The Sizewell C Project

6.3 Volume 2 Main Development Site

Chapter 14 Terrestrial Ecology and Ornithology

Appendix 14A8 Bats

Part 1 of 5

Revision: 1.0

Applicable Regulation: Regulation 5(2)(a)

PINS Reference Number: EN010012

May 2020

Planning Act 2008
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

SIZEWELL C DEVELOPMENT – MAIN DEVELOPMENT SITE: VOLUME 2, CHAPTER 14, APPENDIX 14A8 – Bats:

Documents included within this Appendix group are as follows:

- **APPENDIX 14A8 BATS**
- **ANNEX 14A8.1** – FIGURES (provided separately)
- **ANNEX 14A8.2** - DESK STUDY
- **ANNEX 14A8.3** – METHODOLOGY
- **ANNEX 14A8.4** - RESULTS
- **ANNEX 14A8.5** - SECONDARY DATA
- Annex 14A8.5 Amec Phase 1 Aldhurst Farm 2011
- Annex 14A8.5 Amec Aldhurst Farm Bat Survey 2012
- Annex 14A8.5 Amec Coronation Wood Bat Survey 2012
- Annex 14A8.5 Amec Sizewell Bat Survey Report 2007
- Annex 14A8.5 Amec Sizewell Bat Survey Report 2008
- Annex 14A8.5 Amec Sizewell Bat Survey Report 2009 (included in Part 2)
- Annex 14A8.5 Amec Sizewell Bat Survey Report 2010
- Annex 14A8.5 Amec Sizewell Bat Survey Report 2011 (included in Part 3)
- Annex 14A8.5 Amec Sizewell Hibernation Survey 2011
- Annex 14A8.5 Amec Upper Abbey Ecological Appraisal 2013

- Annex 14A8.5 Royal Haskoning Sizewell Power Station ISFSI and Car Park Extension Ecological Scoping Report 2008
- Annex 14A8.5 Galloper Wind Farm Chapter 5 ES Terrestrial Ecology
- Annex 14A8.5 Sizewell Land Management Annual Review 2013
- Annex 14A8.5 Sizewell Land Management Annual Review 2011
- Annex 14A8.5 Sizewell Land Management Annual Review 2012 (included in Part 4)
- Annex 14A8.5 Site Manager's Report May-Sep 2018
- Annex 14A8.5 Sizewell Annual Report 2014
- Annex 14A8.5 Sizewell B Annual Report 2017

- **ANNEX 14A8.6 - PRIMARY DATA**

- Annex 14A8.6 11H5.1 Hyder Cresswell 2013 Monitoring strategy
- Annex 14A8.6 Sizewell B Relocated Facilities Bat and Badger Technical Note [CONFIDENTIAL, provided separately]
- Annex 14A8.6 Sizewell B Relocated Facilities Bat Re-entry Emergence Survey 2019 Technical Note
- Annex 14A8.6 Bat Radio Tracking Drawings February 2016
- Annex 14A8.6 Bat Radio Tracking Report May 2016
- Annex 14A8.6 Automated Bat Detector Monitoring Report 2013-2014 (included in Part 5)
- Annex 14A8.6 Automated Bat Detector Monitoring Report 2013-2014 Figures
- Annex 14A8.6 Sizewell C Sandpits Technical Note [CONFIDENTIAL, provided separately]

NOTE:

Please note that the red line boundary used in figures within this document may have since been amended, and therefore does not reflect the boundaries in respect of which development consent has been sought in this application. However, the amendment to the red line boundary does not have any impact on the findings set out in this document and all other information remains correct.

VOLUME 2, CHAPTER 14: APPENDIX 14A8 – BATS

Contents

Tables

Plates

None provided.

Figures

Executive Summary

This appendix assesses the baseline conditions for the following bat species: Daubenton's bat (*Myotis daubentonii*); Natterer's bat (*Myotis nattereri*); noctule (*Nyctalus noctula*); Leisler's bat (*Nyctalus leisleri*); common pipistrelle (*Pipistrellus pipistrellus*); soprano pipistrelle (*Pipistrellus pygmaeus*); Nathusius' pipistrelle (*Pipistrellus nathusii*); serotine (*Eptesicus serotinus*); barbastelle (*Barbastella barbastellus*) and brown long-eared bat (*Plecotus auritus*); within the Zone of Influence (ZOI) of the Sizewell C power station at the main development site (hereafter referred to as the "proposed development"). Terrestrial mammals are addressed in **Appendix 14A9 –** Terrestrial Mammals.

All UK bat species are protected under Schedule 5 of the Wildlife and Countryside Act (Ref. 1.1) and as European Protected Species (EPS) under Schedule 2 of the Conservation of Habitats and Species Regulations (Ref. 1.2). Of the species identified within the ZOI of the proposed development site (hereafter referred to as the "site"), four bat species are further protected under Section 41 of the Natural Environment and Rural Communities (NERC) Act (Ref. 1.3): barbastelle, brown long-eared bat, noctule and soprano pipistrelle. Thirteen bat species are additionally listed on the Suffolk Biodiversity Action Plan (BAP) as a grouped bat assemblage (Ref. 1.4).

Desk-study data from the Suffolk Biodiversity Information Service (SBIS) have been obtained for bat records within 10 kilometre (km) of the site, and targeted surveys for bats have been carried out (first by Wood Group, formerly Entec and Amec Foster Wheeler) and then by Arcadis Consulting (UK) Limited (formerly Hyder Consulting, and hereafter referred to as Arcadis), including radio-tracking, transect surveys, automated detector surveys, tree and building assessments and roost inspections. This information has been used to determine the baseline conditions for bats within the ZOI of the site.

To ensure a robust Ecological Impact Assessment (EcIA) process, bat populations within the ZOI of the site have been assessed to determine whether or not they would qualify as Important Ecological Features (IEFs) as defined in Chartered Institute of Ecology and Environmental Management (CIEEM) guidelines on EcIA (Ref. 1.5). For each bat species, this assessment has included consideration of conservation status, distribution across the EDF Energy Estate, the presence of breeding and/or hibernation roosts and the availability and quality of foraging and/or commuting habitat. In addition, the bat populations have been assessed in accordance with the standard Environmental Impact Assessment (EIA) methodology used elsewhere within the **Environmental Statement (ES).**

On the basis of this assessment, the populations of bats within the ZOI of the site, that have been assessed as IEFs are as follows:

- barbastelle is considered to be an IEF at the national level under the CIEEM guidelines, and of high importance following the EIA-specific assessment methodology;

- Natterer's bat is considered to be an IEF at the county level under the CIEEM guidelines, and of medium importance following the EIA-specific assessment methodology;
- Noctule and serotine are considered to be a joint IEF at the local level under the CIEEM guidelines, and of low importance following the EIA-specific assessment methodology;
- Leisler's bat and Nathusius' pipistrelle are considered to be a joint IEF at the local (District) level under the CIEEM guidelines, and of low importance following the EIA-specific assessment methodology; and
- Daubenton's bat, noctule, serotine, common pipistrelle, soprano pipistrelle and brown long-eared bat are considered to be a joint IEF at the local (ZOI) level under the CIEEM guidelines, and of low importance following the EIA-specific assessment methodology.

On the basis of this assessment, barbastelle and Natterer's bat will be assessed as individual IEFs of national and county importance, respectively, within the EcIA.

The remaining species are of local importance and will also be assessed as IEFs, grouped as follows:

- Leisler's bat and Nathusius' pipistrelle will be assessed as a combined IEF, based on their "edge-of-range" status/rarity within the EDF Energy Estate;
- noctule/serotine will be assessed as a combined IEF as these are species adapted to foraging in open space (these are the "big bats" other than Leisler's bat); and
- Daubenton's bat; brown long-eared bat and pipistrelle species other than Nathusius' pipistrelle (i.e. common/soprano pipistrelles). These are the more common species but contribute to the overall bat assemblage.

The data presented in this Technical Appendix is also utilised to inform appropriate and required mitigation. The summary of the data that was used to inform the mitigation and the mitigation approach is presented in **Appendix 14C1A -** Bat Mitgation Strategy.

1. Bats

1.1 Introduction

a) Purpose of this appendix

1.1.1 This is an appendix to the Sizewell C power station at the main development site (referred to throughout this volume as the "proposed development") **Volume 2, Chapter 14** of the **ES** (Doc. Ref. 6.2). This appendix presents a description of the bat baseline for proposed development site (hereafter referred to as the "site") and its ZOI. Terrestrial mammals are addressed in **Appendix 14A9 –** Terrestrial Mammals.

b) Establishing Zone of Influence, study area and survey area

1.1.2 As detailed in **Appendix 14A1**, the extent of the Zol varies relative to the ecology and behaviour of individual ecological features. Details of the survey area and study area are provided in **Volume 2, Chapter 14** of the **ES**.

1.1.3 Any assessment of impacts on bats should consider variations in the home range of different UK bat species. The Bat Conservation Trust has developed an evidence-based methodology for the assessment of core sustenance zones (CSZs) (Ref. 1.6). With reference to planning and development the CSZ is defined as:

- The area surrounding the roost within which development work can be assumed to impact the commuting and foraging habitat of bats using the roost, in the absence of information on local foraging behaviour. This will highlight the need for species-specific survey techniques where necessary.
- The area within which mitigation measures should ensure no net reduction in the quality and availability of foraging habitat for the colony, in addition to mitigation measures shown to be necessary following ecological survey work.

1.1.4 Current figures for CSZs (as published in Ref. 1.7) are provided in **Table 1.1**. Details of the indicative commuting/foraging distances from roost locations for bat species resident within the UK are also provided along with the resulting Zol considered for each species for the purposes of impact assessments.

Table 1.1: CSZ radii and foraging and commuting distances from roosts for UK bat species whose range normally includes East Suffolk, as basis for ZOI.

Species.	CSZ Radius (km).	Commuting/Foraging Distances.		ZoI Considered.
		Average (km).	Maximum Cited (km).	
Common pipistrelle (*Pipistrellus pipistrellus*).	2	1–4 [a]	5–5.1 [b]	As CSZ.
Brown long-eared bat (*Plecotus auritus*).	3	0.5 [c]	3–3.3 [c]	As CSZ.
Soprano pipistrelle (*Pipistrellus pygmaeus*).	3	1.5–1.7 [d]	No available data.	As CSZ.
Noctule (*Nyctalus noctula*).	4	2.5–6 [e]	10–26 [f]	As CSZ.
Natterer's bat (*Myotis nattereri*).	4	No available data.	4 [g]	As CSZ.
Serotine (*Eptesicus serotinus*).	4	2–8.2 [h]	6–12 [i]	As CSZ.
Barbastelle (*Barbastellus barbastella*).	6*	4.5 [j]	18–20 [k]	10km**.
Daubenton's bat (*Myotis daubentonii*).	2	2–10 [l]	6–10 [m]	As CSZ.
Nathusius' pipistrelle (*Pipistrellus nathusii*).	3	6.5 [n]	No available data.	As CSZ.
Leisler's bat (*Nyctalus leisleri*).	3	4.2 [o]	5.75–13.4 [o]	As CSZ.

*Potential justification to increase CSZ to reflect landscape use by all bats within a population
** increased to 10km for ZOI (based on the distances travelled by bats radio-racked in this study).
References used to inform this table:
[a] Ref. 1.8; Ref. 1.9; Ref. 1.10; Ref. 1.11 and Ref.1.12
[b] Ref. 1.11 and Ref. 1.13
[c] Ref. 1.12; Ref. 1.14 and Ref. 1.15
[d] Ref. 1.11 and Ref. 1.12
[e] Ref. 1.8; Ref. 1.11; Ref. 1.12 and Ref. 1.16
[f] Ref. 1.12 and Ref. 1.15
[g] Ref. 1.12 and Ref. 1.17
[h] Ref. 1.9; Ref. 1.11; Ref. 1.12; Ref. 1.18 and Ref. 1.19
[i] Ref. 1.9 and Ref. 1.12
[j] Ref. 1.12
[k] Ref. 1.9; Ref. 1.11 and Ref. 1.20
[l] Ref. 1.9; Ref. 1.12; Ref. 1.13; Ref. 1.21; Ref. 1.22 and Ref. 1.23
[m] Ref. 1.11 and Ref. 1.12
[n] Ref. 1.12
[o] Ref. 1.11; Ref. 1.12 and Ref. 1.24

c) Structure of this appendix

1.1.5 This appendix describes the baseline conditions for bats within the site, with the ZoI being defined in detail in **section 1.1.1 b**.

1.1.6 This appendix has been set out as follows:

- **Section 1.2** sets out the approach and methodology used for obtaining the desk-study and secondary data, as well as the results of this data acquisition. The detail of the desk-study information acquired is presented in **Annex 14A8.2**, whilst a summary of the methodologies and results of secondary data are provided in **Annexes 14A8.3** and **14A8.4** of this respectively. Reports relating to secondary data are provided in **Annex 14A8.5**.
- **Section 1.3** sets out the approach and methodology for the collection of primary data and summarises the results of this work. Detailed information regarding the methodologies employed is provided in **Annex 14A8.3** and the detailed data underpinning these results are presented in **Annex 14A8.4**. Reports produced by Arcadis Consulting (UK) Limited (formerly Hyder Consulting, and hereafter referred to as Arcadis) are provided in **Annex 14A8.6** and reports produced by third parties (i.e. not Arcadis) are provided in **Annex 14A8.5**.
- Finally, **section 1.4** brings together all of this information into a detailed consideration of the baseline conditions for bats within the site and identifies those IEFs to be taken forward to be considered and assessed with the EcIA.

1.1.7 Figures summarising the ecological baseline with regard to bat species are presented in **Annex 14A8.1**.

1.2 Desk-study/secondary data

a) Approach and methodology

i. Desk-study

1.2.1 Five desk-study requests have been made (obtaining data from SBIS) for bat data since 2007:

- an initial request by Wood Group (formerly Entec and Amec Foster Wheeler) in 2007 for bat records within 3km of the survey areas, based on the site boundary at the time;
- a further request by Wood Group in 2009 for bat records within 15km of the 2009 survey area;

- an updated request for bat records by Arcadis in 2014 within 2km of the site;
- a further data request by Arcadis in 2015 for all records of bat roosts within 10km of the site; and
- a further data request by Arcadis in 2018 for all new records of protected species since the 2015 request.

1.2.2 The locations of international statutory designated sites within 30km, national statutory designated sites within 10km, and non-statutory designated sites within 2km were also obtained from the Defra's Multi Agency Geographic Information for the Countryside (MAGIC) website and SBIS. The citations detailing the reasons for the designations of these sites were reviewed to ascertain whether bats were cited as an interest feature for any of the identified sites. A full description of each designated site, together with all their notified interest features and assessment of their current ecological conservation condition, is set out in **Appendix 14A2 –** Designated Sites.

1.2.3 Aerial photographs and mapping of the site were reviewed in February 2015 to identify the presence of habitats and/or buildings with the potential to support roosting bats.

1.2.4 Additionally, the Suffolk BAP (Ref. 1.4), Suffolk's Priority Species and Habitats list (Ref. 1.25), the habitats and species of principal importance for biodiversity listed under Schedule 41 of The NERC Act, the Suffolk Bat Atlas (Ref. 1.26) and Mammals of Suffolk (Ref. 1.27) were also reviewed in relation to the habitats and/or species present, or likely to be present, within the site and its ZOI.

ii. Secondary data

Wood Group

1.2.5 A suite of bat surveys were undertaken by Wood Group between 2007 and 2012. The detailed methodologies, timings and results of these surveys are presented in the respective Wood Group reports as seen in **Annex 14A8.5** and summarised in **Annex 14A8.3** (methodologies) and **Annex 14A8.4** (results) and are therefore not repeated in detail here. **Table 1.2** provides a summary of the surveys carried out by Wood Group.

Table 1.2: Wood Group surveys between 2007 and 2012.

Survey.	Year/Report Reference.	Summary.
Tree assessments.	2007/1.28 2008/1.29 2010/1.30 2011/1.31 2012/1.32.	Inspection of trees from the ground to identify tree roosts or trees with the potential to support bat roosts which may be impacted by the proposed development across the site and at Aldhurst Farm.
Activity transect surveys.	2007/1.28 2008/1.29 2009/1.33 2010/1.30 2011/1.34 2012/1.32 and 1.35.	Walked or driven activity transects across the site and at Aldhurst Farm to provide information for the assessment of the level and nature of bat use.
Automated detector surveys.	2007/1.28 2008/1.29 2009/1.33 2010/1.30 2011/1.34 2012/1.32 and 1.35.	Deployment of static bat detectors across the site and at Aldhurst Farm to provide information for the assessment of the level and nature of bat use.
Landscape assessments.	2008/1.29 2009/1.33.	Assessment of aerial photographs and Ordnance Survey (OS) maps to identify potential bat roosts and commuting routes.
Building inspections and emergence surveys.	2008/1.29 2011/1.34.	Internal building inspections and associated emergence surveys to identify bats within buildings with bat roost potential.
Trapping surveys.	2009/1.33.	Trapping and examination of bats to identify whether lactating/breeding female barbastelle were present within the site.
Trapping and Radio-tracking surveys.	2010/1.30 2011/1.34.	Trapping and tagging of barbastelle for radio-tracking to aid in the identification of those areas of the site of importance, including core foraging areas, commuting routes and maternity colonies.
Emergence surveys.	2008/1.29 2010/1.30 2011/1.34.	Emergence surveys of known barbastelle tree roosts to provide a minimum population count.
Bat box surveys.	2010/1.30 2011/1.34.	Inspection of bat boxes to establish the species, and breeding status, of bats using the boxes.
Hibernation roost surveys.	2011/1.36.	Inspection of potential bat hibernation roosts to inform the assessment of bat use of the site.
Upper Abbey Farm building inspections.	2012 and 2013/1.37.	External and internal inspection of Upper Abbey Farmhouse and adjacent outbuildings to inform licence requriements prior to repair and restoration work.

Other secondary data

1.2.6 A number of surveys were carried out by Suffolk Wildlife Trust (SWT) (for in behalf of NGL) and a summary provided within their annual Sizewell Land Management Reports (1997 – 2018) as seen in **Annex 14A8.5**. These reports were reviewed for data related to the presence and/or signs of bats within the site.

1.2.7 Also reviewed for data relating to the presence and/or signs of bats were a report by Royal Haskoning (Ref. 1.38) relating to Sizewell B power station as seen in **Annex 14A8.5** and the **ES** for the Galloper Wind Farm Eastern Super Grid Transformer Project (Ref. 1.39) as provided in **Annex 14A8.5**.

1.2.8 The results of these reviews are detailed in **section 1.2.8 b)**.

b) Results

i. Desk-study

1.2.9 A summary of the status and legal protection of individual UK bat species at the local, county (Suffolk) and national level is provided in **Table 1.2.1** in **Annex 14A8.2**. Detailed desk-study records from SBIS are also provided in **Annex 14A8.2** (see **Table 1.2.2**); also detailed within this table are all barbastelle flight records within 10km and all flight records of those species considered to be less common, within the site (Daubenton's bat, Leisler's bat (*Myotis leisleri*), Nathusius' pipistrelle and serotine).

Designated sites

1.2.10 A number of international statutory designated sites and national statutory designated sites are present within 30km and 10km of the site respectively; however, none of the citations for these designated sites listed bats as a qualifying feature. Similarly, although a number of non-statutory designated sites were identified within 2km of the site, none of the citations for these sites listed bats as a qualifying feature.

Bat roosts

1.2.11 The 2015 desk-study data requested from SBIS identified the presence of 94 bat roost records within 10km of the site, dating from between 1994 and 2013. A further five bat roosts were identified following the desk-study request in 2018. Roost records were identified for seven species (Natterer's bat, noctule, common pipistrelle, soprano pipistrelle, serotine, barbastelle, and brown long-eared bat) and three species groups (*Pipistrellus* spp., *Plecotus* spp. and 'bat spp.'). A summary of these roost records is provided in **Table 1.3**.

Table 1.3: Bat roost records held by SBIS between 1994 and 2018 within 10km of the site.

Species.	Roost Records.			
	Breeding Roosts.	Roosts.	Probable Roosts.	Total Number of Roost Records.
Common pipistrelle.	5	10	1	16
Brown long-eared.	9	21	3	32
Soprano pipistrelle.	1	2	1	4
Noctule	-	5	-	5
Pipistrellus spp.	6	8	1	15
Natterer's	3	10	-	13
Serotine	1	-	-	1
Barbastelle	-	2	1	3
Plecotus spp.	-	-	2	2
Bat spp.	-	1	1	2
Total	25	59	10	94

1.2.12 Five roost records were identified within the site. Four related to Natterer's bat roosts at Upper Abbey Farm. In 2004 and 2016, it was noted that barn(s) at Upper Abbey Farm were used as a breeding roost, while no indication of roost type was provided for records in 2012 and 2013. In 2016, a further roost record at Upper Abbey Farm was identified, a brown long-eared bat breeding roost within a workshop. Roosting Natterer's bat, noctule, soprano pipistrelle and *Pipistrellus* spp. were identified directly adjacent to the site boundary, within bat boxes in Kenton Hills.

1.2.13 A number of the roost records were found to occur within the ZoI of the identified species:

- Three barbastelle roosts within the species CSZ (10km).
- Two barbastelle roosting in a barn in Westleton, 3.6km north of the site in 2003.
- A roost in a barn at Yoxford, 7.5km north-west of the site in 2013.
- A single barbastelle roosting in an agricultural building in Bramfield, 8.8km north-west of the site in 2011.

