological appraisal (UES03448/01 V3)
- Bat ground-level tree assessment (UES03448/06 V2)
- Bat aerial tree assessment and presence / absence surveys (UES03448/16 V2)



2 METHODOLOGY

2.1 General

All surveys were carried out to recognised guidelines, timings and weather conditions, with particular reference to Natural England and BCT publications (see references for further information).

The habitats on site and in the surrounding area were assessed during the activity survey and through studying aerial photographs, in order to gauge their suitability to support roosting, foraging and commuting bats.

2.2 Desk study

A record search for protected or otherwise notable species, habitats and sites was conducted through Cofnod – North Wales Environmental Information Service in 2021, as part of UES' preliminary ecological appraisal (PEA, reference – UES03448/01 V1). The records search included the land within the development boundary and a buffer of 2km around the site.

2.3 Transect surveys

One transect route across the site was mapped following the PEA and covered a distance of 3.2km. Care was taken to cover the entire site, especially any habitats considered to be of particular suitability for roosting, foraging or commuting bats. The transect route is provided at Appendix 1 – Site plan.

The site is considered to present moderate suitability habitat for bats, therefore one survey visit was carried out each month, from April to October inclusive.

During each survey visit, two surveyors walked slowly along the transect route, equipped with Elekon Batlogger M bat detectors and recorders. This device records bat echolocation calls across the full spectrum, with a sensitivity range of 10 – 150 kHz. The integrated heterodyne live monitoring also allows the observer to hear the echolocation calls in real time, with automatic tuning. The recordings are individually time/date, GPS and temperature stamped, and are of high enough quality to produce time expansion quality sonograms. Any observations of bats were recorded, including time, species, location, number of bats, flight direction, flight height and behaviour, where possible.

The starting point and direction of the transect route was varied throughout the surveys, to reduce survey bias.

The survey dates, timings and weather conditions are provided in the table below.



Table 1 – Survey dates, timings and weather conditions

MONTH	DATE	SUNSET	SURVEY TIMINGS	TEMP.	WIND	RAIN	CLOUD COVER
April	13/04/22	20:08	19:53 – 21:53	14°C	Still	Dry	0%
May	19/05/22	21:10	20:55 – 23:55	14°C	Still	Dry	20%
June	29/06/22	21:42	21:27 – 23:42	16°C	Still	Light rain	40%
July	13/07/22	21:43	21:28 – 23:43	17°C	Still	Dry	0%
	19/07/22	21:26	21:06 – 23:06	24°C	Still	Dry	0%
August	17/08/22	20:35	20:20 – 22:20	18°C	Light breeze	Dry	50%
September	14/09/22	19:30	19:15 – 21:15	15°C	Light breeze	Dry	60%
October	19/10/22	18:08	17:53 – 19:53	12°C	Light breeze	Dry	70%

2.4 Static detector monitoring surveys

In addition to the transect surveys, static detectors were deployed across the site, fixed to mature trees in discrete locations that were anticipated to record bat activity (e.g. trees in hedgerows). Static detectors were deployed in four locations across the site (see Appendix 1).

The static detectors were set to record for a minimum of five consecutive nights per month in their respective locations, from April to October. Following each recording cycle, each detector's batteries were changed, the data was retrieved, and detectors re-set to record. The following static detectors were used during the survey:

- Two Anabat Swift static bat detectors were used throughout the surveys. This device uses frequency division technology with a frequency range of 5 – 150kHz and records echolocation calls in zero crossing format. It has an integrated GPS receiver which automatically sets the internal clock, calculates sunset and sunrise times and records the location. All registrations are automatically recorded onto an SD card and time, date and temperature stamped.
- Two Anabat Express static bat detector were also used. This device uses frequency division technology with a frequency range of 5 – 150kHz and records echolocation calls in zero crossing format. It has an integrated GPS receiver which automatically sets the internal clock, calculates sunset and sunrise times and records the location. All registrations are automatically recorded onto an SD card and time, date and temperature stamped.

2.5 Survey limitations

Static detector 4 failed to record bat activity due to technical / file corruption issues. However, a further three static detectors were deployed onsite exceeding the recommended number of static detectors required for a site with moderate suitability for bats (Table 8.3 of the Bat Survey



Guidelines). The static detector and transect surveys combined ensured that all suitable habitat onsite was surveyed to determine its importance with regards to bats.

Static detector 1 only recorded two days in September, however a minimum of five nights of data was collected during the remaining months. Also, a further two static detectors were deployed onsite which satisfies the survey requirements outlined in Table 8.3 of the Bat Survey Guidelines.

No dawn transect surveys were undertaken during the survey period. However, the static detectors were deployed throughout the night and the results of these surveys are considered to be a good representation of the bat activity and species present within the proposed development site.

Due to the overall amount of data gathered during the transect and static detector surveys, collected over the majority of the active bat season, it is considered that the results present a good representation of the bat activity within the proposed development site. The above limitations are therefore not considered to be significant, as robust conclusions and appropriate recommendations can still be based on the data.



3 RESULTS

3.1 Desk study

The protected species records search highlighted records of the following bat species within 2km of the site:

- Brandt's bat *Myotis brandtii*
- Whiskered bat *Myotis mystacinus*
- Lesser horseshoe *Rhinolophus hipposideros*
- Daubenton's bat
- Noctule
- Natterer's bat *Myotis nattereri*
- BLE bat
- Common pipistrelle
- Soprano pipistrelle
- Other bats only identified to genus level for *Myotis*, *Plecotus* and *Pipistrellus* sp., as well as unidentified bat species.

