Extended Phase 1 Habitat Survey

At

William Ellis School, Highgate Road, London, NW5 1RN

Address	William Ellis School, Highgate Road, London, NW5 1RN		
Client	Camden Council	**Ecologist**	K Philpot
Our Ref	E-14080 V2	**Director**	Billy Hunter
Report Date	19th September 2017	**Quality Checked**	J Greetham
Scope of Report	Extended Phase 1 Habitat Survey		

t 0330 380 1036 f 0330 3801038
planning@innovation-environmental.co.uk
www.innovationpropertyuk.com/environmental

Version	Date	Author	Checked	Approved
2	15/09/2017	K Philpot	J Greetham	G Anderson
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The opinions and information contained within this report were gathered using due skill, care and diligence. The report complies with the Biodiversity Code of Practice for Planning and Development (BS42020:2013) and has been prepared and provided in accordance with the Chartered Institute of Ecology and Environmental Management's (CIEEM) Code of Professional Conduct. We confirm that the opinions expressed are our true and professional bona fide opinions.

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Executive Summary

An Extended Phase One Habitat Survey was undertaken by an experienced ecologist at William Ellis School, Highgate Road, London, NW5 1RN on the 13th November 2013, and updated on the 7th September 2017 by two experienced ecologists (previous ecology reports are included in Appendix VII).

The site is a school complex with outside play areas and enclosed landscaped courtyards. The buildings on the site are of differing ages and heights with multi storey additions. There are a number of mature trees along the frontage of the site and those which overhang the site from the adjoining open space. The site is located to the south and east of a large urban park, there is a large residential complex to the east and another school to the south.

Site habitats have remained largely unchanged since the initial 2013 survey effort, based on the most recent survey effort the following recommendations are made:

- Site vegetation clearance and building demolition should take place outside the bird nesting season (October - February);
- Bat, bird and insect boxes should be included within the new development design and wherever possible wild flower seed mix (suitably sourced for the area) and native trees and shrubs used in the new landscaping.
- No further survey effort is considered necessary unless changes are made to the development area to be affected over and above those indicated within this report.

1.0 Introduction

Environmental Services were commissioned by Camden Council, to undertake an Extended Phase One Habitat Survey; the survey is required in relation to a planning application at William Ellis Hill School, Highgate Road, London, NW5 1RN. The site is centred at Ordnance Survey Grid Reference TQ 282 860.

OS. Licence No.100043218

1.1 Site Description

A drawing of the development area is included within Appendix I and comprises of a tree lined entrance drive which leads to a school complex with outside play areas and enclosed landscaped courtyards. The buildings on the site are of differing ages and heights with multi storey additions. There are a number of mature trees along the frontage of the site and those which overhang the site from the adjoining open space. The site is located to the south and east of a large urban park, there is a large residential complex to the east and another school to the south.

1.2 Scope of Survey

We have been instructed to undertake an Extended Phase 1 Habitat Survey; this is not a survey for the purposes of The Wildlife and Countryside Act 1981 (Variation of Schedule 9 or Schedule 9) (England and Wales) Order which came into force on 6 April 2010 or National Vegetation Classification. This report has been produced with reference to current guidelines for preliminary ecological appraisal (CIEEM, 2012) and in accordance with BS42020:2013: Biodiversity – Code of Practice for Planning and Development.

We have been advised that there will be a one-storey extension on the Eastern brick building although this will not affect the roof or loft space. There will also be refurbishment to the inside of some of the buildings although this will not affect any loft spaces.

The scope of the report is to assess the site and map all habitats present. In addition to this make recommendations based upon the findings of the survey in relation to European Protected or Notable Species and any phase 2 survey work required to satisfy planning requirements.

1.3 Limitations

All of the species that occur in each habitat would not necessarily be detectable during survey work carried out at any given time of the year, since different species are apparent during different seasons. Phase 1 habitat surveys can be undertaken at any time of the year; however, the optimum time of year for these surveys to be undertaken is between April and September (inclusive).

This survey was undertaken within this optimum period, and is therefore considered to provide a robust assessment of the habitats and species present within the site.

All loft spaces within the school were not accessible due to a recent asbestos survey which reported high levels of dust.

None of the school buildings were internally surveyed due to access being denied during term time.

A full PRA was not carried out on this site due to the development proposals not currently affecting the loft spaces or roofs of any of the buildings and due to the lack of access.

2.0 Legislation, Policy and Conservation Status

2.1 Planning and Biodiversity

Local Authorities have a requirement to consider biodiversity under the following European legislation:

- Natural Environment and Rural Communities (NERC) Act (2006);
- The Habitats Directive (EC directive 92/43/EEC);
- Environmental Impact Assessment (85/337/EEC as amended by directive 09/31/EC);
- Strategic Environmental Assessment (2001/42/EEC);
- The Environment Act (1995).

Section 40 of the Natural Environment and Rural Communities Act 2006 (the NERC Act) places a legal duty on public bodies, including planning authorities, to 'have regard' to the conservation of biodiversity when carrying out their normal functions, which includes consideration of planning applications.

In compliance with Section 41 of the NERC Act, the Secretary of State has published a list of species and habitats considered to be of principal importance for conserving biodiversity in England under the UK Post-2010 Biodiversity Framework. This is known as the England Biodiversity Priority (EBP) list, previously referred to as Local Biodiversity Action Plan (LBAP), of which there are 56 habitats and 943 species (Natural England, 2014). The EBP list is used to guide planning authorities in implementing their duty under the NERC Act.

Local Authorities must also have regard for the following national planning policies:

- National Planning Policy Framework (NPPF) (DCLG, 2012);
- ODPM Circular 06/2005 (Defra Circular 01/2005);
- ODPM (March 2006) Planning for Biodiversity and Geological Conservation.

The Camden Biodiversity Action Plan 2013-2018, also contains the following local biodiversity objectives and targets with three key areas of focus: 1. Access to Nature; 2. The Built Environment; and 3. Open Spaces and Natural Habitats.

- Increase and maintain the local areas' level of mature trees, perennial species rich grasslands and hedgerows.
- Engage in environmental education programs
- Retrofit biodiversity and carbon reduction measures.

2.2 Legalisation and Local Policy Documents

Relevant legislation (as amended) and policy documents that have been consulted are detailed below:

- Wildlife and Countryside Act 1981 (as amended);
- The Conservation of Habitats and Species Regulations 2010;
- The Countryside and Rights of Way Act 2000;
- Natural Environment and Rural Communities Act 2006;
- The Protection of Badgers Act 1992;
- The Hedgerow Regulations 1997;
- UK Post-2010 Biodiversity Framework;
- National Planning Policy Framework (NPPF);
- Camden Biodiversity Action Plan 2013-2018.

2.3 Species Legislation

2.3.1 Bats

All species of bat and their breeding sites or resting places (roosts) are protected under Schedule 2 of The Conservation of Habitats and Species Regulations 2010 and Section 9 of the Wildlife and Countryside Act 1981 (as amended). It is an offence for anyone to:

- intentionally to kill, injure or handle a bat;
- possess a bat (whether live or dead);
- disturb a roosting bat, or sell or offer a bat for sale without a licence; or
- damage, destroy or obstruct access to any place used by bats for shelter, whether they are present or not

(*Natural England, 2016*)

A roost is protected whether or not bats are present and any activity or works affecting a roost, even when bats are absent, is likely to be subject to the relevant licence procedure with Natural England.

2.3.2 Water Vole *(Arvicola amphibious)*

The Water Vole has historically received limited protection through inclusion on Schedule 5 of the Wildlife & Countryside Act 1981 (as amended). On the 6th April 2008 legal protection of this species was extended as such it is now an offence to:

- intentionally kill, injure or take (capture) a water vole;
- possess or control a live or dead water vole, or any part of a water vole;

- intentionally or recklessly damage, destroy or obstruct access to any structure or place which water voles use for shelter or protection or disturb water voles while they are using such a place; or
- sell, offer for sale or advertise for live or dead water voles.

(*Natural England, 2016*)

2.3.3 Otter *(Lutra lutra)*

Otters are currently increasing in number and distribution after a prolonged period of decline. They receive protection under both the Wildlife and Countryside Act 1981 (as amended) and The Conservation of Habitats and Species Regulations 2010. Otters and their resting places are fully protected, it is an offence to:

- deliberately, capture, injure or kill them;
- to damage, destroy or obstruct their breeding or resting places;
- or to disturb otters in their breeding or resting places.

(*Natural England, 2016*)

There is, however, provision within the legislation to kill, take, disturb or possess otters or to use prohibited methods to kill or take under a licence in certain defined circumstances, if the issue cannot be resolved by any alternative means.

2.3.4 Great Crested Newts *(Triturus cristatus)*

Great Crested Newts (GCNs) are protected under Schedule 2 of The Conservation of Habitats and Species Regulations 2010 and Sections 9(1) and 9(4) of the Wildlife and Countryside Act 1981 (as amended).

The above makes it an offence to:

- deliberately capture, injure or kill a great crested newt;
- damage any place used for shelter or protection by the species, including breeding ponds and terrestrial habitats; or
- intentionally or recklessly disturb a great crested newt whilst it is occupying a place of shelter.

(*Natural England, 2016*)

The legislation applies to all stages of the life cycle including eggs, larvae and juveniles.

2.3.5 Hazel Dormouse *(Muscardinus avellanarius)*

Dormice are fully protected under UK and European legislation in England including the Wildlife and Countryside Act 1981 (as amended) and the Conservation of Habitats and Species Regulations 2010. Taken together, these legislative instruments make it illegal to:

- deliberately, capture, injure or kill them;
- to damage, destroy or obstruct their breeding or resting places;
- to disturb them in their breeding or resting places;
- possess or sell a wild dormouse.

(*Natural England, 2016*)

2.3.6 Birds

In the UK, the provisions of the Birds Directive are implemented through the Wildlife & Countryside Act 1981 (as amended) and The Conservation of Habitats and Species Regulations 2010. All wild birds, their nests and eggs are protected it an offence to:

- kill, injure, or take any wild bird;
- take, damage or destroy the nest of any such bird whilst it is in use or being built; or
- take or destroying an egg of any such wild bird.

(*Natural England, 2016*)

The law covers all species of wild birds including common, pest or opportunistic species. Special protection against disturbance during the breeding season is also afforded to those species listed on Schedule 1 of the Act.

2.3.7 Reptiles

Adders, slow worms, grass snakes and common lizards are protected against killing and injuring under Schedule 9 of the Wildlife and Countryside Act 1981 (as amended). This legislation makes it illegal to intentionally kill or injure a common reptile. As a result, reptiles must be removed from areas of development and relocated onto suitable release sites before any site works can commence.

Smooth snakes and sand lizards are also protected under schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and Schedule 2 of the Conservation of Habitats and Species Regulations 2010 (as amended) making them European Protected Species. This makes it illegal to carry out the following activities:

- Deliberately or recklessly disturb, capture or kill these animals;
- Deliberately or recklessly take or destroy eggs of these animals;
- Damage or destroy a breeding site or resting place of such a wild animal; or
- Keep, transport, sell or exchange, or offer for sale or exchange, any live or dead animal, or any part of, or anything derived from such a wild animal.

(*Natural England, 2016*)

2.3.8 Badgers *(Meles meles)*

Badgers and their setts are fully protected under the Protection of Badgers Act 1992. This Act makes it an offence, *inter alia*, to:

- Wilfully kill, injure or take, or attempt to kill, injure or capture a badger; or
- Interfere with a badger sett by doing any of the following things, intending to do any of these things or be reckless as to whether one's actions would have any of these consequences:
- Damage, destroy or obstruct access to a badger sett or any part of it.
- Disturb a badger when it is occupying a badger sett.

Where planning permission has been granted, Natural England may issue a licence to interfere with setts for development purposes. However, licences are only usually issued for works between July and November, a period when badgers are unlikely to have dependent young below ground.

(*Natural England, 2016*)

3.0 Methodology

3.1 Data Search

Records of protected species and non-statutory wildlife sites within a 1km radius of the application site were requested from the Greenspace Information for Greater London (GiGL).

Locations of statutory designated sites were accessed via the government 'MAGIC' website (www.magic.gov.uk).

3.2 Extended Phase 1 Habitat Site Survey

To fulfil the brief, an Extended Phase 1 Habitat Survey was conducted following the methodology of the Joint Nature Conservation Committee (JNCC) *Handbook for Phase I Habitat Survey - A Technique for Environmental Audit* (2010). Extended Phase I Habitat Survey is a standard technique for obtaining baseline ecological information for large areas of land in which the main vegetation types present within the survey area are mapped using a standard set of habitat categories. The aim is to provide records of habitats that are of significant ecological value.

Additional Target Notes

Additional target notes were made where applicable to record:

- Key habitat features.
- Ecological features not covered in sufficient detail in the Phase 1 Methodology.
- Important habitats too small to be mapped and to identify dominant species.
- Other features of ecological interest.

3.3 Protected Fauna and Flora Species

Potential signs/suitable habitats for the presence of European and Domestic protected species were recorded.

3.4 Ecological Value and Impact Assessment

Guidelines for ecological value and impact assessment within Volume 11 Section 2 of the Design Manual for Roads and Bridges (DMRB) (Department for Transport, 2009) have been used to place the ecological value of the site in context and assess the likely impacts of the proposed development.

The DMRB is considered by the author to offer a more workable methodology than other assessment methods currently available and is applicable to development situations other than roads and bridges.

Criteria used to assign value and assess likely impacts are provided in Appendix II.

4.0 Results: Desktop Survey

4.1 Data search

Biological records data was searched for and requested over a 1km radius from the Greenspace Information for Greater London (GiGL) (see Appendix IV).

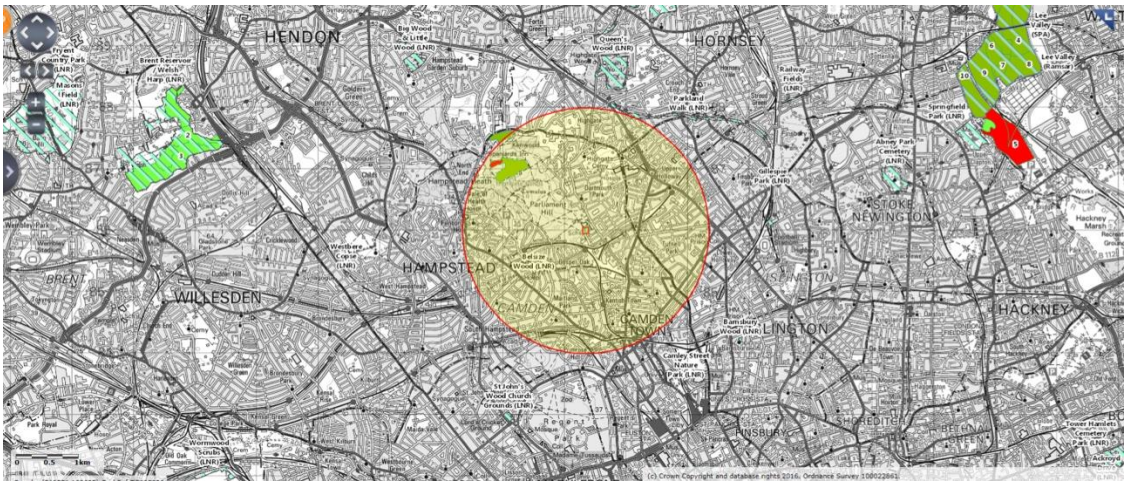
4.1.1 Summary of Protected Species Recorded within a 1km Radius

Species	Scientific Name	Distance from Grid Ref	Source	Date
Stag Beetle	*Lucanus cervus*	160m	GiGL	1998
Multiple moth species		352m	GiGL	2007
Common Toad	*Bufo Bufo*	384m	GiGL	1999
Common Redpoll	*Acanthis flammea*	865m	GiGL	1994
Swift	*Apus apus*	255m	GiGL	2010
Cuckoo	*Cuculus canorus*	977m	GiGL	2010
House Martin	*Delichon urbicum*	865m	GiGL	1994
Kestrel	*Falco tinnunculus*	1845m	GiGL	2011
House Sparrow	*Passer domesticus*	73m	GiGL	1976
Tawny Owl	*Strix aluco*	257m	GiGL	1985
Starling	*Sturnus vulgaris*	73m	GiGL	1976
Redwing	*Turdus iliacus*	73m	GiGL	1976
Hedgehog	*Erinaceus europaeus*	217m	GiGL	1999
Brown Long-eared Bat	*Plecotus auritus*	1km	GiGL	2012
Unidentified Bat	*Myotis*	979m	GiGL	2005
Daubenton's Bat	*Myotis daubentonii*	424m	GiGL	1993
Natterer's Bat	*Myotis nattereri*	924m	GiGL	2001
Nyctalus Bat species	*Nyctalus*	217m	GiGL	2002
Lesser Noctule	*Nyctalus leisleri*	217m	GiGL	2002
Noctule Bat	*Nyctalus noctula*	424m	GiGL	1993
Pipistrelle Bat species	*Pipistrellus*	73m	GiGL	1993
Common Pipistrelle Bat	*Pipistrellus pipistrellus*	73m	GiGL	1993
Soprano Pipistrelle Bat	*Pipistrellus pygmaeus*	217m	GiGL	2002
Vesper Bat	*Vespertilionidae*	795m	GiGL	2004
Serotine Bat	*Eptesicus serotinus*	1km	GiGL	2012

Table 1: Summary of Protected Species Desktop Records

4.1.2 Statutory Designated Nature Conservation Sites

Designated site information drawn from the Multi Agency Geographic Information for the Countryside site www.magic.com confirmed designated sites within the 2km search radius.



The following sites were found within the 2km search radius:

Local Nature Reserves:

1. Belsize Wood
2. Parkland Walk

Sites of Special Scientific Interest Units:

1. Hampstead Heath Woods (unfavourable declining x1)
2. Hampstead Heath Woods (unfavourable recovering x1)

In addition, from the information provided by the Records Provider, the following Sites of Nature Conservation Importance were identified:

1. London's Canals
2. Belsize Wood Local Nature Reserve
3. Hampstead Heath
4. Highgate Cemetery
5. Parkland Walk, Queen's Wood and Highgate Wood
6. Waterlow Park
7. Kentish Town City Farm, Gospel Oak Railsides and Mortimer Terrace Nature Reserve
8. Chalk Farm Embankment and Adelaide Nature Reserve
9. Dartmouth Park Hill and Reservoir
10. Archway Road Cutting
11. Upper Holloway Railway Cutting
12. Junction Road Railway Cutting

13. St Joseph's Social Centre
14. Holly Lodge Gardens
15. Rochester Terrace Gardens
16. Harrington Site
17. Southwood Lane Wood
18. Archway Park
19. Foxham Gardens
20. Tufnell Park Primary School Gardens
21. Hatchard Road Wildlife Garden
22. Whittington Park
23. Royal Northern Hospital

There were no European designated sites within 2km. One nationally designated site and 25 locally designated sites occurred within 2km.