- Six noctule roost records were identified within bat boxes in Kenton Hills between 2011 and 2013. Noctule were not otherwise recorded roosting within the site or elsewhere in the Zol for this species.
- Soprano pipistrelle were recorded roosting in bat boxes in Kenton Hills in 2012 and 2013, as well as a maternity roost 1.3km north-west of the site in Theberton in 2012.
- A single common pipistrelle roost was recorded in the species Zol, 1.4km west of the site in Theberton.
- Eight brown long-eared bat roosts were identified within the species 3km CSZ.
- Two roosts, including one breeding roost, were located adjacent to the site boundary, at Ash Wood Cottages, in 2010.
- Two roosts were located less than 400m west of the site boundary, recorded in 2006 and 2012.
- One roost located in Leiston, 1.2km south of the site.
- One roost located in Theberton, 1.4km west of the site.
- One roost located in Middleton, 2.8km north-west of the site.
- One roost located at Walk Barn Farm, 2.8km north of the site.
- Within the serotine 4km CSZ, no confirmed roost records were identified. However, 12 of the 24 serotine bat records provided insufficient information to identify whether these records related to flight activity or roosts. Of these, one was located within the site at Upper Abbey Farm, while an additional four records of an unclear nature were located within the 4km Zol of serotine bats.
- As detailed in 1.40 as seen in **Annex 14A8.6**, a serotine maternity roost is also known to occur within Theberton House; however, no record of this roost was identified from desk-study data from SBIS. The nearest roost identified in the SBIS desk-study data was a breeding roost located 9km from the site. Whilst it is noted by Dietz *et al*. (1.12) that female serotine may occasionally forage up to 12km from their roost location, 9km is outside The Bat Conservation Trust-defined ZOI/CSZ for this species (4km).

Bat activity

1.2.14 The 2015 desk-study data requested from SBIS identified the presence of 319 bat activity records within 10km of the site, dating between 1994 and

2013. Activity records were identified for ten species (barbastelle; brown long-eared; common pipistrelle; soprano pipistrelle; Nathusius' pipistrelle Daubenton's bat; Natterer's bat; noctule; serotine, and Leisler's bat) and four species groups (*Plecotus* spp.; *Pipistrellus* spp.; *Myotis* spp. and "bat spp."). A summary of these records is provided in **Table 1.4**.

Table 1.4: Bat records held by SBIS between 1994 and 2013 within 10km of the site.

Species	Total Number of Activity Records.
Common pipistrelle.	92
Brown long-eared.	63
Soprano pipistrelle.	43
Noctule	24
Pipistrellus spp.	10
Natterer's	11
Serotine	23
Barbastelle	21
Myotis spp.	16
Bat spp.	5
Daubenton's bat.	7
Plecotus spp.	1
Nathusius' pipistrelle.	2
Leisler's bat*.	1
Total	**319**

*It has become apparent that there is significant overlap between the Leisler's bat, noctule and serotine group, and many calls cannot be identified to a species with confidence. Re-examination of a number of 'Leisler's bat' calls from 2010/2011 (**Annexes 14A8.3** and **14A8.4**) suggests many 'Leisler's bat' calls should be reclassified as belonging to this group, not to species. The reliability of this identification (from 2013) is unknown. While the Suffolk Bat Atlas (1.26) does record Leisler's bat, these records are primarily located at the north-western extent of the county. Although a point is noted at the location of the Scheme, based on the location and timing it is considered likely that it relates to survey work undertaken for the site by Wood Group.

1.2.15 Activity records were identified in the desk-study for serotine, barbastelle, Natterer's bat, brown long-eared bat, Daubenton's bat and soprano pipistrelle within the site, with all records located at Upper Abbey Farm.

1.2.16 Additional activity was recorded in close proximity to the site, with barbastelle, serotine, noctule, Nathusius' pipistrelle, Leisler's bat (unverified – see **Table 1.4**) and *Myotis* spp. all recorded at the south-eastern corner of Broom Covert. Activity records were also identified for serotine (in association with the known roost at Theberton House), for Natterer's bat (in association with the use of bat boxes within Kenton Hills), and for brown long-

eared bat (in association with the roost identified at Walk Barn Farm in Westleton).

1.2.17 Although included on the Suffolk BAP (Ref. 1.4), only a single lesser horseshoe bat (*Rhinolophus hipposideros*) has been recorded in recent years in Suffolk, at the north-western extent. This individual was recorded between 1996 and 2016 (Ref. 1.26). Suffolk is located well outside of the current distribution of lesser horseshoe bats, which are confined to Wales, western England and western Ireland (Ref. 1.41). Only two further lesser horseshoe bat records have been recorded within Suffolk over the last 100 years, the most recent of these during the winter of 1958 to 1959 in the west of the county (Ref. 1.27).

ii. Secondary data

Wood Group

1.2.18 As indicated in **section 1.2a**, and detailed in **Annex 14A8.3**, an extensive suite of bat surveys was undertaken by Wood Group between 2007 and 2012, across and beyond the site. The detailed methodologies, timings and results of these surveys are presented in the respective Wood Group reports as seen in **Annex 14A8.5** and are therefore not repeated here. **Table 1.5** provides a summary of the results of surveys carried out by Wood Group. A more detailed account of the respective results is provided in **Annex 14A8.4**.

Table 1.5: Summary of Wood Group bat survey results.

Survey	Summary of Results.
Desk-study.	Confirmed extensive use of the site and the surrounding area and landscape by bats, largely from data gathered by SWT.
Habitat (landscape) appraisal.	Confirmed a high-quality mosaic of habitats suitable for foraging, commuting and roosting bat species. The habitats were considered to be well established and mature, diverse in species composition and habitat type, and to offer many local roosting opportunities in farm buildings and mature woodlands/scattered trees. Also confirmed that there is generally excellent connectivity between the proposal site and the wider landscape, especially through the hedgerow network, and that the area is largely undeveloped. The main build area of the proposed main platform was confirmed to contain habitats that were likely to be of limited value for barbastelle.
Building surveys.	Buildings within the Upper Abbey Farm complex were considered to be of particular note, supporting brown long-eared bats (maternity roost), at least one common pipistrelle roost, a soprano pipistrelle roost and a Natterer's bat mating roost. Barbastelle were recorded within the barn, with call patterns suggesting presence in very low numbers (there was no evidence of barbastelle using the barn for breeding). The fire-damaged farmhouse was considered unlikely to support bats other than very small non-breeding roosts. Bats found hibernating included a single

Survey	Summary of Results.
	barbastelle, Daubenton's bat, Natterer's bat and probable brown long-eared bat (no more than three bats in total recorded on any one occasion). At least 49 Natterer's bats were recorded using the western end of Leiston Abbey in August 2011 (but with far fewer bats present earlier in the month, indicating that other roost site(s) are in use).
Bat box surveys.	A high proportion of bat boxes showed evidence of use by bats. Two larger roosts of Natterer's bat and soprano pipistrelle were identified. Bat boxes present are not of a design preferred by barbastelle, and none were recorded using the boxes.
Tree surveys.	Over 500 trees were identified as having medium or higher potential for roosting bats. The areas with the highest numbers were: Fiscal Policy woodland (126); Ash Wood (74); the track along the northern edge of Kenton Hills (57); Goose Hill (51); and woodland at The Grove (37). Not all trees were considered suitable for all species and/or all roost types. Only limited emergence surveys were undertaken, during which the maximum number of barbastelle counted at any one time (including juveniles) was 31 individuals. Eleven trees were identified at Aldhurst Farm with limited potential to support roosting bats, along with four buildings considered to contain features of limited roost potential.
Transect surveys and automated detector surveys.	Activity recorded within open areas (on automated detectors) was low. The highest levels of activity were recorded at commuting/foraging areas close to Ash Wood, Upper Abbey Farm bridleway, Goose Hill, the perimeter track around Kenton Hills and Nursery Covert, Fiscal Policy woodland, and Leiston Old Abbey. The large majority of automated detectors recorded barbastelle activity, indicating that barbastelle are widespread and use almost all of the habitats within the site and surrounding area (including Aldhurst Farm), although not to the same extent.
Radio-tracking surveys.	Barbastelle, Natterer's bat and brown long-eared bat (breeding females only of Natterer's bat and brown long-eared bat) were radio-tracked in 2010 and 2011 (pre- and post-breeding). Attempts to catch and tag Nathusius' pipistrelle and Daubenton's bat (to locate roosts) were unsuccessful. Nine serotine bats were trapped but not tracked, as they were not covered by the licence. A total of 22 barbastelle roosts were identified through radio-tracking; all roosts used by females and juveniles were located within trees, while two males were recorded roosting in buildings. The results of the radio-tracking showed a close reliance on the . EDF Energy Estate during these periods of time. The results of the first two seasons of radio-tracking are set out in **section 1.3.6i** alongside a period of later radio-tracking undertaken in 2014 to allow comparison between seasons.
Upper Abbey Farm building inspections.	Six bats were found to be using Upper Abbey Farmhouse as an autumn/winter roost – two Natterer's bat (January, 2013), one probable Daubenton's bat (October 2012), one confirmed Duabenton's bat (November 2012), one probable brown long-eared bat (January 2013) and one bat of undertermined species (December 2012). All individuals were found within the farmhouse cellar which was considered to offer a number of potential roost sites and suitable conditions for roosting bats.

Survey	Summary of Results.
	The farmhouse more generally was considered to have the potential to suppport roosting bats with small numbers of bat droppings found throughout the property and, in one location, feeding remains[1]. A single outbuilding to the east of the farmhouse was considered to have some potentail, primarily as a hibernation or feeding perch, although no evidence of recent use was identified.

Suffolk Wildlife Trust/NGL

1.2.19 A number of surveys were carried out by SWT (for on behalf of NGL) and a summary provided within their annual Sizewell Land Management Reports between 1996 and 2018 see - 1.43 to 1.63 in **Annex 14A8.5**. These reports identified incidental recordings of bat species throughout the site, in addition to the results of annual monitoring of up to 37 bat boxes located in Kenton Hills and Reckham Pits Wood.

1.2.20 Barns at Upper Abbey Farm have been found to provide at least occasional roosting locations for Natterer's bat, *Pipistrellus* spp. and brown long-eared bats since 1996 (the earliest Sizewell Land Management Report available) (Ref. 1.43). An unknown number of serotine bats were recorded in flight at Upper Abbey Farm for the first time in 2007 (Ref. 1.42).

1.2.21 Natterer's bats were recorded using barn(s) at Upper Abbey Farm as a nursery roost in 1996, 2000 and 2002 (Ref. 1.43, Ref. 1.44 and Ref. 1.45). They were also recorded using the barn at various times of the year in 1999, 2003, 2009, 2010, 2011, 2012, 2014 and 2015 (Ref. 1.46, Ref. 1.47, Ref. 1.48, Ref. 1.49, Ref. 1.50, Ref. 1.51, Ref. 1.52 and Ref. 1.53) as well as foraging along the bridleway at Upper Abbey Farm, and were observed emerging, along with soprano pipistrelle, from the barn in 2003 (Ref. 1.45).

1.2.22 A single barbastelle was recorded roosting within barn(s) at Upper Abbey Farm on an annual basis between 1996 and 1999 (Ref. 1.43, Ref. 1.54, Ref. 1.46 and Ref. 1.55). After an absence of three years, a single barbastelle was again recorded roosting in the barn at Upper Abbey Farm in 2003 (Ref. 1.45).

1.2.23 A brown long-eared bat nursery roost, first mentioned in 2009 (Ref. 1.48), was identified within a SWT loft workshop at Upper Abbey Farm. Surveys in 2015 (Ref. 1.53) found brown long-eared bat continued to be present with 12 recorded in October, and a single individual, on a single occasion, in December. Elsewhere within the site, Nathusius' pipistrelle were recorded in flight near Sizewell Wents in 2007 (Ref. 1.42).

[1] Note. extensive renovations have been undertaken at Upper Abbey Farmhouse since this survey work.

1.2.24 Annual monitoring of the bat boxes with Kenton Hills and Reckham Pits Wood identified use by a single noctule of a box at Reckham Pits in 2007 (Ref. 1.42), and use of boxes within Kenton Hills by soprano pipistrelle, pipistrelle spp., noctule and Natterer's bat between 1996 and 2016 (Ref. 1.43 to Ref.1.62). In October 2014 (Ref. 1.52) the presence of 50+ Natterer's bats within a single bat box indicated the box was being used as a maternity roost. Over 40 Natterer's were recorded in November 2016 (Ref. 1.62) across two bat boxes.

1.2.25 The most recent check of bat boxes within Kenton Hills was undertaken by SWT in September 2018 (Ref. 1.63). A total of five *Pipistrellus* spp. bats were identified from four bat boxes. Eleven further bat boxes showed signs of recent use.

Other secondary data

1.2.26 Surveys relating to developments for Sizewell B power station identified nine bat species: common pipistrelle, soprano pipistrelle, Natterer's bat, barbastelle, noctule, Daubenton's bat, brown long-eared bat, Leisler's bat (unverified – see **Table 1.4**) and serotine - see 1.38 in **Annex 14A8.5**. The proposed development area was assessed as having low potential to support roosting bats and the small size of the development area made it unlikely that it would be used as a significant resource even by individual foraging bats. The area covered by this survey work has subsequently been developed and today consists principally of hard standing. It is therefore considered unlikely that these areas are currently used to a significant degree by bats.

1.2.27 The Galloper Wind Farm Eastern Super Grid Transformer Project is located in arable fields to the west of Pillbox Field (south-west of Sizewell A power station). Survey work undertaken in 2006, 2007, 2011 and 2013 identified foraging and commuting activity by at least ten bat species within the survey area. It was, therefore, considered that the survey area provided potentially important foraging habitat for a number of common species, as well as a link between potential roosting and foraging locations see - 1.39 in **Annex 14A8.5**.

1.2.28 These surveys identified two confirmed bat roosts, and nine trees with bat roost potential, within the development footprint, as illustrated on **Figure 5.2** in 1.39 as provided in **Annex 14A8.5**. In addition, a further four bat roosts and 38 trees with bat roost potential were identified in the vicinity of the development. Information on the species recorded using these roosts was not provided. During soft felling of a tree under licence in September 2013, a roosting Natterer's bat was also discovered.

1.3 Field surveys – primary data

a) Approach and methodology

1.3.1 The survey work undertaken by Wood Group between 2007 and 2012 was designed to answer specific questions, adapting to new survey information and changing proposals, options and layouts as they arose. While this work was both comprehensive and valuable for informing the impact assessment, it did not allow for the assessment of either the likely size of the barbastelle population nor how this species use of local habitats within and around the site, spatially and temporally, varies between years.

1.3.2 The Arcadis surveys between 2013 and 2019 were therefore designed to fill any identified gaps in survey coverage, and to gain a better understanding of population size(s) and of temporal and spatial variability in the use of different habitats, in order to determine how bats (in particular, barbastelle) might be affected by the proposals.

b) Methods

1.3.3 The detailed methodologies and results of these surveys are presented in **Annexes 13A8.3 and 13A8.4** respectively and are therefore not repeated in detail here. **Table 1.6** provides a summary of the surveys undertaken by Arcadis. All stand-alone reports (including the automated detector (Ref. 1.64) and radio-tracking (Ref. 1.40) surveys) are provided in **Annex 14A8.6**.

Table 1.6: Arcadis surveys between 2013 and 2019.

Survey	Year	Summary.
Activity transect surveys.	2014 2015 2019.	Walked activity transects across specific locations within the site to provide additional information for the assessment of the level and nature of bat use.
Automated detector surveys.	2013 2014 2016 2019.	Deployment of static bat detectors across and around the site to provide information for the assessment of the level and nature of bat use.
Radio-tracking surveys.	2014	Trapping and tagging of barbastelle for radio-tracking: to aid in the assessment of the level of habitat use by barbastelle within and beyond the EDF Energy Estate; to identify further roost locations; and to identify any variations in adult male barbastelle activity in comparison to adult females and/or juveniles.
Building inspection surveys.	2015 2019.	External building inspections to identify those buildings within the site and ZOI with the potential to support roosting bats and subsequent update to these surveys at specific buildings identified as having the potential to be notably impacted by the proposed development.

Survey	Year	Summary.
Tree assessment surveys.	2015 2019.	Inspection of trees from the ground to identify tree roosts, and/or trees with the potential to support bat roosts, which may be impacted by the proposed development.
Corridor activity surveys.	2016	Ground-truthing manned surveys in areas identified as potentially important for commuting bats based on automated detector surveys.
Building emergence/ re-entry surveys.	2019	Emergence/re-entry surveys of Upper and Lower Abbey Farm and Ash Wood Cottages to determine the presence/absence of roosting bats.

c) Results

1.3.4 The results of surveys undertaken by, and on behalf of, Arcadis between 2013 and 2919, across the site and the wider ZoI are briefly summarised in **Table 1.7**. **Annex 14A8.4** provides a more detailed summation of these results, with full details provided where the results of these surveys have not been reported elsewhere. Where survey results have been reported in standalone documents these are provided in **Annex 14A8.5** and **Annex 14A8.6**.

Table 1.7: Summary of Arcadis survey results between 2013 and 2019.

Survey	Summary of Results.
Activity transect surveys.	Between six and seven bat species were recorded during activity transect surveys in 2014 and 2015. Common pipistrelle was the most frequently recorded species across all activity transects, followed by soprano pipistrelle. On the temporary accommodation campus transect route and green rail route transect route 3 (green rail route transect route 3), barbastelle was the third most frequently recorded species, but was absent from the Pillbox Field and Coronation Wood transects. On both the temporary accommodation campus transect route and green rail route transect route 3, activity peaked in May 2014, with noticeably lower activity levels in July 2014 (on the temporary accommodation campus transect, considered in part to be due to adverse weather conditions) and October 2014. Surveys of Pillbox Field and Coronation Wood were undertaken in September and October 2015 only, with activity in September 2015 found to be significantly higher. A single pass was recorded shortly after sunset at Upper Abbey Farm, where soprano pipistrelle have previously been recorded roosting. Early passes were recorded in the vicinity of the temporary accommodation campus transect route and along the green rail route transect route 3 (more so from common than soprano pipistrelle). During 2019 surveys of the sand pits at least five species were recorded. Common pipistrelle was the most frequently recorded species. While activity levels were higher in September 2019 than October 2019 activity lelves remained low compared to activity transect results gathered elsewhere on the EDF Energy Estate in previous years.

Survey	Summary of Results.
Automated detector surveys.	Barbastelle activity was recorded at all monitoring stations across and out with the site and in both years (2013 and 2014) (though not in every location during every monitoring event). Mean activity for barbastelle and Nathusius' pipistrelle activity was greatest in June (the largely pre-lactation maternity period), while mean activity for Myotis spp. was lowest during this period. Mean activity for "big bats" was highest in July and lowest in September/October. However, the highly-skewed nature of the data required detailed analyses to detect patterns obscured by the raw means, with activity often differing between seasons/years in different locations. The results of these analyses are therefore set out in more detail in **section 1.3.4 d)**. The data recorded indicated the likely absence of serotine and Leisler's bat roosts from the ZOI. The data also indicated the potential presence of barbastelle roosts within Goose Hill and in the vicinity of Broom Covert, and of noctule roosts near woodland at The Grove, eastern Goose Hill and Leiston Old Abbey woodland. *Myotis* spp. roosts were indicated by the activity patterns, consistent with the locations of known roosts in woodland at The Grove, Leiston Abbey and Kenton Hills bat boxes.
Radio-tracking surveys.	Twenty-seven barbastelle were caught during the radio-tracking surveys, of which none were already ringed, and 18 were tagged for radio-tracking (three adult males, 12 breeding females and three non-breeding females). In addition, a single non-breeding female serotine was caught and tagged. Soprano pipistrelle, common pipistrelle, Daubenton's bat, Natterer's bat and noctule were also caught but not tagged. In total, 285 bats were trapped in 2014. Tracking confirmed that Minsmere (to the north of the site) supported breeding barbastelle, providing both roosting and foraging habitat, and that there was interchange of bats between Minsmere and the EDF Energy Estate. Tagged barbastelle were recorded moving between the two areas on a number of occasions throughout the 2014 radio-tracking survey. Of the seven female barbastelle trapped in Minsmere, four were confirmed to be active within the EDF Energy Estate, whilst of the seven females trapped within the EDF Energy Estate, at least six were confirmed to be active within Minsmere. All three of the male barbastelle trapped within the EDF Energy Estate were recorded within Minsmere (no adult males were caught within Minsmere). One tagged female was recorded roosting in both locations. A wider foraging area was thus identified in 2014 than in 2011, with greater levels of foraging over Minsmere and the Eastbridge area recorded. The areas within the identified home ranges of the tagged bats (as defined by 95% Minimum Convex Polygon analysis[2]) reached beyond Westleton to the north, beyond Middleton to the west, east to the coast and south to the south-east of Leiston. A comparison of foraging areas as determined by radio-tracking in all three years is presented in **section 1.3.4d)**. A further fifteen barbastelle roosts were identified, nine confirmed to be within trees. Roosts were located in both the EDF Energy Estate and Minsmere, with an additional three roosts located outside of these areas, at Saxmundham and Reckford Bridge/Eastbridge Marshes. None of the previously identified roosts were used again by tagged bats. The preference for oak (*Quercus* spp.) trees, and for roosting behind raised/loose bark, was consistent with previous years. However, the

[2] The Minimum Convex Polygon enables the creation of a boundary around all fixes using the smallest possible convex polygon. This is a commonly used method but may overestimate the size of home ranges. (1.40, **Annex 14A8.6**).

