PROVIDING TRUSTED ECOLOGICAL ADVICE

PROPOSED PINN RIVER SEND SCHOOL

2022 BAT SURVEY REPORT

Version 1.0

Project	Prepared & Checked by	Approved by	Client	Status	Date
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		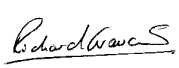			

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Contents

1 Summary

Introduction

Richard Graves Associates Ltd was instructed by Wynne-Williams Associates, on behalf of Kier, working for the Department of Education to undertake Bat Surveys at the 'Grangewood School Site' in Pinner, London henceforth referred to as the 'Site'. The Client is seeking to redevelop the Site into the 'Pinn River Special Educational Need and Disability (SEND) School'.

Surveys conducted

Bat surveys were undertaken in August, September and October 2022, by experienced surveyors. The surveys comprised:

- Internal and External Building Inspection of the Main School Building.
- Bat Speciation from DNA analysis of bat droppings;.
- Ground Level Tree Assessment of trees proposed for tree works;
- Bat Exit and Re-Entry Surveys for the Main School Building; and
- Night Vision Aid Surveys (thermal imaging system and Infra-red camera) were used to facilitate detection of any emerging/returning bats within the Main School Building).

Survey Findings

- Bat Species: The survey findings show that at least five species of bat use the Site to forage over / near and commute over (common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus*, noctule *Nyctalus noctula*, Nathusius' bat *Pipistrellus nathusii* and brown long-eared bat *Plecotus auritus)*.
- Three roosts with the Main School Building roof voids have been confirmed:
    - Roost 1: Brown long-eared maternity roost in the south and west roof voids;
    - Roost 2: Common pipistrelle day roost (for individual / low numbers of bats) in the south and west roof voids; and
    - Roost 3: Soprano pipistrelle day roost (for individual / low numbers of bats) in the south and west roof voids.
- One additional roost (Roost 4), a possible common pipistrelle day roost (for individual / low numbers of bats in the northern roof void is awaiting confirmation, on receipt of the result of the dropping DNA Analysis.
- Trees identified as scheduled for removal / tree works were subject to a Ground Level Tree Assessment (GLTA), all but two of the trees assessed were found to possess negligible bat roost potential. Recommendations are provided for the one tree with 'Low Bat Roost Potential' and the one tree with 'High Bat Potential'.

Licencing Requirements

- An appropriate Bat Licence Application must be submitted to Natural England and a Natural England Bat Licence must be obtained prior to conducting any works that could impact bats roosting on-site, for example (but not limited to: building demolition and building soft strip etc.).
- A Bat Mitigation Licence can only be issued when planning consent is granted and all planning conditions relating to bats that are capable of being discharged have been discharged.

Recommendations

Based on the findings of the 2022 bat surveys, the following impact avoidance, mitigation and enhancement measures are recommended:

- Immediatelt prior to any demolition between March and October an activity survey will be completed to confirm roost locations
- A replacement void roost will be constructed on-site prior to demolition
- Works will be timed to minimise, as far as possible, impacts to bats
- Ecological Clerk of Works by licenced bat ecologist before and during the demolition works.
- Sensitive lighting through the proposed development; and
- No use of Breathable Roofing Membranes in proposed new buildings.

Conclusion

If the recommendations of this report, are undertaken at the appropriate stage, there are no undue constraints, with respect to bats, to the proposed development.

2 Introduction

2.1 Instruction

Richard Graves Associates Ltd was instructed by Wynne-Williams Associates, on behalf of Kier, working for the Department of Education to undertake Bat Surveys at the 'Grangewood School Site' in Pinner, London henceforth referred to as the 'Site'.

The Client is seeking to redevelop the Site into the 'Pinn River Special Educational Need and Disability (SEND) School'.

This report sets out the methods, results and recommendations of the 2022 bat surveys.

2.2 Survey Objectives

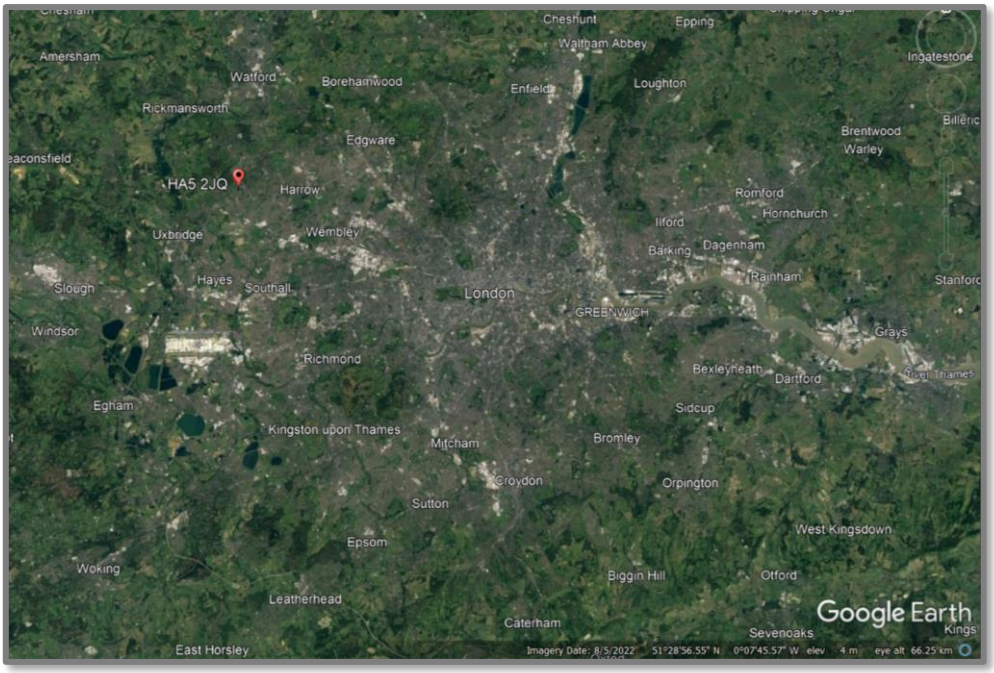
The aims of the bat surveys were as follows:

- Identify if bats roosts are present within the buildings on-site at the time of survey.
- If present, characterise the bat roost(s) in terms of species, number, access points, type of bat roost etc.
- Make recommendations for mitigation of construction / operational impacts; and
- Identify the need for European Protected Species (EPS) Licences, further surveys, / or mitigation, where required.

2.3 Site Location and Setting

The Site is situated adjacent to the Ruislip Woods National Nature Reserve (the largest block of ancient, semi-natural woodland in Greater London[1]) and is accessed *via* Fore Street, Pinner. Grangewood School is centred at Ordnance Survey (OS) grid reference TQ 09921 88833 at the following address: Grangewood School, Fore Street, Eastcote, Pinner, Middlesex HA5 2JQ (Figure 1).

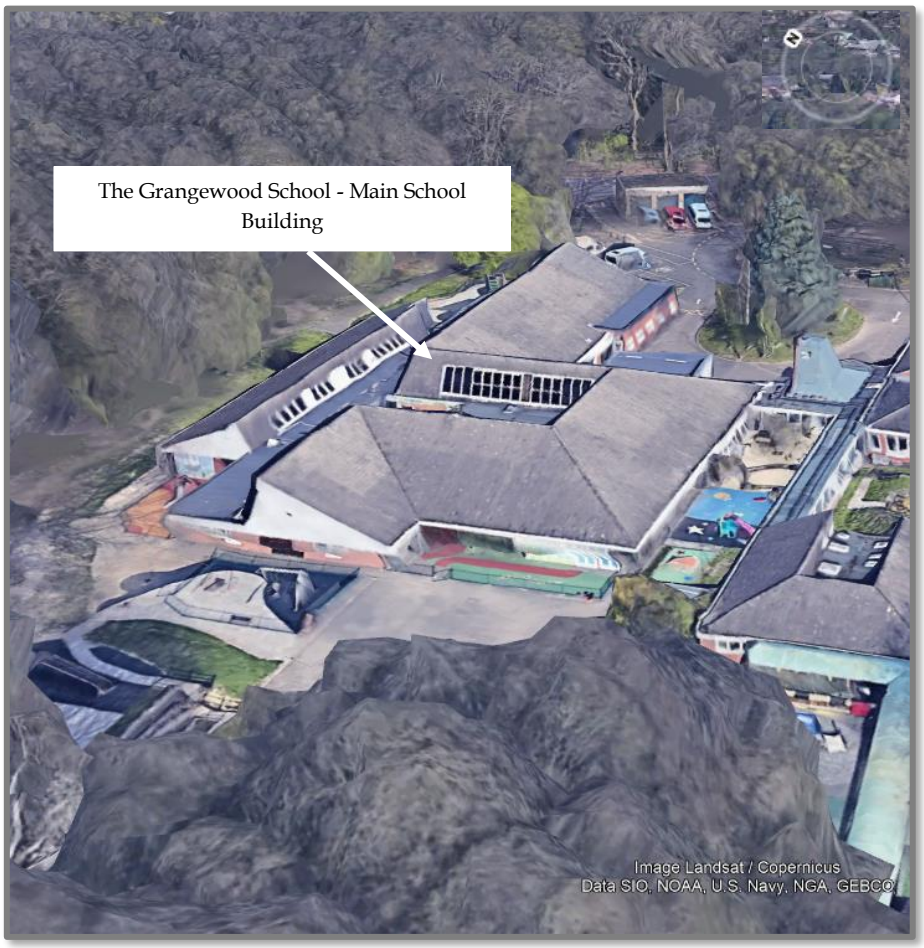
Figure 1: Site Location Indicated by Red Marker © Google Earth 2022



[1] Hillingdon Council (2022), Ruislip Woods National Nature Reserve https://www.hillingdon.gov.uk/article/2866/Ruislip-Woods-National-Nature-Reserve [accessed 1st November 2022).