Hampstead Heath Woods (SSSI) situated to the North-west of the site was designated for its high forest Sessile Oak and Beech woodlands with mature and veteran trees. There are large amounts of decaying heartwood, and dead standing and fallen wood across the site with a dense understorey of Holly, Hazel and Rhododendron providing habitat for many invertebrate species. There is also an area of acidic flush with bog-moss communities.

Belsize Wood (LNR) is an Ash, Sycamore and Swedish White Beam dominated woodland designated for its rich variety of insect species.

Parkland Walk (LNR) is a disused railway line designated for its area of regenerated woodland, scrub and rough grassland which provide multiple habitats for many species.

23 Sites of Importance for Nature Conservation (SINCs) were identified within the search area, of these 23 the closest to site is Kentish Town City Farm, Gospel Oak Railside's and Mortimer Terrace Nature Reserve (SINC) which is situated to the South of the site. This was designated for its mosaic of secondary Sycamore and Silver Birch dominated woodland. Within Kentish Town City Farm there is also a pond with marginal vegetation and a good population of frogs and a bog-garden with insectivorous plants.

Natural England define Impact Risk Zones around Sites of Special Scientific Interest (SSSI), Special Areas of Conservation (SAC), Special Protection Areas (SPA) and RAMSAR sites and categories of development for local authorities to determine if they need to consult Natural England in regards to potential impacts upon them. The development site is within the Impact Risk Zones of Hampstead Heath Woods SSSI. However, the site work does not include any activities that trigger the local planning authority to consider consulting Natural England in regards likely risks from the development on the surrounding statutory sites.

It is unlikely that any other statutory or non-statutory protected sites will be affected by the potential development due to the developments current use, locality and small size.

5.0 Results: Field Survey - Plants and Habitats

5.1 Field Survey

The site was surveyed on 13th November 2013 by Mr Philip May B.Sc MCIEEM, and subsequently updated on 6th September 2017 by Senior Ecologist Miss Jo Greetham B.Sc (Hons) ACIEEM, and Assistant Ecologist Miss Kate Philpot B.Sc M.Sc. All habitats were recorded and described in terms of dominant and characteristic plant species using Phase 1 Habitat Survey methodology (JNCC, 2010). A fauna and flora species list was compiled (see Appendix III).

The site was searched for field signs of badgers such as runs, latrines and feeding signs and assessed in terms of its suitability for other notable or protected species including bats, otter, water vole, reptiles, amphibians, hazel dormouse and birds. In addition, observations were made to identify any primary EBP and Local BAP species or habitats of local, regional and national importance.

Weather conditions during the survey were dry and overcast, day time temperatures for the survey were approximately 17ºC.

5.2 Plants and Habitats

Refer to Appendix I for Habitat Map and Appendix III for comprehensive species list and Target Notes.

The following habitats were recorded during the survey:

5.2.1 A3.1 Scattered Trees Broadleaved

Along the frontage of the main building and the entrance drive are several mature Lime trees (*Tilia cordata)* with specimens of Cedar (*Cedurus atlantica)*, Red Oak (*Quercus rubra*), Holm Oak (*Quercus ilex*), Cherry (*Prunus sp*.) and Ash (*Fraxinus excelsior)*. The site also has a number of mature Oak (*Quercus robur)* and London Plane (*Platanus x hispanica*) just outside the boundary overhanging the playground areas. These trees on site are of amenity value and are of ecological value supporting nesting birds.

5.2.3 J1.2 Amenity Grassland

Along the Eastern boundary of the site is a strip of unmanaged amenity grassland dominated by Perennial Rye Grass (*Lolium perenne*) and abundant Common Knotgrass (*Polygonum aviculare*). Forb species are also found along this boundary including Common Nettle (*Urtica dioica*), White Dead Nettle (*Lamium album*), Greater Plantain (*Plantago major*), Mugwort (*Artemisia vulgaris*) and Wood Avens (*Geum urbanum*). Along the frontage is a small area of lawn with abundant Creeping Bent (*Agrostis stolonifera*) and Red Fescue (*Festuca rubra*) with small shrub beds along the base of the building in places. Common small perennial species such as Daisy (*Bellis perennis),* Ground Ivy (*Glechoma hederacea*), and Ladies Bedstraw (*Galium verum*) are present. This small area has limited ecological value.

5.2.4 J1.4 Introduced Shrubs

At the entrance to the site and along the part of the frontage of the main school building are a series of small shrub beds. Several species have been repeated within the beds and those present are Variegated Laurel *(Aucuba japonica "Crotonifolia/Variegata"),* and various species of Hebe, Choisya, Fuscia, and Camellia. Along the entrance drive to the site are two formal shrub beds with the occasional specimen tree within them. There is a small courtyard within the centre of the school buildings which has planter tubs with ornamental evergreen shrubs and rosemary (*Rosmarinus officinalis*). There is also a small garden with ornamental planting surrounding B7. These areas are of low ecological value.

5.2.5 J2.4 Fence

The site is surrounded by a 3m high metal wired security fence. In places the climbers from the adjoining open space have established. On the northern fence boundary overhanging a patch of AstroTurf is a stand of the invasive species Small Balsam (*Impatiens parviflora*), however although overhanging it is currently not on site. All fences on site are of negligible ecological value.

5.2.6 J3.6 Buildings

The main school building (B1) is brick built with a pitched clay tile roof and lead lined dormer windows. There are occasional gaps under the lead and missing tiles across the whole roof space. There are gaps in the soffit box where vents had fallen out. There are areas along the front of the building densely covered in Virginia Creeper (*Parthenocissus quinquefolia*). The sports building (B2) is brick and wooden clad with metal soffits and a metal curved ridged roof. The north facing building (B3) is brick built with sections of large grey tiles on the northern elevation and a flat roof, there are gaps where B3 adjoins to B2 and also gaps around the bay windows, and gaps where the grey tiles meet the barge board on B3. The eastern most building (B4) is brick built with a pitched clay tile roof, there are gaps where the hinge tiles meet the roof tiles and missing mortar on some of the ridge tiles. There is also a gap under the tiles at the apex of the building. In the western courtyard there is a small bell tower building (B5). The building is

brick with a clay tile pitched roof. There is missing mortar under the ridge tiles although this does not form a feature. There is also a small brick shed (B6) in the playground with a metal felted corrugated roof. There are gaps under the corrugation and lifted felt. There were signs of nesting birds on the buildings and multiple potential features for roosting bats. Building B7 is a red brick residential house with a pitched clay tile roof belonging to the grounds keeper. There were lifted tiles around the chimney and multiple potential roosting features on the roof.

5.2.7 J4 Bare Ground / Tarmac

A large section of the site has a series of coloured tarmac-covered play areas, tennis courts and basketball courts. These are set at different levels and concrete seating areas have been formed and divided by wire panelled fences. All of these areas are of negligible ecological value.

5.2.8 Adjacent Habitat

The site is bordered to three sides by the open space, mature trees and of the southern part of Hampstead Heath, the southern part has an open boundary with the adjoining Parliament Hill School.

6.0 Results: Field Survey - Fauna

6.1 Bats

There are 103 desk based records of bats within 1km of site. The development site itself is considered to be of moderate value for foraging and of moderate bat roost potential. This is based upon information gained during the survey effort that would suggest that the main building along the frontage of the site contains a number of features that bats could use to roost. There are also a few features on the more modern buildings that bats could use to roost, although no evidence of bats was found. The sites natural features could be used for foraging and commuting and there were several trees on site which could have potential roosting features for bats.

The initial bat survey effort undertaken in September 2014 found frequent foraging by Common Pipistrelle (*Pipistrellus pipistrellus*), occasional Soprano Pipistrelle (*Pipistrellus pygmaeus*) bats, however no roost sites were identified within the buildings or trees on site.

6.2 Water vole (*Arvicola amphibious)* and Otter *(Lutra lutra)*

There are no records of Water vole within 1km of the site and no records of Otter. In addition, there was no habitat on the site considered suitable to sustain the species and no evidence of their presence was observed. No further survey effort is recommended.

6.3 Great Crested Newt (*Triturus cristatus)*

There were no records of Great Crested Newts within the 1km search area. The site is generally considered to be of low value for the species and Using Ordnance Survey Explorer Map 173 London North, A series of ponds are located to the north of the site within 500m**,** however these are located within the Hampstead Heath complex and there is significantly higher value habitat between these ponds and the site, which would offer both breeding and terrestrial habitat that is not present on the site. Therefore, the sites habitat, which consists of mainly hardstanding and buildings is not considered suitable for the species and no further survey effort is required.

6.4 Birds

No specially protected Schedule 1 birds or potential breeding habitat were recorded during the Phase 1 Habitat Survey and no further survey effort is recommended. The site does contain a number of mature trees along the frontage of the main building and around the sites boundaries, the buildings are also suitable for nesting birds. Therefore, if any development requires the removal of these areas or works to the shrubs or trees or demolition of the buildings this should be carried out outside the bird breeding season, (March to September inclusive). If works are to be undertaken within these timings then the area should first be inspected by a suitably qualified ecologist immediately prior to any works being undertaken. If nests are found to be present then these areas are to be left until the eggs have hatched and the young have fledged (normally 4-6 weeks dependant on species). This will ensure that there is no major impact on breeding birds which may occupy any of these features.

6.5 Reptiles

From the desk based study no reptile records were noted within the 1km search radius. The development area is considered to be of low suitability for reptiles due to the site consisting of mainly hardstanding and therefore no further survey effort is recommended.

6.6 Badger (*Meles meles)*

Biological records indicate no observations of badgers within 1km of the site; No evidence of use of the site by badgers was recorded during the field survey and no further survey effort is required.

6.7 Other fauna

No other species are thought to occur on site.

6.8 Connectivity to statutory and non-statutory designated sites

The proposed development does not pose any threat to connectivity of statutory and non-statutory sites in the region.

7.0 Ecological Value and Impact Assessment

The following section puts the value of the surveyed site into context and uses DMRB (DoT, 2008) criteria for assessing value and the potential magnitude of impact from the development proposals.

7.1 Ecological value

No UK BAP species were recorded during the Phase 1 Habitat Survey. Site habitats are species moderate in the wider ecological landscape. The site being affected by the development therefore is considered low in its potential to support protected, UK and local BAP and red data species and sensitive development may improve the site from this perspective.

Using DMRB criteria (Appendix II) the site is considered of moderate ecological value.

7.2 Impact Assessment

The proposed development will have a minor magnitude of impact upon the site and its ecological features.

Therefore a minor impact upon a site of moderate value constitutes an ecological impact of slight magnitude.

Considering the size of the site and the nature of the habitats involved the proposed development is considered to pose a slight impact on local biodiversity and this should be offset by biodiversity enhancement associated with landscaping and inclusion of bat, insect and bird boxes within the building structure.

8.0 Recommendations & Conclusion

The Phase One Habitat Survey was undertaken by two experienced ecologists and the following recommendations are made:-

8.2 Any site clearance should take place outside the bird nesting season (October - February); if this is not possible then the site should be surveyed by a trained ecologist prior to works commencing. It should be noted that if nesting birds are found then work cannot commence until the young have fledged.

8.3 Bat, insect and bird boxes should be included within the new development design and wherever possible wild flower seed mix (suitably sourced for the area) and native trees and shrubs used to landscape areas surrounding the new buildings. Assistance should be engaged from an ecologist in the design and location of bird/bat boxes.

8.4 If development plans change and buildings are to be demolished or altered in any way other than the current plans a full PRA assessment and bat surveys may be necessary.

8.5 No further survey effort is considered necessary unless changes are made to the development area to be affected over and above those indicated within this report.

9.0 References

British Standards Institute (BSI) (2013). BS42020 - Biodiversity Code of Practice for Planning and Development. BSI, London.

Cheffings, C. and Farrell, L. (Editors) (2005). *The Vascular Plant Red Data List for Great Britain*. JNCC, Peterborough.

Chartered Institute of Ecology and Environmental Management (CIEEM) (2013). *Guidelines for Preliminary Ecological Appraisal*. Available at: http://www.cieem.net/data/files/Resource_Library/Technical_Guidance_Series/GPEA/GPEA_April_2013.pdf.

Department for Transport. (2008). *The Design Manual for Roads and Bridges. Vol 11 Environmental Assessment*. HMSO, London.

English Nature. (2001). *Great crested newt – Mitigation Guidelines.* English Nature, Peterborough.

Gregory R D, Wilkinson N I, Noble D G, Robinson J A, Brown A F, Hughes J, Proctor D A, Gibbons D W and Galbraith C A. (2002) *The population status of birds in the United Kingdom, Channel Islands and the Isle of Man: an analysis of conversation concern 2002-2007*. British Birds *95:410-450*

Collins, J. (ed) (2016); Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn); The Bat Conservation Trust, London; ISBN-13 987-1-872745-96-1

Institute of Ecology and Environmental Management (IEEM) (2006). *Guidelines for Ecological Impact Assessment in the United Kingdom*. Available at: http://www.cieem.net/data/files/Resource_Library/Technical_Guidance_Series/EcIA_Guidelines/TGSEcIA-EcIA_Guidelines-Terestrial_Freshwater_Coastal.pdf.

Joint Nature Conservation Committee (JNCC) (2010). *Handbook for Phase I Habitat Survey - A Technique for Environmental Audit*. JNCC: Peterborough.

Natural England (2014). *Habitats and Species of Principal Importance in England*. Available at: http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/habsandspeciesimportance.aspx

Stace, C. (2010). The New Flora of the British Isles (3rd Edition). Cambridge University Press, Cambridge.

Websites for access to Full Legislation and Policy Text:

Birds Directive:
http://ec.europa.eu/environment/nature/legislation/birdsdirective/index_en.htm

Conservation of Habitats and Species Regulations 2010 (as amended):
http://www.legislation.gov.uk/uksi/2012/1927/contents/made

Countryside and Rights of Way Act 2000:
http://www.legislation.gov.uk/ukpga/2000/37/contents

Habitats Directive:
http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm

National Planning Policy Framework:
http://www.communities.gov.uk/documents/planningandbuilding/pdf/2116950.pdf

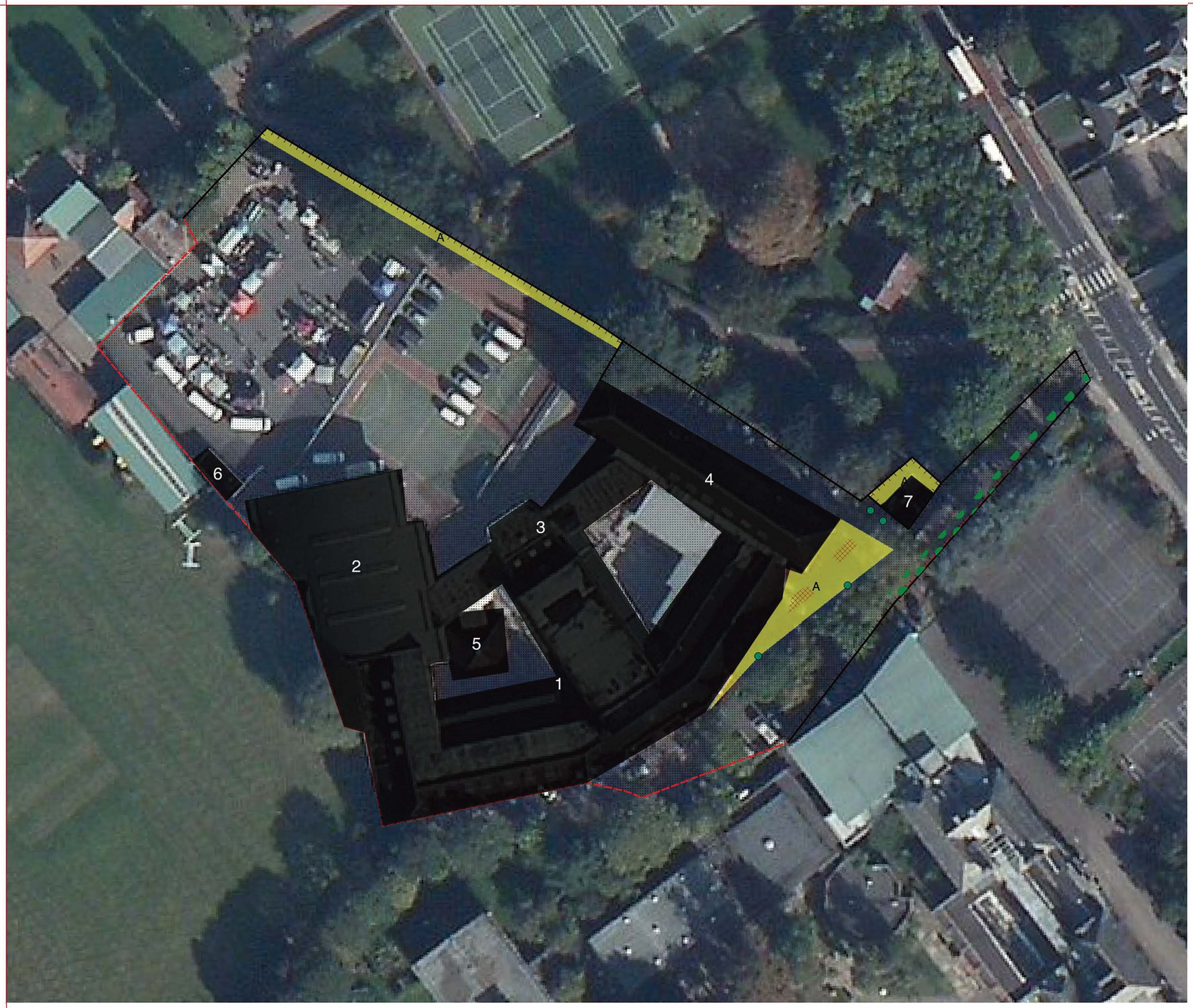
Natural Environment and Rural Communities Act 2006:
http://www.legislation.gov.uk/ukpga/2006/16/contents

UK Post-2010 Biodiversity Framework:
http://jncc.defra.gov.uk/page-6189.

Wildlife and Countryside Act 1981 (as amended):
http://www.legislation.gov.uk/ukpga/1981/69

Appendix I

Phase 1 Habitat Map



Phase 1 Habitat Map

- Broadleaved scattered trees
- A — Amenity grassland
- Introduced shrub
- Fence
- Buildings
- Bare ground
- William Ellis Site Boundary

Project: **Wiliam Ellis School**

I

Drawing Title: **Preliminary Ecological Appraisal**

0 10 20 30 m

SCALE (@A3): *1:656* *Drawn by JG* *Date: 15 September 2017*

Appendix II

DMRB Assessment Criteria

Table 1. Environmental Value (Sensitivity) and Typical Descriptors

Value (sensitivity)	Typical descriptors
Very High	• Very high importance and rarity, international scale and very limited potential for substitution.
High	• High importance and rarity, national scale, and limited potential for substitution.
Medium	• High or medium importance and rarity, regional scale, limited potential for substitution.
Low (or Lower)	• Low or medium importance and rarity, local scale.
Negligible	• Very low importance and rarity, local scale.

