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## A487 New Dyfi Bridge

Environmental Statement -  
Volume 3: Appendix 9.6

### Bat Survey Report

Final Issue | 15 July 2016



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# 1 Introduction

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## 1.1 Background

Ove Arup and Partners Ltd was commissioned by Alun Griffiths (Contractors) Ltd to undertake ecological surveys to inform an Environmental Impact Assessment (EIA) of the proposed A487 New Dyfi Bridge scheme on land to the north of Machynlleth, Mid-Wales, located at National Grid Reference SH747017.

The proposed A487 New Dyfi Bridge scheme (The Scheme) consists of a new viaduct structure across the floodplain and a river bridge to cross the Afon Dyfi approximately 480 m upstream of the existing Pont-ar-Ddyfi. The length of the Scheme is approximately 1100 m with approximately 720 m being on structures.

This report summarises the findings of a desk study on bats near to and on site and also on the bat surveys undertaken on site. The survey objectives were:

- To assess the potential of trees and buildings within the Study Area to support bat roosts;
- To identify the range of bat species present within the Study Area;
- To identify the frequency and levels of bat activity within the Study Area, where possible also recording behaviour;
- To identify key foraging areas and, or flight corridors of importance to bats within the Study Area.

## 1.2 Description of the Scheme

The Scheme consists of a new section of single carriageway road. The typical carriageway width would be 9.3 m (excluding verges), which would consist of two 3.65 m wide lanes, with a 1 m hard strip on either side of the carriageway.

For most of its route, the Scheme will be elevated across a generally flat floodplain and at its highest point (on the river bridge) it will be some 10-11 m above ground level.

At the northern end of the scheme the alignment ties into the existing A487 in the area of the completed Ffridd Gate Improvement and the existing A487 will be renumbered as the A493, joining the new A487 alignment via a ghost island 'tee' junction.

The Scheme crosses the River Dyfi and floodplain on a structure, connecting via a short embankment to the existing A487 north of the Cambrian Line Railway Bridge over the A487 on the edge of Machynlleth. A simple priority junction is provided at the southern end of the scheme connecting the proposed works with the existing A487.

The existing A487 will be de-trunked between the two tie in points with the new scheme. The Pont-ar-Ddyfi and the section of the existing A487 to the south of the river will be restricted to Non-Motorised Users (NMUs) only.



### 1.3 Relevant Legislation

All bat species within the UK are protected under the Conservation of Habitats and Species Regulations 2010 (as amended) as European Protected Species. Regulation 41 makes it an offence to:

- a) Deliberately capture, injure or kill any wild animal of an EPS;
- b) Deliberately disturb wild animals of such a species;
- c) Deliberately take or destroy the eggs of such a species;
- d) Damage or destroy a breeding site or resting place of such an animal.

Disturbance in the context of the offences above is disturbance which is likely to impair the ability of animals to survive, to breed or reproduce, to nurture their young, to hibernate, to migrate; or to affect significantly the local distribution of the species.

Licences can be granted by the relevant Statutory Nature Conservation Organisation for developments (sometime referred to as EPS Licences or Derogation Licences) providing the purposes of the licence is for “preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment”.

The Wildlife and Countryside Act 1981 (as amended) provides further protection to bat species.

Several bat species are also listed as Species of Principal Importance for the Conservation of Biodiversity (Published in response to Section 42 of the Natural Environment and Rural Communities Act 2006 and known as Section 42 Species) and on local Biodiversity Action Plans. The NERC Act 2006 includes a duty on all public authorities to have regard to the conserving of biodiversity in the exercise of their functions. The Environment (Wales) Act 2016 places a further duty on public bodies to conserve and enhance biodiversity in the exercise of their functions. This duty includes consideration of the resilience of ecosystems in terms of their diversity, connectivity, adaptability, scale and condition, The Act also reinforces the duties in relation to the lists of species and habitats of importance and duties to conserve and enhance those species and habitats.

## 2 Survey Methodology

A full desk study has been undertaken and is reported in the Desk Study and Extended Phase 1 Survey Report<sup>1</sup>. The bat surveys have been led by Pete Wells, a bat licence holder with over 25 years' experience in bat conservation, surveys and assessment.

### 2.1 Assessment of Roost Potential

A visual inspection of the trees and buildings within the Study Area and immediately adjacent areas of contiguous habitat was made to assess their potential to support bat roosts. This bat assessment was carried following guidance set out in the Good Practice Guidelines<sup>2</sup>.

Trees within the Study Area were assessed for the presence of natural holes, woodpecker holes, cracks and splits, loose bark and cavities. The presence of such features were considered in determining the potential for bat roosts to be present and assigning trees using the criteria in Table 1 below.

Table 1 Categorisation of the potential for bat roosts within trees and buildings.

Suitability	Description Roosting Habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation). A tree of sufficient size and age to contain potential roost features but with none seen from the ground or features seen with only very limited roosting potential.
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protected, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).
High	A structure or tree with one or more potential roost sites that are obviously more suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.

Buildings were also categorised as having negligible, moderate or high suitability for bats depending on the construction of the building and the presence of potential bat access points ascertained by external inspections if necessary using close focusing binoculars/monoculars.