The Ruislip Woods National Nature Reserve is located to the north, east and west of the Site and Coteford Junior School is located to the south of the Site (Figure 2).

Figure 2. The Grangewood School Site © Copyright Google Earth 2022



2.4 Rationale for the Survey

The surveys were required to support the Department for Education in their undertaking of Due Diligence surveys to inform the necessary planning approvals for the proposed re-development works.

2.5 Quality Assurance

All surveys are led by Ecologists who are members of the Chartered Institute of Ecology and Environmental Management (CIEEM) at the appropriate level. By joining the CIEEM staff sign up to a professional code of conduct.

3 Pre-Existing Survey Information

3.1 Introduction

This section summarises the pre-existing survey information associated with the Wider Site, namely:

- Bat records from Greenspace Information for Greater London (GiGL).
- Protected Species Licence information from the Multi-Agency Geographic Information for the Countryside (MAGIC); and
- The findings from the previous bat surveys undertaken at the Site[2].

3.2 Desktop Study Records

Desktop data from the Local Records Centre Data (GiGL, 10th September 2022) were obtained to determine if any relevant bat records had been recorded on or near the Site (within a radius of 2km of the Site boundary). Bat species recorded within the search area included:

- Common pipistrelle *Pipistrellus pipistrellus*
- Soprano pipistrelle *Pipistrellus pygmaeus*
- Noctule *Nyctalus noctula*
- Brown long-eared bat *Plecotus auratus*
- Long-eared bat species *Plecotus spp.*
- Pipistrelle bat species *Pipistrellus spp.*
- *Myotis spp.*
- Serotine *Eptesicus serotinus*
- Leisler's bat *Nyctalus leisleri*
- Nathusius' pipistrelle *Pipistrellus nathusii*
- Daubenton's Bat *Myotis daubentonii*

None of the species' records were from within the application site. Other than a record of a '*Vespertilionidae* ' / bats' located approx. 67m from the Site, and a common pipistrelle (record from 2001 located 176m away), all of the bat records were more than 300m from the Site.

3.3 Protected Species Licences

MAGIC was used to search for granted European Protected Species (EPS) Licence Applications relating to bats within 2km of the Site. No bat EPS Licences were recorded within the search area.

3.4 Previous Bat Surveys

- 2020: Indigo Surveys undertook a daytime inspection of the buildings on-site which:

"*revealed a couple of slightly raised pantiles on one slope, and a hole in one of the ridges where cement had dropped out. The hole allowed access to the roof void below, and this appeared to be in use by Brown Long-eared Bats Plecotus auritus, as droppings were noted in the void above the medical room…. Photographs of a bat flying round the corridor next to the medical room in the summer subsequently confirmed the species identity.*[2]"

- 2021: Indigo Surveys undertook three Dusk Surveys in June and July 2021, following which their survey report stated:

"No bats emerged from the buildings during any of the surveys, although a Brown Long-eared Bat was recorded on each visit as it flew past the site, having emerged elsewhere. Low levels of Common Pipistrelle Pipistrellus pipistrellus and Soprano Pipistrelle P. pygmaeus activity were also recorded, these foraging around the site and

[2] Indigo Surveys Ltd (2021) *Nocturnal Bat Survey*, Site: Grangewood School, Fore Street, Pinner, Harrow, HA5 2JQ, Ref: 20921/E2, Client: HSP Consulting Ltd

adjacent woodland, whilst a Whiskered/Brandt's Bat Myotis mystacinus/M. brandtii was recorded passing through the site during the second and third surveys on 21st June and 8th July 2021. From the evidence of these surveys and the diurnal inspection, the status of bats at Grangewood School is considered thus: ' Brown Long-eared Bat – day roost for a single animal'.[2]

4 Bat Ecology and Legislation

4.1 Bat Ecology and Behaviour

4.1.1 British Bats

There are eighteen species currently known in the UK, of these eight have been recorded within 2km of the Site.

4.1.2 Bat Roosts

Bats may use several types of roosts during the course of the year, depending on their ecological requirements. During the active season (March to October) bats roost in maternity colonies, which may contain large numbers and are relatively easy to detect. Maternity roosts usually only contain females and their pups. Adult male bats and non-lactating females may use a variety of different roosts during the course of the year but usually roost individually or in small numbers.

Different roosts can be used during the day and night and by some bats specifically for feeding. These roosts, which for common species are of minor nature conservation significance, can be difficult to detect. Mating roosts, used during the autumn, are also often easy to detect because of the high level of activity (dominated by 'social' calls) associated with them.

During the winter months bats, enter a state of torpor within hibernation roosts. These roosts, which are considered to be of nature conservation significance, require very specific conditions of temperature and humidity, which are not present in many structures.

4.1.3 Bat Behaviour

Bats echolocate to communicate, navigate and feed with calls recorded as social, commuting and foraging. Bat calls are typically beyond the range of human hearing, so ultrasound detectors can be used to hear and record them. These calls can be further analysed. Observation of bats in the field by expert surveyors is also important to correctly interpret bat behaviour.

4.2 Legal Protection

All British bat species are protected under the Wildlife and Countryside Act 1981 (as amended)[3] and the Conservation of Habitats and Species Regulations 2017, as amended[4].

Bats are listed on Schedule 2 (European Protected Species of animals) of the Conservation of Habitats and Species Regulations 2017, as amended, and are subject to the provisions of Regulation 41 which makes it an offence to:

- deliberately capture, injure or kill any wild bat.
- deliberately disturb bats (where disturbance is likely to impair their ability to survive, breed or reproduce, rear or nurture their young; or to hibernate or migrate; or to affect significantly the local distribution or abundance of the species).
- damage or destroy a breeding site or resting place of a bat; or
- be in possession of, control, transport, sell or exchange, or offer for sale or exchange any live or dead bat or any part of a wild animal or anything derived from a bat or any part of a bat.

Bats are also listed on Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and are subject to the provisions of Section 9 of the Act, which make it an offence to:

[3] HMG, 1981. The Wildlife and Countryside Act 1981. HMSO

[4] HMG, 2017. The Conservation of Habitats and Species Regulations. London: HMSO

- intentionally or recklessly disturb a bat whilst it is occupying a structure or place which it uses for shelter or protection.
- intentionally or recklessly obstruct access to any structure or place used for shelter or protection by a bat.
- sell, offer, or expose for sale, or to possess or transport for sale a live or dead bat or any part of or anything derived from a bat.

4.3 Bat Licences

Developers must ensure that they commission reasonable survey efforts to determine bat presence and, if required, obtain the necessary European Protected Species Licence for development from the relevant Statutory Nature Conservation Organisation (for this site, Natural England), which is likely to require appropriate mitigation for disturbance and loss of habitats.

5 Methods

5.1 Introduction

This section details the surveyors, dates, methods and limitations of the following bat surveys undertaken at the Site in 2022:

- Internal and External Building Inspection;
- Bat Speciation - DNA Analysis of Droppings;
- Ground Level Tree Assessment;
- Exit / Re-Entry Survey; and
- Night Vision Aid Surveys (thermal imaging system and infra-red camera).

5.2 Survey Personnel

The following experienced surveyors conducted the 2022 bat surveys at the Site:

Richard Graves BSc (Hons) MSc PGDip CEcol CEnv FCIEEM

Richard has twenty-seven years' experience as a practising ecologist and has been involved in bat surveys and survey design for major projects for over fifteen years and the development of good practice for bat surveys. Richard is a fellow of the Chartered Institute of Ecology and Environmental Management (CIEEM) a chartered ecologist and a chartered environmentalist. Richard is also class licenced for great crested newt surveys, a class licenced bat surveyor and technical review panel member of good practice guidelines for bat surveys.

Dr Liat Wicks BSc (Hons) MSc CEcol MCIEEM

Dr Wicks is an ecological consultant and Chartered Ecologist with eighteen years' professional experience specialising in bat surveys, mitigation, sound analysis and advice across the UK. She is a Class 2 licenced bat surveyor and has produced numerous EPS applications and Bat Masterplans for major infrastructure projects. Between 2012 and 2013 Dr Wicks was Head of Biodiversity at the Bat Conservation Trust.

Anna McDermott BSc (Hons) MCIEEM

Anna has worked in ecological consultancy for more than fifteen years. Anna has extensive experience in dedicated species surveys, including bats, reptiles, great crested newts, water voles, otters and badgers. She has successfully designed and implemented mitigation measures for a number of protected species. Anna is a Class 2 licenced bat surveyor and has also produced and currently holds European Protected Species (EPS) mitigation licences for bats.

Dr Kevin Hume BSc (Hons) MCIEEM

Dr Hume is a principal ecologist with over fifteen years' experience including bat survey and investigation all over the UK, as well as acting as an Accredited Agent on multiple bat mitigation licences. Dr Hume is also a Class 2 licenced bat surveyor.

Dani Rozycka BSc (Hons)

Dani is an experienced ecologist and surveyor with over 10 years' experience which includes surveys and Ecological Clerk of Works roles in respect of a range of protected species including bats.

5.3 Internal and External Building Inspection for Bats

Internal and external inspections of the main school building was undertaken on the 24th August 2022 and 14th September 2022 by two licensed bat ecologists, Richard Graves and Dr Liat Wicks.

The building was inspected in accordance with published guidance for evidence of and its potential to support bats, where safe access permitted. The inspection comprised an external and internal inspection. The exterior and interior walls and roofs of the building were viewed from ground level and features

providing potential bat access or roosting places were noted. The internal inspection also comprised a thorough search of the building for evidence indicative of past or present use by roosting bats (Table 1).

Areas where bat droppings may accumulate, such as on the ground, ledges, windowsills and walls, were also inspected. Any features that may potentially be used by bats were identified and any bat roosting features, or evidence of bat activity as listed below were noted. An endoscope and torch were used to inspect the interior of potential roosting features.