Table 2. Magnitude of Impact and Typical Descriptors

Magnitude of impact	Typical criteria descriptors
Major	• Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (Adverse).
	• Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality (Beneficial).
Moderate	• Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements (Adverse).
	• Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial).
Minor	• Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (Adverse).
	• Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (Beneficial).
Negligible	• Very minor loss or detrimental alteration to one or more characteristics, features or elements (Adverse).
	• Very minor benefit to or positive addition of one or more characteristics, features or elements (Beneficial).
No change	• No loss or alteration of characteristics, features or elements; no observable impact in either direction.

Table 3. Arriving at Significance of Effect Categories

		MAGNITUDE OF IMPACT (DEGREE OF CHANGE)				
		No change	**Negligible**	**Minor**	**Moderate**	**Major**
ENVIRONMENTAL VALUE (SENSITIVITY)	Very High	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large
	High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
	Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large
	Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate
	Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight

Appendix III

Species List

Common Name	Latin
London Plane Lime Holm Oak English Oak Cedar Cherry Holly Red Oak Ash	*Platanus x hispanica* *Tilia cordata* *Quercus Ilex* *Quercus robur* *Cedurus atlantica* *Prunus spp* *Ilex sp.* *Quercus rubra* *Fraxinus excelsoir*
Perennial Rye Grass Red fescue Creeping Bent Yarrow Daisy Dandelion Bramble Chickweed Speedwell Nettle Ground Ivy Greater Plantain White dead nettle Wood avens Docks Common Knotgrass Mugwort Ladies Bedstraw	*Lolium perenne* *Festuca rubra* *Agrostis stolonifera* *Achillea millefolium* *Bellis perennis* *Taraxacum officinale* *Rubus spp* *Stellaria media* *Veronica arvensis* *Urtica dioica* *Glechoma hederacea* *Plantago major* *Lamium album* *Geum urbanum* *Rumex sp.* *Polygonum aviculare* *Artemisia vulgaris* *Galium verum*
Mahonia Variegated Laurel Hebe Spirea Lilac Camellia Buddleja Rose Yucca Choisya Pyracantha Phormium Fuscia	*Mahonia aquifolium* *Aucuba japonica* *Hebe sp.* *Spirea sp.* *Syringa vulgaris* *Camellia sp.* *Buddeliea sp.* *Rosa sp.* *Yucca sp.*

Appendix IV

Background Data Search

You selected the location: Centroid Grid Ref: TQ282860
The following features have been found in your search area:

Local Nature Reserves (England) - points

Reference
1421538
Name
BELSIZE WOOD
Hectares
0.27
Hyperlink
http://www.lnr.naturalengland.org.uk/special/lnr/lnr_details.asp?themeid=1421538

Local Nature Reserves (England)

Reference
1421538
Name
BELSIZE WOOD
Hectares
0.27
Hyperlink
http://www.lnr.naturalengland.org.uk/special/lnr/lnr_details.asp?themeid=1421538
Reference
1009064
Name
PARKLAND WALK
Hectares
14.31
Hyperlink
http://www.lnr.naturalengland.org.uk/special/lnr/lnr_details.asp?themeid=1009064

Sites of Special Scientific Interest Units (England) - points

Name
HAMPSTEAD HEATH WOODS
Reference
1064031
Site Unit Condition
UNFAVOURABLE DECLINING
Citation
1004944
Hectares
1.56
Hyperlink
http://designatedsites.naturalengland.org.uk/UnitDetail.aspx?UnitId=1004944
Name
HAMPSTEAD HEATH WOODS
Reference
1064032
Site Unit Condition
UNFAVOURABLE RECOVERING
Citation
1004945
Hectares
14.61
Hyperlink
http://designatedsites.naturalengland.org.uk/UnitDetail.aspx?UnitId=1004945

Sites of Special Scientific Interest Units (England)

Name
HAMPSTEAD HEATH WOODS
Reference
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Site Unit Condition
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http://designatedsites.naturalengland.org.uk/UnitDetail.aspx?UnitId=1004944
Name
HAMPSTEAD HEATH WOODS
Reference
1064032
Site Unit Condition
UNFAVOURABLE RECOVERING
Citation
1004945
Hectares
14.61
Hyperlink
http://designatedsites.naturalengland.org.uk/UnitDetail.aspx?UnitId=1004945

Areas of Outstanding Natural Beauty (England)
No Features found

Limestone Pavement Orders (England)
No Features found

Moorland Line (England)
No Features found

National Nature Reserves (England) - points
No Features found

National Nature Reserves (England)
No Features found

National Parks (England)
No Features found

National Parks: Lake District and Yorkshire Dales Variation Orders 2012 - subject to confirmation (England)
No Features found

Ramsar Sites (England) - points
No Features found

Ramsar Sites (England)
No Features found

Special Areas of Conservation (England) - points
No Features found

Special Areas of Conservation (England)
No Features found

Special Protection Areas (England) - points
No Features found

Special Protection Areas (England)
No Features found

Biosphere Reserves (England) - points
No Features found

Biosphere Reserves (England)
No Features found

Appendix V

Photographs

Plate 1: Frontage of main building

Plate 2: Rear Play area and extension location

Plate 3: Hard standing courtyard

Plate 4: Front shrub bed adjoining main entrance

Plate 5: Main entrance

Plate 6: Scattered trees and shrub planting along the main drive

Appendix VI

Ecology Survey Calendar

SURVEY ACTIVITY	MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
BACKGROUND DATA SEARCH													
DESK STUDY													
BOTANICAL – INITIAL SURVEYS													
EXTENDED PHASE 1 HABITAT SURVEY													
BOTANICAL PHASE 2 SURVEYS													
NATIONAL VEGETATION CLASSIFICATION SURVEY – WOODLAND													
NATIONAL VEGETATION CLASSIFICATION SURVEY – GRASSLAND													
HEDGEROW SURVEY													
RIVER CORRIDOR SURVEY													
SPECIES - INITIAL SURVEYS													
INITIAL SPECIES WALKOVER SURVEY													
SPECIES PHASE 2 SURVEYS													
BADGER-SETT/ ACTIVITY SURVEY													
BAT (BAT ROOST POTENTIAL BRP)													
BAT DUSK EMERGENCE/ DAWN RE-ENTRY/ ACTIVITY SURVEYS													
BAT HIBERNATION SURVEYS													
BIRDS (BREEDING)													
BIRDS (WINTERING)													
COMMON DOREMOUSE (NUT SEARCHES)													
COMMON DOREMOUSE (NEST TUBE/ BOX SURVEYS)													
GREAT CRESTED NEWT SURVEY													
GREAT CRESTED NEWT (HABITAT SUITABILITY INDEX HSI)													
INVERTEBRATES (TERRESTRIAL)													
INVERTEBRATES (AQUATIC)													
OTTER (FIELD SIGN SEARCHES)													
REPTILE SURVEY AND TRANSLOCATION													
WHITE CLAWED CRAYFISH													
WATER VOLE (FIELD SIGN SEARCHES)													

OPTIMAL PERIOD FOR SURVEY WORK

SUB OPTIMAL PERIOD FOR SURVEY WORK

UNSUITABLE NO SURVEY

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MITIGATION ACTIVITY	MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
BACKGROUND DATA SEARCH													
HABITATS / VEGETATION TRANSLOCATION		Planting and Translocation		No Mitigation for the Majority of Species							Planting and Translocation		
BADGER SETT EXCLUSION (ONLY UNDER EPS LICENCE)		Construction of Artificial Setts only						Exclusion from Setts and Destructive Search					
BAT EXCLUSION / WORKS AFFECTING BAT ROOSTS (ONLY UNDER EPS LICENCE)		Works on Maternity and Summer Roosts		Works on Maternity and Hibernation Roosts		Works on Hibernation Roosts Only				Works on Maternity and Hibernation Roosts		Works on Maternity and Summer Roosts	
BREEDING BIRDS CLEARANCE WORKS		Clearance Works		Clearance Works should be Avoided (nesting season) but may be possible under Ecological Supervision						Clearance Works			
COMMON DOREMOUSE DISPLACEMENT (ONLY UNDER EPS LICENCE)		No Clearance Works as Hibernating			Small Scale Clearance Possible		Avoid Clearance Works (breeding season)			Clearance, Translocation and Release		No Clearance as Hibernating	
GREAT CRESTED NEWT TRANSLOCATION (ONLY UNDER EPS LICENCE)		No Trapping as Hibernating		Trapping and Translocation in Ponds and on Land				Trapping and Translocation on Land only				No Trapping as Hibernating	
INVERTEBRATES (TERRESTRIAL)		Due to the Large Diversity of Invertebrates and their Varied Habitats, the Timing of Mitigation Works depends on the Species and Nature of Works being Undertaken											
OTTER (FIELD SIGN SEARCHES) (ONLY UNDER EPS LICENCE)		Mitigation can Potentially be Conducted in any Month, but is Likely to be Restricted where Otters are Breeding											
REPTILE TRANSLOCATION		Scrub Clearance only		Capture/Translocation and Scrub Clearance				Scrub Clearance only		Capture/ Translocation and Scrub Clearance		Scrub Clearance only	
WHITE CLAWED CRAYFISH (ONLY UNDER EPS LICENCE)		Avoid Disturbance (low activity)				Avoid Disturbance (breeding season)			Exclusion Works			Avoid Disturbance	
WATER VOLE DISPLACEMENT / TRANSLOCATION (ONLY UNDER LICENCE)		Avoid Works in Habitat		Trapping and Exclusion		Avoid Works (breeding season)			Trapping and Exclusion		Avoid works in Habitat		

OPTIMAL PERIOD FOR MITIGATION WORKS

SOME MITIGATION WORKS POSSIBLE

MITIGATION WORKS NOT POSSIBLE

N.B. MANY ECOLOGICAL SURVEYS ARE WEATHER DEPENDENT AND ADVERSE WEATHER COULD DELAY THE SURVEY EFFORT/ SURVEY / MITIGATION TIMINGS

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Unit 4, Linnet Court, Cawledge Business Park, Alnwick, NE66 2GD

Appendix VI

Previous Ecology Reports

Bat Presence / Absence Survey

Buildings and Trees

At

William Ellis School, Highgate Road, London, NW5 1RN

Address	William Ellis School, Highgate Road, London, NW5 1RN		
Client	Astudio Ltd	**Ecologist**	Phillip May
Our Ref	E0508141317	**Director**	Robert Sharpe
Report Date	1 October 2014	**Quality Checked**	Paul Hiscocks
Scope of Report	Bat Absence / Presence Survey – Buildings and Trees		

t 0330 380 1036 f 0330 3801038
planning@innovation-environmental.co.uk
www.innovationpropertyuk.com/environmental

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Version	Date	Author	Checked	Approved
1	01/10/2014	P May 	V Telford 	P Hiscocks 

The opinions and information contained within this report were gathered using due skill, care and diligence. The report complies with the Biodiversity Code of Practice for Planning and Development (BS42020:2013) and has been prepared and provided in accordance with the Chartered Institute of Ecology and Environmental Management's (CIEEM) Code of Professional Conduct. We confirm that the opinions expressed are our true and professional bona fide opinions.

This report has been prepared for the exclusive use of the commissioning party and unless otherwise agreed in writing by Environmental Services, no other party may use, make use of or rely on the contents of the report. No liability is accepted by Environmental Services for any use of this report, other than for the purposes for which it was originally prepared and provided.

Executive Summary

A thorough survey, both external and using ultrasonic detection equipment with data analysis, was made of the buildings scheduled for alteration by experienced ecologists. The proposals include the addition of a seating area and surface alteration of the frontage of the site, and the enclosing of a central courtyard.

The external building inspection identified a number of possible ingress/ egress points for bats, these observations were used to guide the ultrasonic surveys at dawn and dusk.

A single dusk emergence and dawn re-entry survey was undertaken. The survey results concluded bat commuting and infrequent foraging activity across the frontage of the school and along the Eastern boundary. In addition to this the South Western corner of the site recorded frequent foraging by Common Pipistrelle (*Pipistrellus pipistrellus*) and occasional Soprano Pipistrelle (*Pipistrellus pygmaeus*) bats.

At no time during the surveys were bats observed entering or leaving any of the buildings or trees on site, all recordings and subsequent screenshots (Appendix 3) were taken from the Anabat placed on site.

Based on the results of the surveys the following recommendations have been made:

1. Bat and bird boxes are required within the new development design wherever possible, located on or integrated into the buildings. In this instance, 4 x Bat boxes will be included within the new development design on buildings and wherever possible, on retained trees. Boxes must be situated between 4m and 6m above ground level, with entrances facing North, South-east and South-west to allow for use all year round. Assistance will be engaged from an ecologist in the design and location of bird / bat boxes. A suitable planting scheme is also required, including native and species beneficial to wildlife with native trees and shrubs used to landscape areas surrounding all buildings.

2. A suitable lighting scheme will be incorporated to prevent light pollution into the garden areas after dark with suitable PIR timers only activated by large moving objects (NOT BATS).

Contents

1.0 Introduction

1.1 Background

This report details the results of a Bat Presence/ Absence Survey of all buildings and trees at William Ellis School, Highgate Road, London.

The survey was undertaken to determine whether bats were using these buildings and trees as roosts and was carried out on behalf of Astudio Ltd.

The site is centered at Ordnance Survey Grid Reference TQ 282 860.

OS. Licence No.100043218

1.2 Site Description

The site consists of a tree lined entrance drive which leads to a school complex with outside play areas and enclosed landscaped courtyards. The buildings on the site are of differing ages and heights with multi storey additions. There are a number of mature trees along the frontage of the site and overhang the site from the adjoining open space. The site is located to the south and east of a large urban park and with a large residential complex to the east and another school to the south. The main building has a large brick and tile facade with large areas of flat roofs behind. The building has been added to over time with a series of new and infill buildings towards the western boundary of the site. The site adjoins another school to the south with a residential area opposite to the east and the large area of open space of Hampstead Heath to the north and west of the site.

1.3 Scope of Survey and Limitations

We have been advised that the buildings on site and the surrounding hard landscaping will be altered and additions added to the school to add further facilities to the school. The scope of the report is to assess the presence/ absence of bats within these parts of the buildings and make recommendations based upon the findings of the survey. It was not possible to access some loft areas as these have been sealed and the majority of the roof area is flat with only external access. In addition, any trees deemed suitable for roosting bats were given a visual assessment from ground level.

Bats are highly mobile in their nature and may only use buildings at certain times of the year that favour a particular part of their roosting, maternity and hibernating requirements.

2.0 Legislation

2.1 Planning and Biodiversity

Local Authorities have a requirement to consider biodiversity under the following European legislation:

- Natural Environment and Rural Communities (NERC) Act (2006);
- The Habitats Directive (EC directive 92/43/EEC);
- Environmental Impact Assessment (85/337/EEC as amended by directive 09/31/EC);
- Strategic Environmental Assessment (2001/42/EEC);
- The Environment Act (1995).

Section 40 of the Natural Environment and Rural Communities Act 2006 (the NERC Act) places a legal duty on public bodies, including planning authorities, to 'have regard' to the conservation of biodiversity when carrying out their normal functions, which includes consideration of planning applications.

In compliance with Section 41 of the NERC Act, the Secretary of State has published a list of species and habitats considered to be of principal importance for conserving biodiversity in England under the UK Post-2010 Biodiversity Framework. This is known as the England Biodiversity Priority (EBP) list, previously referred to as Local Biodiversity Action Plan (LBAP), of which there are 56 habitats and 943 species (Natural England, 2014). Seven bat species are EBP species; these are Barbastelle, Bechstein's, Brown Long-eared, Greater Horseshoe, Lesser Horseshoe, Noctule and Soprano Pipistrelle. The EBP list is used to guide planning authorities in implementing their duty under the NERC Act.

Local Authorities must also have regard for the following national planning policies:

- National Planning Policy Framework (NPPF) (DCLG, 2012);
- ODPM Circular 06/2005 (Defra Circular 01/2005);
- ODPM (March 2006) Planning for Biodiversity and Geological Conservation.

In addition, all bat species are currently listed on Greater London BAP.

2.2 Bat Legislation

All species of bat and their breeding sites or resting places (roosts) are protected under Schedule 2 of The Conservation of Habitats and Species Regulations 2010 and Section 9 of the Wildlife and Countryside Act 1981 (as amended). It is an offence for anyone intentionally to kill, injure or handle a bat, to possess a bat (whether live or dead), disturb a roosting bat, or sell or offer a bat for sale without a licence. It is also an offence to damage, destroy or obstruct access to any place used by bats for shelter, whether they are present or not (*Natural England, 2014*).

A roost is protected whether or not bats are present and any activity or works affecting a roost, even when bats are absent, is likely to be subject to the relevant licence procedure with Natural England.

This legislation makes it is an offence either deliberately or recklessly to:

- possess or control any live or dead specimens;
- destroy, damage or obstruct access to any bat roost, or place used for shelter, protection or breeding;
- disturb a bat using such place ('disturbing' a bat can include simply entering its roost and as such the appropriate licence should be held prior to doing so).

Such offences are punishable with a maximum fine is £5,000 per incident or per bat, up to six months in prison, and forfeiture of items used to commit the offence, e.g. vehicles, plant, machinery.

3.0 Survey Methodology

3.1 Desk Study

A desk study was undertaken to locate all known bat records within a 1km radius of the site using data requested from the Greenspace Information for Greater London (GiGL) and the London Bat Group.

3.2 Weather Conditions and Timing

To comply with national Best Practice Guidelines (Hundt 2012) bat activity surveys should be carried out in dry weather as bats may not leave their roost site if it is raining heavily, making any survey results suspect. Bat activity surveys should be carried out between May and September and winter hibernation surveys between October and April. The months can vary a little, depending on seasonal and geographic variations.

3.3 Personnel

During the survey effort a total of 4 surveyors were used; all surveyors have been appropriately trained and have had at least three full seasons bat surveying experience.

Personnel used on all surveys are as follows:

Paul Hiscocks (Senior Ecologist) (NE Bat Licence CLS001868): Over 10 years' experience with bats, extensive experience in surveying all types of habitat for bats and mitigation including numerous mitigation licences held for exclusion and roost destruction.

Phillip May (Ecologist): Over 20 years' experience as an ecologist and over 15 years work with various bat species and studies into migration over water.

Jonathan Jones (Assistant Ecologist): over 5 years' experience in bat surveying using both heterodyne and Anabat survey equipment.

Victoria Telford (Graduate Ecologist): 4 years' experience in bat surveying using both heterodyne and Anabat survey equipment.

3.4 Internal/ External Building Inspections

A walkover survey of the site and detailed visual inspection of the exterior and interior of the buildings was undertaken to evaluate bat roost potential of the buildings and to locate suitable ingress / egress points that bats could use to fly into the buildings and use areas within to roost. The external inspections were carried out from ground level using a Clulite CB2 1,000,000 candle power torch, Bushnell Nature view Close Focusing 10x42 Roof Prism Binoculars, and a Sony Cyber-Shot 14.1 Mega Pixel camera and where appropriate a Rigid Seesnake Micro Inspection Camera Mk II CA-100 was used to examine inaccessible cavities and a Flir i5 Lightweight Thermal Imaging Camera to check for heat sources (roosting bats).