<sup>1</sup> OAPL. (2015). A487 New Dyfi Bridge; Desk Study and Extended Phase 1 Report. Cardiff: Ove Arup & Partners Ltd.

<sup>2</sup> Collins, J. (2016). Bat Surveys: Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn.). The Bat Conservation Trust, London.

During the surveys the following information in Table 2 on trees and buildings was also recorded using forms on tablet devices along with photographs.

Table 2 Information capture during preliminary roost assessments

Information Recorded for Trees	Information Recorded for Buildings
GPS location	GPS Location
Survey date	Survey Date
Species	Building Type
Height	Age
Diameter at breast height	Height of eaves
Suitable features	Pitch height at gable ends
Signs of bat use	Roof aspect
	Roof complexity
	Roof covering
	Suitable features
	Signs of bat use

This preliminary assessment will be used to scope the requirement of more detailed assessment and inspection surveys using inspection cameras. These were undertaken on eleven trees within 60m of the scheme footprint during July 2016.

## 2.2 Walked Activity Transect Surveys

A walked activity transect was also undertaken in line with BCT best practice guidelines. Two surveyors undertook each transect using a combination of Batbox Duet, Batlogger and EM3 bat detectors with paired GPS receivers. The transect route is shown on Figure 1. The Study Area is considered to be a large site and habitat quality for bats is considered to be high. Survey effort has been dictated by Box 7.2 of the Bat Conservation Trust guidance (2<sup>nd</sup> Edition<sup>3</sup>).

Transect survey work was undertaken once per month from July to October 2015, and from April to June 2016.

Each transect commenced at the time of sunset and continue for at least two hours, targeting areas of potential foraging and commuting habitat. During transects all bats were recorded and their location recorded on mobile tablets with GPS receivers along with notes on behaviour (i.e. whether bats were commuting, foraging or social calling) where possible. The dates of the transect surveys and weather conditions during the surveys are shown in Table 3 below.

Species identification was undertaken following the transects using a combination of different software packages designed for analysing and identifying bat calls, primarily Kaleidoscope Pro and BatExplorer software. Calls were also checked manually to ensure accuracy.

<sup>3</sup> Bat Conservation Trust guidance 2<sup>nd</sup> Edition was current at the time of start of the surveys in July 2015.



Table 3 Transect Survey Dates and Weather Conditions

Date	Temperature (°C)	Wind Speed (Bft)	Wind Direction	Cloud Cover (%)	Conditions	Notes
29.07.2015	18	2	NE	60	Dry	
18.08.2015	16	1	NE	70	Dry	
23.09.2015	15	1	NE		Drizzle	Light drizzle during second hour of survey
19.10.2015	13	1	NE	100	Showery	Rained for approximately 20mins during second hour of survey
14.04.2016	10	1	W	100	Dry	
03.05.2016	11	1	SW	75	Dry	
07.06.2016	13	2	SE	50	Dry	

## 2.3 Static Bat Activity Monitoring

In addition to the walked transects, static bat detectors were used to record bat activity over a five night period each month from July to October 2015 and from April to June 2016. The Static Detector Activity Surveys were undertaken in accordance with the BCT Good Practice Survey Guidelines (3rd Edition).

Three locations were selected on site in line with Good Practice Survey Guidelines (Locations 1 to 3 in Figure 1). The locations were chosen on the tree lined north bank of the Afon Dyfi and on two of the hedgerows which will be interrupted by the scheme, with the aim of identifying the relative importance of these corridors to inform the assessment of any impacts that might arise from severing of these features by the proposed development.

### 2.3.1 Data Collection

Wildlife Acoustic Song Meter 2 Ultrasonic Bat Detectors (SM2+ BAT) with SMX-U1 microphones were used to record bat activity for five consecutive nights each month from July to October 2015 and April to June 2016 for a large site with high habitat quality, in line with the recommended effort within the Good Practice Survey Guidelines.

The detectors were set up with the setting shown in Table 4 below to record between 18:00 and 07.00 each night.

Table 4 SM2 + BAT Settings used during data collection

Parameter	Setting
2.5V Microphone Bias	Off
Low noise filter	1kHz
Microphone pre-amp gain	12dB



Sample rate	354800
Monitoring schedule	Daily from 18:00
Monitoring duration	13hrs

The microphones used with the detectors during the course of the surveys were regularly checked and calibrated using a Wildlife Acoustics Calibration Unit to ensure that they were functioning properly. Microphones that were found not to be shown a significant response to the output of the calibration unit were replaced.

## 2.4 Data Processing and Analysis

The detectors recorded bat activity in Wildlife Acoustics Compression files (.wac). These were downloaded from the detectors and processed using Kaleidoscope Pro Software to produce audio files (.wav) and zero crossing files. The processing also included the automatic identification of bat species based on the classifiers developed by Wildlife Acoustics (Bats of Europe 3.0.0).