The closest roost record is located approximately 330m west of the site and details approximately 30 suspected *Myotis* sp. droppings in a bat box. Field records of common pipistrelle, soprano pipistrelle, BLE, noctule, Natterer's, whiskered / Brandt's, Daubenton's and lesser horseshoe were recorded from a land parcel immediately adjacent to the north-west of the site in 2020.

3.2 Habitat assessment

Plot 3A is found at the north-eastern edge of Wrexham Industrial Estate to the east of the city of Wrexham. Habitats within the development boundary include semi-improved grassland, continuous scrub, broadleaved semi-natural woodland, scattered scrub and trees, tall ruderal vegetation, amenity grassland and six ponds of varying size. Rough semi-improved grassland and continuous scrub comprise the majority of the site area. There are two large areas of hardstanding, one towards the north-west corner of the site and another in the south-eastern corner. The proposed development involves the construction of three large industrial units with associated parking and an access road.

The local area consists of agricultural land to the north, east and south-east of the site, with the rest of Wrexham Industrial Estate to the south-west. Tree lines and hedgerows divide the fields in the nearby agricultural land, providing potential bat foraging and commuting habitat. A large number of ponds are present both in the industrial estate and agricultural land.

In the wider surrounding area, two golf courses are found to the immediate north-west of Wrexham Industrial Estate, featuring large numbers of trees. The town of Wrexham is found further to the west of the industrial estate, while agricultural land dominates in all other directions. Some small patches of woodland are found nearby, particularly to the south near the River Clywedog which joins the Dee to the south-east of the industrial estate.

In summary, Plot 3A provides largely moderate quality habitat for foraging and commuting bats, with smaller areas of high-quality habitat in the form of the woodland and ponds, and low-quality habitat in the form of hardstanding and amenity grassland. The presence of the many ponds and areas of rough grassland, scrub, woodland, and scattered mature trees both



within the site and in the local area provide foraging and commuting opportunities, whilst roosting opportunities are also potentially available from nearby residential and agricultural buildings and mature trees.

3.3 Transect surveys

A minimum of five bat species were recorded during the transect surveys conducted between April and October 2022: common pipistrelle, soprano pipistrelle, noctule, Daubenton's and a *Myotis* sp.

Moderate levels of bat activity were recorded during the surveys with the majority of bats recorded being soprano pipistrelles (approximately 63% of all transect recordings). Common pipistrelles accounted for approximately 17% of all transect recordings. Noctule (12%) and *Myotis* sp. / Daubenton's (8%) bats were recorded to a lesser extent.

Across all species, the majority of activity was recorded in April (approximately 22% of all transect recordings), July (approximately 24% on 13th and 12% on 19th of all transect recordings), and September (approximately 20% of all transect recordings). Peak activity levels for individual species varied across the season:

- Common pipistrelle activity peaked in July with approximately 30% and 20% of all common pipistrelle data recorded on 13th and 20th July respectively.
- Soprano pipistrelle activity peaked in April, July and September with approximately 31%, 21% and 19% of all soprano pipistrelle data recorded respectively.
- Noctule activity peaked in July with approximately 50% and 31% of all noctule data recorded on 13th and 20th July respectively.
- *Myotis* sp. activity peaked in September with approximately 82% of all *Myotis* sp. data recorded. Most of the recordings are from the stand of woodland by the pond at the south-central section of the site; based on the sonograms it's considered that the *Myotis* species recorded in this location is Daubenton's.

In general bat activity was concentrated along the woodland edge, tree lines and lines of scrub along the site / field boundaries, with the woodland and pond in the south-central section of site being a site of particularly high activity.

The transect route has been mapped in Appendix 1 – Site plan. Further details of the transect survey results can be found in Appendix 3 – Transect survey data and Appendix 4 – Heat maps.

3.4 Static detector monitoring surveys

A minimum of five bat species were recorded during the static detector surveys conducted between April and October 2022: common pipistrelle, soprano pipistrelle, BLE, noctule and *Myotis* sp.

Moderate levels of bat activity were recorded during the surveys with common pipistrelle, soprano pipistrelle and *Myotis* sp accounting for 34%, 24% and 37% of all static detector recordings respectively. Noctule (5%) and BLE (0.2%) bats were recorded to a lesser extent.

Based on the average number of recordings per month, across all species, the majority of activity was recorded in April (approximately 21% of all static detector recordings), May



(approximately 31% of all static detector recordings), and July (approximately 20% of all static detector recordings).

Static detector 1 recorded approximately 5% of all static detector recordings, significantly lower than Static detectors 2 and 3 (68% and 27% respectively). Static 1 recorded lower activity overall than Statics 2 and 3, likely due to being subject to light and noise disturbance owing to its proximity to a road and neighbouring industrial sites. Common pipistrelles accounted for the majority of activity at Static detectors 1 and 3 (67% and 60% respectively). *Myotis* sp. accounted for the majority of activity at Static detector 2 (48%), followed by soprano (30%) and common (21%) pipistrelles.

Further details of the static detector survey results can be found in Appendix 5 – Static detector monitoring survey data.



4 EVALUATION AND RECOMMENDATIONS

4.1 Evaluation of results

Across the transect and static detector surveys, a minimum of six species of bat were recorded: common pipistrelle, soprano pipistrelle, BLE, noctule, Daubenton's and *Myotis* sp.