Survey	Summary of Results.
	tree used most frequently, and by the highest number of tagged bats, was a dead Scot's Pine (*Pinus sylvestris*). The tagged serotine roosted for the duration of the radio-tracking surveys within the grounds of Theberton Farm (where access for the surveyors was not permitted), and was recorded foraging widely into the Royal Society for the Protection of Birds (RSPB) Minsmere Reserve, Minsmere Levels and around Goose Hill, woodland at The Grove, and Ash Wood, with further 'fixes' recording movement along the coastal edge.
Building inspection surveys.	Three building complexes were identified as possessing multiple features ranging from low to high potential to support bats (Ash Wood Cottages, Lower Abbey Farm and Upper Abbey Farm). Two buildings were identified as possessing features of low potential to support bats (Plantation Cottage and the Laboratory off Lovers Lane). A single building with no potential to support bats was identified (Walk Barn). Six of the 12 buildings identified for assessment were not evaluated in 2015 due to a lack of access permission[3]. Surveys in 2019 reassessed Ash Wood Cottages (confirmed as a brown long-eared bat roost), Lower Abbey Farm (four structures with negligible suitability, three structures with none/low suitability, three structures with low suitability, two structures with moderate suitability, one structure with high suitability and one structure confirmed as a brown long-eared bat roost) and Upper Abbey Farm (one structure with no suitability, one structure with negligible suitability, one structure with no/low suitability, two structures with low sutiability, three structures with high suitability and three structures confirmed as brown long-eared bat roosts). Further surveys in 2019 inspected 15 buildings associated with Sizewell B relocated facilities proposed works. Of these, 11 were assessed as having negligible or no bat roost suitability, three were assessed as of low suitability and one building was confirmed as a bat roost following the DNA analysis of droppings which identified common pipistrelle.
Tree assessment surveys[4].	Tree surveys were undertaken in areas not previously assessed. A single tree, located within a wooded strip between Black Walks and Ash Wood, was identified as a confirmed roost, due to the presence of a small number of likely bat droppings at the base of the identified bat roost feature. Nineteen trees within the surveyed area were identified as having high or very high bat roost potential. Twenty-two trees were identified as having medium potential, including a group of trees to the south-west of the Round House which were considered to have features suitable for bats, but which, due to access restrictions, could not be fully assessed. The reassessment of trees within Coronation Wood was undertaken in 2019 and where possible trees identified as having bat roost potential were climbed and where no evidence of use by bats found features were filled with expanding foam. Three trees of moderate suitability were identified, climbed and, following no

[3] The Round House, Potters Farm, Birchwood Farm, Old Abbey Farm, Leiston Old Abbey Farm, World War II Bunkers. See **Figures 14A8.6, Figure 14A8.7** and **Figure 14A8.8** for locations.
[4] High level tree assessments were additionally undertaken of land to the east of Eastbridge Road during Phase 1 surveys. This area now falls outside the main development site boundary and therefore the results of this survey work are not included here.

Survey	Summary of Results.
	evidence of use by bats filled with expanding foam. A further tree and three groups of trees were identified as requiring further survey before removal.
Corridor activity surveys.	West to east commuting was recorded at the crossroads of Fiscal Policy and Kenton Hills by common pipistrelle, soprano pipistrelle, "big bat" spp., and *Myotis* spp. with activity diminishing the further east into Kenton Hills surveyors were positioned, likely due to the dispersal of bats into the wider woodland. To the north, on the Upper Abbey Farm bridleway, commuting was recorded primarily by common and soprano pipistrelles with some *Myotis* spp. and some potentially commuting barbastelle. Commuting bats were primarily observed flying north to south along the bridleway. Overall, activity (incluidng foraging) was notably lower at the northern end of the bridleway[5]. A number of commuting barbastelle passes were recorded between 40 minutes and 1 hour after sunset at MS20 (which is a more open location within Goodrum's Fen), and commuting at Stonewall Belt primarily occurred on the more sheltered eastern side. Elsewhere, clear evidence of commuting (rather than foraging) was limited. Foraging activity from the bat assemblage known to be present on the site was recorded, to varying degrees, at all locations surveyed during corridor activity surveys.
Building emergence/re-entry surveys.	A maximum of 32 bats were recorded emerging from seven different emergence points at Ash Wood Cottages (June 2019), while between four and eight individuals emerged in May 2019. No bats were confirmed to have re-entered during the July 2019 survey, but it was considered likely, due to the degree of activity around known entrance points, that a proportion of the activity observed reflected re-entering bats. Although no echolocation calls were heard the presence of brown long-eared bats within the building during internal inspections means it is considered that this activity is likely to represent brown long-eared bats. At Lower Abbey Farm bats were observed emerging/re-entering from Building 1 (one confirmed re-entry and one possible re-entry in June 2019 (species unknown due to lack of echolocation calls) and one possible emergence from a common pipistrelle in July 2019), Building 2 (two confirmed re-entries and two likely re-entries in June 2019 (species unknown due to lack of echolocation calls)), Building 6 (one confirmed and one possible emergence in June 2019 (species unknown due to lack of echolocation calls)), Building 8 (one common pipistrelle re-entry in June 2019 and one common pipistrelle emergence in July 2019) and Building 11 (between 12 and 14 emergences in April 2019, three confirmed re-entries and the possibility of a number of others based on activity levels in June 2019 and 17 emergences and four possible emergence in July 2019). None of these bats were heard echolocating and as such species could not be confirmed although brown long-eared bat dropping were found during internal inspection at Lower Abbey Farm). In addition, it was considered possible that small numbers of bats may have emerged from Buildings 7 and 10 although this could not be confirmed. At Upper Abbey Farm bats were observed emerging/re-entering from Building 1 (three common pipistrelle and one soprano pipistrelle emerged in May 2019, two common pipistrelle, one common or soprano pipistrelle and two unidentified bat re-entered in June 2019 and one common pipistrelle, one soprano pipistrelle and one unidentified bat emerged in July 2019), Building 5 (two identified bats re-entered in July 2019), Building 10 (one brown long-eared bat and one unidentified

[5] Corresponding with the static detector results identified at this location (see 1.62).

Survey	Summary of Results.
	bat re-entered in June 2019) and Building 11 (two common pipistrelle were confirmed emerging in June 2019 along with a possible emergence of a soprano pipistrelle, two common pipistrelle and one identified bat re-entered in July 2019). The three low suitability and one confirmed roost building at Sizewell B relocated facilities proposed works were subject to between one and three emergence/re-entry surveys. No emergence was identified from the Temporary Visitor Centre or Technical Training Centre. One emergence (in July 2019) and one re-entry (in August 2019) of bats of an unknown species were recorded for the Operation Training Centre. During surveys at the Civil Workshop seven emergences (common pipistrelle, soprano pipistrelle and unknown bat species) were recorded in July 2019, two common pipistrelle re-entries were recorded in August 2019 and three soprano pipistrelle and six bats of unknown species were recorded emerging in September 2019.

d) Synthesis of information

1.3.5 This section provides a combined summation of the results of trapping and radio-tracking surveys undertaken by Wood Group and on behalf of Arcadis between 2009 and 2014. The standalone results of individual trapping and/or radio-tracking surveys are summarised in **Annex 14A8.4** and provided in full detail in separate reports in (Ref.1.33 (2009)), (Ref. 1.30 (2010)), (Ref. 1.34 (2011)) as seen in **Annex 14A8.5** and 1.40 as seen in **Annex 14A8.6**.

1.3.6 A further synthesis is also provided for the results of static detector surveys between 2013 and 2014. The standalone results of these surveys are summarised in **Annex 14A8.4** and provided in full detail in 1.64 in **Annex 14A8.6**.

i. Trapping and radio-tracking studies

Trapping data

1.3.7 The trapping data from 2009, 2010, 2011 and 2014 revealed that:

- no barbastelle trapped in 2014 had previously been ringed;
- the proportion of adult female barbastelle in breeding condition was high (100% in 2010; 78% in 2011; and 80% in 2014);
- very few male barbastelles were caught;
- only small numbers of noctule were caught (largely males, though a single breeding female was caught in Minsmere in 2014);
- within the EDF Energy Estate and Minsmere, only small numbers of male (adult and juvenile) Daubenton's bats were caught – a single (non-

breeding) adult female Daubenton's bat was caught in Minsmere (2014);

- common pipistrelle was trapped within the EDF Energy Estate in all years, but not caught in Minsmere (2014 trapping only);
- soprano pipistrelle was trapped in greater numbers than common pipistrelle within EDF Energy Estate in 2010 and 2011 – in 2014, these proportions were reversed; and
- 71% of the soprano pipistrelles caught at Minsmere were juveniles.

1.3.8 Most of these differences are likely to be a function of sample size and species behaviour rather than an indication of presence/absence or actual species demographics.

Roosts used by barbastelles

1.3.9 The identified barbastelle roosts are described in **Table 1.4.27** of **Annex 14A8.4**. These were grouped within five areas: at Scottshall Covert in Minsmere, and at four locations within the EDF Energy Estate (Kenton Hills/Nursery Covert, Ash Wood, Plantation Cottages/Lower Abbey Farm, and woodland at The Grove). Minsmere and Ash Wood were considered to be key roost areas because of the high number of potential roost trees as well as the number of identified roosts.

Roost-switch distances for barbastelles

1.3.10 **Table 1.8** presents the distances between roosts (roost-switches) made by female barbastelles in each of the three years of tracking.

Table 1.8: Roost-switch distances of breeding females.

Year	Minimum (m).	Maximum (m).	Mean (m).	Comment.
2010	488	2006	1203	Based on 13 roost-switches.
2011	105	1741	857	Based on 14 roost-switches (switches involving only juveniles removed).
2014	175	2920	904	Based on eight roost-switches of breeding females (excludes switches involving a male and a non-breeding female); discounts consecutive nights in which the same roost was used. The single roost switch recorded by a male bat was considerably further, at 6.7km.

Distances travelled by barbastelles

1.3.11 The distances travelled from roosts in each of the three years of tracking are presented (by gender) in **Table 1.9**. The distances measured are straight-line distances between the furthest recorded location and the roost used during the daytime beforehand. Males were not recorded regularly travelling further than females, although it is possible that longer distances travelled by male barbastelle may have been missed as the sample size was small and males were not tracked to the full extent of their range, due to priority being given to tracking female barbastelle.

Table 1.9: Distances travelled from roosts (where specified).

Year	Gender (No. in Sample where Specified).	Minimum (km).	Maximum (km).	Mean (km).
2010	Female (breeding) (4).	1.3	2.8	2.3
2011	Female (breeding).		3.1	
2011	Female (adult).			2.3
2011	Juvenile		2.3	1.8
2014	Male (3).	4.0	7.2	5.2
2014	Female (breeding) (10).	2.6	9.1	4.4
2014	Female (non-breeding) (2).	4.1	4.3	4.2

Home range analyses: barbastelle data

1.3.12 Home ranges calculated using different techniques in each of the three years for three different cohorts (breeding females, non-breeding females and males) are presented in **Table 1.10**. Note that homes ranges for males are an under-estimate, as males were not tracked to the full extent of their ranges.

Table 1.10: Home ranges calculated using different techniques in each of the three years for three different cohorts[6].

Analysis	Sample Size.	Areas in Hectares (ha).		
95% Minimum Convex Polygon breeding females.	**No. of bats assessed.**	**Minimum**	**Maximum**	**Mean**
2010	6	34	388	160
2011	7	128	547	272
2014 (excludes Bat 4).	10	117	2020	666

[6] The different methods of calculating home ranges are explained in 1.38 in **Annex 14A7.6**

Analysis	Sample Size.	Areas in Hectares (ha).		
95% Minimum Convex Polygon non-breeding females.	**No. of bats assessed.**	**Minimum**	**Maximum**	**Mean**
2010	0	N/A	N/A	N/A
2011	2	57	320	188
2014	3	415	951	703
95% Minimum Convex Polygon males.	**No. of bats assessed.**	**Minimum**	**Maximum**	**Mean**
2010	1	112		
2011	1	490		
2014	3	558	1782	990
95% cluster breeding females.	**No. of bats assessed.**	**Minimum**	**Maximum**	**Mean**
2010	6	4	175	69
2011	7	20	287	142
2014	10	37	819	286
95% cluster non-breeding females.	**No. of bats assessed.**	**Minimum**	**Maximum**	**Mean**
2010	0	N/A	N/A	N/A
2011	2	64	82	73
2014	3	231	680	398
95% cluster males.	**No. of bats assessed.**	**Minimum**	**Maximum**	**Mean**
2010	1	112		
2011	1	216		
2014	3	115	425	269
95% kernel breeding females.	**No. of bats assessed.**	**Minimum**	**Maximum**	**Mean**
2010	6	39	410	188
2011	7	203	508	323
2014	10	153	1275	567
95% kernel non-breeding females.	**No. of bats assessed.**	**Minimum**	**Maximum**	**Mean**
2010	0	N/A	N/A	N/A
2011	2	101	380	241
2014	3	502	1049	739

Analysis	Sample Size.	Areas in Hectares (ha).		
95% kernel males.	**No. of bats assessed.**	**Minimum**	**Maximum**	**Mean**
2010	1	653		
2011	1	664		
2014	3	615	1875	1055

1.3.13 The analysis was extended to determine core areas within each animal's home range, defined by 50% of kernel density estimate (following Hillen *et al.* (1.65)). The core areas were compared with the site boundary for the proposed development construction. The resulting percentage overlaps are shown in **Table 1.11**.

Table 1.11: Percentage overlap of 50% kernel core areas of adult breeding female barbastelle within the proposed development construction site footprint.

2014 50% Core Overlap (in Order of Greatest Overlap).			
Bat number.	**Total area (m^2).**	**Overlap area (m^2).**	**Percentage overlap (%).**
Bat 6.	1,766,650	865,909	49.01
Bat 17.	1,585,903	546,338	34.45
Bat 16.	786,975	164,555	20.91
Bat 1.	1,103,958	166,183	15.05
Bat 7.	1,274,964	10,794	0.85
Bat 2.	904,947	0	None
Bat 10.	2,086,272	0	None
Bat 13.	1,282,472	0	None
Bat 18.	942,877	0	None
Bat number.	**Total area (m^2).**	**Overlap area (m^2).**	**Percentage overlap (%).**
Bat 11.	1,126,269	880,110	78.14
Bat 17.	1,283,438	713,045	55.56
Bat 6.	674,118	299,074	44.37
Bat 9.	1,083,685	462,478	42.68
Bat 13.	1,628,983	631,769	38.78
Bat 8.	790,531	294,312	37.23
Bat 20.	766,666	275,220	35.90
Bat number.	**Total area (m^2).**	**Overlap area (m^2).**	**Percentage overlap (%).**
Bat 2.	365,854	362,098	98.97
Bat 3.	175,501	171,512	97.73

2014 50% Core Overlap (in Order of Greatest Overlap).			
Bat 6.	1,367,030	912,412	66.74
Bat 5.	1,452,967	846,006	58.23
Bat 1.	581,004	281,834	48.51
Bat 4.	76,183	30,342	39.83

Assessment of barbastelle foraging areas from radio-tracking studies

1.3.14 **Table 1.12** provides a summary of the key foraging areas that were identified across the EDF Energy Estate, its surrounds and RSPB Minsmere Reserve following radio-tracking surveys in 2010, 2011 and 2014.

Table 1.12: Key foraging areas identified for barbastelle during radio-tracking surveys in 2010, 2011 and 2014.

Year	Key Foraging Areas.	Comments
2010	Fiscal Policy woodland.	Used by two tagged pregnant barbastelles.
	Upper Abbey Farm bridleway.	Used by three tagged pregnant barbastelles.
	Near Lover's Lane.	Used by one tagged pregnant barbastelle.
	Arable fields to the north of Kenton Hills.	Used by four tagged pregnant barbastelles.
	North-eastern area of Sizewell Marshes Site of Special Scientific Interest (SSSI).	Used by two tagged pregnant barbastelles.
	Greenhouse Plantation and pasture west of Abbey Lane.	Used by one tagged pregnant barbastelle.
	Theberton House parkland.	Used by one tagged pregnant barbastelle.
	Leiston Old Abbey.	Used by one tagged pregnant barbastelle.
	Buckle Wood west of Leiston .	Used by the only male bat tagged.
2011	Ash Wood and Black Walks.	Used by all tagged adult females and juveniles.
	Goose Hill.	Used by all tagged adult females and two juveniles.
	Upper Abbey Farm bridleway and Leiston Old Abbey woodland.	Used by all tagged adult females and seven juveniles.
	Woodland at The Grove and fields to the east of The Grove.	Used by two tagged adult females and one juvenile.
	Kenton Hills and Nursery Covert.	Used by four tagged adult females, three juveniles and one male.
	Arable fields to the north of Kenton Hills.	Used by four tagged adult females and four juveniles.
	North-eastern area of Sizewell Marshes SSSI.	Used by six tagged adult females, one juvenile and one adult male.

Year	Key Foraging Areas.	Comments
	Sizewell Marshes SSSI south of Grimseys and Leiston Carr.	Used by two tagged adult females, three juveniles and one adult male.
	Sandy Lane and the area to the south of Sandy Lane.	Used by two tagged adult females and one juvenile.
	Greenhouse Plantation and pasture to the west of Abbey Lane.	Used by two tagged adult females.
	Sandypytle Plantation and north of Lower Abbey Farm.	Used by one tagged adult female.
	Eastbridge and Minsmere New Cut.	Used by two tagged adult females and one adult male.
	Area near Lover's Lane and the sewage works.	Used by one adult female, one juvenile and one adult male.
2014	The Minsmere area of Scottshall Covert into Westleton Walks and Dunwich Heath.	Used by nine adult breeding females, two adult non-breeding females and one adult male.
	Minsmere Levels to the north-west of Eastbridge.	Used by six adult breeding females and two adult males.
	Plantation Covert and Black Walks.	Used by six adult breeding females.
	Minsmere Levels between Sizewell and Minsmere.	Used by four adult breeding females and one adult male.
	Ash Wood.	Used by one adult breeding female, one adult non-breeding female and one adult male.
	Kenton Hills.	Used by two adult breeding females.
	Nursery Covert.	Used by one adult breeding female and one male.

1.3.15 Of particular note were reduced levels of foraging activity within Sizewell Marshes SSSI during radio-tracking surveys in 2014, in comparison to radio-tracking surveys undertaken in 2010 and 2011 (these were undertaken earlier in the year).

ii. Automated detector surveys 2013–2014 – assessment of foraging areas

1.3.16 These results are set out in 1.64 as provided in **Annex 14A8.6** which also specifies the precise locations of monitoring stations referenced in the following section.

1.3.17 In all cases, it is important to note that the numbers of passes recorded by static detectors demonstrate only relative bat activity, and not bat numbers. It is not possible, from these data, to distinguish between twenty bats passing once, and one bat passing twenty times. Relative bat activity is used to determine the importance of different areas to bat species/species groups

and should not be used to infer where the greatest number of individuals may be found. For reasons set out in detail in Ref. 1.64 as provided in **Annex 14A8.6**, it is also not valid to compare metrics such as mean bat passes between species (nor to compare activity levels with other sites recorded/analysed using different methods).

Key points

1.3.18 The following points are noted from the 2013/14 work:

- Barbastelle activity over the six seasons monitored varied between 5.2 mean passes per night and 11.9 mean passes per night, with activity in both years highest in June (maternity, largely pre-lactation; Season 1 (S1)) and lowest in July/August (S2), which covers lactation and the start of colonies dispersing.
- In contrast, "big bat" activity was very high in one season (22.2 mean passes per night in July/August 2013), and otherwise varied from 2.2 to 8.6 mean passes per night. In both years, activity was lowest in September/October (S3; mating and pre-hibernation).
- For *Myotis* spp., activity over the six seasons varied between 3.6 mean passes per night and 8.8 mean passes per night. Activity was lowest in June, and the latter two seasons were similar within each year (all seasons lower, by season, in 2014 than 2013).
- The activity of Nathusius' pipistrelle varied from 1.8 to 3.5 mean passes per night and accounted for less than 1% of overall activity recorded. Earlier work as provided in 1.34, **Annex 14A8.5** suggested that numbers peaked in spring and late summer/early autumn, and that this may have been related to migration. The automated detector monitoring in 2013/14 started after any potential spring peak, but the higher levels of activity recorded in June than September/October do not support the migration theory. Relative activity in June was higher than in the other two seasons.
- Common/soprano pipistrelle activity varied between 294 and 378 mean passes per night, with no obvious pattern between seasons/years in the raw data.

1.3.19 These patterns were drawn from examination of the "raw means" and need to be interpreted with caution because of the highly-skewed nature of the data. Analysis of the data using techniques that took this characteristic of the data into account revealed the following:

- Seasonal differences in the number of total nightly bat passes observed were highly statistically significant for all species groups, indicating

seasonal activity patterns. Bat activity was highest in S1 for barbastelle, Nathusius' pipistrelle and the combined pipistrelle group, and highest in S2 for the *Myotis* spp. and "big bat" species groups.

- There were strongly significant differences in the observed bat pass rate, as measured as bat passes per hour. This indicates that seasonal differences in the number of bat passes recorded are not simply a result of differences in night length, and hence nightly sampling period.

- In some species or species groups, seasonal patterns in total nightly bat passes differed from seasonal patterns in nightly bat pass rate. This was likely to be due to interactions between activity levels and the longer observation period (night length) in S3, which allows opportunity for increased total bat passes but tends to reduce the bat pass rate value.

- Variations in nightly temperature explained some of the variation in bat activity recorded. Minimum nightly temperature was positively related to the number of bat passes and the bat pass rate, such that on warmer nights, higher levels of bat activity was recorded. This effect was recorded in all of the species or species groups, except the *Myotis* spp. group.

Interpretation by species

- Barbastelle were widely distributed, being recorded at every monitoring station in each of the two years (where deployed in both years), though were less active south of Kenton Hills. However, for individual monitoring stations, activity varied between years and between seasons. No monitoring station had consistently high activity in every season, and high activity in one season was not necessarily repeated in the same season the following year. However, in any one monitoring event (i.e. over one season), activity tended to be relatively consistent (with a few exceptions). This may indicate that barbastelle adapt their behaviour to roost location and/or prey availability (this may also partly explain the greater overlapping of home-ranges as seen in the radio-tracking study). Nonetheless, the indication from the raw data that relative activity overall was higher in S1 was borne out by the more detailed analyses that took the skewed nature of the data into account. For both the total number of passes, and the bat pass rate, bat activity was significantly higher in S1. There was no significant effect of year on the number of bat passes.

- Little attempt was made to separate the "big bat" species into noctule, Leisler's bat and serotine. For "big bat" species, the subsequent analyses (taking the skewed distribution of the data into account)

demonstrated a significant increase from S1 to S2, with a steep decline from S2 to S3. There was no significant effect of year on the number of bat passes.

- As described in 1.64, as provided in **Annex 14A8.6**, little attempt was made to separate the *Myotis* spp. recorded into Natterer's bat and Daubenton's bat, though the former is likely to be much more common. For *Myotis* spp., the subsequent analyses similarly confirmed strong seasonal differences, with activity lowest in S1, highest in S2, and considerably lower in S3 (the bat pass rate did not differ significantly between S1 and S3). Numbers of passes were significantly lower in 2014 than in 2013.

- For Nathusius's pipistrelle, the pattern was similar to that of barbastelle, with the number of bat passes highest in S1, lower in S3 and lowest in S2 (though similar in S2/S3). There was no significant effect of year on the number of bat passes.