The files produced by the processing were then reviewed to ensure correct identification of species and to identify where possible the bat species for any calls which could not be recognised by the software. All calls identified as being either common pipistrelle (*Pipistrellus pipistrellus*) or soprano pipistrelle (*P. pygmaeus*) were not reviewed except where high levels of insect noise had been recorded leading to uncertainty over the accuracy of identification. All other calls were checked either by Pete Wells, Catherine Jones (a bat specialist with over nine years of experience in bat work and a holder of a Natural England bat survey licence (Level 2)) or Tom Shelley (a bat specialist with over eight years of experience in bat work and a holder of a Natural England bat survey licence).

The number of files (sound clips) recorded by the detectors each night was taken as a proxy value to the number of bat passes. This was then used to calculate a Bat Activity Index (BAI) for each species at each location during each session. The BAI was calculated on the first five nights recorded each month. In some cases the detector also recorded data on the sixth and seventh nights. These additional nights have been excluded from the BAI as it could not be certain that the detector had recorded data for the entire night. However where rarer or more notable species were recorded on these additional nights, they have been included to ensure their representation within the data in terms of species diversity.

The average BAIs for all species (sum of individual BAIs) at each location has been calculated over the active months from July – September 2015 and April – June 2016.

The time of recording of the first bat of each species, each night, and time of last recording were also compared to sunset and sunrise times obtained using Anasun software to infer the potential proximity of roost sites.

## 2.5 Active Techniques Survey

Initial results from static detectors identified significant activity of *Myotis* bats at Location 1 on the northern river bank. In order to establish the species present and gather further information on the usage of the area by bats, a survey using mist nets and a harp trap was undertaken in May 2016.

The trapping was led by Richard Crompton (CEnv, MCIEEM, FLS) of Wildwood Ecology under a NRW licence and comprised the use of a harp trap at the base of the bank on the north side of the Afon Dyfi, a triple height mist net located in the field to the north of Location 1 (situated between the trees on the river bank and the trees along the cycle path) and a mist net on the shingle bar on the southern side of the river. The nets and traps were in place for approximately five hours on the night of the 17<sup>th</sup> May 2016 during which time there were the occasional heavy showers and force 3 south westerly winds.

In addition, while the nets were in place direct observation were made of bat behaviour, including flight height.

## 2.6 Limitations and Assumptions

Given the number of bat passes recorded (in excess of 30,000 from static detectors) *Myotis* bat calls have been differentiated into two groups; the larger *Myotis* group comprising Natterer's bat (*Myotis nattereri*) and Bechstein's bat (*M. bechsteini*), and the smaller *Myotis* group comprising the remaining species. It should be noted that calls within the larger *Myotis* group were checked for potential Bechstein's bat. This aggregation approach is not considered to be a limitation within the study given the similar behaviours and habitat requirements of these species with the exception of Bechstein's bat.

Due to the subjective nature of bat call analysis it is possible that other ecologists may differ in opinion on the identification of calls, however current reference works<sup>4</sup> have been used along with BatExplorer software which also includes species identification functions.

There is also the potential that some calls may be overlooked principally due to the fact that the automatic species identification systems cannot identify multiple species within the same sound clip. However, with the exception of files identified as common or soprano pipistrelle by the software, all other files have been checked and all species recorded within those files included within the results set out in this report.

Whilst effort was made to programme and undertake surveys during suitable weather conditions, the nature of the static activity monitoring surveys, undertaken over a five night recording session and including surveys in April and October, means that on some occasions these surveys included nights during which there were lower temperatures, periods of rainfall and strong winds.

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<sup>4</sup> Russ, J. (2012). *British Bat Calls: A Guide to Species Identification*. Exeter: Pelagic Publishing, and Middleton, N., Froud, A., & French, K. (2014). *Social Calls of the Bats of Britain and Ireland*. Exeter: Pelagic Publishing.

However the recordings provide an indication of bat activity levels across the site during these different weather conditions.

On some occasions issues with the static detectors meant less than five nights of data were collected. It is not clear why this occurred as all detectors were checked and new batteries installed before each monitoring session. This affected locations 1 and 3 during September 2015 and location 2 in August 2015. The bat activity indices for these locations in these sessions are based on the average activity over the number of nights that the detector was recording.

It should be stressed that the findings presented in this study represent those at the time of survey and reporting, and data collected from available sources. Ecological surveys are limited by factors which affect the presence of species, such as temporal weather conditions, migration patterns and behaviour.

Nevertheless, these surveys were conducted at the optimal survey periods. Every effort has been made to ensure that the findings of the study present as accurate an interpretation as possible of the status of bats within the Study Area.



## 3 Baseline Environment

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### 3.1 Desk Study Records

The desk study carried out for the project identified bat species recorded in the area include brown long-eared bat (*Plecotus auritus*), common pipistrelle, soprano pipistrelle, noctule bat (*Nyctalus noctula*), Daubenton's bat (*Myotis daubentonii*), Brandt's bat (*Myotis brandtii*), whiskered bat (*Myotis mystacinus*), greater horseshoe bat (*Rhinolophus ferrumequinum*) and lesser horseshoe bat (*Rhinolophus hipposideros*).