Table 1: External and internal bat roosting or access features or direct evidence of bats

External Inspection Features	**Internal Inspection – Features and Direct Evidence**
Gaps between roof tiles or ridge tiles	Live bats or bat corpses
Gaps under the eaves	Droppings
Cracks and crevices in the brick and flint	Bat sounds
Gaps around the dormer door	Potential access points
Gaps around doorways and windows	Potential roosting sites
Potential access points	Clean, cobweb free gaps around potential entrance points

5.4 Bat Speciation - DNA Analysis of Droppings

Samples from any bat dropping observed were carefully collected during the Internal Building Inspection and sent to a specialist laboratory (SureScreenScientifics) to undertake molecular analysis of the DNA and confirm the species of bat present.

5.5 Ground Level Tree Assessment for Bats

Trees identified for removal to facilitate the re-development proposals were provided within the Wynne-Williams Associates Tree Survey Removal Plans[5,6]. A Ground Level Tree Assessment (GLTA) of the trees to be affected by the proposed works was undertaken on the 24th August 2022. The GLTA was undertaken to determine the presence and extent of potential bat roosting features (PRFs), leading to the categorisation of the trees in terms of suitability to supporting roosting bats (see Table 2 below).

[5] Wynne-Williams Associates (2022) Pinn River School Tree Survey Removal Plan Sheet 1 of 2 Drawing number: 2181-WWA-ZZ-ZZ-D-L-0703 P02 Sheet 1

[6] Wynne-Williams Associates (2022) Pinn River School Tree Survey Removal Plan Sheet 1 of 2 Drawing number: 2181-WWA-ZZ-ZZ-D-L-0703 P02 Sheet 2

Table 2: Guidelines for assessing the potential suitability of roosting habitats (structures/trees)

Suitability	Description of Roosting Habitats	Commuting and Foraging Habitats
Negligible	Negligible habitat features on-site likely to be used by roosting bats.	Negligible habitats features on-site likely to be used by commuting or foraging bats.
Low	A structure or tree of sufficient size and age to contain PRFs 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 gappy hedgerow or unvegetated 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 (not in a parkland situation) or a patch of scrub.
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 (with respect to roost type only).	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.
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 potential 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 or 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.

5.6 Exit / Re-Entry Surveys

Table 6 (Section 5) sets out the schedule and details of the 'Exit /Re-Entry Surveys' conducted at the Grangewood School Site in 2022.

The 'Dusk/ Dawn Bat Exit / Re-Entry Surveys' were conducted within the active season for bats in 2022. In accordance with the Bat Surveys for Professional Ecologists, Good Practice Guidelines 3rd Edition[7], the dusk surveys were conducted from approximately 15 minutes before sunset until approximately one and

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

half - two hours after sunset. The dawn surveys were conducted from approximately one and half - two hours before sunrise until approx. sunrise.

The dates of the surveys and the weather conditions are presented in Table 6 (Section 5).

5.7 Night Vision Aid (NVA) Surveys

5.7.1 NVAs

Thermal imaging systems (FLIR T1030SC, Guide Track IR Pro 19 and Pulsar Helion XP38) and an infra-red camera (Canon XA11 supported by additional infra-red lighting) were used to facilitate detection of any emerging/returning bats within the Main School Building. The thermal imaging system detects and records heat signatures from any emerging bats. The thermal imaging system is sufficiently sensitive to detect bats otherwise not visible where their body temperatures are higher than their surroundings and ambient temperature (as would be anticipated during the active season). The infra-red camera was used to increase precision during the surveys, particularly in terms of detecting the late-emerging species and surveying for bats in dark conditions.

5.7.2 Acoustic support for NVA

A Bat Logger M and a S2 Static Bat Detector were used to record bat calls alongside the NVAs. This was undertaken on two occasions:

- Session 1: During the Dusk Survey on the 14th September and then during the Dawn survey on the 15th September 2022 a Bat Logger M was placed next to the 'Thermal imaging scope Guide Track IR Pro 19' positioned at Location D (see Figure 19); and
- Session 2: From the start of the Dusk Survey on 5th October throughout the night until Dawn on the 6th October 2022 a S2 Static was installed next to the 'Thermal imaging scope Guide Track IR Pro 19' positioned at Location D (See Figure 20 and Figure 21).

5.8 Equipment

The surveys were undertaken using the following equipment:

- Elekon Bat Logger M and M2 (Time expansion TE);
- Thermal imaging system FLIR T1030SC;
- Thermal imaging system Guide TrackIR Pro 19;
- Thermal imaging system Pulsar Helion XP38;
- Canon XA11 infra-red camera supported by additional infra-red lighting;
- Kestrel 3500 and 5000 Weather meters.

Sound analysis of bat calls was undertaken using the following software as appropriate to the detectors:

- Bat Explorer (Bat Logger); and
- Weather data was recorded on-site using a Kestrel 5000 Weathermeter, the Bat Loggers and from the WeatherOnline weather database.

Bat data were analysed and reported using:

- R (www.cran.r-project.orgh;
- RMarkdown (http://rmarkdown.rstudio.com/); and
- RStudio ™ (https://www.rstudio.com).

5.9 Limitations

- Bat detectors favour recording of those bats which make loud calls (for example: pipistrelles and noctules) over those which make quieter calls or do not echolocate (for example brown long-eared and

some *Myotis* bats). This potential bias introduced by the detectors is compensated for by the visual clues observed by experienced surveyors.

- Bats are highly mobile and their distribution over nights and seasons transient. Therefore, a single site survey provides only a snapshot of the conditions at the time of survey with regards to nature conservation status. Bats also use several different roosts at different times of year and between years.
- The bat activity recorded on the Site is purely a representation of where the surveyors were positioned, and which area of the Site they were focussed on. Hotspots may occur elsewhere within the Site; however they may not have been the focus of the survey.
- The maps in Section 8 which provide the locations of the different bats recorded are created using the latitude/longitude taken from the GPS within the bat detectors. The maps provide a visual interpretation / information graphic only, rather than a precise location for each bat recorded.
- This report includes a series of infographics which illustrate each bat pass recorded as symbol on an aerial plan. It is important to note that the mapping of the bat passes is indicative and approximate due to the tolerance ranges of the GPS systems used to record the bat pass locations.
- Temperatures on the 6th October 2022 were too low to undertake a Dawn Survey, however a Static Recorder (S2) was installed on the night of the 5th October / 6th October 2022, which successfully recorded bat activity throughout the night.

6 Results: Bat External and Internal Inspection

6.1 Introduction

An internal and external inspection of the Main School Building on the Grangewood Site was undertaken on the 24th August 2022 and 14th September 2022 by two licensed bat ecologists, Richard Graves and Dr Liat Wicks.

6.2 External Inspection

The Main School Building is a single storey red brick structure with a large, but shallow, pitched roof. Interlocking clay tiles cover the roof, and UPVC cladding is present at gable ends, and make up the barge boards, fascia and soffit boxes where present (Figure 3). There are areas of the roof with missing or slipped tiles along the ridge lines providing potential access points into the void. Other access points include limited gaps within the soffit box fabric.

Figure 3: Photos of the Main School Building

6.3 Internal Inspection

Four points of inspection were conducted during the internal inspection. The location of the inspection points is shown in Figure 4. The results of the inspection and photos of the findings is presented in Table 4.

Figure 4: Plan Showing Loft Inspection Points and Bat Evidence

6.4 Bat Speciation - DNA Analysis of Droppings

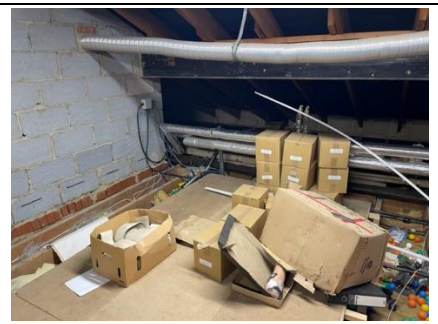
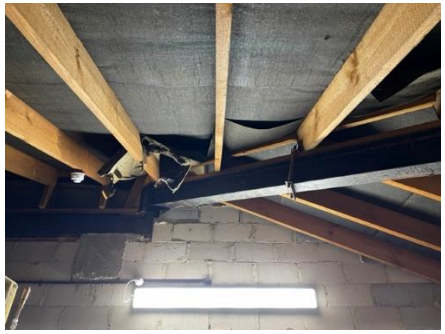
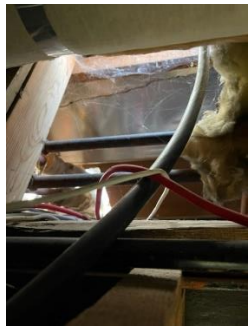
Bat droppings were collected from three locations within the Main School Building (Table 3). The results from the laboratory analysis are summarised in Table 3 and are provided in Appendix A.

Table 3: 6.4 DNA Analysis of Droppings Results Summary

Location of Dropping (Figure 4)	Lab Sample ID	Analysis Results
Location A	B1159	Brown long-eared bat
☆ (Entrance to Roost 1)	B1160	Brown long-eared bat
Location C	TBC	TBC

Table 4: Bat Roost Summary

Reference (see Figure 4)	Bat Evidence Found?	Description	Photographs
A **(Part of Roost 1, Roost 2 and Roost 3)**	– **Yes.** – Three live brown long-eared bats were observed flying within the void (24/08/2022). – A moderate number (20-40) scattered droppings were visible from the hatch. – Void checked in August and September. No bats were visible in September.	– A moderate sized area of the roof void with a high pitch of about 2.5-3m to the apex. Access was only possible from the hatch due to fixed pipes running over the hatch entrance. – A breeze block partition wall is present in front of the hatch with access over the top. There is access throughout all area of the roof void of this building. – Insulation is present on the loft floor and the roof itself is felt lined in most places, although wooden cladding was also present in a few areas.	   