The internal inspections were carried out using a Clulite CB2 1,000,000 candle power torch, Rigid Seesnake Micro Inspection Camera Mk II CA-100 where necessary, to examine inaccessible cavities, a

Sony Cyber-Shot 14.1 Mega Pixel camera for photographs and a Flir i5 Lightweight Thermal Imaging Camera to check for heat sources (Roosting Bats). The following features were the main focal points of the surveys:

- Bats and or bat corpses;
- Droppings, staining and remains of feeding debris;
- Externally: access points such as displaced/missing tiles and ridge tiles, holes in walls, windows or woodwork; and
- Internally: potential roosting points such as cracks and crevices in the structural layout.

3.5 Tree Assessment

All trees deemed large enough to support roosting bats (>300 mm ABH) were observed from ground level to assess their potential to support roosting bats. This involved:

- Using close-focussing binoculars, Clulite (1,000,000 cp) and a Seesnake Endoscope with recorder where necessary, to inspect the tree from the ground to the canopy, and inspecting all aspects of the tree where possible;
- looking for features indicative of bat roosts including, natural holes, Woodpecker holes, cracks/splits in major limbs, loose bark, hollows/cavities, dense epicormic growth and bird and bat boxes if present; and
- listening for bats making audible social calls from roosts in trees.

3.6 Dusk Surveys (Emergence Survey)

The object of dusk surveys was to detect active bat use of the site and possible exit from buildings at points identified during the daytime inspection; this involved:-

- being at the site 15 minutes before sunset and approximately 2 hours after;
- using heterodyne, frequency division and time expansion detectors; additionally, recordings were made using four passive Anabat SD2 detectors left on continuous recording; and
- standing at different vantage points around the buildings (no more than 50m separation), using the bat detectors and attempting to see bats emerging from buildings.

3.7 Dawn Surveys (Re-Entry Survey)

The object of dawn surveys was to detect bats returning to possible roost sites from their night of foraging. Bats tend to swarm around their roost entrance for a period of time before going into the roost, which helps in identifying roost locations; this involved:-

- being at the site 1 ½ hours before sunrise;
- use of bat detectors as (3.4 above); and
- observation for swarming bats around the buildings.

3.8 Site Status Assessment

Based on the internal / external inspection and emergence survey results, structures with evidence of bats have been assessed to determine which of the following categories they fall into, if any (Hundt, 2012):

- **Night roost (March-November)** – used by bats as roosts other than traditional day roosts to rest in during the night. May be used by a single individual on occasion or regularly by an entire colony;
- **Day roost (March-November)** – used by bats during the day to rest in, often by males. Bats may regularly use a number of days roosts or the same site for several weeks;
- **Transitional roost (April-September/October)** – used by a few individuals or occasionally small groups of bats on waking from hibernation or in the period prior to hibernation;
- **Feeding roost (May-November)** – can be occupied by a single bat or a few individuals to an entire colony to feed, shelter from the weather or to rest temporarily;
- **Maternity roost (May-August)** – used by breeding females, where babies are born and raised to independence. Adult males rarely found here;
- **Satellite roost (May-August)** – used by a few individuals to small groups of breeding females as alternative roost sites in close proximity to maternity roosts;
- **Swarming sites (August-November)** – where large numbers of bats from several species gather, generally around caves and mines;
- **Mating roost (September-November)** – established by males of some species to display/call to females to mate;
- **Hibernation roost (October-March)** - where bats may be found during the winter. They vary greatly in terms of the number of individuals and diversity of species using them.

The roost assessment criteria in Appendix 4 were then used to ascertain the importance of any roosts present.

4.0 Results: Desk-based Assessment

Bat records within a 1km radius of the application site were obtained from the Greenspace Information for Greater London (GiGL) and the London Bat Group.

Species	Scientific Name	Grid Ref (SD)	Source	Date
Common Pipistrelle	*Pipistrellus pipistrellus*	TQ287 867	LBG	2010
		TQ276 857	LBG	2010
		16 records, closest 162m SW	GiGL	1993-2006
Pipistrelle	*Pipistrellus sp.*	TQ274 859	LBG	2006
		TQ285 868	LBG	2005
		TQ274 861	LBG	2000
		26 records, closest 162 SW	GiGL	1985-2005
Soprano Pipistrelle	*Pipistrellus pygmeaus*	6 records, closest 280m SE	GiGL	1996-2002
Bat species	*Vespertilionidae*	835m SE	GiGL	2004
		864m NW	GiGL	1985
Mouse-eared Bat	*Myotis sp.*	977m W x 4	GiGL	2005
Daubentons Bat	*Myotis daubentonii*	20 records, closest 368m NW	GiGL	1993-2005
Natterers Bat	*Myotis Nattereri*	864m	GiGL	2001
		942m NW x 2	GiGL	1996-2001
Nyctalus	*Nyctalus sp.*	280m SE	GiGL	2002
Lesser Noctule	*Nyctalus leisleri*	280m SE	GiGL	2002
Noctule	*Nyctalus noctula*	19 records, closest 368m NW	GiGL	1985-2009

Table 1: Bat Species Desktop Records

4.1 Review of Desk Based Assessment Data.

The above desk based assessment shows the closest record of bat activity within 1km of the site was in 2006 for Common Pipistrelle bat record approximately 160m SSW of the site, this is within the Hampstead heath park. The newest records of 2010 (TQ287 867) and (TQ276 857), are to the north of the site some 400m to the north from an area of open space and to the south 300m within Hampstead heath.

Consequently viewing aerial photography of the area the surround area of the site has a large area of open space and a mixture of residential tower blocks and a local hospital, as the site contains significant number of trees the site has a potential for supporting foraging and providing a suitable commuting route.

5.0 Results: Survey

5.1 Weather Conditions

Survey times, temperatures and weather conditions are detailed below. At all times, weather conditions were conducive to bat survey work.

Date	09/09/2014	Sunset/ rise Time	Sunrise 19:29	Survey Type	Dawn Re-entry	
				From/ To	19:15	21:15

	Temperature ºC	Humidity %	Cloud Cover / Oktas	Wind Bft Scale	Precipitation Y/N
Start	18.4ºC	58%	2	0	N
End	17.5ºC	65%	3	1(2)	N

Date	17/09/2014	Sunset/ rise Time	Sunrise 06:38	Survey Type	Dawn Re-entry	
				From/ To	05:00	06:40

	Temperature ºC	Humidity %	Cloud Cover / Oktas	Wind Bft Scale	Precipitation Y/N
Start	16.7ºC	85%	8	0 (1)	N
End	16.5ºC	85%	8	0(1)	N

5.2 Internal/ External Inspection of the Buildings

External inspection of the building was undertaken to determine their Bat Roost Potential (BRP); these revealed a number of possible ingress/ egress points for bats. The results of the Internal Bat Roost Potential Assessment of the building are included in Appendix 2, together with the Bat Roost Potential rating for the building.

The results of the external inspection were used to help focus survey effort during the dusk emergence/ dawn re-entry surveys.

5.3 Tree Assessment

There are a number of mature trees on the site, confined to the boundaries of the site. The boundary trees are in the most part to be retained and incorporated into the proposed development with only minor works scheduled to take place. However, all of the mature trees on site were assessed for their bat roost potential from ground level prior to any bat survey work taking place and none of the boundary trees were identified to have suitable features associated with roosting bats. At no time were bats observed entering or leaving the tree.

5.4 Dusk Emergence & Dawn Re-Entry Surveys

Date	From	To	Temp	Weather	Species Recorded	Comment
09/09/14	19:15	21:15	18°C Avg	30% cloud, still, dry	(1), (2), (3)	Intermittent activity from 19:51 around the eastern boundary and along the frontage and western boundary. From 19:52 until the end of the survey constant foraging was recorded in the western boundary. A single common pipistrelle commuted across the centre of the building at 20:35. A Noctule bat was recorded commuting along the tree line at 20:13. Intermediate foraging was recorded along the eastern boundary by common pipistrelle bats.
17/09/14	05:00	06:40	16.5°C Avg	100% cloud, dry, still	(1)	Foraging was recorded on the western boundary with the open space from 05:07until 05:58 by two common pipistrelle bats. Soprano pipistrelle bats were heard occasionally at 05:43 and 05:48. The last common pipistrelle bat was seen at 06:22 heading south west from the site.

Table 2: Bat Survey Summary of Data *(1) Common Pipistrelle bat (*Pipistrellus pipistrellus*)
(2) Soprano Pipistrelle bat (*Pipistrellus pygmaeus*)
(3) Noctule bat (*Nyctalus noctula*)

5.5 Data Analysis

Ultrasonic survey data was collected throughout the survey period using 4 individually placed Anabat SD2 recording equipment.

One was placed along the western boundary, one at the rear of the building within the play grounds and the third at the frontage of the main building with the fourth within the central courtyard; all recordings were analysed through Analook software.

Species positively identified from a combination of visual sighting, flight patterns and data analysis are recorded within Table 2 above.

6.0 Analysis of Results

During the external survey undertaken on 9th September 2014, a limited number of potential ingress/ egress points were identified within the building. Access was also gained internally, which identified that the majority of the building had a tiled façade along the main frontage and flat roofs behind. Occasional areas of large slate tiles were inspected at the rear of the main building that fronts the playground. No current or historic evidence of roosting bats was found within the building. Additionally, none of the trees on the site contained features suitable to support roosting bats.

A single dawn re-entry and dusk emergence survey was undertaken to ascertain whether bats were using the buildings as roosts in addition to monitoring foraging/ commuting activity across the site. No bats were observed entering/ exiting the building on the site. Constant foraging by a small number of Common Pipistrelle bats was observed along the western corner of the site adjoining the open space. Occasional foraging and commuting activity by Common and Soprano Pipistrelle bats was recorded and observed along the tree line along the frontage and the adjoin trees on the Eastern boundary. Only single passes of Common and Soprano Pipsitrelle bats was noted within the centre of the site, including a pass by a Noctule (*Nyctalus noctula*) bat along the frontage of the building, adjacent to the mature trees.

Impact Assessment

The development to take place on this site is expected to have a slight negative impact on the commuting activities present in the form of the removal of a few trees along the frontage. The ornamental species present only provide limited foraging opportunity for bats, as observed during the surveys with the majority of the foraging on site around the mature trees to the West and East of the site, giving more shelter and insect activity. The loss of the small area of planted species present centrally on the frontage can easily be offset by an appropriate native planting plan and species suitable and beneficial to other species.

There will be no loss of potential roost sites in trees as no suitable trees are to be felled. Additional bat boxes should be incorporated onto the trees to be retained to offset the lack of suitable tree roosting sites and on the building to provide further alternative roosting opportunities where the buildings have been removed Additionally a suitable lighting scheme should be designed for the exterior lighting to allow areas around the tree boundaries to remain unlit during the hours of darkness; also all exterior lighting should be on a suitable PIR timer only activated by large moving objects (NOT BATS).

7.0 Recommendations

A thorough survey, externally and using ultrasonic detection equipment with data analysis, was made of the buildings and trees scheduled for removal at William Ellis School, Highgate Road, London by experienced ecologists.

The main building on the site being considered for alteration is classified as having Low Bat Roost Potential (LBRP) with features on the building providing some roost potential in the form of wooden soffits, lifted lead work and displaced tiles. Of the trees on site none was deemed to have suitable characteristics to support roosting bats on the site.

Four experienced surveyors were used for the dusk emergence survey on 9th September 2014 and the dawn re-entry survey on the 17th September 2014 using BatBox Duet Detectors and 4 Anabat SD2 recording devices. During the survey foraging and commuting activity was recorded by Common Pipistrelles (*Pipistrellus pipistrellus*) and Soprano Pipistrelles (*Pipistrellus pygmaeus*). At no time were bats seen emerging from the trees or buildings.

Based on the results of the surveys the following recommendations have been made:

1. Bat and bird boxes are required within the new development design wherever possible, located on or integrated into the buildings. In this instance, 4 x Bat boxes will be included within the new development design on buildings and wherever possible, on retained trees. Boxes must be situated between 4m and 6m above ground level, with entrances facing North, South-east and South-west to allow for use all year round. Assistance will be engaged from an ecologist in the design and location of bird / bat boxes. A suitable planting scheme is also required, including native and species beneficial to wildlife with native trees and shrubs used to landscape areas surrounding all buildings.

2. A suitable lighting scheme will be incorporated to prevent light pollution into the garden areas after dark with suitable PIR timers only activated by large moving objects (NOT BATS).

8.0 References

British Standards Institute (BSI) (2013). BS42020 - Biodiversity Code of Practice for Planning and Development. BSI, London.

Hundt (2012). *Bat Surveys – Good Practice Guidelines (2nd Edition).* Bat Conservation Trust: London.

Institute of Ecology and Environmental Management (IEEM) (2006). *Guidelines for Ecological Impact Assessment in the United Kingdom*. Available at: http://www.cieem.net/data/files/Resource_Library/Technical_Guidance_Series/EcIA_Guidelines/TGSEcIA-EcIA_Guidelines-Terestrial_Freshwater_Coastal.pdf.

Joint Nature Conservation Committee (JNCC) (2004). *Bat Workers Manual* (3rd Edition). JNCC: Peterborough.

Natural England (2014). *Habitats and Species of Principal Importance in England*. Available at: http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/habsandspeciesimportance.aspx

Mitchell-Jones, A.J. (2004). *Bat Mitigation Guidelines.* English Nature: Peterborough.

Wray, S., Wells, D., Long, E. & Mitchell-Jones, T. (2007). *EcIA: Specific Issues Associated with Bats.* Presentation at the Mammal Society/Zoological Society of London/IEEM Symposium on Advances in EcIA for Mammals.

Websites for access to Full Legislation and Policy Text:

Conservation of Habitats and Species Regulations 2010 (as amended):
http://www.legislation.gov.uk/uksi/2012/1927/contents/made

Countryside and Rights of Way Act 2000:
http://www.legislation.gov.uk/ukpga/2000/37/contents

Habitats Directive:
http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm

National Planning Policy Framework:
http://www.communities.gov.uk/documents/planningandbuilding/pdf/2116950.pdf

Natural Environment and Rural Communities Act 2006:
http://www.legislation.gov.uk/ukpga/2006/16/contents

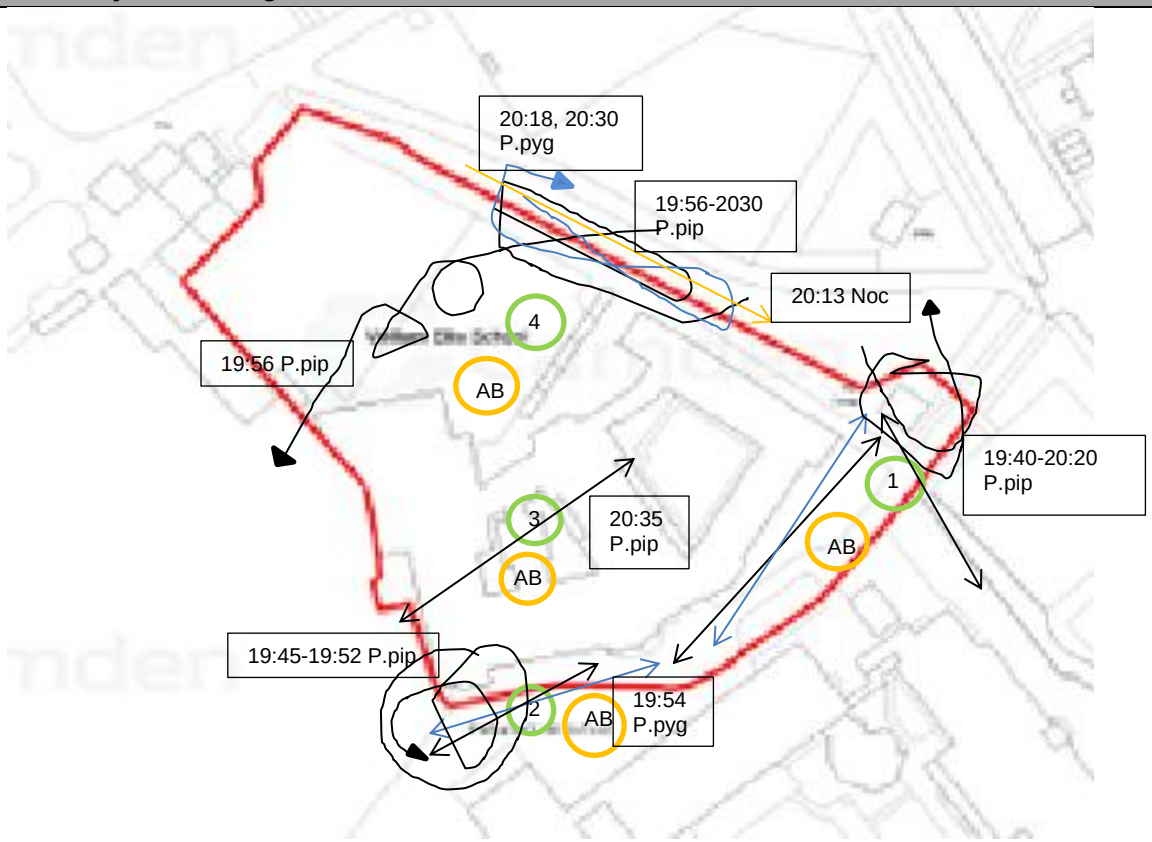
UK Post-2010 Biodiversity Framework:
http://jncc.defra.gov.uk/page-6189.