There are historic<sup>5</sup> records of bat roosts within the immediate vicinity of the scheme at Pont-ar-Ddyfi and 831m north near Ffridd gate. There is an historic record of a brown long-eared bat roost approximately 1.9km to the north of the scheme and a number of historic records between 1.9 – 4.2km from site at Gelligen Fawr, Pantperthog, Plas Llwyngwern and Garthgwynion, Glaspwll. There are numerous further records of bat roosts in the wider area around the Study Area.

There are also numerous records of bat activity in the area; brown long eared bat activity approximately 1.4-1.9km from site at Pant Lludw and Gelligen Fawr. There are recent records of noctules foraging approximately 1.4km from the Study Area along the A487 and at 3.6km south east at Coed Ty Gwyn. There are a number of records of Daubenton's bat activity along the Afon Dulais 1.4km south east of the site, and 4.5km north east at Llanwrin, and an historic record of whiskered bat 3.8km from site near Pennal. There are records of greater and lesser horseshoe bats at Plas Llwyngwern.

Further details of previous records of bats can be found in the Desk Study and Extended Phase 1 Report.

### 3.2 Field Surveys

#### 3.2.1 Preliminary Roost Assessments

##### 3.2.1.1 Buildings

Two buildings have been assessed within the Study Area for their potential to provide roosting opportunities for bats, including a house and a gauging station; the locations of these buildings are shown on Figure 2.

The Haulfryn property to the north of the Study Area was assessed externally only, and considered to have medium potential to support bat roosts. The building is considered to be approximately 100 years old and contains two storeys with a single ridge slate roof, with features such as gaps behind fascias, soffit boxes and potentially loose slates, providing access for bats to roost within these gaps.

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<sup>5</sup> Pre-2000 records.



The gauging station is located within the broadleaved woodland on the northern bank of the Afon Dyfi, and was assessed externally only. It is made of close-boarded wood with a single ridge felt roof, and was considered to have a low potential to support bat roosts, containing some suitable features including wooden boarding and soffit boxes.

### 3.2.1.2 Trees

Forty-two trees were considered to have potential to provide roosting opportunities for bats within the Study Area following the initial assessment. In addition there are a large number of trees within the broadleaved woodland to the north of the Afon Dyfi. These included ash (*Fraxinus excelsior*), alder (*Alnus glutinosa*), oak (*Quercus spp.*), sycamore (*Acer pseudoplatanus*), crack willow (*Salix fragilis*) and goat willow (*Salix caprea*). Of these trees, eight were classed as having high potential, twenty-five were classified as having medium roost potential and nine were classified as having low roost potential.

Eleven of these trees which were situated within 60m of the proposed Scheme footprint were inspected using aerial tree climbers to inspect features suitable for bats. Following the inspection of these trees the assessment of potential was updated. Of these trees, two showed signs of previous use by bats (smooth polished interior to cavity), one was classed as medium – high potential, four had medium potential and the remainder were of low potential. The results of the tree climbing inspections are shown in

Tree No.	Species	PRF's	Potential to support a roost	Further surveys required
31881	Ash ( <i>Fraxinus excelsior</i> )	Knot hole located at 5m on east side; 4" crevice within, dry condition Various other knot holes present	Moderate	Aerial inspection if tree work is required
31882	Ash ( <i>Fraxinus excelsior</i> )	Ivy offers numerous small crevices through main stem	Low	No
31883	Ash ( <i>Fraxinus excelsior</i> )	Cavity on south at 7m travel inwards for 12", conical in shape with slight smudging on substrate. Large knot hole at 7m on south travels 20" with dusty substrate. Knot hole at 8m on south contains two chambers largest travels upwards for 12" with smooth substrate, 2 <sup>nd</sup> chamber located behind reaction wood offers multiple crevices with smooth substrate.	High – evidence of previous roosting	Aerial inspection if tree work is required

31884	Common Alder ( <i>Alnus glutinosa</i> )	Woodpecker hole at 1.5m on east; no upwards traveling cavity, damp and partially dusty substrate. Areas of loose/flaking bark throughout.	Low	Ground based survey with endoscope
31885	Common Alder ( <i>Alnus glutinosa</i> )	Loose/flaking bark throughout.	Low	Ground based survey with endoscope
31886	Crack Willow ( <i>Salix fragilis</i> )	Large open cavity extending into conical top with multiple cracks and fissures.	Moderate/ High	Ground based survey with endoscope
31887	Ash ( <i>Fraxinus excelsior</i> )	Hole located within canker at 5m on east travels upwards for 3' with multiple crevices.	High – evidence of previous roosting	Aerial inspection if tree work is required
31888	English oak ( <i>Quercus robur</i> )	Large torn wound at 4.5m on north, open in condition with sections of shelter. Large 2.5m tear on west stem facing south with dusty substrate travels upwards for 6"	Moderate	Aerial inspection if tree work is required
31889	English oak ( <i>Quercus robur</i> )	Large split at 10m on north with multiple cracks and fissures with significant shelter to support moderate sized roost	Moderate	Aerial inspection if tree work is required
31890	English oak ( <i>Quercus robur</i> )	Large split on north of main stem traveling up to 3m with crevices located behind reaction wood.	Low	Ground based survey with endoscope
31891	Ash ( <i>Fraxinus excelsior</i> )	Large arboreal ivy along top side of main stem with multiple crevices throughout.	Low	No
31892	English oak ( <i>Quercus robur</i> )	Large woodpecker hole on south at 3.5m with no upwards traveling cavity, woodpecker hole adjoins large split on north. Small crevices located behind reaction wood around split.	Low	Ground based survey with endoscope

### 3.2.2 Walked Activity Transects

The results of the surveys have been mapped (Figures 3-9), with tables showing individual records in Appendix B.