B **(Part of Roost 1, Roost 2 and Roost 3)**	No	– A smaller void to A, but with a high pitch and felted roof. Some areas of the felt were sagging or torn providing potential access in. – The loft floor was insulated and in places boarded allowing access to inspect all areas. – The void is currently used for storage and is actively accessed for maintenance.	  
C **(Potentially Roost 4)**	– TBC – One or two pipistrelle like droppings found (14/09/22) currently awaiting DNA analysis results. – Rodent droppings also evident.	– Two hatches in a similar location both with very restricted views. The voids are small in size, the 1st one housed pipes, wiring and services and was less than a meter in height with a windows. – The second hatch was along the lower rake edge	  1st hatch

		of the roof and had a slanted felted roof. – Evidence of rodent droppings was found near the hatch entrance. – One or two TBC bat droppings were found in this location (14/09/22).	 
D **(Part of Roost 1, Roost 2 and Roost 3)**	**– Yes.** – Scattered droppings found around the hatch (14/09/22).	– This hatch location is connected to the roost entrance identified by the star. – The bats would enter the void and are able to use the space throughout the wider roof structure as all areas are interconnected.	 

			
☆ **(Entrance to Roost 1)**	– The roost entrance was identified during the August Dawn Survey, as a small access point in the corner of a sheltered section of the playground.	– Extensive staining and droppings stuck to the walls below the roost entrance are present droppings collected and analysed, confirming brown long-eared presence (Appendix A). – Subsequent thermal video footage revealed bats exiting and re-entering at this location.	 

7 Results: Bat Ground Level Tree Assessment

A number of trees understood to require removal / tree works were assessed during the GLTA (Figure 5). The tree species assessed included English oak, silver birch, hornbeam. All of the trees assessed where considered to possess negligible bat roost potential with the exception of T21 which was considered to have Low Bat Potential (Table 5).

T48, an English oak (Figure 6), which is understood to be retained, was particularly noteworthy, possessing multiple potential bat roosting features. This tree was assigned the category of 'High Bat Potential'. Appropriate Bat Surveys and inspections in accordance with the Bat Survey Guidelines[7] will be required should any work be required for this tree.

Figure 5: Location and Categorisation of Surveyed Trees © Copyright Wynne-Williams Associates[5]

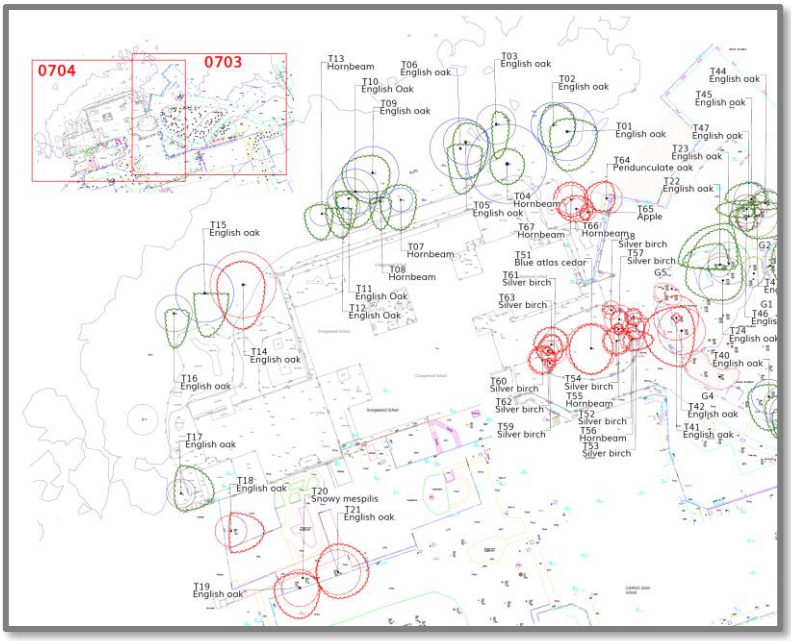


Figure 6: Location of Tree 48 with High Bat Potential © Copyright Wynne-Williams Associates[6]

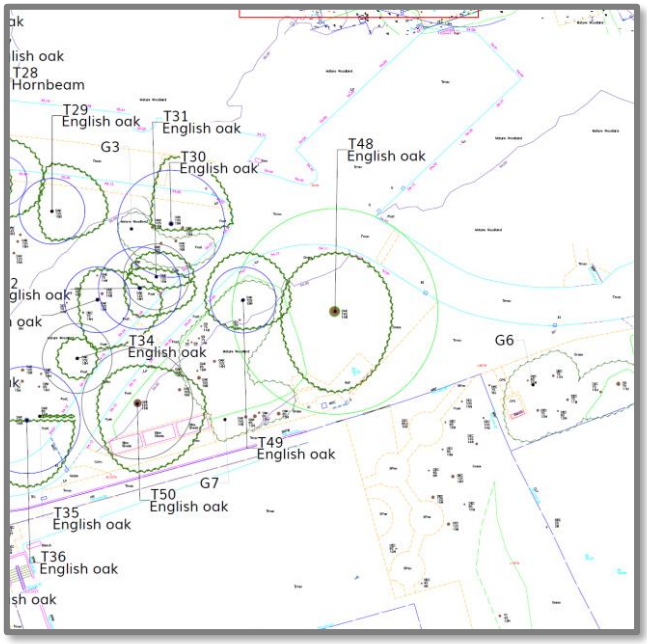


Table 5: Bat Ground Level Tree Assessment Summary Results

Tree Number[5,6]	Tree Species	Bat Roosting potential after assessment	Recommendation*
T15	English Oak	Negligible	No further assessment
T18	English Oak	Negligible	No further assessment
T19	English Oak	Negligible	No further assessment
T20	Snowy mespilis	Negligible	No further assessment
T21	English Oak	Low Bat Potential – loose bark offering bat roost potential.	Ecological endoscope inspection prior to any tree works / felling
T64	Pendunculate oak	Negligible	No further assessment
T65	Apple	Negligible	No further assessment
T66	Hornbeam	Negligible	No further assessment
T67	Hornbeam	Negligible	No further assessment
T63	Silver birch	Negligible	No further assessment
T61	Silver birch	Negligible	No further assessment
T60	Silver birch	Negligible	No further assessment
T59	Silver birch	Negligible	No further assessment
T62	Silver birch	Negligible	No further assessment
T60	Silver birch	Negligible	No further assessment
T51	Blue atlas cedar	Negligible	No further assessment
T58	Silver birch	Negligible	No further assessment
T57	Silver birch	Negligible	No further assessment
T54	Silver birch	Negligible	No further assessment
T55	Hornbeam	Negligible	No further assessment
T52	Silver birch	Negligible	No further assessment
T56	Hornbeam	Negligible	No further assessment
T53	Silver birch	Negligible	No further assessment
G5	Variety of species	Negligible	No further assessment
T41	English Oak	Negligible	No further assessment
T42	English Oak	Negligible	No further assessment
G4	Variety of species	Negligible	No further assessment

*** Recommendations provided related to bat potential – checks should always be made for nesting birds (other any other applicable protected species) prior to any tree works.**

Should any trees in addition to those already inspected need to be removed as part of the development, further tree inspections will also be required to identify any potential roosts within those trees before any tree works. Should a bat(s) be found to be roosting in any of the trees scheduled for works on-site, works will need to be carried out under a licence issued by Natural England. Additional surveys may be required, and replacement roosts may also be needed to ensure the favourable conservation status of the species is maintained.

8 Results: Bat Exit/Re-entry Surveys

8.1 Introduction

This section presents a summary of bat data collected during the Exit/Re-entry surveys, the infographics generated using the data and provides an interpretation of the data set collected from the manual bat survey (see Section 9 for the Night Vision Aids Surveys results).

8.2 Survey Summary

The manual bat activity surveys were conducted during the active bat season in 2022 and focused directly on the Main School Building. Four experienced surveyors were present during each survey, all equipped with a handheld Bat Logger M and M2 Detectors. A fifth bat logger (a Bat Logger M) was installed next to one of the thermal cameras (see Section 9). The bat calls recorded on all five bat loggers was collated and analysed collectively. The data from the Static Detector (S2) installed throughout the night of the 5th / 6th October 2022, was not collated with the Bat Logger Data and is summarised separately in Section 9.

8.3 Surveyor Locations

The surveyor locations during the bat surveys are shown in Figure 7-9.

Figure 7: Surveyor Locations August 2022 Surveys Google Earth 2022©

Figure 8: Surveyor Locations September 2022 Surveys Google Earth 2022©

Figure 9: Surveyor Locations October 2022 Surveys Google Earth 2022©

8.4 Weather Conditions

Temperatures and conditions during all the surveys undertaken were suitable for recording bats (Table 6). In accordance with the Bat Survey Guidelines, temperatures during the 6th October 2022 were considered to be too low for a manual bat survey to be undertaken, however a Static Recorder was installed throughout the night of the 5th / 6th October 2022 which detected eight bat passes at times that would not have been covered during the manual surveys despite the weather conditions.

Table 6: Bat Surveys Weather Conditions Summary

Date (2022)	Sunset / Sunrise	Start / End	Temp (°C)	Wind Speed (mph)	Cloud Cover (oktas)	Rain
24th August	20:05	Start	24	0	4	×
		End	18	0	4	×
25th August	06:00	Start	15	0	5	×
		End	14	0	6	×
14th September	19:18	Start	17	0	4	×
		End	15	0	5	×
15th September	06:34	Start	15	0	5	×
		End	11	0	6	×
5th October	18:30	Start	13°C	0	4	×
		End	10°C	0	5	×
6th October (No Manual Re-entry Survey Undertaken)	07:03	Start	13	0	8	N
		End	10	0	6	N

8.5 Existing Lighting

The main school building and outbuildings are externally lit with bright security lighting which operated continuously throughout the hours of darkness (see Figure 10).