Wildlife and Countryside Act 1981 (as amended):
http://www.legislation.gov.uk/ukpga/1981/69

APPENDIX 1

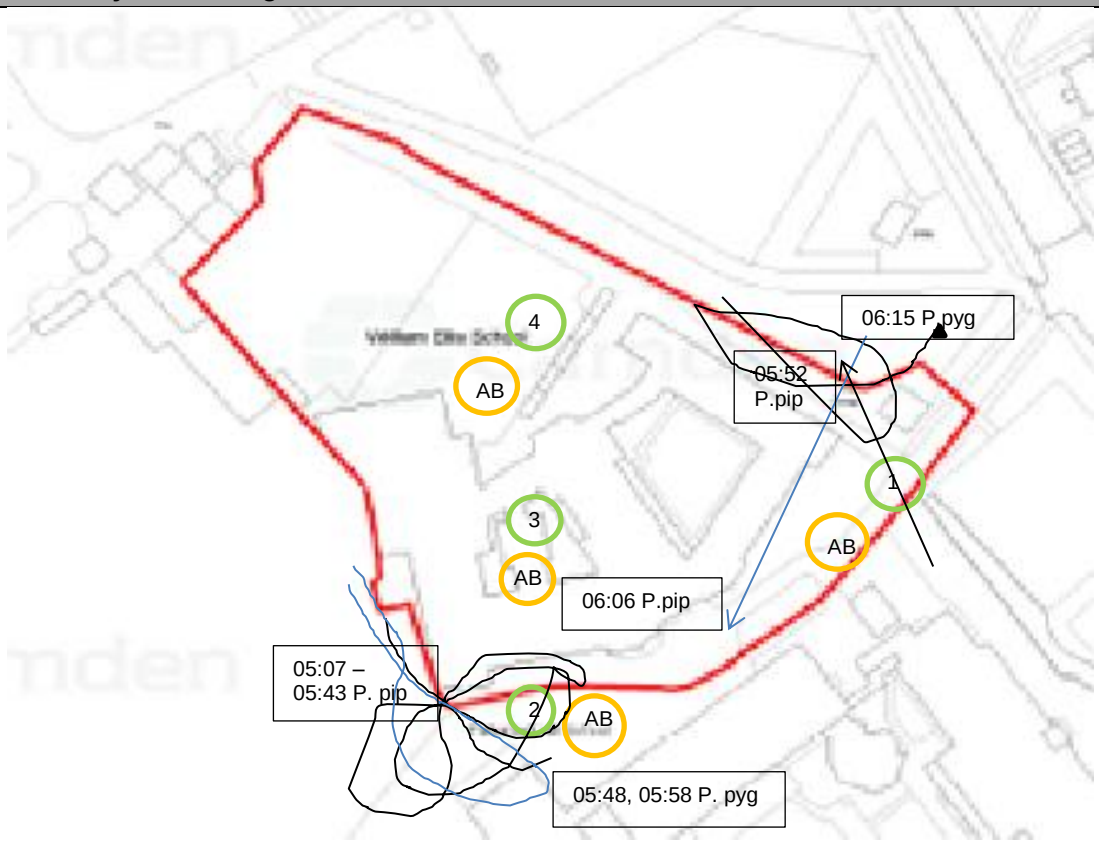
Surveyor Location and Flight Lines

Location of Surveyors and Flight Lines – 09/09/2014 Dusk



1	Surveyor 1	P May
2	Surveyor 2	V Telford
3	Surveyor 3	P Hiscocks (CLS001868)
4	Surveyor 4	J Jones
AB	Anabat Locations	
↘	Bat flight lines	Common Pipistrelle (black) Soprano Pipistrelle (blue) Noctule (yellow)

Location of Surveyors and Flight Lines – 17/09/2014 Dawn



1	Surveyor 1	P May
2	Surveyor 2	V Telford
3	Surveyor 3	P Hiscocks (CLS001868)
4	Surveyor 4	J Jones
AB	Anabat Locations	
↘	Bat flight lines	Common Pipistrelle (black) Soprano Pipistrelle (blue)

APPENDIX 2

Bat Roost Potential Assessment Results of Buildings

With Building Layout.

Surveyor	Phillip May	**Case Ref**	E0508141317
Site Address	William Ellis School, Highgate Road, London	**Survey Date**	09/09/14
Building Type	School	**Roof Shape**	Multi-Pitched and flat roofed
Approximate Construction Date	c. 1910 – frequent and modern extensions	**Roof Cover**	Clay tiles, waterproof membrane.
Number of Stories	3	**Roof Condition**	Clay tiles are rounded and do not interconnect fully leaving suitable entrance gaps underneath. Despite this the roof is generally in good condition.
Number of Chimneys	2	**Soffits & Condition**	Some gaps are present, but overall few gaps.
Walls & Condition	All in excellent condition	**Windows & Condition**	Mixture of Wooden frames with PVC replacements – all in relatively good condition.
Signs of Bats	None	**BRP**	Low Bat Roost Potential (LBRP)
Additional comments: the roof area has large area of flat sections. Part of the rear section has hanging tiles			
Building Plan			

N

Main frontage Elevation	Eastern Elevation
	
Gaps under Tiles	
	

Rear of main building an Gym building with curved metal sheet roof

APPENDIX 3

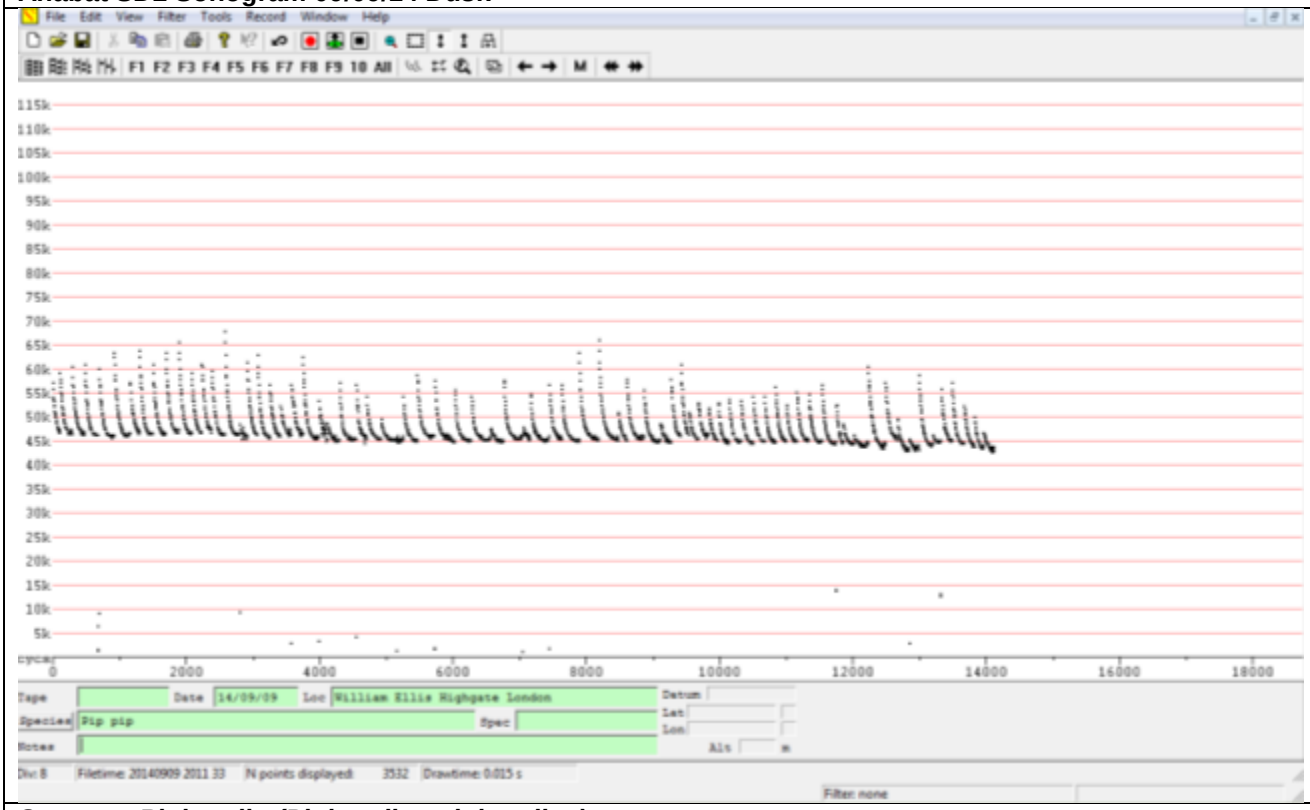
Tree Bat Roost Potential Assessment Results

Individual multi stemmed trees to be removed. None have any feature that could be used by bats

APPENDIX 4

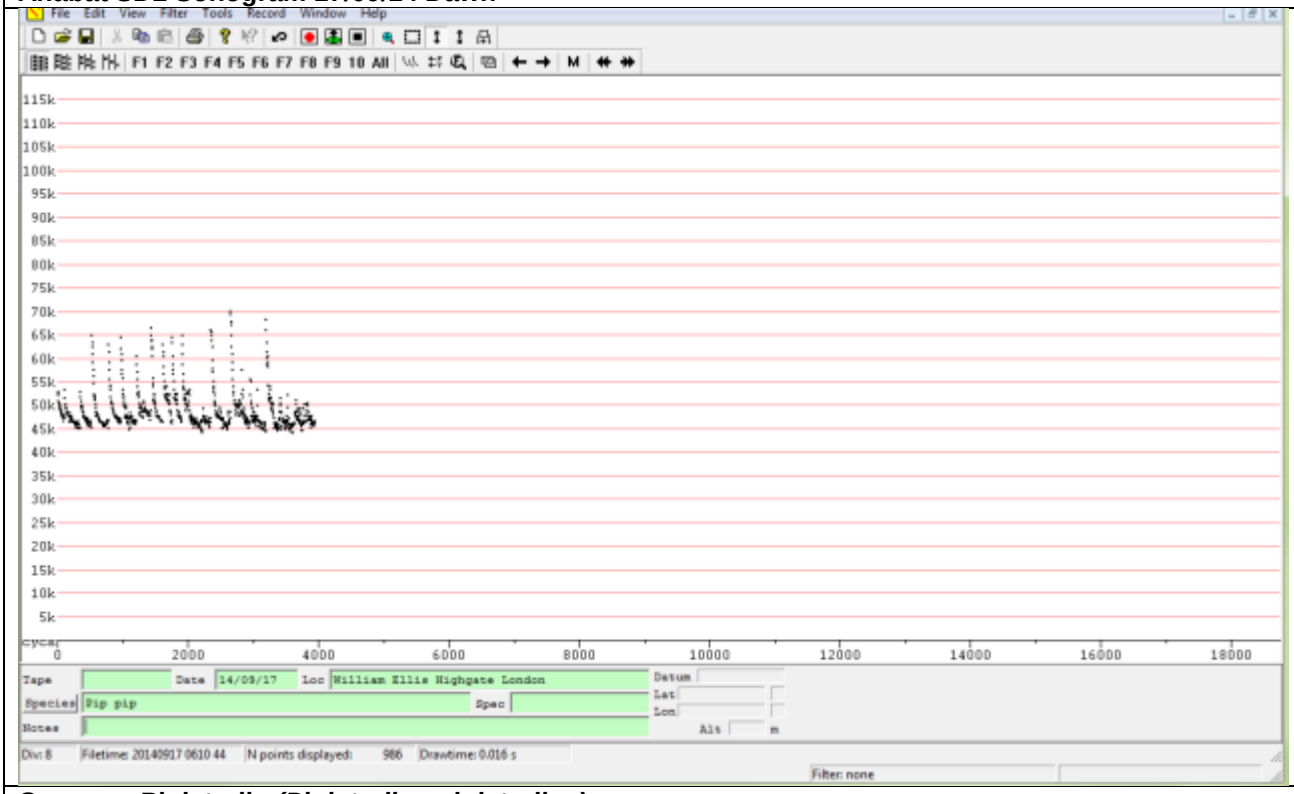
Ultrasonic Data Analysis

Anabat SD2 Sonogram 09/09/14 Dusk



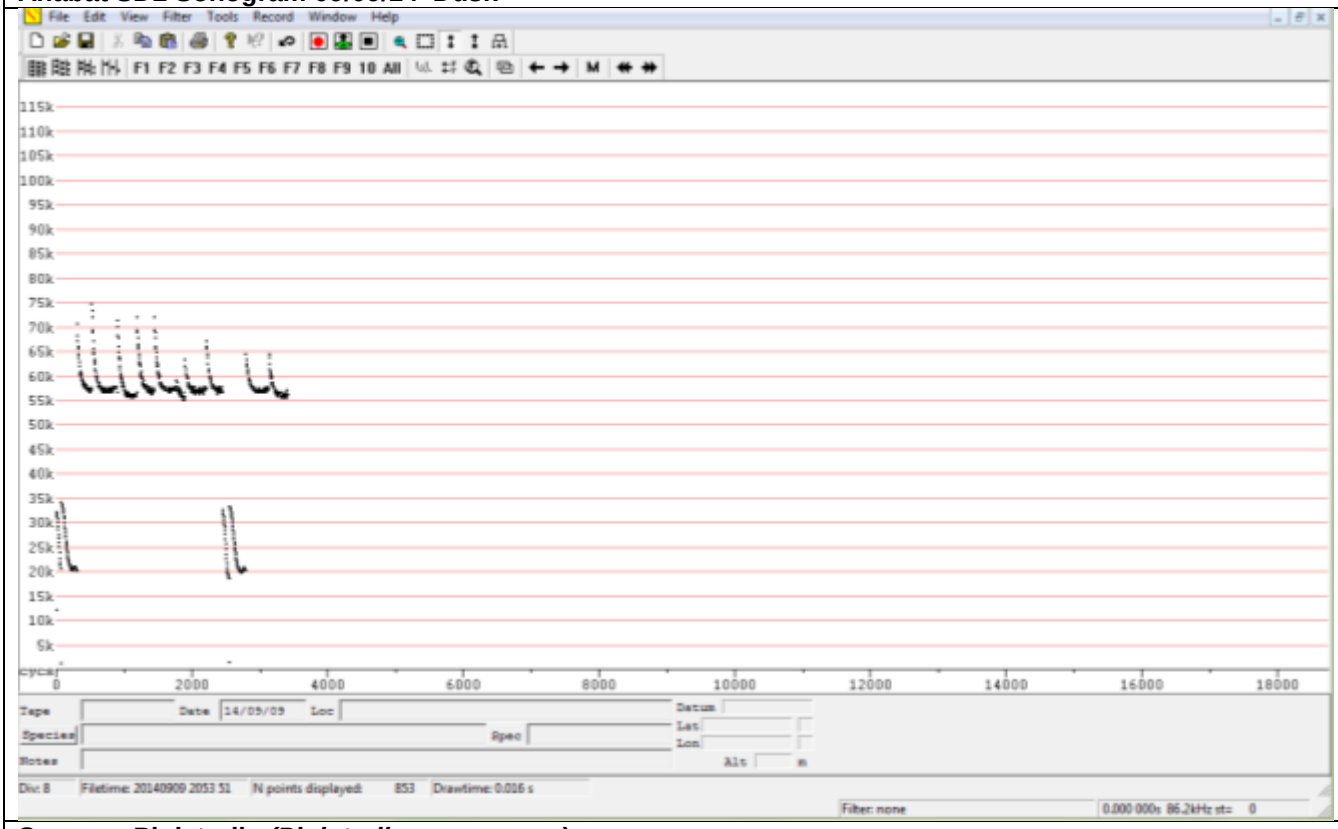
Common Pipistrelle *(Pipistrellus pipistrellus)*

Anabat SD2 Sonogram 17/09/14 Dawn



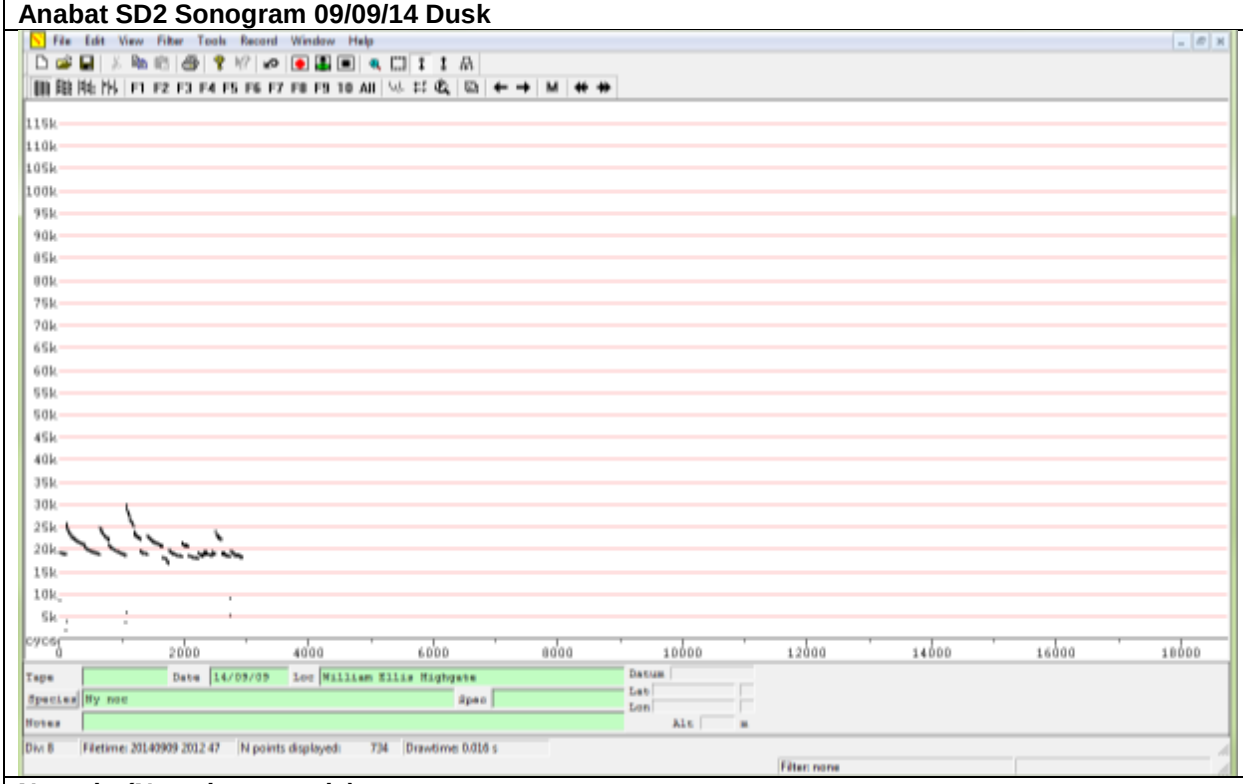
Common Pipistrelle *(Pipistrellus pipistrellus)*

Anabat SD2 Sonogram 09/09/14 Dusk



Soprano Pipistrelle *(Pipistrellus pygmaeus)*

Anabat SD2 Sonogram 09/09/14 Dusk



Noctule *(Nyctalus noctula)*

APPENDIX 5

Roost Assessment Criteria

Table 1: Categorisation of Bats by National Rarity (From Wray et al., 2007)

Rarity Within Range	England	Wales	Scotland	Northern Ireland
Common (population over 100,000)	Common Pipistrelle Soprano Pipistrelle Brown Long-eared	Common Pipistrelle Soprano Pipistrelle	Common Pipistrelle Soprano Pipistrelle	Common Pipistrelle Soprano Pipistrelle
Rarer (population 10,000 - 100,000)	Daubenton's Natterer's Lesser Horseshoe Nathusius' Pipistrelle Leisler's Whiskered Brandt's Noctule Serotine	Daubenton's Natterer's Brown Long-eared Lesser Horseshoe	Daubenton's Natterer's Brown Long-eared	Daubenton's Natterer's Brown Long-eared Nathusius' Pipistrelle Leisler's
Rarest (population. under 10,000)	Alcathoe Greater Horseshoe Bechstein's Barbastelle Grey Long-eared Greater Mouse-eared	Alcathoe Whiskered Brandt's Greater Horse-shoe Bechstein's Noctule Nathusius' Pipistrelle Serotine Barbastelle	Alcathoe Whiskered Brandt's Noctule Nathusius' Pipistrelle Leisler's	Whiskered

Following the above framework for valuing bats in Ecological Impact Assessment set out by Wray et al. (2007), the site's bat roosts were each assigned a value, based on roost type and species rarity, using a geographic frame of reference (see Table 2 below).