Five individual bat species and one cryptic species group were recorded during the transect surveys. These included common and soprano pipistrelle, noctule, Daubenton's bat, Natterer's bat and whiskered/Brandt's bat. Soprano and common pipistrelle were the most frequently recorded species during the transect surveys with Daubenton's bat also frequently recorded along the Afon Dyfi. Noctule were occasionally recorded on the northern bank of the river and over the

central part of the flood plain. The majority of bat activity is concentrated along the river corridor, and mature hedgerows and treelines within the centre of the Study Area. Of note was the first registration of a bat during the July transect was of a common pipistrelle approximately 8 minutes prior to the time of sunset. The bat was recorded on the A487 just to the south of the existing Pont-ar-Ddyfi, suggesting that a roost could be present within the local vicinity.

Table 5 Comparison of the time of the first bat registration and sunset time for each transect survey.

Survey	Time of first bat	Species	Minutes after Sunset Time	Location
July 2015	21:05:28	Common pipistrelle	-8mins	Along a hedgerow boundary on the western side of the A487, to the north-west of the site
August 2015	20:50:58	Common pipistrelle	15mins	Along a hedgerow on the eastern side of the A487, to the south-west of the site
September 2015	19:29:06	Common pipistrelle	1 hr 25mins	Along a hedgerow boundary to the north-east of the site, just south of the Dyfi Bridge
October 2015	18:05:07	Common pipistrelle	49mins	Along the woodland edge to the north of the Millennium Bridge, to the north-east of the site
April 2016	20:29:37	Soprano pipistrelle	16 mins	Along hedgerow boundary in the centre of the site
May 2016	20:10:19	Daubentons	36 mins	Along southern bank of the river in the centre of the site
June 2016	21:09:27	Common pipistrelle	-24 mins	Along the tree line marking the northern boundary of the Dyfi Eco Park

### 3.2.3 Static Activity Monitoring

Ten individual species of bats have been recorded on the static bat detectors to date along with the small Myotis group. Bat activity was recorded at all three locations in July and August 2015 (Figures 7-9), and April and May 2016. These results are currently preliminary, as data collected from June is pending analysis.

No activity was recorded at Location 2 during September 2015 (Figure 9), although other sounds not from bats were recorded suggesting that the detector had not failed. No bats were recorded during the October 2015 recording session although other sounds were recorded by all three detectors. Wind conditions were relatively high during the October session with gust speeds of 24mph (high force 5) recorded at the Foel Friog Weather Station.

The highest level of activity was recorded at Location 1 on the north bank of the river during September 2015. The next highest level of activity was at Location 3 in May 2016. The levels of bat activity recorded at all three locations are considered to be high or very high, with a maximum average of 1390 bat pass equivalents per night recorded at Location 1 in September 2015 (see Graph 1).