Figure 10: Photo of the Existing Lighting

8.6 Bat Species Recorded during Bat Surveys

Five bat species were recorded using the Site in 2022 during the Bat Surveys (Table 7).

Table 7: Bat Species Recorded During the Bat Surveys

Scientific Name	Common Names	Bat Species Description
Pipistrellus pipistrellus	Common pipistrelle	Common pipistrelles are the most common and widespread of all British bat species. They are found in lots of places, including towns and cities, as well as in the countryside. They are small, and their flight is fast and jerky as they pursue small insects which they catch and eat whilst flying. A single pipistrelle can consume up to 3,000 insects in one night.
Nyctalus noctula	Noctule	Noctules are among the largest of the British bats. The noctule is generally one of the first bats to be seen of an evening, and they like to hunt over open ground, particularly pasture.
Pipistrellus pygmaeus	Soprano pipistrelle	The soprano pipistrelle was discovered as a different species to the common pipistrelle in the 1990s - they are very similar, but they use slightly different echolocation calls and there are subtle differences in how they look. They also tend to roost and hunt in slightly different places, with the soprano pipistrelle favouring river habitat and wetland areas.
Pipistrellus nathusii	Nathusius' pipistrelle	The Nathusius' pipistrelle is quite rare in the UK, though records have increased in recent years. It is migratory between the UK and mainland Europe and is most commonly found in autumn, although there are now records of colonies remaining all year and breeding in the UK. It is similar in appearance to, but slightly larger than the common and soprano pipistrelles and the fur on its back is longer, sometimes giving a shaggy appearance. The Nathusius' is strongly associated with water and woodlands.
Plecotus auritus	Brown long-eared bat	The ears of a brown long-eared bat are nearly as long as its body. Their highly sensitive hearing means they can hunt by listening for sounds made by insects, rather than using echolocation, which some moths can detect. Brown long-eared bats are found hunting amongst vegetation in gardens and parks, along hedgerows and in woodland where they will pluck insects off leaves as well as catching them mid-air.

8.7 Bat Pass Numbers for Bat Surveys

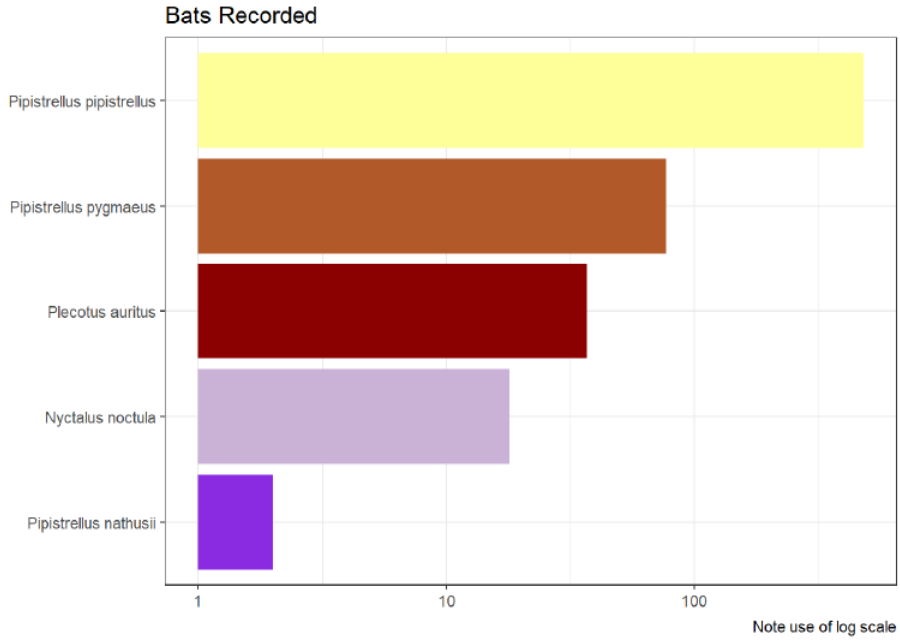
Common pipistrelle bats were the most frequently recorded bat species (accounting for 78% of the bat passes recorded), followed by soprano pipistrelles (accounting for 12% of the bat passes recorded) and brown long-eared bats (6%). Occasional passes of noctules and Nathusius' pipistrelle were also recorded (Table 8 and Figure 11).

Table 8: Summary of Bat Pass Numbers from the Bat Surveys[8]

Scientific Name	Common Names	Bat Pass Count	Colour in Figures
Pipistrellus pipistrellus	Common pipistrelle	480	
Nyctalus noctula	Noctule	18	
Pipistrellus pygmaeus	Soprano pipistrelle	77	
Pipistrellus nathusii	Nathusius' pipistrelle	2	
Plecotus auritus	Brown long-eared bat	37	
Total		**614**	

[8] "*Relative bat activity can be measured from the search-phase echolocation calls of bats or, more commonly, from 'bat passes/sequences' – where a pass/sequence is a series of calls belonging to an individual bat*" Paola F. Reason, Stuart E. Newson & Kate E. Jones (2016) Recommendations for using automatic bat identification software with full spectrum recordings.

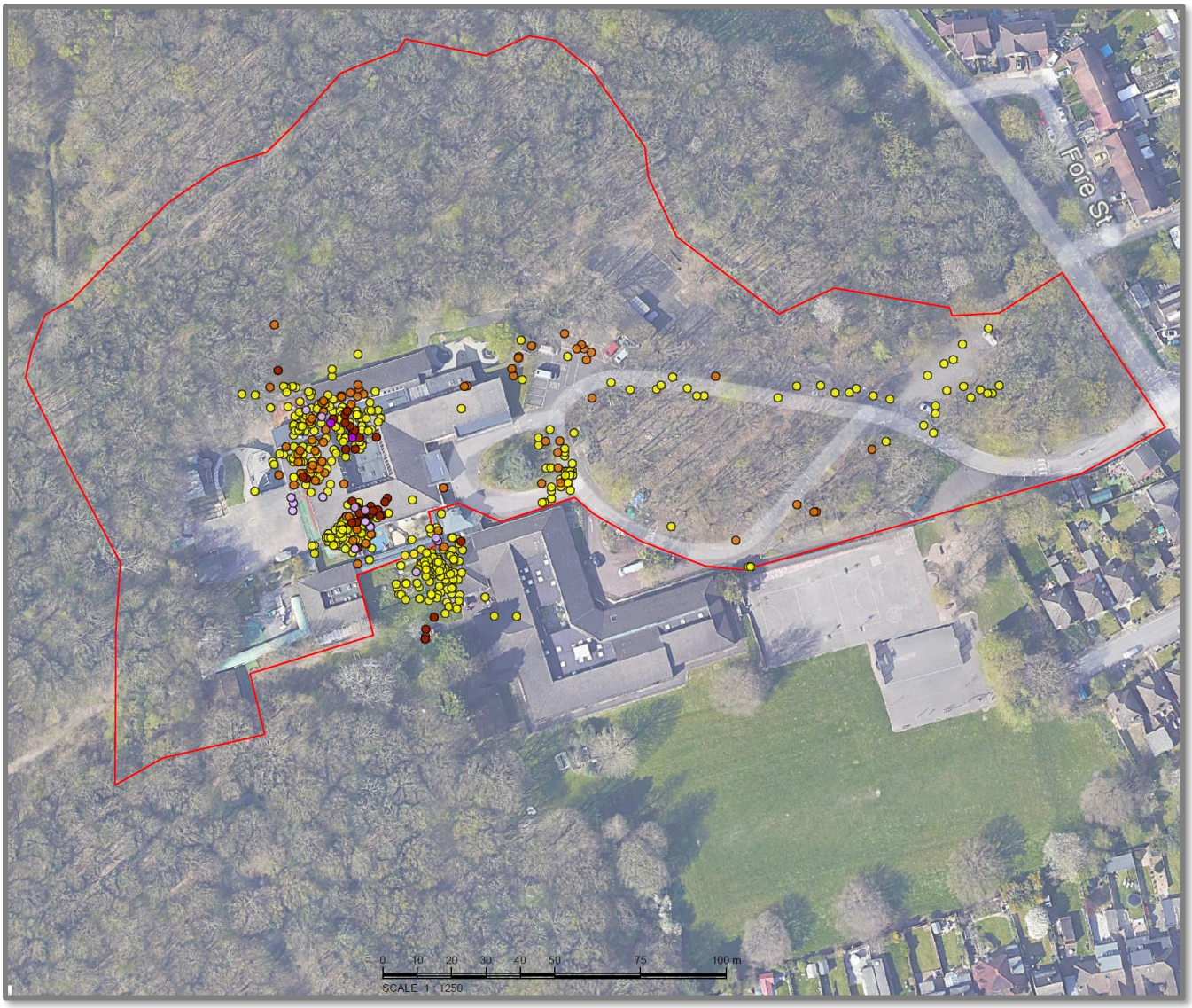
Figure 11: Bat Passes, per Species -Total Calls Bat Surveys



8.8 Bat Activity Across the Site

An illustration of the bat activity recorded within the Site, for all the handheld detector / manual Exit/Re-Entry surveys combined, is presented in Figure 12. The surveys across the Site enabled both acoustic recordings of each species detected, and visualisation of their flight paths, behaviour and direction of flight during the earlier part of the night and later parts of the pre-dawn surveys. Bat activity across the Site was considered to be low to moderate in the context of the site location.

Figure 12: Bat Activity – Bat Passes from All 2022 Bat Exit/Re-entry Surveys Combined[9] © Google Earth 2022



[9] Please note, the areas of the map without colour doesn't reflect an area of no bats but the location of the surveyors during activity surveys.