Overall, moderate levels of bat activity were recorded during the surveys, with bats exhibiting foraging and commuting behaviours. Bat activity was recorded across the entire site but was generally highest along the woodland, tree lines, hedgerows and lines of scrub along the site and field boundaries. The woodland and tree lines associated with the ponds in the centre of the site provided a hotspot of activity. These results are to be expected as these linear corridors provide good commuting routes that connect the site to larger areas of foraging habitat off-site. Furthermore, these features, particularly those associated with aquatic features, will support good sources of invertebrate prey in addition to the cover and linear features that they provide for commuting bats.

Common pipistrelles accounted for 17% of the transect survey data and 34% of the static detector data. Common pipistrelles were frequently recorded by all three static detectors. Similar numbers of recordings were collected from Static 2 and 3 with common pipistrelles recorded utilising the majority of habitats on site. Common pipistrelles accounted for the majority of data from Static 1, this is likely to be because they are known to tolerate higher levels of disturbance and Static 1 was subject to light and noise disturbance from the adjacent road and industrial estate.

Soprano pipistrelles accounted for 63% of the transect survey data and 24% of the static detector data. Soprano pipistrelle activity was higher during the transect surveys; this is potentially due to the transects capturing higher levels of data from soprano pipistrelle bats using the southern half of the site around the ponds. Significantly higher levels of soprano pipistrelle activity were recorded on Static 2 (in comparison to Statics 1 and 3). Static 2 was located along a linear corridor which runs through the centre of site connecting higher quality habitats, such as woodland and ponds.

Myotis sp. accounted for 8% of the transect survey data and 37% of the static detector data. *Myotis* sp. activity was significantly higher during the static detector surveys compared to the transect surveys. This may indicate that the roosts of the *Myotis* bats using the site are located a greater distance from the site than those of the *Pipistrellus* bats, resulting in *Myotis* not being present on the site around the dusk emergence period. *Pipistrellus* species are also more likely to emerge earlier than *Myotis* species and are therefore more frequently detected during transect surveys. Significantly higher levels of *Myotis* sp. activity were recorded on Static 2 (in comparison to Statics 1 and 3). As with soprano pipistrelles, *Myotis* sp. are likely to be using the linear corridor which runs through the centre of site providing suitable foraging and commuting habitats.

Noctule accounted for 12% of the transect survey data and 5% of the static detector data. Noctule were recorded across site will no affinity to a specific habitat.

BLE accounted for 0.2% of the static detector data. The low number of BLE recordings in comparison to other species may be due to their tendency to avoid echolocating, their tendency to have quieter echolocation calls or may simply be due to a lower number of BLE using the survey area.



The seasonal usage of the site based on the static data generally follows the anticipated trend. Bat activity increased April to May, as would be expected due to bats reducing the amount of time spent in torpor and more time feeding as the temperature increases. High levels of bat activity were also recorded in June and July before a marked decline in activity August onwards as bats moved towards mating sites. The transect surveys also recorded bat activity peaking in September. An increase in activity in September is likely due to the start of the mating period and bats feeding as regularly as possible to build up fat stores prior to the winter hibernation period. Bats were not observed swarming during the surveys.

4.2 Impacts

The loss of dense scrub, hedgerows, ponds, small areas of woodland and semi-improved grassland on site will result in a reduction of foraging opportunities for bats. This impact is reduced however due to the proposed retention of large areas of high-quality habitat on site including the unimproved grassland, areas of woodland, ponds, ditches, dense scrub, open mosaic habitat and hedgerows. The impact on commuting routes is limited as all linear features such as trees, watercourses, vegetated ditches and hedgerows at the site boundaries are being retained, in addition to a 10m buffer zone to provide an ecological corridor.

In terms of operational impacts, habitats could be degraded or fragmented as a result of the development via increased human activity and associated recreational pressures, as well as light disturbance, which could deter bats from using commuting corridors and foraging beats.

4.3 Mitigation and recommendations

UES has been involved in the design of the site masterplan from an early stage. The development proposals have been designed to incorporate linear features where possible and a focus has been maintained during the development of the site masterplan of providing connecting corridors across the development site.

In addition to the habitats retained onsite, the proposals include the retention of a significant area of habitat within the southern section of the site and an additional area within the eastern section of the site, hereby referred to as the ecological compensation area. This ecological compensation area will be subject to enhancement measures and managed as a community nature reserve, with access granted to the public or special interest groups by permit.

To compensate for the loss of areas of foraging habitat, the ecological compensation area within the eastern section of the site will be enhanced to provide higher quality foraging opportunities through woodland planting, pond creation, conversion of agricultural grassland to both species-rich wildflower grassland and tussocky rough grassland and the creation of a small orchard area. The loss of the ponds on site will be compensated for by the creation of thirteen new ponds in the compensation area in the east of the site. Ponds provide excellent foraging opportunities for bats and the inclusion of marginal vegetation bordering the ponds will encourage invertebrate populations, in turn providing foraging opportunities for bats.

In addition to the ponds created within the ecological compensation area, two ponds / shallow ephemeral scrapes and three swales will also be created within the open mosaic habitat within the southern section of the site.

Connectivity between retained habitats on site, the ecological compensation area and offsite habitats will be retained through the retention of habitat corridors at the site boundaries,



including the retention of all ditches, the watercourse and a 10m buffer zone of dense scrub or wildflower grassland.