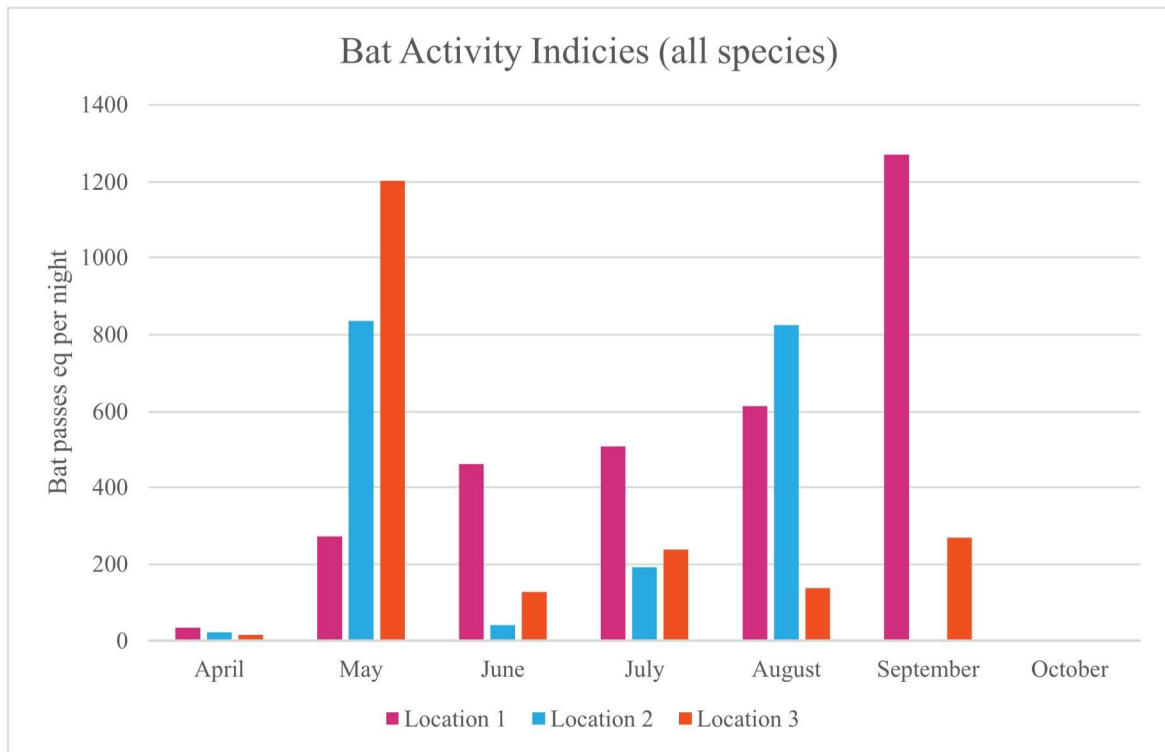


Common and soprano pipistrelle was the most frequently recorded species on the static detectors, followed by the small Myotis group. The majority of the calls from this group recorded at Location 1 are considered likely to be Daubenton’s bat which are known to forage over the river from the transect surveys.

Other species recorded include occasional passes by noctule bats, and individual passes of serotine, barbastelle, brown long eared bat, lesser horseshoe and greater horseshoe bats. A single pass of a greater horseshoe bat was recorded on the northern bank of the Afon Dyfi (Location 1) during the August 2015 recording session. Lesser horseshoe were recorded on the floodplain at Location 2 in August (one pass over two nights) and at Location 1 in September 2015 (four over three nights). Lesser horseshoe were also recorded at Location 1 in April 2016 (four passes over three nights) and Location 2 in May 2016 (one pass over six nights).

Natterer’s bat were recorded at Location 1 in September 2015 (two passes over three nights) and May 2016 (27 passes over five nights), and at Location 2 (25 passes over six nights) and Location 3 (434 passes over six nights) in May 2016. Nathusius’ pipistrelle were recorded at Location 1 in August 2015 (one pass over five nights) and May 2016 (one pass over five nights), and at Location 3 (two passes over six nights) in May 2016.

Monthly bat activity indices are shown in Graph 1.



Graph 1 Monthly Bat Activity Indices recorded within the Study Area – June data currently being analysed.



Table 6 Bat Activity Indices per session for each species/species groups

		Common pipistrelle	Soprano pipistrelle	Nathusius's <sup>1</sup> pipistrelle	Greater horse-shoe	Lesser Horse-shoe	Noctule	Barbastelle	Serotine	Large Myotis Group (Natterer's bat)	Small Myotis group	Brown long eared
Location 1	July 2015	54.8	387.4				19.2	0.2			48.2	
	August 2015	497	83.4	0.2	0.2		8.6				25.6	
	September 2015	82	907.67			1.33	22			0.67	376.33	
	April 2016	5.2	27.8			0.8	1.2					
	May 2016	68	158.6	0.2			31.2	0.2		5.4	8	0.8
	June 2016	92.8	193.6			0.2	8.2			152.2	12.8	
Location 2	July 2015	79.6	98.2				9		0.2		5	
	August 2015	332.5	440			0.5	12.5				39.5	
	September 2015											
	April 2016	12.2	8				1.2				1	
	May 2016	183	638.4			0.2	7			4.8	2.6	
	June 2016	2	33.2				6.2				0.4	
Location 3	July 2015	194.4	36.6				4.6		0.2		2.4	
	August 2015	332.5	440			0.5	12.5				39.5	
	September 2015	219.67	41				6				2.67	
	April 2016	11.8	3				0.4				0.8	
	May 2016	565.6	455.6	0.4			7.6		0.2	84.6	88.6	0.2
	June 2016	99.8	20.4				4.8			0.6	2	

Table 7 Bat Activity Indices (all species combined)

	<b>Location 1</b>	<b>Location 2</b>	<b>Location 3</b>
July 2015	509.8	192	238.2
August 2015	615.2	825	137.8
September 2015	1390	0	269.34
October 2015	0	0	0
April 2016	35	22.4	16
May 2016	272.4	836	1203
June 2016	460.4	41.8	127.6

### 3.2.4 Bat Trapping Results

The trapping resulted in the capture of a soprano pipistrelle in the harp trap at the base of the bank. Natterer's bats were caught in the high net in the field to the north and were observed foraging along the north edge of the trees on the river bank at approximately 3 – 4m above ground level. No bats were caught in the net on the southern side of the river possibly due to the relatively strong south westerly wind.

### 3.2.5 Potential Proximity of Roosts

The times at which the first and last bats recorded each night on the Static detectors was compared with sunset and sunrise times to assess the potential proximity of roosts. A table showing these comparisons is provided in Appendix A.

The comparison found that both common and soprano pipistrelle were regularly recorded within only a few minutes of the time of sunset suggesting that these species are likely to be using roosts located within relatively close proximity to the scheme.

During the 2016 monitoring sessions noctule bat have also been frequently recorded at around the times of sunset suggesting the proximity of a roost of this species may also be close to the Scheme.