- While no obvious pattern of activity was discernible from the raw means for 'all pipistrelle species', the subsequent analysis revealed a significant seasonal difference in the number of pipistrelle passes recorded. The number of bat passes was highest in S1, decreased in S2 and further declined in S3. Numbers of bat passes were significantly higher in 2014 than 2013, the opposite trend to that seen for *Myotis* spp.

Evidence of potential roosts

1.3.20 A number of potential roosts were indicated by the automated detector data (some of this activity may relate to commuting behaviour from which it may be possible to locate roosts):

- Activity which suggested the presence of a barbastelle roost (in addition to the previously identified roosts), was recorded in Goose Hill (relatively close to previously identified roosts), with a further possible roost in the vicinity of Broom Covert.

- Activity which suggested the presence of a "big bat" roost (likely noctule) nearby was identified near one or both of the monitoring stations in Ash Wood and/or within woodland at The Grove, in the eastern part of Goose Hill and within Leiston Old Abbey woodland. Grimseys (which is known to support barbastelle) may also support roosts.

- Activity which suggested the presence of a *Myotis* spp. roost nearby was consistent with the known Natterer's bat roosts in woodland at The Grove, Leiston Abbey and the bat boxes in Kenton Hills; early activity also suggested a possible roost in Ash Wood.

- Woodland at The Grove may also support a roost of brown long-eared bats. The area around Plantation Cottages may support a common or soprano pipistrelle roost.

Interpretation by location

1.3.21 In relation to specific areas, the following patterns of behaviour were indicated from the automated detector data:

- Barbastelle more frequently commuted north-south than east-west from Ash Wood, though it is also possible that they did not use linear features to fly away from the wood. Very little activity was recorded on the south-west of Ash Wood, suggesting that the linear feature here is of low importance.
- Barbastelle activity at Black Walks and the northern end of woodland at The Grove was high, suggesting links to the north beyond the EDF Energy Estate (including to the area of Plantation Cottages, where there are known roosts). Woodland at The Grove itself was one of the more important areas for barbastelle, particularly in the first season of monitoring (though note that the monitoring station here covered only a small area of this feature). It also appears to be important for "big bats" and *Myotis* spp., with suspected/known roosts present.
- The "linear corridors" heading north, monitored at three points (along the Eastbridge Road (north of the junction with the Upper Abbey Bridleway); at the north end of Black Walks; and to the north of The Grove) were all well-used by barbastelle, particularly the corridor located within Black Walks (which lies between Plantation Cottages and Ash Wood). The two more eastern routes (Black Walks and The Grove) were also used by "big bats", much less so for *Myotis* spp.
- Goose Hill was identified as important for barbastelle, "big bats" and *Myotis* spp., with activity varying with season and inconsistencies between locations, even when only a few hundred metres apart. The highest single peak for any species group was recorded at the monitoring station located to the east of (i.e. outside, though in close proximity to) the site boundary.
- At the south-eastern corner of Goose Hill, where the detectors were located adjacent to wet grassland foraging habitat, the rides appeared to be of greater importance for barbastelle, "big bats" and pipistrelle (including Nathusius' pipistrelle), while the foraging habitat appeared to be used more by *Myotis* spp. (note that only a small proportion of the foraging habitat would have been sampled). That said, the field was probably used more consistently by "big bats" than the rides. There

was much less bat activity at the location of the proposed crossing from Goose Hill across the Sizewell Marshes SSSI to the main platform.

- Habitat within the north-western corner of Goodrums Fen generated higher levels of barbastelle activity (in terms of recorded passes, and not necessarily individuals) in almost all monitoring seasons than other habitat of this type (or similar) located in and around the Sizewell Marshes SSSI. In the first year, foraging appeared to be focused in the early part of the evening, as has been noted in other surveys (detector and radio-tracking, where barbastelle was regularly seen, foraging consistently but in low numbers). It is important to note, however, that foraging activity in the more open areas covered by these monitoring stations may be under-recorded, partly because activity may be at a distance from the recorder, and partly because barbastelle reduce the amplitude of their calls when catching prey, which makes them harder to detect when hunting. These areas also had some importance for "big bats" and *Myotis* spp.

- Although the corridor linking Ash Wood to Hilltop Covert via Stonewall Belt was used by barbastelle, "big bats" and *Myotis* spp., the data did not suggest that this belt of vegetation is a strong commuting route for barbastelle, at least not early in the evening when this species is more likely to use linear features; nor did this seem to be the case for other species.

- There were high levels of barbastelle activity along the Upper Abbey Farm bridleway in the location of the farm; these were much reduced at the monitoring station only a short distance to the north. The sheltered part of the track appears to have greater importance as a foraging area than as a linear corridor to the north. This was also the case for *Myotis* spp., though "big bats" did not use this corridor to any great extent.

- A potential western commuting route was explored, running between Leiston Old Abbey woodland and Eastbridge, along the Eastbridge Road. This area did not record significant numbers of bats, but was used by all species, including Nathusius' pipistrelle. Higher numbers of *Myotis* spp. were recorded here. The route is connected to both Upper Abbey Farm bridleway and Leiston Old Abbey woodland, where high levels of activity were recorded.

- Leiston Old Abbey woodland, Fiscal Policy woodland and the track along the northern edge of Kenton Hills all met the criterion of an overall "bat hotspot" on five occasions out of six (though for Fiscal Policy woodland, this almost entirely comprised pipistrelle activity). There were distinct differences in the species' use of these areas, with "big bats" and *Myotis* spp. very active in Leiston Old Abbey woodland, and barbastelle and *Myotis* spp. more active along the Kenton Hills track.

For species other than pipistrelle, activity was always lower in Fiscal Policy woodland than along the track.

- The peripheral ride through the southern part of Kenton Hills was well used at its eastern end by barbastelle (less so to the west); a similar pattern was seen for *Myotis*. This woodland track was not frequently used by "big bats", despite occasional use of bat boxes in Kenton Hills by noctule.

- The arable fields were monitored along tree-lines which extended into them. Very little activity was recorded along the western-most tree-line (parallel to, and east of, the Upper Abbey Farm bridleway), whilst the eastern tree-line (running north from Nursery Covert) generated high levels of pipistrelle activity, including Nathusius' pipistrelle. Of particular interest is that the high levels of barbastelle and *Myotis* spp. activity recorded at the western part of the Kenton Hills track were not reflected in higher levels of activity in the eastern monitoring point.

- The fields to the south, which are adjacent to habitat that is intended to provide improved foraging opportunities for bats in the short- to medium-term, largely generated low levels of bat activity, with the exception of Broom Covert.

- Only very low levels of barbastelle and "big bats", and slightly higher levels of *Myotis* spp., were recorded in Coronation Wood.

1.3.22 "Bat hotspots", as illustrated on **Figures 6a** and **6b** in 1.64 as provided in **Annex 14A8.6**, were determined based on relative activity (as noted relative bat activity is defined in terms of the numbers of bat passes recorded in this study, and does not correlate to the numbers of bats or to published criteria):

- Three-quarters of the monitoring stations were classified as "bat hotspots" in one or more season (i.e. mean passes per night for a single recording season from all species combined exceeded 300). Much of this activity related to common/soprano pipistrelle, both of which are widespread and common. These are illustrated on **Figure 6a** in 1.64, **Annex 14A8.6**, which illustrates the number of occasions a monitoring event met the criterion of a hotspot.

- Sixteen monitoring stations met the criterion for a 'bat hotspot' where pipistrelle activity comprised less than 90% of the total on at least one occasion. Of these, only four (along Stonewall Belt, on the Upper Abbey Bridleway, within Goose Hill and on the southern edge of Goose Hill) are within the site boundary. Four were close to the site boundary; the remainder are beyond it. These are illustrated on **Figure 6b** in 1.64, **Annex 14A8.6**.

1.4 Baseline conditions – bat features and their importance

a) Introduction

1.4.1 This section describes the bat baseline and assesses the ecological value of each of the bat features identified. This assessment is then used, in conjunction with a description of the extent and magnitude of the predicted impacts of the scheme, to carry out the detailed EcIA presented in **Volume 2, Chapter 14** of the **ES**.

1.4.2 To comply with both the CIEEM guidelines for EcIA (1.5) and with the standard EIA methodology used elsewhere within the **ES**, both methodologies have been used to evaluate the receptors. Full details of both assessment methodologies are presented in **Volume 1, Chapter 6** of the **ES** and **Appendix 14A1** – Introduction to the Ecological Baseline.

1.4.3 There are no formally accepted guidelines for the valuation of bats as an IEF (i.e. that guide the determination of "importance"). The Bat Mitigation Guidelines (1.66) assigns a broad nature conservation value to roosts of different status but notes that these require regional interpretation. Wray *et al.* (1.67) published a proposal for valuing bats in EcIA (using a scoring system), but this has not been widely adopted. This is possibly because it over-values the roosts of common species, and because the valuation of commuting/foraging habitat includes a broad-brush estimation of bat numbers which are both difficult to estimate and have low thresholds. The principle of valuing foraging and commuting habitat is, however, useful and has been adopted here.

1.4.4 The criteria used specifically to assess the importance of the bat species/species groups within the Zol of the site are set out in **Table 1.13** and **Table 1.14**.

Table 1.13: Criteria for assessing the importance of the bat species/species groups within the ZOI of the site.

Source of Data	Published Data.		Information Derived from Project Data (inc. Local Desk-Study Information) Supported by Professional Judgement based on Known Species Ecological Traits.			
KEY to SCORE.	**Conservation Status.**	**Status UK/Suffolk (1.68) [Select Highest Rating].**	**Status within the EDF Energy Estate.**	**Breeding Roosts (Maternity) within the ZOI.**	**Hibernation within the ZOI.**	**Use of Habitats within the ZOI for Foraging/ Commuting.**
Red [score 3]	+ Habs. Dir. Annex II [additional importance applied if species is qualifying feature of a Special Area of Conservation (SAC)].	Nationally rare International Union for Conservation of Nature (IUCN) Critically Endangered or Endangered.	Population apparently centred on the EDF Energy Estate (for at least part of the year); 50+ individuals rarest/rarer species .	Maternity colony of rarest/rarer species within the EDF Energy Estate.	Majority of individuals likely to hibernate within the EDF Energy Estate and adjacent areas.	High reliance on habitats present within the EDF Energy Estate (inside or outwith the construction site boundary).
Amber [score 2]	+ NERC Act.	Nationally uncommon /less common IUCN Vulnerable or Near Threatened.	Fewer than 50 rarest/rarer species; 50+ more common species. *Note these are very broad estimates.*	Maternity colony of more common species within the EDF Energy Estate; rarer species outside the Estate but within ZOI.	Hibernation within ZOI very likely; within the EDF Energy Estate probable.	Moderate reliance on habitats present within the EDF Energy Estate (based on data and species preferences); higher reliance on habitats outside of the Estate.
Green [score 1]	EPS only.	Common/ widespread IUCN Least Concern.	Present in lower numbers than listed for the amber category (in low or very low numbers).	No evidence of maternity roost within the EDF Energy Estate; more common species outside the Estate but within ZOI.	Majority of individuals are likely to hibernate outside the EDF Energy Estate (or outside the ZOI).	Low reliance on habitats present within the EDF Energy Estate; species considered to be generalist and adaptable.

This matrix has been used to apply consistency to the assessment of different species. The categories are broad and not weighted, and the scores applied to individual factors for each species are based both on information collected and on professional judgement. The data on numbers of individuals are very broad estimates based on a combination of: roost/trapping data; relative species activity and detectability; and 'typical' species behaviour (from published literature sources). Supporting data is outlined in the following sections. The geographic context of importance is a sum of the scores applied to individual factors. The boundaries between categories are based on professional judgement; other interpretations may be equally valid.

Table 1.14: Criteria for assigning the geographic context of importance of the bat species/species groups within the ZOI of the site.

Geographic Importance: Local.	Geographic Importance: County.	Geographic Importance: Regional.	Geographic Importance: National.
A score of 6–10	A score of 11–13.	A score of 14–16.	A score of 17+ international if species is qualifying feature of a SAC.
	The boundaries between these are subjective based on an even distribution of possible scores between the three categories.		

b) Description and assessment of ecological features

1.4.5 This section describes the bat ecological baseline and, for each bat receptor, assesses the ecological value of that feature. Figures have been provided to aid the interpretation of the bat baseline, presented in **Annex 14A8.1**.

i. Feature: barbastelle

Description

1.4.6 The status and distribution of barbastelle at the local, county and national levels are outlined in **Table 1.2.1** in **Annex 14A8.2**. This species is one of the rarest in the UK (despite its relatively wide distribution) (1.69) and, in addition to its inclusion on Annex II of the Habitats Directive (1.70), is listed as a priority species within Section 41 of the NERC Act (1.3) and on the Suffolk BAP (1.4).

1.4.7 The British pre-breeding population was estimated at 5,000 in 1995 (4,500 in England, 500 in Wales) (1.71), with a range currently thought to extend mainly over southern and central England and Wales. However, confidence in this estimate is low. Often cited, it was based purely on an assumption of the number of individuals that would be likely to be needed to maintain the population over its UK distribution (as understood in the early 1990s). In 2018, a recent assessment of Britain's Mammals (1.68) concluded that there was insufficient evidence to determine any kind of population estimate and classed the population as 'vulnerable'.

1.4.8 Work undertaken by Zeale (1.72) indicated that the number of known maternity colonies in ~2008, prior to his study, was just 18 (his study identified a further six in south-west Wales). This is now understood to be a considerable underestimate and highlights the poor state of knowledge until very recently (as an example, intensive survey has doubled the number of km^2 known to support barbastelle in Wiltshire – from 95 to 194 – over the last two to three years (1.73). Advances in technology are allowing new colonies to be identified, but these records tend to be held by voluntary groups, treated as confidential and/or retained in 'grey literature'.

1.4.9 Insufficient maternity colonies have been identified to determine "typical" colony size, though the University of Bristol (1.74) suggests that "*10–20 females are typically found in nursery roosts*". Altringham (1.13) indicates "*small nursery roosts, 10–20 females, rarely up to 100*", but this is based on European data, with roosts more common in buildings (unlike the UK). There are seven SACs in the UK where barbastelle is a primary reason for site selection, and two further sites where this species is a qualifying feature, but not a primary reason for site selection. Estimated population sizes are available for four of these sites: two at 11 to 50 individuals (but one of these is, atypically, a maternity colony based in a building); and two at 51 to 100.

For the remaining five sites, barbastelle is simply recorded as 'present'. Confidence in these numbers is unstated. A more recent study carried out for the Norwich Northern Distributor Road (1.75) recorded peak counts of between 55 and 59 bats (adults and juveniles) emerging from a single tree-roost; this was considered atypically high (but, as noted, there is insufficient evidence to determine typicality).

1.4.10 As noted, the barbastelle has been poorly studied until very recently. Using modelling, Zeale (1.68) determined that this species is "*highly dependent on large areas of mature woodland"* and "*limited in its distribution by summer climate"*. It is of note that he used two models. The second, which was used to predict the presence of maternity colonies, used all maternity colonies then known to 'train' the model. None of these were located in East Anglia. However, research from Italy indicates that the barbastelle can also exist in non-forested open landscapes (1.76) and may have been over-looked in habitats previously considered atypical. In Wiltshire, barbastelle have been recorded throughout the county, often in wooded landscapes, but also foraging and roosting on the fringe of urban areas, commuting across and foraging in very open landscapes such as Salisbury Plain, and even in the centre of a small town on a well-lit site (1.70).

Roosts

1.4.11 A total of 28 trees have now been confirmed as having been used by roosting barbastelle during the studies described in **section 1.3**. Additionally, two buildings were recorded being used by single male barbastelle in 2010 (Roost (R) 10) and 2011 (R22). There are also five roosts where the approximate location indicates the roost is almost certainly in a tree (R4, R32, R34, R35, R36) and two roosts where neither the precise location nor roost structure could be confirmed (R33, R37). Overall, these roosts are distributed as far west as Saxmundham, almost as far east as the coast, as far north as Scottshall Covert, Minsmere, and as far south as the edge of Leiston. The roosts furthest to the south (R10) and west (R33, R34) were only recorded as used by male bats, but use by untagged bats (i.e. those not followed through the radio-tracking studies) clearly cannot be ruled out.

1.4.12 Roosts used by female barbastelle identified during radio-tracking surveys in 2010 and 2011 were primarily located within the EDF Energy Estate, with the exception of a roost (R12) used briefly within Hangmans Wood (north of the EDF Energy Estate) in 2010. In contrast, only five of the 15 new roosts identified during radio-tracking in 2014 were located within the EDF Energy Estate. The remaining roosts identified in 2014 were located within the RSPB Minsmere Reserve (six) or elsewhere beyond the EDF Energy Estate (four). Note that bats were only trapped within the EDF Energy Estate in 2010/11, and there and in Minsmere in 2014, but capture location in 2014 did not define subsequent activity.

1.4.13 Full details of all identified barbastelle roost locations and characteristics are provided in **Table 1.4.27** in **Annex 14A8.4**.

1.4.14 Activity recorded on static detectors which suggested the presence of a barbastelle roost (in addition to the previously identified roosts), was recorded in Goose Hill (though the previously identified roosts are relatively close), and possibly in the vicinity of Broom Covert.

1.4.15 In 2011, a further two-night roosts (not provided with a roost number) were considered to have been used. The precise location of these roosts could not be determined but were considered to be in the vicinity of Greenhouse Plantations and the Minsmere New Cut (i.e. to the west and north of the EDF Energy Estate, respectively).

1.4.16 Barbastelle are known to switch roost regularly (1.77), and radio-tracking to date confirms this variability, with tagged bats found to be using a number of roosts within the radio-tracking period in all years of study. Only two roost locations were found to be used by tagged and tracked barbastelle in more than one year: R9 and R13, both located within Ash Wood, were used by tagged barbastelles in both 2010 and 2011.

1.4.17 Tagged bats in 2014 were distributed between a number of day roosts on any one night (most commonly five or six), and each used between one and four roost sites during the study, although not all day-roost locations were confirmed each day for each bat. A similar picture was seen in 2011; tagged bats were distributed between slightly fewer roosts (three or four) on any day, but each used between one and five roosts sites during the period they were tracked.

1.4.18 Mean roost-switch distances were around 1km. When comparing this to other studies which is summarised in 1.34 of **Annex 14A8.5**, there appears to be much variation between colonies, which may reflect, in part, the relative availability of roost sites between studies. There are significant clusters of trees with potential for supporting barbastelles in these woodland blocks, with Ash Wood supporting the greatest number of potential trees within the EDF Energy Estate. Scottshall Covert similarly has a high number of mature oak trees with potential for barbastelle roosting.

1.4.19 Twenty-two of the 28 confirmed tree roosts were in oak trees (79%). The remaining six tree roosts were elm (*Ulmus* spp.), two pine trees (*Pinus* spp.), willow (*Salix* spp.), sweet chestnut (*Castanea sativa*), and alder (*Alnus* spp.). Of the 28, 20 roosts were located behind raised/lifted/loose bark (71%). These preferences have also been observed in a number of other radio-tracking studies in England (including 1.78).

1.4.20 A preference for quiet locations well away from woodland edges, as identified in radio-tracking studies such as Greenaway (1.79) and Russo *et*

al. (1.78), has not been replicated during the present studies. Of the 28 confirmed tree roosts, six were directly on woodland edge, whilst another was at 5m from the edge, and another at 10m. A further seven were within 11–20m of the edge, with seven more within 21–30m. Over half (15) were therefore within 20m of woodland edge. Three of those located on the edge of woodland are adjacent to a track used frequently by dog-walkers.

1.4.21 Summer roosts were almost always located more than 6m above the ground, and often considerably higher (up to 20m). The position of roosts did not appear to indicate a pattern to the direction in which a roost feature faced, with loose bark recorded on both the northern and southern sides of roost trees. There was also no clear preference for the extent of ground cover: the shrub layer was generally dense for roosts located in 2011; less so for those located in 2010.

1.4.22 The status of the roost in the barn at Upper Abbey Farm was unclear: peak activity was recorded in May to June and August to September (based on available data). It was suggested this could represent spring use by a maternity group in poor weather, a mating roost in late summer, males and non-breeding females roosting singly, and/or bats visiting just to forage.

1.4.23 One tree (R27), appeared to be functioning as a mating roost, based on the presence of several females and a male (though the latter's testes did not appear to be fully in breeding condition at the time of capture). Elsewhere in England, barbastelle have been recorded at underground swarming sites (1.12).

1.4.24 Barbastelle hibernate in trees, buildings, caves and mines, though appear to use underground sites only in very cold weather (1.79). Greenaway (1.80) noted winter roosts in trees (usually dead and among holly understorey) and sometimes in buildings or underground sites. It is very likely that barbastelle remain on site during the winter. A single hibernating barbastelle was recorded in 2011 in the fire-damaged farmhouse of the Upper Abbey complex.

Colony structure and size

1.4.25 It remains difficult to draw a firm conclusion about the size of the maternity colony using the EDF Energy Estate. There were a limited number of locations suitable to erect mist-nets or harp-traps to catch bats (and the weather on some trap-nights further reduced the locations sampled), so it is likely that only a proportion of the barbastelle population has been sampled through trapping.

1.4.26 The highest number of individuals counted concurrently from two trees, in 2011 (this included adult and juvenile bats), was 31.

1.4.27 A similar number of individuals (a minimum of 27) can be inferred from the 2014 study seen in 1.40 of **Annex 14A8.6**, which combined radio-tracking and emergence surveys. Simultaneous emergence surveys were only conducted on two trees. From day roost records, tagged bats were distributed between five other trees and, although counted within the 27, may not (all) have been roosting alone. In addition, none of the barbastelle trapped in 2014 had previously been ringed (despite using a proportion of the same trapping locations). From this, it would not be unreasonable to estimate a colony size greater than 50 (though perhaps likely to be closer to 50 than 100).

1.4.28 Non-breeding female bats also appeared to roost within maternity roost trees, and to move with other breeding females and juveniles. In addition, in 2014, one of the male bats roosted for eight or nine days with breeding and non-breeding females in Roost R27 (Nursery Covert) and was present with at least 16 other bats when an emergence survey was undertaken. The other two males trapped in 2014 were recorded roosting in the Grimseys area (Bat 3) and towards Saxmundham (Bat 5); as these roosts were not precisely located, it is not possible to know if they roosted alone.

