

Havant Thicket Reservoir Project

Environmental Statement Volume 4 - Appendices
Appendix A9 Biodiversity
A9.4 Bat Survey Report

Portsmouth Water Ltd.



**HAVANT THICKET WINTER STORAGE RESERVOIR,
ROWLAND'S CASTLE, HAMPSHIRE**

**APPENDIX 9.4
BAT SURVEY REPORT**

Final Document

August 2020

Preliminary Ecological Appraisals • Protected Species Surveys and Licensing • NVC • EclA • HRA • Management Plans
Habitats • Badger • Bats • Hazel Dormouse • Birds • Reptiles • Amphibians • Invertebrates • Riparian and Aquatic Species

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ECOSA Quality Assurance Record

This report has been produced in accordance with the Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Report Writing 2017 (CIEEM, 2017). The survey work has been undertaken in line with references within CIEEM's Source of Survey Guidance (CIEEM, 2017).

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* ECOSA produced this report as a stand-alone Ecological Impact Assessment. The document was converted into an Appendix to an Environmental Statement by Atkins, with approval of ECOSA, in August 2020. This has included removal of impact assessment and mitigation text which is covered in Chapter 9 (Biodiversity) of the ES.

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HAVANT THICKET WINTER STORAGE RESERVOIR, ROWLAND'S CASTLE, HAMPSHIRE

BAT SURVEY REPORT

Table of Contents

1.0	INTRODUCTION	5
1.1	Background.....	5
1.2	Aims and Scope of Report.....	5
1.3	Definitions	7
2.0	METHODS.....	9
2.1	Introduction	9
2.2	Zone of Influence	9
2.3	Desktop Study	9
2.3.1	<i>Biological Records Centre</i>	<i>9</i>
2.3.2	<i>Multi-Agency Geographic Information for the Countryside.....</i>	<i>10</i>
2.3.3	<i>Other Sources of Information</i>	<i>10</i>
2.4	2018 Bat Survey	12
2.4.1	<i>Survey Methods.....</i>	<i>12</i>
2.4.2	<i>Survey Details.....</i>	<i>18</i>
2.4.3	<i>Survey Limitations</i>	<i>24</i>
2.5	Discussion and Criteria used to Assess Ecological Value	27
3.0	BASELINE ECOLOGICAL CONDITIONS, DISCUSSION AND EVALUATION.....	32
3.1	Introduction	32
3.2	Desktop Study Results	32
3.3	Survey Results.....	39
3.3.1	<i>2005/2006 Summary</i>	<i>39</i>
3.3.2	<i>2008/2009 Summary</i>	<i>39</i>
3.3.3	<i>Mist-Netting / Harp Trapping (2018)</i>	<i>46</i>
3.3.4	<i>Radio-Tracking</i>	<i>50</i>
3.3.5	<i>Ground Level Tree Assessment.....</i>	<i>57</i>
3.3.6	<i>Bat Box Check.....</i>	<i>70</i>
3.3.7	<i>Bat Emergence / Re-entry Survey.....</i>	<i>70</i>
3.3.8	<i>Vantage Point Surveys</i>	<i>72</i>
3.3.9	<i>Bat Automated Detector Survey.....</i>	<i>80</i>
3.4	Discussion and Evaluation	91
4.0	CONCLUSIONS	110
4.1	Conclusions	110
5.0	REFERENCES	112
Map D1	Site Location Plan	
Map D2	Key Site Features	
Map D3	Desktop Study Data – Alcaethoe Bat	
Map D4	Desktop Study Data – Barbastelle	

Map D5	Desktop Study Data – Location of Sites with Trapping and / or Tracking for Bechstein's Bat within 3km
Map D6	Desktop Study Data – Bechstein's Bat
Map D7	Desktop Study Data – Common Pipistrelle
Map D8	Desktop Study Data – Daubenton's Bat
Map D9	Desktop Study Data – Leisler's Bat
Map D10	Desktop Study Data – Long-eared Bat Species
Map D11	Desktop Study Data – Myotis Species
Map D12	Desktop Study Data – Nathusius' Pipistrelle
Map D13	Desktop Study Data – Natterer's Bat
Map D14	Desktop Study Data – Noctule
Map D15	Desktop Study Data – Pipistrelle Bat Species
Map D16	Desktop Study Data – Serotine
Map D17	Desktop Study Data - Soprano Pipistrelle
Map D18	Desktop Study Data – Whiskered / Brandt's Bat
Map D19	Vantage Point Surveyor Locations
Map D20	Location of Static Detectors
Map D21	Location of Bat Trapping Sites in 2018
Map D22	Bat Trapping and Roost Data May 2018
Map D23	Bat Trapping and Roost Data July 2018
Map D24	Bat Trapping and Roost Data August 2018
Map D25	Bechstein's Bat Female 238 Range (Radio Tracking May 2018)
Map D26	Bechstein's Bat Female 238 – 16 th – 17 th May 2018 Movements
Map D27	Bechstein's Bat Female 238 – 17 th – 18 th May 2018 Movements
Map D28	Bechstein's Bat Female 238 – 18 th – 19 th May 2018 Movements
Map D29	Bechstein's Bat Male 338 Range (Radio Tracking May 2018)
Map D30	Bechstein's Bat Male 338 – 16 th -17 th May 2018 Movements
Map D31	Bechstein's Bat Male 338 – 17 th -18 th May 2018 Movements

Map D32	Bechstein's Bat Female 277 Range (Radio Tracking July 2018)
Map D33	Bechstein's Bat Female 277 17 th -18 th July Movements
Map D34	Bechstein's Bat Female 277 19 th -20 th July Movements
Map D35	Bechstein's Bat Female 2957 Range (Radio Tracking August 2018)
Map D36	Bechstein's Bat Female 2957 20 th – 21 st August 2018
Map D37	Bechstein's Bat Female 2957 21 st -22 nd August Movements
Map D38	Bechstein's Bat Female 2957 23 rd -24 th August Movements
Map D39	Location of Bat Roosts Identified Within and Surrounding the Site 2008-2018
Map D40	Location of Bat Boxes Erected During 2018
Map D41	Assessment of Brown Long-eared Bat Colonies
Map D42	Key Foraging Areas and Movements of Bechstein's Bat (2008 2009, 2014, 2018)
Appendix D1	Assessment of Bechstein's Bat Population Size and Time Spent Foraging on the Havant Thicket Winter Storage Reservoir Site
Appendix D2	Bat Survey Report 2008 – 2009
Appendix D3	Bat DNA Analysis Results
Appendix D4	Gipsies Plain Woodland Corridor
Appendix D5	Investigation of Bat Roost in Middle Clearing (Tree 1604)
Appendix D6	Appraisal Criteria for Bats
Appendix D7	Automated Detector Settings and Locations
Appendix D8	Automated Detector Results by Location
Appendix D9	Automated Detector Results by Time Before/After Sunset
Appendix D10	Trapping Data

An additional Ground Level Tree Assessment report prepared by Ecological Consultancy Services Ltd in April 2020 has been added as **Appendix D11**.

An additional note on 2020 bat survey results from Ground Level Tree Assessment at the northern access road and an emergence survey at Manor Lodge has been added as **Appendix D12**.

An additional assessment of bat activity at four woodland blocks in Havant Thicket has been added as **Appendix D13**.

An additional Assessment of Bat Activity within the Phase 1 planting area on Gipsies Plain has been added as **Appendix D14**.

1.0 INTRODUCTION

1.1 Background

Ecological Survey & Assessment Limited (ECOSA) have been appointed by Portsmouth Water Limited (Portsmouth Water) to undertake a bat assessment of their land at Havant Thicket, Rowland's Castle, Hampshire. The site is centred on National Grid Reference (NGR): SU 715 097 (**Map D1**).

The bat report is required as a result of Portsmouth Water's plan to construct a winter storage reservoir, Havant Thicket Winter Storage Reservoir (HTWSR), for public water supply in the centre of the site. At the time of the surveys the final designs were not confirmed, although the extent of the development was proposed to be approximately 1.6 kilometres from east to west and 800 metres from north to south with a storage capacity of approximately 8,700 million litres. It was understood water would be pumped into the reservoir from Portsmouth Water sources at Havant and Bedhampton Springs, providing a sustainable supply of water with no requirement to change the existing abstraction licence.

At the time the surveys were undertaken the planning application red line boundary (see **Figure 2.1 in Volume 3**) had not been defined and therefore the Site Boundary (the site) and Ecological Enhancement Area (wider site) boundaries referred to in this report were provisional boundaries available at that time. Within this report where mention is made of 'the site' this refers to the reservoir footprint and other areas used for built development and habitat creation. This area is referred to as the 'Reservoir Footprint' in the Environmental Statement (as the Site includes the reservoir footprint, the pipeline corridor as well as land around the reservoir footprint being used for ecological mitigation and compensation). Where reference is made in this report to the 'wider site' this includes the reservoir and the area proposed for ecological enhancement within Forestry England's (FE) Havant Thicket woodland to the north and Bell's Copse to the west of the site and Staunton Country Park (SCP) to the south of the site. This area is similar to the area referred to as the 'Reservoir Site' in the Environmental Statement. The areas covered by 'the site' and 'wider site' in this report are shown in **Map D1** and the key ecological and landscape features mentioned in this report are shown in **Map D2**.

1.2 Aims and Scope of Report

The information within this report is based on a desktop study and bat surveys carried out by ECOSA in 2008-2009 and in 2018.

The gap between the survey periods reflects a period when the reservoir project was on hold. There was no significant change in the bat roosting and foraging habitat at the site between 2009 and 2018. Through discussions with the Local Planning Authority,

Natural England and Hampshire and Isle of Wight Wildlife Trust it was agreed that updating radio tracking of Bechstein's bat was important. The aim of the 2018 radio-tracking surveys was to locate roost sites (especially maternity roosts), identify population and individual home ranges, assess habitat use and understand activity patterns.

Following on-going discussions with Natural England throughout the 2018 survey season it was agreed that in addition to the originally agreed two survey periods (May and July 2018), a third survey session would be undertaken (August 2018).

As the results of the 2018 radio-tracking surveys were collected it became apparent that a maternity roost of Bechstein's bat was not present within or adjacent to the site in 2018. As a result, Natural England agreed that this report include the 2008-2009 Bechstein's bat survey data (2008 was the only year when a Bechstein's bat maternity roost was recorded adjacent to the site). Therefore, this data is also provided in full.

In addition, the trees where Bechstein's bat roosts were recorded previously were subject to emergence / re-entry surveys during 2018 (two off-site and three on-site trees). The other species roosts within the site, identified during 2008-2009, were also subject to updating emergence / re-entry surveys.

During a meeting of 10th July 2019 Sue Crutchley (NE EPS Licensing) from Natural England suggested that, notwithstanding the 2018 survey and evaluation, the following points should be looked at in more detail:

- The percentage of the colony that has been tagged to date; and
- The percentage of time that Bechstein's bats have been spending on site.

Following the meeting Portsmouth Water's Biodiversity and Environmental Specialist Trevor Codlin has undertaken analysis to answer these queries. A summary of this is presented in Section 3.4 Discussion below, with full details reproduced in **Appendix D1**.

The 2008-2009 bat transect and radio-tracking surveys have provided a good understanding of the roosting, foraging, commuting activity at the site. Following discussion with the Havant Borough Council Ecologist (Tristan Norton) and Natural England, it was agreed that rather than undertaking surveys to standard guidance a more bespoke survey protocol would be followed. The scope of the survey work was agreed in advance with Natural England, the Local Planning Authority and Hampshire and Isle of Wight Wildlife Trust.

This has involved undertaking vantage point surveys to assess the level of roosting activity in the four blocks of woodland lost as a result of the proposals (Corsican Pine

Block, The Avenue, Middle Clearing and Round Wood). Surveyors were located around the perimeter of these woodlands to assess whether roosting bats were emerging. Surveys were undertaken in May, June and July 2018 to have the best chance of identifying any maternity roosts that may be present.

The data collected during the 2018 vantage point surveys have been combined with the results of the 2008-2009 radio-tracking work and 2018 static detector surveys to provide a robust assessment of the status of bats at the site. This report includes details of all survey work undertaken at the site for bats.

The detailed and extensive information collected in relation to bats has been used to inform an updated assessment of the impacts of the proposed development and to inform an effective mitigation strategy, compensatory habitat provision and associated long-term management.

1.3 Definitions

Population

To undertake a robust assessment of the impacts and effects of the scheme for bat species it is necessary to define the term 'population'. Guidance from the European Commission (European Commission, 2007) states that, "*A population is defined as a group of individuals of the same species that live in a geographic area at the same time and are (potentially) interbreeding (i.e. sharing a common gene pool).*"

Guidance from Natural England (per comms.) has defined that for European Protected Species (EPS) licencing purposes; "*...the conservation status of the species concerned is determined and the impact of the activity is then considered on both biogeographic and (local) population scales. For practical purposes, biogeographic typically refers to the natural range of the species within the UK.*"

Within this context the following terms have been applied to the bat populations definitions within this document: population > colony > maternity roost > lower status roost. A simple schematic representation of this is shown in **Figure 1**, it should be noted that it is understood that this significantly simplifies the dynamics of bat population and is only meant to be used to define the terms in this report.

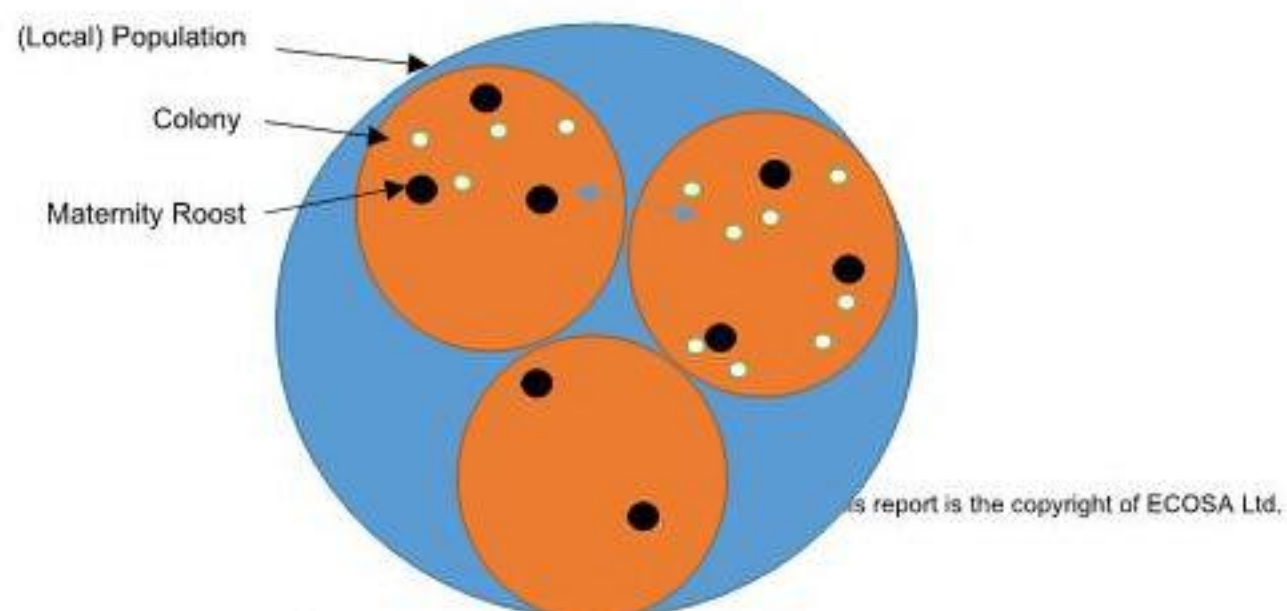
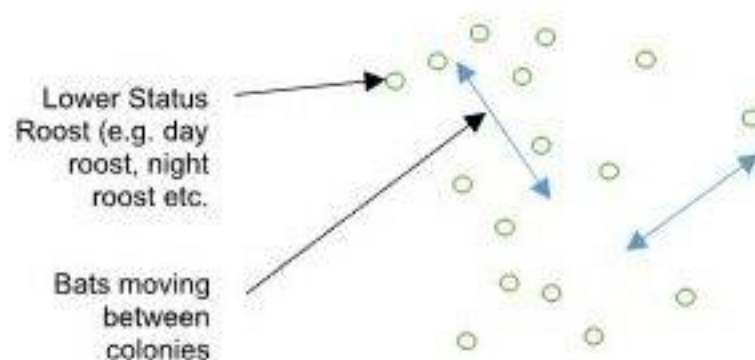


Figure 1: Schematic representation of bat population



A colony is defined within this report as a single or group of linked maternity roosts and lower status roosts.

A maternity roost is defined by the Bat Conservation Trust (BCT) as a roost where female bats give birth and raise their young to independence.

A day roost is defined by BCT as; *'a place where individual bats, or small groups of males, rest or shelter in the day but are rarely found by night in the summer'*.

A night roost is defined as *"place where bats rest or shelter in the night but are rarely found in the day. May be used by a single individual on occasion or it could be used regularly by the whole colony"*.

Core Sustenance Zones (CSZs)

Within this report reference is made to CSZs which BCT define as, *'...the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost.'* (Collins, 2016)

2.0 METHODS

2.1 Introduction

This section details the methods employed during the bat surveys undertaken for the HTWSR site during 2008-2009 and 2018. Any significant limitations to the survey methods are also discussed. This section also includes desktop study data from relevant bat surveys undertaken within the site by ECOSA between 2005 and 2006 and studies carried out for other projects in the surrounding area.

2.2 Zone of Influence

To define the total extent of the study area for this appraisal (Zone of Influence¹), the proposed scheme was reviewed to establish the spatial scale at which bats could be affected. The appropriate survey radii for the various elements of the appraisal (i.e. desktop study and field survey) have been defined in the relevant sections below. These distances are determined based on the professional judgement of the ecologist leading the appraisal, taking into account the characteristics of the site subject to appraisal, its surroundings and the nature and scope of the development proposals and the ecology of the species of focus within this report.

2.3 Desktop Study²

2.3.1 Biological Records Centre

Hampshire Bat Group and Sussex Biodiversity Information Centre (SxBRC) was consulted on 30th April 2018 for records of all bats located within three kilometres of the site boundary. A request for records held by Hampshire Bat Group and SxBRC of Bechstein's bat within 10 kilometres of the site was made separately. Bat records from Hampshire Bat Group cover the period 1983 to 2018 and SxBRC cover the period from 1989 to 2017. Furthermore, HBIC were consulted for Sites of Importance for Nature Conservation within the vicinity of the site which were either designated for bats or include bat species within their citation for a reason for designation.

A three kilometre search radius for all bats was chosen based on the habitat linkage around the local landscape and typical species CSZs. The search distance has been extended for Bechstein's bat due to rarity of this species and previous records from the site and local landscape.

¹ The Zone of Influence (Zoi), as defined by CIEEM, is the area over which ecological features may be subject to significant effects as a result of the proposed project and associated activities.

² Due to the age of this data an updated desk study has been undertaken in 2020 and details are included in Appendix 9.1.

2.3.2 Multi-Agency Geographic Information for the Countryside

The Multi-Agency Geographic Information for the Countryside (MAGIC)³ database was reviewed on 12th June 2018 to establish the location of statutory designated sites located within the vicinity of the site which were either designated for bats or include bat species within their citation for a reason for designation. This included a search for all internationally and nationally designated sites such as Special Areas of Conservation (SACs), Wetlands of International Importance (Ramsar sites), Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs) and Local Nature Reserves (LNRs) within two kilometres of the site.

2.3.3 Other Sources of Information

During 2008/2009 ECOSA and Ecological Consultancy Services (ECS) undertook a series of bat trapping, radio-tracking and transect surveys across the site and wider landscape. The full details of these surveys are presented in **Appendix D1** and a summary provided in Paragraph 3.3.2.

A number of other bat trapping and radio-tracking surveys have been undertaken within a three kilometres radius of the site specifically in relation to Bechstein's bat. A list of these sites and their associated planning applications are detailed in **Table D1**.

Table D1: Planning applications with bat trapping surveys and /or tracking of Bechstein's bat

Planning Reference and Site Name	Local Authority	Consultant	Survey Year(s)	Approximate Distance from Site
APP/19/00007 Camp Field (land to the west of Havant Crematorium), Bartons Road, Havant	Havant Borough Council	(Ecology Co-op, 2018)	2017 and 2018	1.6km, south-east
55562/001 Development Land East of Horndean, Rowlands Castle Road, Horndean, Waterlooville	East Hampshire Borough Council	(WYG, 2014) and (EPR, 2018)	2014 (WYG), 2017 and 2018 (EPR)	350m north-west
55023/001 Solar Farm Site – EIA screening opinion only, site not taken forward to formal planning application	East Hampshire Borough Council	WYG (per comms. via email ⁴)	2014	Adjacent, northern boundary
55406/002 Land Rear of, 191-211 Lovedean Lane, Horndean, Waterlooville	East Hampshire Borough Council	(Lindsay Carrington Ecological Services, 2017)	2017	3km north-west
APP/17/00736 Staunton Country Park, Middle Park Way, Havant, PO9 5HB	Havant Borough Council	(RPS, 2017) for Hampshire County Council	2017	135m south-east

³ www.defra.magic.gov.uk

⁴ Email from Ian Davidson-Watts dated 12th December 2014

Planning Reference and Site Name	Local Authority	Consultant	Survey Year(s)	Approximate Distance from Site
GEN/18/01143 Land North of Long Copse Lane, Emsworth	Havant Borough Council	Prime Environmental ⁵	2016	2.8km south-east
APP/17/00863 Southleigh Park House, Eastleigh Road, Havant, PO9 2PE	Havant Borough Council	(ECOSA, 2018)	2016	2km south-east
APP/15/01156 Plot 2, Dunsbury Hill Farm, Park Lane, Cowplain, Waterlooville	Havant Borough Council	Atkins ⁵	2015	795m south-west
52585/001 Land East of Church Centre, Blendworth Lane, Horndean, Waterlooville	East Hampshire Borough Council	(Davidson-Watts Ecology, 2014) and Conservation Constructions	2014	1.7km north-north-west
30016/018 Oaklands House, Redhill Road, Rowlands Castle, PO9 6DJ	East Hampshire Borough Council	(ACD Environmental, 2014)	2014	125m east

In addition to those sites surveyed as part of planning application a project was undertaken in 2016 in association with the development of a Bechstein's Bat Survey Protocol⁶ within the Forest of Bere. Eleven woodlands in Hampshire were surveyed using mist and harp traps by Colleen Hope of ECS. The location of survey sites within three kilometres of the site is presented in **Table D2** and is shown in **Map D5**. Biddenfield High Wood, whilst beyond three kilometres from the site, has also been included as the only site where Bechstein's bat were recorded.

Table D2: Woodland sites surveyed in 2016 for the Bechstein's Bat Protocol

Woodland	Grid Reference	Approximate Distance from Site
Blendworth Lith	SU70801390	2.5km north-north-west
Gundymoor Wood	SU68850760	2.5km south-west
Johnston's Coppice	SU69100790	2.2km south-west
Biddenfield High Wood	SU54601220	16.4km west

On 27th and 28th July 2019 Hampshire Bat Group's small *Myotis* bat research team undertook bat capture surveys at Brickkiln Ponds on the Stansted Estate (an area within Southleigh Forest). The surveys were undertaken using three harp traps located

⁵ Formal report not available at the time of writing

⁶ Per comms. with Tristan Norton Havant Borough Council Ecologist. The Bechstein's bat planning protocol is not yet published

in the area around SU 7556 0919. The Hampshire Bat Group survey area is located approximately three kilometres east of the site.

Online mapping resources, including aerial photography, at an appropriate scale, were used to identify the presence of habitats such as woodland blocks, ponds, watercourses and hedgerows, in the vicinity of the site. These habitats may offer resources and connectivity between the site and suitable habitat in the local area, which may be exploited by bat populations.

2.4 2018 Bat Survey

2.4.1 Survey Methods

Trapping and Radio-tracking

Trapping surveys for Bechstein's bats were undertaken across the active bat season, with surveys taking place pre-parturition and post-parturition⁷ between May and August 2018. The surveys followed the Bat Conservation Trust guidelines on surveying Bechstein's bat (Collins, 2016). A licence was obtained from Natural England (Licence reference 2018-33676-SCI-SCI-2) to fit radio transmitters to up to 10 Bechstein's bat during May to mid-August 2018. A further licence was subsequently granted by Natural England (Natural England Reference 2018-36925-SCI-SCI) to extend the trapping period to the end of August 2018.

The survey was focused on trapping female Bechstein's bat and aimed to tag at least three bats. The key aim of these surveys was to understand whether a breeding population of Bechstein's bat was present within or adjacent to the site. Breeding sites are best located by tracking female bats and this is why females Bechstein's bat were targeted. The status of roosts (where appropriate) has been based on standard terminology as detailed in Paragraph 2.5.

Mist-Netting/Harp Trapping

Surveyors used a combination of mist nets and a harp trap to capture bats during the sessions, using two teams at different locations. On each night survey teams initially focussed on a particular location, where bats had previously been successfully captured, but then switched to a 'roving' trapping technique whereby surveyors set up a single mist net in likely habitat for 30 minutes or less, using a lure to attract Bechstein's bat.

Capture sites (see **Map D21**) targeted a number of areas comprising:

⁷ Parturition is the act of giving birth

- The vicinity of the 2008 Bechstein's bat maternity roost recorded in 2008 (see **Map D39**);
- Suitable woodland habitat or commuting corridors within the site;
- Suitable woodland habitat in SCP where Bechstein's bat were caught in previous years; and
- Suitable woodland habitat within Havant Thicket woodland.

An acoustic lure⁸ was used during all trapping sessions to increase the capture rate. Two lures were used, primarily the Sussex Autobat which is pre loaded with calls of range of species. The main calls played were two Bechstein's social call types (Autobat calls 'Bechstein2.csv' and 'Bechstein3.csv'). In addition, the following calls were cycled occasionally 'Natterer.csv', 'Natterer2.csv', 'Nathusius.csv', 'Mixedpips.csv', 'Barbastelle.csv' and 'Barbastelle2.csv'. The other lure was an adapted Pettersson D1000x bat detector to replay social calls in the field. This recorded and played pre-recorded bat social calls, predominantly Bechstein's bat and Barbastelle calls. Speakers to project the sound included a combination of standard and custom built ultrasound transducers (speakers) including Autobat 'spinners' which are designed to reflect the ultrasound into the surrounding landscape.

The time of capture, species, sex, sexual status, weight and forearm measurements were recorded for each bat captured. To aid identification to species level tragus and penis shape were recorded for whiskered bat / Brandt's bat and tragus width and thumb length were recorded for long-eared bat⁹ *Plecotus* species. Wing length was also used for female *Myotis*¹⁰ bat species to identify potential Alcahoie bat, individuals with a forearm length of <32 centimetres were classed as 'small *Myotis* bat species'; which comprises whiskered bat, Brandt's bat or Alcahoie bat. In these cases where possible samples of droppings were taken to allow species specific identification using DNA analysis. Pipistrelle bats were visually assessed and finger measurements were taken if the bat had characteristics of a Nathusius' pipistrelle.

Where possible dropping samples were collected where 'small' *Myotis* bat species were recorded. This was undertaken to allow assessment of the presence of Alcahoie bat at the site. Sexual status was also recorded as this provides valuable information

⁸ An acoustic lure emits artificially created ultrasonic bat calls to attract (lure) bats to capture apparatus such as nets or a harp trap.

⁹ There are two species of long-eared bat, the brown long-eared bat *Plecotus auritus* and the grey long-eared bat *Plecotus austriacus*. These species can only be separated by examination of physical characteristics and Phylogenetic Analysis Identification of bat droppings. Unless confirmation of identification has been made by visual identification the two species shall be referred to in this report as long-eared bat. The brown long-eared bat is the commonest of the two species typically being found roosting within large roof voids although small voids and trees are also utilised. The grey long-eared bat is rare and confined to southern England and like the brown long-eared typically roosts in roof voids.

¹⁰ There are seven species of *Myotis* bats in Britain. *Myotis* bats are very difficult to identify specifically, this can generally only be done by examination of physical features and Phylogenetic Analysis Identification of bat droppings. Many of these bats are common and will utilise buildings for roosting often occupying small and inaccessible voids. For the purpose of this report all species shall be referred to as *Myotis* bats unless a specific identification has been possible.

on the sites value for pregnant and foraging bats. Bechstein's bats were fitted with radio transmitters and Mammal Society rings¹¹. In order to locate any maternity roosts on the site transmitters were preferentially fitted to female bats.

Within this report technical terms are used to describe the breeding status of female bats. These terms are important to understand the status of bats within the site. To ensure consistent understanding of these terms for the reader they are explained below:

- Nulliparous – a female yet to have given birth and raised young i.e. is a non-breeding individual;
- Parous – a female that has raised young in the past i.e. is of breeding age;
- Lactating – a female that has dependent young;
- Post-lactating – a female that raised young in the year in which it was caught; and
- Parturition – the act of giving birth.

Radio Tracking

Bats were tracked for at least three full nights from emergence to re-entry and roost sites were located on each day.

Two methods of radio tracking were used during the survey; these included 'triangulation' and the 'close approach' methods (Kenwood, 2001). The type of method employed depended upon the species, distances travelled and surveyor resources. Wider ranging bats were 'triangulated' with surveyors taking bearings sequentially every ten minutes. These bearings were recorded and later mapped to cross reference the location of the bats. The 'close approach' method involves the surveyors following the bat on foot aiming to remain in close contact with the animal. This method proved to be more accurate in most cases. On occasions where this was not possible (for example when bats moved quickly between areas) judgements were made on the bats approximate location using a combination of bearing and signal strength.

Where possible, surveyors took bearings to confirm the location of a bat. In many cases a combination of the 'close approach' and 'triangulation' methods were employed when a second surveyor was used for added accuracy. Analysis of the bats movements was then undertaken to show the percentage of time each bat spent in different parts of the

¹¹ Metal rings placed onto the wing of bats with a unique number to allow identification if recaptured

site and different habitats. Maps were produced of each full night radio tracking data for each bat (see **Map D25** to **Map D38**).

During the survey the following information was recorded for each identified bat roost:

- Roost location (including National Grid Reference co-ordinates);
- Tree species/building type;
- Roost type;
- Roost aspect and height; and
- Number of bats recorded emerging/returning during each evening/dawn.

Each tree roost was tagged on the north side low to the ground so as not to be obvious to members of the public.

Analysis of tracking data was undertaken using Ranges 7 software (Anatrack Limited, n.d.). Radio tracking fixes (collected at 10 minute intervals while the bat was active) were pooled for the entire tracking period of each individual. This data was used to calculate home range area using 100% Minimum Convex Polygons, allowing for a standard tracking error of 100 metres.

Ground Level Tree Assessment

The ground level tree assessment of trees where roosts had previously been identified was undertaken in line with current good practice guidelines (Collins, 2016). Trees where bat roosts were recorded on-site during 2008 surveys were revisited to assess their current suitability for roosting bats. Trees adjacent to the site which previously held Bechstein's bat were also revisited to reassess their suitability for roosting bats.

Prior to the survey grid references of previously identified trees were loaded into a GPS device to aid locating tree roosts. As described in **Appendix D2** all trees with confirmed bat roosts were tagged in 2008-2009 to aid identification in the future. Appendix D2 contains a place holder rather than the full report. If required, a copy of the bat survey report 2008-2009 can be obtained on request.

In addition, trees where Bechstein's bat were recorded roosting in summer 2018 on or in close proximity to the site were revisited during November 2018 to affix tree tags and assess whether further roosting features could be identified whilst the trees were not in leaf.

Climb and Inspect and Endoscope Surveys

The climb and inspect was undertaken in line with current good practice guidelines (Collins, 2016). The aim of the survey was to assess whether the bat boxes erected in 2018 were being used by roosting bats, with a particular focus on Bechstein's bat.

An endoscope survey was also undertaken of tree 1604 to provide evidence of roosting bats from this tree, which was used as a brown long-eared bat night roost during 2008. The survey was designed to assess whether the feature was still suitable for roosting bats and record any evidence of bats such as droppings, fur, staining or roosting bats.

Bat Emergence/Re-entry Survey

The trees where Bechstein's bat roosts were recorded previously, on or adjacent to the site, were subject to emergence / re-entry surveys. All on-site roosts of other species (brown long-eared bat and Natterer's bat) were also subject to emergence / re-entry surveys. Emergence / re-entry surveys followed current best practice guidelines (Collins, 2016)

Tree emergence / re-entry surveys were carried out by experienced ECOSA surveyors, positioned at previously identified vantage points around the tree. The vantage point locations allowed surveyors to view the previously identified roosting feature or features.

The main focus of the tree emergence / re-entry surveys was to determine whether historic tree roosts were still in use by roosting bats. As such, surveyors used night vision binoculars / monocular during the surveys to allow constant viewing of suitable roost features. Batlogger M detectors were also used on occasion to record other bat activity in the vicinity, although this was not the primary purpose of the surveys and any data collected on foraging and commuting behaviour throughout each survey is treated as incidental only. Surveyors were asked to concentrate during the survey on identifying any roosting bats emerging from or re-entering trees, and to provide a description of general activity if recorded (see Paragraph 3.3.5).

Vantage Point Survey

Vantage point surveys were undertaken to assess the level of roosting activity in the four woodland blocks within the site (Corsican Pine Block, The Avenue, Middle Clearing and Round Wood, see **Map D2**). Surveyors were located around the perimeter of these woodlands to assess the movements of bats (**Map D19**). The aim of these surveys was to provide a broad assessment of whether roosting bats are present within the woodland blocks. This was achieved by assessing whether:

- Bats are recorded emerging from the woodland, particular in quick succession, at a time which would suggest emerging bats i.e. around the emergence period for that species;
- Bat movements at multiple points around woodland blocks to provide a better understanding of bat usage of the site; and

- Details of when bats, particular *Myotis* bat species, were first recorded to gain a better understanding of their roosting location.

Surveys were undertaken during May, June and July/early August 2018 to have the best opportunity of identifying maternity roosts (see Paragraph 3.3.8). All surveyed lasted from 15 minutes before sunset to at least one hour after sunset (as agreed with the LPA and NE). These timings were aimed at identifying bats emerging from or commuting into / out of the woodland blocks during the peak emergence period for the majority of species, and also when light levels would mean that bats were visible.

Bat Automated Detector Survey

Automated detector surveys were undertaken in line with current best practice guidelines (Collins, 2016) between April and October 2018 inclusive.

Ten Wildlife Acoustics Song Meter 4 Full Spectrum (SM4 FS) detectors with SMM-U2 microphones were deployed at the site for five consecutive nights each month between April and October 2018.

The automated detectors were secured in suitable habitat with the microphone positioned to face towards the nearest open space. The devices were programmed to record between 30 minutes before sunset, until 30 minutes after sunrise the following morning on each night they were deployed. The settings utilised on the automated detectors are provided in **Appendix D7**.

The detectors were deployed at the same location during each survey period in order to allow a determination of the levels of activity at the site in each survey period. The locations at which the automated detectors were deployed are provided in **Map D20** and further details of their locations included in **Appendix D7**.

At the end of each automated survey period, the remote bat detectors were retrieved from the site, data was downloaded and then analysed using Kaleidoscope Pro® (Version 4.5.5). This program is designed to analyse large volumes of bat call data using an automated classifier (Bats of United Kingdom Version 4.3.0). More information on the settings used for the conversion process are provided in **Appendix D7**.

The species calls were subsequently checked manually by a suitably qualified ecologist using the Kaleidoscope software, to verify their identities. Sonobat® (v2.9.7) was used to confirm the species identity for ambiguous bat calls. Where suitable recordings were

obtained, bats were identified to species level. For some groups, notably long-eared bat⁹ species and *Myotis*¹² bat species, specific identification was not always possible.

The data was then exported to Microsoft Excel for detailed analysis (i.e. counts of bat registrations) of various parameters.

The number of registrations recorded is not a measure of the number of bats present on site; the number of registrations provides a quantitative assessment of the level of bat activity at a particular location (i.e. the greater the number of registrations, the greater the level of bat activity). The data cannot differentiate between, for example, a single bat passing the detector 10 times or 10 bats passing the detector on a single occasion. The detectors were programmed to count each two second call as a single bat pass.

In order to standardise the number of bat calls recorded the data was then used to calculate an "Activity Index" for various different parameters to be assessed. This involved dividing the number of registrations by the number of nights which detectors were deployed. This data is then represented as number of registrations per night.

The results of the static detector surveys are located in Paragraph 3.3.9.

2.4.2 Survey Details

Mist Netting/Harp Trapping

The bat trapping surveys were undertaken between May and August 2018 with a total of nine nights trapping undertaken. **Table D3** provides details of each trapping session. Trapping locations are shown in **Map D21** which differentiates between locations where bats were trapped and locations where no bats were captured.

Table D3: Bat trapping survey details

Survey Date	Duration	Weather Conditions	Sunset/ Sunrise Time
14 th May 2018	20:30-02:00	14-10°C, 20% cloud cover and a light breeze	20:45
15 th May 2018	20:30-01:05	18-13°C, 20% cloud cover and a gentle breeze	20:48
16 th July 2018	21:00-03:00	20-15°C, 0% cloud cover and a light to gentle breeze	21:09

¹² There are seven species of *Myotis* bats in Britain. *Myotis* bats are very difficult to identify specifically, this can generally only be done by examination of physical features and Phylogenetic Analysis Identification of bat droppings. Many of these bats are common and will utilise buildings for roosting often occupying small and inaccessible voids. For the purpose of this report all species shall be referred to as *Myotis* bats unless a specific identification has been possible.

Survey Date	Duration	Weather Conditions	Sunset/ Sunrise Time
17 th July 2018	21:00-02:00	18-14°C, cloud cover ranged from 10-100%, no wind	21:08
18 th July 2018	21:00-00:10	17-16°C, cloud cover ranged from 10-100%, no wind	21:07
19 th August 2018	19:30-03:00	20-16°C, 100% cloud cover, light breeze	20:14
20 th August 2018	21:00-03:30	20-17°C, 100% cloud cover, no wind	20:13
21 st August 2018	21:00-03:00	18-15°C, 100% cloud cover, no wind	20:13
23 rd August 2018	21:00-02:00	18-10°C, 100% cloud cover, light breeze	20:09

During the bat trapping the surveyors were equipped with Sussex AutoBat and/or Pettersson D1000x acoustic lures. Capture methods comprised a combination of harp traps and mist nets (varying between eight and 15 metres in length).

The bat trapping surveys were coordinated by Colleen Hope (Natural England bat licence numbers 2015-10277-CLS-CLS[CL19] and 2015-15456-CLS-CLS[CL20]) and Paul Hope (Natural England bat licence numbers 2015-15167-CLS-CLS [CL19] and 2015-15166-CLS-CLS [CL20]) of Ecological Consultancy Services (ECS) and Simon Boswell of ECOSA (Natural England Bat Licence 2015-12526-CLS-CLS) assisted by suitably qualified and experienced ECOSA surveyors.

Radio Tracking

To track Bechstein's bat Biotrack PIP4 Ag 337 radio transmitters (tags) were used. These transmitters have a life span of 10 to 14 days and weigh 0.32 grams. Bechstein's bats were selected for radio tagging where tag weight represented no more than 5% of the bats body weight (Aldridge & Brigham, 1998). Small areas of fur were trimmed and tags fitted between the shoulder blades with Salts Ostomy Adhesive Solution. Bats were tracked using Biotrack Sika receivers and Yagi 3-element antennas. The tag details and radio tracking dates of each bat are provided in **Table D4**.

Table D4: Bechstein's bat radio tracking details

Tag/ring number	Species	Date Tagged	Time Tagged	Date Period Tracked
173.338/ H1959	Bechstein's bat	15 th May 2018	01:30	16 th -18 th May 2018

Tag/ring number	Species	Date Tagged	Time Tagged	Date Period Tracked
173.238/ Z9429	Bechstein's bat	16 th May 2018	00:20	16 th -19 th May 2018
173.277/ H1958	Bechstein's bat	16 th July 2018	23:00	17 th -20 th July 2018
173.2957/ H1968	Bechstein's bat	19 th August 2018	01:50	21 st -24 th August 2018

Within this report where reference is made to these bats the latter part of the tag number is used i.e. 338, 238, 277 and 2957 rather than using the full tag number and ring number.

The bat radio tracking was coordinated by Colleen and Paul Hope assisted by suitably qualified and experienced ECOSA surveyors.

Ground Level Tree Assessment¹³

The ground level tree assessment of roosts identified during 2008-2009 was carried out by Simon Boswell (Natural England Bat Licence 2015-12526-CLS-CLS) on 19th June 2018 (see **Table D21**). The weather conditions were overcast and muggy, an ambient temperature of 22°C and a light wind.

Roosts where Bechstein's bat were recorded during the 2018 radio-tracking survey were subject to a Ground Level Tree Assessment carried out by Colleen Hope and Paul Hope on 20th November 2018 (see **Table D20**). The trees were also tagged during this assessment. The weather conditions were part cloudy, an ambient temperature of 5°C and a light to moderate wind.

Climb and Inspect and Endoscope Surveys

In accordance with Health and Safety Executive guidance¹⁴ (AFAG401) the Schwegler 1FW inspections were carried out by a team of two ECOSA surveyors, experienced and trained in tree climbing. One surveyor climbed the tree and the other surveyor remained on the ground to perform a competent aerial rescue in case of an emergency. The tree climbing was carried out using an appropriate work-positioning system and suitable Personal Protective Equipment (PPE). The other bat boxes erected in the vicinity of the site were checked from a extendable ladder.

¹³ A Ground Level Tree Assessment report prepared by Ecological Consultancy Services Ltd in April 2020 has been inserted as Appendix D11.

¹⁴ Health and Safety Executive (2013) AFAG201 (Rev.2), Tree Climbing Operations. Available from www.hse.gov.uk/pubns/afag401.htm

The tree climb and inspect survey was undertaken by ECOSA Field Ecologist Jack Medley (2018-38355-CLS-CLS) and Greenvue Limited's Ecologist Ed Venables (Natural England Bat Licence: 2015-14865-CLS-CLS) and on 15th July 2019.

The endoscope survey was carried out by Trevor Codlin (NE bat licence ref: CL18-2015-12342-CLS-CLS) of Portsmouth Water who undertook an external visual assessment and an internal investigation of tree 1604 on 20th June 2019.

The internal investigation was carried out using a PiAEK inspection camera HD 1200p, connected via Wi-Fi to an Apple iPad pro. The endoscope includes a two megapixel HD camera and eight LED lights that can be adjusted according to the level of ambient light. The semi-rigid cable can be bent and maintained in shape and can extend for a distance of up to ten metres.

Vantage Point Survey

The vantage point surveys were undertaken between May and September 2018. **Table D5** provides details of each vantage point survey and the locations survey during each survey. The location of each vantage point is provided on **Map D19**.

Table D5: Bat vantage point survey details

Survey Date	Vantage Point Nos.	Survey Type	Duration	Weather Conditions	Sunset Time
21 st May 2018	8-14	Dusk	20:40-22:00	Overcast, dry, 14°C, 100% cloud cover, calm	20:56
24 th May 2018	1-7	Dusk	20:45-22:00	Part cloudy, dry, 18-14°C, 30-50% cloud cover, light breeze	21:00
28 th May 2018	15-16	Dusk	20:47-22:07	Part cloudy, dry, 21-20°C, 10-50% cloud cover, light breeze	21:05
27 th June 2018	1-16	Dusk	21:05-22:24	Muggy, dry, 22-18°C, 0% cloud cover, calm	21:23
25 th July 2018	5-16	Dusk	20:45-22:02	Warm, dry, 25-22°C, 0% cloud cover, calm	21:02
1 st August 2018	1-4	Dusk	20:35-21:51	Clear, dry, 17°C-12°C, 0-20% cloud cover, calm	20:51

Emergence/Re-entry Survey

The bat tree emergence/re-entry surveys were undertaken between May and September 2018. **Table D6** provides details of each emergence/re-entry survey. Locations of trees and their associated tag numbers are provided on **Map D39**.

A small number of the surveys were undertaken in advance of trapping surveys (NT001, 1616, 1610 and two of the surveys for 1615) and therefore these surveys do not conform to current guidelines, however they have been included here to provide additional information to support the assessment.

Table D6: Bat emergence/re-entry survey details

Survey Date	Tree No(s).	Survey Type	Duration	Weather Conditions	Sunset/ Sunrise Time
14 th May 2018	1615	Dusk	20:45-21:40	Clear and warm, dry, 23-13°C, 0% cloud cover, light breeze	20:45
16 th July 2018	1615	Dusk	21:00-22:15	Clear, dry, 18-14°C, 0-25% cloud cover, light breeze	21:11
25 th July 2018	1615	Dusk	20:45-22:30	Warm dry, 25-22°C, 0% cloud cover, calm	21:02
30 th July 2018	1601, 1611	Dusk	20:38-22:23	Cloudy, dry, 19-18°C, 40-80% cloud cover, light breeze	20:53
31 st July 2018	1612, 1617, 1619	Dusk	20:37-22:33	Clear humid, dry, 22-18°C, 0% cloud cover, light breeze	20:52
14 th August 2018	1615, 1619	Dawn	04:08-06:04	Clear, mild, dry, 16-15°C, 5-10% cloud cover, light breeze	05:49
15 th August 2018	1612, 1617	Dawn	04:20-06:10	Cloudy, dry, 18°C-19°C, 80-100% cloud cover, light breeze	05:55
16 th August 2018	1601, 1611	Dawn	04:23-06:08	Cloudy, light drizzle at start of survey, 16.5-14°C, 100% cloud cover, light breeze	05:53
19 th August 2018	1616, NT001	Dusk	20:00-21:47	Clear, dry, 21-18°C, 0% cloud cover, light breeze	20:18
23 rd August 2018	1610	Dusk	19:55-21:48	Turning overcast, dry, 19-16°C, 50%-80% cloud cover, light breeze	20:11
5 th September 2018	1612, 1615, 1617, 1619	Dusk	19:25-21:25	Clear, dry, 20-17°C, 15% cloud cover, light breeze	19:40
6 th September 2018	1601, 1611	Dusk	19:24-21:24	Cloudy, dry, 21-19°C, 100% cloud cover, light breeze	19:39

During the bat emergence/re-entry surveys the surveyors were equipped with Pettersson D240x, Batlogger M or Wildlife Acoustics Echo Meter Touch bat detectors. The Pettersson detectors were connected to Edirol R-05 recorders for the full duration of the survey whilst the EchoMeter Touches were connected to a compatible iOS device. Recordings made with the detectors were later analysed using Bat Explorer 2 and Sonobat® (v2.9.7) to confirm the identity of any species encountered.

Each surveyor viewed potential roosting features using either a Bushnell Equinox Z digital night vision binoculars or Yukon Ranger RT 6.5 x 42 Night Vision Scope for the duration of the survey. Using night vision increases the likelihood of recording emerging / re-entering bats.

The results of the emergence / re-entry surveys are presented in Paragraph 3.3.7.

The bat emergence/re-entry surveys were coordinated by Simon Boswell Principal Ecologist of ECOSA assisted by suitably trained and experienced ECOSA surveyors.

Bat Automated Detector Survey

The automated detector surveys were undertaken between April and October 2018 with a total of 340 nights recording undertaken across 10 bat detectors. **Table D7** provides details of each recording period.

Table D7: Automated detector survey details

Survey Period	Date	Weather Conditions ¹⁵				Sunset	Sunrise
		Temperature (°C)		Wind (km/h)	Precipitation (mm)		
		High	Low				
27 th April – 2 nd May 2018	27 th	11	6	17	0.0	20:20	05:47
	28 th	8	7	13	0.0	20:22	05:46
	29 th	8	6	30	0.0	20:23	05:44
	30 th	10	5	33	0.0	20:25	05:42
	1 st	12	0	33	0.0	20:27	05:40
24 th – 29 th May 2018	24 th	14	11	17	0.0	21:01	05:05
	25 th	18	11	9	0.0	21:02	05:04
	26 th	25	14	20	0.0	21:04	05:03
	27 th	23	16	13	0.0	21:05	05:02
	28 th	23	13	17	0.0	21:05	05:01
20 th – 25 th June 2018	20 th	21	14	22	0.0	21:24	04:52
	21 st	19	10	24	0.0	21:24	04:52
	22 nd	21	8	15	0.0	21:24	04:52
	23 rd	22	7	15	0.0	21:24	04:52
	24 th	24	13	11	0.0	21:24	04:53
	25 th	27	15	13	0.0	21:03	05:22

¹⁵ Weather data is sourced from online weather data (Weather Underground , 2018)

Survey Period	Date	Weather Conditions ¹⁵				Sunset	Sunrise
		Temperature (°C)		Wind (km/h)	Precipitation (mm)		
		High	Low				
25 th – 30 th July 2018	26 th	29	15	24	0.0	12:02	05:23
	27 th	25	16	22	0.0	21:01	05:25
	28 th	19	14	41	0.0	20:59	05:26
	29 th	18	15	37	0.0	20:58	05:27
20 th – 25 th August 2018	20 th	22	16	17	0.0	20:19	06:01
	21 st	22	15	17	0.0	20:17	06:02
	22 nd	21	15	15	0.0	20:15	06:04
	23 rd	21	15	20	0.0	20:13	06:06
	24 th	17	10	22	0.0	20:11	06:07
27 th September – 2 nd October 2018	27 th	21	2	13	0.0	18:55	07:00
	28 th	16	5	22	0.0	18:52	07:01
	29 th	16	2	9	0.0	18:50	07:03
	30 th	14	0	15	0.0	18:48	07:05
	1 st	14	5	17	0.0	18:46	07:06
18 th – 23 rd October 2018	18 th	14	8	18	0.0	18:06	07:34
	19 th	15	4	9	0.0	18:07	07:36
	20 th	17	2	7	0.0	18:05	07:37
	21 st	18	4	11	0.0	18:03	07:39
	22 nd	12	2	24	0.0	18:01	07:41

The automated detectors were deployed by a suitably experienced ECOSA ecologist. The detector programming and data analysis was conducted by Simon Boswell Principal Ecologist, and Ecologists Hugh Turner and Joanne Richmond of ECOSA. The results of the automated detector surveys are presented in Paragraph 3.3.9.

2.4.3 Survey Limitations

Some bat species, e.g. long-eared bat⁹ species, generally emerge from their roosts in total darkness and do not produce strong echolocations, and therefore these bats can be difficult to observe and record during bat surveys, leading to under-recording.

Mist nets and harp traps will only capture a small percentage of bats present within any habitat during any period. Some species are more readily able to avoid mist nets and harp traps than others.

The use of an acoustic lure to attract bats is an effective method of increasing capture rates when trapping bats, including Bechstein's bat, in woodland (Hill & Greenaway, 2005). However relatively little is known about the exact response to calls made by the lure, for instance some species appear to be attracted to the acoustic lure more than others, and males, females and juveniles may respond differently. Seasonal differences in capture rates have been observed with bats more likely to be attracted to acoustic calls in autumn and spring than in summer; some of the calls may even have a repellent effect (Barlow & Jones, 1997). For these reasons the interpretation of results must be treated with caution.

Bat detectors are less likely to detect quiet species such as long-eared bat⁹ species and *Myotis*¹² bat species and consequently these species are likely to be under-represented in surveys. Bat echolocation calls are more likely to attenuate within areas of dense vegetation and consequently bats are more difficult to detect in these habitats. Bats from most British species tend to adapt their echolocation calls (rapid frequency modulated sweeps) when flying in cluttered vegetation, even distinctions between calls of bats such as noctule and serotine (which are normally readily identifiable in open environments) can be difficult. Therefore, where possible calls were recorded in time expansion mode (the most reliable recording method to retain elements of a call for analysis).

Identification to species level is often not possible for *Myotis*¹² bat species and long-eared bat⁹ species in many cases. Where *Myotis* bat species could not be reliably identified the registrations were recorded as *Myotis* bat species or in a few cases *Myotis* bat species / long-eared bat species. Whiskered and Brandt's bats cannot be separated by sound or sonogram analysis and not always when in the hand. Therefore Whiskered/Brandt's were recorded as such unless a high degree of confidence from a bat in the hand could be obtained. Where *Myotis* bat species could be seen (e.g. Daubenton's bats over water) or where surveyors had a high level of confidence in the quality of recordings bats were noted to species level.

Similarly, grey long-eared bat and brown long-eared bat cannot be distinguished without taking measurements from a bat in the hand, consequently all detector recordings of long-eared bats were recorded as long-eared bat species. However, during the survey period no grey long-eared bat were captured indicating that this species may not be present within the survey area. Therefore, whilst ECOSA remained

vigilant to the possibility of this species occurring, the grey long-eared bat is not considered or discussed further within this report.

Noctule and serotine bats are normally readily identified, however Leisler's bat may be confused with either species, particularly with noctule. Surveyors considered the presence of Leisler's bat as possible but no typical calls were recorded suggesting that it was unlikely that this species was present. If a low frequency call could not be readily identified with a high degree of confidence it was recorded simply as noctule / Leisler's bat.

Numerous trees on the site have high potential to support roosting bats, however only a small proportion of these trees are likely to have been revealed during surveys to date. Added to this, bats move roost sites frequently, often every few days. Furthermore, it is often not possible to see suitable roost features from the ground as they can be obscured by leaves or branches. As a result, and given the extent of the woodland within the site, it is not possible to obtain exact figures for the number of bats roosting in the on-site woodlands. However, the detailed level of survey work over a number of years has provided a robust assessment of the bat usage of the site.

The quality of both hand-held and automated bat detector recordings is based, to a large extent, on the proximity of a bat to the detector's microphone. Obstructions such as vegetation or environmental variables such as rainfall and wind noise from vegetation will all influence the quality of sound reaching the microphone and thus some bat echolocation recordings are of insufficient quality for specific identification. Bats routinely alter their echolocations in relation to behaviour and their environment. It is not always possible to make a robust identification of every bat recording.

The use of bat detectors is likely to result in the under-recording of a percentage of bats present, such as those flying at height (Collins & Jones, 2009), which would be out of the recording range for the detectors.

During July 2018 the detector at Location 8 (see **Map D20**) was vandalised, rendering the device unusable. As a result, the recordings were not retrievable. The device at Location 8 was also subject to a technical error in October 2018, again no recordings were obtained. All other devices were deployed successfully during the season representing 340 nights of remote recording. Given the number of detectors deployed the data lost from Location 8 represents 10 nights of recording, approximately 2.8% of the overall total, and therefore this was not considered to be a significant limitation given the amount of data obtained throughout the season, including for Location 8 itself.

Despite the intensity and range of surveys undertaken to date, only a series of snapshots can ever be obtained on the percentage of animals present. The surveys on

and adjacent to the proposed development area, however have employed a range of techniques and been repeated on a monthly basis with the aim of overcoming these limitations. Surveys have also been undertaken during previous years. It is considered sufficient data has been collected to allow a robust assessment to be made of bat usage at the site.

2.5 Discussion and Criteria used to Assess Ecological Value

Discussion of the bat survey results is based on ECOSA's professional judgement and publicly available publications, survey data and other sources as referenced in the main text. In addition, in this Appendix, an evaluation of the site for bats is provided, based on a geographic scale of importance as follows; international and European, national, regional, county, local and site. There are a wide range of characteristics which contribute to the importance of ecological features, and these may justify an increase or reduction in the value of an ecological feature. Where deviations occur, these will be explained in the evaluation section of this report (Section 3.04).

Current published relevant guidance, including information sources such as A Nature Conservation Review (Ratcliffe, 1977) and Guidelines for Ecological Impact Assessment in the United Kingdom (CIEEM, 2018) have also been used to inform the discussion.

Conservation Status of bats within this report is based on A Review of the Population and Conservation Status of British Mammals: Technical Summary (Matthews, et al., 2018). The site may of value at different geographic scales for different bat species.

Discussion of the results and the evaluation of the site for bats is based on ECOSA's best professional judgement considering the following factors:

- **Species rarity** - Relative rarity of bat species in England is based on guidance set out in 'In Practice' Article 'Valuing Bats in Ecological Impact Assessment' (Wray, et al., 2010), which is based on estimates in (Richardson, 2000), (Harris, et al., 1995) and (Harris & Yalden, 2008). **Table D8** shows the relative rarity of different species of bat. Rarer species are considered to be of greater ecological value.

Table D8: Relative rarity of UK bat species

Rarity within England	Species
Common (Population over 100,000)	Common pipistrelle Soprano pipistrelle Brown long-eared bat
Rarer (Population 10,000 – 100,000)	Lesser horseshoe Whiskered bat Brandt's bat Daubenton's bat

Rarity within England	Species
	Natterer's bat Leisler's bat Noctule Nathusius' pipistrelle Serotine
Rarest (Population under 10,000)	Greater horseshoe Bechstein's bat Alcathoe bat Greater mouse-eared bat Barbastelle Grey long-eared bat

- **Species distribution** – The Hampshire Bat Group data, other consultants reports and Article 17 reporting (JNCC, 2019) is used to determine the distribution of bat species at various geographic scales.
- **Presence of roosts and their ecological function (i.e. breeding or non-breeding roosts)** – Roost types have been defined in accordance with Bat Conservation Trust guidelines (Collins, 2016). Definitions and their relative status are set out in **Table D9**.

confidence in the assessment is presented in **Table D10** which has been extracted from (Collins, 2016).

Table D10: Core Sustenance Zones of UK bat species

Species	CSZ Radius in Kilometres	Confidence in Zone Size
Alcathoe bat	Unknown	n/a
Barbastelle	6	Moderate
Bechstein's bat	3	Moderate
Brandt's bat	1	Poor
Brown long-eared bat	3	Poor
Common pipistrelle	2	Poor
Daubenton's bat	2	Poor
Greater horseshoe	3	Moderate
Grey long-eared bat	3	Moderate
Leisler's bat	3	Moderate
Lesser horseshoe	2	Good
Nathusius' pipistrelle	3	Poor
Natterer's bat	4	Good
Noctule	4	Poor
Serotine	4	Poor
Soprano pipistrelle	3	Poor
Whiskered bat	1	Poor

These factors have been taken into account to provide an assessment of the site's value at a geographic scale for bat species and the bat assemblage. Many ecological impact assessments use Valuing Bats in Ecological Impact Assessments (Wray, et al., 2010) to provide an assessment of the sites value to bats. However, for this site assessment that method is not considered appropriate given the fine scale of data available for the site and surrounding area. As a result, the evaluation of bats at the site has used the criteria in **Table D11**.

Table D11: Criteria for geographic scale of importance for bats

Importance	Criteria
Site	Supports habitat that is likely to provide a resource for bat species, but this resource is not considered to be significant to the local population.
Local	Supports habitat that is likely to provide a significant resource for bat species in the local area but would not qualify for SINC status in accordance with ' <i>Criteria for the Selection of Sites of Importance for Nature Conservation in Hampshire</i> ' (Hampshire Biodiversity Information Centre, 1996).
County	Supports a bat population or assemblage that would qualify for SINC status in accordance with ' <i>Criteria for the Selection of Sites of Importance for Nature Conservation in Hampshire</i> ' (Hampshire Biodiversity Information Centre, 1996). HBIC state that a notable species ¹⁶ must have been recorded breeding at a site over a number of years for it to be considered as of county value (HBIC per comms.).
National	Supports a bat population or assemblage that would qualify for SSSI status in line with criteria set out in ' <i>Guidelines for the Selection of Biological SSSIs</i> ' (Drewitt, et al., 2015).
European	Supports a bat population or assemblage that would qualify for Special Area of Conservation status in line with criteria set out in ' <i>The Habitats Directive: Selection of Special Areas of Conservation in the UK</i> ' (McLeod, et al., 2005)

¹⁶ Greater horseshoe, lesser horseshoe, Bechstein's bat, mouse-eared bat, serotine, common pipistrelle, barbastelle and grey long-eared bat are classed as notable in Hampshire

3.0 BASELINE ECOLOGICAL CONDITIONS, DISCUSSION AND EVALUATION

3.1 Introduction

This section details the results of the 2018 bat assessment work undertaken for the HTWSR site, along with survey data from previous years. It assesses the baseline ecological conditions of the site in respect to bats at the time of the desktop study and field surveys. The baseline draws on a wealth of historical and present data, relevant data from historic surveys has been included in the report to increase the understanding of the site in terms of bats.

The discussion and evaluation section of baseline includes an assessment based on the results of the 2018 bat surveys and those carried out in 2008/2009 (see Paragraph 1.2 for further details). The full results of the 2008/2009 bat surveys is provided in **Appendix D12**.

3.2 Desktop Study Results

There are no bat SACs within 10 kilometres of the site, and the nearest SAC designated for bats is Singleton and Cocking Tunnels located 15.2 kilometres to the east. These tunnels are designated for their hibernating populations of barbastelle *Barbastella barbastellus* and Bechstein's bat *Myotis bechsteinii*. Six other species of bat have also been recorded hibernating in Singleton and Cocking Tunnels, including the only known individual of the mouse-eared bat *Myotis myotis* in the UK.

The detailed desktop study data for bat species / species groups likely to be present within the site is provided in the **Table D12**. Records of fourteen bat species were returned within the data search comprising; whiskered bat *Myotis mystacinus*, Brandt's bat *Myotis brandtii*, Alcahloe bat *Myotis alcathoe*, Bechstein's bat, Daubenton's bat *Myotis daubentonii*, Natterer's bat *Myotis nattereri*, serotine *Eptesicus serotinus*, noctule *Nyctalus noctula*, Leisler's bat *Nyctalus leisleri*, common pipistrelle *Pipistrellus pipistrellus*, Nathusius' pipistrelle *Pipistrellus nathusii*, soprano pipistrelle *Pipistrellus pygmaeus*, brown long-eared bat *Plecotus auritus* and barbastelle. The location and status of each record returned with the data search is presented in **Map D3** to **Map D18**.

Table D12: Desktop study overview

Species	Details
Alcahloe bat (Map D3)	Hampshire Bat Group data includes five records of Alcahloe bat within three kilometres of the site. A male trapped on 14th August 2018 at Camp Field, Havant (Ecology Co-op, 2018), located approximately 1.6 kilometres south-east of the site. The bat was identified through DNA analysis of droppings. A second individual was recorded during 2018 (per comms. with Hampshire Bat Group) from Oaklands School Playing Field (SU689079) located approximately 2.6 kilometres south-west of the

Species	Details
	site. It is assumed that the bat was identified through DNA analysis of droppings. A third individual was rescued after being picked up by a member of the public from Horndean Technology College on 27th September 2017, again this individual was identified through DNA analysis of droppings. This location is approximately 2.5km north-west of the site. The fourth and fifth individuals were recorded on 27th July 2019 (per comms. with Hampshire Bat Group) from Southleigh Forest (SU 7556 0919) on the Stansted Estate located approximately three kilometres east of the site. The bats were identified from DNA analysis of droppings and comprised an adult male and juvenile female. There are two other records of Alcaho bat in the Hampshire Bat Group database both of which are located in north-east Hampshire, well removed from the site.
Barbastelle (Map D4)	Hampshire Bat Group (records 1995-2017) and Sussex Biodiversity Information Centre (1989-2017) data indicate that barbastelle has been recorded in relatively low numbers (nine records) within three kilometres of the site. However, there are also 13 records for the species located approximately 590 metres east of the site at May's Coppice Farm between April and October 2017. There are no records of roosts within the three-kilometre radius of the site.
Bechstein's bat (Map D5 and Map D6)	Hampshire Bat Group (1995-2017) and Sussex Biodiversity Information Centre (1989-2017) data indicates that Bechstein's bat has been widely recorded within two kilometres of the site, largely due to a significant survey effort associated with the species in recent years. Many of the roost records were recorded by ECOSA during 2008-2009 and these have been discussed as part of the survey results in this report (see Paragraph 3.3.1). Records of three Bechstein's bat maternity roosts were recorded by WYG in 2014, these are located: ▪ In a birch <i>Betula</i> species tree within Stein Wood approximately 180 metres east of the proposed access track and 1.1 kilometres north of the reservoir footprint (34 bats, August 2014); ▪ In a woodpecker hole in a pedunculate oak tree within Stein Wood approximately 300 metres north of the proposed access track and 1.3 kilometres north of the reservoir footprint (16 bats, August 2014); ▪ In a pedunculate oak tree located approximately 1.1 kilometres north of the proposed access track and 1.8 kilometres north of the reservoir footprint at Hazelton Farm, Horndean (25 bats; August 2014). Four day roosts containing one or two individuals were also recorded from Stein Wood, The Holt and Hazelton Farm by WYG in 2014. Bat trapping works within two kilometres of the site in relation to Bechstein's bat were mainly recorded by WYG in 2014 and EPR in 2017 at Hazelton Farm to the north of the site. Three other individuals have been caught within two kilometres; further details of these records are provided in Table D13 (below). The most recent records of Bechstein's bat in the local area comprise four individuals caught by Hampshire Bat Group on 27th July 2019 on the Stansted Estate in Southleigh Forest located approximately three kilometres east of the site (SU 7556 0919). The bats comprised one female and three males, all of which were judged to be juveniles.