## **4 Conclusions and Recommendations**

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### **4.1 Bat roosts**

The effects of the proposed Scheme cannot be assessed at the time of preparation of this report; further tree inspection and emergence surveys in 2016 aim to inform the potential impacts of the Scheme on potential bat roost within the Study Area.

### **4.2 Bat foraging and commuting routes**

The construction of the scheme will require the clearance of vegetation leading to the severance of hedgerows within the flood plain, and the wooded corridor on the northern bank of the Afon Dyfi. These areas have been shown to be used by an assemblage of common bat species and small numbers of rarer and more specialised species.

## Figures

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Figure 1 Study Area, Transect Route and Static Locations

Figure 2 Roost Potential Assessments of Trees

Figure 3 July Bat Activity Transect Results

Figure 4 August Bat Activity Transect Results

Figure 5 September Bat Activity Transect Results

Figure 6 October Bat Activity Transect Results

Figure 7 April Bat Activity Transect Results

Figure 8 May Bat Activity Transect Results

Figure 9 June Bat Activity Transect Results

Figure 10 July Bat Activity Monitoring Results

Figure 11 August Bat Activity Monitoring Results

Figure 12 September Bat Activity Monitoring Results

Figure 13 April Bat Activity Monitoring Results

Figure 14 May Bat Activity Monitoring Results

Figure 15 June Bat Activity Monitoring Results

## Appendix A

### Comparison of First and Last Bat Registrations from Static Monitor with Sunset and Sunrise Times

Date	Location 1			Location 2			Location 3											
	First Bat	Last Bat	Minutes after sunset	First Bat	Last Bat	Minutes after sunset	First Bat	Last Bat	Minutes before sunrise									
Time	Species	Time	Species	Time	Species	Time	Species	Time	Species									
29/07/2015	18:04:01	SMMY	-3hrs 9mins	05:12:31	PIPY	17 mins	21:25:57	PIPY	12 mins	05:12:20	PIP1	17 mins	21:18:03	PIP1	5 mins	04:48:48	PIP1	40 mins
30/07/2015	21:15:37	PIPY	4mins	23:32:13	PIP1	5 hrs 58 mins	21:22:42	PIPY	11 mins	00:09:23	SMMY	5 hrs 21 mins	21:26:20	PIP1	15 mins	23:27:51	SMMY	6hrs 3 mins
31/07/2015	21:21:16	PIPY	11mins	04:52:59	PIPY	1 hr	21:17:32	PIP1	8 mins	04:32:08	PIP1	1 hr	21:14:38	PIP1	5 mins	04:37:13	PIP1	55 mins
01/08/2015	21:13:44	PIPY	5mins	05:12:32	PIPY	21 mins	21:11:45	PIP1	3 mins	05:15:21	PIP1	18 mins	21:18:53	PIP1	10 mins	05:21:05	PIPY	12 mins
02/08/2015	20:23:57	PIPY	-43mins	05:20:47	PIPY	15 mins	21:20:34	PIPY	14 mins	05:19:43	PIPY	16 mins	21:13:12	PIPY	7 mins	05:32:02	PIP1	3 mins
03/08/2015	21:17:48	PIPY	13mins	04:14:06	PIPY	1hr 23mins	21:19:46	PIPY	15 mins	03:56:24	PIP1	1 hr 41 mins	21:15:45	PIP1	11 mins	00:02:09	PIP1	3 hrs 28 mins
19/08/2015	21:52:47	PIP1	1 hr 19 mins	05:55:13	PIP1	8 mins	20:36:25	PIP1	3mins	05:57:54	PIPY	6mins	No recordings					
20/08/2015	20:26:19	PIP1	-5mins	05:57:20	PIPY	8 mins	20:36:51	PIP1	5mins	21:48:47	PIP1	8 hrs 7mins	20:55:47	PIPY	22 mins	05:57:38	NYNO	6 mins
21/08/2015	20:34:30	PIP1	5 mins	05:44:17	PIP1	23 mins	No recordings						20:24:43	PIPY	minus 7 mins	05:51:38	PIPY	14 mins
22/08/2015	20:25:58	PIP1	- 2 mins	06:00:10	PIP1	8 mins	No recordings						20:45:51	PIPY	16 mins	05:54:31	PIP1 NYNO	13 mins
23/08/2015	20:42:13	PIP1	18 mins	05:45:37	PIP1	25 mins	No recordings						20:38:48	PIPY	11 mins	05:08:58	NYNO	1 hr 2 mins
24/08/2015	20:09:55	SMMY	- 13 mins	23:24:59	PIP1	6hrs 48 mins	No recordings						20:33:40	PIPY	9 mins	22:32:14	PIPY	7 hours 40 mins
23/09/2015	19:11:42	PIPY	- 1 min	06:43:28	PIPY	45 mins	No Recordings						19:29:44	NYNO	17 mins	06:38:48	PIPY	40 mins