1.4.29 Other studies (1.78) have found barbastelle colonies broken into sub-groups. From the results of 2010/11, it was not possible to determine if the bats using the EDF Energy Estate were isolated or a sub-group within a larger colony. The 2014 radio-tracking results confirmed exchange between the EDF Energy Estate and Minsmere, which demonstrates that they are not restricted to the EDF Energy Estate but may be isolated within this part of Suffolk due to the apparent lack of suitable woodland habitats within the wider surrounding area.

Use of the EDF Energy Estate and surrounding areas

1.4.30 Three radio-tracking surveys were undertaken at varying points during the year - June 2010 as seen in 1.30 of **Annex 14A8.5**; late July/early August 2011 as seen in 1.34, of **Annex 14A8.5**; and mid-August 2014 as seen in 1.40 of **Annex 14A8.6**, to facilitate the assessment of three key periods (pre-breeding, post-breeding and the commencement of colony dispersal/mating). Through these surveys, barbastelle have been confirmed to use a wide range of habitats across the EDF Energy Estate throughout the bats' active season. This was supported by static detector surveys, which in 2013/2014 recorded (variable) barbastelle activity at every monitoring station in both years (where deployed for both years) as seen in 1.64, **Annex 14A8.6**. Recorded activity varied between years and seasons, suggesting an element of adaptability to roost location and prey availability. Analysis of static detector activity indicated that activity levels in both years were highest in June (maternity, largely pre-lactation) and lowest in July/August (lactation and the start of colony dispersal).

1.4.31 It is apparent that barbastelle use the EDF Energy Estate all year round, with radio-tracking surveys in 2010 as seen in 1.30 of **Annex 14A8.5** and 2011 as seen in 1.34 of **Annex 14A8.5** confirming the importance of this area for barbastelle during the main breeding period. The adjacent area of Minsmere also supports breeding barbastelles, and significant interchange between the two areas in the latter part of the active season has been confirmed through radio-tracking.

1.4.32 During the pre-lactation period, bats were recorded regularly flying from Ash Wood and/or woodland at The Grove in the north through Goose Hill to the sheltered eastern section of the Sizewell Marshes SSSI, north of Grimseys. As found during both the earlier (Wood Group) transect and later static (SM2) surveys, this was used regularly for early foraging, before bats moved to other foraging areas. Although not possible to determine numbers from radio-tracking or static detector surveys, Wood Group considered that these sheltered areas of Sizewell Marshes SSSI represent an important primary foraging area for small numbers of barbastelle in the early part of the night due to the low but consistent number of barbastelle passes recorded within this area. Periods of sustained foraging were recorded elsewhere, with frequent visits back to the roost areas of Ash Wood and woodland at The Grove.

1.4.33 The core foraging zone identified from the (post-birthing) 2011 radio-tracking consisted of woodland blocks, adjacent scrubby habitats and sheltered grazing marsh (including that described previously) as seen in 1.34 of **Annex 14A8.5**. The foraging areas of breeding females and juveniles were centred on Ash Wood and the woodland adjacent to Plantation Cottages, with the juvenile bats foraging consistently in these areas before extending their foraging further afield. The breeding female bats were all recorded in these areas, with tree roosts in Kenton Hills also being used. The majority of bats moved roosts from Ash Wood to the woodland adjacent to Plantation Cottages before moving to Leiston Old Abbey woodland, and there was a notable amount of movement between the roost in Leiston Old Abbey woodland and those at Plantation Cottages. The later static detector surveys confirmed the continued importance of the Black Walks/Ash Wood/Plantation Cottages area, with woodland at The Grove also of high importance.

1.4.34 In 2014, the main foraging areas for breeding females at the end of the breeding season appeared to be centred at a number of locations: around Kenton Hills and Goose Hill; towards Ash Wood; around Lower Abbey Farm and Black Walks; to the north of Eastbridge; and in Minsmere, around Scottshall Covert and north into Dunwich Heath. A number of more wide-ranging bats provided clusters of activity north, around Dunwich into Dunwich Forest, and south, around The Walks south-east of Leiston. This variation may be in part a consequence of the greater focus on the Minsmere area during 2014 compared to previous years of radio-tracking, but the results of

the automated detector surveys indicate that this is a genuine result of seasonal variation in foraging strategies.

1.4.35 The area comprising Kenton Hills/Nursery Covert was highlighted as a key foraging area across all three years of radio-tracking (see **Table 1.11**). The static surveys echoed this, with high relative activity along the track passing along the northern edge of Kenton Hills, and along the peripheral ride circling further south. However, much less activity was recorded within Fiscal Policy woodland, just to the west, or within the treelines that extended into the arable areas from the northern edge of Kenton Hills. Unlike 2011, there was limited activity in 2014 in the vicinity of Leiston Old Abbey (this seasonal shift was also noted to an extent during the 2013/14 static detector surveys).

1.4.36 The Upper Abbey Farm bridleway was identified as a key foraging area in early transect and static surveys, and through the 2010/11 radio-tracking. The 2013/14 surveys also highlighted the importance of this area for foraging, though not necessarily for commuting: activity levels only a short distance to the north of Upper Abbey Farm were noticeably reduced. The static surveys indicated this area was important in five out of six monitoring events. For unknown reasons, it appeared less important in the late summer of 2014 (this was also indicated by the radio-tracking surveys of 2014).

1.4.37 More open, grazing marsh habitats were also well-used. The preference for foraging in wetland habitat by barbastelle has been recorded at other locations. Zeale *et al*. (1.20) recorded a strong preference to forage in riparian vegetation and deciduous woodland at two sites (Hampshire and Devon). In these studies, barbastelle were found to forage predominantly in vegetation on the periphery of waterbodies rather than over open waterbodies; it was considered that this was due to riparian and deciduous woodland habitats typically supporting high moth abundance.

1.4.38 In 2010/11, the areas of the Sizewell Marshes SSSI, and to the east of woodland at The Grove and Goose Hill, were used by many of the tracked bats. The area north-east of Eastbridge also appeared to be significantly used for foraging by the breeding females and the juveniles in 2011, as they extended their range from the core foraging zone to have multiple centres of activity. In 2014, the area of the Minsmere Levels (which comprises more open grazing marsh habitat with a ditch network and open wetland pools) both to the north-west and to the east of Eastbridge was used more widely and frequently than previously recorded. Even when considering only those bats caught within the EDF Energy Estate (with the exception of one bat for which there was limited data), all six female bats caught in the EDF Energy Estate were recorded using the Minsmere Levels during the 2014 surveys. Activity levels amongst tagged barbastelle within the Sizewell Marshes SSSI to the south of Kenton Hills were noted to be reduced in 2014 in comparison to levels recorded during previous radio-tracking surveys in 2010 and 2011.

This may have been an artefact of the number of bats trapped (only a small sample are trapped in any tracking exercise), or a genuine seasonal variation; Wood Group also considered this area to be used by fewer bats than the sheltered north-eastern areas of the Sizewell Marshes SSSI. Barbastelle activity recorded on static detectors in 2013/14 similarly found activity levels to be reduced south of Kenton Hills and in Sizewell Marshes SSSI to the south.

1.4.39 Unimproved grassland was also preferentially used for foraging at one of Zeale *et al*.'s (1.20) study areas. At the second, improved grassland was often used for foraging, though bats were thought to be using the adjacent hedgerows with the field margins and woodland edge habitat supporting relatively high densities of moths. It is likely that where arable and improved grassland were used within the EDF Energy Estate, the hedgerows with field margins were the target area. However, the treelines monitored during the 2013/14 static surveys did not indicate extensive use of the margins by barbastelle (there was a scattering of records during transects in 2014, but only in September).

1.4.40 Rides and edges within the coniferous plantation of Goose Hill were well used by barbastelle. The areas of heathland, broadleaved woodland and grassland habitat (particularly that set aside for stone curlew) within the RSPB Minsmere Reserve (and beyond the Minsmere Levels) were also extensively used, along with the heathland areas around The Walks, south-east of Leiston as seen in **Figure A3** in 1.40 of **Annex 14A8.6**.

Home range analyses

1.4.41 The mean home ranges (using any of the three analysis techniques applied) increased as the year progressed, from pre-breeding (as surveyed in 2010) through early lactation (2011) through to juvenile independence (2014). The maximum distances travelled from roost sites to foraging locations (i.e. straight-line distances between the furthest recorded location and the roost used during the daytime beforehand) also increased as the season progressed (though the sample sizes on which these were calculated are not always specified). It is important to determine if the increases in home ranges, particularly the use of areas to the north of the EDF Energy Estate later in the season, are genuinely due to seasonal range expansion, or in part an artefact of the trapping or tracking methodologies.

1.4.42 In 2010, a single individual (a pregnant female) was the only bat recorded flying to the north. This bat was recorded roosting in Hangman's Wood and foraging over the Minsmere Levels near the bridge at Eastbridge. However, only six females were tagged that year, so the sample sizes are very small. Greenhouse Plantation, and the pasture to the west of Abbey Lane, were used in both 2010 and 2011, by small numbers of bats, as were areas to the

south, around Lover's Lane. The only male caught also ranged more widely, but to the south-west.

1.4.43 Of the 17 barbastelle tagged and tracked in 2011 as seen in 1.34 of **Annex 14A8.5**, two post-lactating females regularly spent time out of the EDF Energy Estate. One (Bat 8) regularly moved away from the main site and was often not tracked down, but was recorded to the north in Minsmere towards Westleton Walks. The other (Bat 13) was recorded (from the fifth night onwards) to the north-west of Eastbridge, where it remained for large parts of the nights whilst roosting in Leiston Old Abbey Woods (to the south). Occasional forays into Hangman's Wood were also recorded. Three others in 2011 (Bats 14 and 19 (juvenile males) and Bat 16 (non-breeding)) were all recorded in the vicinity of Dovehill/Sandypytle Plantations, on the western edge of the Minsmere Levels.

1.4.44 This contrasts with the results from 2014 when, all six female bats caught in the EDF Energy Estate were recorded using the Minsmere Levels.

1.4.45 From this data, it would seem likely that there is a greater reliance on the EDF Energy Estate in the early period (pre-maternity and early lactation), though not exclusively so. This was tested through statistical analysis of the data collected during the static detector surveys in 2013/14. With the exception of a few key areas (and even in apparently key areas), activity varied between years and between seasons, suggesting that, to some extent, barbastelles adapt their behaviour to roost location and prey availability. Nonetheless, relative barbastelle activity was higher earlier in the bats' active season (June) than at other times, whether measured using total bat passes (passes per night) or the bat pass rate (bat passes per hour). There was no significant effect of year on the number of bat passes, showing that this effect was apparent in both years.

1.4.46 In all years, although only low numbers of male barbastelle were tracked, these individuals were found to have generally larger home ranges than tracked females. In 2014, all three males were caught within the EDF Energy Estate, and all three were recorded in Minsmere as well as the EDF Energy Estate.

Overlap of foraging areas

1.4.47 In all years, when the home ranges (as calculated by 95% Minimum Convex Polygon) were overlaid, there was a greater degree of overlap between home ranges than might have been expected based on data from other studies. This was apparent even in 2014, when bats appear to have larger home ranges than in previous seasons. The area where the home ranges of nine breeding females overlapped was (unsurprisingly) small, and (less obviously) centred in Minsmere to the south of Scottshall Covert (rather than further

south), and north of the site. The area where the home ranges of seven breeding females overlapped extended south to Ash Wood and Goose Hill.

1.4.48 Looking at core areas in 2014 (defined by 50% kernel analysis[7]), there were two distinct areas, one to the north centred around Minsmere, and one to the south, within the EDF Energy Estate. The core area to the north was focused on Scottshall Covert, towards Dunwich Heath and The Warren; the core area to the south covers a relatively wide area extending from Eastbridge to Nursery Covert and Goose Hill. This, and the lack of recorded exchange between the EDF Energy Estate and Minsmere during the earlier seasons, may indicate two sub-populations, but this is by no means certain.

1.4.49 A similar analysis of the 2011 data (based on information from breeding females caught only within the EDF Energy Estate) identified three core areas: one towards Leiston Old Abbey; another to the north over Ash Wood and Black Walks; and a third to the east over Goose Hill and the grazing marsh to the east. The core foraging zone used by juvenile and breeding female bats extended south from the woodland adjacent to Plantation Cottages through Black Walks, Ash Wood and into Goose Hill and Kenton Hills. This area was considered to be the "*critical productive foraging zone*" providing the juvenile and shared breeding female foraging areas as described by Greenaway (1.81). In the peripheral areas, there was less overlap. The level of overlap is very likely to be an underestimate, as the behaviour of untagged bats is obviously unrecorded. There was also more overlap between areas used by males with females than in other studies.

1.4.50 Research in Sussex suggested that breeding female barbastelles dispersed from the roost area along established flight lines to foraging areas often several kilometres away. Each female was said to repeatedly use the same flight line, with juveniles following the mothers out along the flight lines to become familiarised with the routes and foraging zones (1.82). Whilst the flight lines may have been shared, they were generally found to end in a section used by a single bat to access the most distant foraging area (1.82).

1.4.51 The radio-tracking surveys undertaken for this site have not found this, with bats flying widely within the landscape; in other words, the tracked barbastelle did not tend to follow linear features and did not seem to follow predetermined routes. For example, they were regularly recorded flying over the open arable fields between Ash Wood and Upper Abbey Farm bridleway, appearing to be less reliant on linear features to commute to foraging areas than has been suggested for other studies. The arable habitat within the core area did not restrict their movement, and may have been used for foraging (though, as noted, relatively few of the fixes were recorded in the open, and

[7] Kernel methods quantitatively determine areas which are intensively used by animals by converting position coordinates into lines or areas with varying probabilities of use and present these graphically. (1.40, **Annex 14A8.6**).

the boundary features may have been more productive). This is also supported by the earlier transect/static surveys, and the later SM2 static surveys, which did not identify 'commuting routes' regularly used by barbastelle.

Overview

1.4.52 A summary of the information provided in **section 1.4.5i** is provided here and in **Table 1.15** as seen in **section 1.4.141c**:

- Barbastelles centred on the EDF Energy Estate are using a wide range of habitats situated in close proximity to each other. They use habitats of varying quality, and the areas of arable land do not appear to restrict their movement.
- There is higher relative activity and a greater reliance on habitats within the EDF Energy Estate earlier in the bats' active season, with range expansion as the season progresses and juveniles become fully independent. It is possible that the colonies within the EDF Energy Estate and Minsmere behave as separate sub-populations earlier in the year, but there is significant interchange in the later summer/autumn, indicating access to a wider resource beyond the boundaries of the EDF Energy Estate that is shared.
- Barbastelle do not appear to be using defined commuting routes to travel to specific areas used by individuals. Areas of high activity vary, and there is significant overlap between areas used by individuals, both adults and juveniles. This is perhaps because habitats that are sufficiently productive are in relatively short supply and distant within the wider landscape, so it is more efficient to share resources within the EDF Energy Estate and, to a greater or lesser extent, Minsmere.

Assessment

1.4.53 Given the rarity of barbastelle across the UK and in Suffolk, the presence of a maternity colony (of which relatively few are known), the likelihood of bats remaining on site all year round, and the quality of the habitats within the EDF Energy Estate and surrounding area, which appear to be relatively uncommon in the county, then barbastelle would be:

- be an IEF at the national level under the CIEEM guidelines (1.5); and
- be of high importance under the EIA-specific methodology.

ii. Feature: Natterer's bat

Description

1.4.54 The status and distribution of Natterer's bat at the local, county and national levels are outlined in **Table 1.2.1** in **Annex 14A8.2**. This species is considered to be "common", and the population trend is "increasing" (1.82). Natterer's bats are considered to be widespread within the UK and Suffolk (1.26).

Roosts

1.4.55 Five roosts have been recorded within the EDF Energy Estate and the ZOI. A nursery roost has been recorded at Upper Abbey Farm over in 1996, 2000 and 2002 (1.43, 1.44 and 1.45). Additional evidence of use in barns at Upper Abbey Farm was recorded on a number of years between 1999 and 2016 (1.46, 1.47, 1.48, 1.49, 1.50, 1.34, 1.51, 1.52, 1.53 and 1.62) including a mating roost in 2011 as seen in 1.34 of **Annex 14A8.5** and hibernating bats (small numbers) in 2012/13 (1.83).

1.4.56 Maternity colonies have also been recorded in bat boxes in Kenton Hills (six bats in a single box in 2011, 21 amongst boxes in 2012, and over 50 individuals in a single box in 2014 (1.50, 1.51 and 1.52)), as well as over 40 individuals across two bat boxes in November 2016 (1.62) and in Leiston Abbey as seen in 1.34 of **Annex 14A8.5**.

1.4.57 Further roosts in woodland at The Grove and Sandypytle Plantation were identified through radio-tracking as seen in 1.34 of **Annex 14A8.5** of this volume. Early activity recorded on static detectors (2013/14 study) also suggested a possible roost in Ash Wood as seen in 1.64 of **Annex 14A8.6**.

1.4.58 Natterer's bats visit swarming sites (it is thought) to mate and have been recorded visiting such sites in their hundreds or thousands (1.13). Such sites may be many kilometres from the maternity colony. This species also hibernates almost exclusively in caves and mines (these are often also swarming sites) and, according to the Suffolk Bat Atlas (1.26), Natterer's bats use most of the known hibernation sites around the county. One of these, Dunwich Shelter (in Dunwich Forest), approximately 4km to the north of the site, is regularly monitored, and Natterer's bats have been recorded regularly in the ten years between 2004–2015: details provided in **Annex 14A8.3**. This site is on the edge of the ZOI of the site; no other regular hibernation sites (other than the presence of small numbers of hibernating bats on occasion, including two individuals found in the Upper Abbey Farmhouse in January 2013) were identified within the ZOI.

Colony structure and size

1.4.59 Nursery colonies tend to use a complex of roost sites. Smith and Racey (1.17) reported that roost sites were concentrated mainly in core areas of up to 2km^2, were of a variety of types (buildings and trees) and were often used only for a few days (though with high inter-annual roost fidelity). Dietz (1.12) records that colonies tend to comprise 20 to 50 animals, and these tend to divide themselves into constantly changing satellites or sub-colonies. Altringham (1.13) reports nursery roosts of up to 200 bats, with males forming up to 25% of maternity colonies and sometimes forming groups of up to 30 individuals.

1.4.60 Over 50 individuals have been found in a single bat box, so it seems reasonable to assume that the EDF Energy Estate colony is at least a little larger than this, and it is very likely that only a proportion of the roosts have been identified. It is possible, though relatively unlikely, that more than one maternity colony is present.

Use of the EDF Energy Estate and surrounding areas

1.4.61 Natterer's bats are known to use a wide range of habitats with a loose association with woodland, from open parkland and large gardens, to dense woodland (Ref. 1.12 and Ref. 1.13). There are, therefore, large parts of the EDF Energy Estate that appear suitable for this species.

1.4.62 The home ranges of bats radio-tracked in and around the EDF Energy Estate in 2011 appear smaller than published ranges which is summarised in 1.34 of **Annex 14A8.5**, though this species was not tracked as closely as barbastelle, and too few fixes were collected for this to be a reliable estimate.

1.4.63 The core areas used differed for the Natterer's bats tracked. For the two bats caught in Turf Pits woodland and Fiscal Policy woodland, the core area included the Fiscal Policy woodland and the grassland and ditch network with associated hedgerows and tree lines around the sewage works area to south and west of Lover's Lane. For the two bats caught in The Grove, the core areas included Goose Hill, The Grove and adjacent areas. The home ranges of these two pairs of bats did not overlap during the radio-tracking surveys, though the sample sizes are clearly too small to infer the presence of separate maternity colonies.

1.4.64 Little attempt was made to separate the *Myotis* spp. recorded into Natterer's bat and Daubenton's bat, though the former is likely to be much more common. For *Myotis* spp. overall, detailed analyses of the 2013/14 static detector data confirmed strong seasonal differences, with activity lowest in S1 (June), highest in S2 (July) and considerably lower in S3 (September/October – though the bat pass rate (passes per hour) did not differ significantly between S1 and S3 because of the longer nights).

1.4.65 From this work, the areas recording the highest relative activity were: The Grove; Goose Hill; the wet grassland to the east of Goose Hill; areas of the Sizewell Marshes SSSI, including Goodrums Fen; Stonewall Belt; the Upper Abbey bridleway; Leiston Old Abbey woodland; the track running along the northern edge of Kenton Hills; and the peripheral ride through Kenton Hills, primarily at its eastern end. There was much less *Myotis* spp. activity in the fields to the south. Recorded levels of *Myotis* spp. activity, in comparison to barbastelle and "big bats", were slightly higher within Coronation Wood (but still relatively low).

1.4.66 Numbers of passes were significantly lower in 2014 than in 2013, which could suggest either less reliance on the EDF Energy Estate (i.e. it forms only a part of their home range), or a less successful breeding year (though a similar effect was not seen for species other than pipistrelle).

Assessment

1.4.67 A summary of the information provided in **section 1.4.53ii** is provided in **Table 1.15** as seen in **section 1.4.141c**.

1.4.68 Given that Natterer's bat is likely to be reliant on habitats within the ZoI and the presence of maternity colonies, then Natterer's bat would:

- be an IEF of county importance under the CIEEM guidelines (Ref. 1.5); and
- be of medium importance under the EIA-specific methodology.

iii. Feature: Daubenton's bat

Description

1.4.69 The status and distribution of Daubenton's bat at the local, county and national levels are outlined in **Table 1.2.1** in **Annex 14A8.2**. This species has a wide distribution and a stable population across Suffolk (1.26); it is considered *"common"* across the UK (1.75), though perhaps less so in Suffolk (1.26). Few records of Daubenton's bats were received as part of the desk-study, and none of these were of roosts.

Roosts, colony structure and size

1.4.70 There is no evidence to suggest that Daubenton's bats are roosting in significant numbers within the EDF Energy Estate (smaller roosts cannot be ruled out, particularly as the majority of calls from the *Myotis* spp. group were not identified to species). Similarly, the presence of small numbers of hibernating Daubenton's bats cannot be ruled out. According to the Suffolk Bat Atlas (1.26), this is the most abundant species found in known

hibernacula, and they often share hibernation sites with Natterer's bats as seen in **section 1.4.53ii**, but none were reported from the closest hibernation roost used by Natterer's bats. A single hibernating Daubenton's bat was recorded in 2011 in the fire-damaged farmhouse of the Upper Abbey complex, with a further individual found in the cellar of the farmhouse at Upper Abbey in November 2012, and a possible Daubenton's bat found in this location in October 2012.