Species	Details
	There are also four SINC's within three kilometres of the site which have been partly designated for Bechstein's bat. The names and relatively locations of these sites are presented below: - Havant Thicket SINC – A large block of mixed woodland adjacent to northern boundary of the site and within the boundary of the north-western access track; - Redcroft Row (Keydell Nurseries) SINC – A small section of broadleaved woodland located approximately 1.2 kilometres north-west of the site; - Idsworth Common SINC – A block of broadleaved woodland adjacent to the northern edge of Havant Thicket SINC located approximately one kilometre north of the reservoir footprint and within the boundary of the north-western access track; and - The Holt SINC - A large block of mixed woodland located approximately 550 metres north of the reservoir footprint. Information received from HBIC indicates that the Bechstein's bat designation for Havant Thicket SINC resulted from the survey work carried out in 2014 (presumably by WYG, see above), when five fixes of three different bat were recorded within Havant Thicket woodland SINC. It should be noted that the majority of the activity of these bats was recorded from Idsworth Common SINC and the farmland to the north-west of the site (see (WYG, 2014)) rather than Havant Thicket woodland.
Brown long-eared bat / long-eared bat species (Map D10)	Hampshire Bat Group (records 1995-2017) and Sussex Biodiversity Information Centre (1989-2016) data indicates that brown long-eared bat and long-eared bat species have been widely recorded within three kilometres of the site. Away from the site, two maternity roosts have been recorded within three kilometres, one in a tree in Staunton Country Park (SCP), 22 bats in June 2008 and one in a residential property approximately 1.5 kilometres north-west (10 bats, 2002). Two larger hibernation roosts have also been recorded from residential properties within three kilometres of the site, one approximately 180 metres south-east (25 bats, November 1999) and one approximately 250 metres north-north-east (15 bats, December 1996).
Common pipistrelle (Map D7)	Hampshire Bat Group (records 1995-2017) and Sussex Biodiversity Information Centre (1989-2016) data indicates that common pipistrelle has been widely recorded within three kilometres of the site. A number of roosts for the species have also been recorded. The closest of these is located approximately 760 metres east of the site at Kimbridge Lane, Havant (6 bats, July 2007).
Daubenton's bat (Map D8 and Map D11)	Hampshire Bat Group (1995-2017) and Sussex Biodiversity Information Centre (1989-2017) data indicates that Daubenton's bat has been recorded in very low numbers (two records) within three kilometres of the site. However, many more records are for <i>Myotis</i> bat species (unspecified). No records of roosts of Daubenton's bat were returned in the data search.
Leisler's bat (Map D9)	Hampshire Bat Group (records 1995-2017) and Sussex Biodiversity Information Centre (1989-2016) data indicates that Leisler's bat in low numbers (seven records) in the local area, none of which are from within the site. The majority of records (5) are associated with Hazelton Farm approximately 400 metres north-west of the site. Two records are located to the west of the site, at Mays Coppice Farm and

Species	Details
	south of Barton Copse. There are no records of Leisler's bat roosts within three kilometres of the site.
Nathusius' pipistrelle (Map D12)	Hampshire Bat Group (records 1995-2017) data indicates that Nathusius' pipistrelle has been recorded in small numbers (seven records) within three kilometres of the site. The closest of these is located approximately 590 metres east at May's Coppice Farm. There are no records of roosts within three kilometres of the site.
Natterer's bat (Map D13 and Map D11)	Away from the site one maternity roost has been recorded within three kilometres, located in a tree roost in SCP (21 bats, May 2008). In addition, two other single Natterer's bat days roosts were recorded in SCP during ECOSA's 2008 radio-tracking. Biological Record Centre data does not contain any other Natterer's bat roost sites within three kilometres of the site. 21 records of foraging / commuting Natterer's bat were returned in the data search, mainly within woodland and parkland present locally. Given the difficulty in identifying <i>Myotis</i> bat species from echolocation it is possible that some of the <i>Myotis</i> bat species records returned with the data searches relate to Natterer's bat. Trapping work in other nearby areas has recorded a number of Natterer's bat, including eight individuals at Land East of Horndean (2014), four at the nearby proposed solar farm site, including two that were pregnant (2014), four at Oaklands (2014), in SCP (2016/2017), two males at Camp Field, Bartons Road (2017) and a post-lactating female on the Stansted Estate in Southleigh Forest (2019).
Noctule (Map D14)	Hampshire Bat Group (records 1995-2017) and Sussex Biodiversity Information Centre (1989-2016) data indicates that noctule has been recorded on 39 occasions within three kilometres of the site, three of which are located within or on the site boundary. There is a single record of an emergence survey approximately 200 metres east of the site, although the details of the status of this roost are unknown.
Serotine (Map D16)	Hampshire Bat Group (1995 – 2017) and Sussex Biodiversity Information Centre (1989 – 2017) data indicates that serotine has been recorded in moderate numbers (33 records) within three kilometres of the site, three of these records are located within or on the site boundary. There are records of two serotine maternity roosts within the wider area, both are located approximately 1.6 kilometres south of the site on Stockheath Lane, Havant (28 bats each, June 2011). There are also six further records of other serotine roosts within three kilometres of the site.
Soprano pipistrelle (Map D17)	Hampshire Bat Group (records 1995-2017) and Sussex Biodiversity Information Centre (1989-2016) data indicates that soprano pipistrelle has been widely recorded within three kilometres of the site. A number of soprano pipistrelle roosts have also been recorded within the three-kilometre radius. The closest of these is located just outside the site boundary on its south-eastern edge, located within a tree shared with whiskered bat / Brandt's bat (>1 bat, July 2008).
Whiskered / Brandt's bat (Map D18 and Map D11)	Hampshire Bat Group (records 1995-2017) and Sussex Biodiversity Information Centre (records 1989-2017) data indicates that whiskered bat (14 records) and Brandt's bat (six records) have been recorded in small numbers within three kilometres of the site. However, many more records are for <i>Myotis</i> bat species (unspecified). There is one record for whiskered/Brandt's maternity roost located within a tree immediately south-east of the southern boundary (>1 bat, July 2008).

Species	Details
	Away from the site, there was one additional record for a roost of whiskered/Brandt's bat located on Link's Lane approximately 1.2 kilometres north-east of the site (one bat, August 2002).

Particular attention has been paid to identifying Bechstein's bat survey data from existing planning applications, surveys for conservation and on-going work which is not yet in the public domain. This information is presented in **Table D13** and **Map D6**. Between 2014 and 2017 a total of 23 Bechstein's bat have been caught within the local area, comprising 15 females and eight males¹⁷. During this period three maternity roosts were located within Stein Wood (34 bats), The Holt (16 bats) and Hazelton Farm (24 bats) to the north-east, north and north-west of the site.

¹⁷ Note that the numbers referenced here do not include the Bechstein's bat trapped by ECOSA in 2008/09 and 2018

Table D13: Bechstein's bat data from the local area (see **Map D5**)

Planning Reference and / or Site Name	Survey Year(s)	Approximate Distance from Site	Bat Survey Methods	Bechstein's Bat Data
Oaklands School Playing Fields (SU689079)	2018	2.3 kilometres, south-west	Exact trapping information not available at the time of writing.	No Bechstein's bat caught during the surveys.
APP/19/00007 Camp Field (land to the west of Havant Crematorium), Bartons Road, Havant	2017 and 2018	1.6 kilometres, south-east	Three nights trapping 14 th August 2017, 19 th September 2017 and 21 st May 2018.	No Bechstein's bat caught during the surveys.
55562/001 Development Land East of Horndean, Rowlands Castle Road, Horndean, Waterlooville	2014, 2017 and 2018	350 metres north-west	Five nights trapping during 2014; 15 th -17 th July and 10 th -11 th August 2014. A total of seven locations were trapped. Eight nights trapping during 2017-2018; 17 th -18 th August 2017, 25 th August 2017, 25 th -26 th September 2017, 28 th September 2017, 21 st -22 nd May 2018.	Five Bechstein's bat trapped and radio-tracked for up to four days during 2014 (four female and one male). At least three maternity roosts located. During 2017 four Bechstein's bat were trapped but not radio-tracked. Two males were caught in Dell Piece East and two females caught along a field boundary on the south-east corner of the site. A licence obtained in 2018 for Bechstein's bat radio-tracking but none were caught during the May 2018 surveys.
55023/001 Solar Farm Site – EIA screening opinion only, site not taken forward to formal planning application	2014	Adjacent, northern boundary (north of Havant Thicket woodland)	Three nights trapping during 2014; 22 nd April 2014, 27 th May 2014 and 9 th June 2014	One pregnant female Bechstein's bat trapped. No radio-tracking undertaken.
55406/002 Land Rear of, 191-211 Lovedean Lane, Horndean, Waterlooville	2017	3 kilometres north-west	Three nights trapping; 26 th June 2017, 21 st July 2017 and 16 th August 2017	No Bechstein's bat caught during the surveys.

Planning Reference and / or Site Name	Survey Year(s)	Approximate Distance from Site	Bat Survey Methods	Bechstein's Bat Data
APP/17/00736 Staunton Country Park, Middle Park Way, Havant, PO9 5HB	2017	135 metres south-east	Four nights trapping; 29 th September 2016, 8 th May 2017, 12 th June 2017, 30 th July 2017	No Bechstein's bat caught during the surveys.
GEN/18/01143 Land North of Long Copse Lane, Emsworth	2016	2.8 kilometres south-east	Radio tracking summer 2016.	Roosts identified in nearby woodland and hedgerow tree. Full details not yet in the public domain.
APP/17/00863 Southleigh Park House, Eastleigh Road, Havant, PO9 2PE	2016	2 kilometres south-east	Three nights trapping; 17 th June 2016, 5 th July 2016 and 11 th August 2016.	Male recorded 5 th July 2016, two juvenile females recorded on 11 th August 2016. No radio-tracking undertaken. No evidence of Bechstein's bat roosts within the site.
Biddenfield High Wood	2016	16.4 kilometres west	Five nights trapping; 3 rd June 2016, 4 th June 2016, 5 th June 2016, 11 th August 2016 and 28 th August 2016	One female Bechstein's bat recorded June 2016. No radio-tracking undertaken.
APP/15/01156 Plot 2, Dunsbury Hill Farm, Park Lane, Cowplain, Waterlooville	2015	795 metres south-west	At least one night of trapping on 7 th September 2015, three nights trapping in 2016.	A single adult female Bechstein's bat was caught during 2015. The bat was considered to be parous at the time but not likely to have bred that year. No further Bechstein's bat caught during 2016.
52585/001 Land East of Church Centre, Blendworth Lane, Horndean, Waterlooville	2014	1.7 kilometres north-north-west	Two nights of trapping; 3 rd July 2014 and 17 th July 2014	An adult parous female and juvenile female were caught on 3 rd July 2014. No Bechstein's bat were trapped on 17 th July 2014.
30016/018 Oaklands House, Redhill Road, Rowlands Castle, PO9 6DJ	2014	125 metres east	Three nights trapping; 28 th August 2014, 10 th September 2014 and 24 th September 2014	No Bechstein's bat caught during the surveys.
Brickkiln Ponds, Stanstead Estate	2019	Three kilometres east	One nights trapping using three harp traps.	One female and three males Bechstein's bat, all of which were judged to be juveniles.

3.3 Survey Results

3.3.1 2005/2006 Summary

ECOSA undertook seven evening bat detector transect surveys of the proposed development area between June and September 2005 and a further four transect surveys between May and August 2006. During these surveys eight species of bat were recorded, these species included common pipistrelle, soprano pipistrelle, long-eared bat species, Natterer's bat, Daubenton's, whiskered/Brandt's bat, noctule and serotine bat. The most significant bat foraging areas were identified as The Avenue, Middle Clearing, the northern boundary of the site near Havant Thicket, the south-eastern corner and adjacent grazed pasture. Potential roost sites were identified in trees located in The Avenue and Middle Clearing.

One unidentified recording of a bat echolocation call was taken in September 2006 (on The Avenue) which was believed to have characteristics similar to the rare Bechstein's bat. As a result, more detailed bat surveys were undertaken by ECOSA in 2008/2009.

3.3.2 2008/2009 Summary

During 2008 20 nights of vantage point and transect surveys were undertaken by ECOSA within the site, Havant Thicket woodland and SCP recording eleven species of bat. The key areas of activity were identified as The Avenue, woodland to the south-east and south-west of The Avenue in Staunton Country Park, Havant Thicket to the north of The Avenue, Middle Clearing and Round Wood. The full report from the 2008/09 surveys is presented in **Appendix D1**.

Trapping and radio-tracking surveys were undertaken between April and August 2008 resulting in the trapping of 39 bats of at least six species; brown long-eared bat, Bechstein's bat, whiskered bat, Brandt's bat, Natterer's bat and pipistrelle bat species¹⁸. During this period six Bechstein's bat were caught between July and August 2008; four breeding females, one male and one juvenile. A fifth adult female was captured within the site during October 2008.

A total of 16 bats of six species, comprising brown long-eared bat, Bechstein's, Natterer's, common pipistrelle, whiskered bat and Brandt's bats, were fitted with radio transmitters (see **Table D14**). It should be noted that Natterer's bat 173.348 and 173.334 is the same bat which was radio-tracked in two months with two different radio tags (April 2008 and May 2008). Therefore, the table below includes 17 rows, representing 16 individual bats.

¹⁸ Common and soprano pipistrelle cannot be reliably identified in the hand as differences in wing venation traditionally used to identify bats to species level are considered unreliable. Therefore, pipistrelle bat species is used.

Table D14: Bats fitted with radio-transmitters during 2008

Date of Capture Session	Species	Capture Location	Sex	Sexual Status	Tag No.	Notes
22 nd April 2008	Brown long-eared bat	Northern end of The Avenue	Male	-	173.316	
25 th April 2008	Natterer's bat	Northern end of The Avenue	Female	No signs	173.348	Same bat as 173.334
19 th May 2008	Common pipistrelle	SCP woodland	Female	Parous	173.856	
19 th May 2008	Whiskered bat	SCP woodland	Female	Parous	173.285	
21 st May 2008	Natterer's bat	Northern end of The Avenue	Female	Parous	173.334	Same bat as 173.348
21 st May 2008	Brown long-eared bat	Northern end of The Avenue	Female	Parous	173.845	
9 th June 2008	Brown long-eared bat	SCP woodland	Female	Parous	173.986	
11 th June 2008	Brown long-eared bat	SCP woodland	Female	Parous	173.334	
11 th June 2008	Natterer's bat	SCP woodland	Male	-	173.213	
14 th July 2008	Brown long-eared bat	Northern end of The Avenue	Female	Lactating	173.233	
14 th July 2008	Bechstein's bat	Central part of The Avenue	Male	-	173.886	
16 th July 2008	Bechstein's bat	SCP woodland	Female	Lactating	173.347	
16 th July 2008	Brown long-eared bat	SCP woodland	Female	Lactating	173.806	
16 th July 2008	Bechstein's bat	SCP woodland	Female	Lactating	173.202	
17 th July 2008	Bechstein's bat	SCP woodland	Female	Lactating	173.2590	
13 th August 2008	Bechstein's bat	SCP woodland	Female	Juvenile	173.247	
14 th August 2008	Brandt's bat	Northern end of The Avenue	Male	-	173.210	

During 2008/09 38¹⁹ roosts were recorded within the survey area, with 13 roosts recorded within the HTWSR site; 36 of these roosts were recorded in trees and two were recorded in buildings. Further details of the roosts located in 2008 are presented in **Table D15** and on **Map D39**.

¹⁹ **Table D15** includes 40 roosts, however the soprano pipistrelle and whiskered bat roost was not confirmed to a specific tree, therefore these two roosts appear in rows for both 1616 and 1618. The 2013 bat report specifies that 37 roosts were recorded during the 2008/09 surveys, however the correct figure, as reported here, should be 38 roosts.

Radio-tracking work identified The Avenue, woodland in Havant Thicket, woodland in SCP and to some extent fields to the west and east of The Avenue as the primary foraging areas and roosting sites (further details in **Appendix D12**). The Avenue and woodlands in SCP were also used by bats as commuting routes. This was supported by the results of the 2008 bat detector survey findings, and indicated that The Avenue and Havant Thicket woodland were important for commuting Bechstein's bat, with this species possibly using these areas to socialise during this late summer period. Radio-tracking confirmed that the Bechstein's bat maternity roost was not on the proposed reservoir site.

Following consultation with Natural England in September 2008 the surveys were extended to include sites considered suitable to support Bechstein's bats located within a three kilometre radius of the maternity roost at SCP. During these surveys, a male and a female Bechstein's bat were captured in Southleigh Forest, located approximately 1.5 kilometres east of the site.

During 2009, Bechstein's bat trapping and radio tracking survey work confirmed the presence of Bechstein's bat maternity colonies within four woodlands within a three kilometre radius of the reservoir footprint. The identified roosts were located 1.7 kilometres south-east, 1.8 kilometres north-north-west, three south-south-east, and 3.2 kilometres east, of the proposed reservoir site, the maximum recorded counts for each of these roosts was 38, 24, 51 and 48, respectively (see **Map D39**). The simultaneous count of three roost trees on the same evening in July 2009 confirmed a minimum population of 108 bats. During the 2009 survey work no bats captured during the 2008 survey work were recaptured, and therefore it was not possible to establish a link between the maternity colony recorded at SCP site during 2008, and those identified in 2009.

The 2009 survey work at woodlands within three kilometres of the 2008 maternity roost in SCP confirmed the importance of the wider wooded and parkland landscape to Bechstein's bat. Survey work also confirmed that there was no maternity roost present on or adjacent to the site in 2009, indicating intermittent use of the site by Bechstein's bat.

Table D15: Bat roosts located during 2008 and 2009

Tree/ Building Number ²⁰	Grid Reference	Tree or Building	Species	Max Count	Status	Location	Year
1600	SU7137510123	Tree	Brown long-eared bat	14	Maternity Roost	Havant Thicket - The Avenue	2008
1601	SU7156909844	Tree	Natterer's bat	3	Day Roost	Havant Thicket - The Avenue	2008
1602	SU7122509731	Tree	Brown long-eared bat	1	Day Roost	Havant Thicket - Middle Clearing	2008
1603	SU7122809695	Tree	Brown long-eared bat	1	Day Roost	Havant Thicket - Middle Clearing	2008
1604	SU7124209684	Tree	Brown long-eared bat	1	Night Roost	Havant Thicket - Middle Clearing	2008
1605	SU7186109291	Tree	Natterer's bat	1	Day Roost	SCP - Woodland just north of the lake	2008
1606	SU7178909255	Tree	Brown long-eared bat	1	Day Roost	SCP - Woodland just north of the lake	2008
1607	SU7206609358	Tree	Brown long-eared bat	3	Day Roost	SCP - Woodland to east of The Avenue	2008
1608	SU7220009198	Tree	Brown long-eared bat	3	Day Roost	SCP - Parkland east of the lake	2008
1609	SU7217009198	Tree	Natterer's bat	1	Day Roost	SCP - Parkland east of the lake	2008
1610	SU723189251	Tree	Brown long-eared bat	22	Maternity Roost	SCP – Field off Durrants Road	2008
1610	SU7231809251	Tree	Natterer's bat	21	Maternity Roost	SCP – Field off Durrants Road	2008

²⁰ Buildings numbers are prefixed by 'B' all other roosts recorded were in trees

Tree/ Building Number ²⁰	Grid Reference	Tree or Building	Species	Max Count	Status	Location	Year
1611	SU7155809880	Tree	Brown long-eared bat	16	Maternity Roost	Havant Thicket - The Avenue	2008
1612	SU7179909459	Tree	Bechstein's bat (male)	1	Day Roost	Havant Thicket - The Avenue	2008
1613	SU7177909486	Tree	Bechstein's bat (male)	1	Day Roost	Havant Thicket - The Avenue	2008
1614	SU7168509261	Tree	Brown long-eared bat	3	Day Roost	SCP - Woodland just north of the lake	2008
1615	SU7241609640	Tree	Bechstein's bat	22	Maternity Roost	SCP - South of Gipsies Plain	2008
1616	SU7244709635	Tree	Soprano pipistrelle	1 (no count, one bat min.)	Not determined	SCP - South of Gipsies Plain	2008
1616	SU7244709635	Tree	Whiskered bat / Brandt's bat	1 (no count, one bat min.)	Not determined	SCP - South of Gipsies Plain	2008
1617	SU7179209543	Tree	Bechstein's bat (male)	1	Day Roost	Havant Thicket - The Avenue	2008
1618	SU7244209645	Tree	Soprano pipistrelle	1 (no count, one bat min.)	Not determined	SCP - South of Gipsies Plain	2008
1618	SU7244209645	Tree	Whiskered bat / Brandt's bat	1 (no count, one bat min.)	Not determined	SCP - South of Gipsies Plain	2008
1619	SU7238509615	Tree	Bechstein's bat	7	Maternity Roost (same bats as 1615)	SCP - South of Gipsies Plain	2008

Tree/ Building Number ²⁰	Grid Reference	Tree or Building	Species	Max Count	Status	Location	Year
1620	SU7171309667	Tree	Long-eared bat type droppings	1 (no count, one bat min.)	Not determined	Havant Thicket - The Avenue	2008
1621	SU7160209801	Tree	Brown Long-eared bat	1	Day Roost	Havant Thicket - The Avenue	2008
1622	SU7123709524	Tree	Long-eared bat type droppings	1 (no count, one bat min.)	Night Roost	Havant Thicket - Middle Clearing	2008
1623	SU7125809504	Tree	Long-eared bat type droppings	1 (no count, one bat min.)	Night Roost	Havant Thicket - Middle Clearing	2008
NT004 (untagged)	SU7211508738	Tree	Common pipistrelle	1	Day Roost	SCP - Near Staunton Farm	2008
B1	SU7245908856	Building	Common pipistrelle	43	Maternity Roost	Wakefords Way, Havant	2008
B2	SU7221310586	Building	Whiskered bat	14	Maternity Roost	Manor Lodge Road, Rowland's Castle	2008
1630	SU7515708297	Tree	Bechstein's bat	1	Day Roost	Long Copse, Hollybank	2009
1631	SU7517408344	Tree	Bechstein's bat	1	Day Roost	Long Copse, Hollybank	2009
1632	SU7505008375	Tree	Bechstein's bat	13	Maternity Roost	Long Copse, Hollybank	2009
NT007 (untagged)	SU7467108180	Tree	Bechstein's bat	3	Day Roost	Garden of Hollybank House	2009
1633	SU7565609607	Tree	Bechstein's bat	48	Maternity Roost	The Grove, Stansted Park	2009
1634	SU7480810388	Tree	Bechstein's bat	1	Day Roost	Lyells Copse	2009

Tree/ Building Number ²⁰	Grid Reference	Tree or Building	Species	Max Count	Status	Location	Year
1635	SU7515608292	Tree	Bechstein's bat	26	Maternity Roost	Long Copse, Hollybank	2009
NT006 (untagged)	SU7481607937	Tree	Bechstein's bat	51	Maternity Roost	Dairy House Farm	2009
1636	SU7336908478	Tree	Bechstein's bat	38	Maternity Roost	Bartons Copse	2009
NT001 (untagged)	SU7060012300	Tree	Bechstein's bat	24	Maternity Roost	Dell Piece East	2009

3.3.3 Mist-Netting / Harp Trapping (2018)

A total of 48 bats of six species were captured over nine nights of trapping. Bats of particular note include four Bechstein's bat comprising a male and three nulliparous females. The other bat species included Natterer's bat (11), brown long-eared bat (9), pipistrelle bat species¹⁸ (7), whiskered bat / Brandt's bat (6), whiskered bat (6), barbastelle (2), Small *Myotis* bat species (2) and Daubenton's bat (1). The details of bats trapped during the 2018 surveys is presented in **Table D16**. The locations of bats trapped during the 2018 surveys is presented in **Map D22**, **Map D23** and **Map D24**.

Table D16: Bats captured 2018

Trap Night	Time	Bat Species	Sex	Status	NGR Grid Reference	Notes
14 th -15 th May 2018	22:04	Whiskered bat	Female	Parous	SU 72351 09502	
	22:30	Natterer's bat	Female	Nulliparous	SU 72368 09581	
	22:42	Natterer's bat	Female	Parous	SU 72351 09502	
	22:56	Whiskered bat / Brandt's bat	Female	Nulliparous	SU 72351 09502	
	00:30	Whiskered bat / Brandt's bat	Female	Parous	SU 72351 09502	
	01:30	Bechstein's bat	Male	n/a	SU 7205 0934	Radio tag 338
15 th -16 th May 2018	21:45	Pipistrelle bat species	Male	n/a	SU 71837 09432	
	22:00	Pipistrelle bat species	Female	Parous	SU 71442 09965	
	22:00	Whiskered bat	Male	n/a	SU 71442 09965	
	22:00	Brown long-eared bat	Female	Parous	SU 71442 09965	
	22:00	Natterer's bat	Female	Parous	SU 71442 09965	
	22:05	Whiskered bat	Male	n/a	SU 71442 09965	
	22:30	Whiskered bat / Brandt's bat	Female	Parous	SU 71837 09432	
	22:30	Brown long-eared bat	Female	Parous	SU 71442 09965	
	22:30	Whiskered bat / Brandt's bat	Female	Parous	SU 71442 09965	
	22:40	Brown long-eared bat	Female	Parous	SU 71442 09965	
	22:40	Natterer's bat	Male	n/a	SU 71442 09965	
	23:10	Pipistrelle bat species	Female	Parous	SU 71442 09965	
	23:10	Natterer's bat	-	-	SU 71442 09965	Escaped from net
	23:35	Whiskered bat / Brandt's bat	Female	Parous	SU 71442 09965	
	23:45	Whiskered bat / Brandt's bat	Female	Parous	SU 71442 09965	
	00:20	Bechstein's bat	Female	Nulliparous	SU 71837 09432	Radio tag 238
	00:20	Natterer's bat	Female	Parous	SU 71837 09432	

Trap Night	Time	Bat Species	Sex	Status	NGR Grid Reference	Notes
16 th -17 th July 2018	21:30	Small <i>Myotis</i> bat species	Female	Lactating	SU 72360 09570	See Table D17 , table row 1
	21:30	Small <i>Myotis</i> bat species	Male	n/a	SU 72360 09570	See Table D17 , table row 2
	22:45	Brown long-eared bat	Female	Nulliparous	SU 72346 09499	
	23:00	Bechstein's bat	Female	Nulliparous	SU 72360 09570	Radio tag 277
	01:05	Pipistrelle bat species	Female	Parous	SU 71442 09965	
17 th -18 th July 2018	21:59	Natterer's bat	Female	Lactating	SU 71824 09463	
	00:50	Pipistrelle bat species	Female	Lactating	SU 71667 09338	
	01:21	Daubenton's bat	Unknown	-	SU 71515 09225	Escaped from net
	01:50	Pipistrelle bat species	Female	Parous	SU 71515 09225	
18 th -19 th July 2018					SU 71442 09965	Confirmed by DNA analysis, See Table D17
	21:59	Whiskered bat	Female	Lactating		
	22:05	Brown long-eared bat	Male	n/a	SU 71442 09965	
	22:05	Brown long-eared bat	Male	n/a	SU 71442 09965	
	22:10	Brown long-eared bat	Female	Lactating	SU 71442 09965	
	22:37	Brown long-eared bat	Female	Lactating	SU 71442 09965	
	22:55	Brown long-eared bat	Male	n/a	SU 71442 09965	
19 th -20 th August 2018	00:05	Natterer's bat	Female	Lactating	SU 71442 09965	
	00:40	Barbastelle	Male	n/a	SU 72130 09427	
	00:40	Barbastelle	Male	n/a	SU 72130 09427	
	01:00	Pipistrelle bat species	Female	Nulliparous	SU 72130 09427	
	01:00	Natterer's bat	Female	Nulliparous	SU 71810 09311	
	01:50	Bechstein's bat	Female	Nulliparous	SU 71632 09343	Radio tag 2957
20 th -21 st August 2018	01:55	Whiskered bat / Brandt's bat	-	-	SU 72261 09428	Escaped from net
	21:05	Whiskered bat	Female	Post-lactating	SU 71442 09965	
	21:40	Natterer's bat	Female	Nulliparous	SU 71442 09965	
21 st -22 nd August 2018	21:50	Natterer's bat	Female	Nulliparous	SU 71442 09965	
	No bats caught					
23 rd -24 th August 2018	No bats caught					

Bat droppings were collected from three small *Myotis* bat species and sent for DNA analysis. The results are presented in **Table D17** and **Appendix D3**.

Table D17: 'Small' *Myotis* bat DNA results

DNA Analysis Result	Capture Site	Capture Location	Date of Capture	Lab and Sample Number	Notes
Small <i>Myotis</i> bat species	SCP	SU 72360 09570	16 th July 2018	SureScreen Scientifics (E3573)	1 st sample - Sample could not be identified to species level
				Swift Ecology (SEL-3522-1)	2 nd sample - Sample could not be identified to species level
<i>Myotis</i> bat species	SCP	SU 72360 09570	16 th July 2018	SureScreen Scientifics (E3007)	Sample could not be identified to species level
Whiskered bat	Northern end of The Avenue	SU 71420 10053	18 th July 2018	Swift Ecology (SEL-3522-2)	

Distribution of Records by Species

Bats were mainly captured within the SCP woodland and at the northern and southern end of the Avenue (see **Table D18** and **Map D21**). Of the four Bechstein's bat caught three were within SCP woodland and the fourth was at the southern end of the Avenue, immediately adjacent to SCP. Eight of the nine brown long-eared bat, and six of the 11 Natterer's bat were caught at the northern end of The Avenue. Two barbastelle were recorded during the survey, both males trapped together in SCP during August. Despite trapping effort in Havant Thicket woodland during August 2018 no bats were caught in this area.

Table D18: Location and number of captured bats (2018)

Species	Northern End of The Avenue	Southern End of The Avenue	SCP	Havant Thicket Woodland	Total
Barbastelle	0	0	2	0	2
Bechstein's bat	0	1	3	0	4
Brown long-eared bat	8	0	1	0	9
Daubenton's bat	0	0	1	0	1
Natterer's bat	6	2	3	0	11

Species	Northern End of The Avenue	Southern End of The Avenue	SCP	Havant Thicket Woodland	Total
Pipistrelle bat species	3	1	3	0	7
Small <i>Myotis</i> bat species	0	0	2	0	2
Whiskered bat	4	0	1	0	5
Whiskered bat / Brandt's bat	3	1	3	0	7
Grand Total	24	5	19	0	48

Location of Records by Month

The location and species of bats caught in each survey month is presented in **Map D22** to **Map D24** a summary of the monthly data provided below.

May 2018

50% (24) of the bats caught during 2018 were trapped during May. Of these six were caught in SCP, four were caught at the southern end of The Avenue and 14 were caught at the northern end of The Avenue.

Two Bechstein's bat were caught during the May trapping. A male in SCP on 14th May 2018 and nulliparous female at the southern end of The Avenue on 15th May 2018. Both bats were fitted with radio-tags reference 338 and 238, respectively.

Other species recorded during May 2018 included Natterer's bat (six), pipistrelle bat species (four), brown long-eared bat (three), whiskered / Brandt's bat (six) and whiskered bat (three). Full details of the bats trapped during the May 2018 surveys is presented on **Map D22**.

July 2018

31% (15) of the bats caught during 2018 were trapped during July. Of these bats seven were caught in SCP, one was caught at the southern end of The Avenue and seven were caught at the northern end of the Avenue.

One Bechstein's bat was caught during the July trapping. A nulliparous female in SCP on 16th July 2018. This bat was fitted with radio-tag reference 277.

Other species recorded during July 2018 included brown long-eared bat (six), Natterer's bat (two), pipistrelle bat species (two), Small *Myotis* bat species (two), whiskered / Brandt's bat (one) and whiskered bat (one). Full details of the bats trapped during the July 2018 surveys is presented on **Map D23**.

August 2018

A reduced level of bat activity was recorded during August 2018 with only nine bats (19% of the total) trapped during August. Of these bats six were caught in SCP, and three were caught at the northern end of the Avenue. No bats were trapped at the southern end of The Avenue or within Havant Thicket woodland.

One Bechstein's bat was caught during the August trapping. A nulliparous female in SCP on 19th August 2018. This bat was fitted with a radio-tag reference 2957.

Other species recorded during August 2018 included Natterer's bat (three), whiskered bat (two), barbastelle (two) and a pipistrelle bat species (one) Full details of the bats trapped during the July 2018 surveys is presented on **Map D23**.

3.3.4 Radio-Tracking

Bechstein's Bat (female) – Tag No. 238

A nulliparous female Bechstein's bat was tagged and ringed at SU 71837 09432 in SCP on 15th May 2018. This bat was radio tracked over three full/part night-dawns on 16th/17th, 17th/18th and 19th/20th May 2018.

Bechstein's bat 238 spent most of its time in its core foraging range within SCP and Round Wood. The roosting location of this bat were monitored for five nights during which time it roosted in four trees (Tree Tags 0997, 0969, 1000 and NT003). One night was spent in a tree in Round Wood, the remaining trees are all in SCP. The bat always roosted alone. The range and 10 minute coordinated triangulation points throughout the radio tracking surveys are shown on **Map D25**. The bat spent the majority of the time it was active within SCP woodland and Round Wood.

On the night of 16th/17th May 2018 (**Map D26**) the bat spent all of its time in the deciduous woodland associated with SCP and Round Wood.

On the night of 17th/18th 2018 (**Map D27**) the bat focussed its activity in a small area associated with SCP woodland and Round Wood. In the early morning bat 238 commuted towards Middle Clearing and foraged within this area and the adjacent tree lines for a short period of time. Only two triangulation points are associated with this area giving an indication of the limited time spent here (approximately 20 minutes), the bat then moved back towards Round Wood and SCP.

Bat 238 spent much of the night of 18/19th May 2018 (**Map D28**) at a static night roost within SCP woodland (tree tag 1000). When active 238 foraged in SCP woodland and Round Wood, as had been recorded on previous night's surveys. The bat roosted in an ash within SCP no other bats were recorded returning to the roost at dawn.

238 was not tracked on the nights of 21st/22nd or 22nd/23rd May 2018. However, the bat was recorded roosting in NT003 in SCP on the evening of 21st May 2018 and at dawn on 22nd May 2018 in 0969 within Round Wood. No suitable roost features were visible from ground level in the tree within Round Wood.

Bechstein's Bat (male) – Tag No. 338

A male Bechstein's bat was tagged and ringed at SU 7205 0934 in SCP on 15th May 2018. This bat was radio tracked over two full/part night-dawns on 16th/17th, 17th/18th May 2018 using both 'close approach' and 'close approach'/triangulation methods.

Bechstein's bat 338 foraged within a relatively small core area within SCP, with a single triangulation point from the base of The Avenue. Bechstein's bat 338 foraged within and along the edge of broadleaved woodland in SCP over an area of approximately 10 hectares. The roosting location of this bat were monitored for three nights during which time it roosted in two ash trees within SCP (Tree Tags 0982, 0972). The bat always roosted alone. The range and 10 minute coordinated triangulation points throughout the radio tracking surveys are shown on **Map D29**.

On the night of 16th/17th May 2018 (**Map D30**) the bat remained static in the roost in SCP until 21:45. After emerging the bat spent all of its time foraging in the deciduous woodland associated with SCP. At dawn on 17th May 2018 the Bechstein's bat 338 roosted in tree 0982, no other bats were recorded returning to the same tree.

On the night of 17th/18th 2018 (**Map D31**) the bat focussed its activity in a small area associated with SCP woodland with a single movement into the base of The Avenue. The bat was active in SCP woodland until approximately 00:00, when the signal was lost until 03:00 when the bat was refound in tree 0972 within SCP.

After the morning of 18th May 2018, the tag was recorded transmitting from tree tag 0972 that evening but did not move suggesting it had detached from the bat. Bechstein's bat 338 was not recorded again.

Bechstein's Bat (female) – Tag No. 277

A nulliparous female Bechstein's bat was tagged and ringed at SU 72360 09570 in SCP on 16th July 2018. This bat was radio tracked over two full/part night-dawns on 17th/18th and 19th/20th July 2018.

Bechstein's bat 277 covered a wide area during the two tracking nights, the main focus of her foraging activity was from within parkland and woodland within SCP (see **Map D32**). Bat 277 also spent time foraging in open grassland areas with associated residential gardens between SCP and the roosting sites in Barton Copse and Southleigh Forest. On both nights the bat was also recorded making short foraging trips

across the far eastern edge of the site into the southern edge of Havant Thicket woodland. This route took the bat across open grassland areas with associated defunct boundary hedgerows.

The roosting location of this bat was monitored for three nights during which time it roosted in an ash *Fraxinus excelsior* tree in Barton's Copse tree tag 0960 and within a pedunculate oak in Southleigh Forest tree tag 0968. This tree contained multiple woodpecker holes and an emergence survey undertaken on the evening of 19th July 2018 recorded 58 Bechstein's bat emerging confirming this tree as a maternity roost.

After capture on the morning of 17th July 2018 the bat was tracked to a roost site in Bartons Copse approximately 1.4 kilometres south-east of the site (tree tag 0960). The roost was located in an ash tree which contained no visible roosting features.

On the night of 17th/18th 2018 (**Map D33**) the bat emerged from the roost in Bartons Copse at around 21:40, then stayed in this area until 21:55 when the bat moved north towards the railway line and through fields / along hedgerows and tree lines east of Whichers Gate Road (recorded here at 22:00), by 22:27 the bat had arrived at SCP. The majority of the bat's time was then spent close to the capture site in SCP woodland and also in the adjacent parkland field. A number of short (c.10 minute) night roosts were made in a group of four oak within the SCP parkland (tree NT005). During the night the bat also made two journeys north across Gipsies Plain to the southern edge of Havant Thicket woodland in an area approximately 2.3 kilometres from the roost site. In the morning the bat roosted in Southleigh Forest, the location could not be ascertained in the morning as access permission to this area had not been arranged.

Access permission for the roost in Southleigh Forest was arranged during 18th July 2018 and the bat was located that evening roosting in a pedunculate oak with multiple woodpecker holes. An emergence survey undertaken recorded 58 Bechstein's bat emerging from the roost, confirming that a maternity roost was present. Bat 277 emerged from the roost at 21:45 and moved across Whichers Gate Road, a railway line and fields to the east of Whichers Gate Road, then crossing Durrants Road arriving on site at 22:12. The bat spent approximately 40 minutes travelling between the roost site and SCP and spent time foraging around back gardens and mature tree lines east of Whichers Gate Road, especially in the area closer towards SCP.

During the night of 18th/19th July 2018 the bat followed the same pattern, moving from the roost in Southleigh Forest to SCP then foraging in the area and adjacent SCP woodland (**Map D34**). During the night the bat made a single short trip to Havant Thicket again passing across the grassland at the eastern edge of Gipsies Plain.

Bechstein's Bat (female) – Tag No. 2957

A nulliparous female Bechstein's bat was tagged and ringed at SU 71632 09343 in SCP on 19th August 2018. This bat was radio tracked over four full/part night-dawns on 19th/20th, 20th/21st August, 21st/22nd August and 23rd/24th August 2018.

Bechstein's bat 2957 spent most of its time in its core foraging area within the eastern end SCP woodland where the bat spent c.89-96% of its time (**Map D35**). That bat also occasionally foraged in the base of The Avenue and on the eastern edge of Round Wood (c.4-6% of its time). Bat 2957 also made a single short trip to Havant Thicket woodland. The roosting locations of this bat were monitored for four nights during which time it roosted in three trees (Trees 0988, NT002 and 0951). NT002 is located in the southern part of The Avenue, the bat spent 25 minutes roosting here during the night of 21st/ 22nd August 2018. The other roosts are both with SCP.

On the morning of 20th August 2018 Bechstein's bat 2957 roosted in ash tree 0988 on the northern edge of the lake in SCP. With difficulty a cavity could be seen on the main trunk, although it is not known whether this was the roost feature.

During the night of 20th-21st August 2018 2957 spent most of its time around the capture site on the northern edge of SCP woodland with a small amount of foraging also in Round Wood (**Map D36**). At around 22:50 the bat headed north from Round Wood across the site, possibly using the tree lines along streams, into Havant Thicket woodland, and was then recorded in The Corsican Pine Plantation at 22:55 before heading south back towards the key foraging area within SCP.

On the night of 23rd/24th August 2018 bat 2957 spent the majority of her time foraging on SCP with occasional visits to the southern end of The Avenue (**Map D38**). At around 03:00 the temperature dropped and the bat went back to roost and did not emerge again.

No other bats were recorded emerging from the two trees in which bat 2957 (0988 and 0951) roosted on 20th, 21st and 23rd August 2018. This indicated that the bat roosted alone and therefore a more important roost was not considered to be present.

The roosting data for Bechstein's bat is presented in **Table D19** and additional details of the trees is presented in **Table D20**.

Table D19: Bechstein's bat tracking and roosting data²¹ (2018, **Map D39**)

Date of Roosting (Morning)	Tag No.	Sex	Number of bats in roost	Tree species	Tree Tag	NGR Grid reference	Date of Roosting (Evening)	Notes
16 th May 2018	338	Male	1	Ash	0982	SU 71886 09375	16 th May 2018	Roosted alone but emergence not visible.
16 th May 2018	238	Female	1	Ash	1000	SU 71886 09256	16 th May 2018	Appeared to roost alone.
17 th May 2018	338	Male	1	Ash	0982	SU 71886 09375	17 th May 2018	No other bats identified at dawn.
17 th May 2018	238	Female	1	Ash	0997	SU 71887 09238	17 th May 2018	No other bats seen or heard emerging.
18 th May 2018	238	Female	1	Ash	0997	SU 71887 09238	18 th May 2018	No other bats identified at dawn.
18 th May 2018	338	Male	1	Ash	0972	SU 72119 09320	18 th May 2018	After roosting in this tree tag believed to have detached and the bat not encountered again.
19 th May 2018	238	Female	1	Ash	0997	SU 71887 09238	19 th May 2018	No other bats identified at dawn.
21 st May 2018	238	Female	1	Oak	NT003 (untagged tree)	SU 71713 09206	21 st May 2018	Roost located in evening - no emergence done but multiple potential splits and crevices higher up.
22 nd May 2018	238	Female	1	Oak	0969	SU 71501 09394	22 nd May 2018	Roost located at dawn in Round Wood. No obvious roost feature - no emergence survey undertaken.

²¹ A more detailed description of the location of the roosts shown in **Table D19** is presented in **Table D20**.

Date of Roosting (Morning)	Tag No.	Sex	Number of bats in roost	Tree species	Tree Tag	NGR Grid reference	Date of Roosting (Evening)	Notes
17 th July 2018	277	Female	unknown	Ash	0960	SU 73401 08750	17 th July 2018	Not possible to ascertain feature due to canopy around and on private land at Barton's Copse off site. Access granted subsequently.
18 th July 2018	277	Female	1	Oak	0968	SU 73718 08865	18 th July 2018	No access to roost at time but same coordinates as next day when permission allowed to locate tree.
19 th July 2018	277	Female	58	Oak	0968	SU 73718 08865	19 th July 2018	Emergence undertaken evening 19 th July 2018 - 58 bats emergence from a woodpecker hole.
20 th July 2018	277	Female	1	Oak	0968	SU 73718 08865	20 th July 2018	No other bats seen emerging.
21 st July 2018	277	Female	-	-	-	-	-	Bat searched for 21 st , 22 nd , 23 rd July 2018 but no signal found presumed tag failed.
22 nd July 2018	277	Female	-	-	-	-	-	Bat searched for 21 st , 22 nd , 23 rd July 2018 but no signal found presumed tag failed.
23 rd July 2018	277	Female	-	-	-	-	-	Bat searched for 21 st , 22 nd , 23 rd July 2018 but no signal found presumed tag failed.
20 th August 2018	2957	Female	1	Ash	0988	SU 71733 09235	20 th August 2018	No other bats seen emerging.
21 st August 2018	2957	Female	1	Ash	0988	SU 71733 09235	21 st August 2018	No other bats seen emerging.

Date of Roosting (Morning)	Tag No.	Sex	Number of bats in roost	Tree species	Tree Tag	NGR Grid reference	Date of Roosting (Evening)	Notes
22 nd August 2018	2957	Female	1	-	NT002 (untagged tree)	SU 71795 09459	n/a	Bat roosted here from 01:20-01:45 (night roost only)
23 rd August 2018	2957	Female	1	Ash	0951	SU 71730 09227	23 rd August 2018	No other bats seen emerging.

3.3.5 *Ground Level Tree Assessment*

The Bechstein's bat roost trees recorded during the 2018 trapping and radio tracking were tagged during November 2018. The locations of these trees are presented on **Map D39** and details of their characteristics are shown in **Table D20**. The tree roosts identified on and adjacent to the site during 2008/2009 were revisited during June 2018 to reassess their suitability for tree roosting bats. The results of the Ground Level Tree Assessments are presented in **Table D21**, with the location of roosts, species and numbers recorded presented in **Map D39**.

Table D20: Bechstein's bat roost tree details (2018, Map D39)

Tree Tag Number	Grid Reference	Dates Roost Monitored	Bechstein's Bat Tag	Sex	Tree Species	Tree Diameter at Breast Height	Height of Roost Feature	Roost Feature	Aspect of Roost Feature Entrance	Notes i.e. other potential roost features, surrounding habitat
0972	SU 72119 09320	N/A	338	m	Ash	400 millimetres	No features visible.			Location: SCP, just east of footpath. Roost Type: Night roost.
0982	SU 71886 09375	16 th -17 th May 2018	338	m	Ash	200 millimetres	c.8 metres	Unknown ²²	East	Location: SCP, five metres east of path just north of lower cross roads. Roost Type: Day roost.
1000	SU 71886 09256	16 th May 2018	238	f	Ash	500 millimetres	c.10 metres	Unknown	South-east	Location: North-east of the lake in SCP, c.10 metres north of tree 0997. The exact roost feature used by bat 238 was not recorded however this tree contains three woodpecker holes south and south-east at 10-12 metres above ground level. One of these features may have been the roost site. Roost Type: Day roost.
0997	SU 71887 09238	17 th -19 th May 2018	238	f	Ash	800 millimetres	c.12 metres	Unknown	South	Location: North-east of the lake in SCP, c.10 metres south of tree 1000. Tree forked at six metres and 12 metres, no roost features visible. Roost Type: Day roost.

²² Where the roost feature is unknown but the height and aspect of the feature is included this is a result of the bat being recorded emerging from an unknown feature on the tree. In this situation the approximate height and aspect of the roost feature is known but the details of the roost feature are not.

Tree Tag Number	Grid Reference	Dates Roost Monitored	Bechstein's Bat Tag	Sex	Tree Species	Tree Diameter at Breast Height	Height of Roost Feature	Roost Feature	Aspect of Roost Feature Entrance	Notes i.e. other potential roost features, surrounding habitat
NT003	SU 71713 09206	21 st May 2018	238	f	Ash	800 millimetres	Many splits and crevices recorded higher up. Unclear which feature was used.			Location: Near to SCP lake (south-west corner). Multiple similar trees in this area. Roost Type: Night roost.
0969	SU 71501 09394	22 nd -23 rd May 2018	238	f	Pedunculate oak	300 millimetres	Roost feature not visible but likely to be relatively high in the canopy at c.10 metres			Location: Round Wood, north-eastern edge. Roost Type: Day roost.
0960	SU 73401 08750	17 th July 2018	277	f	Ash	1000 millimetres	Unknown, but many suitable roosting features present.			Location: Barton's Copse, south-east of site. First of two roosts used by this bat in July 2018. Roost Type: Day roost.
0968	SU 73718 08865	18 th -20 th July 2018	277	f	Pedunculate oak	c.500 millimetres	6-8 metres	Woodpecker hole	N/NW	Location: Southleigh Forest Roost type: Large maternity roost 58 bats emerged on 19 th July 2018.
0988	SU 71733 09235	20 th -22 nd August 2018	2957	f	Ash	c.400 millimetres	Unknown	Cavity	Unknown	Location: Northern end of lake within SCP woodland. Just off path. With difficulty a single cavity could be seen from the ground. Roost Type: Day roost.
NT002	SU 71795 09459	22 nd August 2018	2957	F	Unknown	Unknown	Unknown	Unknown	Unknown	Location: Southern end of The Avenue. The bat roosted here for 25 minutes during the night of 22 nd August 2018. Therefore, only limited details of this roost and associated tree are known.

Tree Tag Number	Grid Reference	Dates Roost Monitored	Bechstein's Bat Tag	Sex	Tree Species	Tree Diameter at Breast Height	Height of Roost Feature	Roost Feature	Aspect of Roost Feature Entrance	Notes i.e. other potential roost features, surrounding habitat
										Roost Type: Night roost.
0951	SU 71730 09227	23 rd -24 th August 2018	2957	f	Ash	c.400 millimetres	Various	Unknown	Various	Location: Northern end of lake within SCP woodland. Just off path. Two woodpecker holes seven and 14 metres above ground level on east side and one rot hole four metres above ground level on southern elevation. No bat recorded emerging from this tree but signal for tagged bat located here. Roost Type: Day roost.

Table D21: 2018 Ground Level Tree Assessment of bat roosts recorded on site and Bechstein's bat roosts adjacent to the site in 2008/2009

Tree Tag No.	Grid Reference	Tree Species	Figure	Species and Roost Recorded in 2008/2009	2018 Description	2018 Suitable Bat Roost Features Recorded
1600	SU7137510123	Silver birch <i>Betula pendula</i>	 Figure 2: 1600	Brown long-eared bat maternity roost. Maximum 14 bats recorded.	Top section of tree, and associated roost feature identified in 2008-2009 has now fallen.	No suitable roosting features present.
1601	SU7156909844	Pedunculate oak	 Figure 3: 1601	Day roost of Natterer's bat. Maximum three individuals.	Semi-mature pedunculate oak located on the edge of the central track along The Avenue.	Woodpecker hole on western branch, north-western elevation. Same feature present as was recorded in 2008/2009.

Tree Tag No.	Grid Reference	Tree Species	Figure	Species and Roost Recorded in 2008/2009	2018 Description	2018 Suitable Bat Roost Features Recorded
			 Figure 4: 1601			
1602 and 1603	SU7122509731 and SU7122809695	Pedunculate oak	-	A single brown long-eared bat tagged in 2008 was recorded roosting in one of these trees during the daytime. A single emergence survey recorded at least one brown long-eared bat in 1602 and 1603.	Semi-mature pedunculate oak located on the western edge of Middle Clearing (2008 description). The location of both trees could not be relocated during the updating 2018 survey	The 2008/2009 survey recorded that no suitable bat roosting features visible from ground level.

Tree Tag No.	Grid Reference	Tree Species	Figure	Species and Roost Recorded in 2008/2009	2018 Description	2018 Suitable Bat Roost Features Recorded
1604	SU7124209684	Pedunculate oak	 Figure 5: 1604  Figure 6: 1604	Single brown long-eared bat used feature during radio-tracking surveys.	Semi-mature pedunculate oak located within Middle Clearing.	Entrance hole at base of main trunk on southern elevation. Rotten heart extending at least one metre from base up inside of main trunk. Feature has not altered since 2008/2009. On 20th June 2019 an endoscope investigation by Portsmouth Water recorded that there was no evidence of roosting bats, such as bat droppings or actual bats, within the cavity. The feature was assessed to still be suitable for roosting bats. Full details of this investigation is presented in Appendix D5.

Tree Tag No.	Grid Reference	Tree Species	Figure	Species and Roost Recorded in 2008/2009	2018 Description	2018 Suitable Bat Roost Features Recorded
1611	SU7155809880	Pedunculate oak	 Figure 7: 1611	Brown long-eared bat maternity roost. Maximum 16 bats recorded.	Semi-mature pedunculate oak located on the edge of the central track through The Avenue.	Five woodpecker holes on northern elevation of main trunk and west and south facing limbs. Tree retains suitable features recorded in 2008/2009.
1612	SU7179909459	Pedunculate oak	 Figure 8: 1611	A single male Bechstein's bat was recorded in this tree during 2008/2009. The same male also roosted in 1613 and 1617.	Mature pedunculate oak at the southern end of The Avenue	During 2018 a limb scar was recorded on the northern elevation at approximately 3.5 metre height. A small number of other features were recorded when viewing the tree from the central track along The Avenue. These included two large limb scars at c.15 metres height and a significantly amount of deadwood in the canopy. A moderately dense covering of ivy is also present around the main trunk.

Tree Tag No.	Grid Reference	Tree Species	Figure	Species and Roost Recorded in 2008/2009	2018 Description	2018 Suitable Bat Roost Features Recorded
1613	SU7177909486	Pedunculate oak	-	A single male Bechstein's bat was recorded roosting in a limb scar on northern elevation during 2008/2009. The same male also roosted in 1612 and 1617.	Mature pedunculate oak at the southern end of The Avenue (2008 description). Tree could not be relocated during 2018.	Unknown if this feature is still present.
1615	SU7241609640	Pedunculate oak	 Figure 9: 1615  Figure 10: 1615 – hornet entering 2008 Bechstein's bat roost entrance	Bechstein's bat maternity roost present in 2008, maximum emergence count of 22.	Mature pedunculate oak located in parkland on the northern edge of SCP.	A woodpecker hole with staining is located on the north-west elevation approximately three metres above ground level. The previously identified roost feature on the upper elevation of a limb on the south-east elevation contained a very active hornet nest throughout the 2018 bat survey season (see Figure 10).

Tree Tag No.	Grid Reference	Tree Species	Figure	Species and Roost Recorded in 2008/2009	2018 Description	2018 Suitable Bat Roost Features Recorded
1617	SU7179209543	Pedunculate oak	 Figure 11: 1617	A single male Bechstein's bat was recorded in this tree during 2008/2009. The same male also roosted in 1612 and 1613.	Mature pedunculate oak at the southern end of The Avenue	Crevices and cracks recorded at c.15 metre height on the northern elevation. Could not locate callous hole on south-east elevation previously recorded in 2008/2009, although dense foliage obstructs branches and trunk.
1619	SU7238509615	Pedunculate oak	 Figure 12: 1619	A maximum count of 6-7 Bechstein's bat were recorded from a hole cavity present on a limb. Roost entrance located on the north-eastern elevation. One of the bats was a radio-tagged female that moved between 1619 and 1615, suggesting the roosts in these trees were associated with a single maternity roost.	Mature pedunculate oak located in parkland on the northern edge of SCP.	A woodpecker hole is present on the south-eastern elevation and the cavity is still present on the north-eastern elevation limb.

Tree Tag No.	Grid Reference	Tree Species	Figure	Species and Roost Recorded in 2008/2009	2018 Description	2018 Suitable Bat Roost Features Recorded
1621	SU7160209801	Pedunculate oak	-	Maximum of one brown long-eared bat roosted in lower of three woodpecker holes on southern elevation.	Semi-mature pedunculate oak located in Middle Clearing. Tree could not be relocated during 2018.	Unknown if this feature is still present.
1622	SU7123709524	Pedunculate oak	 Figure 13: 1622	Single long-eared bat type dropping recorded in rot hole during winter investigation.	Semi-mature pedunculate oak located in Middle Clearing.	Rot hole present on the northern elevation at approximately one metre. Rot hole is exposed and does not lead to an accessible cavity. This feature is only likely to be used by bats as a night roost.

Tree Tag No.	Grid Reference	Tree Species	Figure	Species and Roost Recorded in 2008/2009	2018 Description	2018 Suitable Bat Roost Features Recorded
			 Figure 14: 1622			
1623	SU7125809504	Pedunculate oak	 Figure 15: 1623	Single long-eared bat type dropping recorded in rot hole during winter investigation.	Semi-mature pedunculate oak located in Middle Clearing.	Rot hole present on the southern elevation at approximately one metre. Rot hole is exposed and does not lead to an accessible cavity. Furthermore, the feature is now almost completely obscured by a hawthorn <i>Crataegus monogyna</i> which significantly reduces the suitability of this bat feature for roosting bats. During 2008/2009 this feature was only likely to be used by bats as a night roost. Given the hawthorn obscuring the entrance it is unlikely that this feature is used as a roost anymore.

Tree Tag No.	Grid Reference	Tree Species	Figure	Species and Roost Recorded in 2008/2009	2018 Description	2018 Suitable Bat Roost Features Recorded
			 Figure 16: 1623			

3.3.6 **Bat Box Check**

Trees where nine Schwegler 2FN and three Schwegler 1FW bat boxes had been erected in 2018 were subject to an inspection on 15th July 2019. Of the twelve boxes checked bat droppings were recorded in a single box, the 1FW located in the parkland at SCP (SU 7250 0959). A sample of the droppings was taken and sent to Swift Ecology for DNA analysis. The results identified the species as soprano pipistrelle (see **Appendix D3**). A single Schwegler 2FN bat box erected in 2018 on the eastern edge of the site (SU 7240 1000) was not located during the 2019 box check.

Bat droppings rapidly degrade in bat boxes and therefore it is difficult to draw firm conclusions about the status of the roost using this box. However, the relatively small number of droppings present was indicative of a low status roost, an assertion which is backed up by the static detector and vantage point surveys.

3.3.7 **Bat Emergence / Re-entry Survey**

The trees where Bechstein's bat roosts were recorded previously, on or adjacent to the site, were subject to emergence / re-entry surveys. All on-site tree roosts of other species (brown long-eared bat and Natterer's bat) were also subject to emergence / re-entry surveys.

Of the nine trees surveyed, only one was found to be currently in use by roosting bats. One bat of unknown species was recorded emerging from Tree 1610 during the survey carried out on 23rd August 2018. Although no bats were recorded emerging from Tree 1612, the first registration of a *Myotis* bat species was recorded just 13 minutes after sunset, suggesting that a roost of bats within this species group may be roosting nearby.

Table D22 provides details of the tree emergence / re-entry surveys carried out on each tree. For each survey, details of any roosting bats are presented, as well as incidental data regarding the appropriate species of bat associated with each historic roost. General bat activity of other species of bat is not presented as this information was not considered relevant for the purposes of these surveys. 'No data' is entered where foraging and commuting behaviour was not recorded during any given survey. Where possible, the time of the first registration is shown, to provide an indication of whether the species is roosting nearby. The location of tree roosts and their associated tag number is presented in **Map D39**.

Table D22: Bat Emergence/Re-entry Survey Results (2018)²³

Tree No. and Previously Recorded Roost Type	Survey Date	Survey Type	Bats Recorded Emerging / Re-entering
1601 (The Avenue) <i>Natterer's bat (day roost)</i>	30 th July 2018	Dusk	0
	16 th August 2018	Dawn	0
	6 th September 2018	Dusk	0
	<u>Summary:</u> No bats of <i>Myotis</i> bat species or any other species of bat were recorded emerging from or re-entering the tree during any of the surveys of Tree 1601. On the 6 th September 2018, a total of seven registrations of <i>Myotis</i> bat species were recorded with the first at 20:23 (approximately 45 minutes after sunset).		
1610 (SCP) <i>Brown long-eared bat (maternity)/ Natterer's bat (maternity)</i>	23 rd August 2018	Dusk	1
	<u>Summary:</u> One bat of unknown species was recorded emerging from the knot hole on the northern elevation of Tree 1610 at 21:05. Constant foraging of pipistrelle bat species was recorded at the time of the emergence, therefore the species emerging from the tree was unclear. Three registrations of <i>Myotis</i> bat species were recorded during the survey, the first was recorded at 21:12 (approximately one hour after sunset). No registrations of brown long-eared bat were recorded.		
1611 (The Avenue) <i>Brown long-eared bat (maternity)</i>	30 th July 2018	Dusk	0
	16 th August 2018	Dawn	0
	6 th September 2018	Dusk	0
	<u>Summary:</u> No brown long-eared bats or any other species of bat were recorded emerging from or re-entering Tree 1611 during any of the surveys. No long-eared bat species were recorded foraging or commuting in the vicinity during any of the surveys.		
1612 (The Avenue) <i>Bechstein's bat</i>	31 st July 2018	Dusk	0
	15 th August 2018	Dawn	0
	5 th September 2018	Dusk	0
	<u>Summary:</u> No <i>Myotis</i> bat species or any other species of bat were recorded emerging from or re-entering Tree 1612 during any of the surveys. A total of six registrations of <i>Myotis</i> bat species were recorded on 31 st July 2018 with the first at 21:25 (approximately 30 minutes after sunset). On 5 th September 2018, a total of ten registrations for <i>Myotis</i> bat species were recorded with the first at 19:53 (13 minutes after sunset). The last registration of <i>Myotis</i> bat species recorded on 15 th August 2018 was at 05:08 (approximately 45 minutes before sunrise). Eleven registrations of <i>Myotis</i> bat species were recorded in total. The timings of <i>Myotis</i> bat registrations after sunset and before sunrise indicate that there are bats of this species group roosting nearby, either in SCP or The Avenue.		
1616 (SCP) <i>Soprano pipistrelle / whiskered bat</i>	19 th August 2018	Dusk	0
	<u>Summary:</u> No soprano pipistrelle bats, whiskered bats or any other species of bat were recorded emerging from Tree 1616 during the survey.		
1615 (SCP)	14 th May 2018	Dusk	0

²³ Tree 1604, and the associated roost feature, were refound late in the 2018 bat survey season and therefore this tree was not subject to an emergence / re-entry survey. An endoscope inspection will be carried out during summer 2019.

Tree No. and Previously Recorded Roost Type	Survey Date	Survey Type	Bats Recorded Emerging / Re-entering
<i>Bechstein's bat (maternity)</i>	16 th July 2018	Dusk	0
	25 th July 2018	Dusk	0
	14 th August 2018	Dawn	0
	5 th September 2018	Dusk	0
	<u>Summary:</u> No <i>Myotis bat species</i> , or any other species of bat were recorded emerging from Tree 1615 during any of the surveys. A total of three registrations of <i>Myotis bat species</i> were recorded on 25 th July 2018 with the first at 22:13 (approximately one hour and ten minutes after sunset). On 5 th September 2018, there were a total of three registrations with the first at 20:06 (approximately 45 minutes after sunset). The timings of <i>Myotis bat</i> registrations after sunset and before sunrise indicate that there are unlikely to be bats of this species group roosting nearby.		
1617 (The Avenue) <i>Bechstein's bat (day roost)</i>	31 st July 2018	Dusk	0
	15 th August 2018	Dawn	0
	5 th September 2018	Dusk	0
	<u>Summary:</u> No <i>Myotis bat species</i> , or any other species of bat were recorded emerging from or re-entering Tree 1617 during any of the surveys. No <i>Myotis bat species</i> registrations were recorded during the survey carried out on 31 st July 2018.		
1619 (The Avenue) <i>Bechstein's bat (day roost)</i>	31 st July 2018	Dusk	0
	14 th August 2018	Dawn	0
	5 th September 2018	Dusk	0
	<u>Summary:</u> No <i>Myotis bat species</i> , or any other species of bat were recorded emerging from Tree 1619 during any of the surveys. A total of five registrations were recorded for <i>Myotis bat species</i> on 31 st July 2018, with the first registration recorded at 21:54 (approximately one hour after sunset). The timings of <i>Myotis bat</i> registrations after sunset on 31 st July do not provide a clear picture of the potential roosting within the area by <i>Myotis bat species</i> . However, considering that <i>Myotis bats species</i> were only recorded during a single survey it is unlikely that there is a <i>Myotis bat species</i> roost within close proximity to Tree 1619.		
Dell Piece (North of Site)	19 th August 2018	Dusk	0
<i>Bechstein's bat (Maternity Roost)</i>	<u>Summary:</u> No <i>Myotis bat species</i> , or any other species of bat were recorded emerging from the previously recorded maternity roost.		

3.3.8 Vantage Point Surveys

Table D23 provides details of the species and activity levels recorded at each vantage point location over the three surveys undertaken in summer 2018. Location of vantage points are shown on **Map D19**. Based on this information, an assessment of roost potential of each woodland has been made.

The vantage point surveys were undertaken from 15 minutes prior to sunset until at least one hour after sunset. Surveyors were asked to record whether bats were

emerging from woodland, which may suggest a presence of a roost. Further, more prescriptive details of the methodology are provided in Paragraph 2.4.1.