External lighting guidance has been provided (see Appendix 7 – External lighting guidance) which should be used to create a bat friendly lighting plan to ensure that light spillage is minimised where possible. The scheme should be designed to avoid overspill onto the ecological corridors at the site boundaries and any retained areas of high-quality bat foraging or commuting habitat including the entire ecological compensation area and retained ponds, woodland, dense scrub, the unimproved grassland and hedgerows. The finalised lighting strategy should be submitted to and agreed with the LPA prior to the commencement of works.



5 CONCLUSION

The site provides mostly moderate quality habitat for foraging and commuting bats in the form of scrub and rough grassland, with smaller areas of high-quality habitat (small stands of woodland and ponds) and low-quality habitat (hardstanding and amenity grassland).

During the surveys, a minimum of six species of bat were recorded: common pipistrelle, soprano pipistrelle, BLE, noctule, Daubenton's and a *Myotis* species. Of these, common and soprano pipistrelles and *Myotis sp.* were the most abundant. Overall, moderate levels of bat activity were recorded during the surveys, with bats exhibiting foraging and commuting behaviours. Bat activity was recorded across the entire site but was generally highest along the woodland, tree lines, hedgerows and lines of scrub along the site and field boundaries. The woodland and tree lines associated with the ponds in the centre of the site provided a hotspot of activity.

The proposed level of habitat retention, creation and enhancement including the retention of wildlife corridors at the site boundaries will ensure that connectivity to offsite habitats and sufficient foraging opportunities will remain available for bats currently using the site. Furthermore, the ecological compensation area within the eastern section of the site will be enhanced to provide higher quality foraging opportunities for bats.

The implementation of a wildlife friendly lighting plan will reduce the potential operational impacts of the development on bats to the lowest practicable level and will ensure that suitable foraging habitats and commuting corridors across the site will remain undisturbed and functional.



6 REFERENCES

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Department for Communities and Local Government (2012). *National Planning Policy Framework*.

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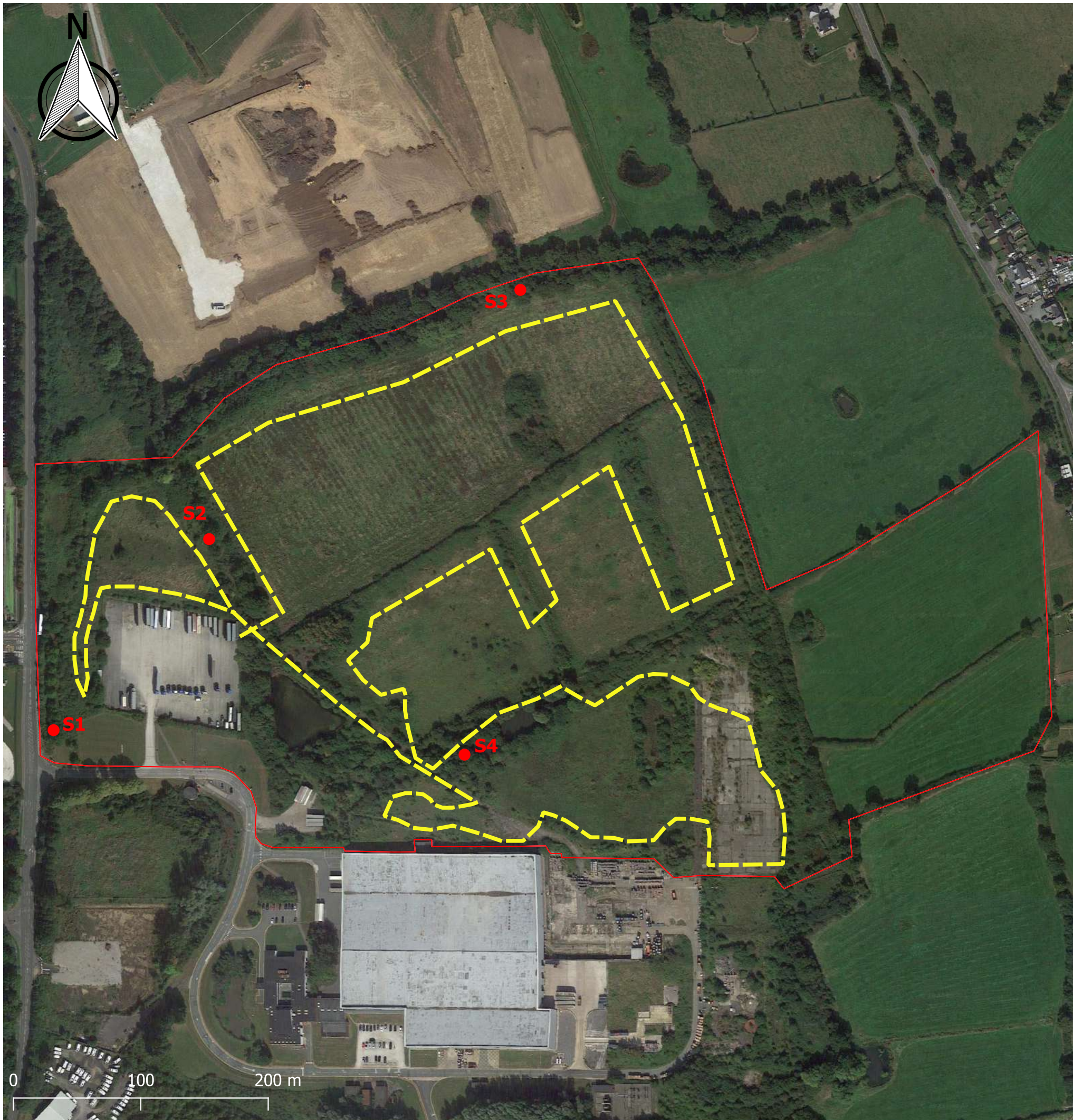
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Mitchell-Jones, A.J. & McLeish, A.P. (2004). *The Bat Workers Manual*. (3rd ed.) JNCC