Date	Location 1				Location 2				Location 3									
	First Bat	Species	Minutes after sunset time	Last Bat	First Bat	Species	Minutes after sunset time	Last Bat	First Bat	Species	Minutes after sunset time	Last Bat	Minutes before sunrise time					
24/09/2015	19:19:49	PPY	10 mins	06:34:40	PPY	37 mins			19:25:09	PIP	16 mins	20:32:46	PIP	10 hrs 31 mins				
	19:20:04	NYNO	13 mins	21:07:45	NYNO	9 hrs 58 mins			No recordings									
25/09/2015	No recordings																	
01/04/2016	22:23:02	RHHI	2hr 33mins	No recordings				21:34:16	MYDA U	1 hr 44 mins	No recordings							
	20:02:28	PPY	10 mins	21:08:55	PIP	9 hrs 38 mins	20:03:37	PPY	11 mins	21:11:56	PIP	9 hrs 35 mins	20:15:10	PIP	23 mins	23:39:17	SMMY	7 hrs 6 mins
04/04/2016	20:13:07	PPY	18 mins	06:10:45	PLAUR	32 mins	20:07:58	PPY	12 mins	01:17:10	NYNO	5 hrs 25 mins	20:19:07	PPY	24 mins	04:14:35	PIP	2 hr 28 mins
	20:13:05	PPY	16 mins	22:41:16	PIP	7 hrs 58 mins	20:09:05	PPY	12 mins	00:28:46	SMMY	6 hrs 11 mins	20:21:04	PIP	24 mins	22:09:56	PPY	8hrs 30 mins
05/05/2016	20:52:01	NYNO	2 mins	05:07:13	NYNO	28 mins	20:58:35	NYNO	1 hr 1 min	05:04:15	PIP	31 mins	20:58:02	PIP	8 mins	05:06:28	PIP	29 mins
	20:50:52	NYNO	-1min	05:37:21	NYNO	+4 mins	21:00:43	PPY	9 mins	05:03:11	PIP	30 mins	21:00:15	PIP	9 mins	05:37:57	NYNO	+4 mins
07/05/2016	20:55:53	NYNO	2 mins	05:28:23	NYNO	3 mins	21:09:48	PIP	16 mins	04:08:23	PIP	1 hr 23 mins	20:35:33	PIP	-18mins	05:33:28	NYNO	+2 mins
	21:02:59	NYNO	8 mins	05:17:06	NYNO	12 mins	21:03:53	NYNO	9 mins	05:14:15	NYNO	15 mins	21:03:59	NYNO	9 mins	05:13:01	NYNO	16mins
09/05/2016	20:48:23	NYNO	- 8 mins	05:18:56	NYNO	10 mins	20:49:12	NYNO	-7mins	05:19:41	NYNO	29 mins	20:59:08	NYNO	3 mins	05:19:21	NYNO	9 mins
	21:03:49	NYNO	5 mins	05:19:59	NYNO	7 mins	21:04:16	NYNO	5 mins	02:37:58	PPY	2 hrs 49 mins	21:04:30	NYNO	6 mins	22:52:21	PPY	6 hrs 34 mins
11/05/2016	21:08:35	NYNO	9 mins	05:15:46	NYNO	9 mins	No recordings				21:50:49	PIP	18 mins	04:31:36	PIP	20 mins		
07/06/2016	21:53:16	PIP	20 mins	04:24:11	PIP	27 mins	22:20:25	PPY	47 mins	04:39:48	NYNO	11 mins						



Date	Location 1			Location 2			Location 3											
	First Bat	Species	Minutes after sunset time	Last Bat	First Bat	Species	Minutes after sunset time	Last Bat	Species	Minutes before sunrise time	First Bat	Species	Minutes after sunset time	Last Bat	Species	Minutes before sunrise time		
08/06/2016	21:42:28	PPY	8 mins	04:25:10	PIP	26 mins	21:58:18	PPY	24 mins	03:06:01	PPY	1 hr 45 mins	21:47:58	PPY	14 mins	04:24:39	PIP	26 mins
	21:47:15	PIP	12 mins	04:53:47	NYNO	1 min after	No recordings			04:28:53	NYNO	21 mins	21:50:45	PPY	16 mins	04:27:37	PPY	23 mins
10/06/2016	21:45:53	NYNO	10 mins	04:31:33	PIP	18 mins	22:02:54	PPY	27 mins	04:32:39	NYNO	17 mins	21:48:26	PIP	13 mins	04:31:40	PPY	18 mins
	21:40:18	PIP	4 mins	04:14:29	PPY	35 mins	21:35:43	PPY	3 mins	04:32:11	NYNO	17 mins	21:47:29	PPY	11 mins	04:14:05	PIP	35 mins
12/06/2016	21:52:52	PIP	16 mins	04:35:13	PIP	14 mins	21:53:58	NYNO	17 mins	02:37:53	PPY	2 hr 11 mins	22:02:03	PIP	25 mins	04:40:43	PPY	9 mins
	21:54:58	PPY	17 mins	04:29:57	NYNO	19 mins	No recordings											

Species Codes:  
 PIP – common pipistrelle  
 PIPY – soprano pipistrelle  
 NYNO – noctule  
 RHHL – lesser horseshoe bat  
 PLALR – long eared bat species  
 SMMY – small Myotis group