Table 2: Roost Valuation System (From Wray et al., 2007)

Geographic Frame of Reference	Roost Types
District, Local or Parish	Feeding perches (common species) Individual bats (common species) Small numbers of non-breeding bats (common species) Mating sites (common species)
County	Maternity sites (common species) Small numbers of hibernating bats (common and rarer species) Feeding perches (rarer/rarest species) Individual bats (rarer/rarest species) Small numbers of non-breeding bats (rarer/rarest species)
Regional	Mating sites (rarer/rarest species) including well-used swarming sites Maternity sites (rarer species) Hibernation sites (rarest species) Significant hibernation sites
National/UK	Maternity sites (rarest species) Sites meeting SSSI (Sites of Special Scientific Interest) guidelines
International	SAC sites (Special Areas for Conservation)

APPENDIX 6

Bats and Lighting

Bat Conservation Trust 

BATS AND LIGHTING IN THE UK
Bats and the Built Environment Series

This document is aimed at lighting engineers, lighting designers, planning officers, developers, bat workers and anyone specifying lighting. It is intended to raise awareness of the impacts of lighting on bats and mitigation is suggested for various scenarios. It also offers an explanation of the facts associated with the lighting industry for the benefit of bat workers.

This is a working document and as such the information contained will be updated in line with advances in our knowledge both into the impact on bats and also to reflect the advances in technology available in the lighting industry.

ABOUT BATS – FOR THE LIGHTING INDUSTRY

General Ecology

Bats are the only true flying mammals. Like us, they are warm-blooded, give birth and suckle their young. They are also long-lived, intelligent and have a complex social life. In Britain there are 17 species, all of which are small (most weigh less than a £1 coin) and eat insects.

Bats have evolved a number of unusual features, mainly connected with their ability to fly. Their wings are formed from a web of highly elastic skin stretched over greatly elongated finger bones, the legs and tail, though their thumbs remain free to help them cling on when roosting. Bats have also developed a highly sophisticated echolocation system that allows them to avoid obstacles and catch tiny insects, which they seize in flight or pick off water, the ground or foliage, even in complete darkness. When they're flying, bats produce a stream of high-pitched calls and listen to the echoes to produce a sound picture of their surroundings.

Some bats specialise in catching large insects such as beetles or moths but others eat large numbers of very small insects, such as gnats, midges and mosquitoes. Bats gather to feed wherever there are lots of insects, so the best places for them include traditional pasture, woodland, marshes, ponds and slow moving rivers.

During the winter there are relatively few insects available, so bats hibernate. In September and October they put on weight and then, as the weather gets colder, they seek out appropriate sheltered roosts, let their body temperature drop to close to that of their surroundings and slow their heart rate to only a few beats per minute. This greatly reduces their energy requirements so that their food reserves last as long as possible. Bats don't hibernate right through the winter but may wake up and go out to feed on mild evenings when insects are active.

During the spring and summer period female bats gather together into maternity colonies for a few weeks to give birth and rear their young (called pups). Usually only one pup is born each year. This is looked after carefully and suckled for between four and six weeks until it is old enough to fly out and hunt for itself. Bats don’t build nests and don't bring food back to the roost to feed their young, so the baby lives only on its mother's milk until it is old enough to fly. Once the baby is independent, the colony breaks up and the bats generally move to other roosts. Bats may gather together from a large area to form these maternity roosts, so any disaster at the summer breeding site can affect the whole colony of bats from a wide surrounding area. Many of these maternity sites are used every summer as bats have a strong tradition of returning to the same site year after year.

Legal Protection of bats

Due to the decline in bat numbers, all species of bat are protected by the Wildlife & Countryside Act (1981) (as amended) and the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). This makes it illegal to: kill, injure, capture or disturb bats, obstruct access to bat roosts or damage/destroy bat roosts. Lighting in the vicinity of a bat roost causing disturbance could constitute an offence, so it is important that Natural England, Countryside Council for Wales, Scottish Natural Heritage or Environment and Heritage Service, Northern Ireland is consulted and allowed time to provide advice on lighting proposals in the vicinity of bats and roosts.

Impacts on bats

Roosts

Illuminating a bat roost creates disturbance and may cause the bats to desert the roost. Light falling on a roost access point will at least delay bats from emerging and this shortens the amount of time available to them for foraging. As the main peak of nocturnal insect abundance occurs at and soon after dusk, a delay in emergence means this vital time for feeding is missed.

Insects and foraging

In addition to causing disturbance to bats at the roost, artificial lighting can also affect the feeding behaviour of bats. There are two aspects to this. One is the attraction that light from certain types of lamps has to a range of insects; the other is the presence of lit conditions.

Many night flying species of insect are attracted to light, especially those lamps that emit an ultra-violet component and particularly if it is a single light source in a dark area. As well as moths a range of other insects can be attracted to light such as craneflies, midges and lacewings. Studies have shown that, although noctules, Leisler's, serotine and pipistrelle bats swarm around white mercury street lights (this would also apply to metal halide) feeding on the insects attracted to the light, this behaviour is not true for all bat species. The slower flying broad winged species such as long-eared bats, *Myotis* species (which include Brandt's, whiskered, Daubenton's, Natterer's and Bechstein's), Barbastelle and greater and lesser horseshoe bats generally avoid street lights. In addition it is also thought that insects are attracted to lit areas from further afield. This is thought to result in adjacent habitats supporting reduced numbers of insects. This is a further impact on the ability of the light avoiding bats to be able to feed. It is noticeable that most of Britain's rarest bats are among those species listed as avoiding light. Clearly, effective mitigation where there is potential for impact on bats has importance in the conservation of these species.

Artificial lighting is thought to increase the chances of bats being preyed upon. Many avian predators will hunt bats which may be one reason why bats avoid flying in the day. Observations have been made of kestrels (diurnal raptors) hunting at night under the artificial light along motorways.

Lighting can be particularly harmful if used along river corridors, near woodland edges and near hedgerows used by bats. In mainland Europe, in areas where there are foraging or 'commuting' bats, stretches of road are left unlit or lighting is designed in such a way as to avoid isolation of bat colonies.

Other behaviours
Artificial lighting disrupts the normal 24-hour pattern of light and dark which is likely to affect the natural behaviour of bats. Bright light may reduce social flight activity and cause bats to move away from the light area. Studies have shown that continuous lighting along roads creates barriers which some bat species cannot cross. For example, Daubenton's bats move their flight paths to avoid street lamps. The following images indicate possible scenarios where bats' commuting routes may cross a road. They are linear features such as tree lines, river corridors, hedgerows or where tree canopies form a link over the road.

ABOUT THE LIGHTING – FOR BAT WORKERS

Types of lights in use
A range of lighting equipment is available:

1) **Low pressure sodium lamps (SOX)** (typical orange lamps seen along roadsides). Light is emitted at one wavelength, contains no ultraviolet (UV) light and has a low attraction to insects. The lamps tend to be large which makes it more difficult to focus the light from these lamps. These are in the gradual process of being removed or replaced.

2) **High pressure sodium lamps (SON) (**brighter pinkish-yellow lamps). Commonly used as road lighting. Light is emitted over a moderate band of long wavelengths including a small UV component. Insects are attracted to the brighter light. The lamp is of medium size and the light can be more easily directed than low pressure sodium. This is the predominant lamp now in use.

3) **Mercury lamps (MBF)** (bluish-white lamps). These emit light over a moderate spectrum including a larger component of UV light to which insects are particularly sensitive. Insects are attracted in large numbers along with high densities of bat species. (Rydell & Racey 1993). They are rare now and are not used in new developments.

4) **White SON.** This is whiter than High Pressure Sodium and has a larger component of UV light.

5) **Metal Halide**. A small lamp and therefore more easy to focus light and make directional. Emits less UV light than mercury but more than high pressure sodium. It comes in three forms a) Quartz arc tube (HQI); b) Ceramic arc tube (CDM-T) and c) Cosmo which is a new ceramic form.

6) **Light Emitting Diodes** (LEDs). Predicted to compete with metal halide and high pressure sodium as a widely used light source within the next few years. The light emitted is more directional. The light is produced in a narrow beam. It is instant light.
7) **Tungsten Halogen** (more directional). It is not used in new lighting schemes but may be encountered as security light on a private household.
8) **Compact Fluorescent** Mostly in use in residential street lighting. It produces a white light that does include UV light. It can be used at a low wattage and therefore on a low output to achieve low lux.

Legal requirements for lighting

There is no legislation requiring an area or road to be lit.
The Building Regulations specify that 150 W is the maximum for exterior lighting of buildings but this does not apply to private individuals.
There are a number of British Standards that relate to various components of lighting and there are also guidelines that relate to crime prevention, prevention of vehicular accidents and amenity use.
Many County councils and less often District and Borough councils set out standards in local guidance policy documents. These are sometimes based on the advice given by the Highways Authority 'TA49 – Approval of new and replacement lighting on trunk roads and trunk road motorways'.
In assessing the need for lighting it would be beneficial to ask the local authority for their lighting policy document as this should incorporate all of the above.

The installation of lighting and the planning system

Domestic lighting needs no planning permission and depends on direct advice being given to the householder. Lighting associated with new development or a listed building does require planning permission. Planning officers or developers when dealing with applications for lighting in an area of suitable bat habitat eg. woodland, old pasture, linking hedgerows and water habitats) should seek information on bat roosts in the area.

If assistance is needed they can contact the BCT Bat Helpline 0845 1300 228 who may be able to suggest how best to access information on bat roosts known in the area. If bat roosts are suspected, it may be necessary to conduct a bat survey. A survey may need to

determine the species of bat affected, their population levels, the likely impact of the lighting on the bats and possible mitigation.
The need to install lighting should be questioned. Where lighting is permitted, as may be necessary for public safety, conditions should be imposed to ensure the impact of the lighting on the bats is kept to a minimum. The use of a lighting design computer program that predicts where light will fall should be used to predict the potential impact and to plan mitigation.
The consultation on the addition to PPS23 on Pollution Control of Annex 3 on lighting is on hold at the present time (July 2007) until the outcome of the Baker review is known.

MITIGATION OF LIGHTING IMPACTS ON BATS

1. BAT ROOSTS

No bat roost (including access points) should be directly illuminated. If it is considered necessary to illuminate a building known to be used by roosting bats, the lights should be positioned to avoid the sensitive areas. Close offset accent lighting causes less light pollution; it is more specific and can be designed to avoid bat sensitive areas, and better highlights the features of the subject of the illumination.

2. FORAGING AND COMMUTING

Type of lamp (light source)

The impact on bats can be minimised by the use of low pressure sodium lamps or high pressure sodium instead of mercury or metal halide lamps where glass glazing is preferred due to its uv filtration characteristics.

Luminaire and light spill accessories

Lighting should be directed to where it is needed and light spillage avoided. This can be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvres and shields to direct the light to the intended area only. Planting can also be used as a barrier or manmade features that are required within the build can be positioned so as to form a barrier.

Lighting column

The height of lighting columns in general should be as short as is possible as light at a low level reduces the ecological impact. However, there are cases where a taller column will enable light to be directed downwards at a more acute angle and thereby reduce horizontal spill. For pedestrian lighting this can take the form of low level lighting that is as directional as possible and below 3 lux at ground level. The acceptable level of lighting may vary dependent upon the surroundings and on the species of bat affected.

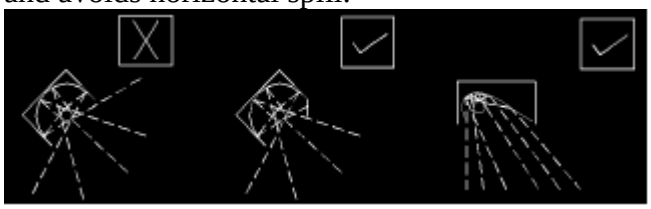
Predicting where the light cone and light spill will occur

There are lighting design computer programs that are widely in use which produce an image of the site in question, showing how the area will be affected by light spill when all the factors of the lighting components listed above are taken into consideration. This should be a useful tool to inform the mitigation process.

Light levels
The light should be as low as guidelines permit. If lighting is not needed, don't light.
Timing of lighting
The times during which the lighting is on should be limited to provide some dark periods. Roads or trackways in areas important for foraging bats should contain stretches left unlit to avoid isolation of bat colonies. These unlit stretches should be 10 metres in length either side of commuting route.

3. FLOODLIGHTING OF SPORTS OR EVENTS

The use of asymmetric beam floodlights (as opposed to symmetric) orientated so that the glass is parallel to the ground will ensure that the light is cast in a downward direction and avoids horizontal spill.



See the National Trust guide to 'Events, concerts and bats' at http://www.nationaltrust.org.uk/main/w-bat05_events.pdf for further advice on ways to reduce the impact of event lighting.

4. SECURITY LIGHTING

Power It is rarely necessary to use a lamp of greater than 2000 lumens (150 W) in security lights. The use of a higher power is not as effective for the intended function and will be more disturbing for bats.
Movement sensors Many security lights are fitted with movement sensors which, if well installed and aimed, will reduce the amount of time a light is on each night. This is more easily achieved in a system where the light unit and the movement sensor are able to be separately aimed.
Timers If the light is fitted with a timer this should be adjusted to the minimum to reduce the amount of 'lit time'.
Aim of light The light should be aimed to illuminate only the immediate area required by using as sharp a downward angle as possible. This lit area must avoid being directed at, or close to, any bats' roost access points or flight paths from the roost. A shield or hood can be used to control or restrict the area to be lit. Avoid illuminating at a wider angle as this will be more disturbing to foraging and commuting bats as well as people and other wildlife.
Alternatives
It may be a better solution for security lighting on domestic properties to use a porch light.

Ongoing areas of research

- The impact of light on commuting corridors used by lesser horseshoe bats. Emma Stone, University of Bristol
- The effects of lighting on prime bat foraging areas within London, concentrating on riparian habitats and open spaces. Alison Fure.
- The effect of light and noise on British bat species. Frank Greenaway.

References

Arlettaz R, Godat, S & Meyer H (2000) Competition for food by expanding pipistrelle bat populations (Pipistrellus pipistrellus) might contribute to the decline of lesser horseshoe bats (Rhinolophus hipposideros). Biological Conservation 93 (2000) 55-60

Bat Conservation Trust (2007) Bats and lighting in the UK- bats and the built environment series www.bats.org.uk

Blake, A. M. et al (1994) Use of lamplit roads by foraging bats in southern England. J. Zool., Lond. (1994) 234, 453-462.

Downs, N. C. et al (2003) The effects of illuminating the roost entrance on the emergence behaviour of Pipistrellus pygmaeus. Biological Conservation 111, 247-252

Fure, A (2006) Bats and Lighting. The London Naturalist No. 85

http://www.furesfen.co.uk/downloads.html

Institution of Lighting Engineers(2005) Guidance Notes for the Reduction of Light Pollution

Institution of Lighting Engineers (2003) Domestic Security Lighting, Friend or Foe.

Jones, J. (2000) The Impact of lighting on bats.

Mitchell-Jones, A. J. (2004) Bat Mitigation Guidelines. English Nature

Outen, A.R. 3rd ed. (1998) The possible ecological implications of artificial lighting. Hertfordshire Biological Records Centre.

Rich & Longcore (Eds) 2006 Ecological Consequences of Artificial Night Lighting. Island Press, Washington.

Richardson, P.(2003) Events, concerts and bat. National Trust Guidance Note No. 5

Rydel, J. Baagoe, H.J (1996) Bats and Streetlamps. Bats. Vol 14; No.4:10 www.batcon.org/batsmag/v14n4-4.html

Rydell J & Racey, P A (1995) Street lamps and the feeding ecology of insectivorous bats. Recent Advances in Bat Biology Zool Soc Lond Symposium abstracts

Glossary of terms
(used in this article or that may be used by the lighting industry)

Arc tube	A tube normally ceramic or quartz enclosed by the outer glass envelope of a HID lamp that contains the arc stream.
Asymmetric beams	Lamp is off-centre in a reflector more steeply curved at one end.
Candela	The intensity of a light source in a specific direction. Unit of Luminous intensity
Contrast	The relationship between the luminance of an object and its background. The higher the contrast the more likely it is an object

	can be seen.
Cowl	Physical light spill control accessory.
Diffuse	Term describing dispersed light distribution referring to the scattering of light.
Efficacy	A measure of light output against energy consumption measured in lumens per watt.
HID	High Intensity Discharge. Describes mercury vapour, metal halide and high pressure sodium lamps.
High Pressure Sodium Lamp	A HID lamp whose light is produced by radiation from high pressure sodium vapour which usually includes a small amount of UV light.
Hood	Physical light spill control accessory.
Illuminance	Illuminance is the quantity of light, or luminous flux, falling on a unit area of a surface. It is designated by the symbol E. The unit is the lux (lx).
Lamp	Light source.
Light cone	The angle at which the beam falls off to 50% of peak intensity.
Light Pollution	The spillage of light into areas where it is not required. Also known as obtrusive light.
Light spill	The light that falls outside the light cone.
Light Trespass (nuisance)	Light that impacts on a surface outside of the area designed to be lit by a lighting installation. The correct legal term is nuisance.
Louvres	Physical light spill control accessory.
Low Pressure Sodium	A discharge lamp in which light is produced by radiation from low pressure sodium vapour. Emits light at only 589nm ie. monochromatic.
Lumen	The unit of light output from a lamp.
Luminaire	Light fitting or unit designed to distribute light from a lamp or lamps.
Luminance	The physical measure of the stimulus that produces the sensation of brightness measured by the luminous intensity reflected in a given direction. The unit is the candela per square metre (cd/m^2).
Lux (LX)	Illuminance is the quantity of light or luminous flux, falling on a unit area of a

	surface in the environment. It is designated by the symbol E. The unit is lux (lx).
Metal Halide (includes CDM-T)	A type of HID lamp in which most of the light us produced by radiation of metal halide and mercury vapours in the arc tube. Emits UV light. UV poor variants are available. It comes in three forms a) Quartz arc tube (HQI); b) Ceramic arc tube (CDM-T) and c) Cosmo which is a new ceramic form
Mercury	High pressure white light lamp that emits significant UV light.
Optic	The components of a luminaire such as reflectors, refractors, protectors which make up the directional light control section.
Photocell	A unit which senses light to control luminaires.
Reflector	A device used to reflect light in a given direction.
Refractor	A device used to redirect the light output from a lamp when the light passes through it. It is usually made from prismatic glass or plastic.
Shield	Physical light spill control accessory.
Sky glow	The brightening of the night sky caused by artificial lighting.
Symmetric beams	Lamp mounted in the centre of the reflector.
Ultra violet (UV)	Radiation that is shorter in wavelength and higher in frequency than visible violet light.
Voltage	The difference in electrical potential between two points of an electrical circuit.
Watt (W)	The unit for measuring electrical power.