Table D23: Bat Vantage Point Survey Results

Survey Location	Bat Activity at the Site	
Vantage Point Location 1 Middle Clearing (North-western Corner)	Overall Activity Summary	Species Recorded
	During the survey carried out in May 2018, three species of bat were recorded from Vantage Point 1: noctule, soprano pipistrelle and common pipistrelle, with the majority of registrations attributable to common pipistrelle. Noctule foraging activity was recorded within the northern part of Middle Clearing (although none were recorded emerging from the woodland itself), as well as along tree lines leading from Middle Clearing to the north-east. Common pipistrelle and soprano pipistrelle were recorded commuting along the bridleway from west to east, as well as along the hedgerow to the north. During the survey carried out in June 2018, only common pipistrelle was recorded. The majority of bats were seen commuting from west to east, north of Middle Clearing. In July/August 2018, limited activity was recorded, with all registrations attributable to common pipistrelle. Bats were recorded predominantly commuting north along the treeline adjacent to Middle Clearing, but not emerging from the woodland itself during any of the three surveys.	Noctule
		Soprano pipistrelle
		Common pipistrelle
Vantage Point Location 2 Middle Clearing (North-eastern Corner)	Overall Activity Summary	Species Recorded
	During the survey carried out in May 2018, a total of 10 noctule registrations and 12 common pipistrelle registrations were recorded. Noctule were recorded foraging within the woodland at the start of the survey, before commuting south and west along woodland edges. Constant foraging of common pipistrelle was recorded along woodland edges, and a number of bats were recorded commuting from a north-easterly direction to forage in and around Middle Clearing. In June 2018, a large number of common pipistrelle registrations were recorded. A number of bats were seen entering the woodland at the north-eastern corner and foraging within the woodland as well as along woodland boundaries. Two registrations of <i>Myotis</i> bat species were also recorded. In July/August 2018, only one common pipistrelle registration was recorded. No bats were recorded emerging from the woodland during any of the three surveys.	Noctule
		Common pipistrelle
		<i>Myotis</i> bat species
Vantage Point Location 3 Middle Clearing (South-western Corner)	Overall Activity Summary	Species Recorded
	During the May 2018 survey, continuous foraging of a small number of noctule was recorded. Low	Noctule
		Common pipistrelle

Survey Location	Bat Activity at the Site	
	numbers of pipistrelle bat species were also recorded foraging around Vantage Point 3. In June 2018, no bats were recorded at this vantage point location during the survey. In July/August 2018, activity levels were low with one common pipistrelle observed commuting along the woodland edge. No bats were recorded emerging from the woodland during any of the three surveys.	Pipistrelle bat species
Vantage Point Location 4 Middle Clearing (South-eastern Corner)	Overall Activity Summary	Species Recorded
	Activity levels during May 2018 were moderate with the majority of registrations attributable to common pipistrelle. Bats were recorded foraging along the treeline extending south-east from Middle Clearing. Noctule and soprano pipistrelle were also recorded in low numbers. In June 2018, two common pipistrelle were recorded constantly foraging within and along the edge of Middle Clearing throughout the survey. In July/August 2018, low numbers of <i>Myotis</i> bat species were recorded foraging in the vicinity of the woodland as well as constant foraging of common pipistrelle. No bats were recorded emerging from the woodland during any of the three surveys.	Noctule
		Soprano pipistrelle
		Common pipistrelle
		Pipistrelle bat species
		<i>Myotis</i> bat species
Vantage Point Location 5 Round Wood (North-western Edge)	Overall Activity Summary	Species Recorded
	Three species of bat were recorded during the May 2018 survey: noctule, common pipistrelle and pipistrelle bat species. Bats were recorded foraging in the vicinity of Round Wood, however no bats were recorded emerging from the woodland. In June 2018, bat activity levels were low in this location, with a total of three registrations, two attributable to common pipistrelle and one to Pipistrelle bat species. Bats were recorded foraging for a short time in the vicinity, however no emergences were recorded. In July/August 2018, no bats were recorded from this vantage point. No bats were recorded emerging from the woodland during any of the three surveys.	Noctule
		Common pipistrelle
		Pipistrelle bat species
Vantage Point Location 6 Round Wood (Southern Edge)	Overall Activity Summary	Species Recorded
	During the May 2018 survey, the majority of registrations were attributable to common pipistrelle, with noctule, soprano pipistrelle and <i>Myotis</i> bat species also recorded. Bats were recorded foraging within Round Wood as well as commuting between nearby woodlands. No bats were recorded emerging from the woodland. In June 2018, bat activity levels were low with just five registrations in total. A small number of	Noctule
		<i>Myotis</i> bat species
		Common pipistrelle
		Soprano pipistrelle

Survey Location	Bat Activity at the Site	
	common pipistrelle and soprano pipistrelle were recorded foraging in the vicinity of Round Wood. In July/August 2018, bat activity was very low with just two common pipistrelle observed. No bats were recorded emerging from the woodland. No bats were recorded emerging from the woodland during any of the three surveys.	
Vantage Point Location 7 Round Wood (North-eastern Edge)	Overall Activity Summary	Species Recorded
	General bat activity was very low at this vantage point throughout all three surveys. In May 2018, just one common pipistrelle was recorded foraging around the woodland. In June 2018, no bats were recorded during the survey. During the July/August 2018 survey, one common pipistrelle registration was recorded at the end of the survey. No bats were recorded emerging from the woodland during any of the three surveys.	Common pipistrelle
Vantage Point Location 8 The Avenue (South-western Edge)	Overall Activity Summary	Species Recorded
	During the May 2018 survey, bat activity levels were moderate with the majority of registrations attributable to soprano pipistrelle and common pipistrelle. <i>Myotis</i> bat species was also recorded. Common pipistrelle and soprano pipistrelle were recorded commuting north-west along the treeline adjacent to The Avenue, west along the treeline and ditch into The Avenue, as well as exiting the Avenue into the adjacent field. In June 2018, activity levels were lower with only soprano pipistrelle and common pipistrelle recorded. Activity was more sporadic, with no clear commuting routes recorded and only low levels of foraging nearby. Only a small number of common pipistrelle registrations were recorded in July/August 2018, one common pipistrelle was seen foraging close to the woodland edge. No bats were recorded emerging from the woodland during any of the three surveys.	<i>Myotis</i> bat species
		Soprano pipistrelle
		Common pipistrelle
Vantage Point Location 9 The Avenue (Western Edge)	Overall Activity Summary	Species Recorded
	In May 2018, a small number of common pipistrelle were recorded sporadically foraging nearby, including around an oak tree within The Avenue. In June 2018, one noctule registration was recorded, however this was heard and not seen. One pipistrelle bat species was also recorded. In general, activity levels were very low. No bats were recorded during the July/August 2018 survey. No bats were recorded emerging from the woodland during any of the three surveys.	Common pipistrelle
		Noctule
		Pipistrelle bat species

Survey Location	Bat Activity at the Site	
Vantage Point Location 10 The Avenue (Northern Edge)	Overall Activity Summary	Species Recorded
	In May 2018, a total of four common pipistrelle and four <i>Myotis</i> bat species registrations were recorded. Activity levels were generally low with a small number of bats recorded along the treeline extending north of The Avenue. Several passes of <i>Myotis</i> bat species were also recorded. In July 2018, multiple registrations of noctule were recorded at the start of the survey. Following this, common pipistrelle was continuously recorded. One <i>Myotis</i> bat species registration was also recorded. Common pipistrelle was the only species recorded at this location during the July/August 2018 survey. Activity levels were low throughout the survey, with no obvious emergences recorded. Some foraging was recorded along the northern woodland edge of The Avenue. No bats were recorded emerging from the woodland during any of the three surveys.	Common pipistrelle
		Noctule
		<i>Myotis</i> bat species
Vantage Point Location 11 The Avenue (North-eastern Edge)	Overall Activity Summary	Species Recorded
	Bat activity levels during the May 2018 survey were moderate. Four species of bat were recorded: noctule, long-eared bat species, common pipistrelle and soprano pipistrelle, with the majority of registrations attributable to common pipistrelle and just one registration of noctule and long-eared bat species. Foraging behaviour was recorded throughout the survey, and the long-eared bat species commuted from The Avenue towards Havant Thicket woodland. In June 2018, moderate levels of foraging activity were recorded along the north-eastern edge of The Avenue comprising low numbers of long-eared bat species, <i>Myotis</i> bat species, common pipistrelle and soprano pipistrelle. During the July/August 2018 survey, foraging activity was predominantly attributable to <i>Myotis</i> bat species. Bats were heard foraging within the woodland before two <i>Myotis</i> bat species commuted east along the southern edge of the Corsican Pine Plantation. No bats were recorded emerging from the woodland during any of the three surveys.	Noctule
		Long-eared bat species
		Soprano pipistrelle
		Common pipistrelle
		<i>Myotis</i> bat species
Vantage Point Location 12 The Avenue (Eastern Edge)	Overall Activity Summary	Species Recorded
	In May 2018, multiple passes of noctule, common pipistrelle and soprano pipistrelle were recorded at this location. The majority of activity was attributable to common pipistrelle with a total of 19 registrations. Bats were recorded foraging back and forth from this location, along the eastern edge of The Avenue. During the June 2018 survey, activity levels were slightly lower, with just common pipistrelle	Noctule
		Soprano pipistrelle
		Common pipistrelle

Survey Location	Bat Activity at the Site	
	registrations recorded. Bats were recorded foraging within the Avenue for short periods of time. In July/August 2018, two common pipistrelle were recorded emerging from The Avenue on its eastern edge. In general, little foraging and commuting activity was recorded. No bats were recorded emerging from the woodland during any of the three surveys.	
Vantage Point Location 13 The Avenue (Eastern Edge)	Overall Activity Summary	Species Recorded
	Four species of bat were recorded during the May 2018 survey: noctule, <i>Myotis</i> bat species, common pipistrelle and soprano pipistrelle, with the majority of activity attributable to common pipistrelle. Noctule was recorded foraging along the eastern edge of the Avenue south of Vantage Point 13, as well as common pipistrelle and soprano pipistrelle foraging along the woodland edge. Foraging activity was recorded throughout the duration of the survey. In June 2018, soprano pipistrelle, common pipistrelle and <i>Myotis</i> bat species were recorded. A single <i>Myotis</i> bat species was recorded entering the woodland from the adjacent field to forage. The same behaviour was recorded for a number of common pipistrelle bats. During the July/August 2018 survey, registrations of serotine and common pipistrelle were recorded. Two bats were recorded emerging from the Avenue at this location, foraged around the bridleway before returning. No bats were recorded emerging from the woodland during any of the three surveys.	Noctule
		<i>Myotis</i> bat species
		Soprano pipistrelle
		Common pipistrelle
		Serotine
Vantage Point Location 14 The Avenue (South-eastern Edge)	Overall Activity Summary	Species Recorded
	During the May 2018 survey, common pipistrelle and noctule were the only species recorded, with the majority of registrations of common pipistrelle. One common pipistrelle was seen flying east to west along the southern treeline on the northern edge of SCP. Constant foraging was recorded for the rest of the survey. In June 2018, common pipistrelle and <i>Myotis</i> bat species were recorded. A <i>Myotis</i> bat species was seen commuting along the treeline along the northern edge of SCP from east to west before entering The Avenue woodland. A small number of common pipistrelle were recorded foraging back and forth along the SCP tree line. In July/August 2018, one common pipistrelle was recorded emerging from The Avenue at this vantage point location within half an hour of sunset, before re-entering soon after. Lots of foraging activity was recorded during the survey, with registrations consisting of <i>Myotis</i> bat species, serotine, soprano pipistrelle and common pipistrelle. The majority of bats were seen flying	Common pipistrelle
		Noctule
		<i>Myotis</i> bat species
		Serotine
		Soprano pipistrelle

Survey Location	Bat Activity at the Site	
	over the adjacent field and entering The Avenue to forage. No bats were recorded emerging from the woodland during any of the three surveys.	
Vantage Point Location 15 Corsican Pine Plantation (Southern Edge)	Overall Activity Summary	Species Recorded
	In May 2018, small numbers of common pipistrelle were recorded foraging. Bat activity levels were low throughout the survey. During the survey carried out in June 2018, low numbers of common pipistrelle and <i>Myotis</i> bat species were recorded foraging along the woodland edge from east to west throughout the second half of the survey. In July/August 2018, registrations of serotine and common pipistrelle were recorded, with the majority attributable to serotine. Both serotine and common pipistrelle were recorded foraging and commuting along the woodland edge at this location. No bats were recorded emerging from the woodland itself. No bats were recorded emerging from the woodland during any of the three surveys.	Common pipistrelle
		<i>Myotis</i> bat species
		Serotine
Vantage Point Location 16 Corsican Pine Plantation (Western Edge)	Overall Activity Summary	Species Recorded
	Bat activity levels were generally very low at this vantage point location, with a small number of common pipistrelle recorded during the May 2018 survey. No bats were recorded or observed during the June 2018 or July/August 2018 surveys. No bats were recorded emerging from the woodland during any of the three surveys.	Common pipistrelle

Middle Clearing Activity Summary

The majority of activity was recorded at the northern end of Middle Clearing during the survey carried out in May 2018. Common pipistrelle was the most frequently recorded species within and around the Middle Clearing woodland, with comparatively lower numbers of noctule registrations, as well as limited numbers of soprano pipistrelle and *Myotis* bat species.

The majority of noctule calls recorded at the northern end of Middle Clearing were recorded within half an hour of sunset. Noctule were not recorded emerging from the woodland indicating that the species does not roost within Middle Clearing. However, the records of the species were concentrated in May 2018, including foraging bats, suggesting that this species may be taking advantage of a seasonally available food source in the area around Middle Clearing.

Soprano pipistrelle registrations were also made within half an hour of sunset, although these were not recorded within or emerging from Middle Clearing. Common pipistrelle, soprano pipistrelle and *Myotis* bat species were recorded commuting rather than foraging, suggesting that they are utilising the edges of Middle Clearing to forage and move between other suitable bat foraging habitats within the site and surrounding landscape.

Round Wood Summary

The majority of bat activity was recorded along the western edge of Round Wood during the survey carried out in May 2018. Common pipistrelle was the most frequently recorded species with comparatively fewer numbers of noctule registrations, lower numbers of soprano pipistrelle and *Myotis* bat species also recorded.

No bats were recorded emerging from Round Wood during any of the surveys. The noctule records of bats foraging around the edge of the woodland during May 2018 are indicative of this species exploiting a food source in this location. These findings are consistent with the results of Vantage Point surveys carried out for Middle Clearing.

The Avenue Summary

The majority of bat activity was recorded along the eastern edge of the Avenue woodland, while fewer bats were recorded along the western edge. Common pipistrelle was the most frequently recorded species, as well as soprano pipistrelle, *Myotis* bat species and noctule. One registration of long-eared bat species was also recorded. Bat activity was predominantly recorded in May 2018.

Along the eastern edge of the Avenue, registrations of *Myotis* bat species, common pipistrelle, soprano pipistrelle and noctule were all recorded within half an hour of sunset, suggesting that these species may be roosting in woodland nearby. However, the majority of *Myotis* registrations were towards the end of the surveys, and surveyors mainly recorded bats moving north along the eastern edge of The Avenue, possibly suggesting *Myotis* bat roosts are located in SCP woodland. No definitive evidence was provided to suggest that bats are roosting within the Avenue woodland, however activity levels were relatively high with bats regularly commuting along the woodland edge as well as regularly entering and exiting the woodland whilst foraging.

The Corsican Pine Plantation Summary

The majority of activity was recorded along the southern boundary of the Corsican Pine Plantation. Common pipistrelle was the most frequently recorded species with registrations of serotine and *Myotis* bat species also recorded. No bats were recorded emerging from the woodland, and none of the registrations were recorded within half an hour of sunset. However, the behaviour recorded during the surveys suggests that this woodland edge represents a commuting route for a number of species.

In general bat activity levels recorded around each woodland block was low, with more activity in the north of Middle Clearing and eastern and northern edge of The Avenue. A key purpose of the survey was to look for species emerging from the woodland close to sunset, which would be suggestive of a nearby roost within on-site woodland. No such emergence was observed from any of the blocks.

In isolation it is difficult to extrapolate robust conclusions from the vantage point data given the difficulty with observing bats within and around woodland; however in conjunction with static detector and tracking data a good understanding of usage of each woodland block has been obtained (further details are provided in Paragraph 3.4).

3.3.9 **Bat Automated Detector Survey**

The automated bat detector survey results recorded a total of 81,557 bat registrations in 2018 of at least eight species: common pipistrelle, soprano pipistrelle, noctule, serotine, *Myotis* bat species, Nathusius' pipistrelle, barbastelle, long-eared bat species and Leisler's bat / noctule.

Detectors were placed at 10 locations for five days a month between April and October 2018, as shown on **Map D20** (see Paragraph 2.4.1 for further details of methodology).

Activity by Species

Table D24 shows the number of registrations and proportion of recorded bat activity at the site by species. The majority of records were related to common pipistrelle and soprano pipistrelle (94.36%). *Myotis* bat species were the next most frequently recorded species with 3.29% of registrations. A similar number of serotine and noctule were recorded from the site, although these species combined only represented 1.58% of all registrations. Nathusius' pipistrelle was recorded on 513 occasions representing 0.63% of all registrations. Very small numbers of barbastelle and long-eared bat species registrations were recorded. It should be noted that long-eared bat species are known to have echolocation 'quietly' and therefore the number of registrations of this species recorded during the static detector survey is likely to be an under representation of the activity levels at the site.

Ten registrations were attributed to either Leisler's bat or noctule. Calls of Leisler's bat are hard to distinguish from noctule, and these calls had characteristics which did not allow which species was involved to be distinguished. Given that records of Leisler's bat have been returned in the three kilometre radius data search it is possible that this species occasionally visits the site.

Table D24: Number of registrations and proportion of bat activity from each species

Species	No. Registrations	% Registrations
Common pipistrelle	72,442	88.82%

Species	No. Registrations	% Registrations
Soprano pipistrelle	4,522	5.54%
<i>Myotis</i> bat species	2,686	3.29%
Noctule	660	0.81%
Serotine	624	0.77%
Nathusius' pipistrelle	513	0.63%
Long-eared bat species	56	0.07%
Barbastelle	44	0.05%
Leisler's bat / noctule	11	0.01%
Grand Total	81,557	100.00%

It should be noted that a bat foraging close to a detector will result in multiple registrations. Therefore, the total number of registrations does not represent the number of bats present but reflects the general level of bat activity at the site for each species.

Species Activity by Month

Table D25 provides the number of registrations and an activity index of each species recorded within each month. **Appendix D8** and the associated **Table D39** to **Table D48** provide monthly activity and registration per location.

Table D25: Number of registrations of each month split by species at all locations

Period	Species	No. Registrations	Activity Index
April – May 2018	Common pipistrelle	3,120	89.1
	Long-eared bat species	2	0.1
	<i>Myotis</i> bat species	455	13.0
	Nathusius' pipistrelle	43	1.2
	Noctule	3	0.1
	Soprano pipistrelle	114	3.3
April 2018 Total		3,737	106.8
May 2018	Barbastelle	9	0.3
	Common pipistrelle	15,834	452.4
	Leisler's bat / noctule	10	0.3
	Long-eared bat species	17	0.5
	<i>Myotis</i> bat species	546	15.6
	Nathusius' pipistrelle	288	8.2
	Noctule	510	14.6
	Serotine	175	5.0
	Soprano pipistrelle	331	9.5
May 2018 Total		17,720	506.3
June 2018	Barbastelle	5	0.1
	Common pipistrelle	25,476	727.9
	Leisler's bat / noctule	1	0.0

Period	Species	No. Registrations	Activity Index
	Long-eared bat species	6	0.2
	<i>Myotis</i> bat species	284	8.1
	Nathusius' pipistrelle	123	3.5
	Noctule	38	1.1
	Serotine	156	4.5
	Soprano pipistrelle	649	18.5
June 2018 Total		26,738	763.9
July 2018	Barbastelle	6	0.2
	Common pipistrelle	16,277	542.6
	Long-eared bat species	12	0.4
	<i>Myotis</i> bat species	258	8.6
	Nathusius' pipistrelle	5	0.2
	Noctule	60	2.0
	Serotine	282	9.4
	Soprano pipistrelle	1,544	51.5
July 2018 Total		18,444	614.8
August 2018	Barbastelle	9	0.3
	Common pipistrelle	3,302	94.3
	Long-eared bat species	3	0.1
	<i>Myotis</i> bat species	365	10.4
	Nathusius' pipistrelle	9	0.3
	Noctule	14	0.4
	Serotine	9	0.3
	Soprano pipistrelle	935	26.7
August 2018 Total		4,646	132.7
September – October 2018	Barbastelle	12	0.3
	Common pipistrelle	6,825	195.0
	Long-eared bat species	16	0.5
	<i>Myotis</i> bat species	251	7.2
	Nathusius' pipistrelle	34	1.0
	Noctule	10	0.3
	Soprano pipistrelle	709	20.3
September 2018 Total		7,857	224.5
October 2018	Barbastelle	3	0.1
	Common pipistrelle	1,607	53.6
	<i>Myotis</i> bat species	527	17.6
	Nathusius' pipistrelle	11	0.4
	Noctule	25	0.8
	Serotine	2	0.1
	Soprano pipistrelle	240	8.0
October 2018 Total		2,415	80.5
Grand Total		81,557	347.1

Table D25 provides an overall summary of bat activity across the site. Further analysis of this data, including interpretation of usage of the site by different species, is presented in the paragraphs below.

Myotis bat species Activity Index by location and month is presented in **Table D26**. The levels of *Myotis* bat species activity was highest at Location 4 adjacent to the parkland in SCP, especially during May, July and August 2018. Location 9 along the tree line which runs from Havant Thicket to The Avenue also had a high level of *Myotis* bat species activity. The location with the least activity was Location 1 in the south-west corner of the site adjacent to Leigh Park. Location 6 in the centre of the site and Location 10 adjacent to The Corsican Pine Plantation also had a particularly low level of *Myotis* bat species activity.

Higher levels of *Myotis* bat species activity was recorded during April, May and October 2018 with much less activity during the period between June and September 2018. This data would indicate that *Myotis* bat species utilise the site less during the summer.

Table D26: Activity Index of *Myotis* bat species by location and month

Location	April-May	May	June	July	August	September-October	October	Average
1	0.0	0.4	0.0	1.4	0.8	0.2	0.0	0.4
2	2.4	19.8	7.0	16.4	3.8	2.0	33.0	12.1
3	13.6	13.6	6.0	8.0	11.4	13.8	8.6	10.7
4	2.8	35.2	2.6	10.8	46.0	4.6	0.8	14.7
5	6.2	8.8	1.2	2.2	3.0	3.4	7.2	4.6
6	2.6	1.6	0.4	0.0	0.2	0.0	8.6	1.9
7	0.8	11.4	15.2	4.0	2.0	2.0	43.4	11.3
8	25.4	0.8	3.6	No data	0.8	No data	2.6	6.6
9	34.8	13.4	13.8	8.6	2.4	22.2	3.6	14.1
10	2.4	4.2	7.0	0.2	2.6	0.8	0.2	2.5
Average	9.1	10.9	5.7	5.7	7.3	5.4	10.8	

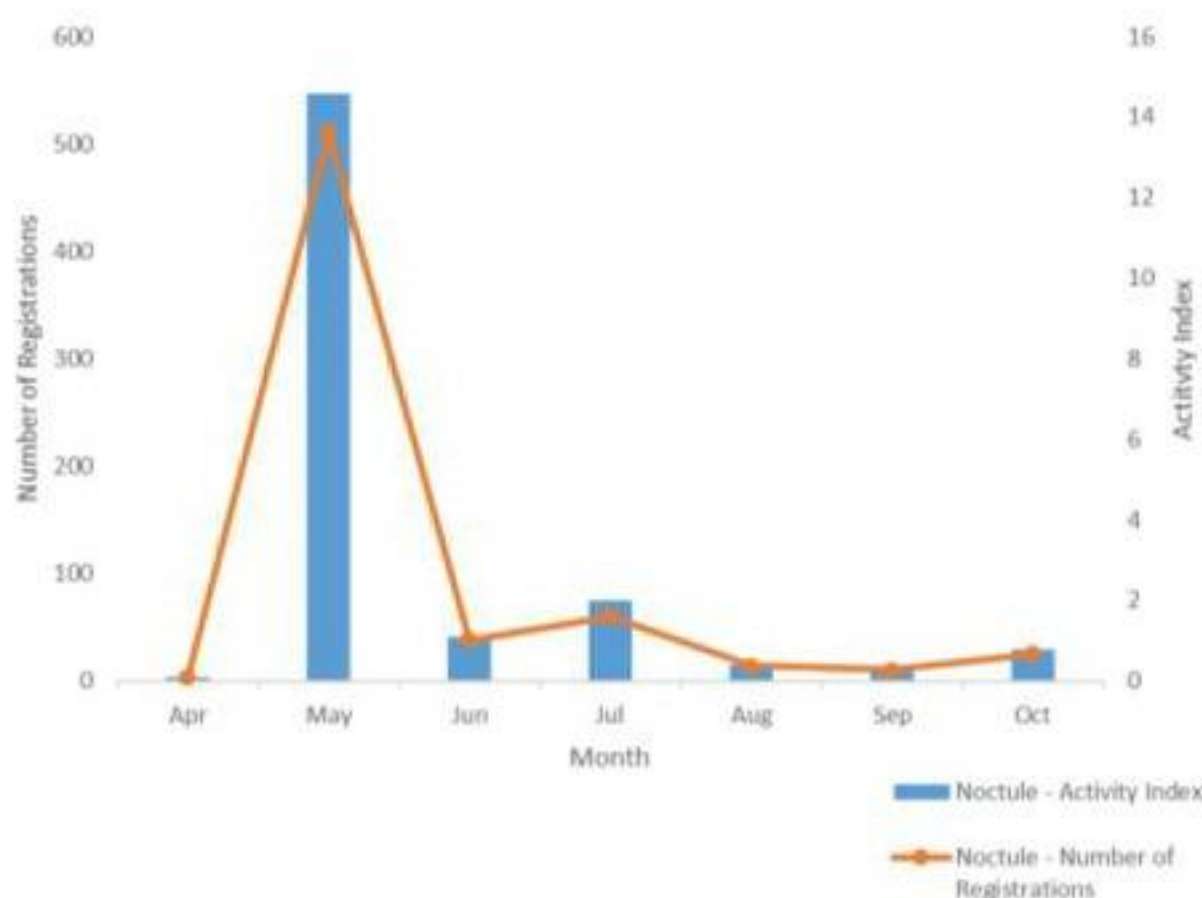
There was a notable increase in the noctule activity at the site during May 2018 (see **Figure 17** and **Table D27**). When the data is viewed across all 10 detectors there is a peak at Location 7 by Middle Clearing during May 2019, this activity at this detector in May comprised 23% of all noctule registrations at the site (152 registrations). During this period noctule were recorded during the vantage point survey (**Table D23**, VP1)

foraging around Middle Clearing (see Paragraph 3.3.8) in the early evening suggesting that a particular food source was attracting this species to this area. No bats were recorded emerging from the wood itself. Location 3, at the southern end of The Avenue, also recorded a relatively high level of noctule activity.

Table D27: Activity Index of noctule by location and month

Location	April-May	May	June	July	August	September-October	October	Average
1	0.0	13.8	3.8	1.0	1.2	0.0	0.0	2.8
2	0.0	6.4	0.4	1.4	0.0	0.2	0.2	1.2
3	0.0	21.8	0.0	0.2	0.2	0.0	0.2	3.2
4	0.2	7.8	0.6	2.4	0.2	0.4	0.2	1.7
5	0.4	2.6	0.8	1.2	0.0	0.8	0.0	0.8
6	0.0	1.0	1.0	0.4	0.0	0.0	0.2	0.4
7	0.0	30.7	0.0	1.6	0.4	0.0	1.4	4.9
8	0.0	4.4	0.6	No data	0.2	0.0	No data	1.0
9	0.0	5.2	0.4	3.2	0.2	0.0	2.2	1.6
10	0.0	8.6	0.0	0.6	0.4	0.6	0.6	1.5
Average	0.1	10.2	0.8	1.3	0.3	0.2	0.6	2.8

Figure 17: Noctule registrations and activity index per month



Nathusius' pipistrelle activity peaked in May 2018 (**Table D28**), potentially indicating migrant bat activity associated with bats passing through the UK. However, the small number of overall registrations of this species make it difficult to draw conclusions from this data given that 513 registrations could have been made by single / small numbers of bats.

Table D28: Activity Index of Nathusius' pipistrelle by location and month

Location	April-May	May	June	July	August	September-October	October	Average
1	0.0	1.0	0.0	0.0	0.0	0.0	0.2	0.2
2	0.0	0.0	0.0	0.0	0.0	0.4	0.6	0.1
3	0.0	4.2	14.2	0.0	0.0	0.4	0.0	2.7
4	0.0	0.0	0.0	0.0	0.4	1.2	0.2	0.3
5	0.4	5.2	0.4	0.8	0.2	1.4	1.2	1.4
6	6.6	13.2	0.4	0.4	0.0	0.0	0.0	2.9
7	1.0	14.0	4.8	0.0	0.0	0.4	0.0	2.9
8	0.0	12.2	3.6	No data	0.0	2.4	No data	3.6
9	0.4	3.2	0.4	0.2	0.0	0.6	0.0	0.7
10	0.2	4.2	0.8	0.2	0.8	0.0	0.0	0.9
Average	0.9	5.7	2.5	0.2	0.1	0.7	0.2	1.6

Between 3 and 12 registrations of barbastelle were recorded per month between May and October 2018, with the highest number recorded in late September / early October (12). Over 50% (23) of the barbastelle records at the site were recorded from Location 5 on the eastern edge of the site adjacent to Gipsies Plain.

There was a consistently high usage of the site by common pipistrelle between May and July 2018. During this period there was particularly high usage of Location 2 on the edge of Round Wood and Location 7 on the edge of Middle Clearing. Registrations from these locations of common pipistrelle between May and July 2018 represented 40% of the overall total number of registrations for this species.

Soprano pipistrelle activity at the site was relatively low compared to common pipistrelle accounting for 5.54% of registrations. Activity increased from April to June, and reached a peak in July 2018 before decreasing from August to October (**Table D29**). Location 3 at the southern end of The Avenue was particularly favoured by soprano pipistrelle. Location 6 within Gipsies Plain recorded the lowest soprano pipistrelle activity, and the Activity Index figure was also low at Locations 1, 8, 9 and 10.

Table D29: Activity Index of soprano pipistrelle by location and month

Location	April-May	May	June	July	August	September-October	October	Average
1	0.0	0.0	0.2	41.0	3.0	2.0	4.6	7.3
2	0.0	1.2	5.4	22.6	69.6	3.8	6.4	15.6
3	21.0	23.4	47.8	95.2	61.0	98.0	23.2	52.8
4	0.0	33.8	23.6	18.8	17.6	6.0	5.2	15.0
5	0.4	5.0	57.8	13.8	5.6	16.4	2.8	14.5
6	0.0	1.0	4.0	7.6	0.4	1.4	1.8	2.3
7	0.2	1.4	2.8	71.0	0.4	3.0	3.0	11.7
8	0.0	0.2	0.2	No data	27.6	4.8	No data	6.6
9	0.8	0.0	0.8	11.4	0.6	4.0	0.4	2.6
10	0.4	0.2	1.0	27.4	1.2	2.8	0.2	4.7
Average	2.3	6.6	14.4	34.3	18.7	14.2	5.3	

Serotine was not recorded from the automated detector surveys during April and September 2018, and a very low level of activity was recorded in August and October 2018 (**Table D30**). There was peak in activity at the site between May and July 2018. Location 5, on the eastern edge of the site and Location 9 on the edge of Havant Thicket

woodland north of The Avenue were particularly favoured areas, although activity levels fluctuated at these locations.

Table D30: Activity Index of serotine by location and month

Location	April-May	May	June	July	August	September-October	October	Average
1	0.0	0.8	2.8	0.8	0.2	0.0	0.2	0.8
2	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.2
3	0.0	1.8	1.4	1.0	0.4	0.0	0.0	0.8
4	0.0	1.2	23.6	3.2	0.8	0.0	0.0	4.8
5	0.0	15.2	1.0	25.2	0.4	0.0	0.0	7.0
6	0.0	0.4	0.2	0.0	0.0	0.0	0.0	0.1
7	0.0	2.4	0.4	0.6	0.0	0.0	0.0	0.6
8	0.0	0.2	0.0	No data	0.0	0.0	No data	0.1
9	0.0	4.4	0.4	25.4	0.0	0.0	0.2	5.1
10	0.0	7.6	1.4	0.2	0.0	0.0	0.0	1.5
Average	0.0	3.5	3.1	6.3	0.2	0.0	0.0	

Species Time Analysis

The registrations of Nathusius' pipistrelle, noctule, serotine, *Myotis* bat species and barbastelle have been analysed in relation to sunset (**Figure 18**) and sunrise (**Figure 19**). These species have been particularly targeted as they are notable species or species which are heavily reliant on tree roosts. The registrations in relation to sunrise and sunset are split by location in **Appendix D9**.

Out of the British bats noctule emerge from their roosts the earliest (average 0-10 minutes after sunset (Russ, 2012)) and there is an increase in records of this species around sunset, then a large increase in the 10-20 minutes after sunset and a peak in the period 20-30 minutes after sunset. There is also a peak 20-30 minutes before sunrise, which is generally suggestive that this species is not roosting at the site, but could be roosting nearby.

Given that only 44 registrations of barbastelle were recorded during the survey period it is difficult to draw conclusions from the time analysis undertaken for this species and no clear pattern is shown in the data. However, the species has not been recorded on site frequently at the species emergence times (average 25-60 minutes after sunset (Russ, 2012)), suggesting this species is not roosting at the site.

On average serotine emerge 20-30 minutes after sunset (Russ, 2012). No records of serotine were made from the static detector recorders during this period, and only a single registration of serotine was made during the period 30-40 minutes after sunset. A very small number of registrations (4) were made between 10 and 40 minutes before sunrise, suggesting this species is not roosting at the site.

Myotis bat species activity levels were highest between 60-140 minutes after sunset. No locations showed a particular high level of activity during the period when most *Myotis* bat species are emerging (20-60 minutes after sunset (Russ, 2012)). A similar pattern was generally observed for the period before sunrise, with much less activity between 20 and 60 minutes before sunrise. However, Location 9 (on the boundary of Havant Thicket Woodland north of The Avenue) and Location 10 (on the south-western edge of the Corsican Pine Plantation) did show a relatively high level of *Myotis* bat activity in the period between 40-50 minutes before sunrise. However, a converse increase in records soon after sunset was not recorded at these locations. This may indicate usage of the landscape by *Myotis* bat is different at dusk compared to dawn. Overall, the data suggests limited evidence of roosting *Myotis* bat species across the majority of the site.

Figure 18: Activity of species before and after sunset

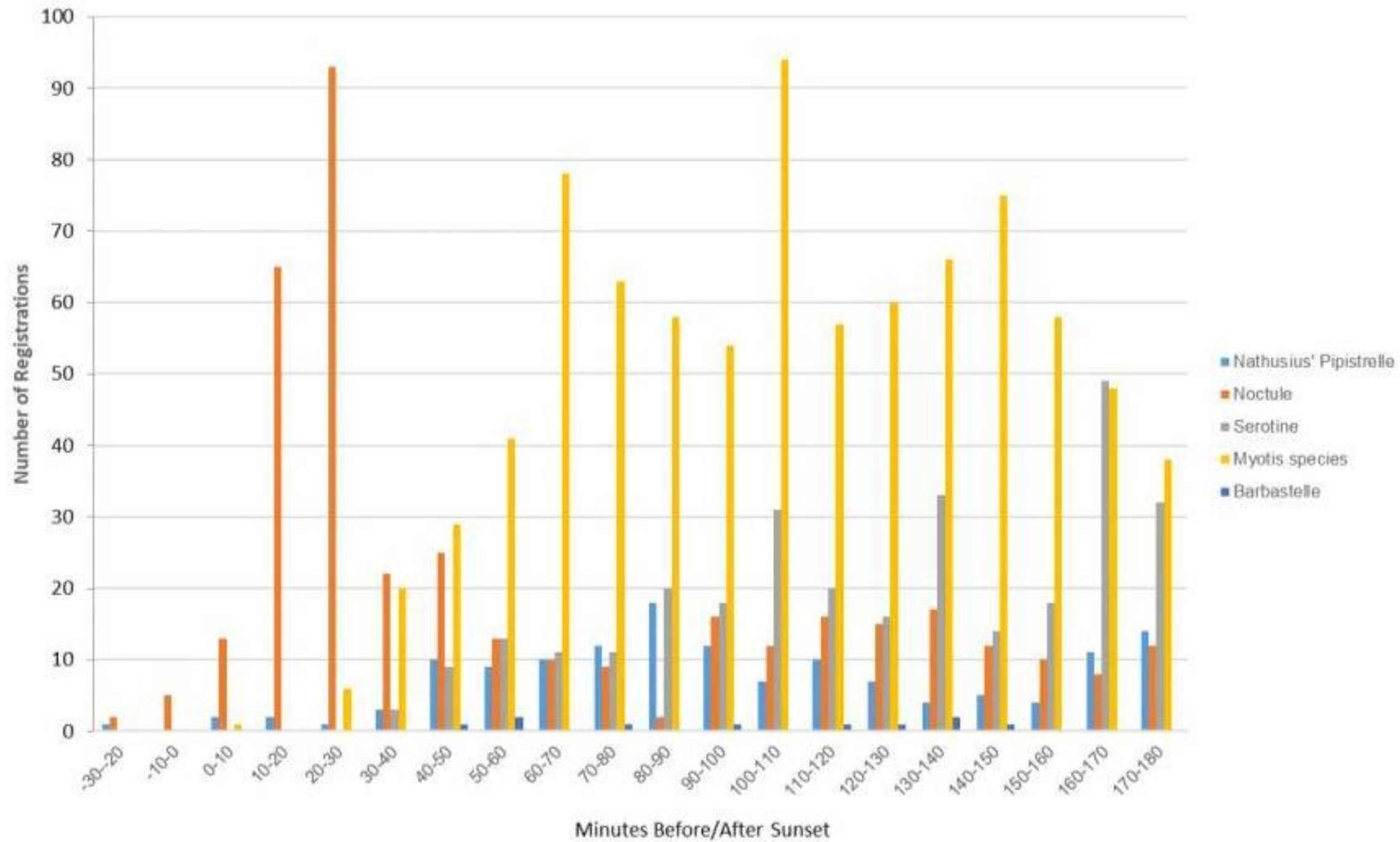
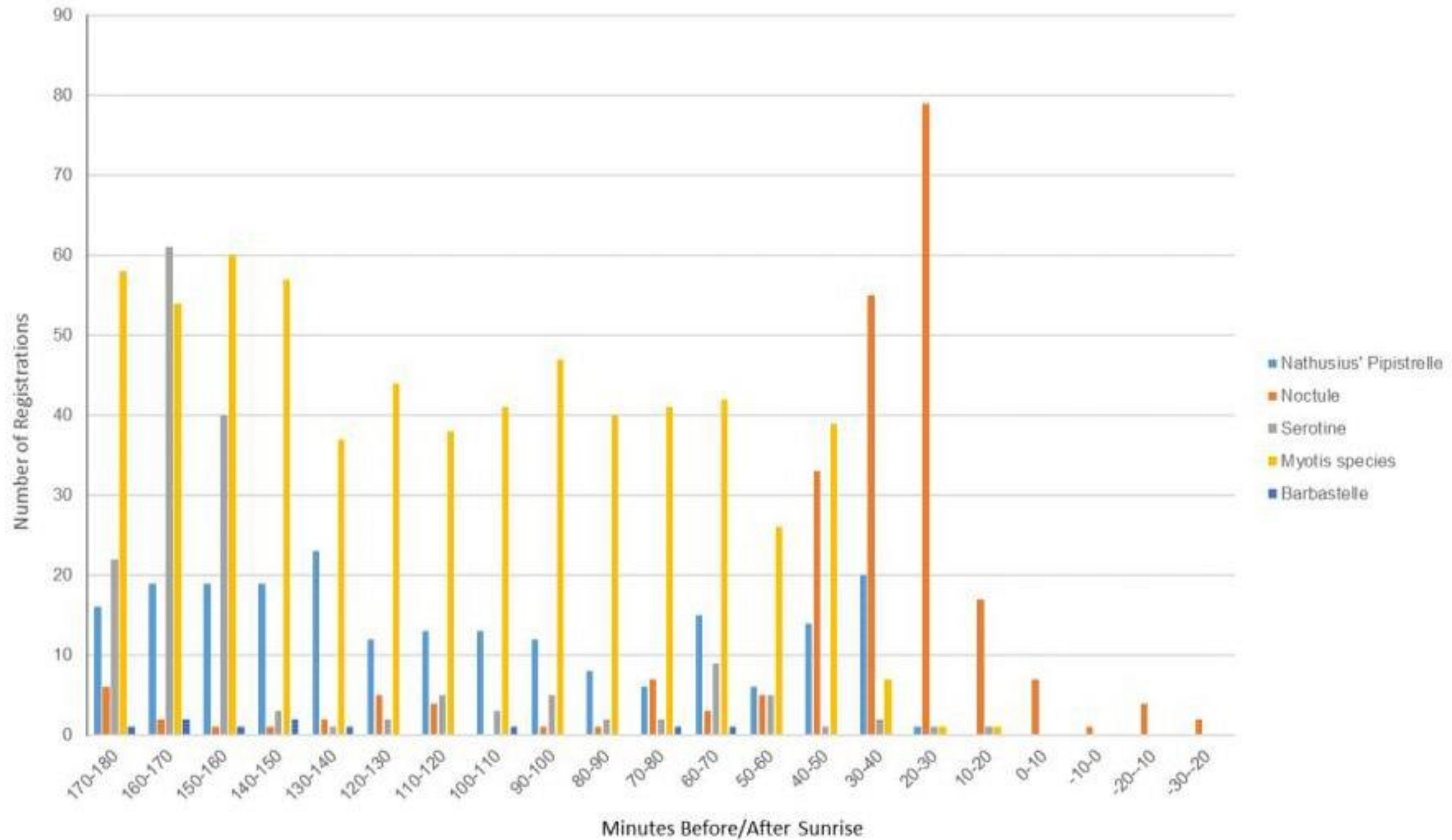


Figure 19: Activity of species before and after sunrise



3.4 Discussion and Evaluation

The site contains four small woodland areas with suitability to support roosting bats, Middle Clearing, Round Wood, The Corsican Pine Plantation and The Avenue. Between 2008 and 2018 at least 13 bat species have been recorded at the site: barbastelle, Bechstein's bat, Brandt's bat, brown long-eared bat, common pipistrelle, Daubenton's bat, Leisler's bat/noctule, Nathusius' pipistrelle, Natterer's bat, noctule, serotine, soprano pipistrelle and whiskered bat. A fourteenth species Alcahoie bat has also been recorded within three kilometres of the site. The discussion and evaluation below of the site for roosting bats and foraging and commuting bats is based on desktop study data, and ECOSA surveys (2008/2009 and 2018).

Bechstein's bat, Natterer's bat and brown long-eared bat have been evaluated in more detail as they were shown by tracking surveys in 2008 to be roosting on and immediately adjacent to the site.

Alcahoie bat

Alcahoie bat has only recently been described from the UK and therefore the population is currently unknown. Desktop study data have provided evidence of five records of Alcahoie bat within three kilometres of the site, the nearest of these is approximately 1.7 kilometres south-east. All records have been identified through DNA analysis of this cryptic species. DNA analysis of three 'small' *Myotis* bat species droppings recorded during mist-netting at the site in 2018 included confirmation of a single whiskered bat. Two other 'small' *Myotis* bat species were recorded from SCP in July 2018 and comprised a breeding female and a male, analysis of droppings from these bats could not be identified to species level.

Evidence from mainland Europe indicates that Alcahoie bat has a preference for 'old woodland, structured edges of broadleaved woodland, and riparian habitats with large trees. Limited radio-tracking data show that it forages both in the crown of trees and over water. Hunting areas are usually within 3km of the roost, although individuals are recorded travelling up to 6km' (Matthews, et al., 2018).

Based on the current knowledge of Alcahoie bat it is considered a rare species with a restricted distribution within England, not enough is known about Alcahoie bat for Bat Conservation Trust to provide details of core sustenance zones (Collins, 2016). There is no evidence that the species roosts within the site. Overall the site is considered to be of site level importance for Alcahoie bat.

Barbastelle

Barbastelle bat is an Annex II and S41 species, and has an estimated UK population of 5,000 individuals. A small number of barbastelle records were returned with the

Hampshire Bat Group data search none of which related to roosts. Two records were made by ECOSA in 2009, both relating to bats recorded along The Avenue in March.

Two male barbastelle were trapped just after midnight in SCP during August 2018. A small number of registrations of this species were identified during the static detector surveys, with the eastern edge of the site adjacent to Gipsies Plain a particularly favoured location for barbastelle. Analysis of static detector time data did not show particular peaks of activity by this species during typical emergence/re-entry times for barbastelle, and no records of barbastelle were made during vantage point surveys.

The baseline data for barbastelle indicate that this species is infrequently recorded and unlikely to be roosting on-site or rely on the site for foraging and / or commuting. However, given the presence of individuals on site and suitable habitat present, occasional roosting within the site by single individuals cannot be completely ruled out. It is considered that the site is of local value for barbastelle, especially in the context of the extensive woodland in the local landscape associated with Havant Thicket woodland, The Holt, Stein Wood and Southleigh Forest. Furthermore analysis of records of this species collected by ECOSA has identified the species at sites throughout Hampshire indicating that the barbastelle is a much more widespread species than currently thought and is severely under recorded (Codlin, 2011).

Bechstein's bat

Bechstein's bat is an Annex II and S41 species; and has an estimated UK population of 1,500 individuals. Over the past 10 years eleven Bechstein's bat maternity roosts have been recorded within three kilometres of the site, none of which are located within the site itself. Six of these roosts are located in woodland in the vicinity of Southleigh Forest to the east of the site, three are located to the north-west and north-east of the site in Stein Wood, The Holt (FE) and Dell Piece East woodland. A single maternity roost was recorded in SCP during 2008, with 22 bats emerging. Intensive survey on and in the vicinity of the site during 2009 and 2018 has not recorded another Bechstein's bat roost within SCP or provided evidence that a maternity roost is present within 500 metres of the site and survey on behalf of Hampshire County Council in SCP in 2016 did not record the presence of Bechstein's bat.

Survey work to date has resulted in the capture and tracking of 16 Bechstein's bat from a total population estimate of at least 108 bats, which is based on the maximum count recorded simultaneously in 2009. Based on these figures it is estimated that 14.81% of the local Bechstein's bat population has been tagged and tracked comprising 14 females and two males (see **Appendix D1** for further details). It is considered that the results obtained from these bats, and other trapping work has enabled enough data to be collected on Bechstein's bat for this assessment to be robust.

Four SINC's within the local landscape include Bechstein's bat as part of the reason for their designation. None of the on-site SINC's, nor those within SCP have been designated for the usage of these sites by Bechstein's bat. The threshold for inclusion of Bechstein's bat as part of a SINC designation is unclear.

During 2018 four Bechstein's bat were caught and radio-tracked, three females and one male. The male and two of the females roosted in non-breeding day roosts within SCP, with one of these females also using a non-breeding low status roost in Round Wood on the southern edge of the site. These three bats spent the majority of the time they were active foraging within SCP. The fourth Bechstein's bat, a nulliparous female, was recorded travelling between a Bechstein's bat maternity roost containing 58 individuals located in Southleigh Forest approximately 1.7 kilometres south-east of the site and SCP. This bat foraged around rear gardens and tree lines when moving between the maternity roost and SCP. Much of its time was spent foraging in parkland within SCP with occasional trips to forage on the southern edge of Havant Thicket woodland. During these trips the bat travelled across the open grassland or along the edge of Gipsies Plain.

During three years of intensive survey work (2008, 2009 and 2018) a total of two day roosts and one night roost of Bechstein's bat have been recorded at the site. During 2008 a single male roosted in three separate trees at the southern end of The Avenue. During 2018 a nulliparous female roosted in Round Wood and another nulliparous female was roosting for 25 minutes in a night roost at the southern end of The Avenue. No other Bechstein's bat have been recorded roosting at the site.

Foraging by the species at the site is considered to occur within The Avenue based on data from 2008, which recorded an individual using this area. During 2018 individuals were also recorded foraging in Round Wood and at the southern end of The Avenue for a small percentage of the time. During both 2008 and 2018 Bechstein's bat were recorded flying across the site to visit Havant Thicket woodland, although these trips usually involved limited time spent within the site itself. During 2008-2009 Bechstein's bat were recorded passing across the on-site grassland between Havant Thicket woodland and SCP, and travelling from SCP through The Avenue to Havant Thicket woodland. In 2018 the individual recorded roosting in Southleigh Forest also passed across the grassland on the eastern edge of the site to reach Havant Thicket woodland.

The summer 2009 bat radio tracking survey work confirmed the presence of Bechstein's bat maternity colonies within four woodlands within a three kilometre radius of the site. The identified roosts were located 1.7 kilometres south-east, 1.8 kilometres north-north-west, three kilometres south-south-east, and 3.2 kilometres east, of the site, the maximum recorded counts for each of these roosts was 38, 24, 51 and 48,

respectively. The simultaneous count of three roost trees in the Southleigh Forest area on 22nd July 2009 confirmed a minimum population of 108 bats (**Table D31**).

Table D31: Results of Simultaneous Bechstein's Bat roost count carried out on 22nd July 2009

Roost Location	Grid Reference	Roost Reference	Total No. of Bats Recorded Emerging
Stansted Forest	SU 75656 09607	1633	19
Bartons Copse	SU 73369 08478	1636	38
Hollybank Wood	SU 74816 07937	NT006	51
Total Count			108

Given the number of roosts located within the Southleigh Forest area it is considered this is a Bechstein's bat colony which is likely to comprise a number of maternity roosts. The geographic extent which the colony occupies is likely to expand and contract with resources and local conditions. The key foraging areas of all Bechstein's bat radio-tracked between 2008 and 2018 is shown in **Map D42**, this provides a graphical representation of the interconnectivity of the populations throughout the local landscape.

During 2009 an overall total of 12 Bechstein's bat roosts were recorded during the surveys and the species was present throughout the local landscape (see **Map D42**). In addition to the locations identified in **Table D31** the species was also recorded roosting in or at Long Copse Hill, The Grove, Lyells Wood, Hollybank House, Hollybank Farm and Dell Piece East.

The 2018 record of a bat moving between SCP and Havant Thicket woodland suggests there may be a link between the populations to the north of the site associated with The Holt and Stein Wood and those in Southleigh Forest.

The reduction in *Myotis* bat activity recorded on static detectors at the site during the period from June to August 2018 suggests a population of *Myotis* bats is not present within the site, furthermore *Myotis* bat activity recorded during the vantage point surveys was limited, providing additional evidence to support this theory.

The 2018 baseline data indicates that a Bechstein's bat population is present within the local landscape, with all of the CSZ for the recorded maternity roost located within Southleigh Forest and The Holt/Stein Wood. Bechstein's bat CSZ is estimated to be within one to three kilometre of a roost (Collins, 2016).

Further analysis of the trapping and tracking data by Portsmouth Water has looked at the usage of the site by Bechstein's bat (see **Appendix D1**). The results of this analysis are reproduced below:

"...the percentage of time that Bechstein's bats foraged on the HTWSR site was 17.74% whereas off-site was 82.26%. The Avenue was the most used part of the proposed reservoir site with 11.09% of the time spent within it. The most used location overall, and therefore the most important site for this population would appear to be SCP where 23.60% of recorded time was spent in this location. However, it is important to acknowledge that SCP has been the area where survey effort has been focused given its proximity to the proposed reservoir site and therefore the time spent in other woodlands with less survey effort will be underestimated²⁴.

Looking at the data in more detail it is worth noting that the figures above are calculated using data for all bats e.g. both males and females. Radio-tracking has shown that males have a more restricted foraging range, staying within a smaller area and closer to their roost, whereas females tend to range more widely. During the PW studies two male Bechstein's bats were radio-tracked, both were caught in SCP. One bat spent 90.85% of its time in The Avenue and 1.85% in Havant Thicket, 7.3% was unknown. The other male bat spent 98.33% of its time in SCP and 1.67% on The Avenue.

If male bats are removed from the analysis the overall time female bats spent foraging on the HTWSR site drops to 13.66% of total time and off-site foraging increases to 86.34. The amount of time spent on The Avenue decreases to 6.06% of the overall time. SCP still remains the most used site with 19.95% of total time spent on it, the parkland area east of Hammonds Lands Coppice was used 8.91% of the time."

Overall the site is assessed as being of county value for Bechstein's bat. This is based on the following:

- Between 2008-2018 only low-status roosts have been recorded from the site;
- During survey work in 2018 there was no evidence of a maternity roost within 500 metres of the site;
- Middle Clearing, Round Wood and the Corsican Pine Plantation are low quality single species plantations that in isolation are not suitable to support maternity roosts of Bechstein's bat;

²⁴ It is worth noting at this point that PW do have access to the WYG survey data for the application Land East of Horndean. We have not used this data in our analysis as it is not ours and has been calculated in a different way to PW/ECOSA data. However, if this data was used it would reduce further the percentage of time radio-tracked bats spent on the proposed reservoir site, since no bats from that study travelled beyond Havant Thicket.

- The Avenue provides the most suitable area of habitat for foraging and roosting, although only low status roosts have been recorded and the habitat is limited in extent compared to the habitat in the species' core area within Southleigh Forest and The Holt / Stein Wood;
- The Avenue is suitable for commuting and functions as a link between SCP and Havant Thicket woodland. Although Bechstein's bat do not rely on this link and have been shown to use grassland and boundary features on the east of the site to commute between SCP and Havant Thicket woodland and crossed the grassland to the west of The Avenue probably along linear features;
- In 2008 a maternity roost was recorded in SCP adjacent to the site, the bats from this roost mainly foraged within the SCP woodland. Small numbers of bats were also recorded foraging within The Avenue and using this feature to move across the site into Havant Thicket woodland;
- In 2018 a small number of non-breeding Bechstein's bat (one male and three females) were recorded adjacent to the site. The key foraging areas for these bats were all within SCP woodland or parkland within SCP, with only limited activity extending into the site. No regular usage of The Avenue was recorded.
- Middle Clearing has only been used very occasionally by Bechstein's bat and is not considered to be important for this species; and
- Only one day roost (Round Wood) and one night roost (southern end of The Avenue for 25 minutes) containing single non-breeding Bechstein's bat were recorded on site during 2018.

Brandt's bat

This species is difficult to tell apart from whiskered bat and Alcaethoe bat and sometimes cannot be identified in the hand. Due to the similarity of this species to other small *Myotis* bat species the most recent Mammal Review did not give a population estimate for Brandt's bat (Matthews, et al., 2018). A 1995 review of mammal status estimated a Brandt's bat population of 30,000 individuals, although this estimate was graded as having very poor reliability (Harris, et al., 1995).

Numerous records of whiskered / Brandt's bat and unidentified *Myotis* bat species were returned with the Hampshire Bat Group data. The only record specifically attributed to Brandt's bat was a male trapped by WYG at Land East of Horndean in 2014. No roosts of this species have been recorded in the local landscape.

A single bat which could be positively identified as a male Brandt's bat was caught and radio-tagged at the northern end of The Avenue in August 2008. Despite extensive

searching this bat could not be relocated subsequently. *Myotis* bat species, especially males, are known to move around the landscape more frequently in the autumn, and therefore this bat may have moved away from the site. Considering the small (one kilometre) CSZ for Brandt's bat, it would be expected that this bat was relocated following tagging. Again, this is suggestive of the bat moving away from the area after tagging.

During survey work associated with Bechstein's bat in July and August 2008 a whiskered / Brandt's bat roost was recorded from an oak tree in the parkland within SCP. No counts were made and the proximity of the area to the Bechstein's maternity roost (in 2008) meant that using a lure and mist netting in this area was not feasible. Survey work in 2018 did not re-record any evidence of a roost in this location.

No bats specifically identified as Brandt's bat were recorded during the 2018 trapping work, however a total of nine whiskered / Brandt's bats or 'small' *Myotis* bat species (whiskered / Brandt's / Alcahoë) were recorded at the site. Of these bats six were females in breeding condition (parous, lactating or post-lactating), the remaining three comprised a non-breeding female (nulliparous), a male and a bat that escaped from the net before it could be studied in detail. These bats were all recorded from The Avenue and SCP, with no records from Havant Thicket woodland.

The baseline data for Brandt's bat is difficult to assess given that it only indicates that this species is infrequently recorded and highly unlikely to be roosting on-site or rely on the site for foraging and / or commuting. It is considered that the site is of local value for Brandt's bat, especially in the context of the extensive woodland in the local landscape associated with Havant Thicket woodland, The Holt, Stein Wood and Southleigh Forest.

Brown long-eared bat

Brown long-eared bat is an S41 species and has an estimated UK population of 934,000 in the UK (Matthews, et al., 2018). Data from Hampshire Bat Group and Sussex Biodiversity Information Centre data indicates that brown long-eared bat and long-eared bat species have been widely recorded (120 records) within three kilometres of the site. Two female and one male brown long-eared bat were also captured in SCP woodland in 2016/17 (RPS, 2017).

Away from the site, two maternity roosts have been recorded within three kilometres, one in a tree in SCP, (22 bats in June 2008) and one in a residential property approximately 1.5 kilometres north-west (10 bats, 2002). Two larger hibernation roosts have also been recorded from residential properties within three kilometres of the site, one approximately 180 metres south-east (25 bats, November 1999) and one approximately 250 metres north-north-east (15 bats, December 1996).

Two brown long-eared bat maternity roost trees were identified in The Avenue during 2008-2009 (see **Map D39**). Roost counts recorded a maximum of 14 (tree 1600, April 2008) and 16 (tree 1611, July 2008) bats emerging from each roost. The roosts were approximately 290 metres apart, were not in use concurrently, and are located towards the northern end of The Avenue. Given the proximity of these roosts to one another it is likely that a single maternity roost was present within The Avenue during 2008.

Further roost records from 2008 included a single hibernating brown-long-eared bat (February 2009) in The Avenue. In addition, at least one bat (May 2008) was recorded using trees in Middle Clearing as day roosts (tree tags 1602, 1603) and night roosts (1604). An emergence survey undertaken on 1602 and 1603 carried out during May 2008 was inconclusive as roost features were not visible due to canopy obstructions. A third roost tree (1610) was recorded in woodland in the south east of SCP in June 2008 with a maximum count of 22 brown long-eared bat. Bats using tree roosts switch between roost sites regularly and it is assumed that the two roosts located within The Avenue during 2008 support bats from the same colony.

All of the roost trees were revisited in July 2018 when it was revealed that one of the 2008 maternity roost tree features in The Avenue had been lost as the tree has partially collapsed (tree 1600). Three emergence surveys undertaken on the other maternity roost (1611) between May and September 2018 recorded no emerging / re-entering bats. An emergence survey of the roost tree (1610) within SCP on 23 August 2018 recorded a single emerging bat which could not be identified to species level, but it is assumed it was a brown long-eared bat as this species was recorded previously.

Trapping in The Avenue in 2018 has recorded nine brown-long-eared bat including three parous females in May and two lactating females in July. This demonstrates the continued presence of a maternity roost within SCP/The Avenue area. Trapping undertaken in Middle Clearing, Round Wood, The Avenue and Havant Thicket woodland in August 2018 caught no brown long-eared bat.

Middle Clearing, Round Wood and the Corsican Pine Plantation are all relatively young single species plantations with no understorey present, as a result these small woodland blocks are very limited in their scope to offer natural roost features suitable for supporting a maternity colony; they also provide lower quality foraging habitat than the broadleaved woodland of SCP.

Brown long eared bat generally forage within 500 metres of a roost tree (in good quality habitat) and rarely more than two kilometres (Entwistle, et al., 1996) They have an average home range of 2.1 hectares (range 0.7 -5.4 hectares) (Murphy, et al., 2012). The CSZ of brown long-eared bat is estimated to be within three kilometre of a roost (Collins, 2016).

Radio-tracking undertaken in 2008 tracked two brown long-eared bat one of which was captured in SCP and exclusively foraged in this area before returning to a maternity roost on the southern edge of SCP (1610). The second tracked brown long-eared bat was trapped at the northern end of The Avenue and was only recorded foraging in Middle Clearing, and also used this woodland to roost (alone).

The results of the trapping surveys (2008-2009 and 2016, 2017 and 2018) indicate that the site and SCP support at least one colony of brown long-eared bat comprising at least two maternity roosts. One centred on The Avenue and one centred on SCP.

The maximum count of bats within this area was 22 individuals recorded from the SCP maternity roost in June, 2008. The maximum count within the site was from April 2008 when 14 individuals were recorded emerging from tree 1600. At this time of year when a higher proportion of bats may be expected to be males (1/3rd of the roost could be males). Brown long-eared bat roosts frequently include male as well as female bats but colonies may split and use more than one roost site consecutively. Taking these considerations into account, data available in literature (Swift, 1998) (Matthews, et al., 2018) and looking at the amount and quality of habitat available for brown long-eared bat within three kilometres of The Avenue, a precautionary approach has been taken to estimating 30-50 bats for the colony, of which between 22-36 bats may roost within The Avenue.

Given the frequent nature with which brown long-eared bat (as do most tree roosting bats) switch between roost sites we have also estimated on a precautionary basis that a further (maximum) 10-15 day/night roosts used by brown long-eared bat could be present within The Avenue, Middle Clearing and Round Wood.

Analysis of data obtained from various trapping surveys undertaken by ECOSA and other consultants within a four kilometre radius of the site suggest a minimum of four colonies of brown long-eared bat within this area **Map D41**. This is based upon the location of suitable woodland habitat and associated captures of parous, pregnant, lactating or post lactating female bats recorded up to three kilometres apart (the likely maximum distance a brown long-eared bat will travel from roost whilst foraging). Although, given the common and widespread nature of the species there are likely to be many more maternity roosts present in the local landscape and likely to be twice this number of colonies at least. This is based on average home range size of this species, maximum distance recorded flying between maternity roost sites and foraging areas, and that maternity roost can be situated on the edge of a home range.

The habitat within the site (and surrounding three to four kilometres) has not altered since 2008 and therefore there is no reason to suggest that a significant change in the brown long-eared bat population has occurred at the site, or within this wider area. The

capture of nine brown long-eared bat (including lactating females) during 2018 trapping on the development site demonstrates a consistent level of activity and roosting patterns similar to those in 2008.

There is a maternity roost of brown long-eared bat on site (recorded in 2008) and likely to be a number of low status roosts within the on-site woodland blocks. Given the common status of this species, but importance of the on-site roosts the site has been assessed as being of county value for roosting, foraging and commuting brown long-eared bat.

Common pipistrelle

Common pipistrelle is widespread across the UK and has a population estimate of 3,040,000 individuals (Matthews, et al., 2018). Desktop study data provided evidence that this species has been recorded widely in the local landscape. During the 2008 ECOSA surveys a female common pipistrelle was radio-tagged in SCP and tracked back to a maternity roost in a building approximately 700 metres south of the site (maximum 43 bat emerged). Two other maternity roosts in buildings have been recorded within three kilometres.

This species was recorded frequently during transect and vantage point surveys in 2008. A similar pattern was observed in 2018, with a peak in activity at the site recorded on SM4 detectors during June, July and August 2018. A small number of pipistrelle bats in breeding condition were recorded during the 2018 trapping work.

The results indicate that maternity roosts are present in the local landscape, most likely associated with buildings, for which the species has a strong preference (Collins, 2016). It is possible that a number of lower status roosts, non-breeding roosts and hibernation roosts are present within on-site woodland.

This species is a generalist and the landscape within three kilometres of the site provides excellent foraging habitat for this species. The site itself is utilised for foraging by this species and it is possible that the species commutes across the site. It is considered that the site is of local value for common pipistrelle, especially in the context of the extensive woodland in the local landscape associated with Havant Thicket woodland, The Holt, Stein Wood and Southleigh Forest.

Daubenton's bat

Daubenton's bat is widespread across the UK and has a population estimate of 1,030,000 individuals (Matthews, et al., 2018). Daubenton's bat has been infrequently recorded from the site and local landscape. Two records were returned with the Hampshire Bat Group data search, one near the lake in SCP and one caught in a mist net approximately 200 metres east of the site.

During 2008 the species was recorded five times, one of which was within the site, the other records were associated with Bells Copse, Havant Thicket woodland and SCP. No Daubenton's bat were captured during the 2008/09 trapping surveys. During 2018 a single Daubenton's bat was caught in SCP, although it escaped before its breeding status could be assessed.

Daubenton's bat has a preference for wetland habitats (Collins, 2016). Within the site the only wetland areas are the upper lake at the northern end of The Avenue and on-site the ephemeral streams.

Given the limited number of records of this species on-site and in the local landscape it is considered that Daubenton's bat does not breed within the site and is unlikely to roost within the site. The records from previous surveys indicates that this species may occasionally commute across or forage within the site on an irregular basis. Overall the site is considered to be of site level importance to Daubenton's bat.

Leisler's bat

Leisler's bat has a restricted distribution in the UK, and is mainly confined to south and central England and Wales. Due to the likelihood of misidentification of echolocation calls of this bat with noctule the most recent Mammal Review did not give a population estimate for Leisler's bat (Matthews, et al., 2018).

A small number of Leisler's records were returned with the Hampshire Bat Group data search none of which related to roosts. During 2008/09 no calls typical of this species were recorded from the site. During 2018 10 registrations of bat calls which could not be differentiated between noctule and Leisler's bat were made.

The baseline data for Leisler's bat indicate that this species is infrequently recorded and highly unlikely to be roosting on-site or rely on the site for foraging and / or commuting. It is considered that the site of site value for Leisler's bat.

Nathusius' pipistrelle

Nathusius' pipistrelle has a restricted distribution in the UK, and is mainly confined to south and central England and Wales. There is currently insufficient information on roost density to allow a population estimate for Nathusius' pipistrelle (Matthews, et al., 2018).

Seven Nathusius' pipistrelle records were returned with the Hampshire Bat Group data search none of which related to roosts. Nathusius' pipistrelle has not been trapped at the site. A small number of registrations of this species were recorded during the 2018 SM4 detector surveys with the highest activity level recorded in May, possibly relating to Nathusius' pipistrelle migrating through the country.

The baseline data for *Nathusius' pipistrelle* indicate that this species is infrequently recorded and highly unlikely to be roosting on-site or rely on the site for foraging and / or commuting. It is considered that the site is of local value for *Nathusius' pipistrelle*, especially in the context of the extensive woodland in the local landscape associated with Havant Thicket woodland, The Holt, Stein Wood and Southleigh Forest.

Natterer's bat

Natterer's bat is widespread across England and Wales and has a population estimate of 973,000 individuals (Matthews, et al., 2018). However, the estimated range in population sizes of this species is large (510,000-1,360,000), and therefore this population figure associated with this species should be treated with caution.

A small number of foraging / commuting Natterer's bat records were returned in the Hampshire Bat Group data search, mainly within woodland and parkland present locally. Given the difficulty in identifying *Myotis* bat species from echolocation it is possible that some of the *Myotis* bat species records returned with the data searches relate to Natterer's bat.

Trapping work in other nearby areas has recorded a number of Natterer's bat, including eight individuals at Land East of Horndean during 2014 (WYG, 2014), four at the nearby proposed solar farm site north-west of Havant Thicket woodland, including two that were pregnant during 2014, four at Oaklands during 2014 (ACD Environmental, 2014), two in SCP during 2016/2017 (RPS, 2017) and a post -lactating female in Southleigh Forest in 2019 (Hampshire Bat Group per comms.).

During trapping at the site in 2008/09 ECOSA recorded a maternity roost within SCP with two nearby day roosts. A single day roost containing three individuals was recorded in The Avenue during 2008. No other Natterer's bat roosts have been recorded within three kilometres of the site.

During 2018 three emergence surveys have been undertaken on the previously recorded on-site roost. No bats were recorded emerging from the tree, although it retains its suitability for roosting bats in the form of woodpecker holes.

Trapping in The Avenue during 2018 has recorded six Natterer's bat including two parous females in May and two lactating females in July. Singles of Nulliparous and parous females were also caught in SCP during the surveys in May 2018. The data collected in 2008 indicated that the three individuals tracked differed in their movements around the landscape, with some bats travelling relatively far and other foraging in a small area, therefore the presence of lactating females in The Avenue does not necessarily suggest a maternity roost in the immediate vicinity. However, the

2018 data is indicative of a maternity roost still being present within the local landscape, which could feasibly be located within The Avenue.

The habitat within the site, or surrounding area has not changed since 2008 and therefore there is no reason to suggest that a significant change in the local Natterer's bat population has occurred at the site in the interim. The capture of six Natterer's bat during 2018 trapping on the development site indicates a level of activity consistent with a maternity site in the local area with a number of associated day roosts. The CSZ for this species is four kilometres, and therefore individual Natterer's bat have a large foraging area. As a result, the location of a maternity roost may be relatively distant from the site.

A maternity roost has been recorded within SCP and a small number of low status Natterer's bat roosts within the on-site woodland blocks. Given the habitat present, particularly within The Avenue, it is possible that a maternity roost may be present within the site, although no evidence of this has been recorded during the surveys. Based on the potential presence of a maternity roost and day roosts of Natterer's bat within The Avenue the site is assessed as being of local value for roosting, foraging and commuting Natterer's bat. A higher level of importance of the site for this species is not proposed because of extensive suitable habitat for the species in the local landscape and the relative frequency of records of Natterer's bat within the desktop study data and bat trapping work in the local landscape.

Noctule

Noctule is an S41 species and has an estimated UK population of 565,000 in England (Matthews, et al., 2018). The Hampshire Bat Group desktop study data included a wide spread of noctule records in the local landscape. A single record of a roost was recorded approximately 200 metres to the east of the site, although further details of the roost status were unknown.

No confirmed roost sites for this species or captured bats were recorded during 2008/09 or 2018. The 2018 vantage point surveys and SM4 detector surveys identified that noctule were foraging along the edges of woodland within the site, especially during May 2018. It is considered that they were taking advantage of a particular food resource.

The CSZ for this species is four kilometres, and therefore individual Noctules have a large foraging area. As a result, the location of a maternity roost of this species may be relatively distant from the site.

Overall the site is considered to be of site level value for roosting noctule and local value for foraging and commuting noctule.

Serotine

Serotine is widespread across southern England and Wales and has a population estimate of 136,000 individuals (Matthews, et al., 2018).

The Hampshire Bat Group data includes a single maternity roost of this species in the local landscape, which is associated with a building approximately 1.9 kilometres south of the site. The roost has been surveyed a number of times with a maximum emergence count of 28 individuals in June 2011. Seven other low status roost are present within buildings within three kilometres of the site and there is a scattering of bat detector records.

Serotine was not captured at the site either in 2008/09 and it was only recorded three times during vantage point / transect surveys undertaken during this time. During 2018 a very low level of activity by this species was recorded from the site, both during vantage point surveys and static detector survey, and serotine was not recorded trapped at the site.

The baseline data for serotine indicate that this species is infrequently recorded and highly unlikely to be roosting on-site or rely on the site for foraging and / or commuting. Furthermore, the species has a large (four kilometre) CSZ and therefore the serotine which were recorded at the site may be coming from relatively distant roost sites. It is considered that the site of local value for serotine, especially in the context of the extensive woodland in the local landscape associated with Havant Thicket woodland, The Holt, Stein Wood and Southleigh Forest.

Soprano pipistrelle

Soprano pipistrelle is an S41 species and has an estimated UK population of 720,000 in the UK (Matthews, et al., 2018). A small number of low status soprano pipistrelle roosts were returned within the Hampshire Bat Group data search, scattered throughout the local landscape. During 2008/09 a single roost was recorded adjacent to the site within SCP. Soprano pipistrelle was also recorded frequently during the transect and vantage point surveys undertaken in 2008/09. No evidence of roosting by this species was recorded from the site. During July 2019 a low status roost was recorded in a bat box erected within the SCP parkland located south-east of the site.