APPENDICES

Appendix 1 – Site plan



Preliminary Ecological Appraisal

**Site: Plot 3A, Wrexham
Industrial Estate**
NGR: SJ 39272 50416
Author: Robert Mooney
Date: 17/02/2023



KEY:

- Site Boundary
- - - Transect route
- Static detector

Map data © 2022 Google, Imagery © 2022 Google

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Appendix 2 – Aerial photographs



Plot 3A, Wrexham Industrial Estate

Close aerial photograph

— Survey boundary



Plot 3A, Wrexham Industrial Estate

Wide aerial photograph

 Site location



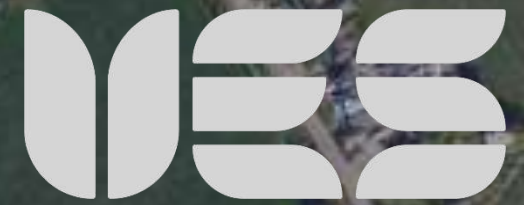


Appendix 3 – Transect survey data

TRANSECT SURVEY DATA				
Date	Species	Number of recordings	Number of calls	Total number of calls
13/04/2022	<i>Pipistrellus pipistrellus</i>	6	92	934
	<i>Pipistrellus pygmaeus</i>	76	836	
	<i>Nyctalus noctula</i>	3	6	
19/05/2022	<i>Pipistrellus pipistrellus</i>	4	28	301
	<i>Pipistrellus pygmaeus</i>	19	269	
	<i>Nyctalus noctula</i>	1	4	
29/06/2022	<i>Pipistrellus pipistrellus</i>	8	50	338
	<i>Pipistrellus pygmaeus</i>	12	269	
	<i>Myotis sp.</i>	3	10	
	<i>Nyctalus noctula</i>	2	9	
13/07/2022	<i>Pipistrellus pipistrellus</i>	20	260	1099
	<i>Pipistrellus pygmaeus</i>	51	520	
	<i>Nyctalus noctula</i>	24	319	
19/07/2022	<i>Pipistrellus pipistrellus</i>	13	278	840
	<i>Pipistrellus pygmaeus</i>	16	345	
	<i>Myotis sp.</i>	3	47	
	<i>Nyctalus noctula</i>	15	170	
17/08/2022	<i>Pipistrellus pipistrellus</i>	8	94	436
	<i>Pipistrellus pygmaeus</i>	19	320	
	<i>Nyctalus noctula</i>	3	22	
14/09/2022	<i>Pipistrellus pipistrellus</i>	7	193	1134
	<i>Pipistrellus pygmaeus</i>	46	894	
	<i>Myotis sp.</i>	27	47	
19/10/2022	<i>Pipistrellus pygmaeus</i>	5	31	31



Appendix 4 – Heat maps



**Plot 3A, Wrexham Industrial
Estate**

Bat activity heatmap

Survey date: 13/04/2022





**Plot 3A, Wrexham Industrial
Estate**

Bat activity heatmap

Survey date: 19/05/2022



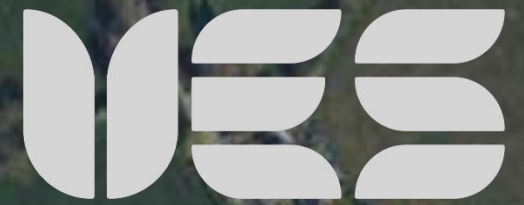


**Plot 3A, Wrexham Industrial
Estate**

Bat activity heatmap

Survey date: 29/06/2022





**Plot 3A, Wrexham Industrial
Estate**

Bat activity heatmap

Survey date: 13/07/2022





**Plot 3A, Wrexham Industrial
Estate**

Bat activity heatmap

Survey date: 14/09/2022





Appendix 5 – Static detector monitoring survey data

STATIC DETECTOR MONITORING SURVEYS

Species	Total number of recordings over survey period	Average number of recordings per night over survey period	Percentage of total number of recordings
<i>Pipistrellus pipistrellus</i>	8410.00	112.36	33.73
<i>Pipistrellus pygmaeus</i>	6129.00	88.68	24.58
<i>Myotis sp.</i>	9157.00	133.63	36.73
<i>Plecotus auritus</i>	47.00	0.61	0.19
<i>Nyctalus noctula</i>	1189.00	15.84	4.77
All species	24932.00	644.09	100.00

Static 1 Total			
<i>Pipistrellus pipistrellus</i>	915.00	12.04	66.79
<i>Pipistrellus pygmaeus</i>	265.00	3.49	19.34
<i>Myotis sp.</i>	26.00	0.34	1.90
<i>Plecotus auritus</i>	14.00	0.18	1.02
<i>Nyctalus noctula</i>	150.00	1.97	10.95
All species	1370.00	18.03	100.00