8.9 Bat Activity Recorded – Per Species

The location of the bat passes for each species group are recorded as shown in Figure 13. Common and soprano pipistrelles were recorded throughout the Site. The high-flying 'big bat' species, noctule, was recorded commuting high over the Site; this species is typically not tied to linear features in the landscape. Brown long-eared were recorded over the Main School Building.

Figure 13: Location of Bat Observations, by Species © Google Earth 2022

Brown long-eared

Noctules

Pipistrelle Species

8.10 Bat Activity Timings & Roosts Recorded from Bat Surveys

8.10.1 Confirmed Roosts

Three confirmed roosts (Roost 1, Roost 2 and Roost 3), and one potential fourth roost (Roost 4), for which DNA analysis results are required before the roost is confirmed, have been recorded on-site within the main school building (Figure 14 and Table 9).

Figure 14: Aerial Mapping indicating the location of Bat Roosts for the Site © Google Earth 2022

Table 9: Summary of Bat Roosts Identified During the 2022 Bat Surveys

Roost Ref (Fig. 14)	Building	Roost Description	Bat Species / Number Type of Roost	Roost Evidence	Photos
Roost 1	Main School Building	The roost entrance comprised a small access point in the corner of a sheltered section of the playground (see red arrows on photos). This entrance led to the southern and western roof voids of the Main School Building as shown on Figure 14.	Brown long-eared x 7 Maternity Colony	– Three live brown long-eared bats were observed flying within the roof void on the 24th August 2022. – Dropping collected on the 24th August 2022, and subsequently analysed, and confirmed as brown long-eared (Appendix A). – Between 05:16-05:26 on the 25th August 2022, three brown long-eared bats were observed returning to the roost during a Dawn Exit Survey and were also recorded by Bat Logger Detectors. – Between 19:36 and 20:31 on the 14th September 2022 seven brown long-eared bats were observed emerging from the roost during a Dusk Exit Survey and were recorded by Bat Logger Detectors and NVAs.	  

Roost Ref (Fig. 14)	Building	Roost Description	Bat Species / Number Type of Roost	Roost Evidence	Photos
Roost 2	Main School Building	The roof voids of the Main School Building as shown on Figure 14.	Common pipistrelle x 1	One common pipistrelle bat was identified exiting the Main School Building at approx. 20:18 on the 24th August 2022.	
Roost 3	Main School Building	The roof voids of the Main School Building as shown on Figure 14.	Soprano pipistrelle x 1	One Soprano pipistrelle bat was identified exiting the Main School Building at approx. 20:18 on the 24th August 2022.	
Potential Roost 4 **TBC**	Main School Building	The roof voids of the Main School Building as shown on Figure 14.	Potentially Common pipistrelle	Dropping collected on the 24th August 2022 and subsequently analysed, currently awaiting results.	

8.10.2 General Roosting Opportunities

As detailed in the section above, three roosts have been confirmed on-site, and a fourth is awaiting confirmation. Roosts have been identified for common and soprano pipistrelles and brown long-eared bats, all of which were recorded within the typical emergence times for their species. However, it is possible these bat species use additional buildings /and or trees in the vicinity of the Site.

Figures 15 – 17 show the first bat species recorded during the evening period; from dusk to 90 minutes after sunset time, for each dusk survey. The coloured dots show the bat species and time they were observed. The white bar indicates the approximate time the bat species exit from their roost; based on timings in (Russ 2021[10]). Based on the emergence times, these results support the finding of the bat surveys and the following species are likely to be roosting in, or in the vicinity of, the Site:

- Soprano pipistrelle (Figure 15, 16 and 17);
- Common pipistrelle (Figure 15, 16 and 17);
- Brown long-eared bat (Figure 16).

Figure 15: August Bat Emergence Times During the Dusk Survey

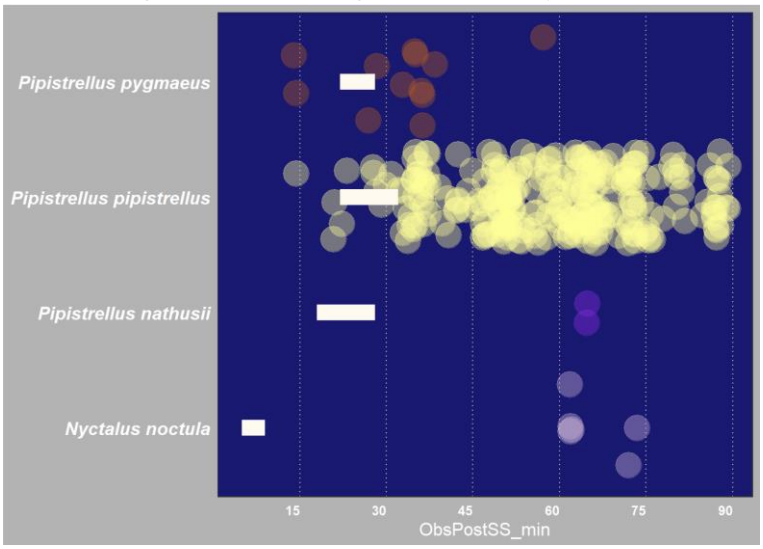
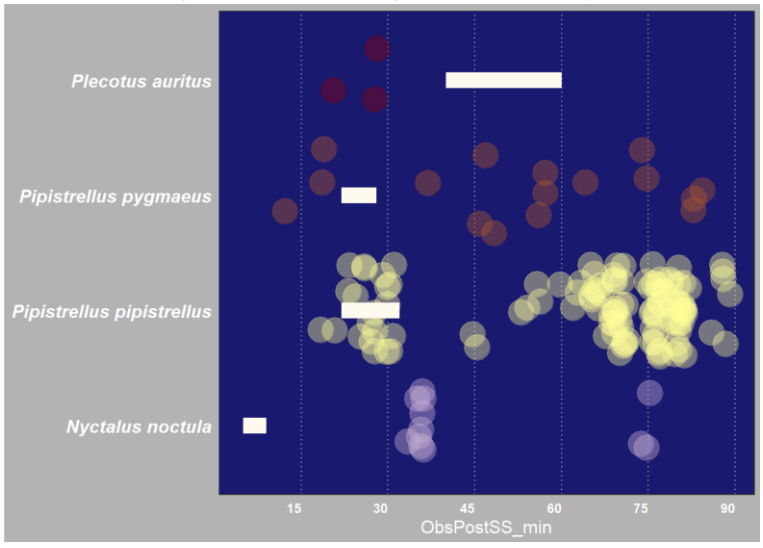
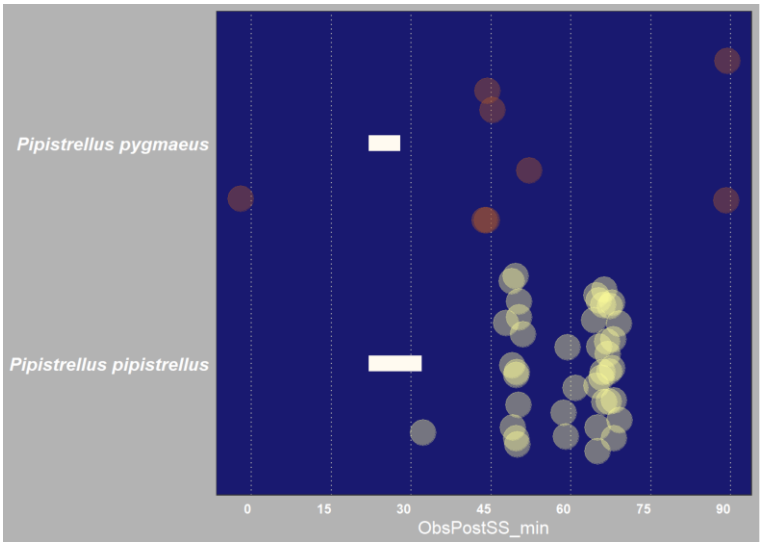


Figure 16: September Bat Emergence Times During the Dusk Survey



[10] Russ, R (2021) Bat Calls of Britain & Europe: A Guide to Species Identification.

Figure 17: October Bat Emergence Times During the Dusk Survey



9 Results: Night Vision Aids Surveys

9.1 Night Vision Aids Survey Schedule

Night Vision Aids (NVAs) (thermal imaging systems and Infra-red cameras) were used to facilitate detection of any emerging/returning bats within the Main School Building. The NVAs were deployed during the surveys as summarised in Table 10.

9.1.1 Acoustic support for NVA

A Bat Logger M and a S2 Static Bat Detector were used to record bat calls alongside the NVAs. This was undertaken on two occasions:

- Session 1: During the Dusk Survey on the 14th September and then during the Dawn survey on the 15th September 2022 a Bat Logger M was placed next to the 'Thermal imaging scope Guide Track IR Pro 19' positioned at Location D. This detector recorded the bat passes as the brown long-eared bats emerged from Roost 1 on the 14th September 2022 between 19:36 and 20:31; and
- Session 2: From the start of the Dusk Survey on 5th October throughout the night until Dawn on the 6th October 2022 an S2 Static detector was installed next to the 'Thermal imaging scope Guide Track IR Pro 19' positioned at Location D. The static recorded a brown-long eared bat (likely emerging based on time of recording and supporting survey information) at 20:15, after the Dusk Survey had finished. The static also recorded brown long-eared bat passes at 01:45, 02:44 and 03:24 (x3 passes). Confirming the bats were still using the roost albeit in smaller numbers than in September 2022 and at times that would not have been recorded during standard manual survey timings.