During 2018 pipistrelle bat species in breeding condition were captured in The Avenue and SCP, although these could not be assigned to a specific pipistrelle bat species. Given the relatively low number of soprano pipistrelle registrations recorded during vantage point surveys and SM4 detector surveys it is unlikely that a maternity roost of this species is present within the site. Furthermore, the relatively large, three kilometre CSZ of this species means that individuals of this species recorded from the site may

be coming from distant roost sites. However, it is possible that lower status roosts non-breeding roosts and hibernation roosts are present within on-site woodland.

The site itself is utilised for foraging by this species and it is possible that the species commutes across the site. It is considered that the site is of local value for soprano pipistrelle, although there is no evidence that a higher status roost is present.

Whiskered bat

This species is difficult to tell apart from Brandt's bat and Alcaethoe bat and sometimes cannot be identified in the hand. Due to the similarity of this species to other small *Myotis* bat species the most recent Mammal Review did not give a population estimate for whiskered bat (Matthews, et al., 2018). A 1995 review of mammal status estimated a whiskered bat population of 40,000 individuals, although this estimate was graded as having very poor reliability (Harris, et al., 1995).

Numerous records of whiskered / Brandt's bat and unidentified *Myotis* bat species were returned with the Hampshire Bat Group data. Whiskered bat has been recorded relatively widely in the local landscape, although apart from the ECOSA 2008 records described below no roosting locations are known.

During May 2008 a single whiskered bat was radio-tracked back to a maternity roost along Manor Lodge Road approximately 50 metres east of Havant Thicket woodland. A maximum of 14 bats were recorded emerging from this building during 2008 emergence surveys.

During 2018 five bats were specifically identified as whiskered bat and a total of nine additional whiskered / Brandt's bats or 'small' *Myotis* bat species (whiskered / Brandt's / Alcaethoe) were recorded at the site. Of these bats nine were females in breeding condition (parous, lactating or post-lactating), the remaining five comprised a non-breeding female (nulliparous), three males and a bat that escaped from the net before it could be studied in detail. These bats were all recorded from The Avenue and SCP, with no records from Havant Thicket woodland.

Whiskered bat is known to breed locally, and the Manor Lodge Road maternity roost building still contains features suitable for roosting by this species. Although the species has a small CSZ (one kilometre) individuals of this species are likely to be still commuting to the site from this roost.

During the vantage point and trapping surveys *Myotis* bat species were recorded commuting along the edge and foraging within The Avenue. It is likely that a proportion of these individuals are whiskered bats. The timing after sunset and before sunrise of *Myotis* bat activity at the site (SM4 and vantage point data), of which a proportion are

likely to be whiskered bat, does not indicate a maternity roost of this species at the site. Furthermore whiskered bat maternity roosts are rarely recorded within trees (Dietz, et al., 2009), which supports the assertion that a more significant roost of this species is not present within the site. However, it is possible that a small number of low-status whiskered bat roosts are present within the site.

It is considered that the site is of local value for whiskered bat, especially in the context of the extensive woodland in the local landscape associated with Havant Thicket woodland, The Holt, Stein Wood and Southleigh Forest.

Roosting Bats

Bat surveys between 2008 and 2018 recorded three bat species roosting at the site, brown long-eared bat (maternity roost, day roosts, night roosts and a hibernation roost), Natterer's bat (day roosts) and Bechstein's bat (day roosts and night roosts). A summary of roosts on site and their value is presented in **Table D32**, although it should be noted that other species roosts may be present.

Table D32: Value of the site to roosting bat species/species complexes²⁵

Species	Roost Type	Roosting Value
Brown long-eared bat	Day, night, hibernation and maternity	Medium
Bechstein's bat	Day, night	Medium
Natterer's bat	Day	Low

The woodland blocks within the site, in particular The Avenue, contain trees which are suitable for hibernating bats. The recently published Bat Roosts in Trees guide (Andrew, 2018) states the following in relation to winter tree roosts, "*in winter, all but three species roost individually in their own roost feature, the exceptions are the Nyctalus species (Ed: Noctule and Leisler's bat) which may stay in small groups, and the soprano pipistrelle which may overwinter in groups...*". Given that these three bat species were recorded irregularly at the site, with no evidence of roosting, it is likely that the woodland within the site contains a number of hibernation roosts of those species regularly recorded, particularly common pipistrelle, Natterer's bat and brown long-eared bat.

Foraging and Commuting Bats

Bat surveys between 2008 and 2018 recorded at least 13 species of bat foraging and commuting within / through the site. A single bat, Alcaethoe bat, has been recorded in

²⁵ This table considers those species known to be present. It should be noted that lower status roosts of other species (common pipistrelle, whiskered bat and possible barbastelle) may be present within the site.

the local landscape but not from the site itself. **Table D33** shows the geographic level of value of foraging and commuting habitat at the site (Wray, et al., 2010).

Table D33: Value of the site to foraging bat species/species complexes

Species	Foraging and Commuting Value
Alcathoe bat	Site
Barbastelle	Local
Bechstein's bat	County
Brandt's bat	Local
Brown long-eared bat	County
Common pipistrelle	Local
Daubenton's bat	Site
Leisler's bat	Site
Nathusius' pipistrelle	Site
Natterer's bat	Local
Noctule	Local
Serotine	Site
Soprano pipistrelle	Local
Whiskered bat	Local

The key area of the site for foraging and commuting bats comprises The Avenue and this feature provides both foraging habitat and a commuting corridor between SCP and Havant Thicket woodland. The on-site tree lines and grassland are used less by foraging and commuting bats, however there is evidence that species such as noctule forage over the grassland and interface between the grassland and woodland edges in the spring.

The suitability of the habitats within the site for roosting, commuting and foraging bats based on their respective characteristics has also been evaluated in **Table D34**. Overall The Avenue provides the highest level of suitability and value in terms of roosting, foraging and commuting because it is mature mixed broadleaved woodland planted after 1870 with a good structure and many trees with roost features. Round Wood and Middle Clearing are of low to moderate suitability for roosting bat being single species oak plantations planted in the early 1950's, with limited suitable roosting features due to their relatively young age. The Corsican Pine Plantation is of limited value for roosting, foraging and commuting bats, as it is a single species pine plantation planted

in the 1960's with limited suitable roost features due to the relatively young age of the trees. The other on-site tree lines and ditches are of moderate value to foraging and commuting bats.

Table D34: Roosting, foraging commuting value / suitability of on-site habitats

Habitat	Roosting Suitability	Foraging Suitability	Commuting Value
The Avenue	High	High	High
Middle Clearing	Low to moderate	Moderate	Moderate
Round Wood	Low to moderate	Moderate	Moderate
The Corsican Pine Plantation	Low	Low	Low
Tree lines / ditches	Negligible	Moderate	Moderate
Grassland	Negligible	Low	Low
Boundary woodland / hedgerow	Moderate	Moderate	Moderate

During trapping work undertaken during April and August 2009 and August 2018 a total of twelve capture sites were surveyed in Havant Thicket woodland, during which only a small number of bats were caught (three brown long-eared bat and one Natterer's bat). During the 2018 surveys no bats were trapped in Havant Thicket woodland (across five trapping sites). Evidence from radio-tracking also shows that Bechstein's bat occasionally commute into Havant Thicket from SCP. The results of trapping and tracking surveys also indicate that the Havant Thicket woodland has low value for foraging and commuting bats, although Bechstein's bat do visit the area occasionally.

Extensive ecological survey work across Havant Thicket woodland has not recorded high levels of suitable bat roosting features within trees in this area. Furthermore, the predominance of immature birch stands and pine plantations, with low or negligible bat roosting potential provide further evidence that Havant Thicket woodland has limited suitability for roosting bats. Overall the value of Havant Thicket woodland for roosting, foraging and commuting bats is limited.

Survey work (trapping and transects) in Bells Copse, to the east of the site, undertaken during June and August 2008 recorded a low level of bat activity within this area. Bells Copse is partly oak plantation and partly pine plantation, both areas are likely to contain small numbers of trees with suitable bat roosting. However, the tracking surveys undertaken between 2008-2018 have never recorded a bat roost in Bells Copse. The SM4 data from 2018 recorded a moderate level of bat activity on the edge of Bells Copse (Location 8), although analysis of time data indicated that there was no evidence of nearby roosts. Overall Bells Copse is considered to have moderate suitability for

foraging, commuting and roosting bat, although the data available would suggest that this resource is 'underutilised' by bats.

The overall assemblage of bats recorded on site comprises a total of thirteen species including two Annex II species, Bechstein's bat and barbastelle. The reasons for the high diversity of species are likely to include:

- The location of the site within central southern England which supports a number of species such as serotine, barbastelle and Bechstein's bat which are absent from more northerly latitudes (Richardson, 2000);
- The site is large (160 hectares) and contains a range of semi-natural habitats which provide suitable foraging conditions for species which occupy a variety of ecological niches;
- A high level of bat survey effort has been undertaken at the site during 2005/06, 2008/09 and 2018, including trapping, which has allowed some of the more cryptic *Myotis* bat species to be identified e.g. Brandt's bat

Despite the significant survey effort and high species diversity only 15 bat roosts of three species have been recorded from the site.

4.0 CONCLUSIONS

4.1 Conclusions

Ecological Survey and Assessment Ltd (ECOSA) have been appointed by Portsmouth Water Limited to undertake a bat assessment of the proposed Havant Thicket Winter Storage Reservoir site. The purpose of the bat surveys is to assess bat species present, status and populations at the site, and habitats proposed for mitigation and compensation within Havant Thicket Forestry England woodland. The site is located on the northern edge of Havant, Hampshire and predominately comprises an area of grassland with four small blocks of woodland.

Bechstein's bat is an Annex II species within the UK and therefore particular attention has been paid to obtaining a robust ecological baseline for this species. A Bechstein's bat maternity colony has been recorded adjacent to the site during 2008, despite significant survey effort in 2009 and 2018. The maternity roost was also not recorded by RPS during a 2016 survey in SCP (RPS, 2017). It is considered sufficient data has been collected to allow a robust assessment to be made of bat usage at the site.

The main findings of the bat assessment are:

- Desktop study data indicated that a range of bat species have been recorded within three kilometres, including rarer species such as Bechstein's bat and Alcaethoe bat. Bechstein's bat maternity roosts have been recorded in Stein Wood / The Holt and land East of Horndean to the north of the site. Additional Bechstein's bat maternity roosts have also been recorded in the wider landscape, including in a number of woodlands to the east of the site during 2009. This included Bechstein's bat maternity roosts within Barton's Copse, Hollybank Wood, The Grove and Stansted Forest.
- Between 2008 and 2018 bat trapping, radio-tracking, vantage point, tree-climbing, transect and static detector surveys were undertaken at the site. A total of at least thirteen species have been recorded including barbastelle, Bechstein's bat, Brandt's bat, brown long-eared bat, common pipistrelle, Daubenton's bat, Leisler's bat/noctule, Nathusius' pipistrelle, Natterer's bat, noctule, serotine, soprano pipistrelle and whiskered bat.
- The site contains four small woodland areas with suitability to support roosting bats, Middle Clearing, Round Wood, The Corsican Pine Plantation and The Avenue. Additional habitat with suitability for bats is present within Staunton Country Park to the south of the site and Havant Thicket Forestry England woodland to the north of the site.

- Between 2008-2018 the following bat roosts were recorded within the site; four Bechstein's bat day roosts, one Bechstein's bat night roost, one Natterer's bat day roost, two maternity roosts and six day/night roosts of brown long-eared bat. The brown long-eared bat maternity roosts were not recorded concurrently and are considered to be same roost.
- Given the woodland present, a small number of other lower status roosts of these species and of common pipistrelle, soprano pipistrelle and *Myotis* bat species may be present on site. These may include day / night roosts and minor hibernation roosts.
- Further roosts were recorded off-site including a maternity roost of Bechstein's bat in Staunton Country Park which was only recorded in 2008. Additional surveys undertaken by ECOSA and other ecological consultants in Staunton Country Park in 2009, 2016 and 2018 have not recorded another Bechstein's bat maternity roost in this location. Other notable bat roosts in the local landscape included common pipistrelle and whiskered bat maternity roosts in nearby buildings and brown long-eared bat and Natterer's bat maternity roosts in trees within Staunton Country Park.
- Radio-tracking of Bechstein's bat undertaken in May, June and August 2018 did not record any evidence of a maternity roost of this species on-site or within 500 metres of the site. A Bechstein's bat maternity roost was located approximately 1.7 kilometres south-east of the site, with a non-breeding female associated with the roost tracked to Staunton Country Park parkland, where it foraged. A number of day roosts, used by males and non-breeding females, were recorded within Staunton Country Park. These bats mainly foraged in woodland within Staunton County Park.
- Within the site one day roost was recorded in Round Wood used by a non-breeding female on one night, and one night roost was recorded at the southern end of The Avenue, used by a non-breeding female for 25 minutes in late-August 2018.
- Static detector monitoring undertaken in 2018 revealed a reduced level of *Myotis* bat species, activity during the summer compared to the spring and autumn suggesting the site is less important for this species group during the maternity season.

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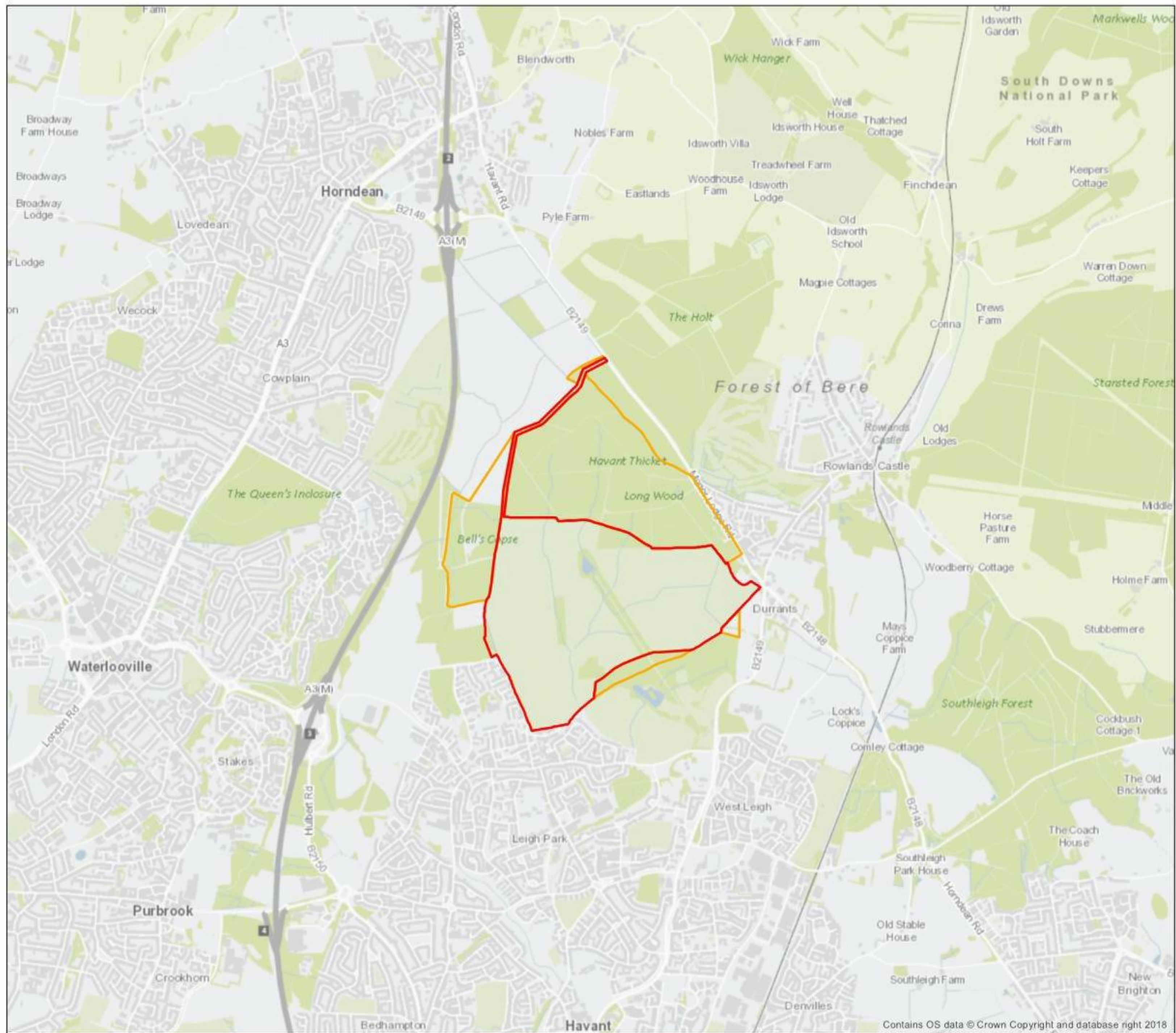
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Map D1 Site Location Plan



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D1 - Site Location Plan

Client: Portsmouth Water

Date: March 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)

Scale at A3: 1:25,000

0 500 1,000 Metres



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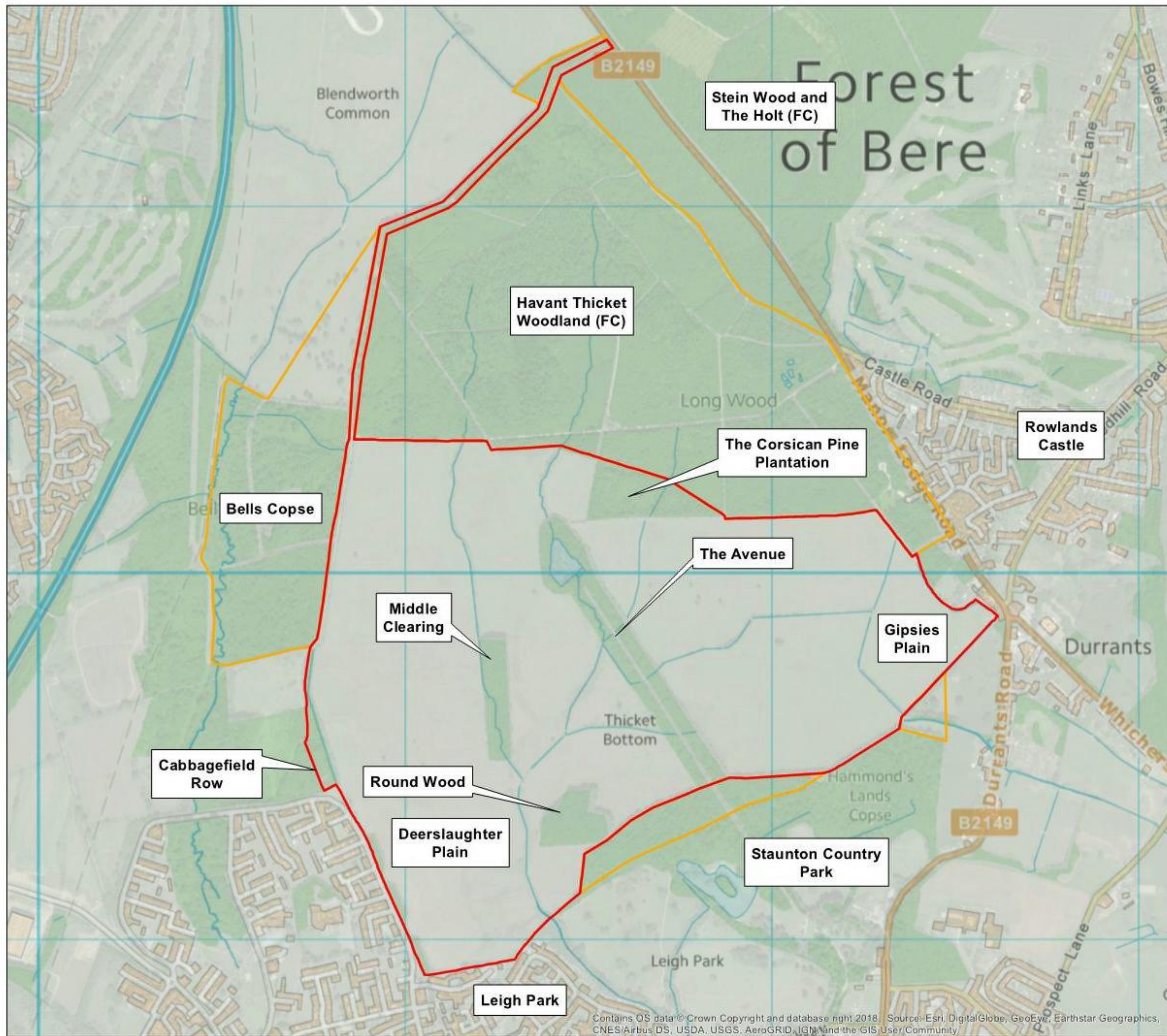
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Map D2 Key Site Features



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D2 - Key Site Features

Client:	Portsmouth Water
Date:	March 2019
Status:	Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)

Scale at A3: 1:10,000

0 250 500 Metres



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Map D3 Desktop Study Data – Alcahloe Bat

Map D4 Desktop Study Data – Barbastelle



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D3 - Desktop Study Data:
Alcathoe Bat

Client: Portsmouth Water

Date: January 2020

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Desktop Study Search Radius: 3km

Hampshire Bat Group (HBG) Alcathoe Bat Records

- Adult male trapped by Ecology Co-op in August 2018 - droppings subject to DNA analysis
- One individual found and taken into care - droppings subject to DNA analysis
- One individual recorded per comms. with HBG - presumed droppings subject to DNA analysis
- HGB capture site 27th July 2019: one adult male and one juvenile female

N.B. Records from Hampshire Bat Group (HBG) are located within either 100m x 100m or 10m x 10m grid squares.

Scale at A3: 1:35,000



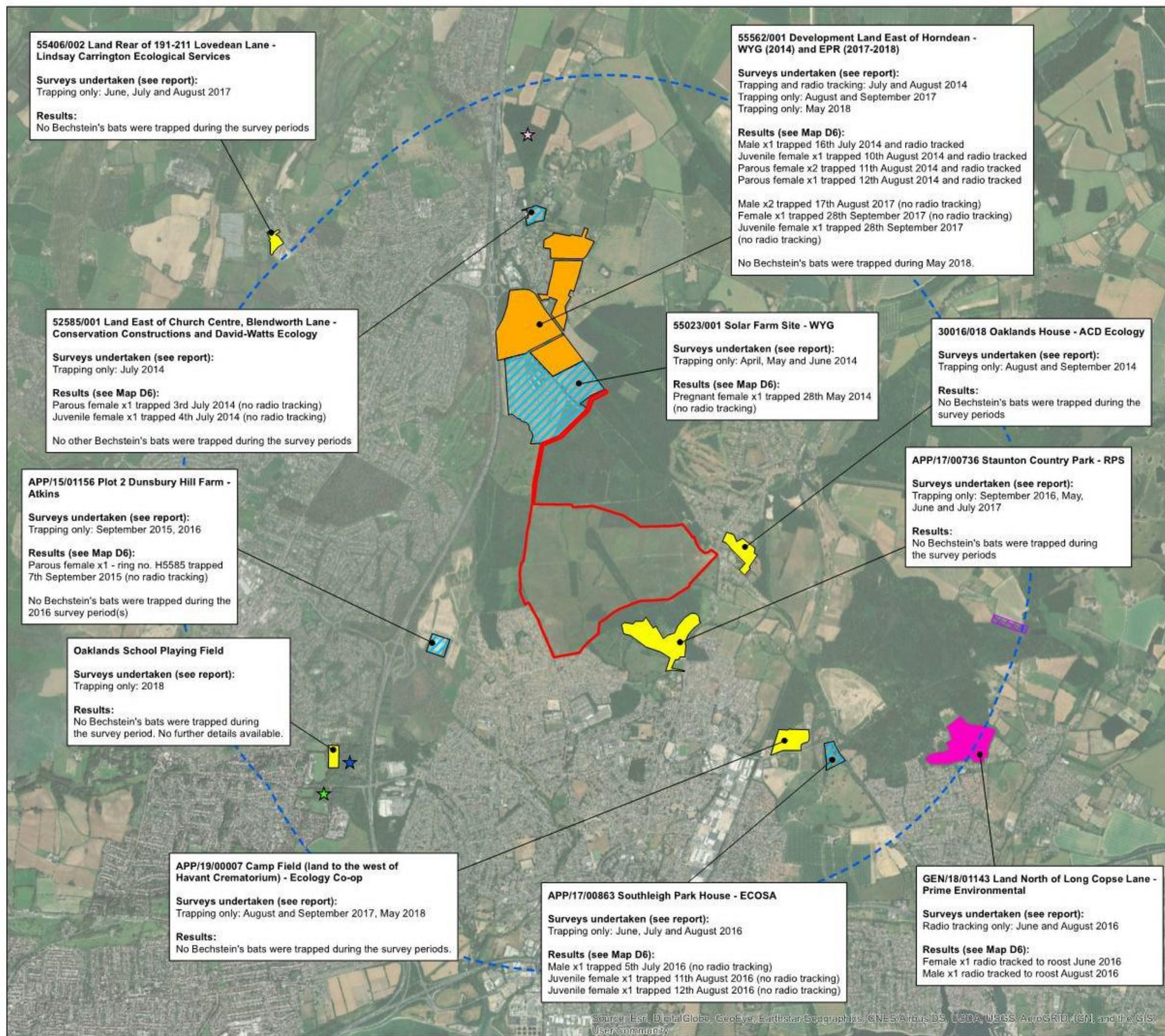
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Map D5 Desktop Study Data – Location of Sites with Trapping and / or Tracking for
Bechstein's Bat within 3km



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D5 - Desktop Study Data: Location of Sites with Trapping and / or Tracking Surveys for Bechstein's Bat within 3km

Client:	Portsmouth Water
Date:	January 2020
Status:	Final

KEY

- Site Boundary (the site)
- Desktop Study Buffer: 3km
- Hampshire Bat Group capture site 27th July 2019: one female and three males (all judged to be juveniles) trapped only

Planning Application Sites with Bechstein's Bat Surveys

- Bechstein's bat(s) trapped and radio tracked
- Bechstein's bat(s) trapped only
- Bechstein's bat(s) radio tracked
- No Bechstein's bats trapped

Sites Surveyed for Bechstein's Bat 2016

- Blendworth Lith (Bechstein's bat not recorded)
- Gundymoor Wood (Bechstein's bat not recorded)
- Johnston's Coppice (Bechstein's bat not recorded)

N.B. Biddenfield High Wood is located approximately 16.4km west of the site and is therefore not shown on this map. A single female Bechstein's bat was recorded here in June 2016.

Portsmouth Water tracking and trapping information is not included here; summary information of this data is provided on Map D42.

Scale at A3: 1:35,000



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Map D6 Desktop Study Data – Bechstein's Bat

HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D6 - Desktop Study Data:
Bechstein's Bat

Client: Portsmouth Water

Date: January 2020

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Desktop Study Search Radius: 3km
- Sites of Importance for Nature Conservation (SINCs) designated for presence of Bechstein's Bat
- Hampshire Bat Group capture site 27th July 2019: one female and three males (all judged to be juveniles) trapped only

Bechstein's Bat Roost Data (WYG/EPR)

- ★ Day roost (max. count one individual), 2014
- ▲ Day roost (max. count two individuals), 2014
- Maternity roost, 2014
- ◆ Single adult male capture, 2017

Bechstein's Bat Trapping Data (planning application sites)

- Adult male, 2014
- ◆ Pregnant adult female, 2014
- ▲ Parous female, 2014
- + Juvenile female, 2014
- ▲ Parous female, 2015
- Adult male, 2016
- + Juvenile female, 2016
- Adult male, 2017
- ▲ Adult female, 2017
- + Juvenile female, 2017

N.B. Roost data taken from WYG and Ecological Planning and Research (EPR) 2014 data. Trapping data taken from ecological reports associated with the planning application sites as shown on Map D5. Maximum counts of individuals within maternity roosts are labelled on the map where known. ECOSA Bechstein's roost data is shown on Map D39.

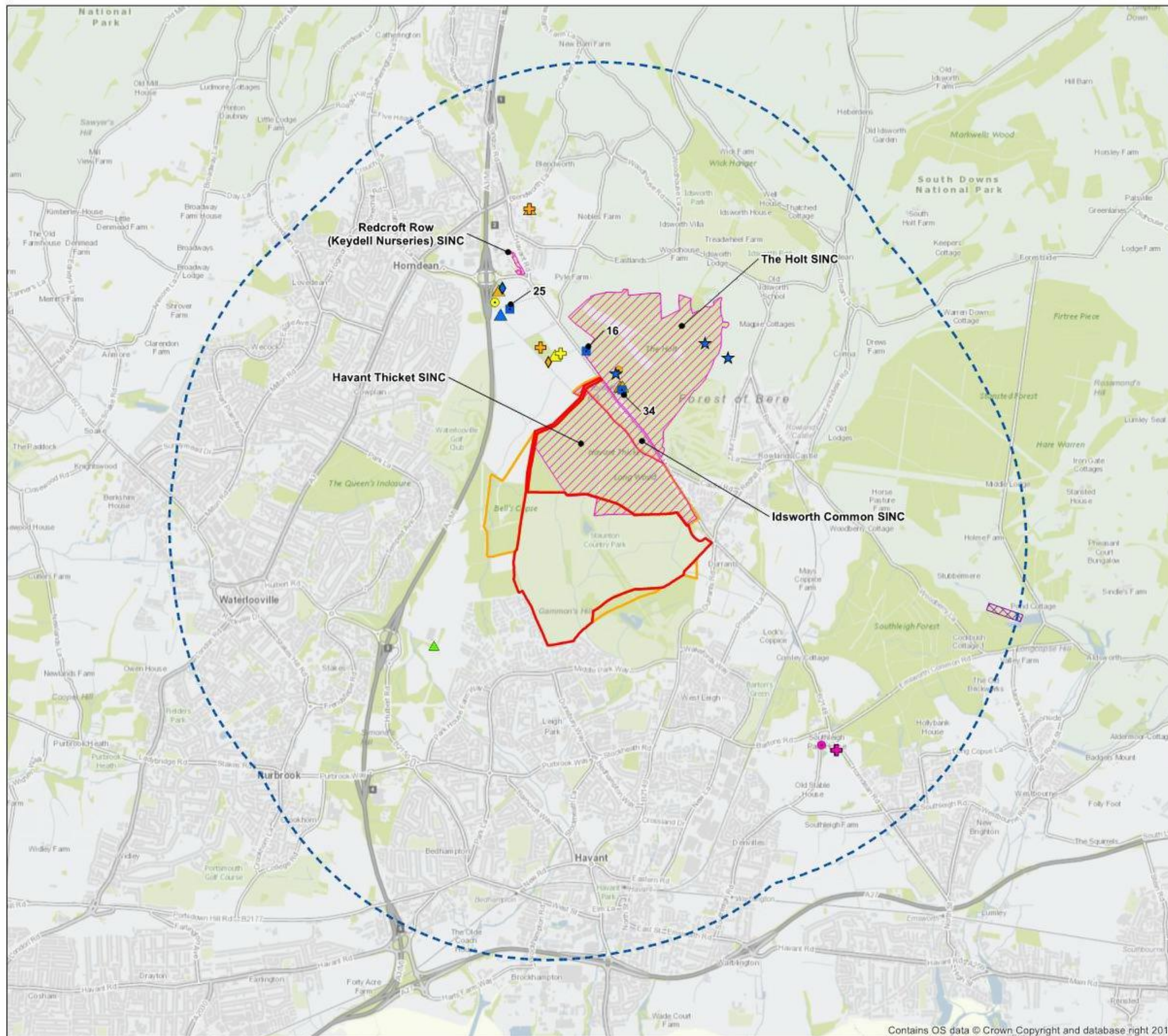
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Map D7 Desktop Study Data – Common Pipistrelle

HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D7 - Desktop Study Data:
Common Pipistrelle

Client: Portsmouth Water

Date: October 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Desktop Study Search Radius: 3km

ECOSA Records

- ★ Maternity roost
- ★ Day roost

HBG Common Pipistrelle Records

- Maternity roost
- Day roost (five individuals)
- Day roost (two individuals)
- Day roost (one individual)
- ✱ Bat in hand
- ▲ Mist net
- Harp trap
- + Dead bat
- ◆ Emergence survey record - heard but not seen
- ✕ Bat detector

N.B. Records from Hampshire Bat Group (HBG) are located within either 100m x 100m or 10m x 10m grid squares. This map does not include roosts of this species recorded by ECOSA between 2008-2019, as shown on Map D39.

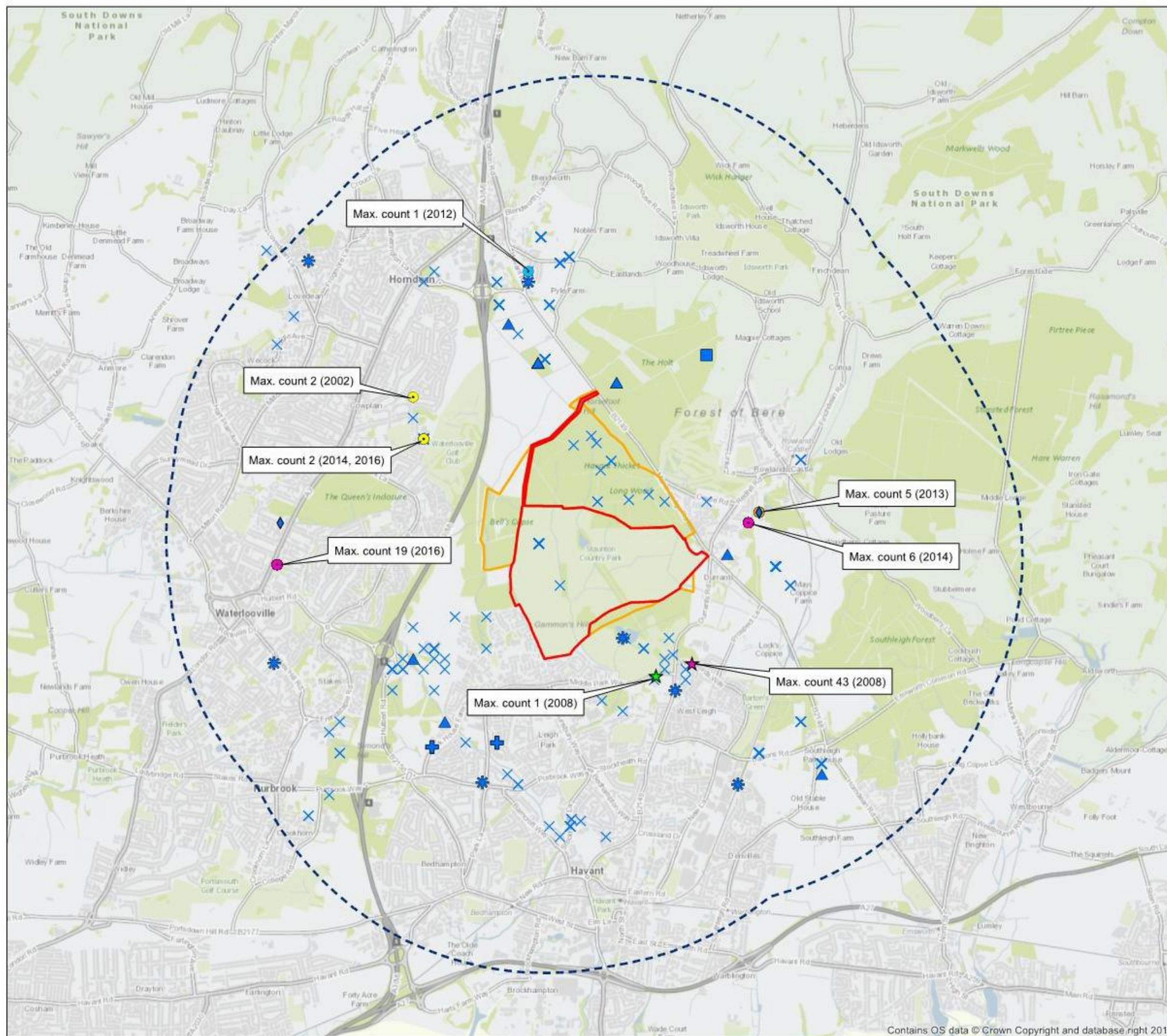
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Map D8 Desktop Study Data – Daubenton's Bat

HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D8 - Desktop Study Data:
Daubenton's Bat

Client: Portsmouth Water

Date: March 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Desktop Study Search Radius: 3km

HBG Daubenton's Bat Records

- + Mist net (one individual)
- ◆ Bat detector

N.B. Records from Hampshire Bat Group (HBG) are located within either 100m x 100m or 10m x 10m grid squares.

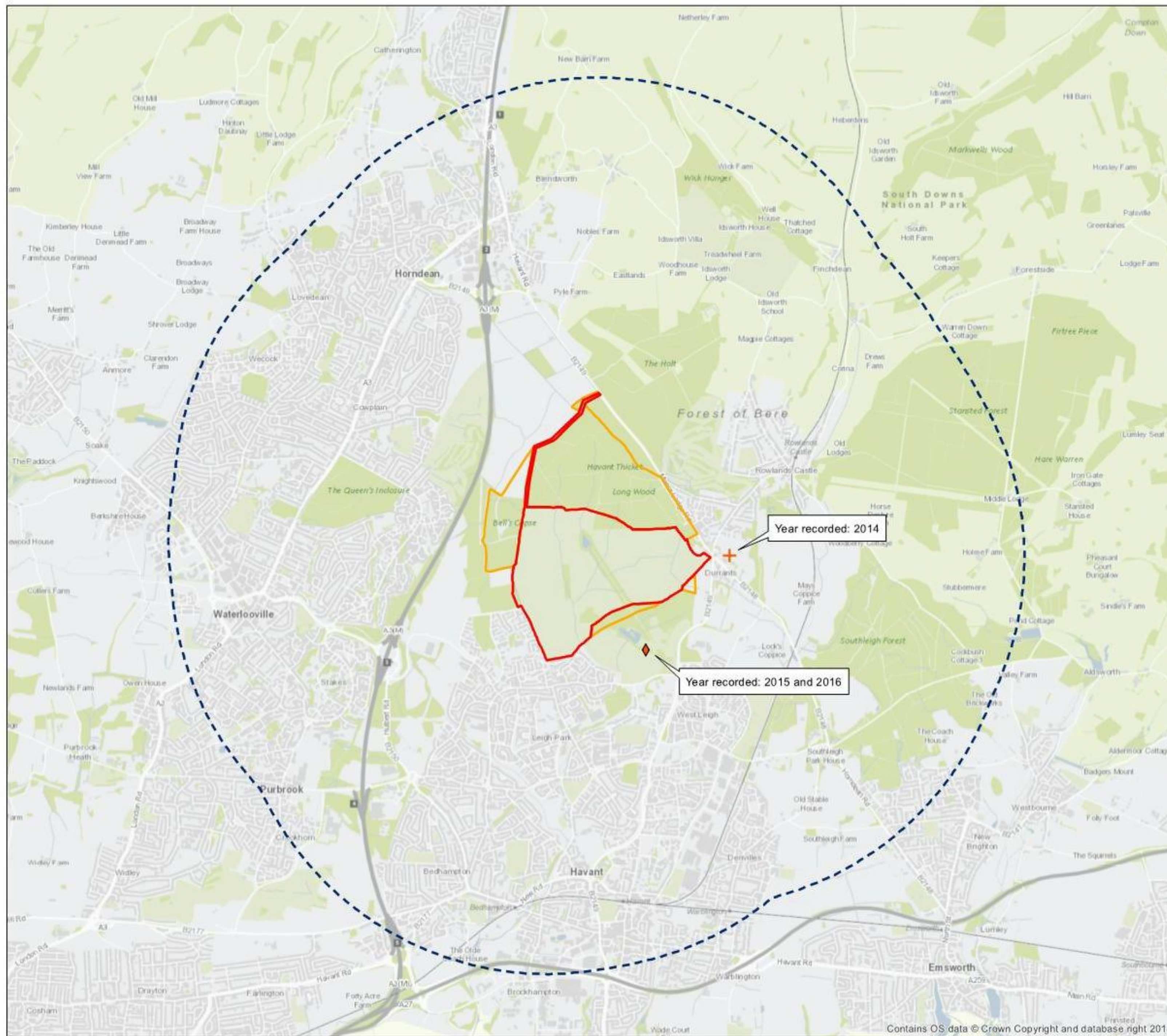
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Map D9 Desktop Study Data – Leisler's Bat

HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D9 - Desktop Study Data:
Leisler's Bat

Client: Portsmouth Water

Date: March 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Desktop Study Search Radius: 3km

HBG Leisler's Bat Records

★ Bat detector

N.B. Records from Hampshire Bat Group (HBG) are located within either 100m x 100m or 10m x 10m grid squares and within a three kilometre radius of the site. Returned records are from 2010, 2013, 2014 and 2017

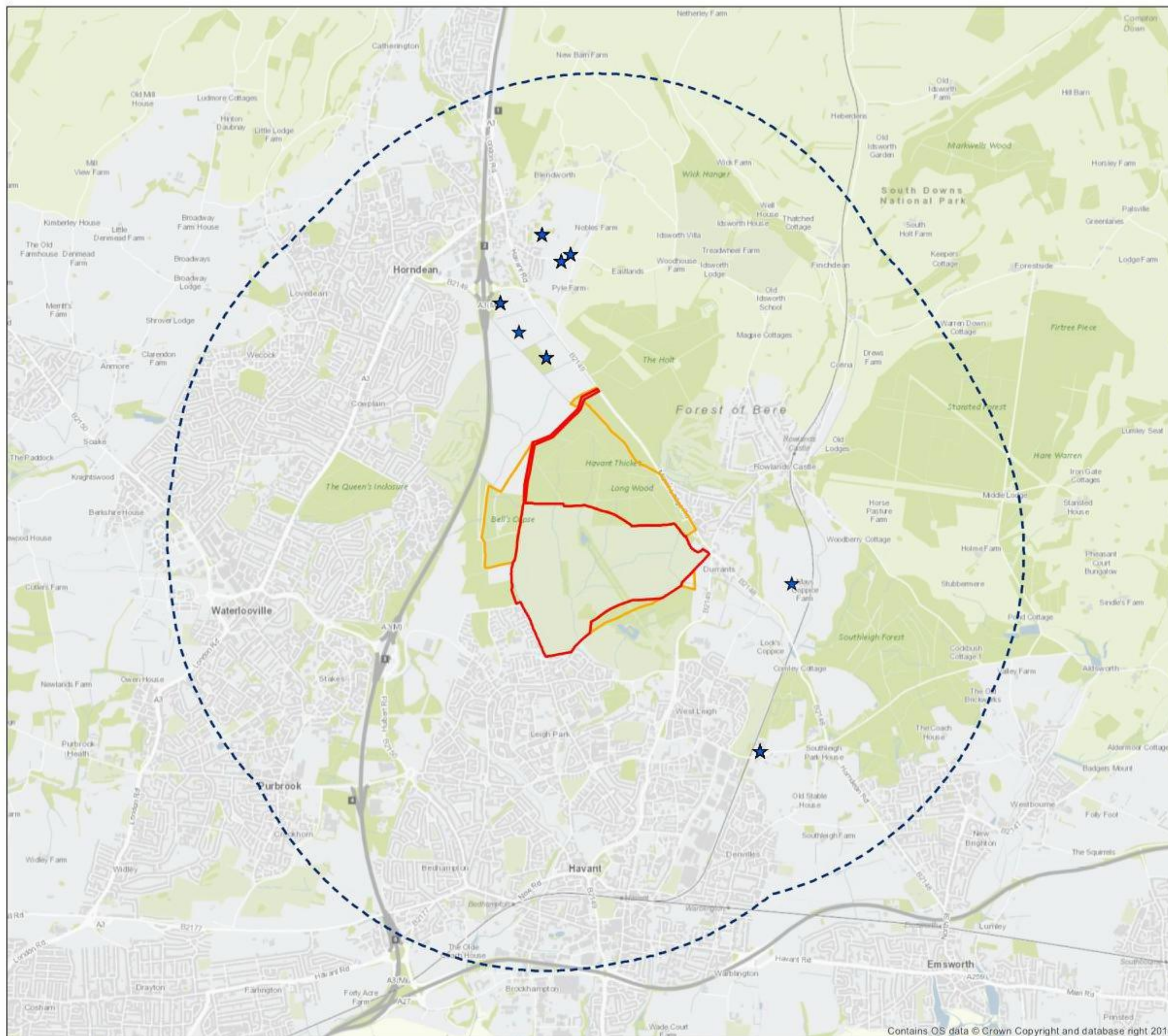
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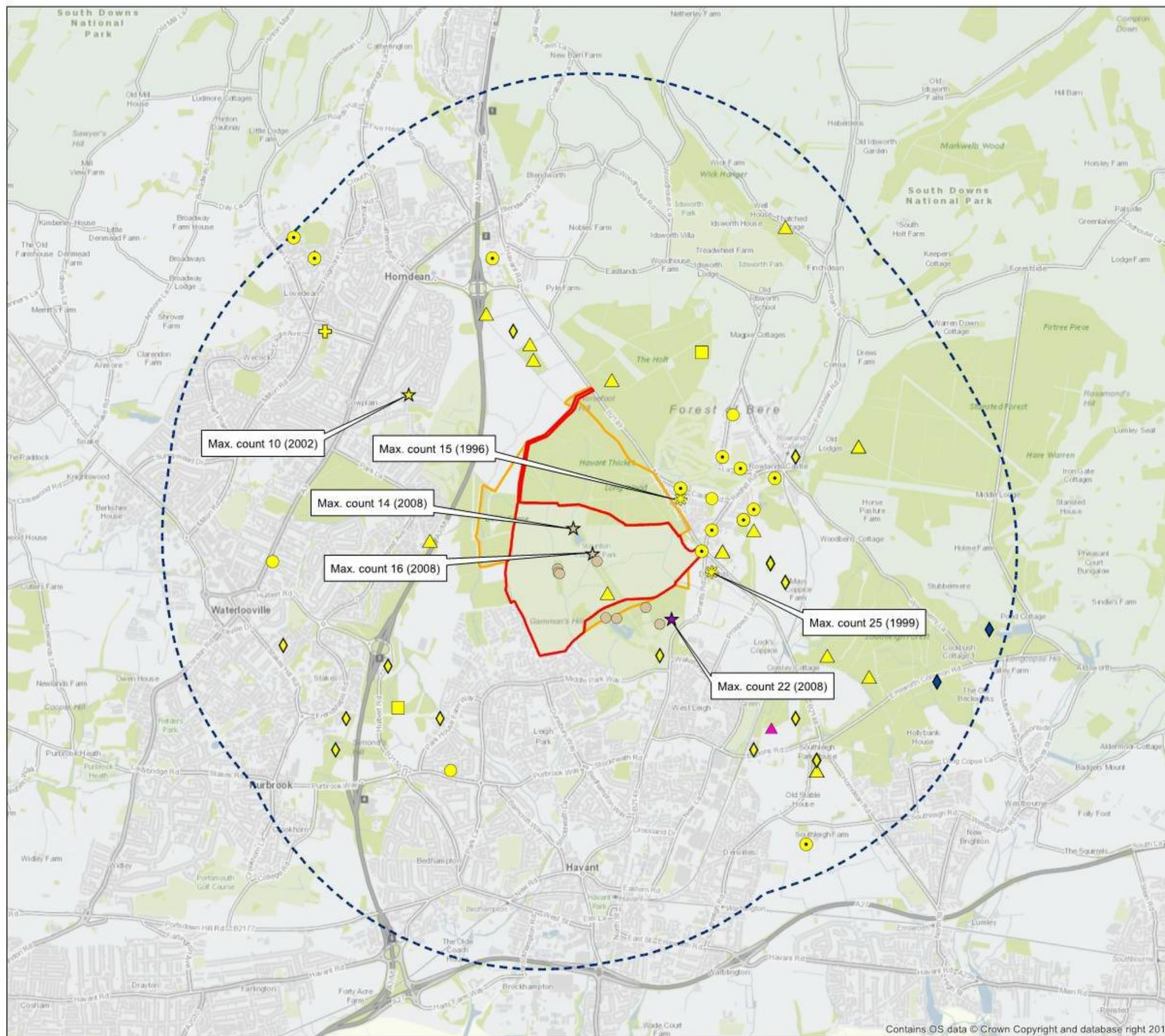
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Map D10 Desktop Study Data – Long-eared Bat Species



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D10 - Desktop Study Data:
Long-eared Bat Species

Client: Portsmouth Water

Date: October 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Desktop Study Search Radius: 3km

ECOSA Records

- ★ Brown long-eared bat (and Natterer's Bat) maternity roost
- ★ Brown long-eared bat maternity roost only
- Other brown long-eared bat roost (one to three individuals)

HGB Long-eared Bat Species Records

- ★ Maternity roost
- ☀ Hibernation roost
- Other roost (one to six individuals or droppings only)
- ▲ Mist net
- Harp trap
- Bat in hand
- ◆ Bat detector
- + Dead bat

SxBRC Long-eared Bat Species Records

- ◆ Bat detector

Ecology Co-op Records

- ▲ Adult female brown long-eared bat trapped and recorded as post-lactating, 2018

N.B. Records from Hampshire Bat Group (HGB) are located within either 100m x 100m or 10m x 10m grid squares. Records from Sussex Biodiversity Records Centre (SxBRC) are located within 100m x 100m grid squares. Maternity and hibernation roosts are shown with the maximum number of individuals recorded on any one occasion where known. This map does not include roosts of brown long-eared bat recorded by ECOSA between 2006-2019, as shown on Map D39.

Scale at A3: 1:35,000

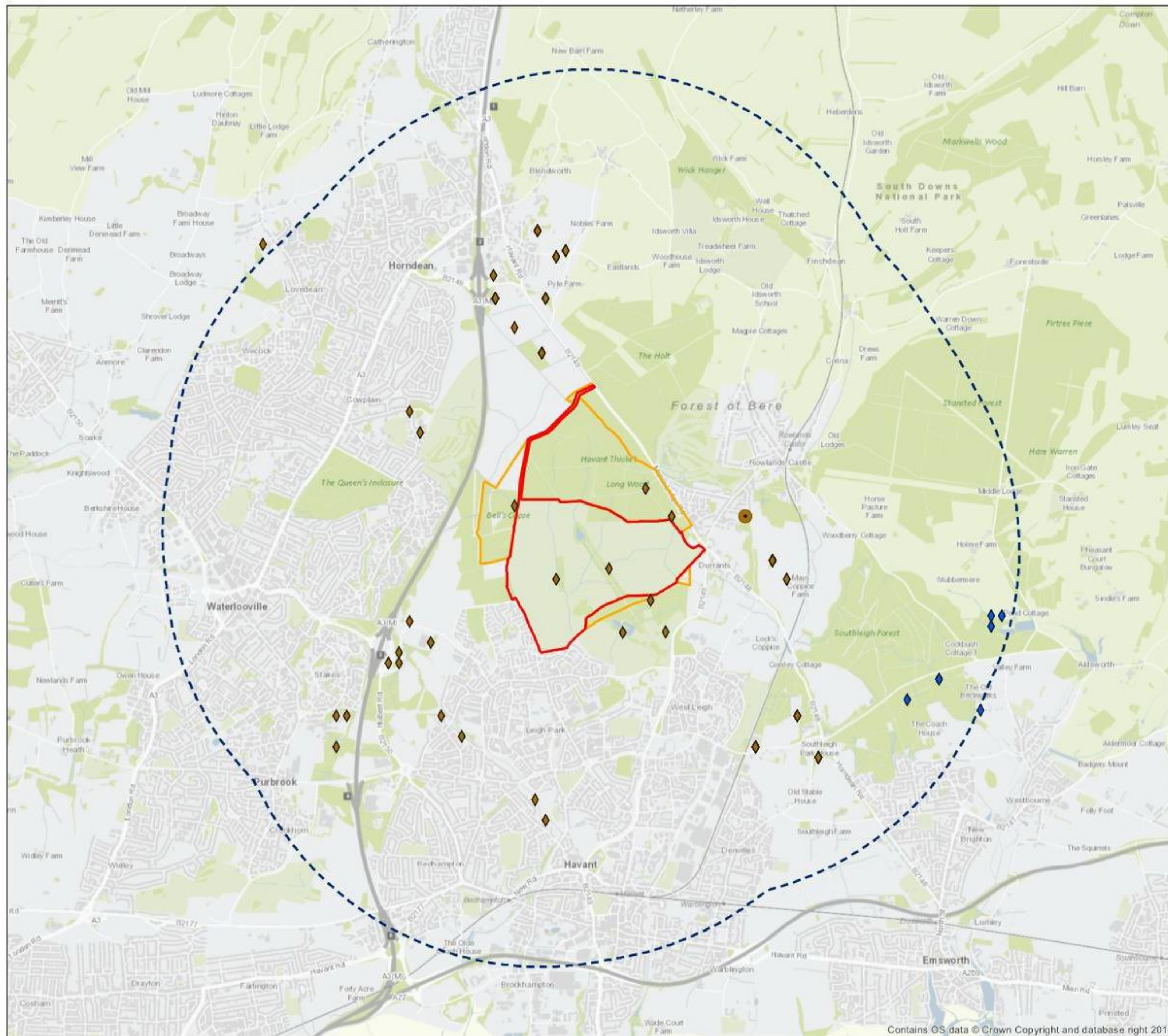


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Map D11 Desktop Study Data –Myotis Species



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D11 - Desktop Study Data:
Myotis Bat Species

Client: Portsmouth Water

Date: March 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Desktop Study Search Radius: 3km

HBG *Myotis* Bat Species Records

- Myotis* species (unspecified) - Bat detector
- Myotis* species (unspecified) - Emergence survey record (2014) - details unknown

SxBRC *Myotis* Bat Species Records

- Bat detector

N.B. Records from Hampshire Bat Group (HBG) are located within either 100m x 100m or 10m x 10m grid squares.

Sussex Biodiversity Records Centre (SxBRC) are located within 100m x 100m grid squares.

Scale at A3: 1:35,000



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Map D12 Desktop Study Data – Nathusius' Pipistrelle

HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D12 - Desktop Study Data:
Nathusius' Pipistrelle

Client: Portsmouth Water

Date: March 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Desktop Study Search Radius: 3km

HBG Nathusius' Pipistrelle Records

◆ Bat detector

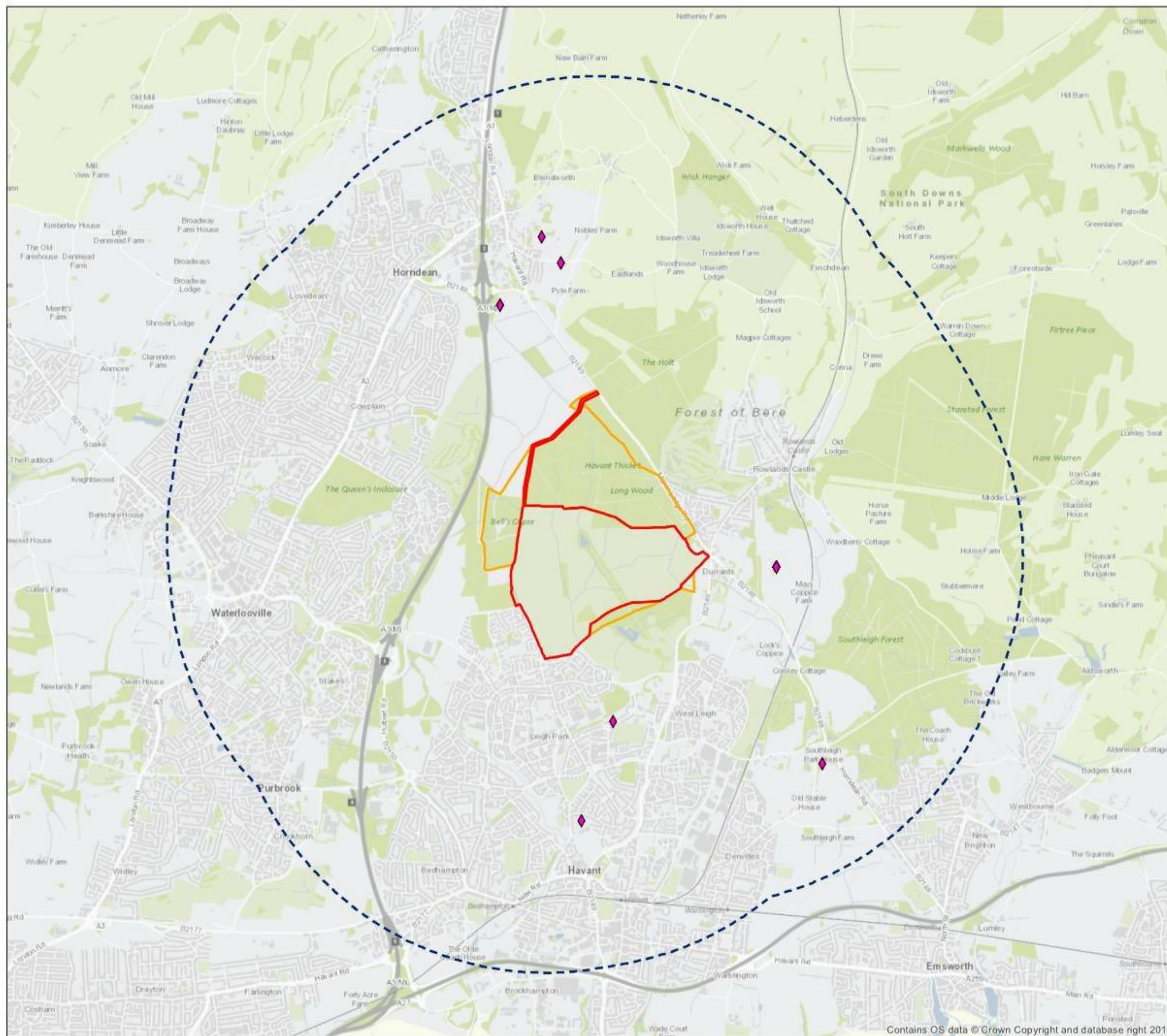
N.B. Records from Hampshire Bat Group (HBG) are located within either 100m x 100m or 10m x 10m grid squares. A total of 20 records were returned. These were all bat detector records ranging from 2014 - 2017.

Scale at A3: 1:35,000

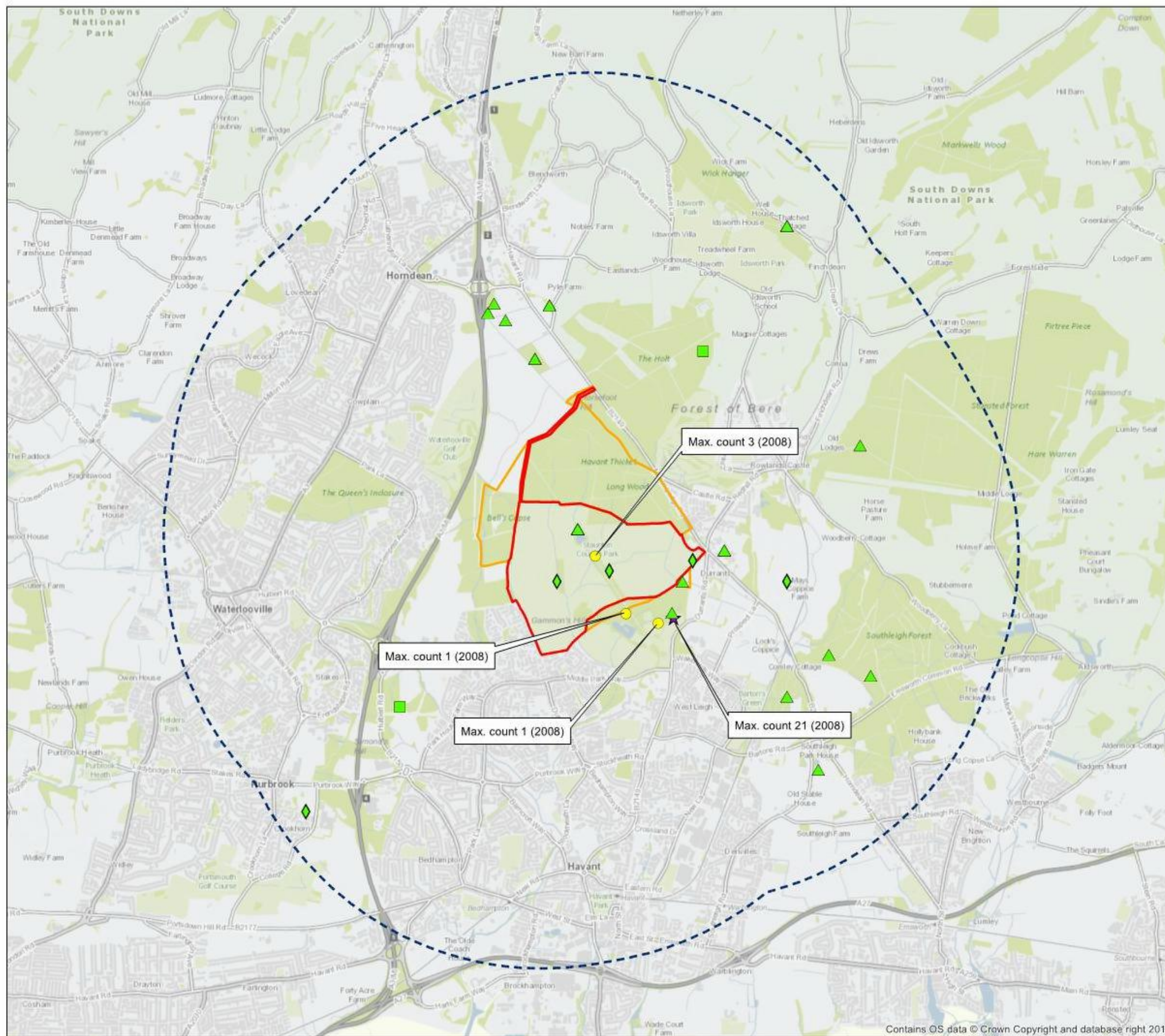


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Map D13 Desktop Study Data – Natterer's Bat



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D13 - Desktop Study Data:
Natterer's Bat

Client: Portsmouth Water

Date: October 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Desktop Study Search Radius: 3km

ECOSA Records

- Maternity roost
- Day roost (one to three individuals)

HBG Natterer's Bat Records

- Harp trap
- Mist net
- Bat detector

N.B. Records from Hampshire Bat Group (HBG) are located within either 100m x 100m or 10m x 10m grid squares and within a three kilometre radius of the site. Roosts are shown with the maximum number of individuals recorded on any one occasion where known. This map does not include roosts of this species recorded by ECOSA between 2008-2019, as shown on Map D39.

Scale at A3: 1:35,000



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Map D14 Desktop Study Data – Noctule

HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D14 - Desktop Study Data:
Noctule

Client: Portsmouth Water

Date: March 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Desktop Study Search Radius: 3km

HBG Noctule Records

- ◆ Bat detector
- Bat in hand
- Emergence survey record - details unknown (2014)
- ▲ Emergence survey record - heard not seen

Ecology Co-op Records

- ▲ Adult female noctule trapped and recorded as post-lactating, 2018

N.B. Records from Hampshire Bat Group (HBG) are located within either 100m x 100m or 10m x 10m grid squares and within a three kilometre radius of the site.