1.4.71 Only five Daubenton's bats were trapped in four separate trapping exercises within the EDF Energy Estate (between none and two each year). All were male, with only one juvenile, though the 2009/2010 trapping events were too early to pick up juveniles. It is important to note, however, that trapping locations were selected primarily for barbastelle rather than for Daubenton's bats.

1.4.72 A slightly higher number (seven) were caught in Minsmere, to the north, in 2014 (one non-breeding female and six juveniles), suggesting a breeding colony centred on Minsmere.

Use of the EDF Energy Estate and surrounding areas

1.4.73 As most of the calls from the *Myotis* spp. group were not identifiable to species, and no Daubenton's bats were radio-tracked, it is not possible to define their use of the EDF Energy Estate and the wider ZOI with precision. However, the majority of animals are known to hunt over water, or in the vicinity of water (1.12). Daubenton's bats were observed feeding over ditches in northern areas of Sizewell Marshes SSSI as seen in 1.30 of **Annex 14A8.5** and are likely to use the wetland habitats within the EDF Energy Estate and within Minsmere. Individual bats also use woodland; the small numbers caught within the EDF Energy Estate were trapped in Fiscal Policy woodland (three); along the Upper Abbey Farm bridleway (one); and near Sandy Lane (one).

Assessment

1.4.74 The information in **section 1.4.68iii** has been summarised into **Table 1.14** as seen in **section 1.4.141c**.

1.4.75 Given that Daubenton's bat has a widespread and stable population across Suffolk, that there is no evidence to suggest they are roosting or hibernating in significant numbers within the site the Daubenton's bat population, in

combination with brown long-eared bats, common pipistrelle and soprano pipistrelle[8], would

- be an IEF of local importance under the CIEEM guidelines (1.5); and
- be of low importance under the EIA-specific methodology.

iv. Feature: noctule

Description

1.4.76 The status and distribution of the noctule at the local, county and national levels are outlined in **Table 1.2.1** in **Annex 14A8.2**. The noctule is uncommon, but widespread through Suffolk, though few roosts are known (as is the case for tree-roosting bats in most areas) (1.26). This species is listed within Section 41 of the NERC Act (1.3) and as a priority species on the Suffolk BAP (1.4).

Roosts, colony structure and size

1.4.77 Individuals used bat boxes in Kenton Hills for summer and winter roosting, and a single noctule was found in a bat box in Reckham Pits Wood (1.42). These were the only roost records held within 10km of the site.

1.4.78 The Wood Group surveys indicated a possible roost to the north of Nursery Covert. Activity from the later static detector surveys also suggested the presence of "big bat" roosts (most likely to be noctule) near Ash Wood, woodland at The Grove, the eastern part of Goose Hill, and Leiston Old Abbey woodland. Grimseys may also support roosts of this species.

1.4.79 Only two individuals were trapped within the EDF Energy Estate as provided in 1.34 of **Annex 14A8.5**. Both were male, as was the individual handled during bat box surveys in the same year. One breeding female and two males were also trapped within Minsmere in 2014 as seen in 1.40 of **Annex 14A8.6**.

1.4.80 Noctule calls are loud and low frequency and can be captured over a significant distance - from preliminary research, over 100m as seen in 1.33 of **Annex 14A8.5**. Calls are therefore less likely to be missed. The number of noctule passes recorded was of a very similar number to those of barbastelle (which are considered harder to detect), though more variable. This suggests they are present in lower numbers. Given the low levels of activity recorded, and the capture of only males, it is considered that they are unlikely to be roosting within the EDF Energy Estate in large numbers or

[8] These species have been combined due to being more common species that nonetheless contribute to the overall bat assemblage.

breeding, though small unidentified roosts are likely to be present given the early passes recorded. Male noctules captured in 2014 were in mating condition (testes only in intermediate condition but buccal glands enlarged), so mating was taking place in Minsmere (none were captured in the EDF Energy Estate at that time).

1.4.81 Noctules in the UK most commonly roost in trees (1.13), and can gather in quite large numbers; however, there was a sharp decline in "big bat" activity between the July and September/October static detector monitoring periods, which suggests that noctules may hibernate elsewhere. The presence of hibernating noctules cannot, however, be ruled out on this basis.

Use of the EDF Energy Estate and surrounding areas

1.4.82 Overall, "big bat" activity, considered to be largely that of noctule, was highest in June (during the post-breeding lactation period). A high number of "big bats" (manually verified to be largely noctule, but also serotine) were recorded in July 2013, and to a lesser extent in June 2014, potentially exploiting a localised food source within Goose Hill (identified through static detector surveys as important to "big bats") at this time of year. "Big bats" (again, considered to be largely noctule) were very active in Leiston Old Abbey woodland and in rides adjacent to wet grassland at the south-eastern corner of Goose Hill, but were much less so to the east, in Kenton Hills and adjoining areas. Despite the presence of known, albeit occasional, noctule roosts within bat boxes in Kenton Hills, "big bat" activity was not frequent along the peripheral ride through the southern part of Kenton Hills.

1.4.83 Noctules were regularly recorded foraging over open areas during the Wood Group surveys, particularly over grazing marsh; the static surveys also recorded foraging to the east of Goose Hill. Other areas of importance to "big bats" were to the north (Black Walk/The Grove).

Assessment

1.4.84 The information in **section 1.4.75iv** has been summarised into **Table 1.14** as seen in **section 1.4.141c**.

1.4.85 Given that it is considered unlikely that noctules are roosting within the EDF Energy Estate in large numbers, or breeding, and the limited number of roost records identified within 10km of the site the noctule bat population, in combination with Leisler's bat would:

- be an IEF of local importance under the CIEEM guidelines (1.5); and
- be of low importance under the EIA-specific methodology.

v. Feature: Leisler's bat

Description

1.4.86 The status and distribution of Leisler's bat at the local, county and national levels are outlined in **Table 1.2.1** in **Annex 14A8.2**. Leisler's bat is considered to be uncommon but under-recorded. Existing records of the species for Suffolk are sparsely distributed and (largely) confined to the west (1.26), which is likely to be a reflection of both their scarcity and the difficulty of obtaining a confirmed identification.

Roosts, colony structure and size, and use of the EDF Energy Estate and surrounding areas

1.4.87 There is considerable overlap between the calls of the two *Nyctalus* spp. (noctule and Leisler's) as well as overlap between the calls of Leisler's bat and serotine. For this reason, particular effort was invested in determining whether or not Leisler's bats are present within the EDF Energy Estate and the ZOI.

1.4.88 The auto-identification software used to identify recordings from static detectors in 2013/14 assigned only 16 calls to "Leisler's bat". On manual assessment, these were reclassified as "*Nyctalus* spp.". None of the calls from the static monitoring undertaken in 2013/14 could therefore be reliably confirmed as Leisler's bat.

1.4.89 As it was important to ascertain the likelihood of roosts being present, a sample of early evening calls from "big bats" were manually assessed for their presence. The large majority were confirmed as noctule or likely noctule. There was little evidence to suggest a Leisler's roost was present.

1.4.90 Although calls from 2007—2011 were initially identified in Wood Group's reports as Leisler's bats, these were small in number and, on reflection, many were re-classified as *Nyctalus* spp. or serotine/Leisler's bat (M. Hobbs, *pers. comm.*). A further reassessment of 2,500 calls from 2010/11 as provided in 1.64 of **Annex 14A8.6** was undertaken; this identified only a small number of calls that could assigned to Leisler's bat with a reasonable level of confidence.

1.4.91 No Leisler's bats have been caught during four separate trapping sessions in different seasons. However, this is less reliable as an indicator; being a relatively high-flying species (1.84), Leisler's are less likely to be caught in traps.

1.4.92 For these reasons, Leisler's bat is almost certainly present only infrequently within the site ZOI, and in low numbers.

Assessment

1.4.93 The information in **section 1.4.85v** has been summarised into **Table 1.14** as seen in **section 1.4.141c**.

1.4.94 Given that Leisler's bat is almost certainly present only infrequently within the ZoI the Leisler's bat population, in combination with Nathusius' pipistrelle[9] would:

- be an IEF of local importance under the CIEEM guidelines (1.5); and
- be of low importance under the EIA-specific methodology.

vi. Feature: serotine

Description

1.4.95 The status and distribution of the serotine at the local, county and national levels are outlined in **Table 1.2.1** in **Annex 14A8.2**. This species is widespread but uncommon within the UK, and its populations are considered stable (1.68). There are desk-study reports of 24 known roosts, of which one is close proximity to the site, and one at 9km.

Roosts, colony structure and size

1.4.96 Serotine nursery roosts in the UK are almost exclusively in buildings, though single animals can occupy bat boxes and trees; during hibernation the majority probably remain within buildings (1.12). They are thought to prefer buildings dating to around 1900, in cavities and crevices, although they have been known to use modern buildings (1.80).

1.4.97 Serotine bats tend to be faithful to their roost sites (1.12), but form relatively small colonies (1.12 notes 10–60 individuals, occasionally up to 300), which means they often go unnoticed. There are buildings yet to be surveyed within the study area which may support this species.

1.4.98 The closest known roost to the site (yet to be fully characterised) is the most likely source of the breeding and non-breeding bats trapped during the radio-tracking studies; the lack of timed records close to sunrise /sunset suggests the absence of any roost within the site itself. No early passes recorded by static detectors in 2013/14 were considered to be serotine, again suggesting that roosts of this species were not present within the EDF Energy Estate.

[9] These species have been combined due to their shared 'edge-of-range' status and rarity within the EDF Energy Estate.

Use of the EDF Energy Estate and surrounding areas

1.4.99 Larger numbers of foraging serotine (an estimated 20 foraging bats within Goose Hill, patrolling the rides in groups of three to five) were recorded in June 2011 (and nine individuals were trapped); it is possible that the larger (i.e. "big bat") species were exploiting a localised food source at this time of year. A similar peak (primarily noctule but also serotine) was recorded by one of the SM2 static detectors in S2 (2013), and, to a lesser extent S1 (2014).

1.4.100 The low levels of activity otherwise recorded during transect and static detector surveys indicate that the site supports foraging by low numbers only, with noctule more common. The single tracked (non-breeding) female was recorded foraging widely over the RSPB Minsmere Reserve, the Minsmere Levels and Goose Hill, with movements also along the coastal edge. This individual roosted within the grounds of Theberton Farm for the duration of the radio-tracking survey in 2014.

Assessment

1.4.101 The information in **section 1.4.94vi** has been summarised into **Table 1.14** as seen in **section 1.4.141c**.

1.4.102 Given that serotine roosts are considered to be absent from the site and that activity levels generally indicated only low numbers of foraging individuals the serotine population, in combination with noctule[10], would:

- be an IEF of local importance under the CIEEM guidelines (1.5); and
- be of low importance under the EIA-specific methodology.

vii. Feature: brown long-eared bat

Description

1.4.103 The status and distribution of the brown long-eared bat at the local, county and national levels are outlined in **Table 1.2.1** in **Annex 14A8.3**. This species is widespread and common within the UK, and its populations are considered stable (1.68). It is listed within Section 41 of the NERC Act (1.3) and on the Suffolk BAP (1.4).

[10] These species have been combined due to some similarities in their ecology – principally the adaption to foraging in open space.

Roosts, colony structure and size

1.4.104 The site supports a breeding population of brown long-eared bat, with two known maternity roosts within the EDF Energy Estate: the workshop at Upper Abbey Farm and Ash Wood Cottages, adjacent to Ash Wood. In addition, surveys in 2019 confirmed brown long-eared bat roost use of the farmhouse at Lower Abbey Farm and the large barn at Upper Abbey Farm. A further likely maternity roost was identified to the south of Pillbox Field, adjacent to the Cliff House Caravan Park (Roost RC) through radio-tracking. Thirty-two roosts were identified within the wider 10km radius of the desk-study, at Theberton, Middleton and Westleton. This species exhibits a high degree of roost fidelity (1.13), particularly within buildings (but also bat boxes).

1.4.105 Colony sizes are often small, and it is probable that other (tree) roosts exist within the site, with one potential location being woodland at The Grove as seen in 1.64 of **Annex 14A8.6**. Barns at Upper Abbey Farm have been recorded to provide at least occasional roosting locations for this species.

1.4.106 Brown long-eared bats are one of the species known to use swarming sites in autumn (these seem to have a mating function), but there are no obvious structures (for example, caves) which would support a swarming site.

1.4.107 A hibernating bat was recorded towards the end of the hibernation season in a disused bunker which was considered to provide sub-optimal conditions for hibernating bats. Occasional brown long-eared bats have been found in the hibernation site described in **section 1.4.53ii** - usually single individuals, but on one occasion five individuals; details in **Annex 14A8.3**, and a *"probable"* hibernating brown long-eared bat was recorded in 2011 in the fire-damaged farmhouse of the Upper Abbey complex. It is likely that a number of bats hibernate within the ZOI, but their tendency to hibernate singly or in very small groups (1.12) would make the identification of specific locations difficult.

Use of the EDF Energy Estate and surrounding areas

1.4.108 Altringham (1.13) stated that brown long-eared bats tend to stay relatively close to their roosts, most frequently within 0.5km, often to 1.5km, but never further than 3km. Dietz *et al*. (1.12) state that summer foraging grounds tend to be within 2.2km of the roost, of 4–11ha in size, and with the core foraging area being smaller than 1ha. The bat tracked in radio-tracked in 2011 foraged up to 2.6km from its roost site (RC) – located to the south of the EDF Energy Estate, on the coast – to the northern end of Goose Hill, and 1.5 km from its roost site (again, RC) to the Sandy Lane area. It therefore occupied a much larger home range than was found by Dietz *et al*. (Ref. 1.12).

1.4.109 The transect and static detector surveys undertaken in 2011 recorded brown long-eared bats within areas of Ash Wood, Walk Barn and Goose Hill.

Locations which recorded relatively higher activity in later surveys on three or more occasions were: woodland at The Grove; Stonewall Belts (the linear feature running south from the known brown long-eared bat roost to the south of Ash Wood); Leiston Old Abbey woodland; and in the vicinity of Leiston Carr. Of these, the locations with the highest number of early evening passes suggested continued use of the roost in Ash Wood Cottages and woodland at The Grove, which may suggest an as-yet unidentified roost here.

1.4.110 Brown long-eared bats were undoubtedly under-recorded because of their quiet calls; nonetheless, from trapping results and the widespread distribution of transect and static detector records, they were considered to be relatively common across the site.

1.4.111 All trapping sessions caught brown long-eared bats in broadly similar numbers to those of barbastelle and Natterer's bats, and also in similar male/female ratios (though males exceeded females in the latter two years, and numbers were small in the first two years).

Assessment

1.4.112 The information in **section 1.4.102vii** has been summarised into **Table 1.14** as seen in **section 1.4.141 c**.

1.4.113 Given that brown long-eared bat is widespread and common across the UK and the absence of obvious structures suitable for swarming activity, the brown long-eared bat population, in combination with Daubenton's bat, common pipistrelle and soprano pipistrelle[11], would:

- be an IEF of local importance under the CIEEM guidelines (1.5); and
- be of low importance under the EIA-specific methodology.

viii. Feature: common pipistrelle and soprano pipistrelle

Description

1.4.114 The status and distribution of both common and soprano pipistrelles at the local, county and national levels are outlined in **Table 1.2.1** in **Annex 14A8.2**. Both species are widespread and common in the UK and across Suffolk, with populations thought to be increasing (1.68).

1.4.115 These species are discussed in tandem in the following paragraphs, as their widespread distribution within the EDF Energy Estate was established at an early stage. Although similar in overall distribution, the soprano pipistrelle

[11] These species have been combined due to being more common species that nonetheless contribute to the overall bat assemblage.

has been found to select riparian habitats over all other habitat types in its core foraging areas, whereas common pipistrelle, although preferring deciduous woodland overall, is more of a generalist, spending its foraging time in a wider range of habitats (1.10).

Roosts

1.4.116 Sixteen common pipistrelle roost records were identified through the desk-study, including five maternity roosts. No roost records were located within the site (the closest were within 1.5km, in Leiston and Theberton). Tree nursery roosts are said to be uncommon for this species (1.13).

1.4.117 Four soprano pipistrelle roost records were identified from the desk-study: a maternity roost in Theberton, in Dunwich and within bat boxes at Kenton Hills.

1.4.118 Emergence surveys undertaken at Gypsy Lodge (near Aldhurst Farm) in 2012 identified the presence of a small common pipistrelle roost (23–31 individuals) within buildings at this location, likely to be a small maternity colony moving between at least two of the buildings.

1.4.119 Common pipistrelle were also seen emerging from the barn and, in 2019, from the farmhouse at Upper Abbey Farm, the Civil Workshop at Sizewell B (with DNA analysis of droppings found in this building confirming its use by common pipistrelle) and Buildings 1 and 8 at Lower Abbey Farm in small numbers. In 2014 a single common pipistrelle was recorded emerging from a roost tree previously used by barbastelle (R14). They may roost in other buildings in the area as well as trees and/or bat boxes. Two males and a post-lactating female common pipistrelle were identified singly in separate bat boxes in 2010. Very early captures of pregnant females also suggests undiscovered maternity sites within or in the vicinity of the site, though larger roosts of this species tend to be in buildings, so are likely to be off-site. The area around Plantation Cottages may support a common or soprano pipistrelle roost.

1.4.120 As described in 1.64 of **Annex 14A8.6**, static detectors (2013/14) in a number of locations produced very high numbers of pipistrelle passes. It was striking that the majority of these calls were recorded more than one hour after sunset. For the 18 monitoring 'events' that recorded over 10,000 passes (one event being one monitoring station in one particular season/year), the mean number of passes recorded in the first hour after sunset was under 10% (range 2–25%). Although one hour after sunset is only a small proportion of a night (and therefore the proportion of calls fitting into that hour might also be small), it is also one of the most 'productive' hours for bat foraging, with species generally less active in the middle of the night. This suggests that the majority of individuals were not arising from roosts in the immediate vicinity.

1.4.121 Known roosts of soprano pipistrelle are present in the Upper Abbey Farm barn, confirmed in 2019 with single emergences during each survey, the Civil Workshop at Sizewell B, where a maximum of three individuals were recorded emerging in 2019, and Kenton Hills bat boxes (where a maternity colony of about 70 individuals was recorded in 2010). In addition, a single individual was considered to have potentially emerged from the main farm house, at Upper Abbey Farm.

1.4.122 Trapping sessions within the EDF Energy Estate caught breeding females of both species. Larger numbers of pregnant female soprano pipistrelles were caught in the first three trapping sessions, suggesting there may be roosts that have not yet been identified. However, more common than soprano pipistrelles were caught in 2014 (when trapping occurred later in the year). Over half of the common pipistrelles caught at this time were male.

1.4.123 Trapping undertaken in the adjacent Minsmere (in 2014 only, later in the year than earlier trapping events) caught no common pipistrelle at all, an unexpected finding given the high levels of activity of both species across the site. A high proportion of all bats caught at Minsmere (82%) were soprano pipistrelles; of these, 71% were recorded as juveniles (38% of the overall catch). These may have arisen from a roost in a cottage at the southern end of Hangman's Wood as reported anecdotally in 1.40 of **Annex 14A8.6**.

1.4.124 Although common and soprano pipistrelle bats are two of the UK's commonest species (and the species that are most frequently encountered in summer), few winter roosts are known, and these tend to be buildings and trees occupied by solitary or small numbers of bats (1.13).

Colony structure and size

1.4.125 Nursery colonies of common pipistrelles usually comprise 50 to 100 animals, rarely up to 250. Those of soprano pipistrelles are often much larger, and reach several hundred (800+) (1.12). Although high numbers of pipistrelle passes were recorded in all surveys, and large numbers trapped compared to other species, it is difficult to determine colony size or structure from this apparent ubiquity.

1.4.126 Larger roosts of both species tend to be in buildings, with common pipistrelles sometimes moving between roosts and fragmenting into a number of roost sites. The soprano pipistrelle is less nomadic and may even display high roost fidelity. There was no evidence of a large roost of either species arising from features within the EDF Energy Estate, though a proportion of the soprano pipistrelles may have arisen from Hangman's Wood (colony size unknown).

Use of the EDF Energy Estate and surrounding areas

1.4.127 Soprano pipistrelle was the most frequently recorded and widespread species at the EDF Energy Estate, though there were seasonal changes in distribution and activity levels, and much overlap with common pipistrelle. For the campus, in the western part of the site, common pipistrelle passes were three times more frequent than those of soprano pipistrelle (2014), perhaps because of the increased distance from the wetter areas surveyed. Common pipistrelles were also more frequently recorded than soprano pipistrelles in Coronation Wood/Pillbox Field in 2015.

1.4.128 From static surveys in 2013/14, three-quarters of the monitoring stations were classified as a 'bat hotspot' in one or more season (i.e. mean passes per night for a single recording season from all species combined exceeded 300). Much of this activity related to common/soprano pipistrelle (species not fully separated), confirming that these species are widespread and common.

1.4.129 Static surveys in 2013/14 suggested the importance of the rides adjacent to wetland habitat at the south-eastern corner of Goose Hill to both common and soprano pipistrelle and, within arable fields, the eastern-most tree line. In contrast to other species, pipistrelle activity at Fiscal Policy was not reduced in comparison to the track along the northern edge of Kenton Hills.

1.4.130 The number of common and soprano pipistrelle bat passes recorded in the static detector surveys was highest in June, decreased in July and further declined in September/October. The numbers of bat passes were significantly higher in 2014 than 2013, the opposite trend to that seen for *Myotis* spp.

Assessment

1.4.131 The information in **section 1.4.113viii** has been summarised into **Table 1.14** as seen in **section 1.4.141 c**.

1.4.132 Given that common pipistrelle and soprano pipistrelle are widespread and common across the UK and Suffolk, the common pipistrelle and soprano pipistrelle populations, in combination with Daubenton's bat and brown long-eared bat[12], would:

- be an IEF of local importance under the CIEEM guidelines (Ref. 1.5); and

[12] These species have been combined due to being more common species that nonetheless contribute to the overall bat assemblage.