Table 10: Summary of NVAs Survey Sessions

NVAs Session	Date (2022)	NVAs Location (Fig 18)	NVAs Models
1	24th August	A	Thermal imaging scope Pulsar Helion XP38
2	25th August	A	Thermal imaging scope Pulsar Helion XP38
3	14th September	A	Thermal imaging scope Pulsar Helion XP38
		B	Thermal camera FLIR T1030SC
		C	Infra-red camera (Canon XA11) combined with two infra-red lights
		D	Thermal imaging scope Guide Track IR Pro 19
4	15th September	A	Thermal imaging scope Pulsar Helion XP38
		B	Thermal camera FLIR T1030SC
		C	Infra-red camera (Canon XA11) combined with two infra-red lights
		D	Thermal imaging scope Guide Track IR Pro 19
5	5th October	A	Thermal imaging scope Pulsar Helion XP38
		B	Thermal camera FLIR T1030SC
		C	Infra-red camera (Canon XA11) combined with two infra-red lights
		D	Thermal imaging scope Guide Track IR Pro 19

9.2 NVAs Locations

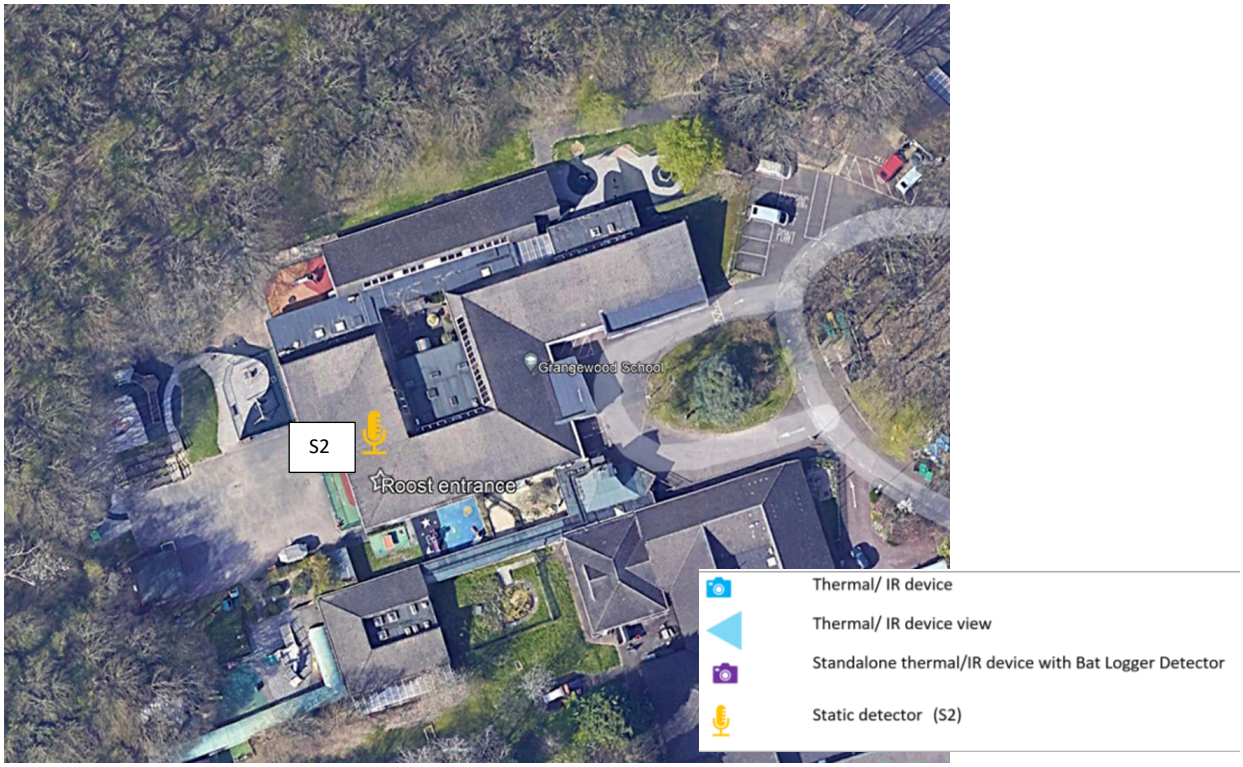
The deployment locations of the NVAs are shown in Figures 18 - 21.

Figure 18: Aerial Mapping indicating the Location of the NVAs during 24th & 25th August 2022 Bat Surveys © Google Earth 2022

Figure 19: Aerial Mapping indicating the Location of the NVAs during 14th & 15th September 2022 Bat Surveys © Google Earth 2022

Figure 20: Aerial Mapping indicating the Location of the NVAs during 5th October 2022 September 2022 Bat Surveys © Google Earth 2022

Figure 21: Aerial Mapping indicating the Location of the NVAs during 6th October 2022 September 2022 Bat Surveys © Google Earth 2022


Grangewood School
S2
Roost entrance
Thermal/ IR device
Thermal/ IR device view
Standalone thermal/IR device with Bat Logger Detector
Static detector (S2)

9.3 Bat Activity Recorded from NVAs

Images from the NVAs were taken during the bat surveys (Figure 22). Brown long-eared bats were detected emerging from Roost 1 on the Thermal Cameras positioned at Location A and B on the 14th September 2022 between 19:36 and 20:31. These findings support those recorded by the manual Bat Logger Surveys, Internal and External Inspections and DNA analysis of bat droppings.

Figure 22: Examples of Thermal & Infra-Red Images of the Buildings on Site

Image 1: Thermal image from Location D during October Dusk Survey	**Image 2:** Thermal camera in Location B during September Dusk Survey
	
Image 3: Thermal image from Location B during September Dusk Survey	**Image 4:** Thermal image from Location B during September Dusk Survey of brown long-eared bat emerging from **Roost 1**
	
Image 5: Thermal image from Location B during September Dusk Survey of brown long-eared bat emerging from **Roost 1**	**Image 6:** Thermal image from Location A during September Dusk Survey of brown long-eared bat
	

10 Interpretation & Recommendations

10.1 Introduction

The following Chapter makes recommendations for the avoidance of harm to bats and their habitats, and enhancements to benefit bats, based on the levels of activity and the evidence of bats recorded in 2022.

10.2 Bat Species Composition

The survey findings show that at least five species of bat use the Site to forage on / near and commute over (common pipistrelle, soprano pipistrelle, noctule, brown long-eared bat and Nathusius' pipistrelle).

10.3 Bat Roost Sites

Three roosts on-site have been confirmed:

- **Roost 1**: Brown long-eared Maternity Colony (peak of 7 bats), located within the Main School Building south and west roof voids. Three brown long-eared bats and their dropping were observed during the Internal Inspections undertaken on the 24th August 2022. Three brown-long eared bats were recorded returning to the roost on the 25th August 2022 and seven brown long-eared bats were recorded emerging from the roost, on the 14th September 2022. A static detector located at the roost entrance on the 5th & 6th October 2022 recorded brown long-eared bat passes, indicating that the bats continued to use the roost into October.
- **Roost 2:** Common pipistrelle Day Roost located within the Main School Building south and west roof voids. One common pipistrelle bat was identified exiting the Main School Building at approx. 20:18 on the 24th August 2022.
- **Roost 3:** Soprano pipistrelle Day Roost located within the Main School Building south and west roof voids. One soprano pipistrelle bat was identified exiting the Main School Building at approx. 20:18 on the 24th August 2022.

One additional roost (**Roost 4**), a possible common pipistrelle day roost (for individual / low numbers of bats in the northern roof void is awaiting confirmation, on receipt of the result of the dropping DNA Analysis.

More generally, based on the emergence times recorded during the surveys, common pipistrelle, soprano pipistrelle and brown long-eared bats are likely to be roosting in the vicinity of the Site, in habitats such as the large expenses of good quality woodland habitat in the locality.

10.4 Licence Requirements

A Bat Licence Application must be submitted to Natural England and a Natural England Bat Licence must be obtained prior to conducting any works that could impact bats on-site.

The Licence Application must set out the pre-works inspections, likely impacts, mitigation, enhancement, monitoring and work schedule required for the loss of bat roosts both within the bat roosts on site. All works must be conducted in accordance with the, legally binding, conditions of the licence.

It should be noted that Natural England will only grant Bat Licences once planning consent is granted and all planning conditions relating to bats that are capable of being discharged have been discharged.

10.5 Further Survey

Where works are proposed between March to October which include removal of roosting features a activity survey will be completed immediately beforehand to confirm the presence / likely absence of bats and refine the location where most capture efforts may be required.

Re-inspection of trees may be required if works have not been completed within one year of the initial inspection or if major storm damage has affected the site.

Should any trees in addition to those already inspected need to be removed as part of the development, further tree inspections will also be required to identify any potential roosts within those trees before any tree works.

10.6 Sensitive Timings of Works

The works will be timed to minimise the impact on bat, with removal of the roof and other features to be completed before the end of May. Removal of the roof will not be permitted between the months of June, July or August.

10.7 No Use of Breathable Roof Membranes

Breathable Roof Membranes should not be installed into a roof used by bats or into the roof voids of proposed new building(s). Only bituminous roofing felt that does not contain polypropylene filaments should be used. For example, bitumen felt type 1F, which is hessian reinforced.

10.8 Ecological Clerk of Works

Prior to any works commencing on the roof of the building (and only under Licence):

- A 'Toolbox Talk' should be given to the contractors to make them aware of the risk of bats being present and what to do should a bat be found.
- Immediately prior to the start of works, the internal and external potential roosting features (PRF) on / in the Main School Building should be inspected by the registered ecologist, in an attempt to locate the bat access points.
- All PRFs should be removed in accordance with relevant licence conditions and under the supervision of the licenced bat ecologist or their agents.
- Any bats present at the time of the proposed works should be removed by hand (by the ecologist) and placed within a bat box which should already be in place on-site.

10.9 Compensation

A new roost structure including void space will be constructed and installed on-site in advance of the start of demolition. Several new bat roost boxes have already been installed on retained trees within the existing school site

10.10 Enhancement

The majority of the woodland within the school site will be retained. This woodland appears to have regenerated naturally over the last 75 years and currently forms a dense canopy with limited ground flora. Management of the woodland to increase its structural and floristic diversity would increase its value as part of the foraging resource for local bat populations.