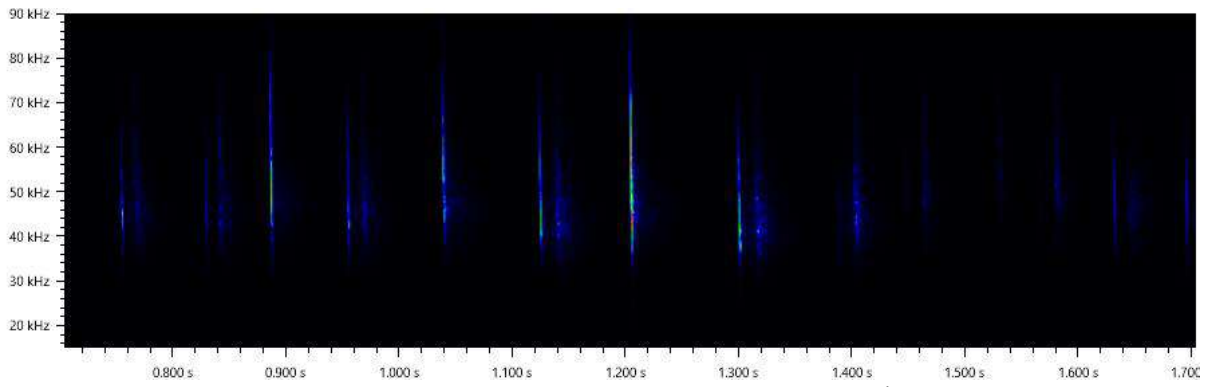
Static 2 Total			
<i>Pipistrellus pipistrellus</i>	3483.00	51.99	20.58
<i>Pipistrellus pygmaeus</i>	5053.00	75.42	29.85
<i>Myotis sp.</i>	8089.00	120.73	47.79
<i>Plecotus auritus</i>	10.00	0.15	0.06
<i>Nyctalus noctula</i>	292.00	4.87	1.73
All species	16927.00	253.15	100.00

Static 3 Total			
<i>Pipistrellus pipistrellus</i>	4012.00	48.34	60.47
<i>Pipistrellus pygmaeus</i>	811.00	9.77	12.22
<i>Myotis sp.</i>	1042.00	12.55	15.70
<i>Plecotus auritus</i>	23.00	0.28	0.35
<i>Nyctalus noctula</i>	747.00	9.00	11.26
All species	6635.00	372.91	100.00

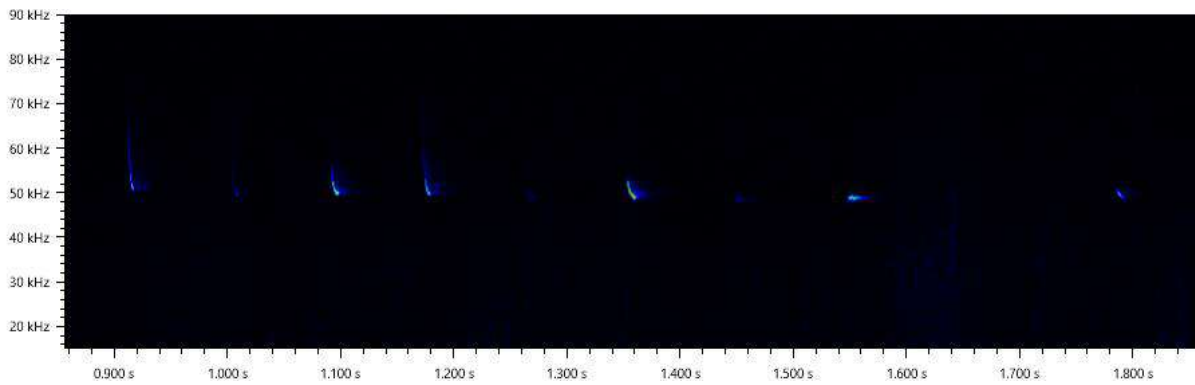
Average number of recordings per night for each month				
Month	Static 1	Static 2	Static 3	Total
April	13.40	122.70	393.40	529.50
May	62.10	685.60	47.60	795.30
June	8.90	310.40	34.80	354.10
July	7.80	478.40	33.80	520.00
August	7.60	139.40	24.20	171.20
September	10.00	111.00	35.20	156.20
October	3.10	4.50	15.20	22.80