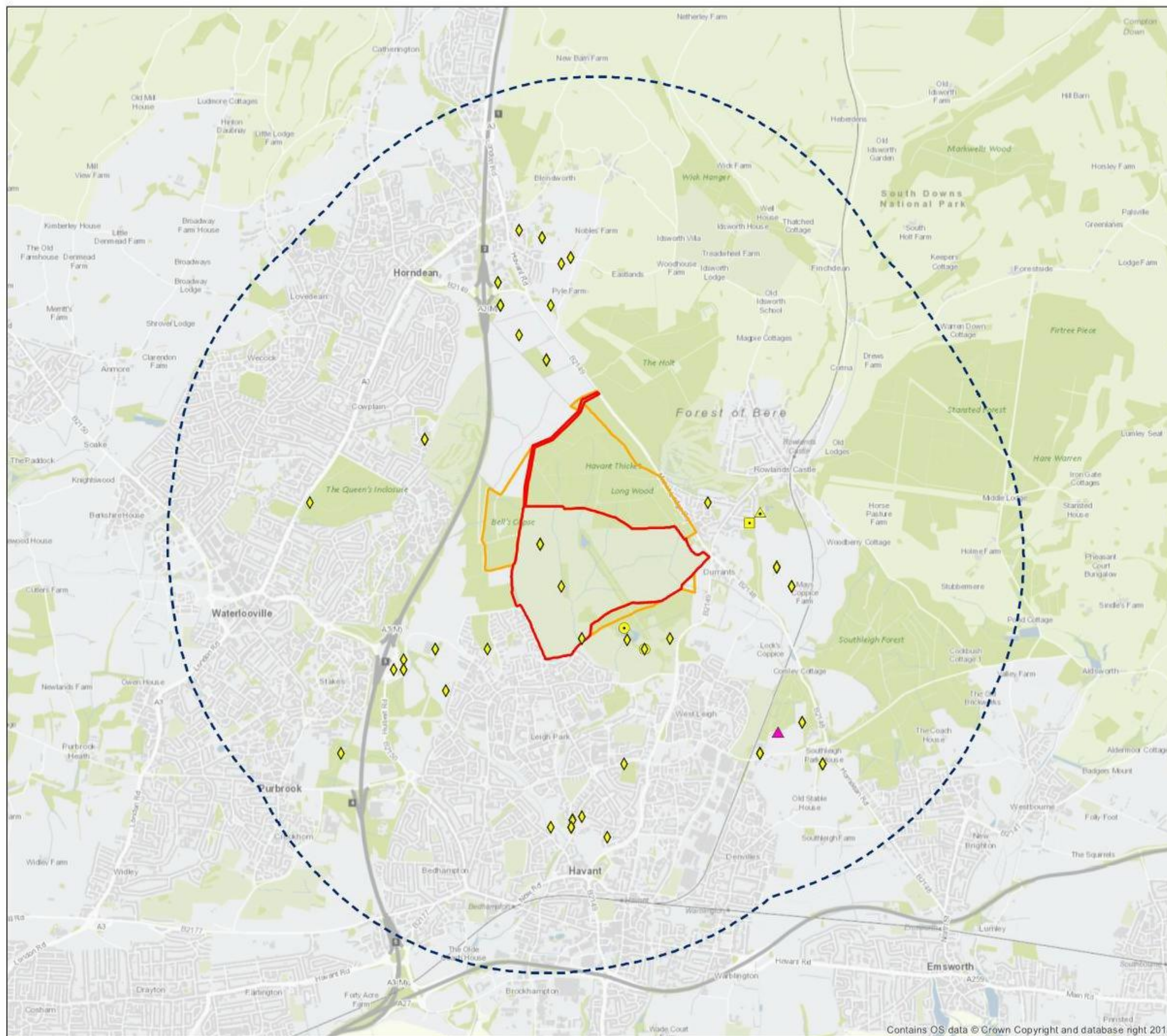
Scale at A3: 1:35,000



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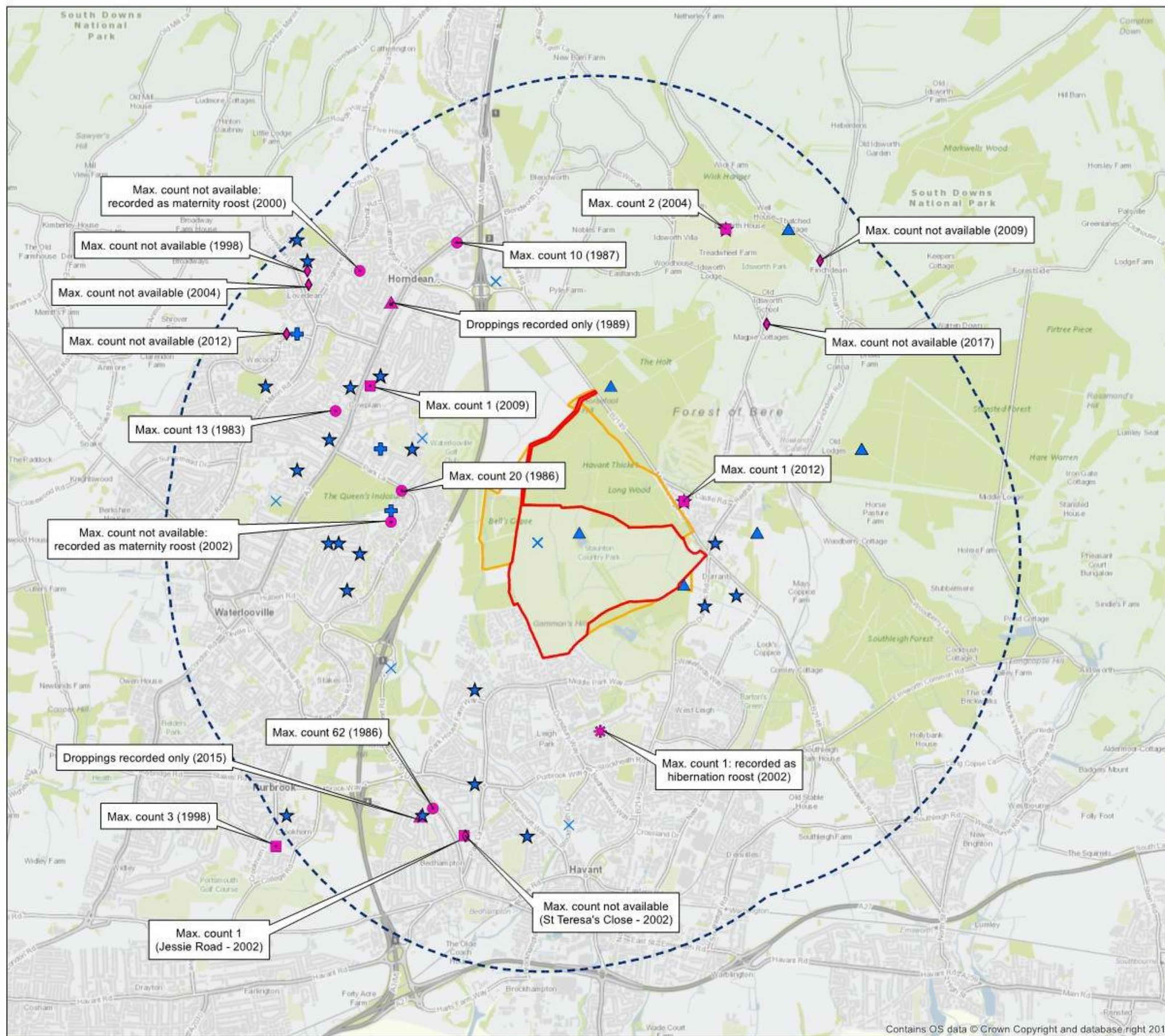
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Map D15 Desktop Study Data – Pipistrelle Bat Species



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D15 - Desktop Study Data:
Pipistrelle Bat Species

Client: Portsmouth Water

Date: October 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Desktop Study Search Radius: 3km

HBG Pipistrelle Bat Species Records

- Maternity roost
- Hibernation roost
- Day roost (one to three individuals)
- Other roost - number of individuals recorded not available
- Droppings recorded only
- Bat in hand
- Mist net
- Dead bat
- Bat detector

N.B. Records from Hampshire Bat Group (HBG) are located within either 100m x 100m or 10m x 10m grid squares. This map does not include roosts of this species recorded by ECOSA between 2008-2019, as shown on Map D39.

Scale at A3: 1:35,000



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Map D16 Desktop Study Data – Serotine

HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D16 - Desktop Study Data:
Serotine

Client: Portsmouth Water

Date: March 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Desktop Study Search Radius: 3km

HBG Serotine Records

- Maternity roost
- Day roost (two individuals)
- Day roost (one individual)
- Other roost (number of individuals recorded not available)
- Bat in hand
- + Dead bat
- ◆ Emergence survey record - heard but not seen
- X Bat detector

N.B. Records from Hampshire Bat Group (HBG) are located within either 100m x 100m or 10m x 10m grid squares.

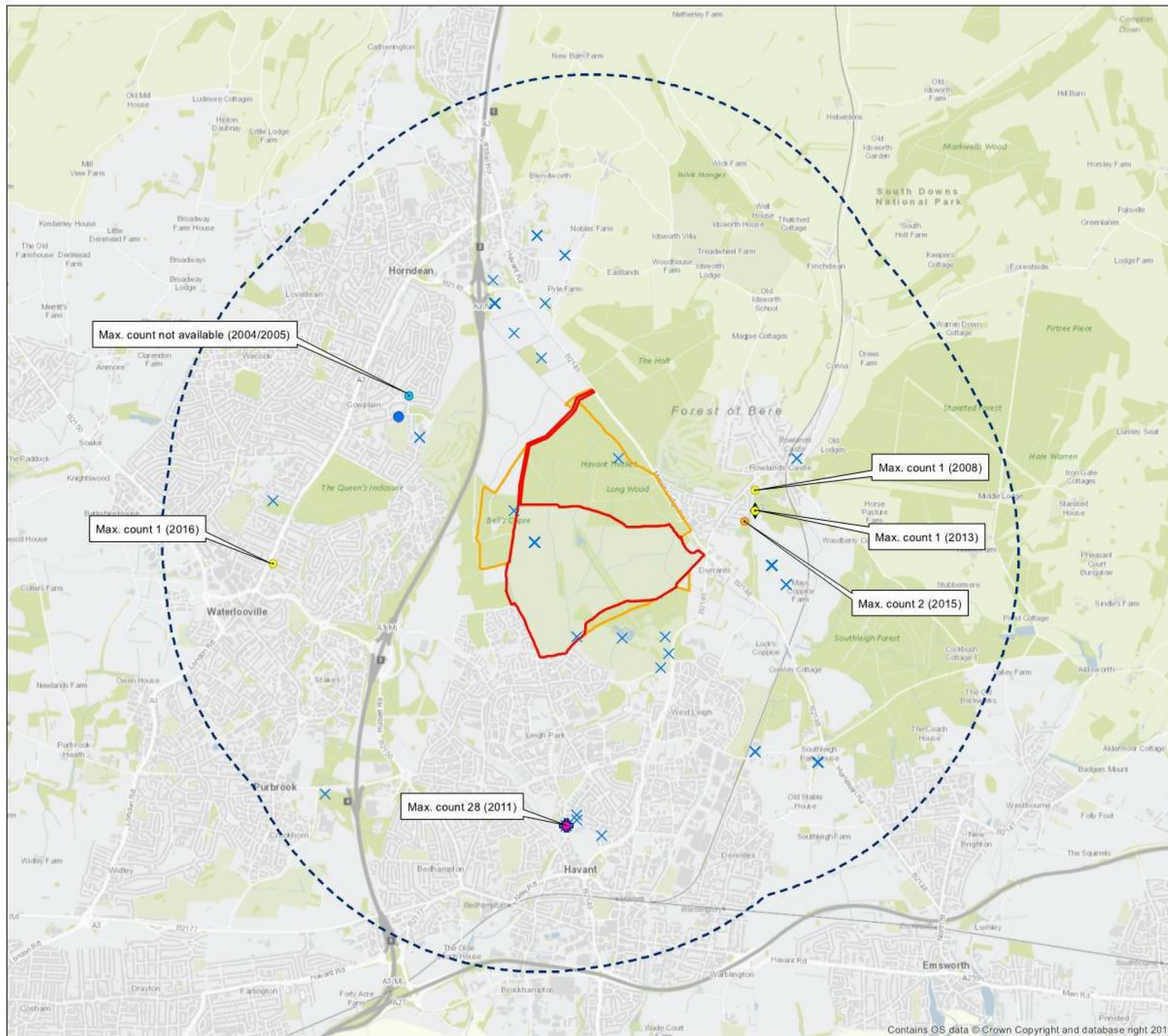
Scale at A3: 1:35,000



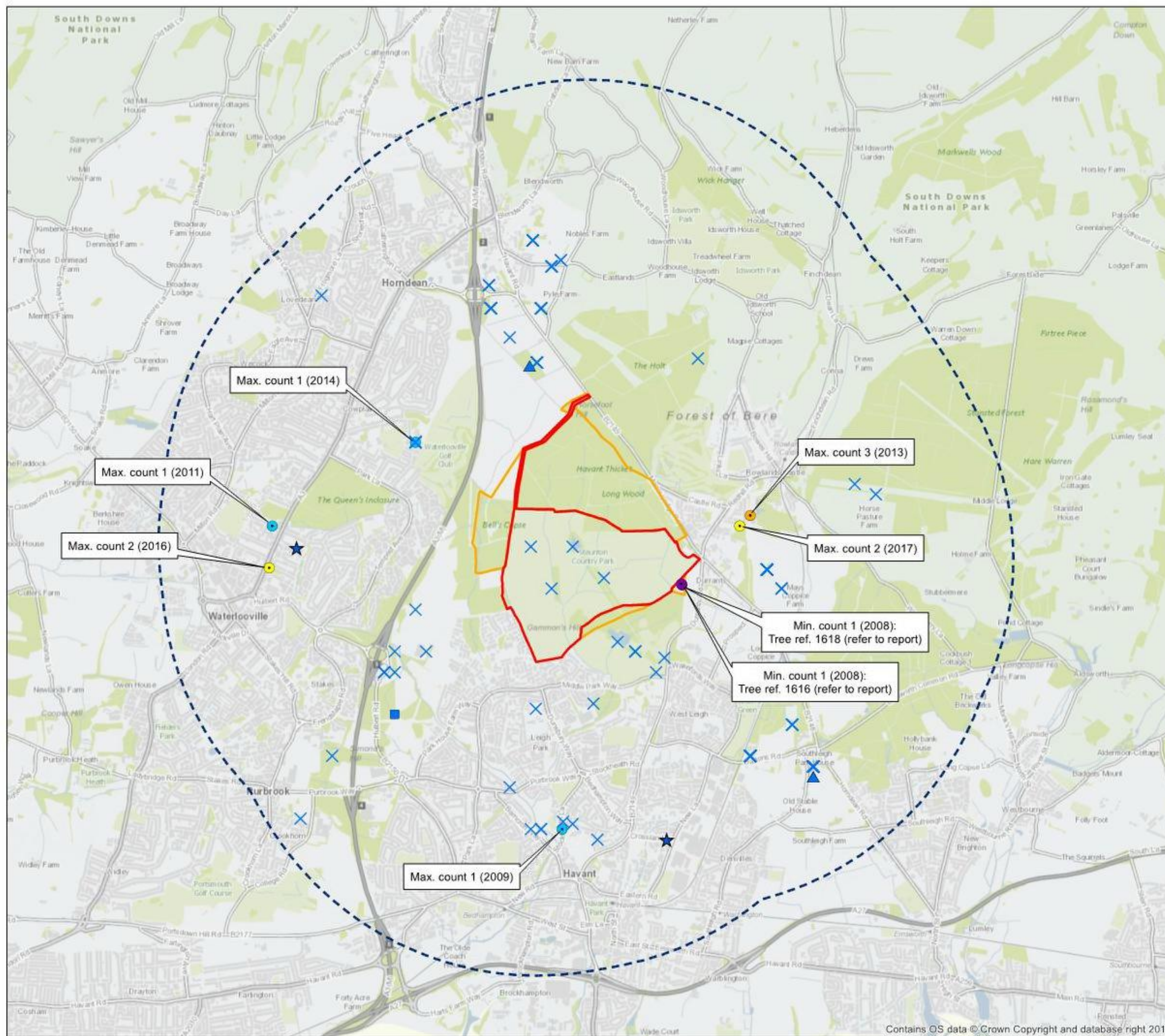
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Map D17 Desktop Study Data - Soprano Pipistrelle



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D17 - Desktop Study Data:
Soprano Pipistrelle

Client: Portsmouth Water

Date: October 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Desktop Study Search Radius: 3km

ECOSA Records

- Soprano pipistrelle tree roost (shared with Whiskered bat/Brandt's bat)

HBG Soprano Pipistrelle Records

- Day roost (three individuals)
- Day roost (two individuals)
- Day roost (one individual)
- Bat in hand
- Harp trap
- Mist net
- Bat detector

N.B. Records from Hampshire Bat Group (HBG) are located within either 100m x 100m or 10m x 10m grid squares. This map does not include roosts of this species recorded by ECOSA between 2008-2019, as shown on Map D39.

Scale at A3: 1:35,000



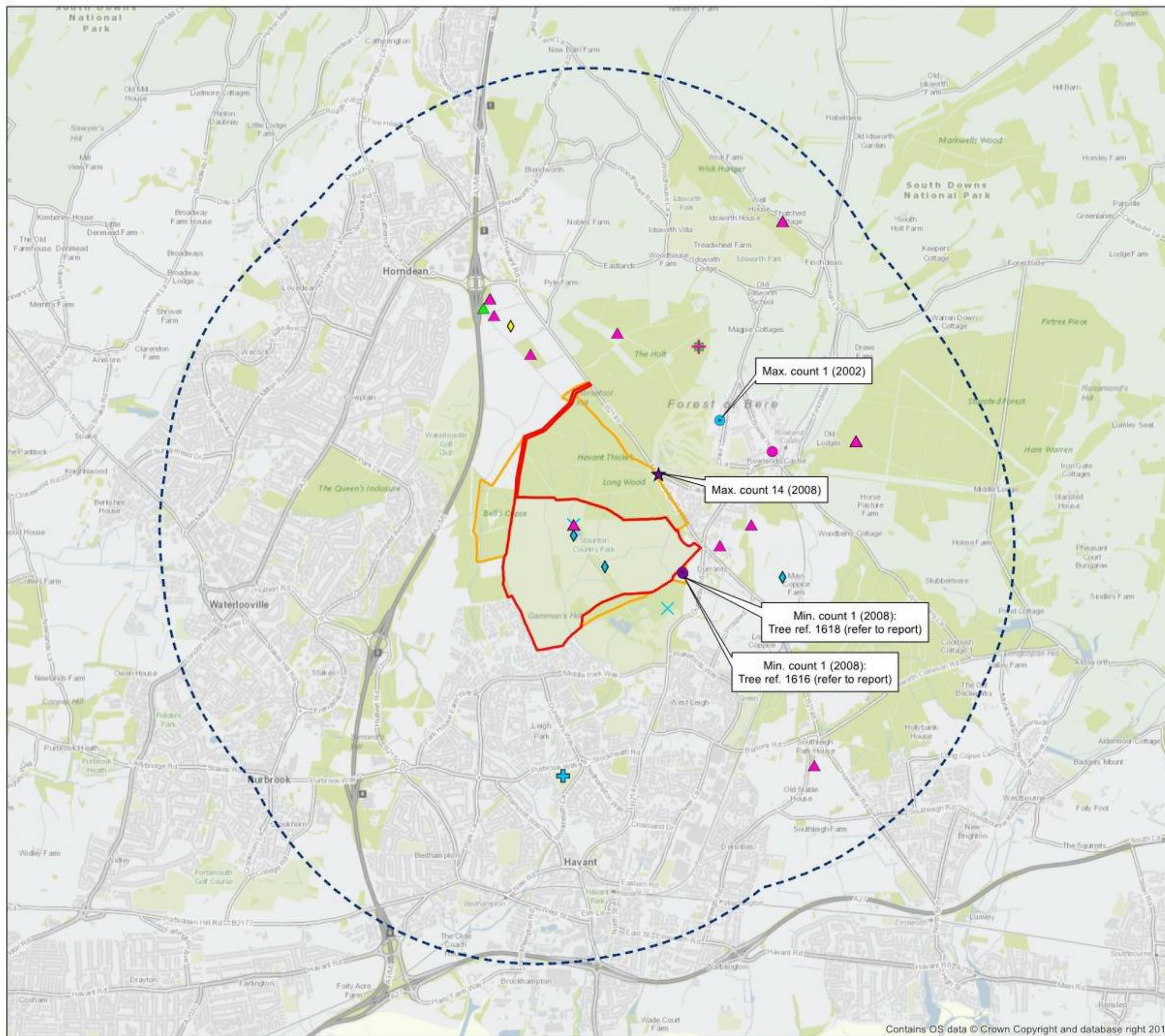
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Map D18 Desktop Study Data – Whiskered / Brandt's Bat



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D18 - Desktop Study Data:
Whiskered Bat / Brandt's Bat

Client: Portsmouth Water

Date: October 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Desktop Study Search Radius: 3km

ECOSA Records

- Whiskered bat roost (tree - shared with soprano pipistrelle)
- Whiskered bat maternity roost (building)

HGB Myotis Bat Species Records

- Brandt's bat - Harp trap
- Brandt's bat - Mist net
- Whiskered bat - Bat in hand
- Whiskered bat - Harp trap
- Whiskered bat - Mist net
- Whiskered bat / Brandt's bat - Day roost (one individual)
- Whiskered bat / Brandt's bat - Dead bat
- Whiskered bat / Brandt's bat - Mist net
- Whiskered bat / Brandt's bat - Bat detector
- Whiskered / Brandt's / Alcatraz bat - Bat detector

N.B. Records from Hampshire Bat Group (HBG) are located within either 100m x 100m or 10m x 10m grid squares. This map does not include roosts of Whiskered bat recorded by ECOSA between 2008-2019, as shown on Map D39.

Scale at A3: 1:35,000



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Map D19 Vantage Point Surveyor Locations



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D19 - Vantage Point Surveyor Locations

Client: Portsmouth Water

Date: March 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Location of Vantage Point (as numbered)
- Direction Surveyor Facing

Scale at A3: 1:6,500

0 75 150 300 Metres



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Map D20 Location of Static Detectors



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D20 - Location of Static Detectors

Client:	Portsmouth Water
Date:	March 2019
Status:	Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Location of Static Automated Detectors

Scale at A3: 1:6,500

0 75 150 300 Metres



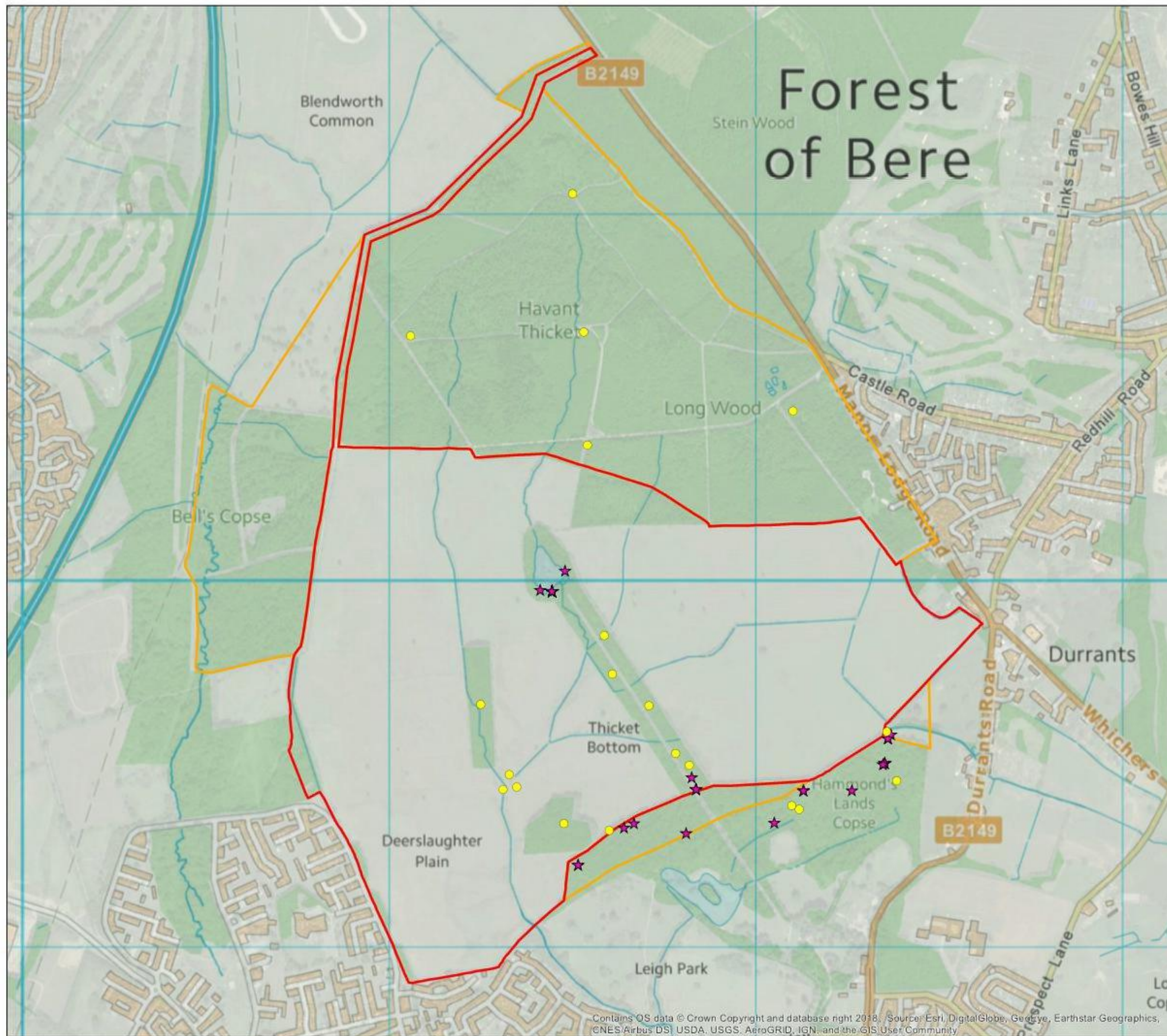
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Map D21 Location of Bat Trapping Sites in 2018



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D21 - Bat Trapping Sites 2018

Client:	Portsmouth Water
Date:	April 2019
Status:	Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- ★ Bat Capture Site (2018)
- No Bats Captured (2018)

Scale at A3: 1:10,000

0 100 200 400 Metres

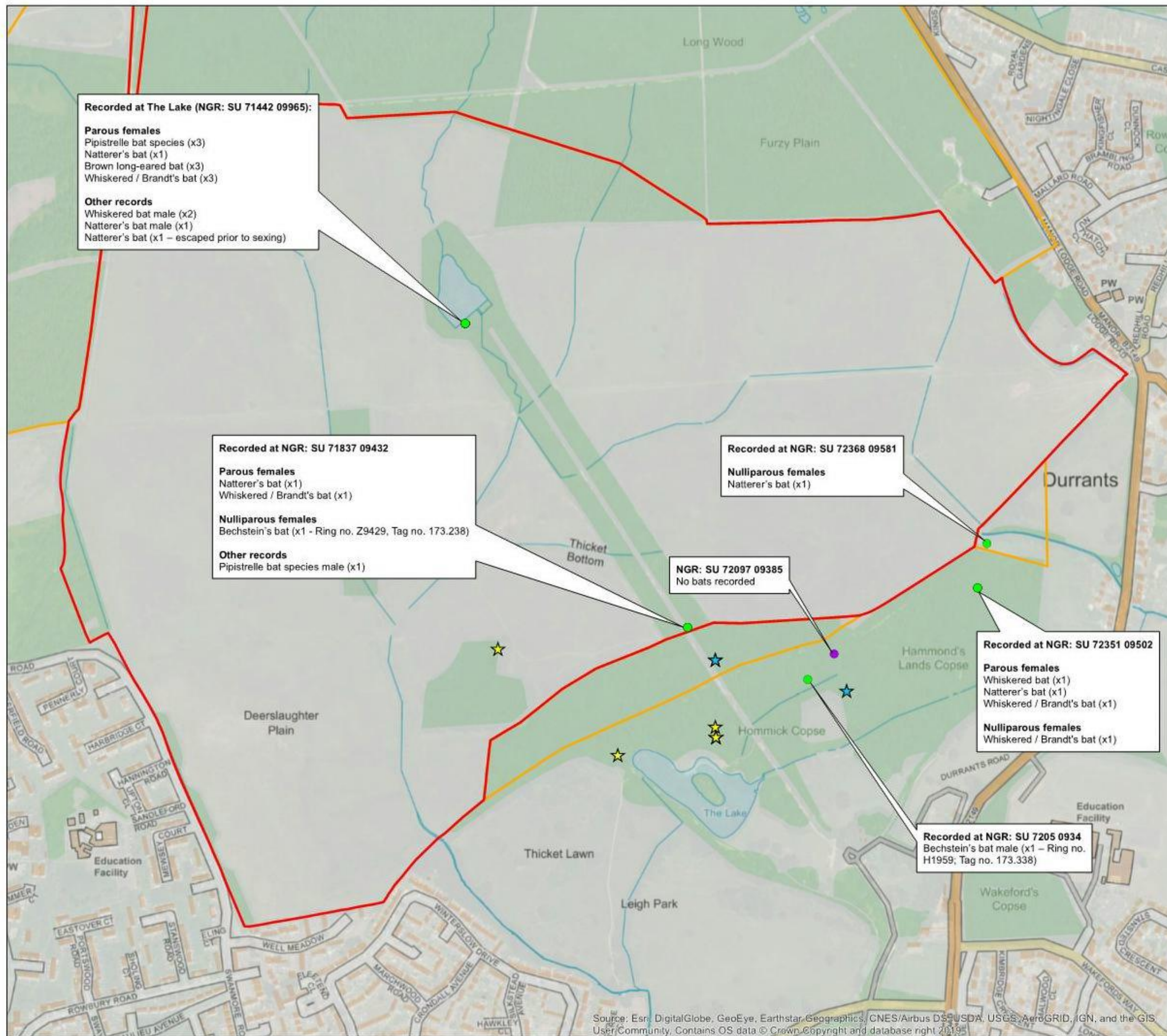


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Map D22 Bat Trapping and Roost Data May 2018



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D22 - Bat Trapping and Roost Data
May 2018

Client: Portsmouth Water

Date: October 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)

Bat Trapping Data: 14th-16th May 2018

- Bat(s) trapped
- No bats trapped

Bechstein's Bat Tree Roost Data: 15th-22nd May 2018

Bat Ring No., Bat Tag No., Sex

- H1959, 3380, Male
- Z9429, 2380, Female

Scale at A3: 1:6,500

0 75 150 300 Metres



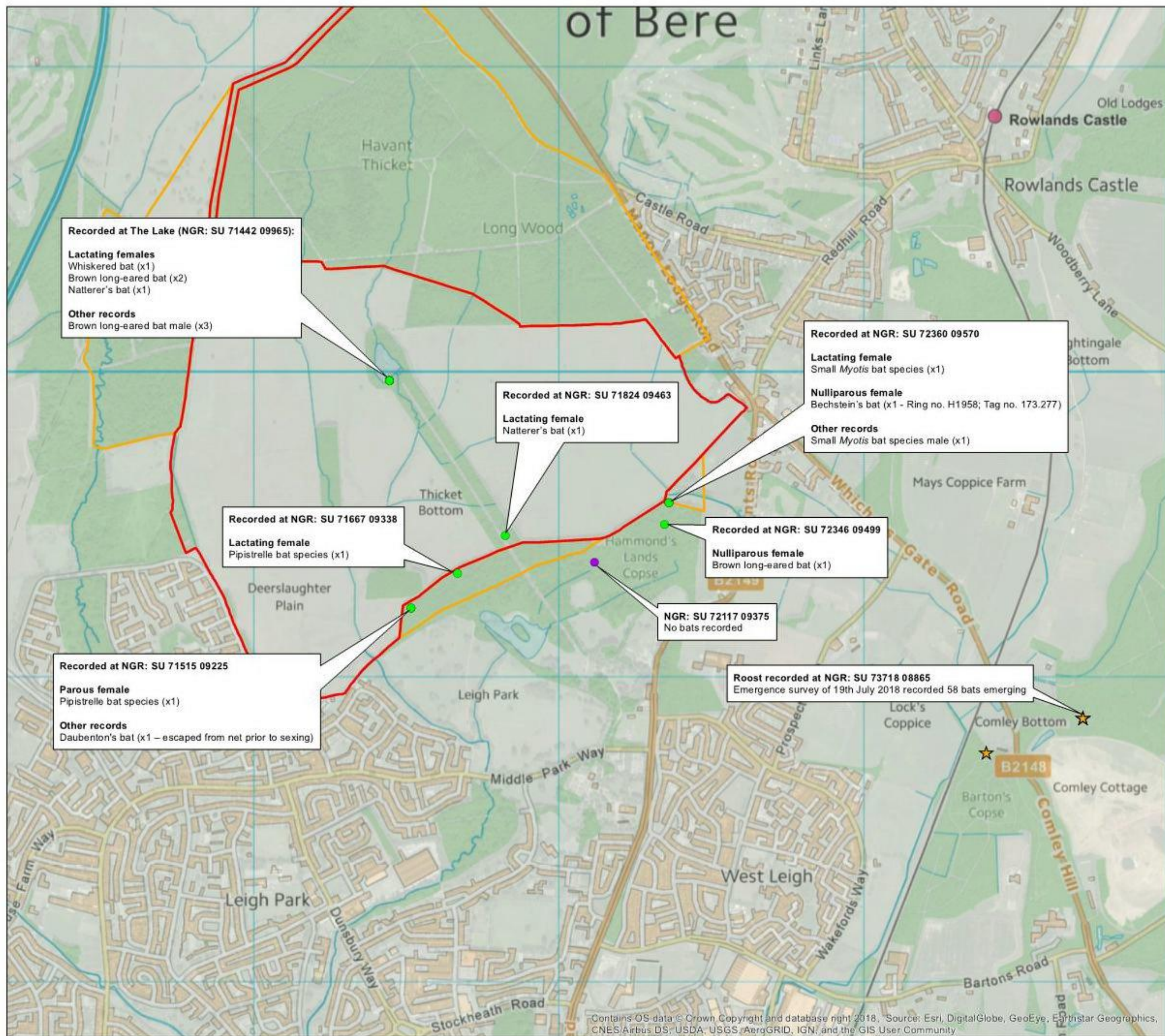
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Map D23 Bat Trapping and Roost Data July 2018



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D23 - Bat Trapping and Roost Data
July 2018

Client: Portsmouth Water

Date: April 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)

Bat Trapping Data: 16th-19th July 2018

- Bat(s) trapped
- No bats trapped

Bechstein's Bat Tree Roost Data: 16th-23rd July 2018

Bat Ring No., Bat Tag No., Sex

- ★ H1958, 173.277, Female

Scale at A3: 1:12,000

0 125 250 500
Metres

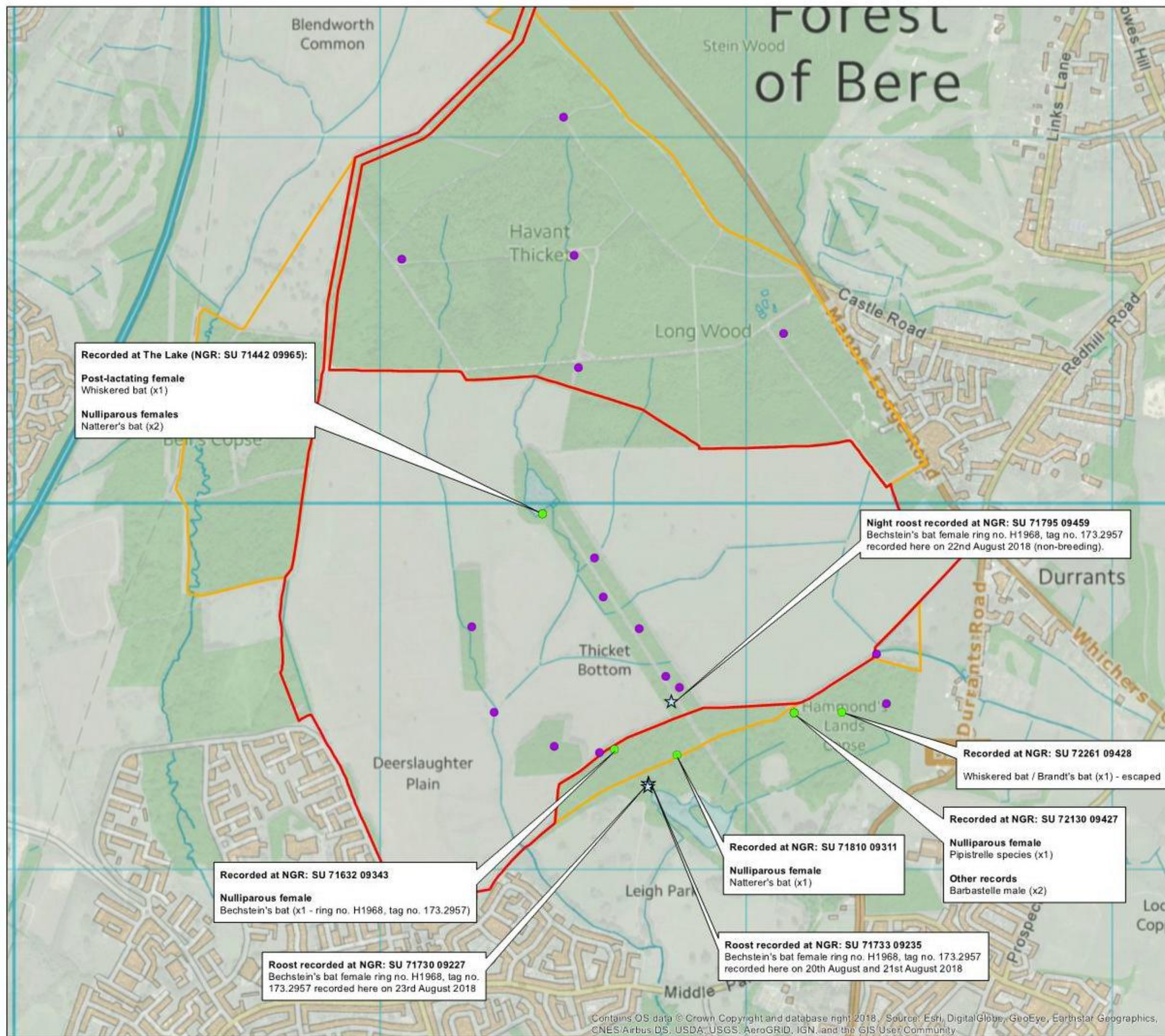


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Map D24 Bat Trapping and Roost Data August 2018



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D24 - Bat Trapping and Roost Data
August 2018

Client: Portsmouth Water

Date: April 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)

Bat Trapping Data: 19th-24th August 2018

- Bat(s) trapped
- No bats trapped

Bechstein's Bat Tree Roost Data: 20th-23rd August 2018

Bat Ring No., Bat Tag No., Sex

★ H1968, 173.2957, Female

Scale at A3: 1:10,000

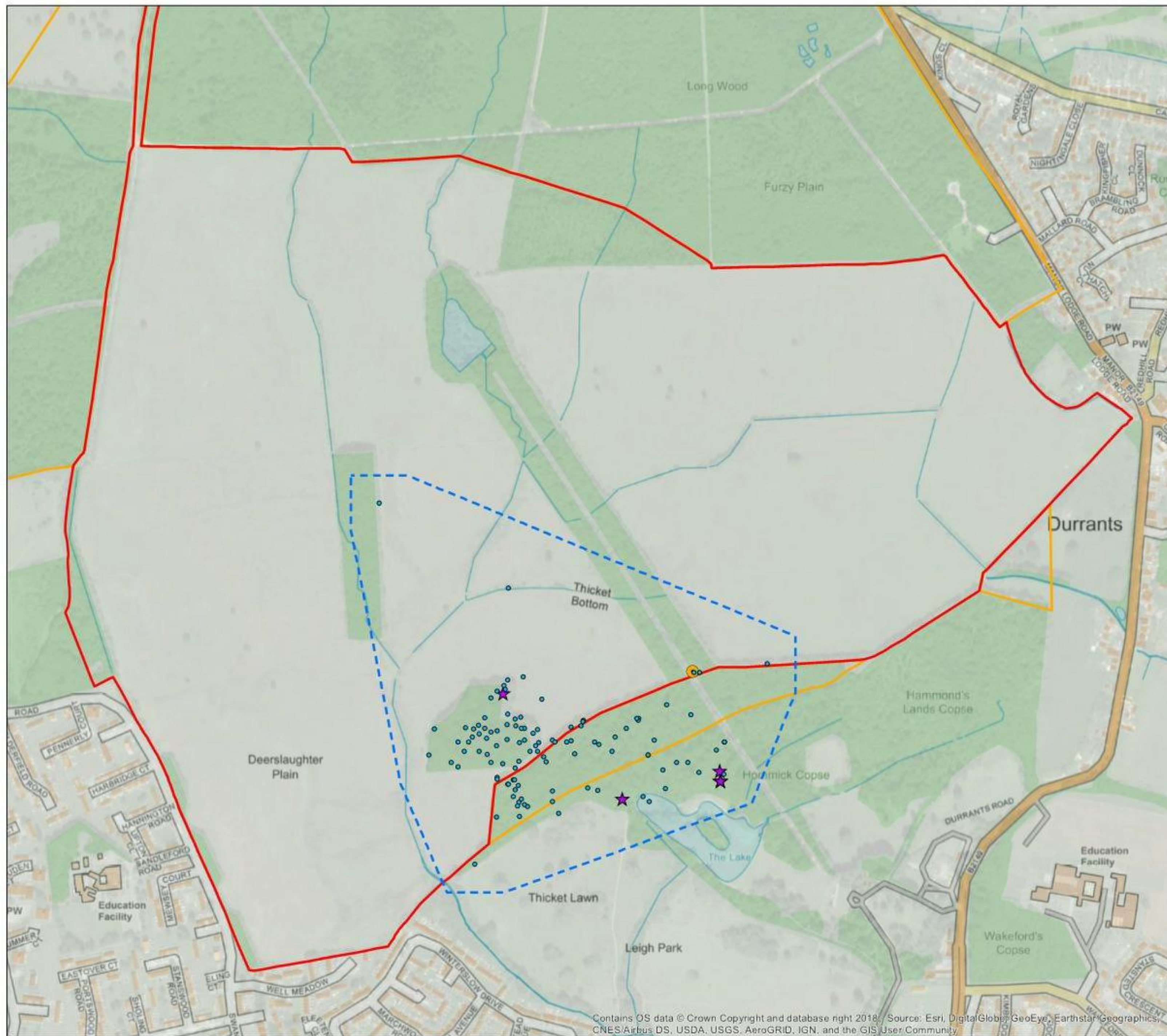
0 125 250 500 Metres



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Map D25 Bechstein's Bat Female 238 Range (Radio Tracking May 2018)



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D25 - Bechstein's Bat Female 238
Range: Radio Tracking 16th-19th May 2018

Client: Portsmouth Water

Date: April 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Range (May 2018)
- Location Fixes (May 2018)
- Bat trapped at NGR: SU 71837 09432 on 16th May 2018
- ★ Roost locations

N.B. Bechstein's Bat Female 238 is a non-breeding female and was recorded roosting alone throughout the radio tracking survey period.

Location fixes comprise triangulated co-ordinates of bat locations from two points, as recorded by surveyors at 10 minute intervals. Bats were followed through the night and co-ordinates were taken when bats were active (i.e. flying).

Scale at A3: 1:6,500

0 75 150 300 Metres



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Map D26 Bechstein's Bat Female 238 – 16th – 17th May 2018 Movements



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D26 - Bechstein's Bat Female 238:
16-17th May 2018 Movements

Client: Portsmouth Water

Date: June 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Female Bechstein's Tag 238 Range (May 2018)
- Area of Movements (16th-17th May 2018)

Roost Locations

Ring No., Tag No., Sex

★ Z9429, 2380, female

N.B. Bechstein's Bat Female 238 is a non-breeding female and was recorded roosting alone throughout the radio tracking survey period.

Scale at A3: 1:6,500

0 75 150 300 Metres



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Map D27 Bechstein's Bat Female 238 – 17th – 18th May 2018 Movements



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D27 - Bechstein's Bat Female 238:
17th-18th May 2018 Movements

Client: Portsmouth Water

Date: June 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Female Bechstein's Tag 238 Range (May 2018)
- Area of Movements (17th-18th May 2018)
- Direction of Flight

Roost Locations

Ring No., Tag No., Sex

★ Z9429, 2380, female

N.B. Bechstein's Bat Female 238 is a non-breeding female and was recorded roosting alone throughout the radio tracking survey period.

Scale at A3: 1:6,500

0 75 150 300 Metres



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Map D28 Bechstein's Bat Female 238 – 18th – 19th May 2018 Movements



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D28 - Bechstein's Bat Female 238:
18th-19th May 2018 Movements

Client: Portsmouth Water

Date: June 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Female Bechstein's Tag 238 Range (May 2018)
- Area of Movements (18th-19th May 2018)
- Direction of Flight

Roost Locations

Ring No., Tag No., Sex

★ Z9429, 2380, female

N.B. Bechstein's Bat Female 238 is a non-breeding female and was recorded roosting alone throughout the radio tracking survey period.

Scale at A3: 1:6,500

0 75 150 300 Metres



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Map D29 Bechstein's Bat Male 338 Range (Radio Tracking May 2018)



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D29 - Bechstein's Bat Male 338
Range: Radio Tracking 16th-18th May 2018

Client: Portsmouth Water

Date: April 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Range (May 2018)
- Location Fixes (May 2018)
- Bat trapped at NGR: SU 7205 0934 on 15th May 2018
- ★ Roost Locations

N.B. Bechstein's Bat Male 338 was recorded roosting alone throughout the radio tracking survey period.

Location fixes comprise triangulated co-ordinates of bat locations from two points, as recorded by surveyors at 10 minute intervals. Bats were followed through the night and co-ordinates were taken when bats were active (i.e. flying).

Scale at A3: 1:6,500

0 75 150 300 Metres



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Map D30 Bechstein's Bat Male 338 – 16th-17th May 2018 Movements



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D30 - Bechstein's Bat Male 338:
16th-17th May 2018 Movements

Client:	Portsmouth Water
Date:	April 2019
Status:	Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Male Bechstein's Tag 338 Range (May 2018)
- Area of Movements (16th-17th May 2018)
- Roost Locations

N.B. Bechstein's Bat Male 338 was recorded roosting alone throughout the radio tracking survey period.

Scale at A3: 1:6,500



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Map D31 Bechstein's Bat Male 338 – 17th-18th May 2018 Movements



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D31 - Bechstein's Bat Male 338:
17th-18th May 2018 Movements

Client: Portsmouth Water

Date: April 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Male Bechstein's Tag 338 Range (May 2018)
- Area of Movements (17th-18th May 2018)
- Roost Locations

N.B. Bechstein's Bat Male 338 was recorded roosting alone throughout the radio tracking survey period.

Scale at A3: 1:6,500

0 75 150 300 Metres

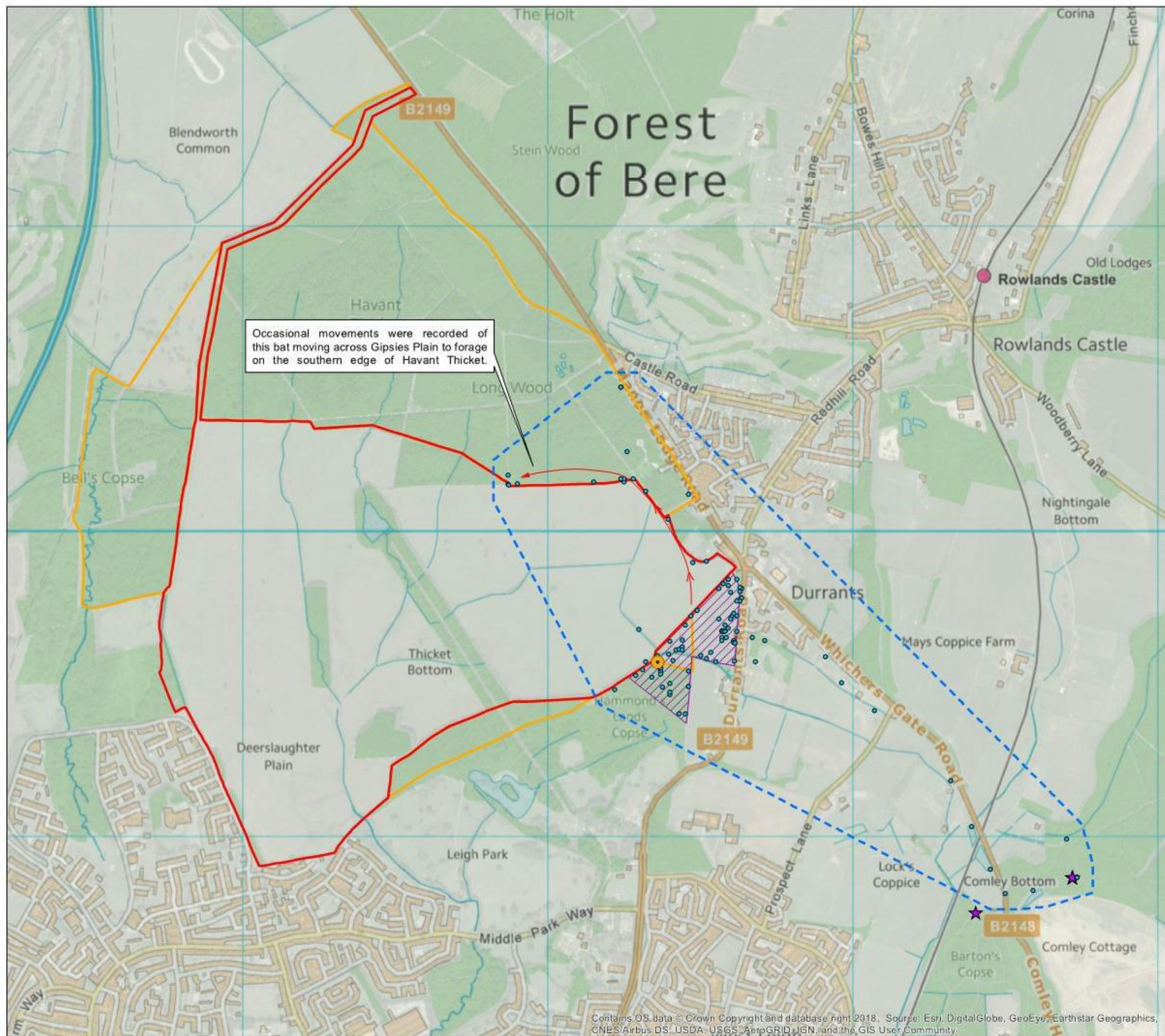


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Map D32 Bechstein's Bat Female 277 Range (Radio Tracking July 2018)



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D32 - Bechstein's Bat Female 277
Range: Radio Tracking 17th-20th July 2018

Client: Portsmouth Water

Date: April 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Range (July 2018)
- Key Foraging Area
- Direction of Flight
- Location Fixes (July 2018)
- Bat trapped at NGR: SU 72360 09570 on 16th July 2018
- ★ Roost Locations

N.B. Bechstein's Bat Female 277 is a non-breeding female.

Location fixes comprise triangulated co-ordinates of bat locations from two points, as recorded by surveyors at 10 minute intervals. Bats were followed through the night and co-ordinates were taken when bats were active (i.e. flying).

Scale at A3: 1:12,000

0 250 500 Metres



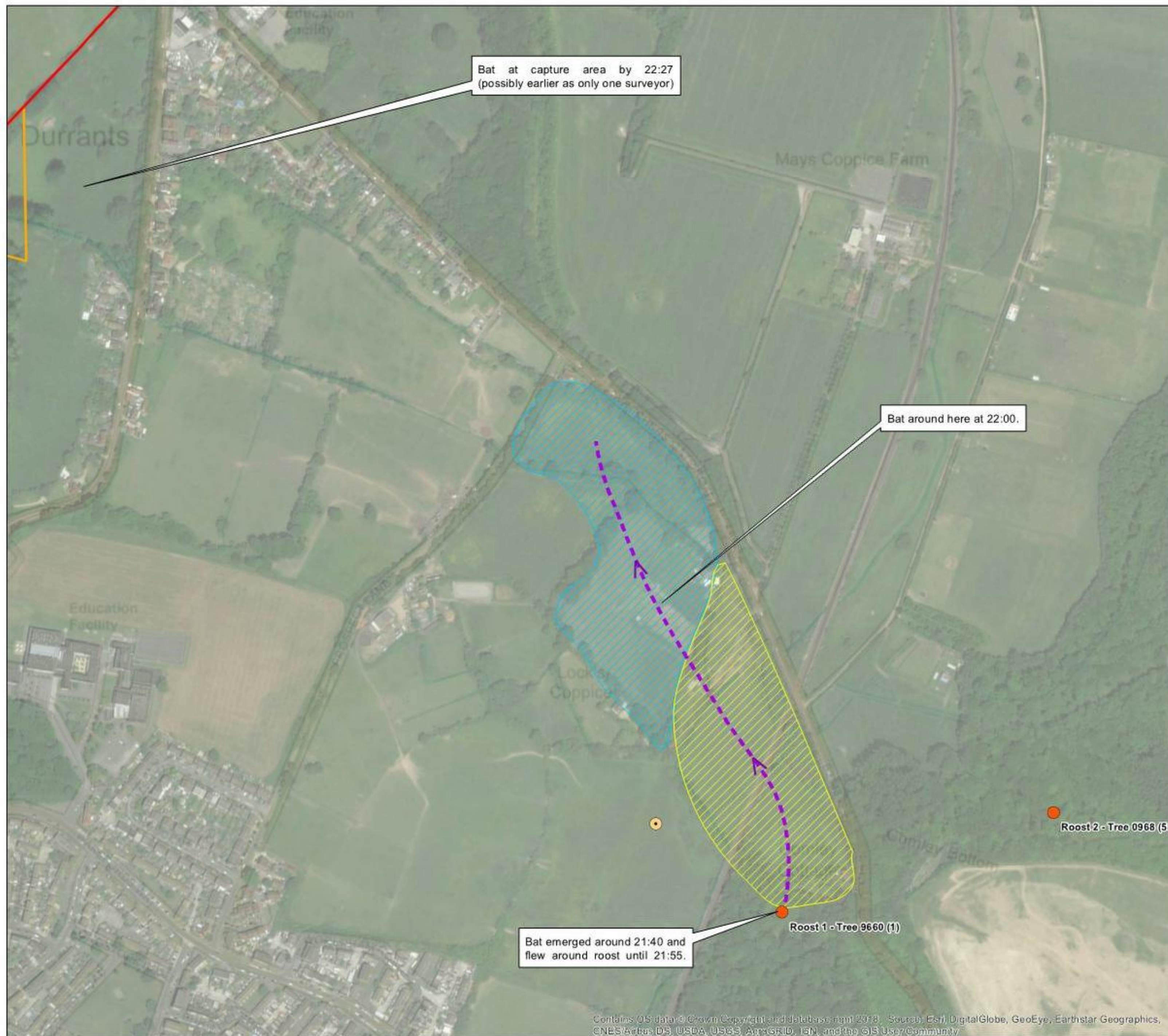
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Map D33 Bechstein's Bat Female 277 17th-18th July Movements



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D33 - Bechstein's Bat Female 277:
17th-18th July Movements

Client: Portsmouth Water

Date: April 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Surveyor Location
- Tree Roost
- - - - - Approximate Direction of Flight
- Area of Travel: Highly likely, high level of confidence
- Area of Travel: Likely, lower level of confidence

N.B. Bechstein's Bat Female 277 is a non-breeding female.

Maximum bat counts within roosts are indicated in brackets. Refer to Map D32 for more detailed radio tracking data where bat is in Staunton Country Park.

Scale at A3: 1:4,500

0 100 200
Metres

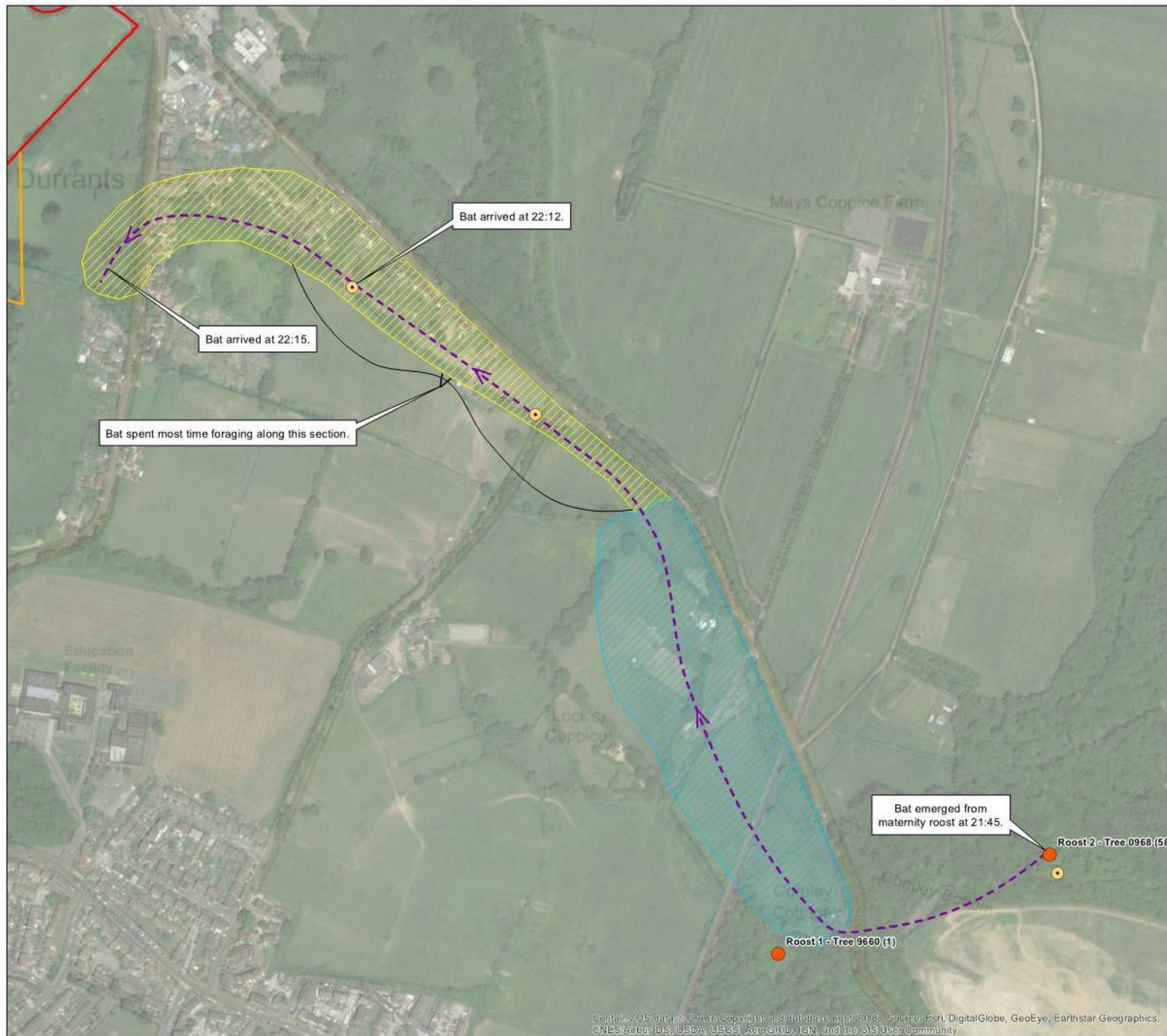


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Map D34 Bechstein's Bat Female 277 19th-20th July Movements



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D34 - Bechstein's Bat Female 277:
19th-20th July Movements

Client: Portsmouth Water

Date: April 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Surveyor Location
- Tree Roost
- Approximate Direction of Flight
- Area of Travel: Highly likely, high level of confidence
- Area of Travel: Likely, lower level of confidence

N.B. Bechstein's Bat Female 277 is a non-breeding female.

Maximum bat counts within roosts are indicated in brackets. Refer to Map D32 for more detailed radio tracking data where bat is in Staunton Country Park.

Scale at A3: 1:4,500

0 100 200 Metres

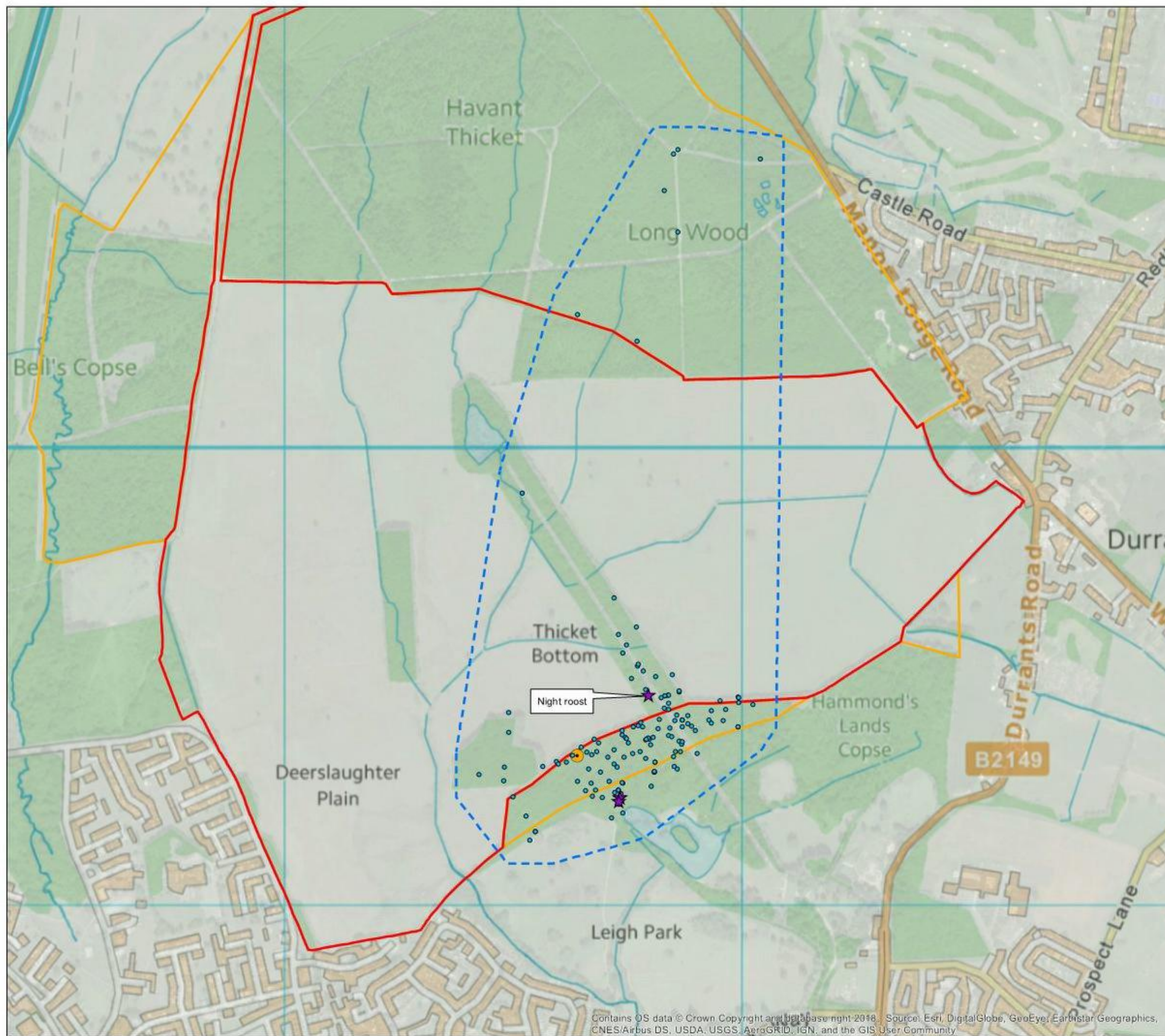


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Map D35 Bechstein's Bat Female 2957 Range (Radio Tracking August 2018)



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D35 - Bechstein's Bat Female 2957
Range: Radio Tracking 20th-24th August 2018

Client: Portsmouth Water

Date: April 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Range (August 2018)
- Location Fixes (August 2018)
- Bat trapped at NGR: SU 71632 09343 on 20th August 2018
- ★ Roost Locations

N.B. Bechstein's Bat Female 2957 is a non-breeding female and was recorded roosting alone throughout the radio tracking survey period.

Location fixes comprise triangulated co-ordinates of bat locations from two points, as recorded by surveyors at 10 minute intervals. Bats were followed through the night and co-ordinates were taken when bats were active (i.e. flying).

Scale at A3: 1:8,000

0 50 100 200 300 400 Metres



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Map D36 Bechstein's Bat Female 2957 20th – 21st August 2018

Map D37 Bechstein's Bat Female 2957 21st-22nd August Movements

HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D37 - Bechstein's Bat Female 2957:
21st-22nd August 2018 Movements

Client: Portsmouth Water

Date: June 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Range (August 2018)
- Key Foraging Area (93% of the time)
- Occasional Foraging Area (5% of the time)
- - - - - Approximate Direction of Flight
- Locations Bat Heard
- ★ Roost Locations

N.B. Bechstein's Bat Female 2957 is a non-breeding female and was recorded roosting alone throughout the radio tracking survey period.

Bat 2957 was recorded moving northwards in a route around the site as indicated from 22:50-23:05. The bat was recorded roosting at NGR: SU 71795 09459 from 01:20-01:45.

Scale at A3: 1:6,500

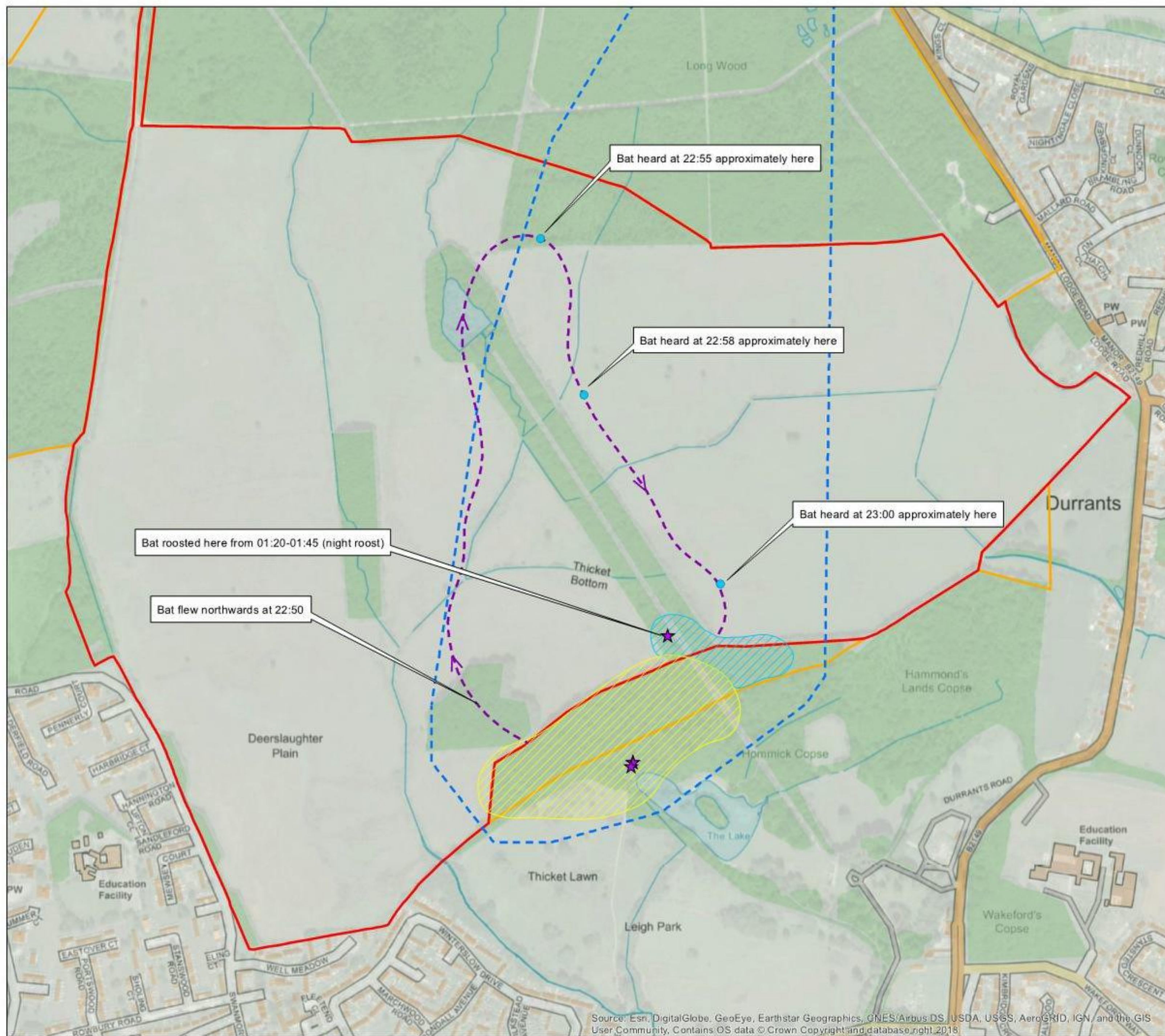
0 75 150 300 Metres



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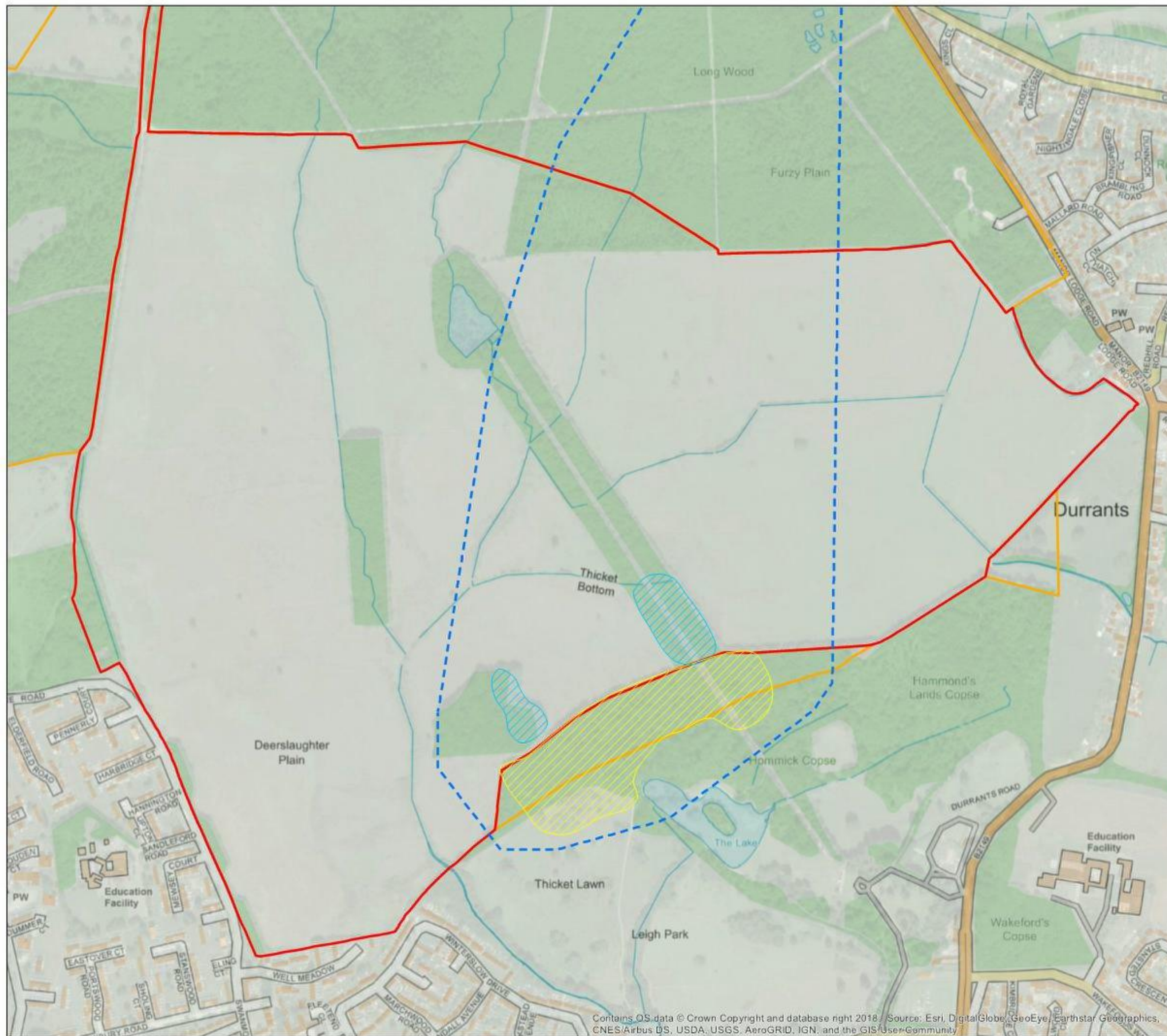
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Map D38 Bechstein's Bat Female 2957 23rd-24th August Movements



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D38 - Bechstein's Bat Female 2957:
23rd-24th August 2018 Movements

Client: Portsmouth Water

Date: April 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)
- Range (August 2018)
- Key Foraging Area (approximately 94-96% of the time)
- Occasional Foraging Area (4-6% of the time)

N.B. Bechstein's Bat Female 2957 is a non-breeding female and was recorded roosting alone throughout the radio tracking survey period.