- be of low importance under the EIA-specific methodology.

ix. Feature: Nathusius' pipistrelle

Description

1.4.133 The status and distribution of Nathusius' pipistrelles at the local, county and national levels are outlined in **Table 1.2.1** in **Annex 14A8.3**. This species was only relatively recently classed as a resident rather than a migrant winter visitor (1.85). It is considered *"uncommon but wide-spread"* and has been under-recorded throughout the UK (1.68). As bat detection equipment, has become more sophisticated, so records have increased. Limited local desk-study records were available. The nearest known maternity roost is on the Norfolk coast (1.86).

Roosts, colony structure and size

1.4.134 No roosts of this species have been confirmed (and it should be noted that few roosts of any type have been recorded in the UK). With very few exceptions, most active and static detector surveys recorded very few Nathusius' pipistrelle passes. Where numbers were raised, they were not higher in the hour after sunset or the two hours before dawn; overall there was very little evidence of early evening activity at any location that might have been suggestive of a roost on-site, or of a commuting route to/from a roost nearby). No Nathusius' pipistrelle have been caught during the trapping and radio-tracking studies, though one male juvenile pipistrelle caught in July 2011 could not be determined to species (and could therefore potentially have been a Nathusius').

Use of the EDF Energy Estate and surrounding areas

1.4.135 Nathusius' pipistrelle was recorded for the first time during the 2009 activity transect surveys (primarily within the Sizewell Marshes SSSI), and subsequently during both transect and static detector surveys. By late 2011 as seen in 1.34 of **Annex 14A8.5**, it was considered that Nathusius' pipistrelle was 'fairly common and widespread' during April/May and August/September, and this was thought to be a potential indication of migration. It was also suggested that much of the activity in June/July was centred on the Sizewell Marshes SSSI, particularly the northern part of this SSSI. This was not, however, supported by the later surveys.

1.4.136 The static detector surveys of 2013 and 2014 were not deployed until after any potential spring migration peak, but no pattern of increased activity was seen in the autumn during these years. The mean activity level was similar, but slightly lower, in September/October than in June and July; the more detailed analyses indicated that activity was significantly higher in the

summer compared to the later recording period. It remains a possibility that migratory bats are using or passing through the EDF Energy Estate, but this does not appear to be the main reason for the patterns seen.

1.4.137 Nathusius' pipistrelle is often associated with water-bodies and riparian habitats, and there are opportunities for Nathusius' pipistrelle to the north at Minsmere and to the south and north-east of Kenton Hills (i.e. within Sizewell Marshes SSSI). It is possible that there are breeding roosts in the vicinity (but outwith the area studied) that are as yet unidentified, and that bats travel more widely (i.e. to the EDF Energy Estate) outside of the breeding season. This may better explain the spring and autumn peaks that have been recorded in some years, and the lower numbers recorded in S2 in 2013/14.

1.4.138 Nathusius' pipistrelle passes accounted for less than 1% of the overall activity recorded during static detector surveys in 2013/14. Recorded activity indicated the use of rides adjacent to wetland habitat on the south-eastern corner of Goose Hill (to a greater extent than in adjacent foraging habitat), as well as the use of the linear corridor between Leiston Old Abbey Woodland and Eastbridge.

1.4.139 It is possible that a number of Nathusius' calls may have been allocated to the common pipistrelle group – there are some bat calls that cannot be definitively identified to one or other species, even on close manual inspection (rather by auto-identification).

Assessment

1.4.140 The information in **section 1.4.132ix** has been summarised into **Table 1.14** as seen in **section 1.4.141 c**.

1.4.141 Given the absence of evidence for Nathusius' pipistrelle breeding roosts within or in close proximity to the EDF Energy Estate, the limited evidence for a significant migratory population and that although areas of wetland habitat, favoured by Nathusius' pipistrelle, are present within the Zol, they are outside the site, the Nathusius' pipistrelle population, in combination with Leisler's bat[13], would:

- be an IEF of local importance under the CIEEM guidelines (1.5); and
- be of low importance under the EIA-specific methodology.

[13] These species have been combined due to their shared "edge-of-range" status and rarity within the EDF Energy Estate.

c) Summary of ecological features

1.4.142 **Table 1.14** provides a breakdown of the assessment that has been carried out in order to determine the importance of each of the different species/species groups discussed in **section 1.3.4 d)**.

1.4.143 The different elements that make up the assigned 'importance' have been *broadly* categorised and colour-coded to show how each element contributes to the assessment (key provided in **Table 1.4** and **Table 1.5** at the end of section a): Red scores 3; Amber scores 2; Green scores 1).

Table 1.15: Summary of elements considered in determining the geographical context (1.5) of each species' importance.

Species.	Conservation Status.	Status UK/Suffolk [Select Highest Rating].	Status within the EDF Energy Estate.	Breeding Roosts (Maternity).	Hibernation.	Use of Habitats for Foraging/ Commuting.	Geographic Context of Importance.
Barbastelle	Habitats Directive (Habs Dir) Annex II. EPS. NERC Act.	Nationally rare IUCN Red List Vulnerable.	Estimated population in the order of 50+ individuals using the EDF Energy Estate and adjacent habitats within Minsmere. Interchange demonstrated between these areas.	Maternity colony centred on EDF Energy Estate during early part of breeding season, but with interchange with roosts in Minsmere later in breeding season.	Conservatively assumed that the majority of individuals are likely to hibernate within the EDF Energy Estate and adjacent habitats within Minsmere.	Wide range of habitats used; high reliance on EDF Energy Estate, particularly earlier in summer, but with use of habitats within Minsmere increasing as the summer progresses. May be two sub-populations.	National (score of 18).
Natterer's bat.	EPS	Nationally common; widespread in UK/Suffolk. IUCN Red List Least Concern.	Counts of individual roosts 50+; tend to use a complex of roost sites, so difficult to estimate population size more precisely.	Maternity colony present within the EDF Energy Estate using both buildings and trees largely outside of the red-line boundary.	The majority of individuals are likely to hibernate outside of the EDF Energy Estate and potentially outside of the ZOI.	Known to use a wide range of habitats; likely to be reliant on ZOI based on project data and species preferences (presence of roosts, average foraging distances, etc.).	County (score of 12).

Species.	Conservation Status.	Status UK/Suffolk [Select Highest Rating].	Status within the EDF Energy Estate.	Breeding Roosts (Maternity).	Hibernation.	Use of Habitats for Foraging/ Commuting.	Geographic Context of Importance.
Daubenton's bat.	EPS	Nationally common; less common in Suffolk. IUCN Red List Least Concern.	Evidence suggests species is present in low numbers.	No evidence of maternity roost within EDF Energy Estate; likely within ZOI.	Potential for small numbers of hibernating Daubenton's bats within the EDF Energy Estate, but also within adjacent habitats within Minsmere.	Foraging associated with water, so largely in habitats outside of the red-line boundary; may also use some woodland areas.	Local (score of 8).
Noctule	EPS NERC Act.	Nationally common and widespread, uncommon, though widespread in Suffolk. IUCN Red List Least Concern.	Likely to be present in moderate numbers (based on project data, including trapping results and relative activity etc.).	No evidence of maternity roost within EDF Energy Estate (though other roosts cannot be ruled out); may be maternity roosts within ZOI.	Small numbers of hibernating noctules are possible, but activity in autumn was much reduced, which suggests likelihood of hibernation relatively low.	Almost all landscape types are used. Less reliant on linear features.	Local (score of 9).
Leisler's bat.	EPS	Uncommon and sparse in Suffolk; under-recorded. May be on edge of range. IUCN Red List Near threatened.	Very uncommon; assumed very low numbers.	Considered unlikely.	Considered unlikely (may be present in very small numbers).	Assumed to be present in low numbers, thus less likely to be reliant on the EDF Energy Estate. Less reliant on linear features.	Local (score of 7).

Species.	Conservation Status.	Status UK/Suffolk [Select Highest Rating].	Status within the EDF Energy Estate.	Breeding Roosts (Maternity).	Hibernation.	Use of Habitats for Foraging/ Commuting.	Geographic Context of Importance.
Serotine	EPS	Uncommon, but widespread, in UK. IUCN Red List Vulnerable.	Uncommon; present in very low numbers.	Maternity colony located outside the proposed construction site but within the ZOI. Roost preferences and data indicate unlikely within EDF Energy Estate.	Hibernation preferences strongly indicate unlikely within EDF Energy Estate.	Assumed to be present in low numbers; less likely to be reliant on the EDF Energy Estate. Less reliant on linear features.	Local (score of 7).
Brown long-eared bat.	EPS NERC Act.	Common and widespread in UK and Suffolk. IUCN Red List Least Concern.	Common and widespread, but numbers difficult to estimate.	Maternity colony present adjacent to proposed construction site boundary.	Hibernation occurs in a wide variety of locations, so hibernation within tree roosts very likely.	Generalist; widespread and common throughout.	Local (score of 10).
Common pipistrelle.	EPS	Common and widespread in UK and Suffolk. IUCN Red List Least Concern.	Common and widespread, but numbers difficult to estimate.	Larger roosts likely to be off-site (outside of the estate); possibly within ZOI.	Few winter roosts are known; these tend to be solitary individuals. Hibernation within tree roosts probable.	Generalist; widespread and common throughout.	Local (score of 8).
Soprano pipistrelle.	EPS NERC Act.	Common and widespread in UK and Suffolk. IUCN Red List Least Concern.	Common and widespread, but numbers difficult to estimate.	Maternity colony in box in Kenton Hills and (anecdotally) in Hangman's Wood to the north.	Few winter roosts are known; these tend to be solitary individuals.	Generalist (though with a bias towards riparian habitats); widespread and	Local (score of 10).

Species.	Conservation Status.	Status UK/Suffolk [Select Highest Rating].	Status within the EDF Energy Estate.	Breeding Roosts (Maternity).	Hibernation.	Use of Habitats for Foraging/ Commuting.	Geographic Context of Importance.
					Hibernation within tree roosts probable.	common throughout.	
Nathusius' pipistrelle.	EPS	Uncommon and sparse in Suffolk; under-recorded. IUCN Red List Vulnerable.	Recorded in very low numbers.	None identified.	Likely to hibernate in tree roosts within the EDF Energy Estate and adjacent areas.	Generalist (though with a bias towards riparian habitats); less likely to be reliant on the EDF Energy Estate.	Local (score of 8).

* This matrix does not allow for finer definitions of 'Local' importance (district, borough, ZOI, site) for which professional judgement is required (and has been applied).

1.4.144 Following a review of the known baseline within the Zol, **Table 1.16** lists the ecological receptors and details the reasoning for carrying them forward into the detailed assessment. IEFs carried forward are of sufficient conservation value that they will be sufficient affected by the proposed development to require material consideration within the assessment.

Table 1.16: Ecological receptors taken forward for detailed assessment.

Receptor/ Receptor Group.	Importance (CIEEM/EIA Methodology).	Justification	Scope In/Out.
Barbastelle	National/high.	This species will experience direct habitat (foraging and roosting) loss and fragmentation of commuting routes and be impacted by increased noise and lighting. Barbastelle is nationally rare, the site has recorded one of few known maternity roosts in the UK and barbastelle is present across the Zol throughout the year. EPS and listed on Annex II of the Habitat's Directive (1.7), Section 41 of the NERC Act (1.3) and Suffolk BAP (1.4).	Scoped in.
Natterer's	County/medium.	This EPS will experience direct habitat (foraging and roosting) loss and fragmentation of commuting routes and be impacted by increased noise and lighting. A Natterer's maternity colony has been identified within the EDF Energy Estate and the population is likely to be reliant on habitats within the Zol.	Scoped in.
Leisler's bat and Nathusius' pipistrelle.	Local/low.	These EPS are combined based on their "edge-of-range" status/rarity within the EDF Energy Estate and will experience direct habitat (foraging and roosting) loss and fragmentation of commuting routes and be impacted by increased noise and lighting.	Scoped in.
Noctule and Serotine.	Local/low.	These species are combined based on ecological similarities including the adaption for foraging in open space and will experience direct habitat (foraging and roosting) loss and fragmentation of commuting routes and be impacted by increased noise and lighting. Both are EPSs, with noctule additionally listed on Section 41 of the NERC Act (1.3) and Suffolk BAP (1.4).	Scoped in.

Receptor/ Receptor Group.	Importance (CIEEM/EIA Methodology).	Justification	Scope In/Out.
Daubenton's bat, brown long-eared bat, common pipistrelle and soprano pipistrelle.	Local/low.	These species are combined based on their similarly common status but value in contributing to the overall bat assemblage and will experience direct habitat (foraging and roosting) loss and fragmentation of commuting routes and be impacted by increased noise and lighting. All are EPS, with soprano pipistrelle and brown long-eared bat additionally listed on Section 41 of the NERC Act (1.3) and Suffolk BAP (1.4).	Scoped in.

References

1.1 Wildlife and Countryside Act, as amended. 1981. (Online) Available from http://www.legislation.gov.uk/ukpga/1981/69 (Accessed 16 December 2015).

1.2 Conservation of Habitats and Species Regulations 2017. (Online) Available from: http://www.legislation.gov.uk/uksi/2017/1012/contents/made (Accessed 6 March 2019).

1.3 Natural Environment and Rural Communities Act. 2006. (Online) Available from http://www.legislation.gov.uk/ukpga/2006/16/contents (Accessed 16 December 2015).

1.4 Suffolk Biodiversity Partnership. 2012. Suffolk Local Biodiversity Action Plan – Grouped Plan for Bats. (Online) Available from https://www.suffolkbis.org.uk/sites/default/files/biodiversity/prioritypeciesha bitats/actionplans/Suffolk%20Grouped%20Bat%20Action%20Plan%20final %20%2027_03_12.pdf (Accessed 20 February 2019).

1.5 Chartered Institute of Ecology and Environmental Management. 2018. Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal. Winchester: CIEEM.

1.6 Bat Conservation Trust. 2015. Core Sustenance Zones: Determining zone size. (Online) Available from: http://www.bats.org.uk/publications.php?search=Search&page=10 (Accessed 12 November 2015).

1.7 J. Collins (ed.). 2016. Bat Surveys for Professional Ecologists: Good Practice Guidelines. 3rd edition. London: The Bat Conservation Trust.

1.8 W. Schober, and E. Grimmberger. 1997. The bats of Europe and North America. Dallas: TFH Publications.

1.9 H.W. Schofield, A.J. Mitchell-Jones, and D. Ovenden. 2003. The bats of Britain and Ireland. Ledbury: Vincent Wildlife Trust.

1.10 I. Davidson-Watts, S. Walls, and G. Jones. 2006. Differential habitat selection by *Pipistrellus pipistrellus* and *Pipistrellus pygmaeus* identifies distinct conservation needs for cryptic species of echolocating bats. Biological Conservation, 133: p.118–127.

1.11 S. Harris, and D.W.Y. Yalden (ed.).2008. Mammals of the British Isles: handbook. London: Mammal Society.

1.12 C. Dietz, O. van Helveson and D. Nil. 2009. Bats of Britain, Europe and North-west Africa. London: A & C Black.

1.13 J. Altringham. 2003. The New Naturalist – British bats. London: Harper Collins Publishers.

1.14 A.C. Entwistle, P.A. Racey, and J.R. Speakman. 1996. Habitat exploration by a gleaning bat, *Plectorus auritus*. Philosophical Transactions of the Royal Society of London B: Biological Sciences, 351 (1342) pp. 921–931.

1.15 P. Richardson. 2000. Distribution atlas of bats in Britain and Ireland, 1980–1999. London: Bat Conservation Trust.

1.16 I.J. Mackie, and P.A. Racey. 2007. Habitat use varies with reproductive state in noctule bats (*Nyctalus noctula*): implications for conservation. Biological Conservation, 140(1), pp. 70–77.

1.17 P.G. Smith, and P.A. Racey. 2005. The itinerant Natterer, physical and thermal characteristics of summer roosts of *Myotis nattereri* (Mammalia: Chiroptera). Journal of Zoology, 266(2): p.171–180.

1.18 C.M.C. Catto et al. 1996. Foraging behaviour and habitat use of the serotine bat (*Eptesicus serotinus*) in southern England. Journal of Zoology, 238(4), p.623–633.

1.19 M.F. Robinson, and R.E. Stebbings. 1997. Home range and habitat use by the serotine bat, Eptesicus serotinus, in England. Journal of Zoology, 243(1): p. 117–136.

1.20 M.R.K. Zeale, I. Davidson-Watts, and G. Jones. 2012. Home range use and habitat selection by barbastelle bats (*Barbastella barbastellus*): implications for conservation. Journal of Mammalogy. 93(4) pp. 1,110–1,118.

1.21 S.M. Swift, and P.A. Racey. 1983. Resource partitioning in two species of vespertilionid bats (Chiroptera) occupying the same roost. Journal of Zoology, 200(2) p.249–259.

1.22 P. Richardson. 1985. Bats. Essex: Whittet Books.

1.23 J.A. Encarnacao et al. 2005. Sex-related difference sin roost-site selection by Daubenton's bats *Myotis daubentonii* during the nursery period. Mammal Review, 35(3–4) pp. 285–294.

1.24 D. Waters, G. Jones, and M. Furlong. 1999. Foraging ecology of Leisler's bat (Nyctalus leisleri) at two sites in southern Britain. Journal of Zoology, 249(2), p.173–180.

1.25 Suffolk Biodiversity Information Service. 2015. Priority Species and Habitats. (Online) Available from: https://www.suffolkbis.org.uk/biodiversity/speciesandhabitats (Accessed 1 February 2019).

1.26 Suffolk Bat Group. 2017. Bats in Suffolk: Distribution Atlas 1983–2016. (Online) Available from http://live-twt-d8-suffolk.pantheonsite.io/sites/default/files/2018-06/Bat%20Atlas%201983_2016%20final.pdf (Accessed 18 February 2019).

1.27 S. Bullion. 2009. The Mammals of Suffolk. Ipswich: Suffolk Wildlife Trust and Suffolk Naturalist' Society.

1.28 Entec. 2007. Sizewell Bat Survey Report 2007. British Energy Group PLC.

1.29 Entec. 2008. Sizewell Bat Survey Report 2008. British Energy Group PLC.

1.30 Entec. 2010. Sizewell Bat Survey Report 2010. NNB Generation Company.

1.31 Amec. 2011. Associated Development Site 1. DRAFT Extended Phase 1 Habitat Survey Report. NNB Generation Company.

1.32 Amec. 2012. Sizewell C New Nuclear Power Station: Terrestrial and Freshwater Ecology and Ornithology DRAFT Coronation Wood Bat Survey Report.

1.33 Entec. 2009. Sizewell Bat Survey Report 2009. EDF Developments Ltd. 2009.

1.34 Amec. 2011. Sizewell Ecology Studies Bat Survey Report 2011.

1.35 Amec. 2012. Associated Development Site 1. DRAFT Bat Survey Report. NNB Generation Company.

1.36 Amec. 2011. Sizewell Survey of Potential Bat Hibernation Sites in Buildings, January-March 2011.

1.37 Amec. 2013. Upper Abbey Farm, Leiston: Ecological Appraisal Report.

1.38 Royal Haskoning. 2008. Sizewell Power Station ISFSI and Car Park Extension Extended Phase 1 and Habitat Survey Report 2008. Entec UK Limited.

1.39 Galloper Wind Farm Limited. 2014. Galloper Wind Farm Eastern Super Grid Transformer Project. Environmental Statement Chapter 5 Terrestrial Ecology.

1.40 Corylus Ecology. 2016. Sizewell Radio-tracking Report.

1.41 Joint Nature Conservation Committee. Third Report by the United Kingdom under Article 17 on the implementation of the Directive from January 2007 to December 2012. (Online) Available from http://jncc.defra.gov.uk/page-6391 (Accessed 18 January 2016).

1.42 NGL. 2008. Sizewell Land Management Annual Review 2007–2008. Suffolk Wildlife Trust.

1.43 NGL. 1997. Sizewell Land Management Annual Review 1996–1997. Suffolk Wildlife Trust.

1.44 NGL. 2001. Sizewell Land Management Annual Review 2000–2001. Suffolk Wildlife Trust.

1.45 NGL. 2003. Sizewell Land Management Annual Review 2002–2003. Suffolk Wildlife Trust.

1.46 NGL. 1999. Sizewell Land Management Annual Review 1998–1999. Suffolk Wildlife Trust.

1.47 NGL. 2004. Sizewell Land Management Annual Review 2003–2004. Suffolk Wildlife Trust.

1.48 NGL. 2009. Sizewell Land Management Annual Review 2009. Suffolk Wildlife Trust.

1.49 NGL. 2010. Sizewell Land Management Annual Review 2010. Suffolk Wildlife Trust.

1.50 NGL. 2011. Sizewell Land Management Annual Review 2011. Suffolk Wildlife Trust.

1.51 NGL. 2012. Sizewell Land Management Annual Review 2012. Suffolk Wildlife Trust.

1.52 NGL. 2014. Sizewell Land Management Annual Review 2014. Suffolk Wildlife Trust.

1.53 NGL. 2015. Sizewell Land Management Annual Review 2015. Suffolk Wildlife Trust.

1.54 NGL. 1998. Sizewell Land Management Annual Review 1997–1998. Suffolk Wildlife Trust.

1.55 NGL. 2000. Sizewell Land Management Annual Review 1999–2000. Suffolk Wildlife Trust.

1.56 NGL. 2002. Sizewell Land Management Annual Review 2001–2002. Suffolk Wildlife Trust.

1.57 NGL. 2005. Sizewell Land Management Annual Review 2004–2005. Suffolk Wildlife Trust.

1.58 NGL. 2006. Sizewell Land Management Annual Review 2005–2006. Suffolk Wildlife Trust.

1.59 NGL. 2007. Sizewell Land Management Annual Review 2006–2007. Suffolk Wildlife Trust.

1.60 NGL. 2009. Sizewell Land Management Annual Review 2008–2009. Suffolk Wildlife Trust.

1.61 NGL. 2013. Sizewell Land Management Annual Review 2013. Suffolk Wildlife Trust.

1.62 NGL. 2016. Sizewell Land Management Annual Review 2016. Suffolk Wildlife Trust.

1.63 NGL. 2018. Sizewell Land Management Annual Review 2018. Suffolk Wildlife Trust.

1.64 Arcadis. 2016. Ecology SM2 Bat Monitoring 2013/2014.

1.65 J. Hillen, A. Kiefer, and M. Veith. 2009. Foraging site fidelity shapes the spatial organisation of a population of female western barbastelle bats. Biological Conservation, 142(4), pp. 817–823.