10.11 Consideration of Lighting

10.11.1 Potential Impacts of Lighting

Lighting schemes can damage bat foraging habitat directly through loss of land and spatial exclusion of bats due to high illuminance, or indirectly by severing commuting routes from roosts, through light spillage polluting hedgerows, mature tree lines and other linear features often used by commuting bats. Lighting around roosts has also been shown to delay emergence, causing bats to miss the peak in insect prey abundance affecting survival and health[11].

[11] Stone, E.L. (2013) Bats and Lighting: Overview of current evidence and mitigation guidance

It should be noted that some bat species (common pipistrelle and noctule) can benefit from lighting and are known to forage around and above streetlights, whereas other species such as brown long-eared bats are light averse and will avoid brightly lit areas. As such the severity of impacts of any lighting scheme will vary depending on the species present.

Any new external lighting should be directed away from any bat mitigation features on-site or the key green linear features and should only operate when it is needed. The lighting strategy for the new development should be based on principles of the following policies and guidance or any subsequent updates:

- Bats and Artificial Lighting in the UK[12];
- Planning guidance (National Planning Policy Framework, 2021)[13]; and

Any lighting during construction should be addressed in the Construction Environmental Management Plan (CEMP). Appendix B summarises the relevant current good practice with regards to bats and lighting.

[12] Bat Conservation Trust and Institution of Lighting Professionals Guidance Note 08/ 18 "Bats and Artificial Lighting in the UK" Bats and the Built Environment Series

[13] Ministry of Housing, Communities & Local Government. 2021. Policy paper: National Planning Policy Framework February 2021.

11 Conclusion

In 2022, Richard Graves Associates undertook bat surveys of the Main School Building located within the Grangewood School Site, Pinner. These surveys provide information in support of a Planning Application for the proposed re-development of the Site to provide the proposed new 'Pinn River SEND School'.

The survey findings show that at least five species of bat use the Site to forage on / near and commute over (common pipistrelle, soprano pipistrelle, noctule, brown long-eared and Nathusius's pipistrelle).

Three roosts with the Main School Building roof voids have been confirmed:

- **Roost 1:** Brown long-eared maternity roost in the south and west roof voids;
- **Roost 2**: Common pipistrelle day roost (for individual / low numbers of bats) in the south and west roof voids; and
- **Roost 3:** Soprano pipistrelle day roost (for individual / low numbers of bats) in the south and west roof voids.

One additional roost (**Roost 4**), a possible common pipistrelle day roost (for individual / low numbers of bats in the northern roof void is awaiting confirmation, on receipt of the result of the dropping DNA Analysis.

A Bat Licence Application must be submitted to Natural England and a Natural England Bat Licence must be obtained prior to conducting any works that could impact roosting bats on-site.

Based on the findings of the Bat Surveys conducted in 2022, this report makes recommendation regarding licencing, sensitive lighting design, further surveys and mitigation.

If the recommendations of this report, are undertaken at the appropriate stage, there are no undue constraints, with respect to bats, to the proposed development.

Appendix A: DNA Analysis of Droppings Results

SureScreen Scientifics

Folio No: E15319
Report No: 1
Purchase Order: RGA211/01
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TECHNICAL REPORT

ANALYSIS OF BAT DROPPINGS FOR SPECIES OF ORIGIN IDENTIFICATION

SUMMARY

The droppings of bats contain small amounts of DNA belonging to the organism from which they originated. By analysing droppings collected from a bat roost or colony for the presence of DNA, a robust identification of the species present can be made. Recent advancements in molecular methods including PCR (polymerase chain reaction) and DNA sequencing mean that 92% of bat species worldwide can be identified including all 17 UK resident bat species.

RESULTS

Date sample received at Laboratory: 30/08/2022
Date Reported: 07/09/2022
Matters Affecting Results: None

Lab Sample ID.	Site Name	O/S Reference	Genetic Sequence	Common Name	Result	Sequence Similarity
B1159	1 Grangewood School	TQ 09911 88835	CCCCATCTTTTCTACTACTTT TAGCTTCGTCTGCAGTAGAG GCTGGAGCAGGTACCGGTTG AACAGTCTATCCTCCTTTAG CGGGAAACC	Brown long-eared bat	*Plecotus auritus*	100%
B1160	3 Grangewood School	TQ 09905 88820	CCTAATAATTGGAMCCCCTG ATATANCTTTTCCCCGAATA AATAACATAAGCTTCTGACT GCTTCCCCCATCTTTTCTAC TACTTTAGCTTCGTCTGCA GTAGAGGCTGGAGCAGGTAC CGGTTGAACAGTCTATCCTC CTTTAGCGGGAAACCT	Brown long-eared bat	*Plecotus auritus*	99.30%

If you have any questions regarding results, please contact us: ForensicEcology@surescreen.com

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METHODOLOGY

Once samples have arrived in the laboratory, a single bat dropping is selected for its suitability (freshness and size). The DNA is then isolated using a commercial DNA extraction kit. Using PCR, bat DNA (if present within the sample) is amplified using bat DNA-specific molecular markers designed to amplify a short fragment of the mitochondrial gene. If amplification is successful, the resulting DNA sequence is revealed using a process known as Sanger Sequencing in order to obtain the genetic sequence. The sequence results are aligned against a library of known bat reference sequences using bioinformatics software, which enables us to determine which species the extracted DNA matches with, informing the species identity and sequence similarity (%).

If the initial analysis is unsuccessful, the entire process is repeated up to two additional times with fresh reserve droppings. If no DNA is detected after three attempts, we can be confident that any further analysis of the sample will likely also fail to result in species identification.

INTERPRETATION

Genetic Sequence:	The unique DNA sequence obtained from the sample.
Sequence Similarity:	How closely matched the DNA sequence from your sample is to the sequences within our reference database. This can be interpreted as a score of result accuracy, with the maximum score of 100% indicating an exact match of dropping to the indicated species' reference sequence. Lower scores (80-99%) indicate some variation between the sample and reference sequence, likely due to natural variation between individual genetic sequences and/or systematic variations generated through the sequencing process. Scores below 80% similarity should be interpreted with care and can indicate part degraded or part contaminated samples.
Inconclusive Result:	**Degraded sample:** DNA degraded, unable to determine species identification due to degradation of sample DNA. This can happen either before sample collection (old droppings, exposure to UV etc.) or after sample collection if stored for long periods before analysis or not handled correctly. **Inhibited/contaminated sample:** Unable to determine species identity due to contamination or the suspected presence of large quantities of PCR inhibitors. Contamination sources can come from other species which come into contact with droppings, human contamination during sample collection.
Alternative Result:	Sometimes, other mammalian species such as rodents are detected. We find this to be a common occurrence as some bat droppings can be similar in appearance to rodent droppings. Although sometimes unexpected, repeat analyses in these cases would likely return the same results.

Appendix B: Lighting Good Practice

In accordance with good practice (Bats and artificial Lighting in the UK[14]) and planning guidance (National Planning Policy Framework, 2021[13]), lighting key habitats and features should be avoided altogether and, where lighting must be used, the lighting impacts of new developments should be considered and the following key points should be incorporated in to the lighting design:

Table 11: Summary of Sensitive Lighting Prescriptions

Sensitive Lighting Action	Description
Protect key habitat features	– Light trespass on key bat habitats should be below 0.2 lux on the horizontal plane and below 0.4lux on the vertical plane. – These figures are lower than what may be expected on a moonlit night.
Avoidance of Up-Lighting	– Trees and green landscaping features should not be uplit in order to reduce the disturbance to bats and other nocturnal wildlife.
Minimising Lightspill	– Lighting should be directed to where it is needed and light spill from the proposed development on to adjacent habitats should be avoided. – Careful selection of the design of the luminaire and the use of accessories such as hoods, cowls, louvres will achieve this and direct the light to the intended area only.
LED Luminaires	– LED luminaires should be used where possible as they have a lower intensity, have a sharp cut off, good colour rendition and can be dimmed.
Directional Street Lighting	– High level Street lamp columns should have built in reflectors to direct the spread of light downwards, thus eliminating upward light pollution. – Only luminaires with an upward light ratio of 0% should be used.
Rear Shields Near Key Green Infrastructure	– Locate street lights so that the rear shields are adjacent to any key green features / darker areas of the site.
Low Level Pedestrian Lighting	– Where needed, this should be limited to low level bollards where possible, with fittings designed to direct light towards the road pathway with minimal upward light spill.
Lightspill Modelling	– Prepare a Horizontal Illuminance Contour Plan to illustrate and, where necessary, facilitate amendment of light trespass from new lighting including from windows.
Motion Sensors	– Any external security lighting should be set on motion-sensors and short (e.g. approx. 1 min) timers.
High Peak Wavelengths	– Luminaires should feature peak wavelengths higher than 550n to avoid the component of light most disturbing to bats.
Warm White Spectrum	– A warm white spectrum (ideally <2700Kelvin) should be used to reduce the component of blue light.
Avoid UV Elements in Luminaires	– Luminaires shouldn't possess UV elements; metal halide fluorescent sources shouldn't be used.
Tall Building Locations	– Taller building may be best located towards the centre of a site away from any key boundary green linear features.
Screen Light Spill	– Consider the use of walls, fences and bunding (preferably in combination with climbers/ planting) to screen light spill.
Minimise Glazing	– Where possible, restrict glazing / employ glazing treatments such as 'smart glass'.
Careful Selection of Internal Light Fittings	– Install recessed luminaires or install luminaires above the window head height where possible. – Set back luminaires further into room. – Avoid pendant lighting fitting.

[14] Bat Conservation Trust and Institution of Lighting Professionals Guidance Note 08/ 18 "Bats and Artificial Lighting in the UK" Bats and the Built Environment Series