Scale at A3: 1:6,500

0 75 150 300 Metres



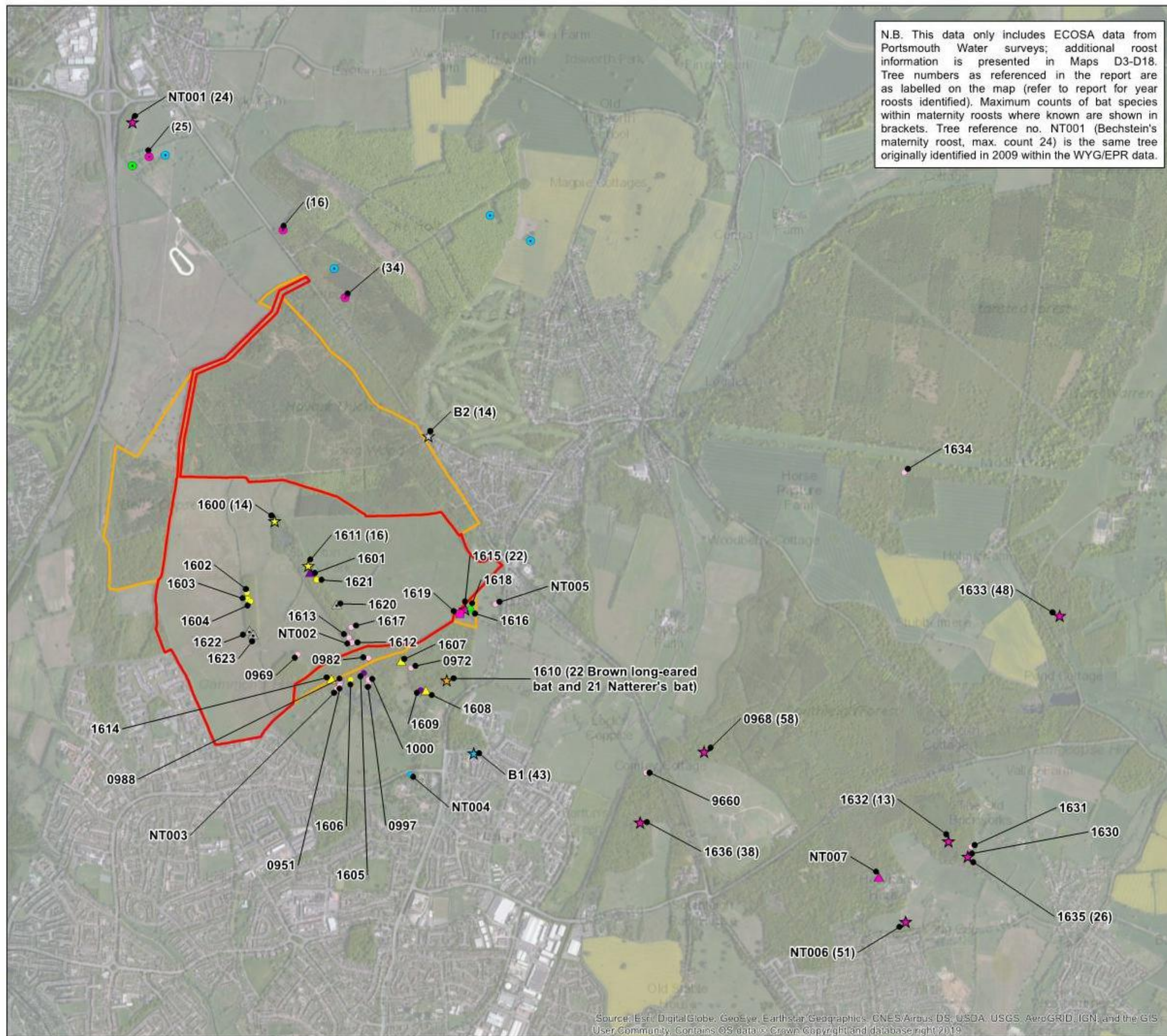
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Map D39 Location of Bat Roosts Identified Within and Surrounding the Site 2008-2018



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D39 - Location of Bat Roosts Identified
Within and Surrounding the Site 2008-2018

Client: Portsmouth Water

Date: October 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)

ECOSA Records 2008-2018 (max. count)

- Bechstein's bat maternity roost
- Brown long-eared bat and Natterer's bat maternity roost
- Brown long-eared bat maternity roost
- Whiskered bat maternity roost
- Common pipistrelle maternity roost
- Bechstein's bat roost (seven individuals)
- Bechstein's bat roost (three individuals)
- Bechstein's bat roost (one individual)
- Brown long-eared bat roost (three individuals)
- Brown long-eared bat roost (one individual)
- Natterer's bat roost (three individuals)
- Natterer's bat roost (one individual)
- Soprano pipistrelle and Whiskered bat / Brandt's bat roost
- Common pipistrelle roost (one individual)
- Bat droppings recorded only

WYG/EPR Records 2009 and 2014 (max. count)

- Bechstein's bat maternity roost
- Bechstein's bat day roost (two individuals)
- Bechstein's bat day roost (one individual)

Scale at A3: 1:20,000

0 250 500 1,000 Metres

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Map D40 Location of Bat Boxes Erected During 2018



HAVANT THICKET WINTER STORAGE RESERVOIR

BAT ASSESSMENT

Map D40 - Location of Bat Boxes Erected 2018

Client: Portsmouth Water

Date: October 2019

Status: Final

KEY

- Site Boundary (the site)
- Ecological Enhancement Area (wider site)

Location of Bat Boxes

Box Type

- Schwegler 1FW
- Schwegler 2FN

Scale at A3: 1:6,500

0 75 150 300 Metres



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Map D41 Assessment of Brown Long-eared Bat Colonies

Map D42 Key Foraging Areas and Movements of Bechstein's Bat (2008 2009, 2014, 2018)

Appendix D1 Assessment of Bechstein's Bat Population Size and Time Spent Foraging on
the Havant Thicket Winter Storage Reservoir Site

HAVANT THICKET RESERVOIR PROJECT

TECHNICAL NOTE



Pages:	11	Action from meeting:	10 th July 2019
Purpose:	Response to Natural England comments	Date:	23 rd December 2019
Subject:	ASSESSMENT OF BECHSTEIN'S BAT POPULATION SIZE, WORST CASE SCENARIO AND TIME SPENT FORAGING ON THE HAVANT THICKET RESERVOIR SITE.		

1. Introduction

1.1 This technical note provides details of analysis in response to questions raised by Natural England at a meeting on 10th July 2019. The meeting was attended by John Stobart (NE planning and conservation), Sue Crutchley (NE EPS Licencing), Tristan Norton (LPA ecologist), Simon Boswell (ECOSA) and Tracey Viney and Trevor Codlin (Portsmouth Water (PW)).

1.2 The focus of the meeting was to discuss impacts of the proposed Havant Thicket Reservoir (HTR) on bats, European protected species licencing and further discussion on woodland habitats.

1.3 Some specific areas that the NE Licensing officer suggested PW look at in more detail with regard to Bechstein's bats *Myotis bechsteinii* were;

- The percentage of the colony that has been tagged to date; and
- The percentage of time that Bechstein's bats have been spending on the HTR site.

1.4 Following further discussion with Sue Crutchley from NE, it was suggested that a 'worst case scenario' assessment of the proposals on the local Bechstein's bat population should also be carried out.

1.5 This technical note should be read in conjunction with the Havant Thicket Reservoir bat report produced by ECOSA¹, and therefore it assumes the reader has a certain knowledge of the project to date and extent of bat survey work.

1.6 As a result of detailed survey work and our understanding of the species' ecology PW/ECOSA have assumed the local Bechstein's bat population to be made up of one population within the 3km study area. This assumption is based on the following;

- In 2008 a maternity roost of 22 bats was recorded in parkland located adjacent to the proposed reservoir site and to the east of Hammond's Lands Copse. Although not specifically proven, when trapping and radio-tracking work was carried out in 2009, bats were no longer using the 2008 roost, but a roost of a similar size (24) was located in Dell Piece, approximately 3km to the north. Tracked bats from that roost were recorded foraging in Havant Thicket as were bats from the 2008 roost in Staunton Country Park (SCP), suggesting some overlap in foraging areas for a species that is known to be territorial.
- In 2014 surveys were carried out on land around the Holt and Stein Wood by Ian Davison-Watts, the same area where Dell Piece is located, in relation to a proposed housing development; a Bechstein's bat maternity roost was still recorded in that area. At the same time surveys were carried out in SCP for Hampshire County Council, adjacent to the proposed reservoir site, no Bechstein's bats were captured.

¹ HTWSR – Chapter D – Bats – Ecological Impact Assessment FINAL 310519.

- Survey work carried out by PW/ECOSA in 2018 on and adjacent to the proposed reservoir site only recorded the roosts of non-breeding female or male bats despite extensive effort. A maternity roost of 58 bats was recorded in the western part of Southleigh Forest at Comley Bottom with a bat from that roost travelling to SCP to forage. Our studies have therefore confirmed a functional link between a female Bechstein's bat roosting at Comley Bottom and Barton's Copse, and the woodland immediately adjacent to the HTR site at SCP, a distance of 1.7km.

- 1.7 The Bat Conservation Trust have been working on defining Core Sustenance Zones (CSZ) for different species through an extensive literature review². For Bechstein's bat the CSZ is considered to cover a radius of around one kilometre. However, they recommend that for Annex II (and other rare) species there may be justification to increase the CSZ to reflect use of the landscape by all bats in a population. With regard to Bechstein's bat they suggest increasing the CSZ to at least 3km, reflecting its specific habitat requirements.
- 1.8 PW/ECOSA survey work has been carried out over a 3km radius of the proposed reservoir site and has recorded Bechstein's bats travelling over 1.5km from a roost location to forage on numerous occasions. We consider that 3km is the appropriate distance to consider as a CSZ for this species, given the fragmented nature of the woodlands in this area and the potential numbers of bats present in each roost.
- 1.9 This assessment document has been prepared by Trevor Codlin MCIEEM, Natural England bat licence number 2015-12342-CLS-CLS (CL18 (Bat Survey Level 2) of Portsmouth Water.

2. Background

- 2.1 Prior to 2008 there was only a single record of Bechstein's bat in the south-east of Hampshire, all other records were generated from the New Forest, as part of the Hampshire Bat Group's New Forest Bechstein's and Barbastelle Bat Project.
- 2.2 Following the confirmation of Bechstein's bat in the local area in 2008, PW, through their consultants ECOSA, have carried out extensive survey work, involving the capture and radio tracking of individual bats on the site and within a 3 kilometre radius of the site in 2008, 2009 and 2018.
- 2.3 The level of survey work carried out has been essential in order to fully understand the status of the species in the local area, the population size and the extent to which the species uses the HTR site and the wider area.
- 2.4 As a result of all the survey work to date by PW/ECOSA and other consultants/bat workers, Bechstein's bats have been recorded in woodlands extending from Dell Piece in the north-west, Blendworth/Wick Hanger and Stansted Forest in the north-east of the proposed reservoir site to Southleigh Forest and Hollybank Woods in the south-east.

3. Percentage of Bechstein's bat population tagged

- 3.1 To date PW/ECOSA survey work has resulted in the capture and tracking of 16 Bechstein's bats over a total of 39.5 nights during 2008, 2009 and 2018. The length of time that each bat has been tracked varies from one to four nights, but across the total it averages out at 2.47 nights per bat. The reason for the variation is that in some instances tags have become detached or stopped working and further tracking was subsequently not possible.

² Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn.) The Bat Conservation Trust, London. (p 30)

- 3.2 Each radio-tracked bat has been tracked back to its roosting location and where feasible emergence surveys have been carried out. In some cases this has not been possible, in particular where roosts have been located high up in a tree and out of view, or where they have been located on private land and access has not been possible.
- 3.3 In the summer of 2009 counts of Bechstein's bat roosts in four woodlands within 3km of the proposed reservoir site recorded 38, 24, 51 and 48 bats. A simultaneous count of three of those roost trees on the same evening in July, confirmed a minimum population of 108 bats.
- 3.4 Following further discussions with NE, in particular in relation to assessing the 'worst case scenario', it was suggested that we treat each area as a separate colony. To establish this we have grouped areas according to the location of a maternity roost and recorded foraging activity.
- 3.5 In order to calculate the percentage of the population tagged we have used the 2009 figure of 108, as this still represents the best available information by which to calculate minimum population size. On this basis the percentage of the population tagged is 14.81%, comprising 14 females and two males.
- 3.6 However, if we take the maximum roost count from each of the presumed different colonies the combined total of 191 is achieved (across several years), see Table 1 below. Using this figure to provide the minimum population it suggests that we have tagged 8.4% of the population, comprising 14 females and two males.

Table 1: Summary of presumed Bechstein's bat colony areas

Colony No.	Colony Area	Peak no. of bats recorded emerging
1.	HTR site, Staunton CP, southern part Havant Thicket, western part of Southleigh Forest including Barton's Copse.	58
2.	Stein Wood, Dell Piece & Hazelton Farm, northern part Havant Thicket	34
3.	Hollybank Wood, Longcopse Hill and southern part of Southleigh Forest	51
4.	Stansted Forest, Lyels Wood and The Groves area	48

- 3.7 Therefore the presumed percentage of the population tagged is considered to be between 8.4% and 14.81%. It is worth noting that other consultants have been trapping and tagging Bechstein's bats in the local area, and as far as is known, none of those captured by PW/ECOSA have been re-trapped as part of these works. All of the Bechstein's bats trapped by PW/ECOSA were fitted with metal rings with unique number combinations so they would be identifiable.
- 3.8 A licence was obtained from Natural England (Reference no. 2018-33676-SCI-SCI-2) to fit radio transmitters on up to 10 Bechstein's bats during May to mid-August 2018. The trapping period was extended under licence 2018-36925-SCI-SCI to the end of August. However, despite intensive survey effort only four bats were trapped during the 2018 surveys, all of these were radio-tracked.
- 3.9 It is PW/ECOSA's considered opinion that this may suggest that there were few Bechstein's bats in the SCP area in 2018 (where survey work was concentrated), and that a maternity colony was not located close to the proposed reservoir site.

4. Percentage of time spent on the reservoir site

- 4.1 As stated in paragraph 3.1, survey work to date has resulted in the capture and tracking of 16 Bechstein's bats over 39.5 nights during 2008 (5 bats, 12 nights), 2009 (7 bats, 16.5 nights) and 2018 (4 bats, 11 nights).
- 4.2 These bats were captured within a 3km radius of the proposed HTR site, in an area extending from Dell Piece in the north-west to Hollybank Woods in the south-east.

- 4.3 Radio-tracking data from 2018 has proven a functional link between the maternity roost at Comley Bottom and Barton's Copse (located in the western Southleigh Forest area) and foraging bats at SCP. In addition, non-breeding bats foraging and roosting in SCP have been shown to forage to the north of the HTR site, in Havant Thicket. Furthermore, bats from the Dell Piece/Stein Wood area have also been recorded foraging in Havant Thicket, to the north of the proposed reservoir site.
- 4.4 Radio-tracking surveys employed two methods, 'triangulation' for wider ranging bats, and 'close-approach' where it was possible to follow bats on foot and remain in contact. The locations of tracked bats were taken every 10 minutes, with the information plotted on a map in order to show the relative amount of time spent in each area. This information is presented in the ECOSA 2013 and 2018 bat reports.
- 4.5 The radio-tracking of each individual bat has been totalled and then averaged over the number of nights tracked to provide comparable data for foraging activity for each bat. This approach was adopted because individual bats have been tracked over different numbers of nights, therefore it would present a bias in the time spent at each location if total tracking time was used.
- 4.6 Figure 1 provides a breakdown of the percentage time each bat spent in each area, for ease of reference each area has been coloured differently.
- 4.7 Overall the data illustrates that the percentage of time that Bechstein's bats foraged on the HTR site was 17.74% whereas off-site was 82.26% (Figure 1). The Avenue was the most used part of the proposed reservoir site with 11.09% of the time spent within it. The most used location overall, and therefore the most important site for this population would appear to be SCP where 23.60% of recorded time was spent in this location. However, it is important to acknowledge that SCP has been the area where survey effort has been focused given its proximity to the proposed reservoir site and therefore the time spent in other woodlands with less survey effort will be underestimated³.
- 4.8 Looking at the data in more detail it is also worth noting that the figures above are calculated using data for all bats e.g. both males and females. Radio-tracking has shown that males have a more restricted foraging range, staying within a smaller area and closer to their roost, whereas females tend to range more widely. During the PW studies two male Bechstein's bats were radio-tracked, both were caught in SCP. One bat spent 90.85% of its time in The Avenue and 1.85% in Havant Thicket, 7.3% was unknown. The other male bat spent 98.33% of its time in SCP and 1.67% on The Avenue.
- 4.9 If male bats are removed from the analysis the overall time female bats spent foraging on the HTR site drops to 13.66% of total time and off-site foraging increases to 86.34% (Figure 2). The amount of time spent on The Avenue decreases to 6.06% of the overall time. SCP still remains the most used site with 19.95% of total time spent on it, the parkland area east of Hammonds Lands Coppice was used 8.91% of the time.

³ It is worth noting at this point that PW do have access to the WYG survey data for the application Land East of Horndean. We have not used this data in our analysis as it is not ours and has been calculated in a different way to PW/ECOSA data. However, if this data was used would reduce further the percentage of time radio-tracked bats spent on the proposed reservoir site, since no bats from that study travelled beyond Havant Thicket.

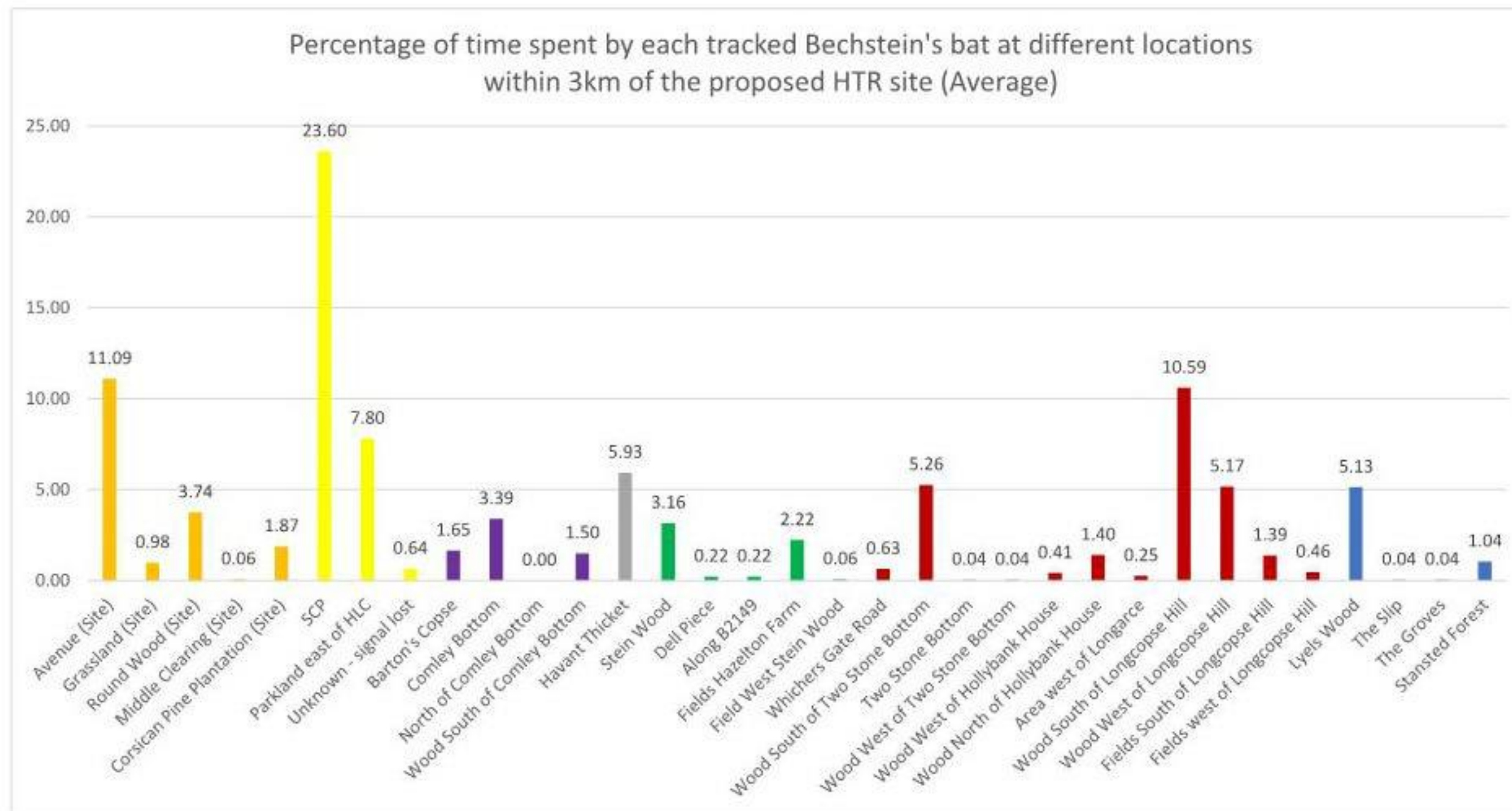


Figure 1: A comparison of the percentage of average time each bat spent foraging in each area. Columns in orange relate to the HTR site; other colours relate to off-site broad areas.

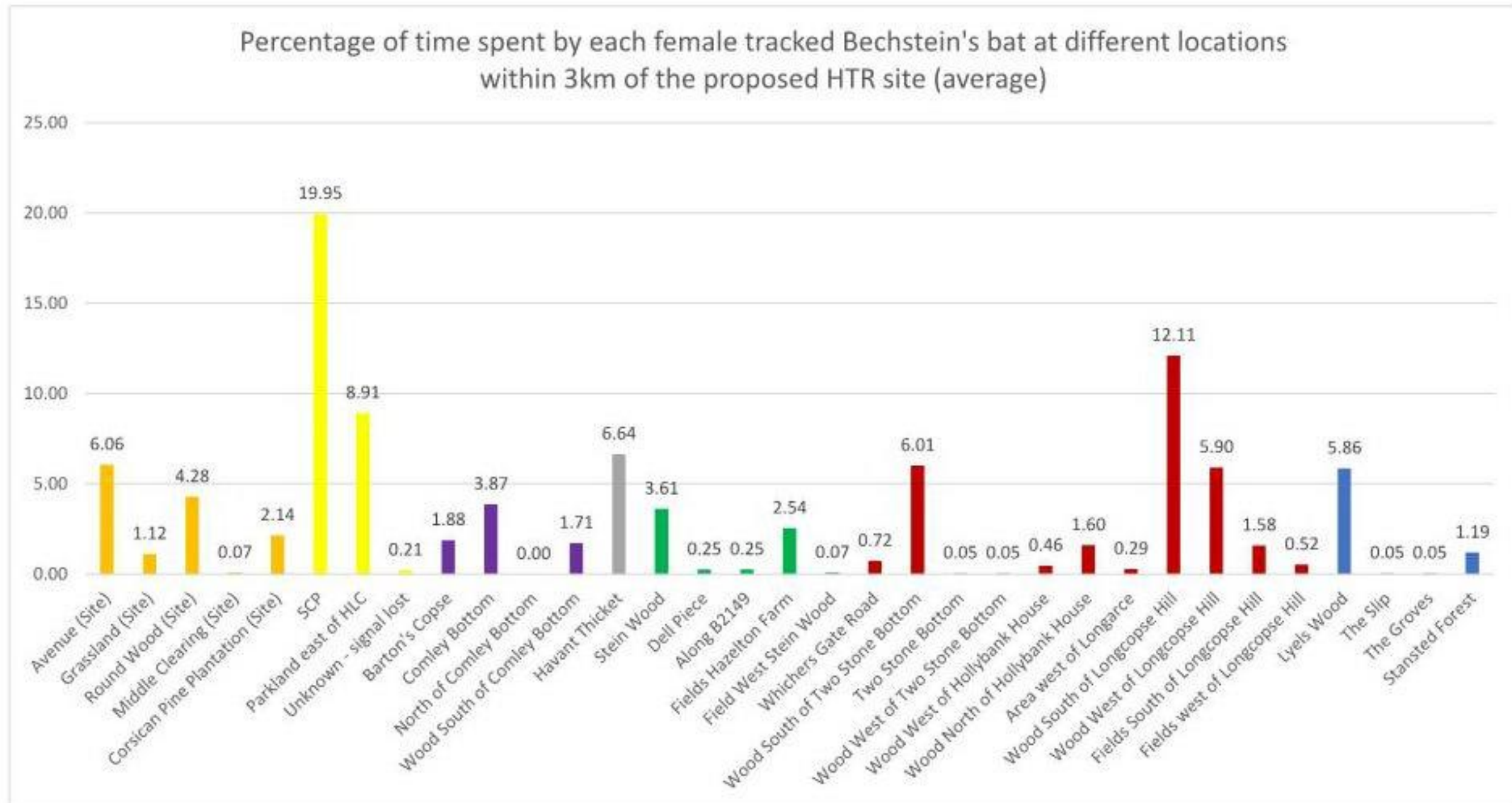


Figure 2: A comparison of the percentage of average time each female bat spent foraging in each area. Columns in orange relate to the HTR site; other colours relate to off-site broad areas.

5. Worst Case Scenario Assessment

- 5.1 In order to make a 'worst case scenario' assessment of the potential impacts of the proposals on the local Bechstein's bat population, Natural England have requested that each maternity group is assessed as being a separate colony.
- 5.2 To do this we have reviewed data presented on Maps D5 – Desktop Study Data: Location of Sites with Trapping and/or Tracking Surveys for Bechstein's Bat within 3km dated October 2019 and D42 – Bechstein's Bat Roosts, Foraging Areas and Movements Recorded Between 2008 and 2019 dated October 2019 of the PW/ECOSA report.
- 5.3 We have then grouped areas where there has been recorded activity centred on a known maternity roost. However, it should be noted that some degree of interchange has been recorded between some different areas making it difficult to define where boundaries between some colonies might lie.
- 5.4 For the purposes of this assessment we have assumed that there are four different colonies, see Table 1 and Figure 3.

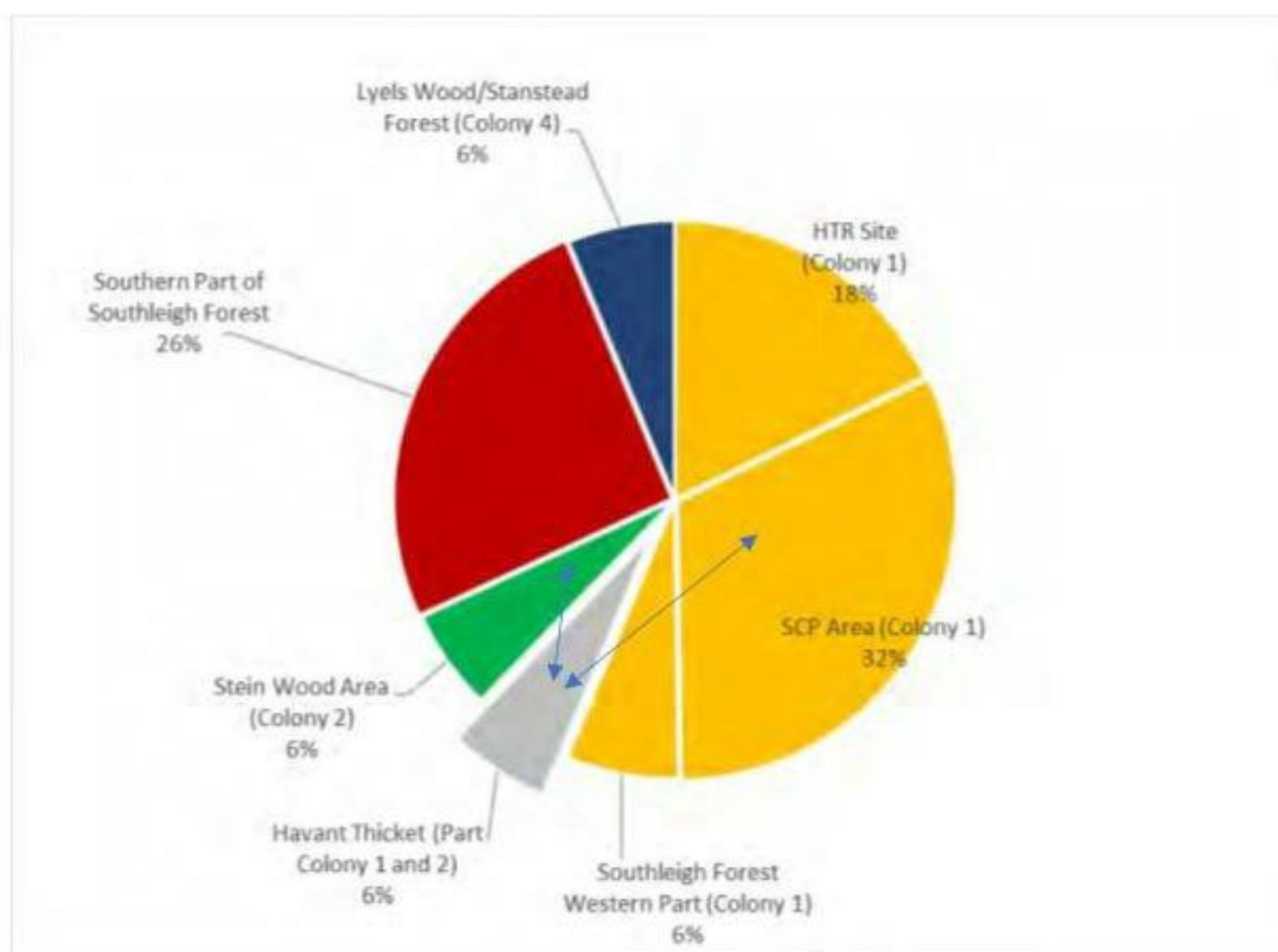


Figure 3: The above chart illustrates the broad foraging areas grouped to indicate the locations of each presumed Bechstein's bat colony. Arrows indicate where there is interchange between colonies into Havant Thicket.

- 5.5 We have concluded that there are potentially four colonies based on the following information;

1. Radio-tracking work has proven a functional link between bats roosting in the western part of Southleigh Forest and foraging in SCP and along The Avenue. During 2018, a maternity colony was not recorded in SCP, therefore we have assumed that bats roosting on the proposed

- reservoir site, SCP and the Barton's Copse area are one colony. Tracked bats occasionally foraged in the southern part of Havant Thicket.
2. Radio-tracking work in 2009 by PW/ECOSA tracked a bat captured in The Holt, Stein Wood back to roosts in Dell Piece, a small wood located adjacent to the A3M and on land at Hazleton Farm. The tracked bat only foraged within Stein Wood/The Holt, grassland within Hazleton Farm and the northern part of Havant Thicket. Additional tracking work was carried out by Ian Davison-Watts in this area in response to development proposals recorded similar patterns of activity in this area as the PW/ECOSA work.
 3. Radio-tracking work in 2009 recorded bats foraging in and around Hollybank Wood, House and Farm and the associated woodland and pasture land, Longcopse Hill and occasionally venturing north of Emsworth Common Road into Twostone Bottom (southern part of Southleigh Forest). No interchange between tracked bats in this area and those tracked in the west of Southleigh Forest (Colony 1) was recorded in 2009 nor 2018.
 4. Radio-tracking work in 2009 recorded bats foraging in Lyels Wood, Stansted Forest and the Grove. There was no interchange between bats using these areas and other sites.
- 5.6 Of the four potential colonies identified, only bats from Colony 1 have been recorded using the proposed reservoir site.
- 5.7 A combination of the 2008, 2009 and 2018 works has shown that bats roosting in the Colony 1 area exploit a large area that extends from Havant Thicket in the north to the western extreme of Southleigh Forest, including Barton's Copse and SCP.
- 5.8 Maternity roosts have been recorded in Barton's Copse, Southleigh Forest and the parkland east of Hammonds Lands Coppice. Non-breeding female and male roosts have been located in SCP, Round Wood (site) and The Avenue (site).
- 5.9 Foraging bats have been recorded using Southleigh Forest, SCP, The Avenue, Round Wood and the southern part of Havant Thicket. Commuting/foraging routes have included the fields south of the B2148 and the woodland strip east of Gipsies Plain and grassland which forms the eastern part of it. Following agreement from NE, the LPA and HIWWT part of the grassland at the extreme eastern end of has now been planted, this will form part of the advance mitigation works to improve connectivity and provide additional foraging resource.
- 5.10 Figure 4 provides a breakdown of time foraging bats from Colony 1 spent in each broad area. We can conclude from this that tracked bats from Colony 1 spent 29% of their time on the reservoir site. However, it is worth noting that this includes both males and females and that PW/ECOSA survey work has prioritised this area given its proximity to the proposed HTR sites, and it is where they were first recorded.

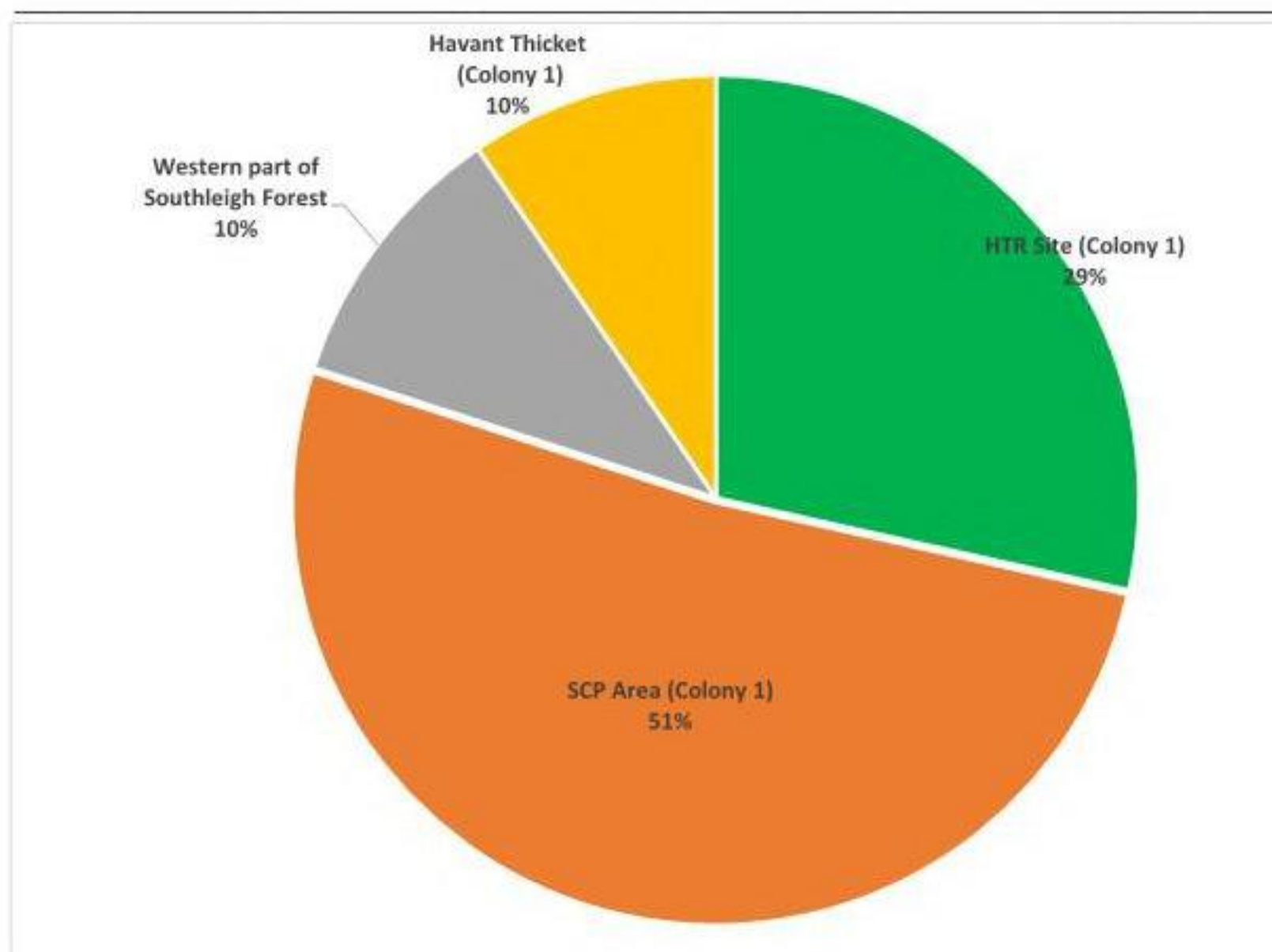


Figure 4: The above chart illustrates the broad foraging areas of Colony 1

5.11 In order to establish the 'worst case Scenario' and area of Bechstein's bat habitat that will be lost as a result of the reservoir proposals, we have drawn a rough perimeter polygon around the total survey area where Bechstein's bats have been captured and tracked using Google Earth. This provides a total area of 1,800ha.

5.12 We have then used the same approach to establish the total area used by Colony 1; this provides a total of 250ha that was used for foraging across the area from the western part of Southleigh Forest, Barton's Copse to Havant Thicket. It is worth noting that this approach will inevitably include areas of habitat that are unsuitable, and also areas that are only used for commuting rather than foraging and roosting. In addition the assessment is calculated on the bats tracked only, therefore it is acknowledged that there will be other bats from the colony that have been recorded foraging in other areas. Nonetheless it provides us with a rough figure from which to base this assessment.

5.13 The proposals will lead to the loss of approximately 130ha of open grassland and woodland, including the linear strip of woodland known as The Avenue that links SCP to Havant Thicket. However, radio-tracking has shown that it is only approximately 70ha that was used by Bechstein's bats for foraging and/or roosting, and of that approximately 50ha are grassland, the remaining areas are woodland. Analysis has shown the grasslands to be the least used habitat (2% of time, Figure 5) and mainly used for commuting, with the woodlands the most used (27% of time, Figure 5).

5.14 Working on the above basis we estimate that the total area of Bechstein's bats habitat to be lost on the 'worst case scenario' as part of the proposals is 70ha, which equates to 4% of the total area used by tracked bats or 28% of the total area used by Colony 1. However, it should be noted that only 14ha of the site comprises woodland, and therefore the actual area lost is much lower.

- 5.15 It is important to point out that the 2018 radio-tracking work was focused on SCP in order to establish if a maternity roost was present. During this work only four bats were radio-tracked, this comprised one male and three females. A total of 18.92% of the time bats were tracked was spent on the reservoir site, with 81.08% spent offsite. This total broadly mirrors the overall data.
- 5.16 The only bats to roost on the site were a male and non-breeding female. A bat from the maternity roost in the south-east of the Colony 1 area (Comley Bottom and Barton's Copse) was tracked to Hammonds Lands Copse, the parkland east of it and Havant Thicket. This bat only crossed the eastern part of the site over Gipsies Plain to access Havant Thicket, over the area that has now been planted as part of the early mitigation works.
- 5.17 Figure 5 provides a breakdown of areas used by all the tracked bats (2008, 2009 & 2018) within the Colony 1 area. The woodlands of The Avenue (18%), Round Wood (6.05%) and the Corsican Pine Plantation (3%) were unsurprisingly the most used areas, the grassland was used for only 2% of the time.

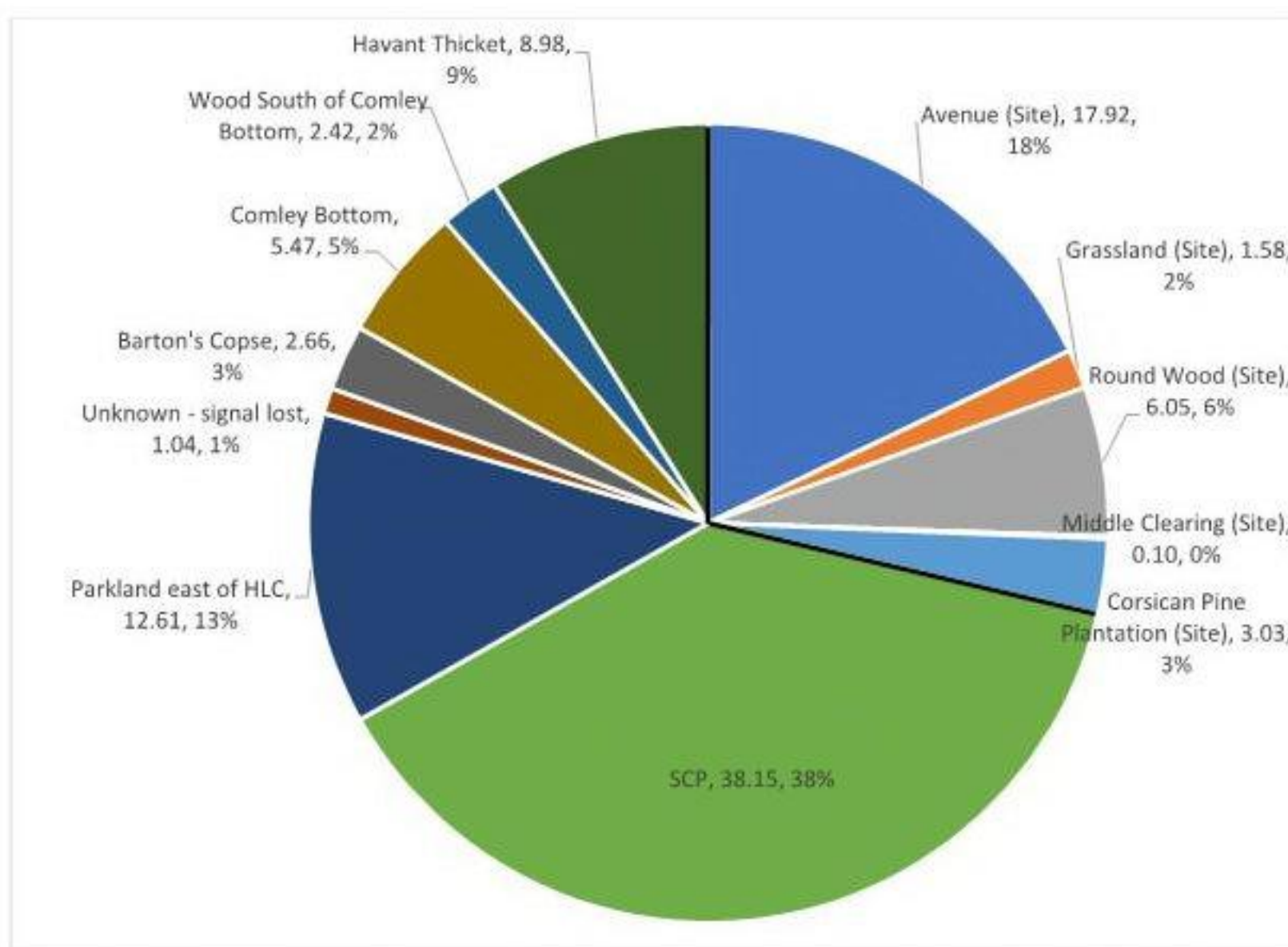


Figure 5: A breakdown of the percentage of time that bats spent in different areas within Colony 1 area. The top left segments within the solid black lines are time spent on the site.

6. Evaluation of Analysis

- 6.1 It is evident from this analysis that the local Bechstein's bat population is exploiting a variety of habitats within the local landscape. The proposed HTR site plays its part through use by individual males and non-breeding females for roosting and foraging. When a maternity roost is located in close proximity to the site, The Avenue also plays an important role as a corridor linking SCP to Havant Thicket.
- 6.2 The loss and fragmentation of habitat across the wider landscape is likely to be a significant issue for the species in the future and therefore it is critical that foraging and commuting routes, and

existing known breeding areas are protected and enhanced, if the favourable conservation status of Bechstein's bat is to be maintained.

- 6.3 PW/ECOSA survey work has demonstrated that foraging/commuting bats already use the habitat around the eastern edge of the proposed reservoir to commute to Havant Thicket. As part of the mitigation strategy, PW have already planted a new woodland corridor with a variety of tree species in order to strengthen the connectivity in that area. Hedgerow enhancements and planting have also been carried out around the eastern perimeter of the site.
- 6.4 PW are also proposing to plant up other areas along the western boundary in order to strengthen connectivity along the western edge of the proposed reservoir. Agreement for this approach has been reached with NE, the LPA and HIWWT. This planting is scheduled to be carried out during the winter of 2019/20.
- 6.5 Mitigation measures include the management works to approximately 56ha of dense secondary birch woodland within Havant Thicket. Survey work to date has demonstrated that these areas are little used by foraging bats and therefore the proposed works are designed to improve the quality of habitats by providing better foraging for bats in the local area, increasing edge habitats, improving rides and creating clearings.
- 6.6 Mitigation measures also include the erection of a variety of bat boxes within Havant Thicket and SCP to increase the number and variety of roosting features. Eleven boxes have already been erected, comprising three Schwegler 1FW (these have been used by Bechstein's bats in other woodlands) and eight Schwegler 2FN. A further 75 bat boxes are proposed to be erected throughout SCP and Havant Thicket.
- 6.7 In order to protect the ancient semi-natural woodland of SCP the southern edge of the reservoir embankment has been moved north from its original proposed location. This will ensure that these woodlands will not be impacted by the proposals and will remain available as an important foraging and roosting resource for the local Bechstein's bat population. In addition a minimum 25m buffer will be retained between the woodland edge and the toe of the reservoir embankment.
- 6.8 PW is committed to delivering a Capital Grant Scheme that will deliver conservation projects in the local area. Projects will be judged against certain criteria, which are yet to be determined, but will include support for targeted projects aimed at delivering enhancements in the local area for Bechstein's bats. Such areas will be identified in part by known foraging and commuting areas.
- 6.9 Further mitigation proposals include the development of a new wetland along the northern edge of the reservoir. The interface between the southern edge of Havant Thicket and the northern edge of the reservoir will provide an enhanced foraging area for bats, including Bechstein's, which are known to forage in woodland sites where they are located in close proximity (up to 1km) to water⁴.

7. Conclusion

- 7.1 PW acknowledge the importance of the local landscape for Bechstein's bat and consider that the loss of The Avenue as a foraging/commuting resource can be compensated through additional planting around the western and eastern sides of the proposed reservoir, the management of habitats and roost creations, north and south of the proposed reservoir site at Havant Thicket and through the provision of our capital grant scheme to deliver new and enhanced habitats in the wider landscape. Further enhancements will be delivered by the creation of a new wetland, which we consider will offer enhanced foraging habitat for many bat species, including the local Bechstein's population.
- 7.2 Given the suite of mitigation and enhancement measures being proposed we are confident that the 'favourable conservation status' of Bechstein's and other bat species can be maintained.

⁴ Johns Associates (2019) Trowbridge Bat Mitigation Strategy SPD – Prepared in support of the Draft Wiltshire Housing Sites Allocation Plan. Paragraph 65

Appendix D2 Bat Survey Report 2008 – 2009

The 2008 – 2009 report has not been appended due to the size of the document, but is available on request as additional background data, but the results are summarised within the main text of this bat report.

Appendix D3 Bat DNA Analysis Results

[illegible]

Folio No: E3007
 Report No: 1
 Order No: 3566
 Client: ECOSA
 Contact: Simon Boswell
 Contact Details: sboswell@ecosa.co.uk
 Date: 19/06/2018

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA FOR THE DETECTION OF BAT SPECIES

Date sample received at Laboratory: 23/05/2018
Date Reported: 19/06/2018
Matters Affecting Results: Required additional processing. Reserve sample amplified with U16S marker to give indistinguishable Myotis sp.

RESULTS

Lab Sample ID.	Site Name	O/S Reference	Genetic Sequence	Common Name	Result	Sequence Similarity
E3007	Havane Thicket	3566	CTCACGAATTAATAACAATATTCTACC ATAAACAAACCTGCTTCAATTGAGTTG ACAATTTAGGTTGGGGTGACCTCGGA ATAAAATTAACTCCCGAGAAAATTTT AATTAAGACCTAC AAGTCAAAGTTATTCTCATTATATACT GATCCGTTAAAAACGATCAACGAAATA AGTTACCCTAGGGATAACAGCGCAAT CCTATTAAAGAGTCCATATCGACAATT ACGGTTTACNACC TCGATGTTGGATCAGGACATCCTAATG GTGCAGCCGCTATTAATGTGTTGTTT GTTCAACGATTAAAGTCTACGTGATC TGANANNN	Indistinguishable Myotis sp.		NA%

METHODOLOGY

First, the DNA from a single bat dropping is extracted and purified. Then, a short fragment of a mitochondrial gene is amplified using polymerase chain reaction (PCR). If the analysis is unassigned the first time, the reaction is performed with different

primer. The amplified product is analysed on a gel to confirm that the expected product size was amplified. It then goes through one more purification step before being Sanger sequenced. The sequence results are aligned against a library of known bat reference sequences using bioinformatics software, and we are able to confirm that the dropping sample came from a certain bat species with the reported percent sequence similarity.

INTERPRETATION

Degradation: Samples are extracted following protocol. If DNA is unsuccessfully amplified with SFF primers, specific to bat genome, the reserve samples are then extracted following protocol yet this time with a restorase enzyme which helps repair degraded DNA. If the reserve samples are amplified unsuccessfully, then the sample is amplified with universal 16S primers, these universal primers will amplify the most prolific DNA in the sample so will detect Bat mitochondrial DNA if it is there, or mouse DNA or bacterial DNA. If bacterial DNA is found this is an indicator that the sample has degraded to such an extent that the SFF primers can no longer detect Bat DNA. If no DNA is amplified whatsoever then the sample has long been degraded as the technique is ultra sensitive. We get few samples with DNA degradation. DNA degrades with time and expedited with the environmental conditions it is exposed to such as sunlight and temperature and moisture, therefore we recommend samples are taken out of direct sunlight, away from moisture and away from warmth where possible. If the sample with the freshest appearance, on top of the surface, is collected taking in to account these environmental parameters then it is likely that the sample has degraded due to the sample being there a long time and Bats may no longer be present. We analyse a sample up to three times to achieve a result. If no DNA is detected after three times, we are confident, there is no longer any DNA in the sample to detect.

Genus: A sample goes through DNA extraction, PCR to amplify, electrophoresis and then genetically sequenced to give the genetic code for that sample GCTATATACGCGC etc. The genetic sequence obtained is used to cross reference against millions of known genomes to find the closest match. If the sample sequence is not long enough due to sample degradation, or if a non specific part of the genetic code is obtained, then the results may indicate the precise genus but not the precise species. This is especially important for Myotis species as there are so many similar Myotis species with very similar genetic coding. If the results come back as non specific for a species, then the sample resubmitted through the entire analysis again to see if a better quality sequence, a longer sequence or a sequence in a different area of the genome could have been obtained so that we were able to differentiate between the species.

Reported by: Emily Ziegler

Approved by: Derry Hickman

End Of Report

Folio No: E3573
Report No:
Order No: 3237
Client: ECOSA
Contact: Admin
Contact Details: admin@ecosa.co.uk
Date: 13/07/2018

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA FOR THE DETECTION OF BAT SPECIES

Date sample received at Laboratory: 29/06/2018
Date Reported: 13/07/2018
Matters Affecting Results:

RESULTS

Lab Sample ID.	Site Name	O/S Reference	Genetic Sequence	Common Name	Result	Sequence Simliarity
E3573	Havant Thicket	NA	Inconclusive			%

METHODOLOGY

First, the DNA from a single bat dropping is extracted and purified. Then, a short fragment of a mitochondrial gene is amplified using polymerase chain reaction (PCR). If the analysis is unassigned the first time, the reaction is performed with different primer. The amplified product is analysed on a gel to confirm that the expected product size was amplified. It then goes through one more purification step before being Sanger sequenced. The sequence results are aligned against a library of known bat reference sequences using bioinformatics software, and we are able to confirm that the dropping sample came from a certain bat species with the reported percent sequence similarity.

INTERPRETATION

Degradation: Samples are extracted following protocol. If DNA is unsuccessfully amplified with SFF primers, specific to bat genome, the reserve samples are then extracted following protocol yet this time with a restorase enzyme which helps repair degraded DNA. If the reserve samples are amplified unsuccessfully, then the sample is amplified with universal 16S primers, these universal primers will amplify the most prolific DNA in the sample so will detect Bat mitochondrial DNA if it is there, or mouse DNA or bacterial DNA. If bacterial DNA is found this is an indicator that the sample has degraded to such an extend that the SFF primers can no longer detect Bat DNA. If no DNA is amplified whatsoever then the sample has long been degraded as the technique is ultra sensitive. We get few samples with DNA degradation. DNA degrades with time and expedited with the environmental conditions it is exposed to such as sunlight and temperature and moisture, therefore we recommend samples are

taken out of direct sunlight, away from moisture and away from warmth where possible. If the sample with the freshest appearance, on top of the surface, is collected taking in to account these environmental parameters then it is likely that the sample has degraded due to the sample being there a long time and Bats may no longer be present. We analyse a sample up to three times to achieve a result. If no DNA is detected after three times, we are confident, there is no longer any DNA in the sample to detect.

Genus: A samples goes through DNA extraction, PCR to amplify, electrophoresis and then genetically sequenced to give the genetic code for that sample GCTATATACGCGC etc. The genetic sequence obtained is used to cross reference against millions of known genomes to find the closest match. If the sample sequence is not long enough due to sample degradation, or if a non specific part of the genetic code is obtained, then the results may indicate the precise genus but not the precise species. This is especially important for Myotis species as there are so many similar Myotis species with very similar genetic coding. If the results come back an non specific for a species, then the sample resubmitted through the entire analysis again to see if a better quality sequence, a longer sequence or a sequence in a different area of the genome could have been obtained so that we were able to differentiate between the species.

Reported by: Yaroslav Terentyev

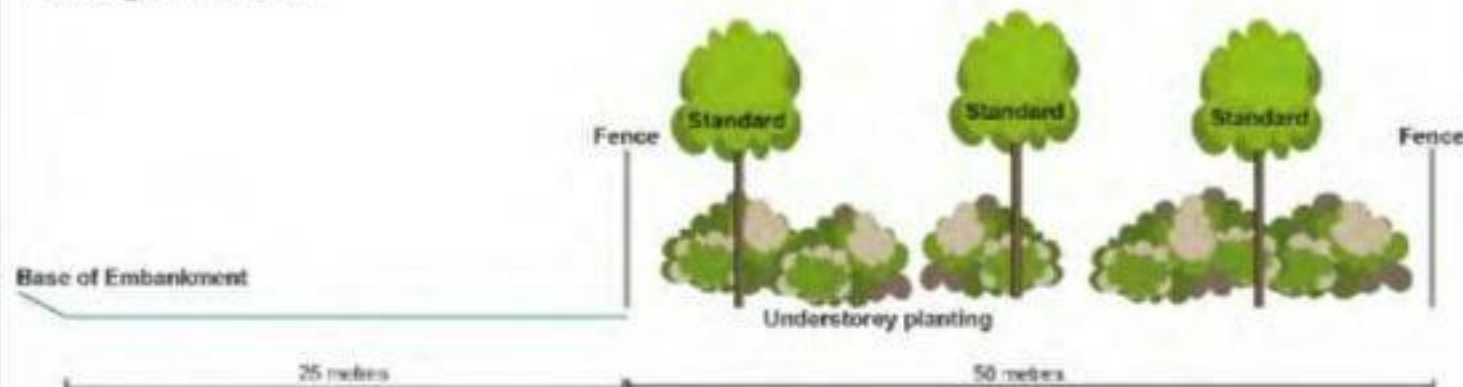
Approved by: Yaroslav Terentyev

End Of Report

Appendix D4 Gipsies Plain Woodland Corridor

Cross Section A

Inset Diagram not to scale



SPECIES COMPOSITION

Wood Pasture (Parkland)

Total 12 Standards at 3 metres in height, planted as three clumps of four trees:

Pedunculate Oak (8)
Common Lime (2)
Sweet Chestnut (2)

Note: Species mix reflects existing Regency period parkland planting.

Woodland Canopy

Total 30 Standards at 3 metres in height:

Pedunculate Oak (9)
Hornbeam (3)
Sweet Chestnut (6)
Common Lime (4)
Field Maple (5)
Downy / Silver Birch (3)

Woodland Understorey Planting

Trees to be spaced in accordance with guidance provided by the Forestry Commission:

Pedunculate Oak (3%)
Field Maple (20%)
Hazel (33%)
Hawthorn (7%)
Guelder Rose (6%)
Holly (5%)
Wild Privet (2%)
Dog Rose (3%)
Downy Birch (8%)
Alder (2% in wet areas)
Grey / Goat Willow (3% in wet areas)
Wild Cherry (4% on edges)
Rowan (3% on edges)
Honeysuckle (Planted throughout x50 specimens)

Hedgerow Bolstering

Field Maple (5%)
Hazel (30%)
Hawthorn (40%)
Guelder Rose (3%)
Holly (5%)
Wild Privet (2%)
Dog Rose (3%)
Downy Birch (2%)
Alder (2% in wet areas)
Grey / Goat Willow (2% in wet areas)
Wild Cherry (2%)
Crab Apple (2%)
Rowan (2%)

Hedge / Scrub Strip (HCC Land)

7m wide. To be planted with mix of:

Hawthorn
Hazel
Crab Apple
Wild Cherry
Blackthorn
Alder (in wetter area)

Gipsies Plain

Stock mesh fence - trees to be planted in tree tubes in these areas.

Woodland Canopy

Woodland Understorey Planting

Wood Pasture (Parkland).
Clumps of trees consist of four trees (3m high) spaced at 4m centres, consistent with existing parkland to south.

Hedgerow Widening and Bolstering
Infill and bolster hedgerow between top of ditch bank and stock mesh fencing to be a typical width of 1.5m (maximum width of 2.5m).

N.B. No new planting within 2m of water main.

Construct chestnut post and rail fence 2m north of the existing metal railings. Plant the gap inbetween the two fence lines with same species as **Hedge / Scrub Strip** in tree tubes.

Hedge / Scrub Strip (HCC Land)
Strip to be 7m wide. Kissing gate to be installed at northern end. Trees to be planted in tubes.

x1 alder

x1 horse chestnut

Clump of 3 standards:
(x2 oak and x1 horse chestnut)

HAVANT THICKET RESERVOIR, ROWLAND'S CASTLE, HAMPSHIRE

OUTLINE ECOLOGICAL MITIGATION AND COMPENSATION STRATEGY

Map 1 - Phase 1 Gipsies Plain Wood Pasture and Broadleaved Woodland Creation

Client: Portsmouth Water

Date: October 2018

Status: Draft Rev. 1

KEY

- Site Boundary
- Water Main
- Private Water Main
- Reservoir Embankment
- Cross Section A (see inset diagram)
- Wood Pasture
- Understorey Planting
- Area of Natural Regeneration (to form a more natural, graded edge / mosaic)
- Pond (ephemeral)
- Hedgerow Bolstering
- Stock Mesh Fencing (trees to be planted in tree tubes)
- Chestnut Post and Rail Fence
- Deer Fencing
- Protection Fencing (to be consistent with HCC lottery funded planting)
- Location of Standard (3 metres in height)
- Gate (to allow passage of livestock)

Scale at A3: 1:1,500

0 5 10 20 30 40
Metres



ECOSA
Ecological Survey & Assessment

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Flexford Road, North Baddesley, Hampshire SO52 9DF
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Source: Esri, DigitalGlobe, GeoEye, Earthstar/Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Appendix D5 Investigation of Bat Roost in Middle Clearing (Tree 1604)

	TECHNICAL NOTE: INVESTIGATION OF BAT ROOST IN MIDDLE CLEARING (TREE 1604)	ref: PWL-HTWSR-BLER1 Version: Draft 0.1 Date: 2nd July 2019
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1. Background

- 1.1 Portsmouth Water appointed Ecological Survey & Assessment Ltd (ECOSA) to update a series of ecological surveys across the proposed Havant Thicket Winter Storage Reservoir site at Rowlands Castle, Hampshire, centred at National Grid Reference (NGR) SU 715 097 during 2018.
- 1.2 The updating surveys included an assessment of all bat roosts that have been located on the site between 2008 and 2012 in order to establish their current status.
- 1.3 The majority of roosts were located in 2018 and subjected to emergence surveys during the survey season however some could not be located or the tree or feature where they had been was no longer viable, for example tree fallen down, or limb fallen off.
- 1.4 Tree number 1604, which was located in Middle Clearing at NGR SU 71242 09684, was used by a female brown long-eared bat *Plecotus auritus* during the night of 22nd/23rd May 2008, whilst the bat was being radio-tracked.
- 1.5 During the 2018 surveys tree 1604 was not located in time to carry out emergence surveys and therefore it was recommended by ECOSA¹ that an endoscopic survey of the roost feature was carried out.
- 1.6 Trevor Codlin BSc (Hons) MCIEEM and bat class licence CL18 – 2015-12342-CLS-CLS of Portsmouth Water undertook an external visual assessment and an internal investigation of tree 1604 on 20th June 2019.

2. Methodology

- 2.1 The tree was initially investigated externally to establish the condition of the entrance hole and make an assessment as to whether it had been recently accessed. This assessment was based on the presence of cobwebs or other matter which could block the entrance and prevent bat access.
- 2.2 An initial investigation of the cavity was made to look for any evidence of bat usage, for example any concentrations of bat droppings, or staining around the entrance where bats had squeezed through the entrance hole.
- 2.2 The internal investigation was carried out using a PiAEK inspection camera HD 1200p, connected via Wifi to an Apple iPad pro. The endoscope includes a 2 megapixel HD camera and 8 LED lights that can be adjusted according to the level of ambient light. The semi-rigid cable can be bent and maintained in shape and can extend for a distance of up to 10 metres.

¹ ECOSA 2019 – Havant Thicket Winter Storage Reservoir, Rowland Castle, Hampshire _ Ecological Impact Assessment Report – Chapter D Bat Assessment. Page 67 - Footnote 18

3. Limitations

- 3.1 Endoscopes can be a useful and effective tool for investigating small crevices that would otherwise be inaccessible. However, where the roost crevice is large or extends over a greater distance it can be difficult to effectively manoeuvre the camera head as such it is possible that some areas may not be visible.
- 3.2 Evidence of bats, such as droppings, will break down much quicker when in damp environments and therefore if a roost is not regularly used there may be no visible signs that it has been used.

4. Results

- 4.1 Tree 1604 was located at its location in Middle Clearing on 20th June 2019, and confirmed by the tag number (Plate 1, Figure 1).
- 4.2 An initial external examination of the tree confirmed that superficially from the outside the entrance to the roost feature looked the same as it did in 2008² (Plate 1, Figure 2) in that it was not blocked by any obstructions and the access was not covered in cobwebs. This conclusion was also reached by ECOSA during their 2018 assessment of the roost entrance².
- 4.3 The internal investigation confirmed that the cavity within the tree was fairly extensive and extended more than a metre upwards from the entrance point, as had been identified in 2008.
- 4.4 There was no evidence of roosting bats, such as bat droppings or actual bats, within the cavity. The cavity was extensively used by woodlice.
- 4.5 The GPS reading pinpointed the location as SU 71249 09703, which differed slightly from that recorded in 2008.

5. Assessment and Recommendations

- 5.1 No evidence of bat activity was recorded within the roost feature on tree 1604, however the endoscope survey confirmed that the tree still has the potential to support bats and therefore it should remain listed as a bat roost.
- 5.2 It is worth noting that according to the ECOSA report during the 2008 surveys the roost feature appears to have only been used during the night³, and as such it is possible that the roost is only used occasionally, or at a different time of year. The location of the roost, low down in the trunk of a tree, would likely make it more suited as a hibernation roost as the temperature would be more stable than a roost located higher up a tree and on a limb.
- 5.3 It is recommended that a further investigation of the roost is carried out later in the year, when bats are either swarming or hibernating, in order to establish if it is used during the winter months.

² ECOSA 2019 – Havant Thicket Winter Storage Reservoir, Rowland Castle, Hampshire _ Ecological Impact Assessment Report – Chapter D Bat Assessment. Table D21 Page 60

³ ECOSA 2019 – Havant Thicket Winter Storage Reservoir, Rowland Castle, Hampshire _ Ecological Impact Assessment Report – Chapter D Bat Assessment. Page 93, 3rd Paragraph, 2nd Sentence.