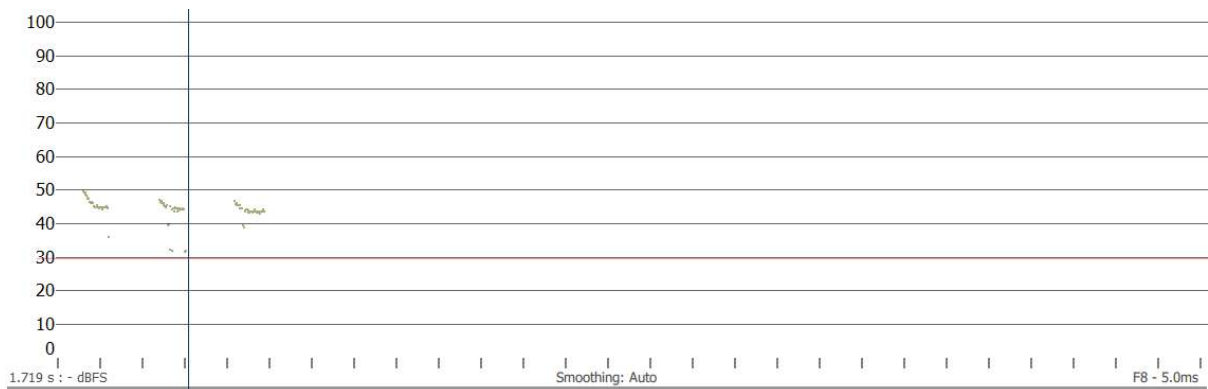
Appendix 6 – Sonograms



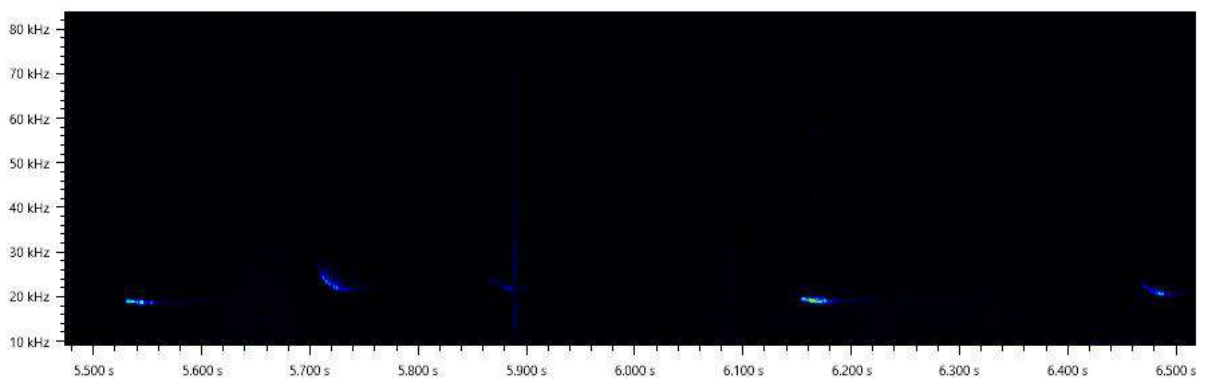
Sonogram 1 – *Myotis* sp. echolocation calls recorded at 03:20 on 12th April 2022.



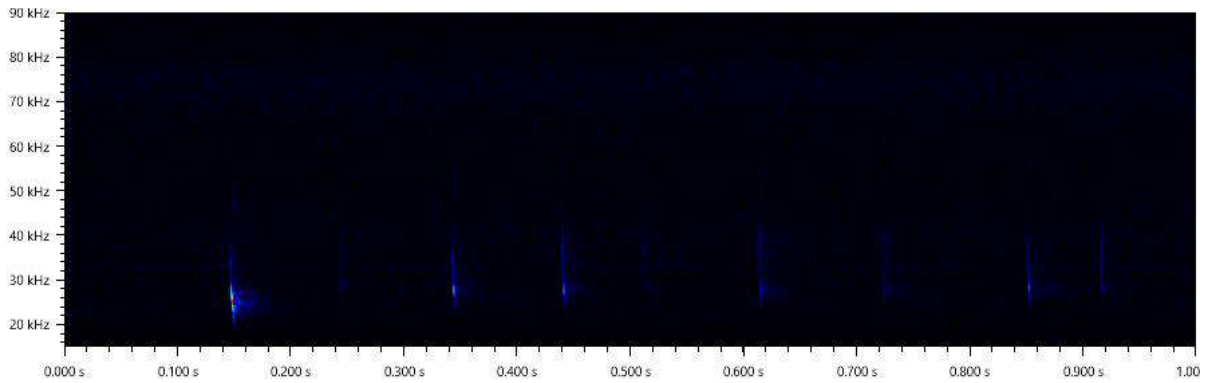
Sonogram 2 – Commuting common pipistrelle calls recorded at 22:11 on 19th May 2022.



Sonogram 3 – Common pipistrelle echolocation calls recorded at 00:22 on 24th June 2022.



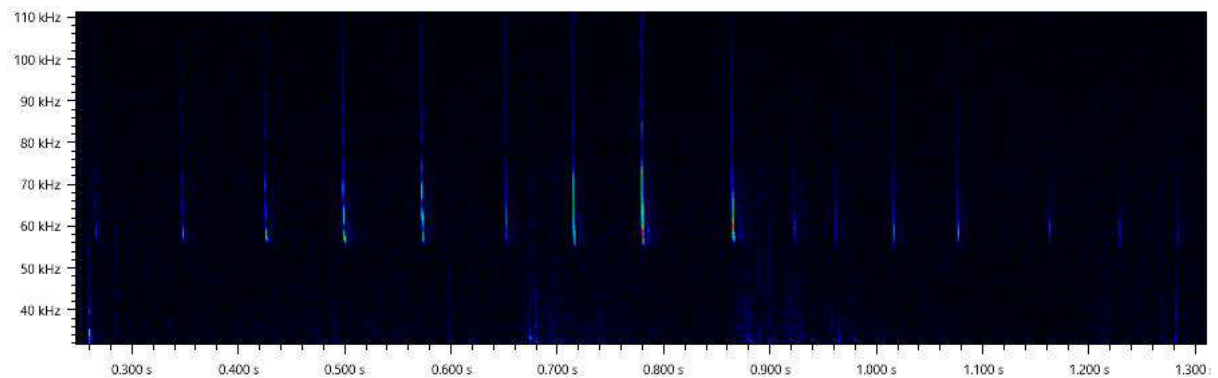
Sonogram 4 – Noctule echolocation calls recorded at 22:00 on 11th July 2022.



Sonogram 5 – Brown long-eared echolocation calls recorded at 23:34 on 11th August 2022.



Sonogram 6 – *Myotis* sp. echolocation calls recorded at 00:49 on 3rd September 2022.