APPENDIX 7

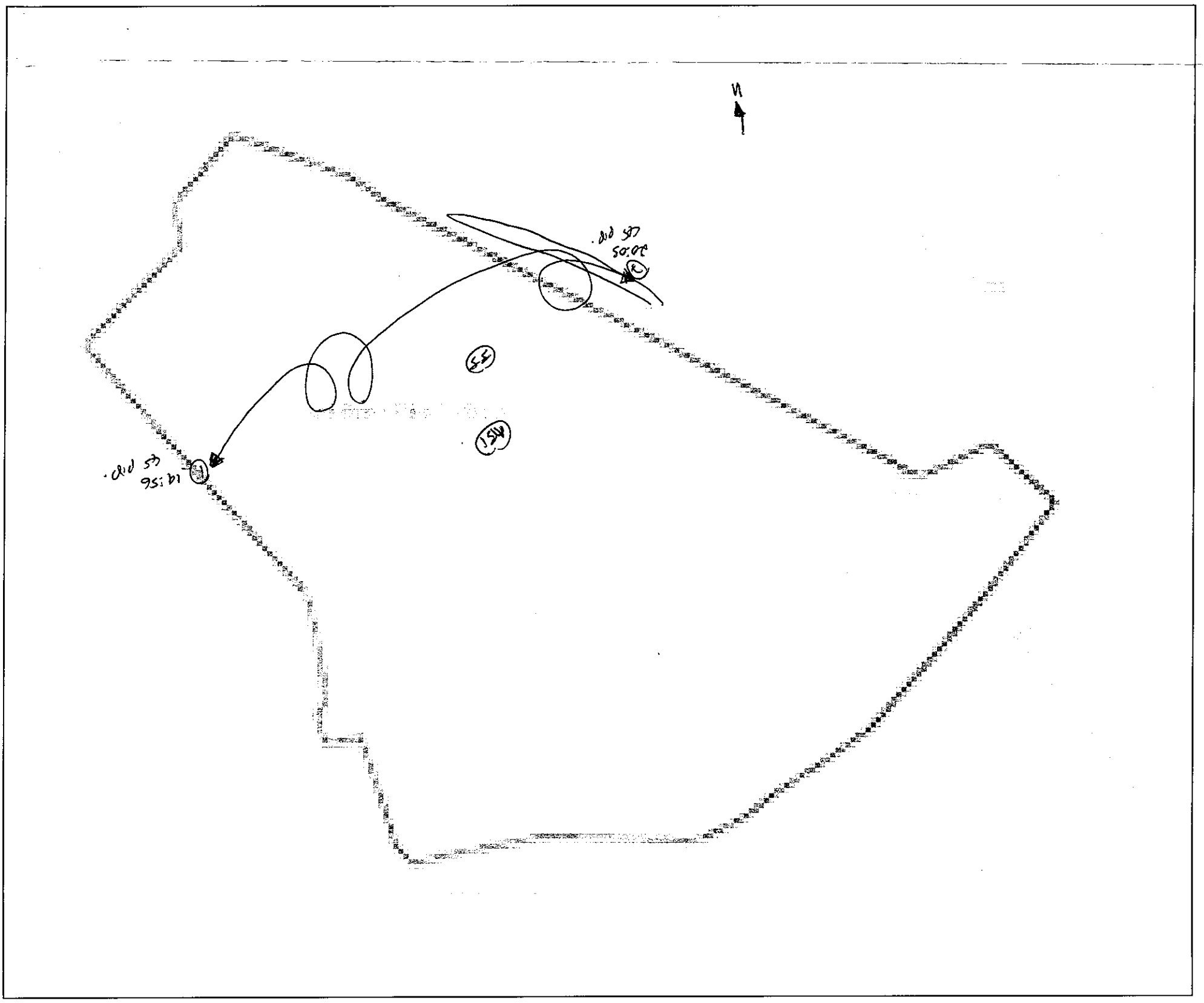
Raw Survey Data

Bat Ultrasound Survey Record Sheet

Date	09/09/2014	Site	William Ellis School, Highgate Road, London, NW5 1RN					Sunrise/ Set Time	19:29	Ecologist	S Jones	Sheet No	1/1
Weather Data		Temperature °C	Humidity %	Cloud Cover Okta	Wind Bft Scale	Precipitation Y/ N		Survey Type	DUSK	Start	19:15		
	Start	18.4°C	58%	2	0	N				End	21:15.		
	End	17.5°C	65%	3	1 (2)	N.		Detector	Duet + AS1				

Time	Map No.	Forage	Comm	Direction	Peak Khz	Species?	Comment
19:15							START SURVEY.
19:56	1	✓		NW	45	Pipistrelle.	Forage along E & then N boundary on playground.
20:03	2	✓		N+S	45	Pipistrelle	Forage over boundary.
20:10	2	✓		S	45	Pipistrelle.	"
20:12	HWS	✓		S	Noctule	Noctule.	"
20:18	HWS	✓			55/45	Pipistrelle.	Brief forage. to E
20:30	HWS	✓			55/45	Pipistrelle.	"
20:35	HWS	✓			45	Pipistrelle	Brief pass over head.
20:42	HWS	✓			45	Pipistrelle	" x2.
21:56	HWS	✓			45	Pipistrelle	" x3.
21:00							END SURVEY

NOTES:

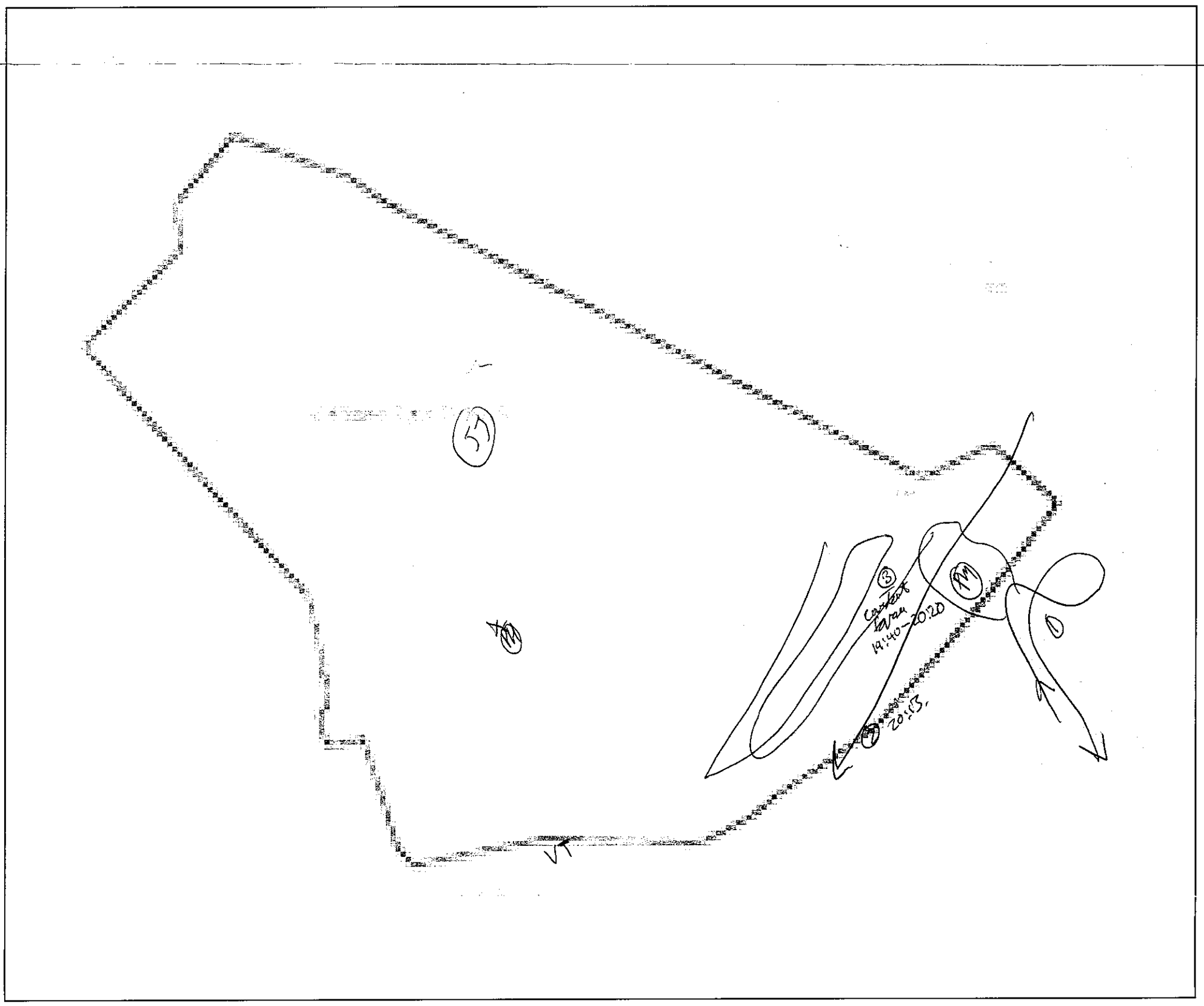


Bat Ultrasound Survey Record Sheet

Date	09/09/ 2014	Site	William Ellis School, Highgate Road, London, NW5 1RN					Sunrise/ Set Time	19:29	Ecologist	PM	Sheet No	1
Weather Data		Temperature °C	Humidity %	Cloud Cover Okta	Wind Bft Scale	Precipitation Y/ N		Survey Type	DUSK	Start	19:10		
	Start									End			
	End							Detector	EM3+ Duet.				

Time	Map No.	Forage	Comm	Direction	Peak Khz	Species?	Comment
19:51 ↓ 20:48	①/③	/			45 55	pip pip	From N. school upto Boundary
20:13.	②		/	E–W.	25	Noc	single pass from E to W
20:49	③	/			45	pip	Infrequent foraging after lights turned on.

NOTES:

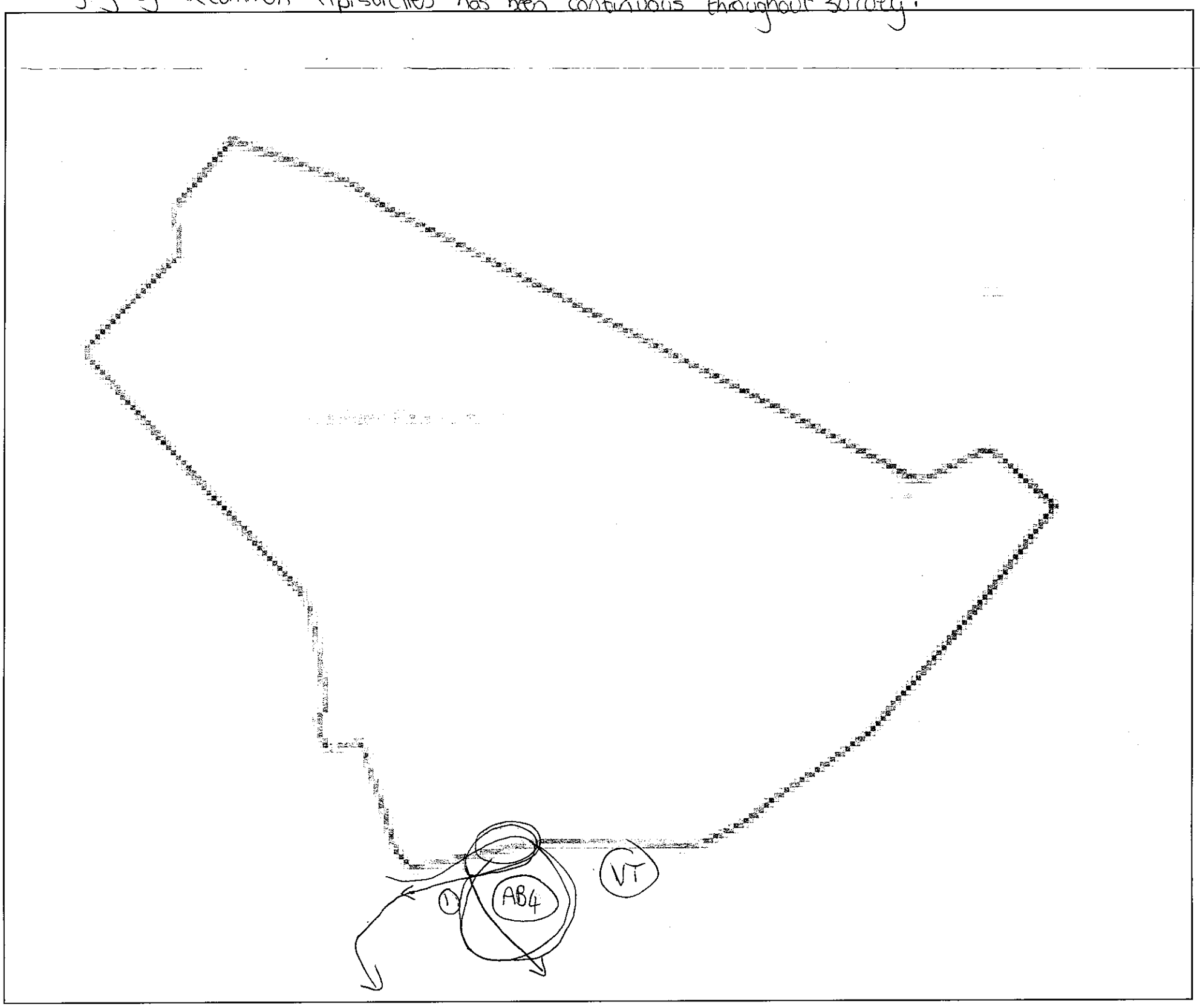


Bat Ultrasound Survey Record Sheet

Date	09/09/2014	Site	William Ellis School, Highgate Road, London, NW5 1RN					Sunrise/ Set Time	19:29	Ecologist	VT	Sheet No	
Weather Data		Temperature °C	Humidity %	Cloud Cover Okta	Wind Bft Scale	Precipitation Y/ N		Survey Type	DUSK	Start			
	Start									End			
	End							Detector	Batbox Duet + AB4				

Time	Map No.	Forage	Comm	Direction	Peak Khz	Species?	Comment
19.45	1	✓		W+SE	45	P.p	Forage lasted ~8mins, was flying near PHS elevation. Bat returned and foraged continuously.
19.52	1	✓		W+SE	45	P.p	recording above joined by another pip briefly. This bat returned and foraged continuously.
19.54	1	✓		W	55	P.p	occasionally foraging in same area as above, returning now and then to briefly forage.

NOTES: Foraging by 2x Common Pipistrelles has been continuous throughout survey.

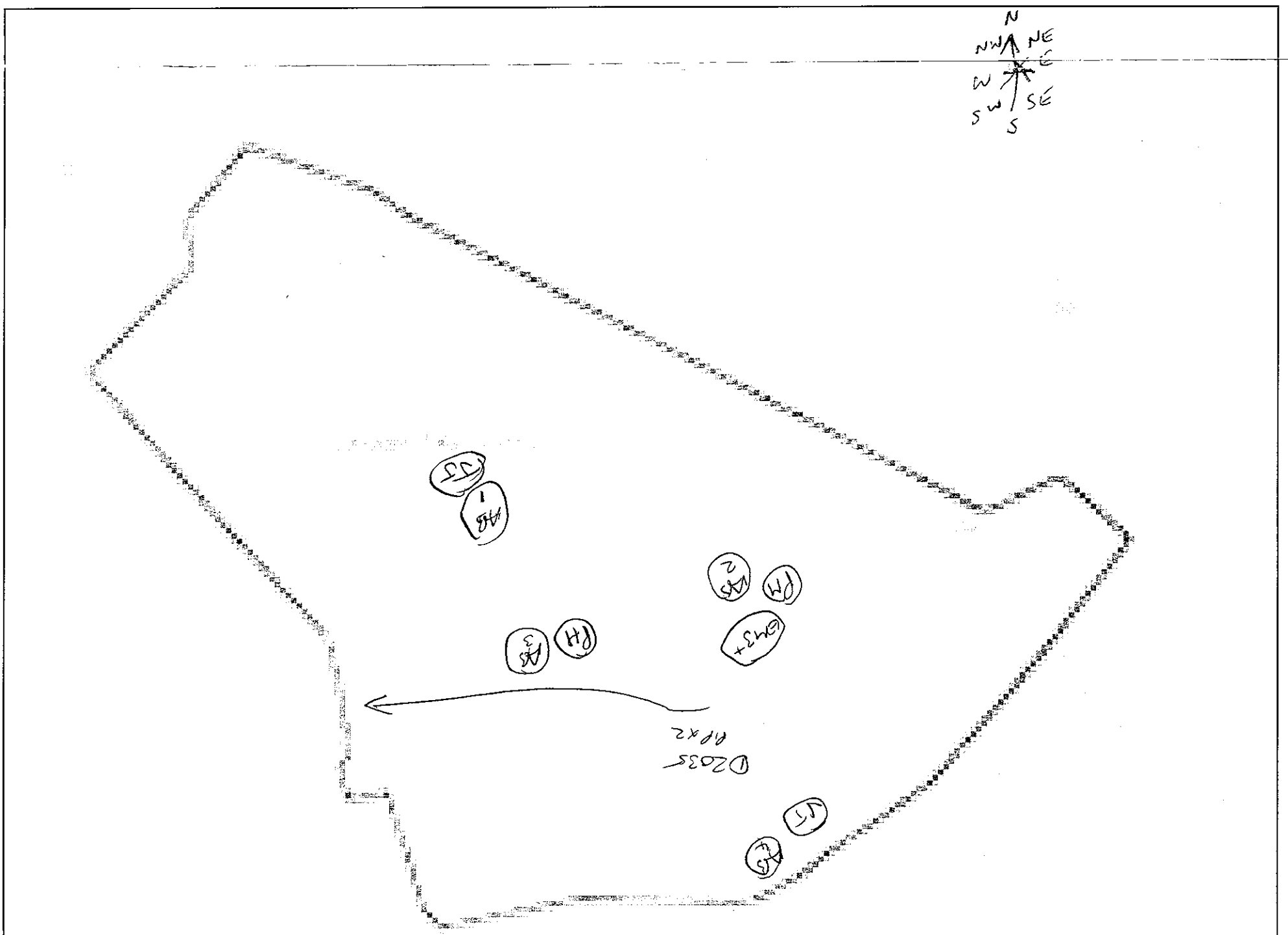


Bat Ultrasound Survey Record Sheet

Date	09/09/2014	Site	William Ellis School, Highgate Road, London, NW5 1RN					Sunrise/ Set Time	19:29	Ecologist	PH	Sheet No	1-1
Weather Data		Temperature °C	Humidity %	Cloud Cover Okta	Wind Bft Scale	Precipitation Y/N		Survey Type	DUSK	Start	1900		
	Start	18-4°C	60%	2	0-1	N				End	2100		
	End	17-3°C	67%	0	1-2	N		Detector	DUET ANABAT				

Time	Map No.	Forage	Comm	Direction	Peak Khz	Species?	Comment
1900							START SURVEY
2035	①		✓	E-W	45	PIP x 2	x2 CLIP Consulted straight across site from E-W.
2105							END SURVEY

NOTES:



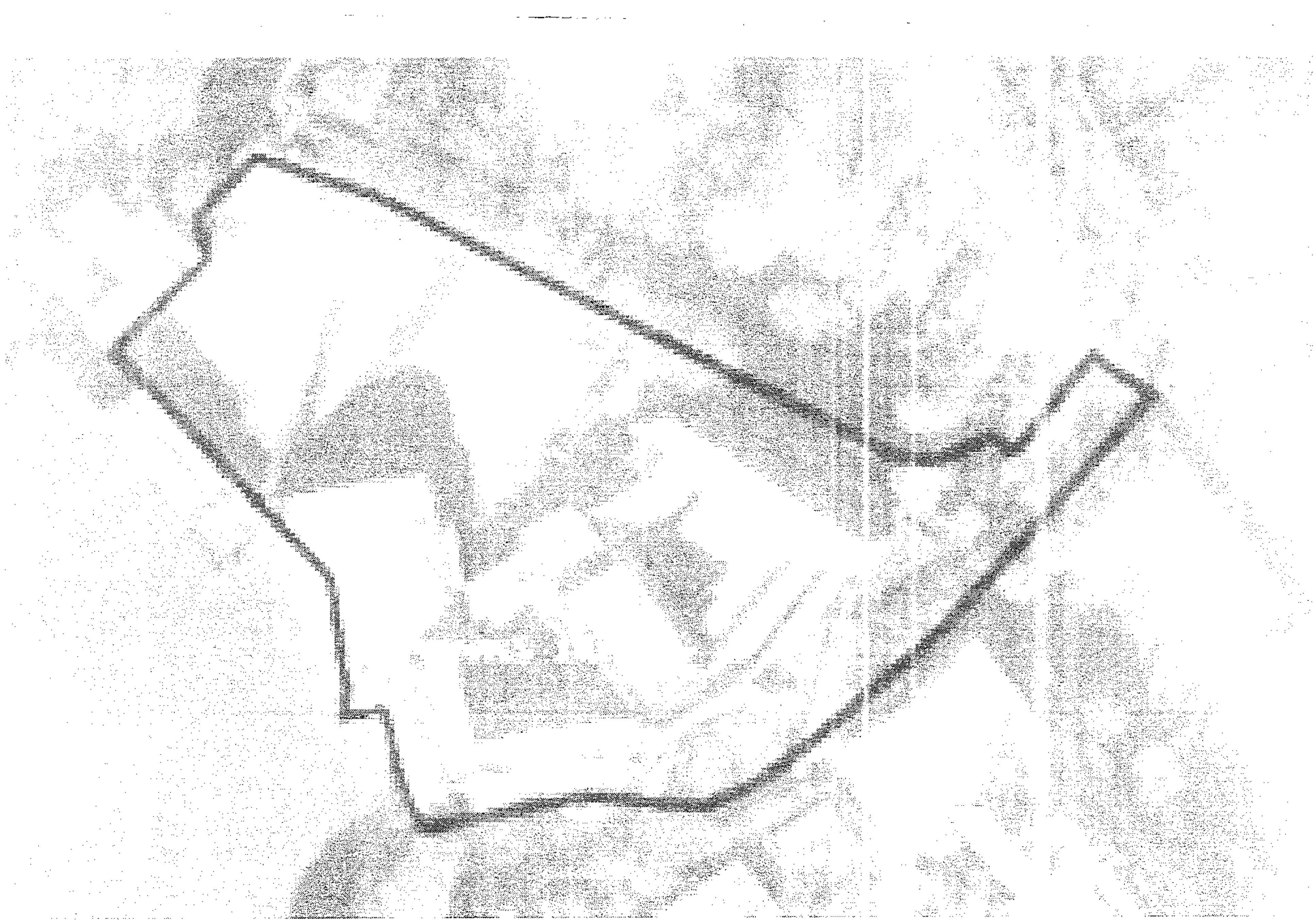
Bat Ultrasound Survey Record Sheet

Date	17/09/2014	Site	William Ellis School, Highgate Road, London, NW5 1RN	Sunrise/Set Time	06:38	Ecologist	J Jones	Sheet No	1/1

Weather Data		Temperature °C	Humidity %	Cloud Cover Okta	Wind Bft Scale	Precipitation Y/N	Survey Type	DAWN	Start	05:00
									End	06:40
	Start	17°C	79%	6	0	N	Detector	Duet & Anabat ①		
	End	17.2°C	79%	7	0	N				

Time	Map No	Forage	Comm	Direction	Peak Khz	Species?	Comment
05:00							START SURVEY.
							NO BATS
06:40							END SURVEY.

NOTES:

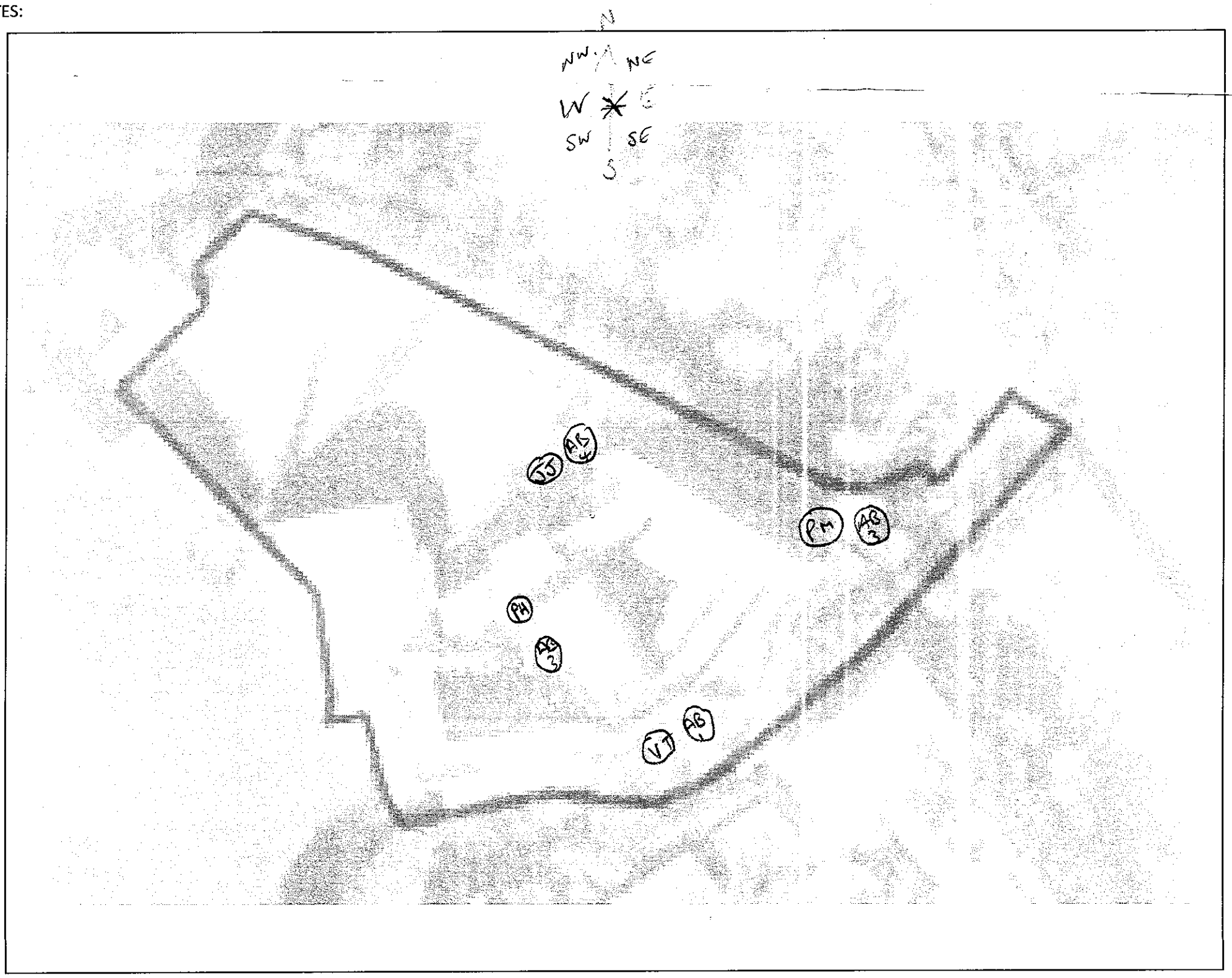


Bat Ultrasound Survey Record Sheet

Date	17/09/2014	Site	William Ellis School, Highgate Road, London, NW5 1RN	Sunrise/ Set Time	06:38	Ecologist	PH	Sheet No	1-1
Weather Data		Temperature °C	Humidity %	Cloud Cover Okta	Wind Bft Scale	Precipitation Y/N	Survey Type	DAWN	Start	0500
	Start	16.7°C	85%	8	0-1	N			End	0640
	End	16.5°C	95%	8	0-1	N	Detector	QUET	IANABAT	

Time	Map No	Forage	Comm	Direction	Peak Khz	Species?	Comment
0500							START SURVEY
0640							END SURVEY.
							NO BAT ACTIVITY RECORDED.

NOTES:

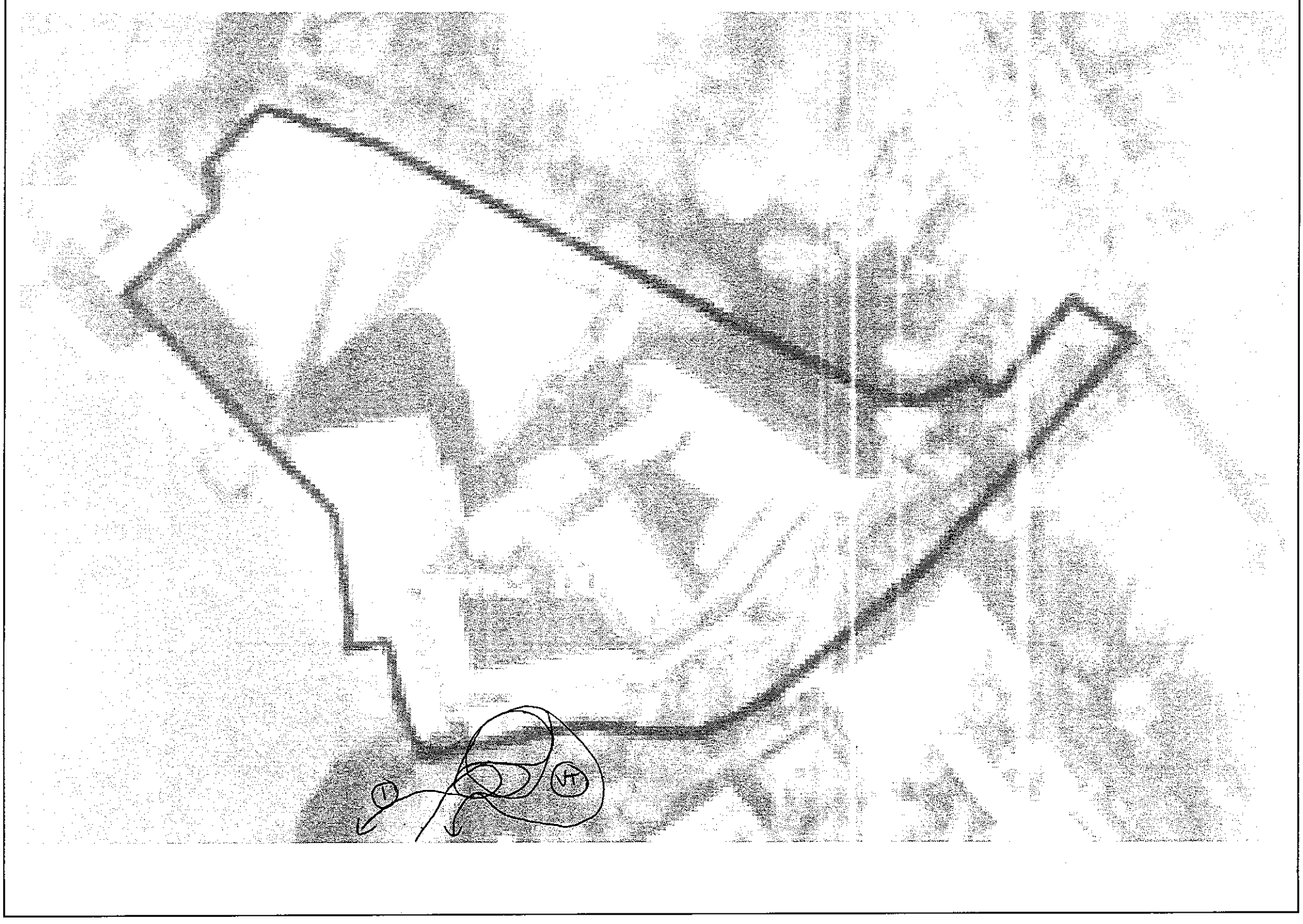


Bat Ultrasound Survey Record Sheet

Date	17/09/2014	Site	William Ellis School, Highgate Road, London, NW5 1RN	Sunset/Set Time	06:38	Ecologist	VT	Sheet No	1/1
Weather Data		Temperature °C	Humidity %	Cloud Cover Okta	Wind Bft Scale	Precipitation Y/N	Survey Type	DAWN	Start / End	
	Start						Detector	Batbox Duet + AB4		
	End									

Time	Map No.	Forage	Comm	Direction	Peak Khz	Species?	Comment
05:07	1	✓		Several	45	P.p	2 foraging. Over grass patch and along lines of parliament hill building and tree line leading to fields. Includes social calls.
05:43	–	✓		–	55	P.p	Briefly foraging amongst above mentioned bats. And again at 05:48. and 05:58 (staying longer)
06:22	–	✓	✓	SW	45	P.p	Final bat seen heading SW along tree line away from site. Another seemed to leave earlier around 06:15. Above foraging was continuous up until around 06:15.

NOTES: Foraging continuous until around 06:15. Mostly 45 P.p, Occasional 55 P.p.

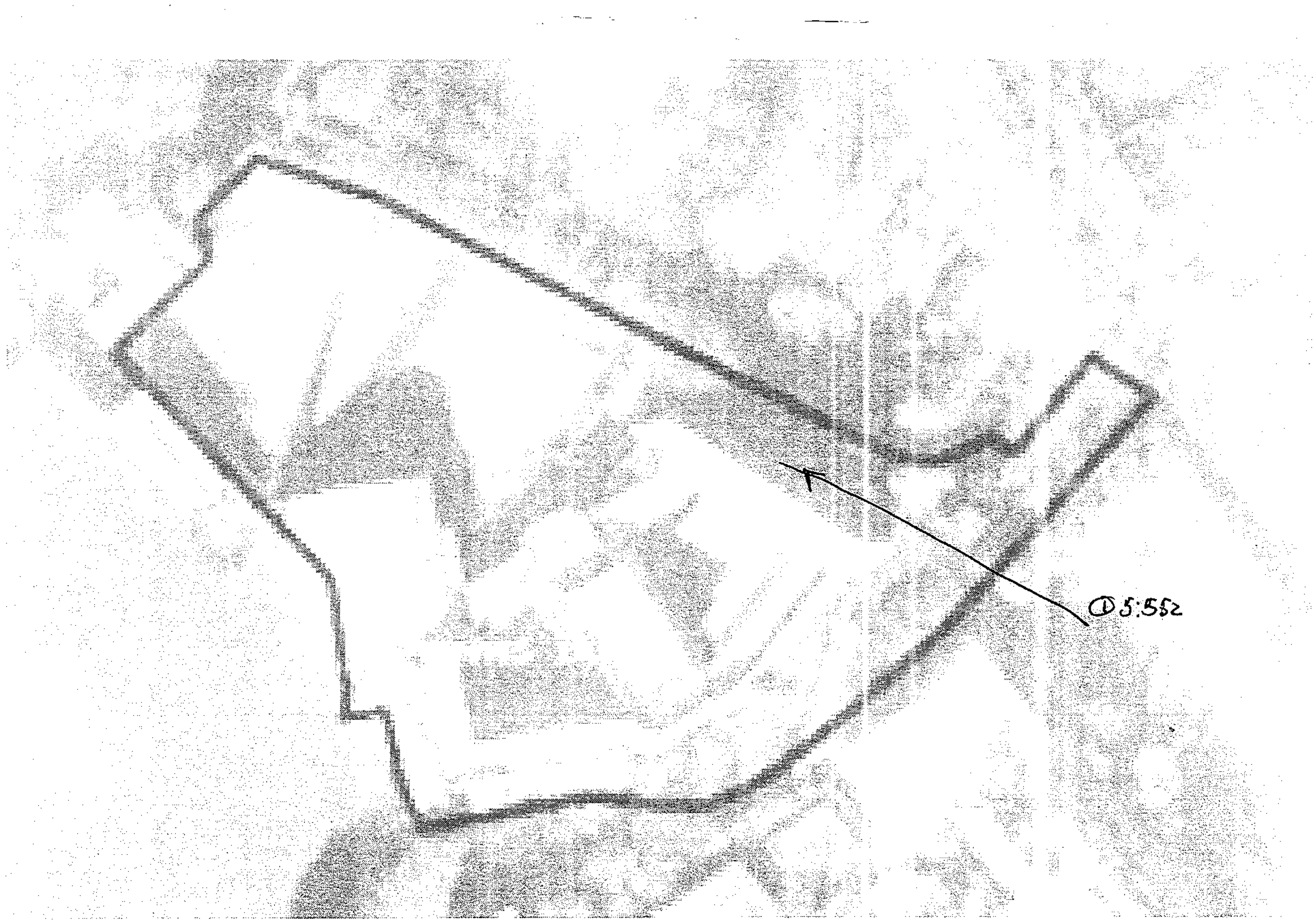


Bat Ultrasound Survey Record Sheet

Date	17/09/ 2014	Site	William Ellis School, Highgate Road, London, NW5 1RN			Sunrise/ Set Time	06:38	Ecologist	PM	Sheet No	1
Weather Data		Temperature °C	Humidity %	Cloud Cover Okta	Wind Bft Scale	Precipitation Y/N	Survey Type	DAWN	Start		
									End		
	Start						Detector	EM3+ Duet			
	End										

Time	Map No.	Forage	Comm	Direction	Peak Khz	Species?	Comment
5:52	①		✓	E-W	45	P.P	Single pass along building
6:06					"	"	Heard Not Seen.
6:10					"	"	" "

NOTES:



APPENDIX 8

Building Classification Form

General				Roof					Walls and windows						Cellar		Loft									
Building	Approximate construction date	Current usage	Number of stories (excluding loft)	Roof shape	Roof cover	Roof condition	Number of chimneys	Soffits	Walls	Cavity walls	Wall condition	Windows	Hanging tiles?	Wooden cladding?	Present?	Description	Exists	Loft access	Loft structure	Flying space within loft	Underfelt	Comments	Obvious access points recorded	Signs of bats	Comments	Bat roost potential assessment
1	1910's	*School*	3	Multi pitched with modern curved section	Red tile with metal sheet	good	5	Wooden And metal edge sheet	Brick and block with render	yes	good	Metal with secondary glazing , double glazing	no	no	unknown	-	none	no	-	-	-	School has sealed loft area, modern buildings at rear have floor to ceiling	Some gaps around soffits	none	Building has been extended many times and modern metal sheet roofs	low