Plate 1



Figure 1: Tree tag on tree 1604



Figure 2: Entrance to bat roost

Appendix D6 Appraisal Criteria for Bats

The criteria used to assess the suitability of roosting and foraging/commuting habitat for bats is based on industry guidelines and outlined in **Table D35**²⁶.

Table D35: Criteria used to Assess Suitability of Roosting and Foraging/Commuting Habitat for Bats

Suitability	Description of roosting habitats	Commuting and foraging habitats
High	A structure or tree with one or more potential roost sites that are obviously 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.	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge. High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland. Site is close to and connected to known roosts.
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status.	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically/structure that does 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.	Habitat that could be used by small numbers of commuting bats such as a gappy hedgerows or un-vegetated stream, but isolated (i.e. not very well connected to the surrounding landscape by other habitat). Suitable, but isolated, habitat that could be used by small numbers of foraging bats such as a lone tree or a patch of scrub.
Negligible	Negligible habitat features on site likely to be used by roosting bats.	Negligible habitat features on site likely to be used by commuting or foraging bats.

²⁶ Table adapted from (Collins, 2016)

Appendix D7 Automated Detector Settings and Locations

Automated detectors can be calibrated in a number of different settings which can result in the potential variations in the way that bat calls are recorded. **Table D36** details the standard settings used by ECOSA during automated detector surveys undertaken.

Table D36: Standard automated detector settings

Option	Basic Setup
Settings - Audio	
Sample rate	192000Khz
Channels	Mono L (left)
Compression	WAV
Gain Left	+0.00
Gain Right	+0.00
Settings - Audio Advanced	
Dig High Pass Filter (HPF) Left	Fs/12
Dig High Pass Filter (HPF) Right	Off
Digital Low Pass Filter (LPF) Left	Off
Digital Low Pass Filter (LPF) Right	Off
Trig Lvl Left	12SNR
Trig Lvl Right	Off
Trg Win Left	2.0s
Trg Win Right	2.0s
Trg Max Length	2s
Bits (Div Ratio)	16
Nap Trg Lvl	Off

Data Conversion Settings

In order to analyse the data efficiently the raw .wav files recorded on the automated detector are subsequently converted to zero crossing (.zc) files which are subject to automated classification by Wildlife Acoustics Kaleidoscope Pro. During the conversion process the data is filtered to remove noise files in line with Wildlife Acoustics recommended setting as provided in **Table D37**.

Table D37: Noise file filtering settings

Option	Basic Setup
Signal of Interest – Frequency	8 – 120 kHz
Signal of Interest – Call Length	2 - 500ms
Signal of Interest – Minimum Number of Calls	2
Advanced Signal Enhancement	On

All filtered noise files are kept and subsequently assessed for bat calls in order to ensure that no bat calls have been incorrectly classified as noise. The “Advanced Signal Enhancement” setting discards files which Kaleidoscope assessed as being insufficient quality. Any discarded files are subsequently not stored by Kaleidoscope and therefore, not subject to analysis by an ecologist.

The location description and grid reference where SM4 detectors were erected in at the site is presented in **Table D38**.

Table D38: Location of SM4 detectors

SM4	Grid Reference	Location Description
1	SU 70962 09166	Hazel <i>Corylus avellana</i> on edge of woodland strip
2	SU 71501 09405	Hawthorn <i>Crataegus monogyna</i> adjacent to next to holly <i>Ilex aquifolium</i> under oak on edge of woodland
3	SU 71794 09488	Hazel next to fallen tree
4	SU 72433 09685	Young oak tree by large gap in hedgerow
5	SU 72393 10032	Willow <i>Salix</i> species
6	SU 71919 09838	Fallen willow next to ditch
7	SU 71281 09634	Hawthorn on edge of woodland opposite to stream bend
8	SU 70782 09884	Willow on field side of track
9	SU 71422 10339	Silver birch <i>Betula pendula</i> in corner of field
10	SU 71503 10148	Oak next to footpath

Appendix D8 Automated Detector Results by Location

Table D39 to Table D48 shows the number of registrations recorded at each individual location within each month.

Table D39: Activity recorded within each month at Location 1

Period	Species	No. Registrations	Activity Index
April -May 2018	Common pipistrelle	27	5.4
April – May 2018 Total		27	5.4
May 2018	Common pipistrelle	112	22.4
	<i>Myotis</i> bat species	2	0.4
	Noctule	69	13.8
	Serotine	4	0.8
	Nathusius' pipistrelle	5	1.0
May 2018 Total		192	38.4
June 2018	Common pipistrelle	253	50.6
	Noctule	19	3.8
	Soprano pipistrelle	1	0.2
	Serotine	14	2.8
June 2018 Total		287	57.4
July 2018	Common pipistrelle	1,484	296.8
	<i>Myotis</i> bat species	7	1.4
	Noctule	5	1.0
	Soprano pipistrelle	205	41.0
	Serotine	4	0.8
July 2018 Total		1,705	341.0
August 2018	Common pipistrelle	196	39.2
	<i>Myotis</i> bat species	4	0.8
	Noctule	6	1.2
	Soprano pipistrelle	15	3.0
	Serotine	1	0.2
	Barbastelle	1	0.2
August 2018 Total		223	44.6
September – October 2018	Common pipistrelle	164	32.8
	<i>Myotis</i> bat species	1	0.2
	Soprano pipistrelle	10	2.0
September – October 2018 Total		175	35.0
October 2018	Common pipistrelle	487	97.4
	Soprano pipistrelle	23	4.6
	Serotine	1	0.2
	Nathusius' pipistrelle	1	0.2
	Barbastelle	1	0.2
October 2018 Total		513	102.6
Grand Total		3,122	89.2

Table D40: Activity recorded within each month at Location 2

Period	Species	No. Registrations	Activity Index
April – May 2018	Common pipistrelle	247	49.4
	<i>Myotis</i> bat species	12	2.4
April – May 2018 Total		259	51.8
May 2018	Common pipistrelle	3,575	715.0
	<i>Myotis</i> bat species	99	19.8
	Noctule	32	6.4
	Soprano pipistrelle	6	1.2
	Serotine	5	1.0
May 2018 Total		3,717	743.4
June 2018	Common pipistrelle	6,775	1355.0
	<i>Myotis</i> bat species	35	7.0
	Noctule	2	0.4
	Soprano pipistrelle	27	5.4
	Long-eared bat species	1	0.2
June 2018 Total		6,840	1368.0
July 2018	Common pipistrelle	3,693	738.6
	<i>Myotis</i> bat species	82	16.4
	Noctule	7	1.4
	Soprano pipistrelle	113	22.6
	Long-eared bat species	1	0.2
	Barbastelle	5	1.0
July 2018 Total		3,901	780.2
August 2018	Common pipistrelle	602	120.4
	<i>Myotis</i> bat species	19	3.8
	Soprano pipistrelle	348	69.6
August 2018 Total		969	193.8
September - October 2018	Common pipistrelle	158	31.6
	<i>Myotis</i> bat species	10	2.0
	Noctule	1	0.2
	Soprano pipistrelle	19	3.8
	Nathusius' pipistrelle	2	0.4
September – October 2018 Total		190	38.0
October 2018	Common pipistrelle	76	15.2
	<i>Myotis</i> bat species	165	33.0
	Noctule	1	0.2
	Soprano pipistrelle	32	6.4
	Nathusius' pipistrelle	3	0.6
October 2018 Total		277	55.4
Grand Total		16,153	461.5

Table D41: Activity recorded within each month at Location 3

Period	Species	No. Registrations	Activity Index
April – May 2018	Common pipistrelle	77	15.4
	<i>Myotis</i> bat species	68	13.6
	Soprano pipistrelle	105	21.0
	Long-eared bat species	2	0.4
April – May 2018 Total		252	50.4
May 2018	Common pipistrelle	1,857	371.4
	<i>Myotis</i> bat species	68	13.6
	Noctule	109	21.8
	Soprano pipistrelle	117	23.4
	Long-eared bat species	1	0.2
	Serotine	9	1.8
	Nathusius' pipistrelle	21	4.2
May 2018 Total		2,182	436.4
June 2018	Common pipistrelle	4,103	820.6
	<i>Myotis</i> bat species	30	6.0
	Soprano pipistrelle	239	47.8
	Long-eared bat species	1	0.2
	Serotine	7	1.4
	Nathusius' pipistrelle	71	14.2
	Barbastelle	1	0.2
June 2018 Total		4,452	890.4
July 2018	Common pipistrelle	2,067	413.4
	<i>Myotis</i> bat species	40	8.0
	Noctule	1	0.2
	Soprano pipistrelle	476	95.2
	Long-eared bat species	5	1.0
	Serotine	5	1.0
July 2018 Total		2,594	518.8
August 2018	Common pipistrelle	510	102.0
	<i>Myotis</i> bat species	57	11.4
	Noctule	1	0.2
	Soprano pipistrelle	305	61.0
	Serotine	2	0.4
August 2018 Total		875	175.0
September – October 2018	Common pipistrelle	468	93.6
	<i>Myotis</i> bat species	69	13.8
	Soprano pipistrelle	490	98.0
	Nathusius' pipistrelle	2	0.4
September – October 2018 Total		1,029	205.8
October 2018	Common pipistrelle	301	60.2

Period	Species	No. Registrations	Activity Index
	<i>Myotis</i> bat species	43	8.6
	Noctule	1	0.2
	Soprano pipistrelle	116	23.2
October 2018 Total		461	92.2
Grand Total		11,845	338.4

Table D42: Activity recorded within each month at Location 4

Period	Species	No. Registrations	Activity Index
April – May 2018	Common pipistrelle	41	8.2
	<i>Myotis</i> bat species	14	2.8
	Noctule	1	0.2
April – May 2018 Total		56	11.2
May 2018	Common pipistrelle	2,296	459.2
	<i>Myotis</i> bat species	176	35.2
	Noctule	39	7.8
	Soprano pipistrelle	169	33.8
	Long-eared bat species	2	0.4
	Serotine	6	1.2
	Nathusius' pipistrelle	2	0.4
	Leisler's bat / noctule	2	0.4
May 2018 Total		2,692	538.4
June 2018	Common pipistrelle	1214	242.8
	<i>Myotis</i> bat species	13	2.6
	Noctule	3	0.6
	Soprano pipistrelle	49	9.8
	Serotine	118	23.6
	Barbastelle	4	0.8
June 2018 Total		1,401	280.2
July 2018	Common pipistrelle	718	143.6
	<i>Myotis</i> bat species	54	10.8
	Noctule	12	2.4
	Soprano pipistrelle	94	18.8
	Long-eared bat species	2	0.4
	Serotine	16	3.2
July 2018 Total		896	179.2
August 2018	Common pipistrelle	169	33.8
	<i>Myotis</i> bat species	230	46.0
	Noctule	1	0.2
	Soprano pipistrelle	88	17.6
	Long-eared bat species	1	0.2
	Serotine	4	0.8

Period	Species	No. Registrations	Activity Index
	Nathusius' pipistrelle	4	0.8
	Barbastelle	4	0.8
August 2018 Total		501	100.2
September – October 2018	Common pipistrelle	84	16.8
	<i>Myotis</i> bat species	23	4.6
	Noctule	2	0.4
	Soprano pipistrelle	30	6.0
	Long-eared bat species	6	1.2
	Nathusius' pipistrelle	6	1.2
September – October 2018 Total		151	30.2
October 2018	Common pipistrelle	25	5.0
	<i>Myotis</i> bat species	4	0.8
	Noctule	1	0.2
	Soprano pipistrelle	26	5.2
	Nathusius' pipistrelle	1	0.2
October 2018 Total		57	11.4
Grand Total		5,754	164.4

Table D43: Activity recorded within each month at Location 5

Period	Species	No. Registrations	Activity Index
April May 2018	Common pipistrelle	131	26.2
	<i>Myotis</i> bat species	31	6.2
	Noctule	2	0.4
	Soprano pipistrelle	2	0.4
	Nathusius' pipistrelle	2	0.4
April – May 2018 Total		168	33.6
May 2018	Common pipistrelle	759	151.8
	<i>Myotis</i> bat species	44	8.8
	Noctule	13	2.6
	Soprano pipistrelle	25	5.0
	Long-eared bat species	6	1.2
	Serotine	76	15.2
	Nathusius' pipistrelle	26	5.2
	Barbastelle	7	1.4
	Leisler's bat / noctule	6	1.2
May 2018 Total		962	192.4
June 2018	Common pipistrelle	1,465	293.0
	<i>Myotis</i> bat species	6	1.2
	Noctule	4	0.8
	Soprano pipistrelle	289	57.8
	Serotine	5	1.0
	Nathusius' pipistrelle	2	0.4

Period	Species	No. Registrations	Activity Index
June 2018 Total		1,771	354.2
July 2018	Common pipistrelle	707	141.4
	<i>Myotis</i> bat species	11	2.2
	Noctule	6	1.2
	Soprano pipistrelle	69	13.8
	Serotine	126	25.2
	Nathusius' pipistrelle	4	0.8
	Barbastelle	1	0.2
July 2018 Total		924	184.8
August 2018	Common pipistrelle	347	69.4
	<i>Myotis</i> bat species	15	3.0
	Soprano pipistrelle	28	5.6
	Long-eared bat species	2	0.4
	Serotine	2	0.4
	Nathusius' pipistrelle	1	0.2
	Barbastelle	4	0.8
August 2018 Total		399	79.8
September - October 2018	Common pipistrelle	1,703	340.6
	<i>Myotis</i> bat species	17	3.4
	Noctule	4	0.8
	Soprano pipistrelle	82	16.4
	Nathusius' pipistrelle	7	1.4
	Barbastelle	9	1.8
September – October 2018 Total		1,822	364.4
October 2018	Common pipistrelle	226	45.2
	<i>Myotis</i> bat species	36	7.2
	Soprano pipistrelle	14	2.8
	Nathusius' pipistrelle	6	1.2
	Barbastelle	2	0.4
October 2018 Total		284	56.8
Grand Total		6,330	180.9

Table D44: Activity recorded within each month at Location 6

Period	Species	No. Registrations	Activity Index
April - May 2018	Common pipistrelle	1,263	252.6
	<i>Myotis</i> bat species	13	2.6
	Nathusius' pipistrelle	33	6.6
April – May 2018 Total		1,309	261.8
May 2018	Common pipistrelle	1,952	390.4
	<i>Myotis</i> bat species	8	1.6
	Noctule	5	1.0
	Soprano pipistrelle	5	1.0

Period	Species	No. Registrations	Activity Index
	Long-eared bat species	2	0.4
	Serotine	2	0.4
	Nathusius' pipistrelle	66	13.2
May 2018 Total		2,040	408.0
June 2018	Common pipistrelle	203	40.6
	<i>Myotis</i> bat species	2	0.4
	Noctule	5	1.0
	Soprano pipistrelle	20	4.0
	Serotine	1	0.2
	Nathusius' pipistrelle	2	0.4
June 2018 Total		233	46.6
July 2018	Common pipistrelle	197	39.4
	Noctule	2	0.4
	Soprano pipistrelle	38	7.6
July 2018 Total		237	47.4
August 2018	Common pipistrelle	11	2.2
	<i>Myotis</i> bat species	1	0.2
	Soprano pipistrelle	2	0.4
August 2018 Total		14	2.8
September – October 2018	Common pipistrelle	129	25.8
	Soprano pipistrelle	7	1.4
September – October 2018 Total		136	27.2
October 2018	Common pipistrelle	34	6.8
	<i>Myotis</i> bat species	43	8.6
	Noctule	1	0.2
	Soprano pipistrelle	9	1.8
October 2018 Total		87	17.4
Grand Total		4,056	115.9

Table D45: Activity recorded within each month at Location 7

Period	Species	No. Registrations	Activity Index
April – May 2018	Common pipistrelle	450	90.0
	<i>Myotis</i> bat species	4	0.8
	Soprano pipistrelle	1	0.2
	Nathusius' pipistrelle	5	1.0
April – May 2018 Total		460	92.0
May 2018	Common pipistrelle	2,994	598.8
	<i>Myotis</i> bat species	57	11.4
	Noctule	152	30.4
	Soprano pipistrelle	7	1.4
	Serotine	12	2.4
	Nathusius' pipistrelle	70	14.0

Period	Species	No. Registrations	Activity Index
May 2018 Total		3,292	658.4
June 2018	Common pipistrelle	7,223	1444.6
	<i>Myotis</i> bat species	76	15.2
	Soprano pipistrelle	14	2.8
	Long-eared bat species	2	0.4
	Serotine	2	0.4
	Nathusius' pipistrelle	24	4.8
June 2018 Total		7,341	1468.2
July 2018	Common pipistrelle	4,475	895.0
	<i>Myotis</i> bat species	20	4.0
	Noctule	8	1.6
	Soprano pipistrelle	355	71.0
	Long-eared bat species	1	0.2
	Serotine	3	0.6
July 2018 Total		4,862	972.4
August 2018	Common pipistrelle	208	41.6
	<i>Myotis</i> bat species	10	2.0
	Noctule	2	0.4
	Soprano pipistrelle	2	0.4
August 2018 Total		222	44.4
September – October 2018	Common pipistrelle	101	20.2
	<i>Myotis</i> bat species	3	0.6
	Soprano pipistrelle	15	3.0
	Nathusius' pipistrelle	2	0.4
September – October 2018 Total		121	24.2
October 2018	Common pipistrelle	260	52.0
	<i>Myotis</i> bat species	217	43.4
	Noctule	7	1.4
	Soprano pipistrelle	15	3.0
October 2018 Total		499	99.8
Grand Total		16,797	671.9

Table D46: Activity recorded within each month at Location 8

Period	Species	No. Registrations	Activity Index
April - May 2018	Common pipistrelle	637	127.4
	<i>Myotis</i> bat species	127	25.4
April – May 2018 Total		764	152.8
May 2018	Common pipistrelle	534	106.8
	<i>Myotis</i> bat species	4	0.8
	Noctule	22	4.4
	Soprano pipistrelle	1	0.2
	Serotine	1	0.2

Period	Species	No. Registrations	Activity Index
	Nathusius' pipistrelle	61	12.2
May 2018 Total		623	124.6
June 2018	Common pipistrelle	1,071	214.2
	<i>Myotis</i> bat species	18	3.6
	Noctule	3	0.6
	Soprano pipistrelle	1	0.2
	Nathusius' pipistrelle	18	3.6
June 2018 Total		1,111	222.2
August 2018	Common pipistrelle	859	171.8
	<i>Myotis</i> bat species	4	0.8
	Noctule	1	0.2
	Soprano pipistrelle	138	27.6
August 2018 Total		1,002	200.4
September – October 2018	Common pipistrelle	2,146	429.2
	<i>Myotis</i> bat species	13	2.6
	Soprano pipistrelle	24	4.8
	Nathusius' pipistrelle	12	2.4
	Barbastelle	1	0.2
September – October 2018 Total		2,196	439.2
Grand Total		5,696	189.8

Table D47: Activity recorded within each month at Location 9

Period	Species	No. Registrations	Activity Index
April – May 2018	Common pipistrelle	177	35.4
	<i>Myotis</i> bat species	174	34.8
	Soprano pipistrelle	4	0.8
	Nathusius' pipistrelle	2	0.4
April – May 2018 Total		357	71.4
May 2018	Common pipistrelle	932	186.4
	<i>Myotis</i> bat species	67	13.4
	Noctule	26	5.2
	Long-eared bat species	3	0.6
	Serotine	22	4.4
	Nathusius' pipistrelle	16	3.2
	Barbastelle	2	0.4
May 2018 Total		1,068	213.6
June 2018	Common pipistrelle	1,547	309.4
	<i>Myotis</i> bat species	69	13.8
	Noctule	2	0.4
	Soprano pipistrelle	4	0.8
	Long-eared bat species	2	0.4

Period	Species	No. Registrations	Activity Index
	Serotine	2	0.4
	Nathusius' pipistrelle	2	0.4
	Leisler's bat / Noctule	1	0.2
June 2018 Total		1,629	325.8
July 2018	Common pipistrelle	2,436	487.2
	<i>Myotis</i> bat species	43	8.6
	Noctule	16	3.2
	Soprano pipistrelle	57	11.4
	Long-eared bat species	3	0.6
	Serotine	127	25.4
	Nathusius' pipistrelle	1	0.2
July 2018 Total		2,683	536.6
August 2018	Common pipistrelle	200	40.0
	<i>Myotis</i> bat species	12	2.4
	Noctule	1	0.2
	Soprano pipistrelle	3	0.6
August 2018 Total		216	43.2
September – October 2018	Common pipistrelle	878	175.6
	<i>Myotis</i> bat species	111	22.2
	Soprano pipistrelle	20	4.0
	Long-eared bat	10	2.0
	Nathusius' pipistrelle	3	0.6
	Barbastelle	1	0.2
September – October 2018 Total		1,023	204.6
October 2018	Common pipistrelle	39	7.8
	<i>Myotis</i> bat species	18	3.6
	Noctule	11	2.2
	Soprano pipistrelle	2	0.4
	Serotine	1	0.2
October 2018 Total		71	14.2
Grand Total		7,047	201.3

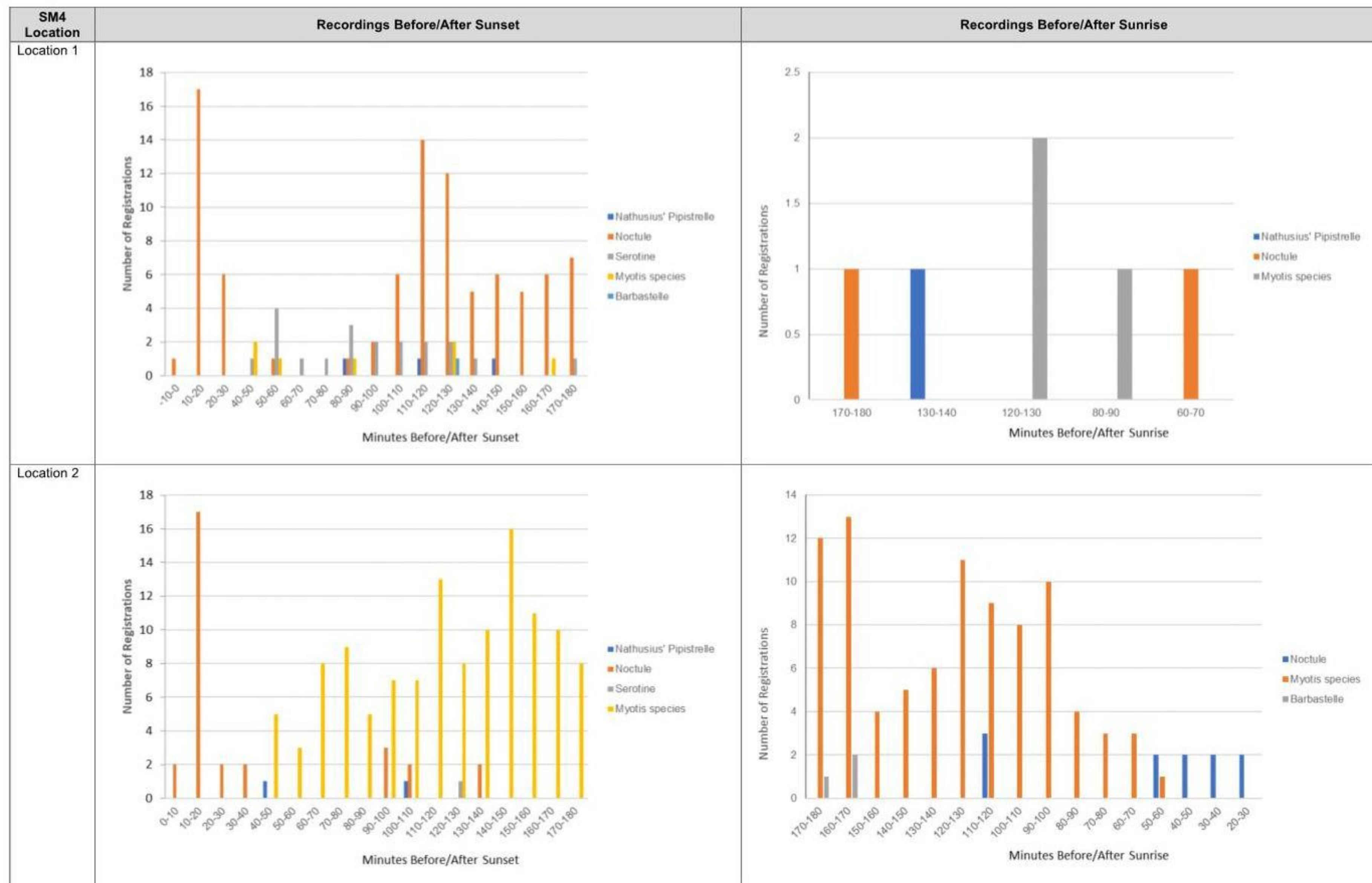
Table D48: Activity recorded within each month at Location 10

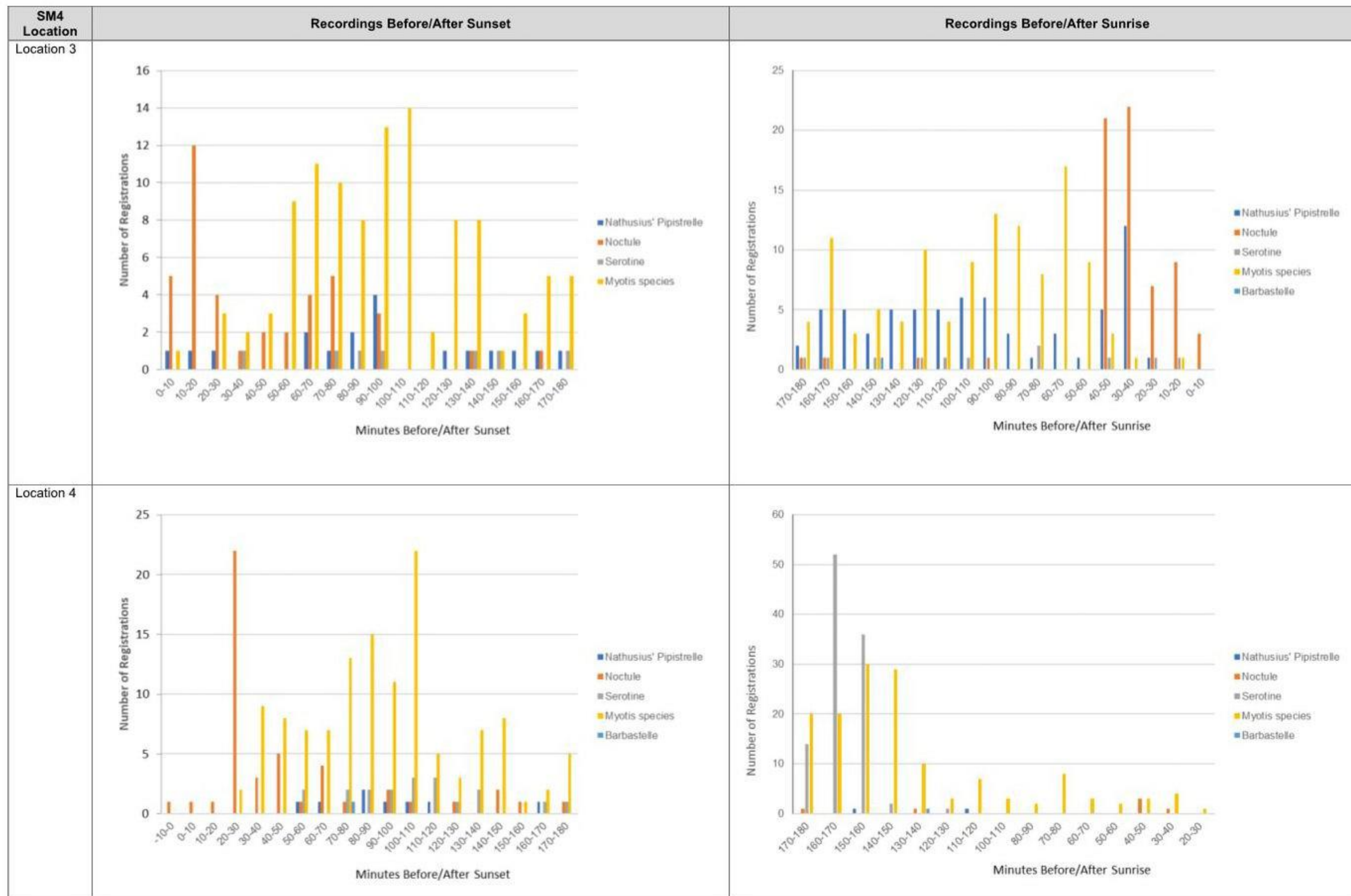
Period	Species	No. Registrations	Activity Index
April – May 2018	Common pipistrelle	70	14.0
	<i>Myotis</i> bat species	12	2.4
	Soprano pipistrelle	2	0.4
	Nathusius' pipistrelle	1	0.2
April – May 2018 Total		85	17.0
May 2018	Common pipistrelle	823	164.6
	<i>Myotis</i> bat species	21	4.2
	Noctule	43	8.6

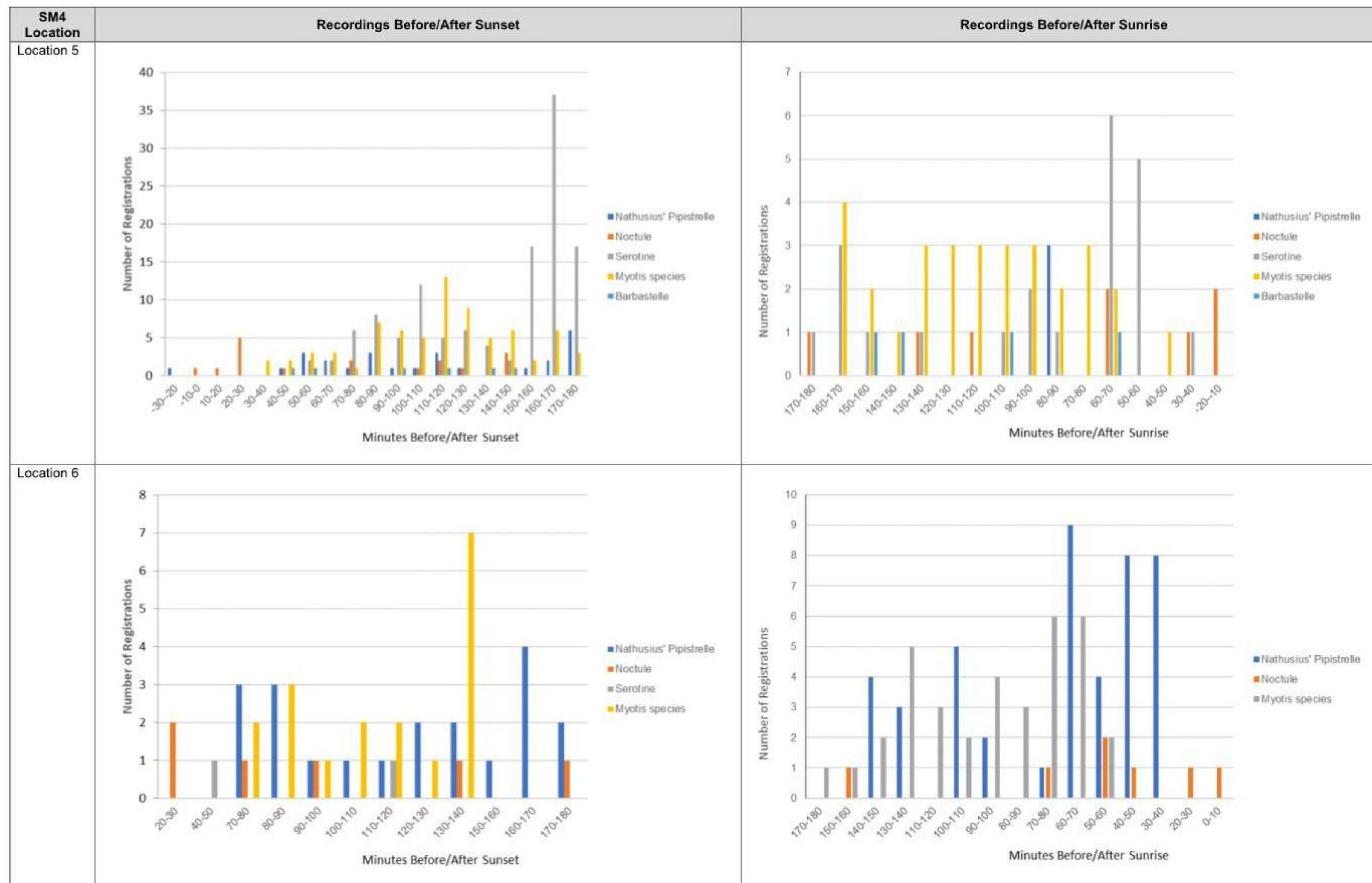
Period	Species	No. Registrations	Activity Index
	Soprano pipistrelle	1	0.2
	Long-eared bat species	3	0.6
	Serotine	38	7.6
	Nathusius' pipistrelle	21	4.2
May 2018 Total		950	190.0
June 2018	Common pipistrelle	1,622	324.4
	<i>Myotis</i> bat species	35	7.0
	Soprano pipistrelle	5	1.0
	Serotine	7	1.4
	Nathusius' pipistrelle	4	0.8
June 2018 Total		1,673	334.6
July 2018	Common pipistrelle	501	100.2
	<i>Myotis</i> bat species	1	0.2
	Noctule	3	0.6
	Soprano pipistrelle	137	27.4
	Serotine	1	0.2
July 2018 Total		643	128.6
August 2018	Common pipistrelle	200	40.0
	<i>Myotis</i> bat species	13	2.6
	Noctule	2	0.4
	Soprano pipistrelle	6	1.2
	Nathusius' pipistrelle	4	0.8
August 2018 Total		225	45.0
September – October 2018	Common pipistrelle	1,046	209.2
	<i>Myotis</i> bat species	4	0.8
	Noctule	3	0.6
	Soprano pipistrelle	14	2.8
	Barbastelle	1	0.2
September – October 2018 Total		1,068	213.6
October 2018	Common pipistrelle	107	21.4
	<i>Myotis</i> bat species	1	0.2
	Noctule	3	0.6
	Soprano pipistrelle	1	0.2
October 2018 Total		112	22.4
Grand Total		4,756	135.9

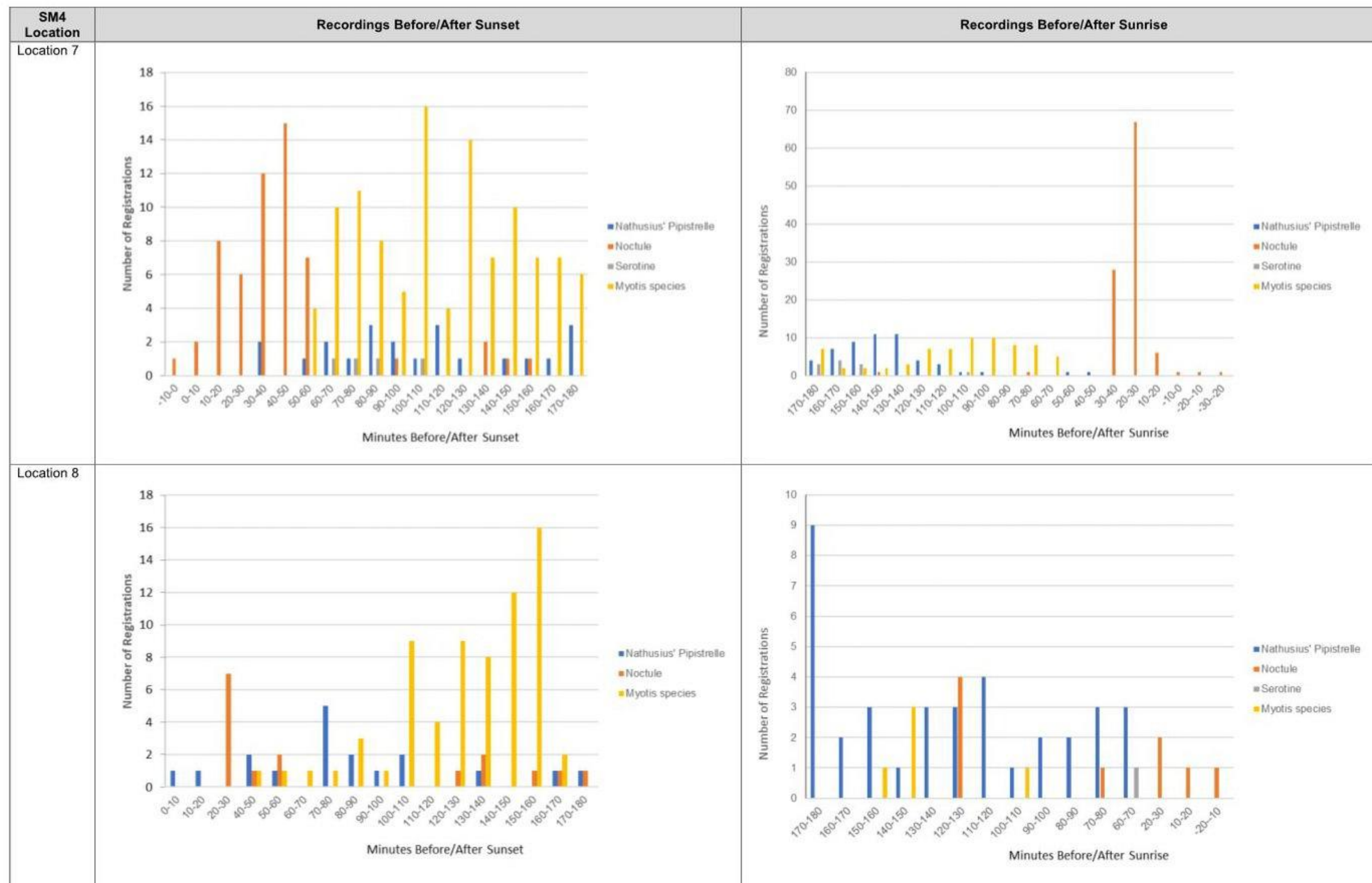
Appendix D9 Automated Detector Results by Time Before/After Sunset²⁷

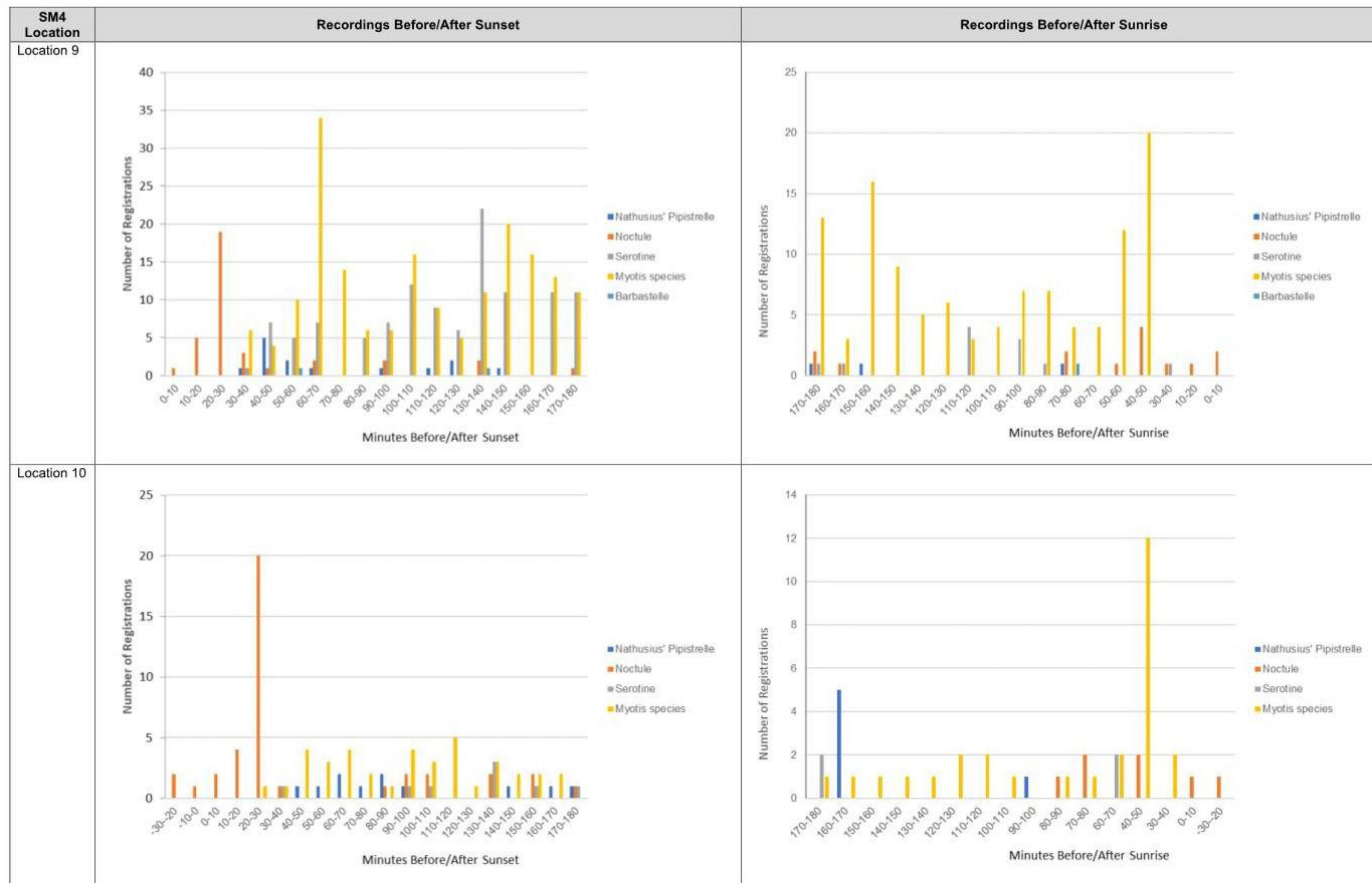
²⁷ Does not include all species











Appendix D10 Trapping Data

Table D49: 2018 bat trapping data

Date	Time	Bat Species	Scientific Name	Sex	Status	F/Arm	Weight (g)	Thumb	Tragus	Ring No.	Tag No.	Notes	NGR Grid Reference
14/05/2018	22:04	Whiskered bat	<i>Myotis mystacinus</i>	Female	Parous	35.5	6						SU 72351 09502
14/05/2018	22:30	Natterer's bat	<i>Myotis nattereri</i>	Female	Nulliparous	39.3	7.5						SU 72368 09581
14/05/2018	22:42	Natterer's bat	<i>Myotis nattereri</i>	Female	Parous	40.2	9						SU 72351 09502
14/05/2018	22:56	Whiskered bat / Brandt's bat	<i>Myotis mystacinus</i> / <i>Myotis brandtii</i>	Female	Nulliparous	35	5.5						SU 72351 09502
14/05/2018	00:30	Whiskered bat / Brandt's bat	<i>Myotis mystacinus</i> / <i>Myotis brandtii</i>	Female	Parous	33.2	5						SU 72351 09502
14/05/2018												No bats recorded - 20 minutes spot netting	SU 72097 09385
15/05/2018	01:30	Bechstein's bat	<i>Myotis bechsteinii</i>	Male	n/a	41.1	7			H1959	338		SU 7205 0934
15/05/2018	21:45	Pipistrelle species	<i>Pipistrellus species</i>	Male	n/a	31.2	6.5						SU 71837 09432
15/05/2018	22:00	Pipistrelle species	<i>Pipistrellus species</i>	Female	Parous	31.9	5						SU 71442 09965
15/05/2018	22:00	Whiskered bat	<i>Myotis mystacinus</i>	Male	n/a	32.7	4						SU 71442 09965
15/05/2018	22:00	Brown long-eared bat	<i>Plecotus auritus</i>	Female	Parous		6.5	7.9	5				SU 71442 09965
15/05/2018	22:00	Natterer's bat	<i>Myotis nattereri</i>	Female	Parous	34	6						SU 71442 09965
15/05/2018	22:05	Whiskered bat	<i>Myotis mystacinus</i>	Male	n/a	31.5	4						SU 71442 09965
15/05/2018	22:30	Whiskered bat / Brandt's bat	<i>Myotis mystacinus</i> / <i>Myotis brandtii</i>	Female	Parous	31.8	6						SU 71442 09965
15/05/2018	22:30	Brown long-eared bat	<i>Plecotus auritus</i>	Female	Parous	38.2	7	5.8	4.2				SU 71442 09965
15/05/2018	22:30	Whiskered bat / Brandt's bat	<i>Myotis mystacinus</i> / <i>Myotis brandtii</i>	Female	Parous	33.9	5						SU 71442 09965
15/05/2018	22:40	Brown long-eared bat	<i>Plecotus auritus</i>	Female	Parous	37.2	7	5.8	5				SU 71442 09965
15/05/2018	22:40	Natterer's bat	<i>Myotis nattereri</i>	Male	n/a	37	7						SU 71442 09965
15/05/2018	23:10	Pipistrelle species	<i>Pipistrellus species</i>	Female	Parous	31	5.5						SU 71442 09965
15/05/2018	23:10	Natterer's bat	<i>Myotis nattereri</i>									Escaped from net	SU 71442 09965
15/05/2018	23:35	Whiskered bat / Brandt's bat	<i>Myotis mystacinus</i> / <i>Myotis brandtii</i>	Female	Parous	31.7	4						SU 71442 09965
15/05/2018	23:45	Whiskered bat / Brandt's bat	<i>Myotis mystacinus</i> / <i>Myotis brandtii</i>	Female	Parous	34	5						SU 71442 09965
15/05/2018	01:05	Pipistrelle species	<i>Pipistrellus species</i>	Female	Parous	30.9	5						SU 71442 09965
15/05/2018	00:20	Bechstein's bat	<i>Myotis bechsteinii</i>	Female	Nulliparous	39.9	8.5			Z9429	238		SU 71837 09432
15/05/2018	00:20	Natterer's bat	<i>Myotis nattereri</i>	Female	Parous	39.8	10						SU 71837 09432
16/07/2018	21:30	Small <i>Myotis</i> bat species	<i>Myotis bat species</i>	Female	Lactating	30.8	5						SU 72360 09570
16/07/2018	21:30	Small <i>Myotis</i> bat species	<i>Myotis bat species</i>	Male	n/a	30.8	4.5						SU 72360 09570
16/07/2018	22:45	Brown long-eared bat	<i>Plecotus auritus</i>	Female	Nulliparous	36.9	7	6.3	5				SU 72346 09499
16/07/2018	23:00	Bechstein's bat	<i>Myotis bechsteinii</i>	Female	Nulliparous	41	11			H1958	277		SU 72360 09570
16/07/2018	02:30-03:00											No bats recorded	SU 72117 09375
17/07/2018	21:59	Natterer's bat	<i>Myotis nattereri</i>	Female	Lactating	40.3	7.5						SU 71824 09463
17/07/2018	00:50	Pipistrelle bat species	<i>Pipistrellus species</i>	Female	Lactating	30.6	5						SU 71667 09338
17/07/2018	01:21	Daubenton's bat	<i>Myotis daubentonii</i>	Unknown								Escaped from net	SU 71515 09225
17/07/2018	13:50	Pipistrelle bat species	<i>Pipistrellus species</i>	Female	Parous	32.1	6						SU 71515 09225
18/07/2018	21:59	Whiskered bat	<i>Myotis mystacinus</i>	Female	Lactating	30.5	6					Confirmed by DNA analysis	SU 71442 09965
18/07/2018	22:05	Brown long-eared bat	<i>Plecotus auritus</i>	Male	n/a	37.5	8	5.8	4.6				SU 71442 09965
18/07/2018	22:05	Brown long-eared bat	<i>Plecotus auritus</i>	Male	n/a	38.9	8.5	7.5	4.3				SU 71442 09965
18/07/2018	22:10	Brown long-eared bat	<i>Plecotus auritus</i>	Female	Lactating	38.7	9	6.6	4.5				SU 71442 09965
18/07/2018	22:37	Brown long-eared bat	<i>Plecotus auritus</i>	Female	Lactating	38.8	9	9	4.7				SU 71442 09965
18/07/2018	22:55	Brown long-eared bat	<i>Plecotus auritus</i>	Male	n/a	38.3	8	6	4.8				SU 71442 09965
18/07/2018	00:05	Natterer's bat	<i>Myotis nattereri</i>	Female	Lactating	39.5	8						SU 71442 09965
19/08/2018	19:30											No bats recorded	SU 72383 09453
19/08/2018	19:30											No bats recorded	SU 72356 09587
19/08/2018	00:40	Barbastelle	<i>Barbastella barbastellus</i>	Male	n/a	37.3	8						SU 72130 09427

Date	Time	Bat Species	Scientific Name	Sex	Status	F/Arm	Weight (g)	Thumb	Tragus	Ring No.	Tag No.	Notes	NGR Grid Reference
19/08/2018	00:40	Barbastelle	<i>Barbastella barbastellus</i>	Male	n/a	38.1	9						SU 72130 09427
19/08/2018	01:00	Pipistrellus species	<i>Pipistrellus species</i>	Female	Nulliparous	31.6	5						SU 72130 09427
19/08/2018	01:55	Whiskered bat / Brandt's bat	<i>Myotis mystacinus</i> / <i>Myotis brandtii</i>	-	-							Escaped from net	SU 72261 09428
19/08/2018	01:00	Natterer's bat	<i>Myotis nattereri</i>	Female	Nulliparous	39.8	8.5						SU 71810 09311
19/08/2018	01:50	Bechstein's bat	<i>Myotis bechsteinii</i>	Female	Nulliparous	40.9	10			H1968	2957		SU 71632 09343
19/08/2018	02:30											No bats recorded	SU 71599 09318
20/08/2018	21:05	Whiskered bat	<i>Myotis mystacinus</i>	Female	Post-lactating	31.5	6						SU 71442 09965
20/08/2018	21:40	Natterer's bat	<i>Myotis nattereri</i>	Female	Nulliparous	38.9	7.5						SU 71442 09965
20/08/2018	21:50	Natterer's bat	<i>Myotis nattereri</i>	Female	Nulliparous	40.7	8.5						SU 71442 09965
20/08/2018	00:30											No bats recorded	SU 71780 09527
20/08/2018	01:10											No bats recorded	SU 71707 09658
20/08/2018	01:45											No bats recorded	SU 71608 09744
20/08/2018	02:45											No bats recorded	SU 71585 09850
21/08/2018	21:00											No bats recorded	SU 71058 10667
21/08/2018	22:30											No bats recorded	SU 71529 10677
21/08/2018	23:45											No bats recorded	SU 71500 11055
21/08/2018	00:50											No bats recorded	SU 72101 10463
21/08/2018	02:00											No bats recorded	SU 71540 10370
21/08/2018	03:00											No bats recorded	SU 71817 09496
23/08/2018	21:00											No bats recorded	SU 71310 09429
23/08/2018	23:00											No bats recorded	SU 71249 09662
23/08/2018	01:00											No bats recorded	SU 71475 09336

Appendix D11 2020 Ground Level Tree Assessment

**Assessment of Trees for Bat Roosting Potential
The Avenue, Round Wood, Middle Clearing
& Corsican Pine Plantation at Havant Thicket**



Havant Thicket Water Storage Reservoir (HTWSR)

For

Portsmouth Water

Final report

**Surveyors Colleen Hope CEcol, MCIEEM, BSc, PGCE
& Dr Paul Hope, MCIEEM, BSc (Hons)**

**Report Author
Colleen Hope**



Ecological Consultancy Services Ltd

May 2020

**Assessment of Trees for Bat Roosting Potential
The Avenue, Round Wood, Middle Clearing
& Corsican Pine Plantation at Havant Thicket**

Contents

	Executive Summary	1
1.0	Survey Areas, Species Recorded during Previous Surveys & Proposed Works	2
2.0	Methodology of Survey & Assessment	6
3.0	Survey Results	9
4.0	Discussion	30
5.0	Conclusions	32
6.0	References	33

Appendices

Appendix 1	Surveyor Experience
Appendix 2	Legislation & Policy

Assessment of Trees for Bat Roosting Potential The Avenue, Round Wood, Middle Clearing & Corsican Pine Plantation at Havant Thicket

Executive Summary

Portsmouth Water appointed Ecological Consultancy Services Ltd (ECS) to undertake a daytime survey of trees in four areas south of Havant Thicket in Hampshire. The purpose of the surveys was to identify trees with potential roost features (PRFs) for bats. All of the trees within the four survey areas (referred to in this report as 'the site') will be removed prior to creation of a new water reservoir (Havant Thicket Water Storage Reservoir).

Bat acoustic and radio tracking surveys have been conducted across the site over the last 12 years (ECS were appointed by ECOSA to undertake some of this work). A considerable amount of data have been collected on the bat species present, this includes the location of a number of trees with bat roosts present. A maternity roost of rare Bechstein's bats *Myotis bechsteinii* was recorded in a tree in 2008. This is outside the site area and this tree will be retained. Although male and female Bechstein's bats have been captured and radio tracked in subsequent years there has been no further confirmed presence of a Bechstein's bat maternity roost within the 'site'.

Two surveyors from ECS undertook the daytime survey over three days in late March 2020. Four distinct woodland areas were surveyed (The Avenue, Round Wood, Middle Clearing and Corsican Pine Plantation). During these surveys, 265 trees were identified as having some potential to support bat roost sites. Of these, 181 were considered to have high potential to support bat roost sites; 68 trees were considered to have moderate potential and 16 trees to have low potential to support bat roost sites.

Fifteen bat roosts were recorded in The Avenue and Middle Clearing in 2008¹. This daytime tree assessment (2020) was requested by Natural England and will provide more detailed information to support a European Protected Species Mitigation (EPSM) licence. All of these trees will require some further assessment prior to felling.

¹ Other roosts were found south of the Avenue during surveys in 2008 and 2018 but these will not be directly impacted by the proposals

1.0 Survey Areas, Species Recorded During Previous Surveys & Proposed Works

1.1 Survey Areas

Figure 1 shows the site location. These four areas (referred to in this report as 'the site') are referred to as The Avenue (c 7.5 Ha), Round Wood (c 2.1 Ha), Middle Clearing (c 2.3 Ha) and Corsican Pine Plantation (c 3.9 Ha) and are shown in **Figure 2**.

1.2 Species Recorded During Previous Surveys

The following bat species have been recorded roosting, foraging and/or commuting through the site and woodland to the south by ECS² and ECOSA. This includes areas adjacent to those being felled.

- Common pipistrelle bat *Pipistrellus pipistrellus*. Frequently encountered during surveys. Some tree roosts but mainly found in residential dwellings to east of site.
- Soprano pipistrelle bat *Pipistrellus pygmaeus*. Less frequently encountered than common pipistrelle during surveys.
- Brown long-eared bat *Plecotus auritus*. Frequently encountered with three maternity roosts in trees at upper end of the Avenue. A number of (non maternity) roosts located in trees in Middle Clearing (some located low down i.e. below 1m).
- Bechstein's bat *Myotis bechsteinii* Maternity roost located in tree southeast of the Avenue. Three male roosts located in trees on The Avenue.
- Whiskered bat *Myotis mystacinus*. Frequently encountered. Maternity roost found during radio tracking in a house north east of site. Tree roosts recorded in woodland south of site.
- Brandt's bat *Myotis brandtii* (only one male bat ever encountered, radio tracked but signal lost. Late autumn and possibly commuting through the area rather than resident)
- Natterer's bat *Myotis nattereri*. Frequently encountered with a number of roosts recorded in trees in the Avenue and maternity roost in woodland to the south.
- Daubenton's bat *Myotis daubentonii*. Occasionally encountered; no tree roosts recorded during radio tracking.
- Noctule bat *Nyctalus noctula*. Occasionally detected acoustically but not captured.
- Barbastelle bat *Barbastella barbastellus*. Occasionally detected acoustically and small number of males captured in 2018 but not captured or radio tracked during surveys in 2008 or 2009.
- Serotine bat *Eptesicus serotinus* Occasionally detected but not considered to be a tree roosting bat.

² It is believed that some other trapping surveys were undertaken and reference should be made to reports produced by ECOSA

A total of nine bat roosts were recorded in The Avenue and six in Middle Clearing in 2008.

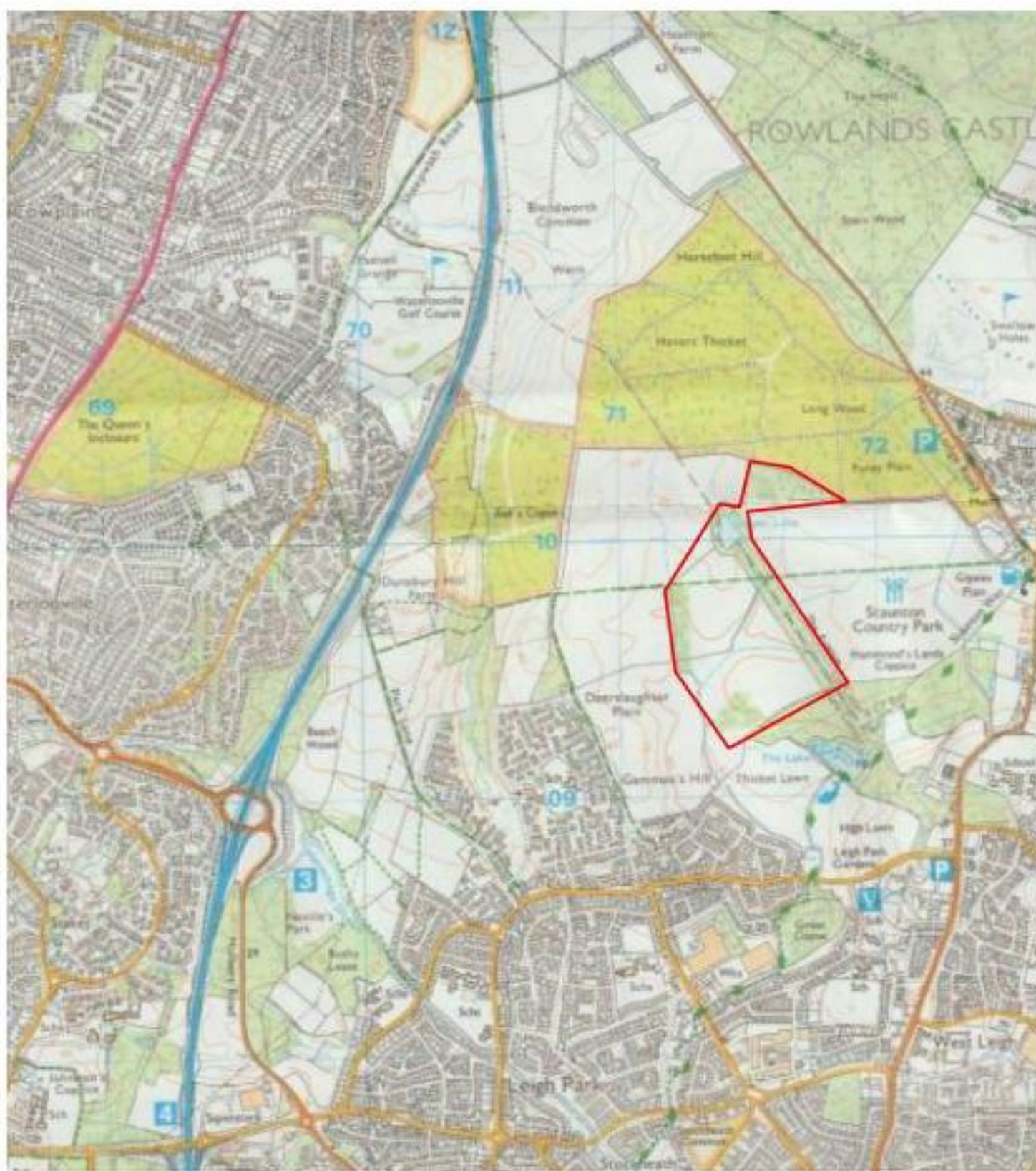
1.3 Proposed Works

The current proposals will fell all trees in the Middle Clearing. Most trees will be felled in the Avenue and Round Wood although the southernmost trees will be retained. All trees will be felled in the Corsican Pine Plantation but it will be restored to wet woodland³.

A new reservoir will then be created. Compensation measures include new planting, woodland management of existing areas within 2km of the site and provision of bat boxes. Engagement with Natural England has been on-going for a number of years. Felling could commence in 2021 and may be completed in one season or over a number of seasons.

³ After consultation with Natural England

Figure 1 Site location



Ordnance Survey © Crown copyright (2007) All rights reserved. Licence number 100050545

Figure 2 Location of Survey Areas (image taken from Google Earth)



2.0 Methodology of Survey & Assessment

2.1 Survey & Reporting Standards

Surveys & assessments were undertaken with reference to Bat Conservation Trust⁴ (BCT) and Natural England survey and mitigation guidelines⁵ and conform to the Chartered Institute of Ecology & Environmental Management (CIEEM) assessment and reporting standards⁶.

2.2 Personnel & Timing

Surveys were conducted over three days as follows:

- Corsican Pine Plantation & Middle Clearing: 19 March 2020 Colleen Hope
- The Avenue: 21 March 2020, Colleen Hope & Dr Paul Hope
- Middle Clearing, Round Wood and the Avenue: 25 March 2020, Colleen Hope & Dr Paul Hope

Each survey was conducted over a 7-8 hour period in the field (total survey time 32 person hours). Weather conditions were fine with little or no cloud, temperatures between 10-19C and with no rain. The surveys were conducted prior to leaves appearing on deciduous trees. Colleen and Paul are both licenced ecologists, each with over 19 years' experience surveying bats.

Colleen Hope licence refs CL19 2015-10277 CLS CLS & CL20 2015-15456-CLS-CLS

Dr Paul Hope licence refs CL19 2015-15167-CLS-CLS & CL20 2015-15166-CLS-CLS

Appendix 1 provides further details of surveyor experience and qualifications.

2.3 Assessment & Evaluation

A visual examination of all of the trees within the site was undertaken from ground level using binoculars. The following equipment was used or on hand during the surveys:

- Leica x 8 close focus binoculars;
- Cluson 1M candlepower torch;
- Garmin Etrex Summit HC GPS unit;
- VS36-10WW endoscope;
- Camera;

⁴ Bat Surveys, Good Practice Guidelines 3rd Ed, BCT (2016)

⁵ Bat Workers Manual (2004), Bat Mitigation Guidelines, (2004) both published by Natural England (formerly English Nature)

⁶ IEEM Guidelines for Ecological Impact Assessment in the United Kingdom (June 2015).

- Selection of small mirrors and torches.

The following potential bat roost features in trees were searched for:

- flaking bark;
- splits or tears in limbs and trunks;
- wounds and damage leading to crevices and cavities;
- holes made by woodpeckers and rot;
- suitable areas of ivy *Hedera helix* i.e. where roots have formed a matt behind which bats could roost.

Features were categorised as being of high, moderate or low suitability as roost sites. These assessment criteria are explained further in **Table 1** below.

Table 1: Criteria for evaluating the potential suitability of a feature as a roost site (ECS Ltd)

Roost feature	High	Moderate	Low
Flaking bark on a tree which is within a hedgerow or woodland setting	✓		
Flaking bark which is on an exposed tree or on very young trees such as groups of elm saplings		✓	
Woodpecker hole - open or only partly open aspect	✓		
Woodpecker hole – covered with ivy or with resident wasp/hornet nest		✓	
Split or tear in branch (particularly of oak or ash) in sunny aspect. Split tapers to narrow crevice	✓		
Split or tear on shaded side of tree in a woodland setting	✓		
Split or tear in a non-exposed location		✓	
Calloused wound or hole at any height or aspect including just above ground level	✓		
Rot hole - damp		✓	
Ivy covering – where a base plate has been created which is similar to the effect of flaking bark		✓	
Ivy – not particularly matted, either very large stems or very small, mostly leaves			✓
Potential roost feature with staining, droppings or flies	✓		

GPS locations were recorded for each tree. The species of tree, approximate diameter at breast height (dbh) and the nature of the potential roost features, their height and aspect were recorded. Early on in the survey photographs were taken of

each tree. However, due to the sheer number of trees and in many cases their close proximity to each other this was not considered helpful and was discontinued.

2.4 Survey Limitations and Precautionary Approach to Evaluation

Signs of bats roosting in trees are rarely present. Most roost sites are secreted away where predators cannot reach bats and so are inherently difficult to access. Bat droppings may fall onto the floor or vegetation and will degrade quickly, also the survey was undertaken in early spring when many bats are likely to have been roosting singly or in small rather than larger groups⁷. Bats also move between roost sites on a regular basis and consequently any set of surveys provide only a 'snapshot' of time.

Due to the limitations of surveying trees from the ground it is possible that some potential roost features may have been missed during survey. Potential roost features may be at a height or aspect whereby they simply cannot be readily identified. This problem is further exacerbated by those trees where leaves on understorey or neighbouring trees obscured views. Equally however, a number of the features identified as having potential may well prove to be unsuitable upon closer inspection. Overall therefore it is considered that the survey provides a reliable overall assessment of value.

⁷ Even accumulations of droppings from a maternity roost are likely to disappear over a period of days and occasionally hours.

3.0 Survey Results

3.1 Results

A total of 265 trees were identified as having Potential Roost Features. Of these, 181 were considered to have high potential, 68 moderate and 16 low potential to support bat roost sites. The greatest number of potential roosts were located in The Avenue, however this is not surprising given that this area has the highest number of trees including the greatest number of mature trees.

Round Wood also had a high number of potential roost trees in relation to the total number of trees present. Many of the potential roost features in Middle Clearing were behind flaking bark or in cavities lower down on trees. Flaking bark often offers high roosting potential but tends to be more ephemeral than features such as cavities and therefore may be of lower potential long term value. The high incidence of cavities lower down in trees in Middle Clearing may relate to past management practices as many appear to be as a result of damage to trees, possibly during harvesting/thinning operations some years ago. The incidence of these features seemed to cluster in two or three areas within Middle Clearing rather than being evenly distributed throughout this small woodland. The lowest incidence of potential roost features was noted in the Corsican Pine Plantation. The vast majority of these were in dead or dying trees; again these were focused in a few small areas rather than being evenly distributed across the woodland.

Table 2 Summary of Findings (all areas)

Area	No of trees with high potential roost features	No of trees with moderate potential roost features	No of trees with low potential roost features	Total
Avenue	91	39	7	137
Round Wood	50	9		59
Middle Clearing	33	16	5	54
Corsican Pine Plantation	7	4	4	15
	181	68	16	265

During radio tracking surveys in 2008 a total of nine roost trees were confirmed in The Avenue (four brown long-eared including three considered to be maternity roosts with emergence counts of 4-23 bats), three Bechstein's (all single male bats) and two Natterer's (two non-maternity roosts). Six roost trees were found in Middle Clearing (all brown long-eared roosts with between 1-5 bats; three of these were night roosts and not specifically identified as individual trees). No roosts were confirmed in Round Wood or the Corsican Pine Plantation in 2008, however the size

of these woodland areas and lack of tracks/rides within them made them less suitable for trapping bats and so less capture survey effort was conducted in these three areas. A non-breeding female Bechstein's bat was radio tracked to a roost site in a tree in Round Wood in May 2018⁸. ECOSA found bat droppings in other trees in Middle Clearing and the Avenue and their reports should be referred to for a definitive list of roost sites found within the four areas⁹.