Sonogram 7 – Soprano pipistrelle echolocation calls recorded at 19:30 on 19th October 2022.



Appendix 7 – External lighting guidance

Lighting scheme in relation to bats

The two most important features of street and security lighting with respect to bats are:

1. The UV component. Low or zero UV installations are preferred to reduce attraction of insects to lighting and therefore to reduce the attraction of foraging bats to these areas.
2. Restriction of the area illuminated. Lighting must be shielded to maintain dark areas, particularly above lighting installations, and in many cases, land adjacent to the areas illuminated. The aim is to maintain dark commuting corridors for foraging and commuting bats. Bats avoid well lit areas, and these create barriers for flying bats between roosting and feeding areas.

UV characteristics:

Low

- Low pressure Sodium Lamps (SOX) emit a minimal UV component.
- High pressure Sodium Lamps (SON) emit a small UV component.
- White SON, though low in UV, emit more than regular SON.

High

- Metal Halide lamps emit more UV than SON lamps, but less than Mercury lamps
- Mercury lamps (MBF) emit a high UV component.
- Tungsten Halogen, if unfiltered, emit a high UV component
- Compact Fluorescent (CFL), if unfiltered, emit a high UV component.
- Variable
- Light Emitting Diodes (LEDs) have a range of UV outputs. Variants are available with low or minimal UV output.
- Glass glazing and UV filtering lenses are recommended to reduce UV output.

Street lighting

- Low-pressure sodium or high-pressure sodium must be used instead of mercury or metal halide lamps. LEDs must be specified as low UV. Tungsten halogen and CFL sources must have appropriate UV filtering to reduce UV to low levels.
- Lighting must be directed to where it is needed and light spillage avoided. Hoods must be used on each lamp to direct light and contain spillage. Light leakage into hedgerows and trees must be avoided.
- If possible, the times during which the lighting is on overnight must be limited to provide some dark periods. If the light is fitted with a timer this must be adjusted to reduce the amount of 'lit time' and provide dark periods.

Security and domestic external lighting

The above recommendations concerning UV output and direction apply. In addition:

- Lighting should illuminate only ground floor areas. Light should not leak upwards to illuminate first floor and higher levels.
- Lamps of greater than 2000 lumens (150 W) must not be used.
- Movement or similar sensors must be used. They must be carefully installed and aimed, to reduce the amount of time a light is on each night.
- Light must illuminate only the immediate area required, by using as sharp a downward angle as possible. Light must not be directed at or close to bat roost access points or flight paths from the roost. A shield or hood can be used to control or restrict the area to be lit.
- Wide angle illumination must be avoided as this will be more disturbing to foraging and commuting bats as well as people and other wildlife.
- Lighting must not illuminate any bat bricks and boxes placed on buildings, trees or other nearby locations.



Appendix 8 – Statutory and planning context

Ecological assessments

Ecological assessments play an important part within the planning context; they include an initial assessment which highlights any specific interests of a site. From the initial site assessment, the surveyor assesses the suitability of habitats within the site to support protected species and makes recommendations for further survey works if required. The following paragraphs provide a brief interpretation of the legislative protection that is relevant to the findings of this report.

Bats

In the United Kingdom, all species of bat and their roosts are afforded full protection under the Wildlife and Countryside Act 1981 (as amended) and the Conservation of Habitats and Species Regulations 2017 (known as the “Habitats Regulations”). The Wildlife and Countryside Act is the domestic implementation of the Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention) and was amended by the Countryside and Rights of Way Act 2000. This makes it an offence to:

- Deliberately, intentionally or recklessly kill, injure or capture a bat
- Deliberately, intentionally or recklessly disturb a bat while it is occupying a structure or place that it uses for shelter or protection
- Deliberately, intentionally or recklessly damage, destroy or obstruct access to any place that a bat uses for shelter or protection (even if the bat is not present at the time)
- Keep, transport, sell or exchange, or offer for sale or exchange any live or dead bat, any part of a bat or anything derived from a bat

Under UK law, a bat roost is *any structure or place which any wild [bat] ... uses for shelter or protection*. As bats often reuse the same roosts, legal opinion is that a roost is protected whether or not the bats are present at the time of the activity taking place.

Penalties for offences include fines of up to £5000, plus up to six months imprisonment, for each offence committed.

If an activity is likely to result in any of the above offences, a licence can be applied for to derogate from the protection afforded. These licences must provide appropriate mitigation and are issued by National Resources Wales (NRW).

The Natural Environment and Rural Communities (NERC) Act 2006 lists the following bat species as species of principle importance under Section 41:

- Barbastelle *Barbastella barbastellus*
- Bechstein's bat *Myotis bechsteinii*
- Noctule *Nyctalus noctula*
- Soprano pipistrelle *Pipistrellus pygmaeus*
- Brown long-eared bat *Plecotus auritus*
- Greater horseshoe *Rhinolophus ferrumequinum*
- Lesser horseshoe *Rhinolophus hipposideros*

Section 40 requires every public body in the exercising of its functions ‘have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity’ (all biodiversity and not just section 41 species and habitats); therefore making these bats a material consideration in the planning process and requiring a detailed ecological bat survey before planning permission can be granted.

Planning Policy

National planning guidance is issued in the form of Planning Policy Wales (PPW - 2018). The most relevant sections are included in Chapter 6: Distinctive and Natural Places. This chapter details the policies on issues such as the protection of trees, woodlands, species, and designated sites. The document is free and available to view online.