⁸ This bat roosted primarily off site (c 2km southeast) during the tracking period

⁹ It is also believed that ECOSA have also undertaken some subsequent emergence and re-entry surveys of trees

Table 3a Results of tree inspection: The Avenue.

Tree no.	Prefix	Eastings	Northings	Tree Species	DBH Tree (mm)	Potential Roost Feature (PRF), Height & Aspect	Value of PRF: H/M/L	Notes
1	SU	71842	09443	Oak	500	Multiple WP holes	H	
2	SU	71821	09487	Oak	500	Split on limb, both on south side, 6m,W	H	
3	SU	71816	09505	Oak	500	Exposed limb end, 8m	L	
4	SU	71808	09511	Silver Birch	150	Cavity in limb, SW	M	
5	SU	71836	09530	Willow	300/150	2x limbs hole, 5m, S	H	Woodland edge near fence
6	SU	717281	09558	Oak	500	WP hole, SE, Calloused split in bark, E, plus flaking bark	H	
7	SU	71780	09560	Ash	200	Hole, 5m, S	M	
8	SU	71789	09576	Oak	500	Hole	M	Only moderate as on upper side of limb and exposed
9	SU	71754	09588	Oak	550	Hole on limb, 10m,E	M	
10	SU	71752	09595	Oak	550	WP hole, 6m, Split, 12m, SW	H	
11	SU	71752	09606	Oak	550	2 X holes	L	Probably branch ends; may not lead to cavities?
12	SU	71729	09610	Oak	400	WP holes x 2, 8m	H	Blue tit using hole
13	SU	71720	09648	Beech	400	Big scar possible gaps at edge, 8m, E	H	
14	SU	71716	09654	Oak	200	Flaking bark, 4m	H	
15	SU	71715	09666	Oak	350	2 X WP holes, 3m, SE	H	

Tree no.	Prefix	Eastings	Northings	Tree Species	DBH Tree (mm)	Potential Roost Feature (PRF), Height & Aspect	Value of PRF: H/M/L	Notes
16	SU	71706	09671	Oak	350	Hole, 1m, NW	M	Endoscope only extends upwards 150mm
17	SU	71690	09683	Oak	500	WP hole, 5m, NW	H	Very high potential and likely roost with staining below hole
18	SU	71689	09688	Oak	400	3 X WP holes, 6-7m, S	H	
19	SU	71699	09687	Oak	400	WP hole amongst Ivy, 7m, E	H	
20	SU	71686	09691	Oak	400	WP hole, 5m, SW, WP hole, 8m, NW, WP hole, 7m, E	H	
21	SU	71683	09689	Oak	250	Splits on all side, tree dead	M	
22	SU	71698	09713	Oak	600	Hole old branch end ,W	M	
23	SU	71684	09704	Beech	250	Calloused bark with gaps, 7m, E, also on branch	M	
24	SU	71667	09717	Oak	250	Calloused branch, probable cavity? 12m, W	M	
25	SU	71678	09709	Oak	300	Flaking bark	H	
26	SU	71695	09722	Oak	250	Flaking bark, 6m and above	M	
27	SU	71678	09712	Oak	500	Flaking bark all aspects	H	
28	SU	71672	09717	Oak	400	Hole on side branch, 7m , NE	H	
29	SU	71671	09715	Oak	300	2 x holes, 5-6m, E	M	

Tree no.	Prefix	Eastings	Northings	Tree Species	DBH Tree (mm)	Potential Roost Feature (PRF), Height & Aspect	Value of PRF: H/M/L	Notes
30	SU	71684	09722	Oak	450	Multiple broken limbs	L	Recent storm damage, could become M/H
31	SU	71664	09765	Ash	400	WP hole, 6m, SE, calloused split side branch, 12m, SE	H	
32	SU	71641	09753	Oak	700	1 X hole, 8m, SW, 2x split limbs, 10-14m	M	
33	SU	71644	09761	Silver Birch	150	Cavity, 1m, W	H	
34	SU	71635	09772	Oak	300	WP hole, 8m, NE, 2x holes at branch ends	H	
35	SU	71621	09781	Oak	400	Split, 0-12m, WP holes 10-12m, W	H	Edge of path
36	SU	71629	09754	Oak	400	2X WP holes, 7-8m, W	H	
37	SU	71634	09757	Oak	450	Possible calloused feature, 8m,	M	Hard to see due to holly
38	SU	71602	09823	Silver Birch	250	Cavity, 6m, SE	M	Ivy obscures view
39	SU	71597	09821	Oak	450	Splits in limbs, 5-10 m, NE, flaking bark, rot holes, 5-4m W	H	
40	SU	71623	09835	Silver Birch	300	Fallen tree, WP hole, 0.5m,	L	Checked with endoscope, no bats
41	SU	71694	09774	Oak		Hole in branch end, 8m, NW	M	End of footpath
42	SU	71603	09850	Oak	350	2 X WP holes, 4-5m, SE	H	Possible 3rd hole higher up
43	SU	71598	09854	Oak	350	1 X hole, 6m, NE	H	Underside of limb on field side; near stream

Tree no.	Prefix	Eastings	Northings	Tree Species	DBH Tree (mm)	Potential Roost Feature (PRF), Height & Aspect	Value of PRF: H/M/L	Notes
44	SU	71593	09873	Oak	350	Split in limb, 12m, SE	M	
45	SU	71572	09856	Oak	300	2 X holes, 5m, SE, split limb, 10-17m	H	
46	SU	71585	09894	Willow	250	Split, 3m, E&W	M	Split may go through to other side? Low value
47	SU	71553	09878	Oak	300	Calloused split, 12m	H	
48	SU	71553	9881	Oak	300	4 X WP holes, 6-9m, NW	H	
49	SU	71555	09891	Oak	300	Flaking bark	H	High potential; moderate value
50	SU	71541	09521	Oak	300	Hole in branch end, 6m, W	L	
51	SU	71543	09934	Oak	450	Splits at top	M	Obscured, cannot see well
52	SU	71533	09962	5 X Oak		All obscured by Holly	L	
53	SU	71483	10036	Pine sp.		Fallen, hung up, dead, 2 X WP holes, 3m, NE	M	
54	SU	71492	10059			Split in branch, 6m, NE	L	
55	SU	71442	10115	Oak		Limb with split and cavity	H	
56	SU	71454	10121	Willow	150	Hollow at base, SW	H	High potential; moderate value
57	SU	71420	10124	Oak	400	Split on trunk, 10m, S	H	
58	SU	71407	10132	Beech	450	Calloused split, 10m, S	H	Stained
59	SU	71402	10139	Oak	600	A number of splits in limbs	M	
60	SU	71413	10132	Silver Birch	250	3 X WP holes, 9-12m	H	

Tree no.	Prefix	Eastings	Northings	Tree Species	DBH Tree (mm)	Potential Roost Feature (PRF), Height & Aspect	Value of PRF: H/M/L	Notes
61	SU	71412	10131	Beech	200	Calloused hole, 4m, SW	H	
62	SU	71458	10083	Oak	600	WP hole, 7m, NE, WP hole, 2m, NE	H	Endoscope extends 300mm
63	SU	71438	10049	Willow	300	Split, calloused cavity, 4-5m, W	H	on small limb
64	SU	71438	10988	Silver Birch	300	Hole above callous, 1m	H	Endoscope searched, no bat present
65	SU	71415	10007	Silver Birch		Calloused split, 0-1m, NE	H	
66	SU	71422	09963	Willow	600	Cavity, 1m, W	H	
67	SU	71371	10032	Willow	600	Various splits, 0.5-2m, mainly south	M	
68	SU	71391	10026	Oak	450	Flaking bark, 0-2m, All aspects	H	Possibly more higher up.
69	SU	71379	10052	Willow		Splits	M	
70	SU	71403	10081	Oak	600	Cavity branch end, 15m, NE	M	
71	SU	71376	10050	Silver Birch		Calloused cavity, 1.5m, NW	M	
72	SU	71399	10131	Oak	750	Calloused split, 14m, S	H	
73	SU	71389	10113	Oak	550	Calloused spur, 18m, S	H	
74	SU	71420	10070	Willow		Hole with staining, 3m, S	H	
75	SU	71408	100065	Willow		Hole, 4m, N	H	
76	SU	71417	10052	Silver Birch	300	Long split with calloused cavity, 5m, W	H	
77	SU	71395	10060	Oak	600	Cavity at base, w	H	

Tree no.	Prefix	Eastings	Northings	Tree Species	DBH Tree (mm)	Potential Roost Feature (PRF), Height & Aspect	Value of PRF: H/M/L	Notes
78	SU	71451	09959	Oak	600	WP hole, 16m, W	H	
79	SU	71462	09973	Oak	300	Cavity, split, 1-8m	M	
80	SU	71465	09986	Oak	625	Various splits, all aspects	M	
81	SU	71471	09944	Oak	600	2X WP holes, 10-14m, W, calloused split, 10m, S	H	
82	SU	71472	09950	Oak	450	Calloused split cavity, side branch, 15m, S, N facing limb	H	
83	SU	71470	09924	Silver Birch	300	2 X WP holes, no top to them	M	
84	SU	71529	09963	Oak		Flaking bark	M	
85	SU	71531	09904	Oak	750	Split dead branch, flaking bark, 6-8m, S	M	
86	SU	71525	09849	Willow		Split and cavity	M	Fallen side branch
87	SU	71541	09897	Oak	400	Snapped branch, cavity, 4.5m, E	M	
88	SU	71538	09887	Oak	400	WP hole, 5m, S, WP hole, 10m, NE	H	
89	SU	71527	09892	Oak	400	Split, 12m, W	H	
90	SU	71526	09906	Oak	600	Hole branch end, 10m, E	M	
91	SU	71521	09907	Oak	600	Hole and split but exposed, 6m, E	M	
92	SU	71512	09944	Oak	400	Various holes and loose bark, all aspects	M	Dead tree only 5m high
93	SU	71519	09941	Oak	400	Gash and crevices, W	M	

Tree no.	Prefix	Eastings	Northings	Tree Species	DBH Tree (mm)	Potential Roost Feature (PRF), Height & Aspect	Value of PRF: H/M/L	Notes
94	SU	71501	09941	Oak	500	3X WP holes, 15m, W	H	
95	SU	71480	09968	Oak		Calloused cavity, 10-11m, NW	H	
96	SU	71474	09991	Oak		WP hole, 6m, S	H	
97	SU	71499	10004	Oak	300	Flaking bark, 2-4m, NW	H	High potential; low value
98	SU	71504	09985	Oak	300	Flaking bark, 3-5m, W	H	High potential; low value
99	SU	71508	09979	Oak	450	2 X cavities, 6-8m, NW	M	
100	SU	71548	09840	Oak	550	Calloused hole, 1.4m, S	M	Hole at top of tree
101	SU	71551	09839	Oak	450	WP hole, 10m, SW	H	
102	SU	71568	09831	Oak	450	WP hole, 8m, W	H	
103	SU	71571	09826	Oak	300	WP hole, 10m, E	H	
104	SU	71568	09821	Oak	700	WP hole, 10m, NW, Calloused limb, 12m, NW	H	
105	SU	71570	09817	Oak	500	WP hole, 8m, NE	H	
106	SU	71569	09812	Oak	400	Calloused limb, 12m, NE	H	
107	SU	71570	09806	Oak	400	WP hole, 10m, W	H	
108	SU	71589	09804	Oak	600	WP hole, 10m, E	H	
109	SU	71593	09772	Oak	750	WP hole, 6m, E, WP hole 14m, E	H	
110	SU	71630	09735	Oak	750	WP hole 10m, W	H	

Tree no.	Prefix	Eastings	Northings	Tree Species	DBH Tree (mm)	Potential Roost Feature (PRF), Height & Aspect	Value of PRF: H/M/L	Notes
111	SU	71624	09733	Oak	500	WP hole in limb, 14m, SE	H	On knuckle of side limb
112	SU	71630	09733	Oak	600	WP hole, 10m, SE	H	
113	SU	71667	09682	Oak	400	Multiple WP holes, 6-10m, all aspects	H	
114	SU	71669	09679	Oak	550	WP hole calloused limb, 8m, NE	H	
115	SU	71665	09673	Oak	500	WP hole, 6m, SW	H	
116	SU	71661	09677	Oak	450	WP hole, 8m, S	H	
117	SU	71683	09655	Oak	350	Multiple WP holes, 4-10m, NE & NW	H	
118	SU	71676	09642	Oak	400	2 X cavities in limb, 12m & 15m, SE	H	Side branches
119	SU	71687	09641	Oak	500	Cavity in limb, 15m, S	H	
120	SU	71710	09611	Oak	500	2 X WP holes, calloused, 10m & 12m, NE	H	
121	SU	71713	09600	Oak	500	WP hole, 6m, NW	H	
122	SU	71735	09578	Oak	650	WP hole, 12m, E	H	
123	SU	71725	09579	Oak	700	WP hole, 12m, NE	H	
124	SU	71741	09528	Oak	600	WP hole 14m, NE	H	
125	SU	71747	09534	Oak	800	Split limb, 6m, NW	H	
126	SU	71759	09534	Oak	450	2 X WP holes, 8m, W & NE	H	Dead tree
127	SU	71758	09513	Oak	750	2X WP holes, 11m, W	H	

Tree no.	Prefix	Eastings	Northings	Tree Species	DBH Tree (mm)	Potential Roost Feature (PRF), Height & Aspect	Value of PRF: H/M/L	Notes
128	SU	71785	09488	Ash	500	5 + WP holes, 12-15m, SW	H	
129	SU	71771	09490	Oak	700	WP hole, 12m, SW	H	
130	SU	71791	09456	Oak	700	Flaking bark all aspects, hole, 14m, NE, Cavity in branch W	H	
131	SU	71809	09467	Oak	800	2 x Large holes into dead limb cavity on side branch	M	
132	SU	71800	09449	Oak	1250	WP holes, 7m, N	H	
133	SU	71844	09548	Oak	600	WP hole, 7m, W	H	Top of tree missing
134	SU	71826	09450	Oak	900	Calloused cavity, 12m, N	H	Branch end rotten and broken but calloused bark and probable cavity
135	SU	71598	09725	Oak	450	Calloused wound, 6m, SW	H	Edge tree seen from field on walk around
136	SU	71712	09698	Oak	550	Split in end of branch, 10m, S	M	Edge tree seen from field on walk around
137	SU	71609	09870	Oak	400	Split in side branch, 10m, S	H	Edge tree seen from field on walk around

Table 3b Results of tree inspection: Round Wood

Tree no.	Prefix	Eastings	Northings	Tree Species	DBH Tree (mm)	Potential Roost Feature (PRF), Height & Aspect	PRF: H/M/L	Notes
1	SU	71556	09314	Oak	800	WP hole, 8m, S	H	
2	SU	71555	09305	Oak	700	Calloused split under branch, 14m, E	H	
3	SU	71550	09307	Oak	500	WP hole, 6m, S, Some loose bark	H	
4	SU	71545	09306	Oak	700	WP holes x 5, 8m, SW	H	
5	SU	71526	09284	Oak	400	Flaking bark, all aspects, all heights	H	
6	SU	71524	09281	Oak	300	Hole, 1m NW., also flaking bark	H	
7	SU	71534	09288	Oak	150	Flaking bark, all aspects	M	moderate potential; low value
8	SU	71570	09292	Oak	250	Flaking bark, all aspects	H	high potential; low value
9	SU	71512	09289	Oak	250	Flaking bark, dead wood at top	M	
10	SU	71493	09277	Oak	750	Cavity, 12m, N	H	underside of dead limb
11	SU	71490	09281	Oak	500	WP hole, 3.5m, lifted bark & hole, 10m	H	Dead tree
12	SU	71470	09275	Oak	1000	2 X WP hole, 8m, W	H	
13	SU	71492	09290	Oak	500	Flaking bark, 3m+, all aspects	H	
14	SU	71501	09299	Oak	500	WP hole, 17m, S, WP hole, 6m, SE	H	Bees nest present
15	SU	71532	09350	Oak	400	WP hole, 8m, W	H	
16	SU	71519	09336	Oak		Flaking bark, all heights, all aspects	H	high potential; moderate value
17	SU	71519	09346	Oak		Flaking bark, all heights, all aspects	H	high potential; moderate value

Tree no.	Prefix	Eastings	Northings	Tree Species	DBH Tree (mm)	Potential Roost Feature (PRF), Height & Aspect	PRF: H/M/L	Notes
18	SU	71510	09333	Oak		WP hole, 3m, SE, WP holes, 5m+7m, N	H	
19	SU	71510	09335	Oak		Flaking bark, all heights, all aspects	M	Dead tree
20	SU	71509	09341	Oak		Flaking bark, all heights, all aspects	H	high potential; moderate value
21	SU	71507	09347	Oak	250	Flaking bark, all heights, all aspects	H	
22	SU	71482	09340	Oak	800	2 x WP hole, 3m + 10m, E, WP hole, 5m, W	H	
23	SU	71472	09321	Oak	400	WP hole, 12m, N, 2 x WP hole, 10m, W	H	
24	SU	71466	09327	Oak	250	Flaking bark, all heights, all aspects	H	
25	SU	71462	09318	Oak	1100	WP hole, small, E	H	tree tagged 0064
26	SU	71459	09273	Oak	400	Flaking bark, all heights, all aspects	H	
27	SU	71451	09281	Oak	800	WP hole, 6m, NW, WP hole, 10m, SE	H	
28	SU	71417	09263	Oak	700	Small split, 6m, E	H	
29	SU	71425	09280	Oak	400	WP hole, 6m, NW	H	
30	SU	71412	09279	Oak		Flaking bark, all heights, all aspects	M	
31	SU	71399	09287	Oak	1000	Calloused cavity, 8-10m, S	H	
32	SU	71389	09296	Oak	250	Calloused cavity, 15m, S	H	
33	SU	71389	09264	Oak	450	Lifted bark and split, 10m, E	H	
34	SU	71393	09298	Oak	750	Numerous holes and lifted bark, SE	H	

Tree no.	Prefix	Eastings	Northings	Tree Species	DBH Tree (mm)	Potential Roost Feature (PRF), Height & Aspect	PRF: H/M/L	Notes
35	SU	71380	09274	Oak	700	Cavities	H	mixture of moderate and high potential
36	SU	71382	09277	Oak	750	WP hole, 12m, SW	H	
37	SU	71407	09319	Oak	200	Flaking bark, all heights, all aspects	M	
38	SU	71378	09338	Oak	450	WP holes, 6m, N and some flaking bark	H	
39	SU	71389	09332	Oak	300	Hole, 3-5m W	M	
40	SU	71444	09319	Oak	250	Calloused cavity, 5m, NE	H	
41	SU	71410	09340	Oak	400	Cavity, 6m, SE and flaking bark	H	dead tree
42	SU	71426	09336	Oak	500	Cavity, 1m, NW	H	
43	SU	71438	09321	Oak	250	Hole, 6m, NE, Split, 6m, S	H	
44	SU	71431	09302	Oak	400	WP hole, 5m, SE	H	
45	SU	71456	09328	Oak	300	WP hole, 4m, SE	H	
46	SU	71438	09381	Oak	600	WP hole, 9m, SW	H	
47	SU	71450	09376	Oak	900	Cavity, 2m, N, WP hole, 12m, N, lifted bark	H	
48	SU	71475	9336	Oak		Split & damage, 5-6m, N	M	
49	SU	71488	09331	Oak	900	WP hole, 4m, W WP hole, 4m, E	H	
50	SU	71452	09390	Oak	400	WP hole, 4m, SE	H	
51	SU	71464	09393	Oak	150	Flaking bark, all heights, WP hole, 6m, W	H	

Tree no.	Prefix	Eastings	Northings	Tree Species	DBH Tree (mm)	Potential Roost Feature (PRF), Height & Aspect	PRF: H/M/L	Notes
52	SU	71487	09381	Oak	200	Flaking bark, all heights, all aspects	M	
53	SU	71475	09409	Oak	300	WP holes, 5-5.5m, SE	H	
54	SU	71484	09401	Oak	700	WP hole, 15m, NE	H	
55	SU	71510	09393	Oak	150	Small amount of flaking bark	M	Dead tree
56	SU	71509	09409	Oak	400	WP hole, 10m, SE	H	Feature on outward facing limb
57	SU	71510	09355	Oak	300	Peeling and flaking bark, all heights, hole, 4m	H	
58	SU	71520	09340	Oak	500	Flaking bark, all heights, all aspects	H	High potential: moderate value
59	SU	71521	09341	Oak	300	Flaking bark, all heights, all aspects	H	High potential: moderate value

Table 3c Results of tree inspection: Middle Clearing

Tree no.	Prefix	Eastings	Northings	Tree Species	DBH Tree (mm)	Potential Roost Feature (PRF), Height & Aspect	PRF: H/M/L	Notes
1	SU	71278	09810	Oak	300	Split, 5-6m, N	M	Split, heartwood exposed
2	SU	71240	09808	Oak	200	WP hole, 6m, N, Flaking bark	H	
3	SU	71240	09808	Oak	150	Flaking bark	L	
4	SU	71246	09806	Oak	150	Flaking bark	M	
5	SU	71246	09806	Oak	150	Flaking bark	M	
6	SU	71246	09806	Oak	150	Flaking bark	M	
7	SU	71246	09806	Oak	150	Flaking bark	M	
8	SU	71232	09800	Oak	140	Flaking bark	M	
9	SU	71235	09814	Oak	200	Flaking bark, all aspects	H	
10	SU	71217	09829	Oak	150	Flaking bark, Exposed cavity, 1m,	H	Although cavity may now be too exposed?
11	SU	71230	09776	Beech	100	Cavity	H	Two stemmed tree; checked cavity with endoscope at least 150mm deep
12	SU	71268	09760	Oak	150	Flaking bark, 7m+, all aspects	L	
13	SU	71270	09755	Oak	300	Peeled bark, 2m,W, Hole, 7m, W	H	
14	SU	71264	09742	Oak	200	Flaking bark, all aspects, all heights	H	
15	SU	71253	09734	Oak	250	Flaking bark, all aspects, all heights	H	Three trees close together; high potential but low value
16	SU	71253	09734	Oak	250	Flaking bark, all aspects, all heights	H	
17	SU	71253	09734	Oak	250	Flaking bark, all aspects, all heights	H	

Tree no.	Prefix	Eastings	Northings	Tree Species	DBH Tree (mm)	Potential Roost Feature (PRF), Height & Aspect	PRF: H/M/L	Notes
18	SU	71262	09755	Oak	300	Flaking bark, all aspects, all heights	H	
19	SU	71269	09728	Oak	150	Flaking bark, all aspects, all heights	H	
20	SU	71235	09708	Oak	380	3 x WP holes	H	Tree tagged 0079
21	SU	71274	09703	Oak	300	Large hole, 5m, S	H	Checked with endoscope; hole at least 150mm deep. Grass nest present
22	SU	71249	09714	Oak	300	Hole at base, SE,	H	Confirmed roost previously radio tracked BLE bat. Endoscope today: no bat present
23	SU	71231	09687	Oak	300	Flaking bark, all aspects, all heights	M	
24	SU	71223	09688	Oak	400	WP hole, 8m, NW	H	
25	SU	71258	09690	Oak	200	Flaking bark, all aspects, all heights	H	
26	SU	71283	09657	Oak	300	WP hole, 8m, NE, WP hole, 8m, SW	H	Tree on edge of wood
27	SU	71240	09603	Oak	230	Flaking bark, all aspects, WP hole, 8m, NE	H	
28	SU	71229	09669	Oak	300	Flaking bark, all aspects, all heights	M	
29	SU	71261	09660	Oak	230	Flaking bark, all aspects, all heights	M	
30	SU	71273	09623	Oak	231	Flaking bark at 6m+	L	
31	SU	71266	09618	Oak	300	Flaking bark at 6m+	M	
32	SU	71249	09613	Oak	300	Flaking bark, all aspects, all heights	M	
33	SU	71253	09613	Oak	300	Hole above callous, 1m, W	H	Endoscope hole extends at least 300mm

Tree no.	Prefix	Eastings	Northings	Tree Species	DBH Tree (mm)	Potential Roost Feature (PRF), Height & Aspect	PRF: H/M/L	Notes
34	SU	71279	09618	Oak	380	Calloused cavity, 1m, S with hole 1m above this	H	
35	SU	71284	09608	Oak		Hole at base, 0.3m, W	H	Endoscope hole extends at least 200mm
36	SU	71259	09584	Oak	300	WP hole, 10m, N	H	
37	SU	71256	09584	Oak	200	Flaking bark, all aspects	L	
38	SU	71265	09553	Oak	300	Scar, 6-10m,	M	Too high to view; probably crevices
39	SU	71287	09527	Oak	400	Hole, scar, 0.5m, NE	M	
40	SU	71285	09527	Oak	300	Cavity above scar	M	
41	SU	71270	09530	Oak	450	Hole, scar, 1m, E	M	
42	SU	71288	09565	Oak	400	Hole, scar, 2m, E	H	Tree on edge of wood
43	SU	71283	09661	Oak	450	WP hole, 9m, E	H	
44	SU	71240	09506	Oak	450	Calloused scar, 0-1m, W, cavity at top	H	
45	SU	71247	09512	Oak	300	2m, E	H	High potential for low value
46	SU	71255	09514	Oak	300	Calloused scar, 0-1m, S, cavity at top	H	
47	SU	71255	09514	Oak	380	Calloused scar, 2m, SW, cavity at top	H	
48	SU	71267	09510	Oak	300	Flaking bark, all aspects, all heights	H	
49	SU	71249	09542	Oak	300	Flaking bark, all aspects, all heights	H	
50	SU	71246	09572	Oak	300	Flaking bark, all aspects, all heights	H	Dead tree
51	SU	71238	09606	Oak	200	Flaking bark, all aspects, all heights	M	

Tree no.	Prefix	Eastings	Northings	Tree Species	DBH Tree (mm)	Potential Roost Feature (PRF), Height & Aspect	PRF: H/M/L	Notes
52	SU	71225	09637	Oak	150	Flaking bark, all aspects, all heights	L	
53	SU	71223	09652	Oak		WP hole, 12m, E, WP hole 11.5m, N	H	
54	SU	71255	09652	Oak		WP hole 2m, SW	H	On stream edge

Table 3d Results of tree inspection: Corsican Pine Plantation, Havant Thicket

Tree no.	Prefix	Eastings	Northings	Tree Species	DBH Tree (mm)	Potential Roost Feature (PRF), Height & Aspect	Roost Feature H/M/L	Notes
1	SU	71764	10165	Beech	150	old scar	L	tree on bank south edge of woodland just outside Corsican Pine plantation
2	SU	71609	10156	Oak	450	Crack in branch, 3.5m, E	L	tree south edge of C Pine
3	SU	71569	10255	Corsican Pine	350	WP hole, 8m, W	H	Top of tree missing; probably unsafe to climb
4	SU	71574	10234	Corsican Pine	250	3 x WP holes, 4m, N	H	Upper 2/3 of tree missing; unsafe to climb?
5	SU	71589	10212	Corsican Pine	200	Flaking bark, 4-6m, all aspects	L	
6	SU	71605	10244	Corsican Pine	250	Flaking bark, 0.5 & 2m, W	H	fallen tree
7	SU	71648	10236	Corsican Pine	300	Flaking bark, 1-2m, west	M	fragile bark so unsuitable to climb
8	SU	71621	10221	Corsican Pine	300	Multiple WP holes, all aspects	H	Top half of tree missing
9	SU	71636	10197	Corsican Pine	250	Holes S & N	M	Top half of tree missing; holes close to broken top therefore only moderate
10	SU	71644	10190	Corsican Pine	300	Hole, 3m, S	M	Upper half of tree missing, Ivy clad
11	SU	71678	10273	Corsican Pine	250	Multiple WP holes at 5, 6 & 7m, all aspects	H	Upper half of tree missing
12	SU			Corsican Pine	300	Flaking bark	L	Fallen (leaning) tree; top missing. GPS not recorded

Tree no.	Prefix	Eastings	Northings	Tree Species	DBH Tree (mm)	Potential Roost Feature (PRF), Height & Aspect	Roost Feature H/M/L	Notes
13	SU	71779	10195	Corsican Pine	450	Flaking bark and holes, 4m +, S	H	Upper half of tree missing
14	SU	71756	10194	Corsican Pine	300	Multiple WP holes, all aspects + heights	H	Upper half of tree missing
15	SU	71760	10177	Corsican Pine	200	2 x small holes, 6-7m,NW	M	Upper half of tree missing

WP woodpecker

**BRP = bat roost potential

Agl above ground level

Dbh diameter at breast height

4.0 Discussion

All bats and their roost sites are legally protected (**See Appendix 2**). It is necessary for an EPSM licence to be in place before felling any trees with a bat roost present.

Further assessments will be required prior to felling any of the trees which are identified as having potential to support bat roost sites. Natural England may request updated information on roost sites recorded in 2008 (although at least one of these has since fallen and disintegrated¹⁰). In many cases a tree climbing inspection will be of greatest value. This may eliminate some features which may not be suitable for roosting on closer inspection. It will also enable a better assessment of the risk of a feature being a bat roost site; in some cases if bats are present at the time then it may also confirm some roost sites. Tree climbing surveys are slow to conduct and require two qualified tree climbers. Not all trees are safe to climb and even on healthy trees some of the features may be on fragile branches and out of safe reach. Flaking bark is fragile and may be damaged during tree climbing.

Other survey techniques are also likely to be helpful including one or more of the following:

- Back tracking towards roosts prior to dawn;
- Emergence/re-entry surveys with experienced surveyors using acoustic bat detectors and night vision;
- Thermal imaging cameras prior to dawn;
- Use of fixed point detectors in areas where roosts are suspected may detect high levels of activity at emergence/re-entry times and help to focus other survey effort;
- Some further trapping and radio tracking of bats within the target areas.

Due to the transient nature of bat roosting and inherent limitations on surveys it is unrealistic to consider all roost sites to be determined prior to a final search on the day of felling¹¹. The level of surveys required prior to that should be adequate to inform an EPSM licence application and to guide a mitigation strategy which can minimise the risk of harm to bats during felling. BCT state (2016)¹² that:

“ Due to these (survey) limitations and from what is known about the ecology of tree-roosting bats, it is arguable that all trees with bat roosting potential should be considered part of a resource that will be used at some one time or another by tree roosting bats in order to determine the extent of impacts. Survey work on individual trees may confirm presence but is unlikely to conclusively confirm absence.

¹⁰ Silver birch at northern end of the Avenue which was used by a small maternity brown long-eared roost

¹¹ Even some of the roosts identified in 2008 and tagged could not easily be re-found in 2020

¹² Page 44

Precautionary measures are likely to still be essential during works even where surveys have not identified occupancy."

5.0 Conclusions

A total of 265 trees were identified as having potential roost features for bats in four woodland areas which will be felled. Nine confirmed bats roosts are also present within these areas. Felling is necessary prior to the creation of a new reservoir. There are no suitable alternative locations for the reservoir and no alternative scheme designs which could avoid felling trees with known and potential bat roosts.

A European Protected Species Mitigation licence will be required prior to felling any of the trees and in most cases some further surveys will be required by Natural England. Any individual survey method has particular strengths and weaknesses and a combination of methods will be the most effective. It is unrealistic to consider that every single bat roost can be identified prior to granting a licence and a suitable levels of assessment must be agreed in advance with Natural England.

6.0 References

Bat Conservation Trust (2016) *Bat Surveys-Good Practice Guidelines 3rd Ed*

The Conservation (Natural Habitats &c.) (England & Wales) Regulations 2017 (as amended).

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CIEEM Guidelines for Ecological Impact Assessment in the UK and Ireland, Terrestrial, Freshwater and Coastal (Jan 2016, 2nd Edition)

JNCC (2000) *Habitat Management for Bats*

National Planning Policy Framework (April 2012) *Department for Communities & Local Government*

Natural England *Bat Mitigation Guidelines* (2004)

Natural England *Bat Workers Manual*, 3rd Ed (2004)

Natural England website: http://www.natural-england.org.uk/regions/east_of_england/ourwork/standingadvice/protectedspecies/bats.aspx

June 2009 ODPM (2005) *Planning Policy Statement 9: Biodiversity and Geological Conservation* Office of the Deputy Prime Minister.

ODPM (2006) *Planning for Biodiversity and Geological Conservation: A Guide to Good Practice* Office of the Deputy Prime Minister

Appendix 1

Surveyor Experience

Colleen Hope (nee Mainstone), Chartered Ecologist, MCIEEM, BSc, PGCE Director, Ecological Consultancy Services Ltd.

Colleen Hope is joint Director of Ecological Consultancy Services Ltd (ECS), an ecological consultancy which she established in 2008. Prior to this Colleen was employed in a senior role at a consultancy based in Winchester for six years. Colleen is a Chartered Ecologist and full member of CIEEM.

ECS employs two permanent staff who undertake surveys for a wide range of protected species including reptiles, great crested newts, dormice, otters, water voles, bat and barn owls. ECS specialises in surveying and assessing sites for bats.

ECS has a wide client base including local authorities, the Environment Agency, MOD, Forestry England, MOD, National Trust, Woodland Trust and large, small and medium sized planning consultancies. ECS also provides specialist bat survey services to other ecological consultancies mainly with regard to Environmental Impact Assessments (EIA). Colleen has successfully obtained over 150 DEFRA/Natural England EPS (bat) development licences for a range of sites including modern and historic buildings, barns, trees, large scale new town developments, wind farms and road schemes.

Over the last 19 years Colleen has managed a number of county and borough wide bat surveys including a capture, ringing and radio tracking study into the distribution of Bechstein's and barbastelle bats in the New Forest, Hampshire. Bat survey work has taken her overseas to India, Burma (Myanmar) and Vietnam.

Colleen holds a Natural England bat survey licence to Levels 3 & 4 and is a licenced Natural England trainer. She is also one of a c 150 Registered Ecological Consultant's (REC) under Natural England's Low Impact Licence scheme. Colleen holds Natural England licences to survey/disturb barn owl, great crested newt, dormouse, sand lizard and smooth snake.

Dr Paul Hope, BSc (Hons), MCIEEM Director, Ecological Consultancy Services Ltd.

Paul is also joint Director of ECS and based in Romsey, Hampshire. He undertakes site appraisals for a range of species including reptiles, badgers, water voles, dormice and species and specialises in surveying for bats.

Paul has held Natural England bat survey licences for over 19 years and undertaken a range of surveys for both bats and reptiles. He is licenced trainer for Natural

England (Conservation licences) and also trains consultants for bat survey licences (to levels 3 & 4). He also holds a licence to survey/disturb great crested newts.

Paul obtained a PhD through the University of Bristol where he studied the hibernation ecology of British bats. He has extensive experience in the collection and analysis of field data using a range of monitoring devices including bat detectors (time expansion, frequency division and heterodyne), infrared motion sensors and radio telemetry equipment for receiving and data logging.

Colleen and Paul have obtained over 40 Project licences for the capture, ringing and fitting of radio tags to bats. During the process of surveying for environmental impact assessments both Colleen & Paul have undertaken radio tracking and ringing studies of seven bat species. They each have over 1200 hours radio tracking experience radio tracking a range of bat species in relation to impact assessments for development and providing information for bat conservation.

Publications

Hope, P. R. & Jones, G. (2011) Warming up for dinner: torpor and arousal in hibernating Natterer's bats (*Myotis nattereri*) studied by radiotelemetry. *Journal of Comparative Physiology B*. DOI 10.1007/s00360-0110631-x

Hope, P. R. & Jones, G. (2013) An entrained circadian cycle of peak activity in a population of hibernating bats. *Journal of Mammalogy* 94 (2) B. DOI 10.1644/12-MAMM-A-095.1

Hope, P. R. et al (2014) Second generation sequencing and morphological faecal analysis reveal unexpected foraging behaviour by *Myotis nattereri* (Chiroptera, Vespertilionidae) in winter. *Frontiers in Zoology* 11:39.

Mason, V., & Hope, P.R. (2013) Echoes in the dark: Technological encounters with bats. *Journal of Rural Studies*, 33, 107-118.

Appendix 2

Legislation & Policy

Legislation

The European Protected Species (EPS) considered within this report include all species of bat.

The two key pieces of legislation affording protection to EPS and their habitats are the Conservation of Habitats and Species Regulations 2017 (as amended)¹³ and the Wildlife & Countryside Act 1981 (amended 2009).

Under the Conservation of Habitats and Species Regulations 2017 (as amended) it is an offence to deliberately kill, capture or injure an EPS, or to damage or destroy the breeding site or resting place of such an animal. Disturbance of a European protected species is also an offence if done in such a manner as to be likely to significantly affect:

- (a) the ability of an EPS to survive, breed, or reproduce, or to rear or nurture young, to hibernate or migrate; or
- (b) the local distribution of that species.

Because EPS may not always be present or evident in their places of shelter are considered to be legally protected even when the animals themselves are not present. If any activities relating to development which could result in any of the offences above are undertaken it is necessary to obtain a licence from Natural England (formerly issued by Department for Environment, Food and Rural Affairs, DEFRA). In order for a licence to be granted the following conditions must be satisfied:

- The proposal must be necessary *'to preserve public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment'*;
- *'There is no satisfactory alternative'*;
- The proposals *'will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range'*.

¹³ Conservation (Natural Habitats &c) Regulations 2017, (England & Wales, as amended)

Wildlife & Countryside Act 1981 (as amended)

The Wildlife & Countryside Act 1981 (as amended) (WCA) also makes it an offence to intentionally or recklessly disturb EPS, to obstruct access to places of shelter (as defined above), and to sell or advertise EPS for trade. The Wildlife & Countryside Act extends protection to a range of non EPS.

The Natural Environment & Communities Act (NERC) 2006

The NERC Act states (s40) that

'Every public body must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity.'

Section 40(3) also states that

'conserving biodiversity includes, in relation to a living organism or type of habitat, restoring or enhancing a population or habitat.'

Policy

National Policy

The National Planning Policy Framework (NPPF) amended in February 2019 sets out the Government's planning policies for England and how these should be applied. It replaces the NPPF 2012 (which was updated with minor amendments in 2018).

The NPPF provides a framework within which locally-prepared plans for housing and other development can be produced. Planning law requires that applications for planning permission be determined in accordance with the development plan (including Local Plans and Neighbourhood Plans), unless material considerations indicate otherwise. The National Planning Policy Framework must be taken into account in preparing the development plan, and is a material consideration in planning decisions. Planning policies and decisions must also reflect relevant international obligations and statutory requirements.

Para 11 of the NPPF states *"Plans and decisions should apply a presumption in favour of sustainable development"*. However Para 177 states that *"The presumption in favour of sustainable development does not apply where the plan or project is likely to have a significant effect on a habitats site (either alone or in combination with other plans or projects), unless an appropriate assessment as concluded that the plan or project will not adversely affect the integrity of the habitats site."*

The NPPF states that opportunities for securing measurable net gains for biodiversity and enhancement should be achieved by *"minimising impacts on biodiversity and providing net gains in biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures..."* (Para 170).

When determining planning applications, local planning authorities should apply the following principles (Par 175):

- a) if significant harm to biodiversity resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused;
- b) Development on land within or outside a Site of Special Scientific Interest, and which is likely to have an adverse effect on it (either individually or in combination with other developments), should not normally be permitted. The only exception is where the benefits of the development in the location proposed clearly outweigh both its likely impact on the features of the site that make it of special scientific interest, and any broader impacts on the national network of Sites of Special Scientific Interest;
- c) development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons and a suitable compensation strategy exists; and
- d) Development whose primary objective is to conserve or enhance biodiversity should be supported; while opportunities to incorporate biodiversity improvements in and around developments should be encouraged, especially where this can secure measurable net gains for biodiversity.

Protection of sites proposed as SPAs, SACs and Ramsar sites or acting as compensation for SPAs, SACs or Ramsar sites should receive the same protection as habitat sites.

Appendix D12 2020 bat survey results from Ground Level Tree Assessment at the northern access road and an emergence survey at Manor Lodge

During May 2008 a single whiskered bat was radio-tracked back to a maternity roost along Manor Lodge Road approximately 50 metres east of Havant Thicket woodland. A maximum of 14 bats were recorded emerging from this building during 2008 emergence surveys.

In 2019 Natural England requested an update emergence survey at this building. The emergence survey was undertaken on the evening of 15/06/2020, led by Trevor Codlin of Portsmouth Water. During a visual inspection of the exterior of the building prior to the emergence survey, conditions appeared unchanged since the 2008 survey when a maternity colony was reported. During the 2020 inspection, bat droppings and urine marks were found on the garage door and in a crevice behind a fascia on the garage.

One soprano pipistrelle bat was recorded emerging from the building. Eleven bats of a *Myotis* species were also recorded emerging.

On 24 June 2020], Trevor Codlin undertook a ground level tree assessment of the trees within and adjacent to the footprint of the northern access road. All these individual trees were assessed as having negligible potential for roosting bats.

Appendix D13 2020 bat survey results from Ground Level Tree Assessment at the northern access road and an emergence survey at Manor Lodge

TECHNICAL NOTE

Pages:	4	Date:	13 th August 2020
Purpose:	Havant Thicket Reservoir Project		
Subject:	ASSESSMENT OF BAT ACTIVITY AT FOUR WOODLAND BLOCKS IN HAVANT THICKET		

1. Introduction

- 1.1 Portsmouth Water Ltd (PW) have been carrying out and commissioning extensive ecological survey work on the site of a proposed winter water storage reservoir, and surrounding land since 2005. The proposals will involve the loss of bat roosting and foraging habitat, therefore PW, as part of their mitigation and compensation strategy, are proposing management works within Forestry England (FE) land at Havant Thicket (HT).
- 1.2 The aim of this work is to improve foraging opportunities for bats by creating woodland edge habitats and clearings.
- 1.3 At a meeting with Natural England on 10th July 2019, it was requested that PW provide evidence that the areas identified for enhancement were not already being used by bats.
- 1.4 This technical note provides details of survey work, carried out on the FE land using remote triggered bat detectors during two six night periods.

2. Methodology

- 2.1 Two Wildlife Acoustics SM4FS bat detectors were placed at four locations within land at Havant Thicket, and set to run for six consecutive nights.
- 2.2 Detectors were located in pairs, with one situated within an area of woodland identified for enhancement, and the other on an adjacent woodland ride. Detectors were located approximately 50m apart, and outside of the range of the microphone of each detector.
- 2.3 Detectors were set to start recording 30 minutes before sunset and stop recording 30 minutes after sunrise; default settings were used on each detector.
- 2.4 Collected data was analysed initially using Kaleidoscope Pro v.5.1.9g and then reviewed and checked manually by the surveyor using Sonobat v2.97vi.

3. Survey Details

- 3.1 The survey was carried out by Trevor Codlin BSc (Hons) MCIEEM, Principal Ecologist with Portsmouth Water and licenced bat worker (CL18), with over 20 years' experience carrying out bat surveys.
- 3.2 Detector locations and dates are provided in Table 1, below.

Table 1: Locations of Detectors each survey date

Detector Number	16 – 22 July 2019	1 – 6 August 2019
S4U08065	Location 4 (SU 71602 10512) – dense secondary bird woodland area to be managed.	Location 6 – (SU 71695 10750) – area of mature conifer woodland area to be managed
S4U08114	Location 3 (SU 71561 10524) – woodland ride	Location 5 (SU 71693 10806) – woodland ride

3.3 The weather conditions on each date were as detailed in Table 2 below;

Table 2: Date and weather conditions

Date	Overnight Temperature (Ave)	Weather conditions
16 – 22 July 2019	High 19.5C – Low 11.8C	Varied from cool clear nights at the start of the survey period with heavy overnight rain on the night of 19/20 th July. Winds generally light and from the south and west
1 st – 7 th August 2019	High 20.5C – Low 14C	Generally fine conditions throughout the week, although some rain on the morning of 5 th August, winds were light and alternating between the north and south-west predominantly.

4. Survey Results

4.1 Figure 1 below presents the results of the remote bat detector survey carried out from 16th - 21st July at Locations 3, woodland ride, and 4, secondary birch woodland.

4.2 The total number of bat registrations recorded at Location 3 was 809 of six species. The most numerous species was the common pipistrelle *Pipistrellus pipistrellus* with 784 registrations which equated to 96.9% of the total registrations.

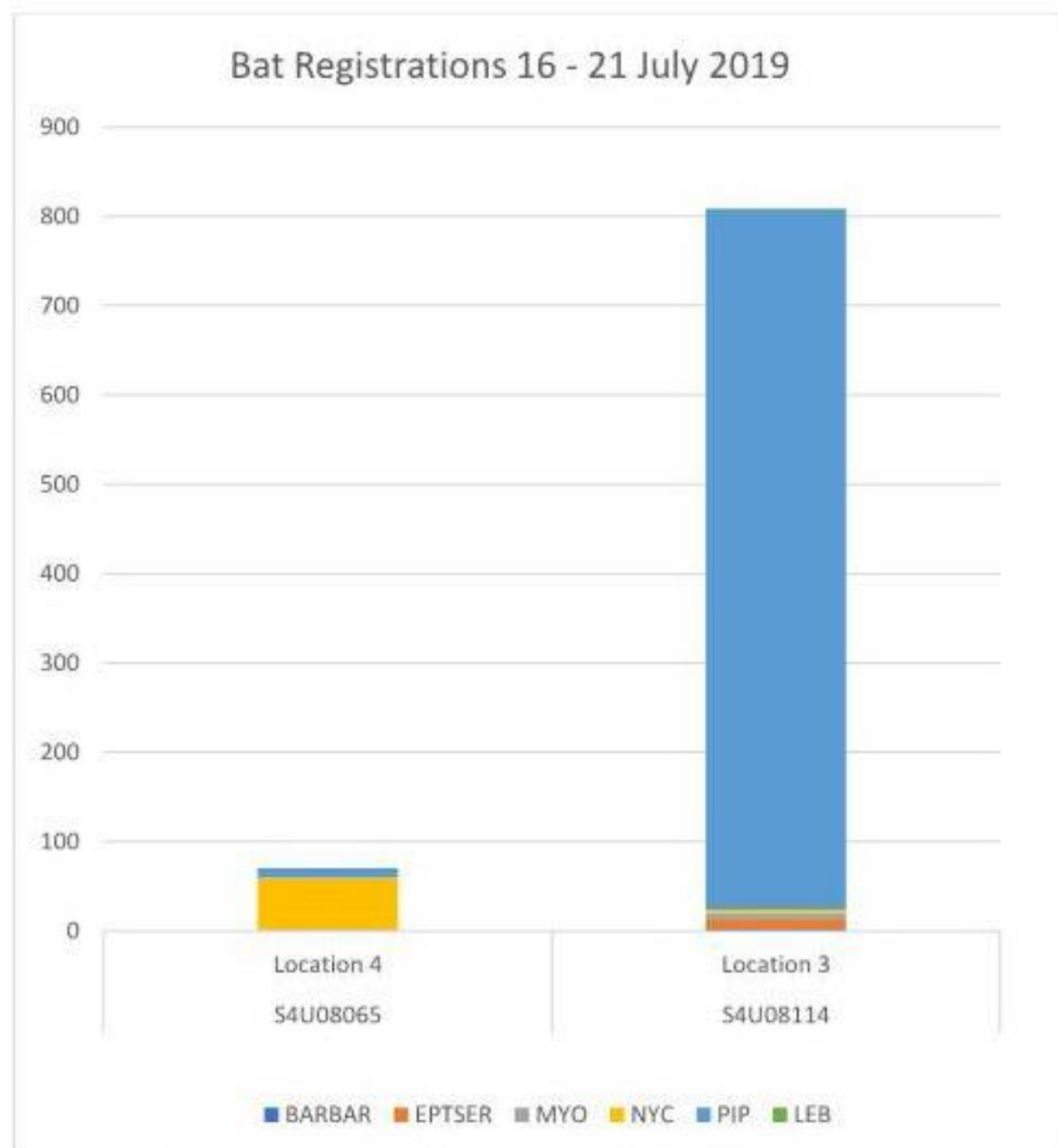


Figure 1: Survey results from 16th - 21st July at survey locations 3 and 4

- 4.3 The other species recorded were western barbastelle *Barbastella barbastellus* 2 (0.25%), serotine *Eptesicus serotinus* (10, 1.24%), *Myotis* species (8, 0.99%), *Nyctalus* species (4, 0.50%) and a long-eared bat species *Plecotus* sp. (1, 0.12%).
- 4.4 In contrast to Location 3, Location 4 recorded only 70 registrations over the same period, which equates to 8.65% of the total number of registrations recorded at Location 3. The most numerous species recorded was *Nyctalus* sp. e.g. Noctule *N. noctula* and Leisler's *N. Leisleri*, with 57 registrations, which equated to 81.42% of the total, the majority of which were recorded on one night, 17th July.
- 4.5 The other species recorded were common pipistrelle (11, 15.7%), serotine (1, 1.44%) and *Myotis* sp. (1, 1.44%).
- 4.6 Figure 2 below presents the results of the remote detector survey from Locations 5, woodland ride and 6, conifer plantation.
- 4.7 The total number of bat registrations recorded at Location 5 was 2,730, with the most numerous species recorded being common pipistrelle with 2,622 registrations (96.04%).
- 4.8 The species mix was the same as the previous woodland ride (Location 3), and comprised serotine (58, 2.12%), *Myotis* sp. (35, 1.29%), barbastelle (8, 0.29%) *Nyctalus* sp. (6, 0.22) and long-eared sp. (1, 0.04%).

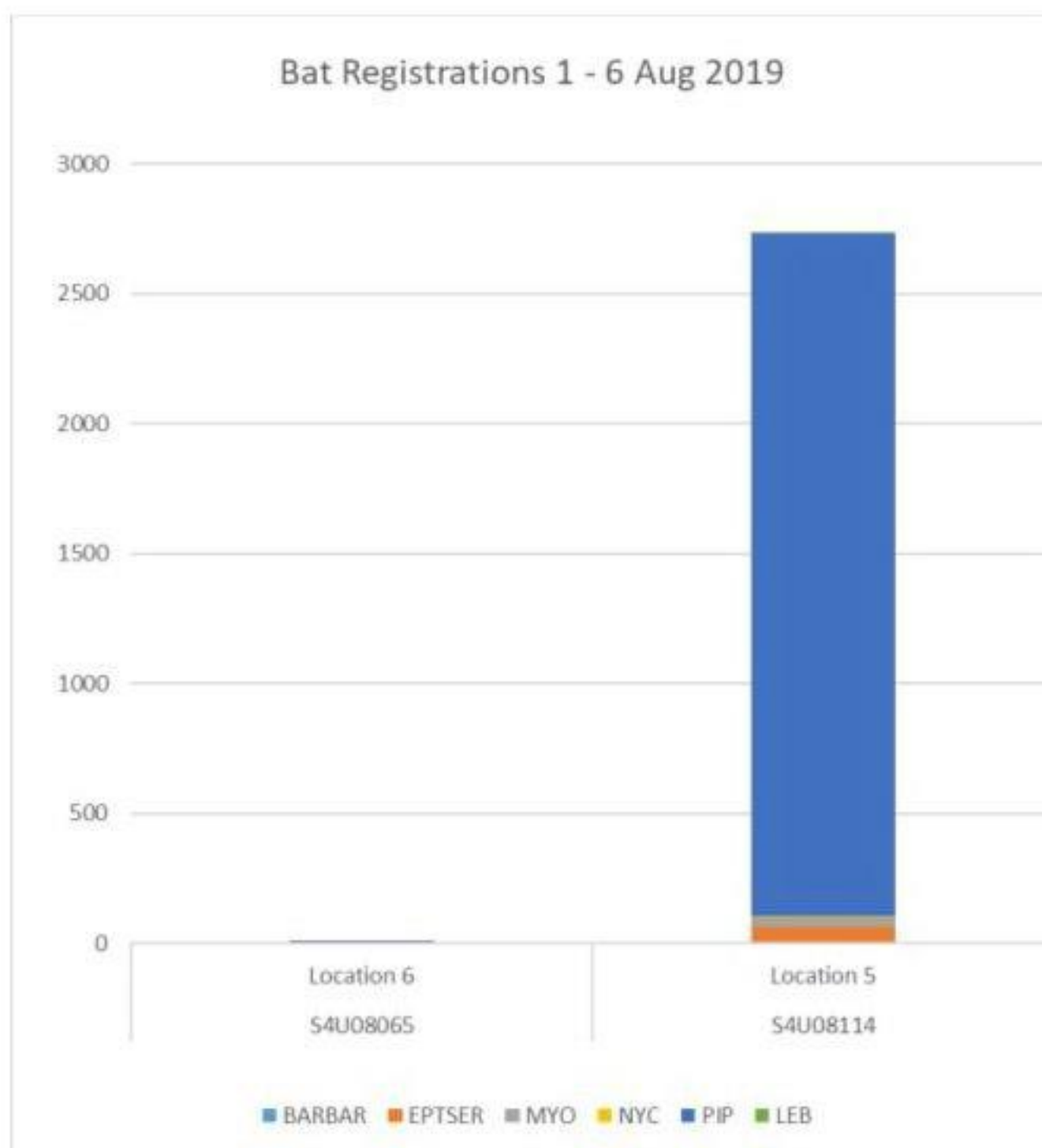


Figure 2: Survey results from 1st to 6th August at survey locations 5 and 6

- 4.9 As with Locations 3 and 4, Location 6 was notably quieter than Location 5, with only 12 registrations recorded, 11 common pipistrelle (91.6%) and one (8.4%) *Nyctalus* sp, only 0.44% of the total of Location 5.
- 4.10 Given the difference between Locations 5 and 6, detector S4U08065 was checked to ensure that it was working correctly, and that the batteries were not failing. Both detectors were set up in a control location and operated over two nights alongside each other. The both detectors recorded the same information.

5. Conclusions

- 5.1 The results of this survey clearly demonstrate that the areas of woodland identified for enhancement within Havant Thicket are not currently being used by foraging bats, and that the woodland ride locations provide an important foraging resource.
- 5.2 Given these results it suggests that the proposed management works, to create woodland clearings and edge habitats, in Locations 4 and 6, will provide additional foraging resource for bats.
- 5.3 The erection of new bat roosting features in the local woodland will also provide additional roosting habitat for bats.

Appendix D14 Assessment of Bat Activity within the Phase 1 planting area on Gipsies Plain

TECHNICAL NOTE

Pages:	3	Date:	17 th August 2020
Purpose:	Havant Thicket Reservoir Project		
Subject:	ASSESSMENT OF BAT ACTIVITY WITHIN THE PHASE 1 PLANTING AREA ON GIPSIES PLAIN		

1. Introduction

- 1.1 Portsmouth Water Ltd (PW) carried out some advanced enhancement works, in the form of tree planting in two areas of land that fall outside of the area proposed for the Havant Thicket Reservoir (HTR), but within their land holding.
- 1.2 The purpose of this tree planting was to strengthen the connectivity on the eastern and western sides of the proposed reservoir site, as part mitigation of the loss of The Avenue, which forms a functioning link between between Staunton Country Park (SCP) in the south and Havant Thicket (HT) in the north.
- 1.3 This tree planting was permitted by Natural England, in advance of the submission of a planning application and the potential granting of planning permission, in order to allow trees to become established, and therefore functional, at least in part, prior to the removal of The Avenue.
- 1.4 During the drafting of the Ecological Impact Assessment, a question was raised concerning the functionality of this tree planting for bats, this Technical Note provides details of an assessment of the area for bats, using a remote sensing bat detector.

2. Methodology

- 2.1 A single Wildlife Acoustics SM4FS bat detector was placed in a central location (SU 72525 09850) within the Phase 1 tree planting area on Gipsies Plain, and left in-situ for seven consecutive nights.
- 2.2 The detector was set to start recording 30 minutes before sunset and stop recording 30 minutes after sunrise; default settings were used.
- 2.3 Collected data was analysed initially using Kaleidoscope Pro v.5.1.9g and then reviewed and checked manually by the surveyor using Sonobat v2.97vi.
- 2.4 Given that the primary purpose of this study was to assess the level of bat activity, no attempt has been made to identify some of the more challenging species groups, e.g. *Myotis*, *Nyctalus* and *Plecotus* bat species for this technical note.

3. Survey Details

- 3.1 The survey was carried out by Trevor Codlin BSc (Hons) MCIEEM, Principal Ecologist with Portsmouth Water and licenced bat worker (CL18), with over 20 years' experience carrying out bat surveys.
- 3.2 The detector was deployed on 5th August 2020 at 14:30 and collected on 12th August at 14:30. The microphone was mounted on a post and set approximately 2.5m off the ground.

3.3 The weather conditions on each date were as detailed in Table 1 below;

Table 1: Date and weather conditions

Date	Temperature Range	Weather conditions
5 th Aug 2020	High 22C – Low 17C	Warm, dry and partly cloudy, occasional showers late evening. Winds SSW moderate.
6 th Aug 2020	High 26C – Low 18C	Warm, dry and partly cloudy, no rain. Winds light S.
7 th Aug 2020	High 31C – Low 14C	Warm, dry and partly cloudy, no rain. Winds light N.
8 th Aug 2020	High 30C – Low 19C	Warm, dry and partly cloudy, no rain. Winds light N.
9 th Aug 2020	High 32C – Low 18C	Warm, dry and partly cloudy, no rain. Winds light N.
10 th Aug 2020	High 28C – Low 19C	Warm, dry and partly cloudy, no rain. Winds light N then veering. S.
11 th Aug 2020	High 33C – Low 17C	Warm, dry and partly cloudy, no rain. Winds light N then veering SSW.

4. Survey Results

- 4.1 A total of 365 bat registrations of eight species/species groups were recorded during the survey period. The most numerous species was the common pipistrelle *Pipistrellus pipistrellus* with 160 registrations which equated to 44% of the total registrations.
- 4.2 The second most numerous species group were bats of the *Myotis* group, which includes Bechstein's *Myotis bechsteinii* and Natterer's *M. Nattereri*, with 79 registrations, 22% of total registrations recorded.
- 4.3 The other species/species groups recorded were soprano pipistrelle *P. Pygmaeus* (37, 10%), noctule/Leisler's *Nyctalus* sp. (36, 10%), long-eared sp., *Plecotus* sp. (20, 8%), serotine *Eptesicus serotinus* (15, 4%), western barbastelle *Barbastella barbastellus* (8, 2%) and Nathusius' pipistrelle *P. nathusii* (2, 0%).
- 4.4 Figure 1, below provides a summary of activity and species recorded per night.

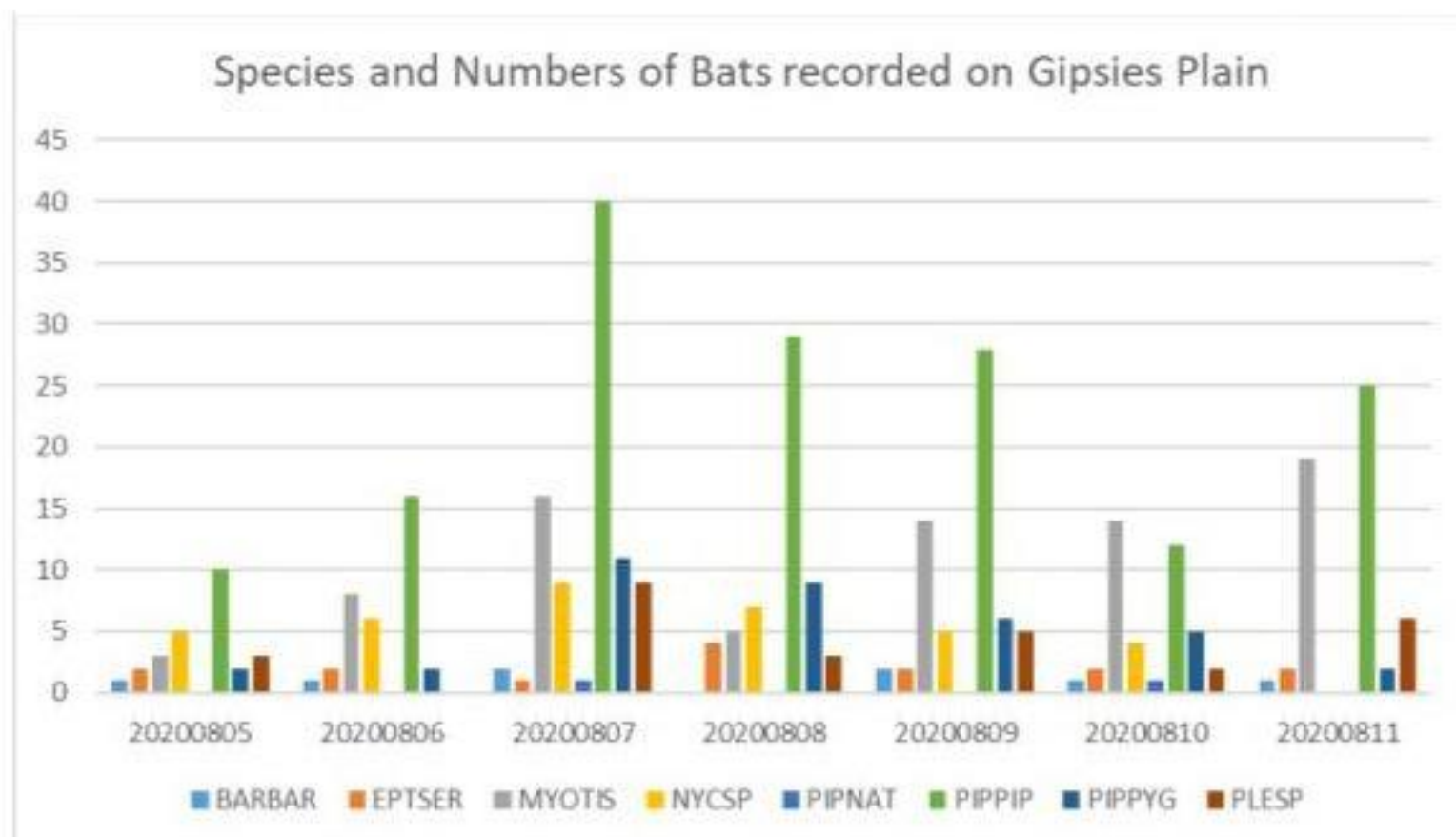


Figure 1: Survey results from Gipsies Plain 5th – 11th Aug 2020

- 4.5 The weather conditions were fine throughout the survey period, with the exception of some showers on the evening of the 5th August. Unsurprisingly the level of activity was quietest on that night (7% of total activity).
- 4.6 The peak of activity was recorded on the night of 7th August, with 24% of the total activity recorded. This was predominantly due to the increase in common pipistrelle activity.

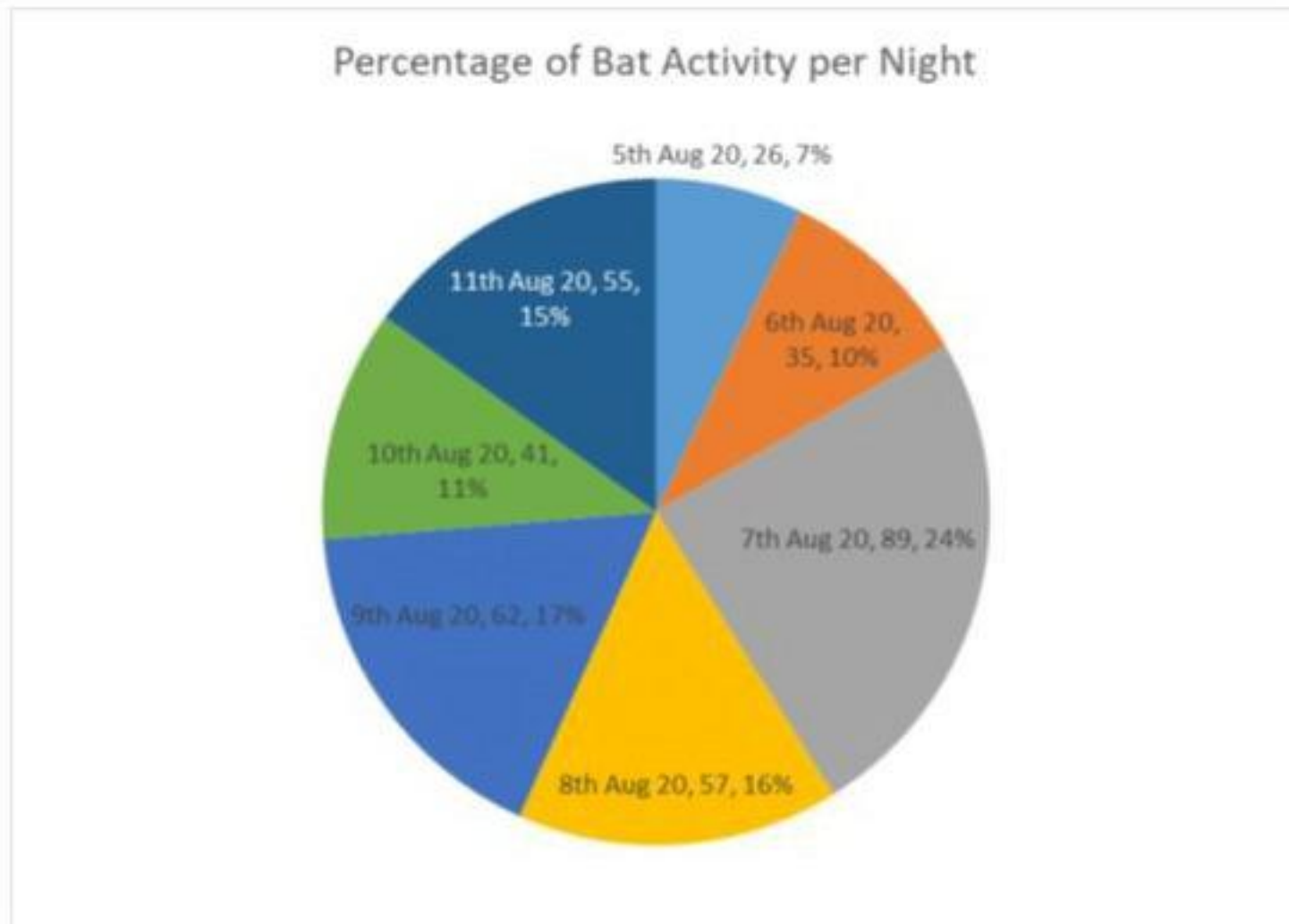


Figure 2 Percentage of total bat activity per night at Gipsies Plain

5. Conclusions

- 5.1 The results of this survey demonstrate that bats are currently using the Gipsies Plain area to cross between the SCP and HT.
- 5.2 It is considered that the suitability of this area for bat commuting and foraging will improve as the tree planting in the Phase 1 area matures. As such it is considered that bats will not be impeded from moving between SCP and HT by the development of the reservoir and loss of the Avenue.
- 5.3 It is anticipated that the Phase 2 planting in the south-west corner of the site will also provide additional connectivity along the western boundary for bats and other species.