1.66 A.J. Mitchell-Jones. 2004. Bat Mitigation Guidelines. Sheffield: English Nature.

1.67 S. Wray, S., D. Wells, E. Long & T. Mitchell-Jones. 2010. Valuing bats in Ecological Impact Assessment. In Practice, No. 70, Institute of Ecology and Environmental Management.

1.68 F. Mathews, F. Coomber, J. Wright and T. Kendall (eds). 2018. Britain's Mammals 2018: The Mammal Society's Guide to their Population and Conservation Status London: The Mammal Society.

1.69 Joint Nature Conservation Committee. (Undated). 1308 Barbastelle Barbastella barbastellus. (Online) Available at: https://sac.jncc.gov.uk/species/S1308/ (Accessed 20 September 2019).

1.70 Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora. 1992 (Online) Available at: http://jncc.defra.gov.uk/page-1374 (Accessed 6 March 2019).

1.71 S. Harris, P. Morris, S. Wray, and D. Yalden. 1995. A review of British mammals: population estimates and conservation status of British mammals other than cetaceans. Peterborough: Joint Nature Conservation Committee.

1.72 M.R.K. Zeale. 2011. Conservation biology of the barbastelle (Barbastella barbastellus): applications of spatial modelling, ecology and molecular analysis of diet. Doctoral dissertation. University of Bristol. [From an unpublished PhD – but information is likely to be published before the ES].

1.73 G. Harris. 2018 in Wiltshire Bat Group Newsletter – Spring 2019 (and pers. comm.). Available here: https://wiltshiremammals.files.wordpress.com/2019/02/wbg-newsletter-spring-2019.pdf.

1.74 Bristol University. (Undated) The Bats of Britain. (Online) Available at: http://www.bio.bris.ac.uk/research/bats/britishbats/index.htm?_ga=2.136442675.249927862.1551899738-1561381016.1551899738 (Accessed 6 March 2019).

1.75 BSG Ecology. 2010. Norwich Northern Distributor Road Bat Activity and Radio-tracking Surveys 2009. Provided as Annex T within Norwich Northern Distributor Road ES Volume 2 Nature and Conservation Part 8. Accessed through : the infrastructure planning portal [6.2.8 ES Volume 2 Nature and Conservation Part 8].

1.76 L. Ancillotto, I. Cistrone, F.Mosconi, G. Jones, L. Boitani and D, Russo. 2005. The importance of non-forested landscapes for the conservation of forest bats: lessons from barbastelle (Barbastella barbastellus). Biodiversity Conservation, 24(1): p.171–185.

1.77 D. Russo, L. Cistrone, G. Jones and S, Mazzoleni. 2004. Roost selection by barbastelle bats (Barbastella barbastellus, Chiroptera: Vespertilionidae) in beech woodlands of central Italy: consequences for conservation. Biological Conservation, 117(1), p.73–81.

1.78 Greenaway, F. 2008. Barbastelle Bats in the Sussex West Weald 1997 – 2008. Unpublished Sussex Wildlife Trust Report. Available at: http://www.westweald.org.uk/pdf/Barbastelle%20Bats%20in%20the%20Sussex%20West%20Weald%201997-2008.pdf.

1.79 K. Barlow/BCT. 2005. A review and synthesis of published information and practical experience on bat conservation within a fragmented landscape. An occasional report by the Three Welsh National Parks, Pembrokeshire County Council and the Countryside Council for Wales.

1.80 F. Greenaway. 2001. The barbastelle in Britain. British Wildlife, 12: 327–334.

1.81 F. Greenaway. 2004. Advice for the management of flightlines and foraging habitats of the barbastelle bat Barbastella barbastellus. English Nature research report 657.

1.82 Bat Conservation Trust. 2019. National Bat Monitoring Programme Annual Monitoring Report 2018. (Online) Available from: https://cdn.bats.org.uk/pdf/Our%20Work/NBMP/National-Bat-Monitoring-Programme-Annual-Report-2018.pdf?mtime=20190509100258 (Accessed 20 September 2019).

1.83 Amec. 2013. Upper Abbey Farm, Leiston: Ecological Appraisal Report.

1.84 J. Russ. 1999. The Bats of Britain and Ireland. Echolocation calls, sound analysis, and species identification. Powys: Alana Books.

1.85 J. Russ. 2014. Nathusius' pipistrelle in Great Britain and Ireland – Life History. (Online) available from: http://www.nathusius.org.uk/Life_History.htm (Access 20 September 2019).

1.86 J. Russ. 2014. Nathusius' pipistrelle in Great Britain and Ireland – Current Distribution. (Online) available from: http://www.nathusius.org.uk/Distribution.htm Access 20 September 2019).

SIZEWELL C DEVELOPMENT – MAIN DEVELOPMENT SITE: VOLUME 2, CHAPTER 14, APPENDIX 14A8 – Bats:

Documents included within this Appendix group are as follows:

- **ANNEX 14A8.1** – FIGURES (provided separately)
- **ANNEX 14A8.2** - DESK STUDY
- **ANNEX 14A8.3** – METHODOLOGY
- **ANNEX 14A8.4** - RESULTS
- **ANNEX 14A8.5** - SECONDARY DATA
- Annex 14A8.5 Amec Phase 1 Aldhurst Farm 2011
- Annex 14A8.5 Amec Aldhurst Farm Bat Survey 2012
- Annex 14A8.5 Amec Coronation Wood Bat Survey 2012
- Annex 14A8.5 Amec Sizewell Bat Survey Report 2007
- Annex 14A8.5 Amec Sizewell Bat Survey Report 2008
- Annex 14A8.5 Amec Sizewell Bat Survey Report 2009 (included in Part 2)
- Annex 14A8.5 Amec Sizewell Bat Survey Report 2010
- Annex 14A8.5 Amec Sizewell Bat Survey Report 2011 (included in Part 3)
- Annex 14A8.5 Amec Sizewell Hibernation Survey 2011
- Annex 14A8.5 Amec Upper Abbey Ecological Appraisal 2013

- Annex 14A8.5 Royal Haskoning Sizewell Power Station ISFSI and Car Park Extension Ecological Scoping Report 2008
- Annex 14A8.5 Galloper Wind Farm Chapter 5 ES Terrestrial Ecology
- Annex 14A8.5 Sizewell Land Management Annual Review 2013
- Annex 14A8.5 Sizewell Land Management Annual Review 2011
- Annex 14A8.5 Sizewell Land Management Annual Review 2012 (included in Part 4)
- Annex 14A8.5 Site Manager's Report May-Sep 2018
- Annex 14A8.5 Sizewell Annual Report 2014
- Annex 14A8.5 Sizewell B Annual Report 2017

- **ANNEX 14A8.6 - PRIMARY DATA**

- Annex 14A8.6 11H5.1 Hyder Cresswell 2013 Monitoring strategy
- Annex 14A8.6 Sizewell B Relocated Facilities Bat and Badger Technical Note [CONFIDENTIAL, provided separately]
- Annex 14A8.6 Sizewell B Relocated Facilities Bat Re-entry Emergence Survey 2019 Technical Note
- Annex 14A8.6 Bat Radio Tracking Drawings February 2016
- Annex 14A8.6 Bat Radio Tracking Report May 2016
- Annex 14A8.6 Automated Bat Detector Monitoring Report 2013-2014 (included in Part 5)
- Annex 14A8.6 Automated Bat Detector Monitoring Report 2013-2014 Figures
- Annex 14A8.6 Sizewell C Sandpits Technical Note [CONFIDENTIAL, provided separately]

VOLUME 2, CHAPTER 14: APPENDIX 14A8 – BATS: ANNEX 14A8.2 DESK STUDY

Contents

Tables

Plates

None provided.

Figures

None provided.

1 Desk Study

1.1 Introduction

1.1.1 Records for bats were requested from Suffolk Biodiversity Information Service (SBIS) in December 2014 for protected or otherwise notable species of conservation concern within 2km of the Sizewell C power station at the main development site (referred to throughout this volume as the "proposed development"). Additional requests were made to SBIS in February 2015 for bat roost records within 10km of the proposed development site, and in 2018.

1.1.2 The locations of statutory designated sites within 10km and non-statutory designated sites within 2km were also obtained and reviewed to ascertain whether or not bats were cited as interest features.

1.1.3 The Suffolk Biodiversity Action Plan (BAP) (Ref. 1.1), the Suffolk Bat Atlas (Ref. 1.2) and Mammals of Suffolk (Ref. 1.3) were also reviewed for information on bats within the main development site and ZoI. The results of these reviews are detailed in **Appendix 14A8 – Bats**.

1.2 Status of UK bat species

1.2.1 In the UK, all bat species are protected under Schedule 5 of the Wildlife and Countryside Act (W&CA) (Ref. 1.4) and as European Protected Species (EPS) under Schedule 2 of the Conservation of Habitats and Species Regulations (Ref. 1.5); hereafter the Habitats Regulations.

1.2.2 Thirteen bat species are listed on the Suffolk BAP (grouped plan for bats (Ref. 1.1)): barbastelle (*Barbastella barbastellus*), Brandt's bat (*Myotis brandtii*), brown long-eared bat (*Plecotus auratus*), common pipistrelle (*Pipistrellus pipistrellus*), Daubenton's bat (*Myotis daubentonii*), Leisler's bat (Nyctalus *leisleri*), lesser horseshoe bat (*Rhinolophus hipposideros*), Nathusius' pipistrelle (*Pipistrellus nathusii*), Natterer's bat (*Myotis nattereri*), noctule (*Nyctalus noctula*), serotine (*Eptesicus serotinus*), soprano pipistrelle (*Pipistrellus pygmaeus*) and Whiskered bat (*Myotis mystacinus*). Of the species identified within the ZoI, four are further protected under Section 41 of the Natural Environment and Rural Communities (NERC) Act (Ref. 1.6): barbastelle, brown long-eared bat, noctule and soprano

pipistrelle[1]. Barbastelle is additionally listed on Annex II of the Habitats Directive (Ref. 1.7).

1.2.3 **Table 1.1** describes the status of UK bat species from a local, county and national perspective.

[1] Lesser horseshoe bat is also listed under Section 41 of the NERC Act but was not recorded within the Zol.

Table 1.1: Status of UK bat species

Species	Conservation Status Assessment		
	Local	Status In Suffolk	National Status
Sources Used	*Background Data Search (see Chapter 4 for different sources of data).* *Local Biodiversity Action Plans (Ref. 1.1).* *Data from ecological reports submitted with planning applications.* *Local Records Centre.*	*County Bat Group and Atlas (Ref. 1.2).* *County Wildlife Trust.* *County Recorder.* *Local Biodiversity Action Plans (Ref. 1.1).* *Mammals of Suffolk (Ref. 1.3).*	*JNCC Article 17 Reporting (Ref. 1.8).* *National Bat Monitoring Programme Annual Report 2017 (Ref. 1.9).* *Britain's Mammals 2018 (Ref. 1.10).*
Barbastelle	Listed on Annex II of the Habitat's Directive (Ref. 1.7), within Section 41 of the NERC Act (Ref. 1.6) and on the Suffolk BAP (Ref. 1.1). Records from SBIS identified barbastelle activity within, at Upper Abbey Farm, and in proximity to, at Sizewell Wents and Minsmere, the main development site as well as within the wider 10km radius. Three roost records were identified within Yoxford, Bramfield and Westleton.	Widespread but uncommon, considered likely to be present across the county within suitable habitat but at only very low numbers. Atlas shows scattered records through most of county.	Rare. Article 17 report (2013) gave the UK population as 5,000 individuals, of which 4,500 were in England+ In 2018, Britain's Mammals (Ref. 1.10) concluded that there was insufficient evidence to determine any kind of population estimate or future trend, and classed the population as 'Vulnerable'.
Natterer's bat	Records from SBIS identified Natterer's bat activity within, at Upper Abbey Farm, and in proximity, at Lower Abbey Farm and Sizewell Wents, to the main	Widespread but uncommon. Atlas suggests this species is widespread across Suffolk using most known	Locally common and widespread throughout the UK. Article 17 report (2013) gave the UK population

Species	Conservation Status Assessment		
	Local	Status In Suffolk	National Status
	development site as well as within the wider 10km radius. 13 roosts records were identified, including three maternity roosts. Three roosts, including one maternity roost were identified within the main development site at Upper Abbey Farm. Roosts were also located in proximity to the main development site in bat boxes at Kenton Hills as well as within the wider 10km radius.	hibernation sites in the county	as 148,000 individuals, of which 70,000 were in England+ The population trend (NBMP[2]) is listed as 'increasing' but should be considered with caution. The 2018 review assessed this as unreliable, citing a population of 414,000, but with extremely wide confidence limits. The future trend was undefined (due to lack of evidence), and the population status defined as being of 'Least Concern'.
Daubenton's bat	Records from SBIS identified Daubenton's bat activity within the main development site at Upper Abbey Farm as well as within the wider 10km radius. No roost records were identified.	Widespread and locally common. Atlas records suggest while this species is not common in Suffolk it displays a relatively stable population and a wide distribution. The most abundant species identified at Suffolk hibernacula sites.	Relatively common and widespread. Article 17 report (2013) gave the UK population as 174,000 individuals, of which 95,000 are in England++ The population trend was listed as stable (NBMP). The 2018 review assessed this as unreliable, citing a population of 1.030,000, but with extremely wide confidence limits. The future trend was undefined (due to lack of evidence), and the population status as being of 'Least Concern'.

[2] National Bat Monitoring Programme

Species	Conservation Status Assessment		
	Local	**Status In Suffolk**	**National Status**
Noctule	Listed within Section 41 of the NERC Act (Ref. 1.6) and as a priority species on the Suffolk BAP (Ref. 1.1). Records from SBIS identified noctule activity records in proximity to the main development site at Sizewell Wents and Minsmere, as well as within the wider 10km radius. Five roost records were identified all within bat boxes located in Kenton Hills.	Widespread and uncommon. Atlas records suggest it is widespread throughout Suffolk although most records relate to activity, rather than roost locations.	Relatively common and widespread baring its absence from Northern Ireland. Article 17 report (2013) gave the UK population as 50,000 individuals, of which 45,000 are in England+ . The population trend was listed as stable (NBMP). The 2018 review is significantly greater, citing a population of 663,900, but with extremely wide confidence limits (the lower limits overlap with the 2013 estimate). The future trend was undefined (due to lack of evidence), and the population status as being of 'Least Concern'.
Leisler's bat	Records from SBIS identified only a single Leisler's bat record within the 10km radius since 1994. This activity record was outside of, but in proximity to the main development site at Sizewell Wents, recorded in 2013.	Rare and uncommon Atlas records indicate a limited presence in Suffolk with the majority located in the west of the county	Uncommon but widespread with a greater presence in Northern Ireland Article 17 report (2013) gave the UK population as between 24,000 and 40,000 individuals, of which 9,750 are in England+ In 2018, Britain's Mammals concluded that there was insufficient evidence to determine any kind of population estimate or trend, and classed the population as 'Near Threatened'.
Serotine	Records from SBIS identified serotine activity records within, at Upper Abbey Farm, and in proximity to, at Sizewell	Widespread but uncommon Atlas records indicate a widespread dispersal but note that this largely consists	Uncommon, largely restricted to south Article 17 report (2013) gave the UK population as 15,000 individuals, of which 14,750 are in

Species	Conservation Status Assessment		
	Local	**Status In Suffolk**	**National Status**
	Wents and Minsmere, the main development site as well as within the wider 10km radius. A single maternity roost record was identified 9km from the main development site. An additional maternity roost is known by Suffolk Wildlife Trust to be present in Theberton.	of small colonies. Suffolk is noted to be the northern breeding limit for serotine	England++ The population trend was listed as 'stable' (NBMP), although this should be treated with caution due to the uncertainty associated with this trend. The 2018 review is significantly greater, citing a population of 136,900, but with wide confidence limits (the lower limits overlap with the 2013 estimate). The future trend was undefined (due to lack of evidence), and the population status as being of 'Vulnerable'.
Brown long-eared bat	Listed within Section 41 of the NERC Act (Ref. 1.6) and on the Suffolk BAP (Ref. 1.1). Records from SBIS identified brown long-eared bat activity records within, at Upper Abbey Farm and in proximity to, at Minsmere, the main development site, as well as within the wider 10km radius. 32 roost records were identified, including nine maternity roosts. No roosts were located within the main development site although records were identified from Ash Wood Cottages adjacent to the main development site and within the wider 10km radius within Theberton, Middleton and Westleton.	Widespread and common The Atlas confirms a widespread and common presence in Suffolk	Relatively widespread and common (Article 17 report (2013) gave the UK population as 245,000 individuals, of which 155,000 are in England. The population trend was listed as 'stable' (NBMP). The 2018 review is significantly greater, citing a population of 934,000, but with wide confidence limits (the lower limits significantly overlaps with the 2013 estimate). The future trend was considered stable (based on NBMP data), and the population status as being of 'Least Concern'.

Species	Conservation Status Assessment		
	Local	**Status In Suffolk**	**National Status**
Nathusius' pipistrelle	Records from SBIS identified only two Nathusius' pipistrelle records in a 10km radius since 1994. Both were outside of the main development site within Sizewell Wents and Thorington Pit.	Rare Only a small number of records identified in the Atlas but considered that the species is likely to be far more widespread than the records suggest due to under-recording	Uncommon to rare but widespread Article 17 report (2013) was unable to provide a UK or England population size or a population trend due to insufficient data to make these calculations. The 2018 Review similarly concluded that there was insufficient evidence to determine any kind of population estimate or future trend, and classed the population as 'Vulnerable'.
Common pipistrelle	Records from SBIS identified common pipistrelle activity within Upper Abbey Farm, and in proximity to, Sizewell Wents, Rosary Cottage, Minsmere and the main development site as well as within the wider 10km radius. 16 roost records were identified, including five maternity roosts. No roost records were located within the main development site, with the closest being within 1.5km in Leiston and Theberton.	Widespread and common	Common and widespread Article 17 report (2013) gave the UK population as between 1,390,000 and 1,611,000 individuals, of which 800,000 are in England+ The population trend was listed as 'increasing' (NBMP). The 2018 review cites a population of 3,040,000, again with wide confidence limit. The future trend was considered likely to be stable (based on NBMP data), and the population status as being of 'Least Concern'.
Soprano pipistrelle	Listed within Section 41 of the NERC Act (Ref. 1.6) and as a priority species on the Suffolk BAP (Ref. 1.1). Records from SBIS identified soprano	Widespread and common	Common and widespread Article 17 report (2013) aive the UK population as between 774000 and 883,000 individuals, of which 450,000 are in England++ The population

Species	Conservation Status Assessment		
	Local	**Status In Suffolk**	**National Status**
	pipistrelle activity within Upper Abbey Farm, and in proximity to Sizewell Wents, Minsmere, Kenton Hills and the main development site as well as within the wider 10km radius. Four roost records were identified, a maternity roost in Theberton, in Dunwich and within bat boxes at Kenton Hills.		trend is 'stable' (NBMP). The 2018 review cites a population of 4,670,000, again with wide confidence limit. The future trend was considered likely to be stable (based on NBMP data), and the population status as being of 'Least Concern'.
Lesser horseshoe bat	Listed within Section 41 of the NERC Act (Ref. 1.6) and as a priority species on the Suffolk BAP (Ref. 1.1). No records of this species were identified within the 10km radius of the main development site considered in the desk-study.	Very rare (a single individual has been recorded in the west of the county, located over 90 miles from the nearest known record elsewhere)	Rare, largely confined to SW England and Wales, so not discussed further.
Greater horseshoe bat (*Rhinolophus ferrumequinum*)	Listed within Section 41 of the NERC Act (Ref. 1.6). No records of this species were identified within the 10km radius of the main development site considered in the desk-study.	Current known distribution excludes Suffolk	Very rare, largely confined to SW England and south Wales, so not discussed further.
Grey long-eared bat (*Plecotus austriacus*)	No records of this species were identified within the 10km radius of the main development site considered in the desk-	Current known distribution excludes Suffolk	Very rare, and well outside the range of this project, so not discussed further.

Species	Conservation Status Assessment		
	Local	**Status In Suffolk**	**National Status**
	study.		
Bechstein's bat (*Myotis bechsteinii*)	No records of this species were identified within the 10km radius of the main development site considered in the desk-study.	Current known distribution excludes Suffolk	Very rare, and well outside the range of this project, so not discussed further.
Whiskered/ Brandt's bat	No records of these species were identified within the 10km radius of the main development site considered in the desk-study.	Very few records exist from either species in Suffolk; the atlas records none in the eastern side of the county.	Relatively uncommon but widespread in England and Wales. Article 17 reports give the UK Whiskered bat population as 64,000 individuals, of which 30,500 are in England+. The population trend is 'stable' (NBMP). Article 17 reports give the UK Brandt's bat population as 30,000 individuals, of which 22,500 are in England+. The population trend is 'stable' (NBMP). The NBMP indicates these trends should be treated with caution due to uncertainties associated these species The 2018 Review does not give a population estimate nor trend for either species.
Alcathoe bat (*Myotis alcathoe*)	No records of this species were identified within the 10km radius of the main development site considered in the desk-study.	A species newly-identified in the UK, and not known to be in Suffolk.	Status unconfirmed – presence in UK confirmed in 2010

Species	Conservation Status Assessment		
	Local	**Status In Suffolk**	**National Status**
Greater mouse-eared bat (*Myotis myotis*)	No records of this species were identified within the 10km radius of the main development site considered in the desk-study.	Current known distribution excludes Suffolk	Status unconfirmed – only one individual known to over-Winter in the UK at present (on the south coast).

[+]Population estimate based on expert opinion with no or minimal sampling
[++]Population estimate based on partial data with some extrapolation and/or modelling
[+++]Population estimate based on complete survey or statistically robust estimate.

1.3 SBIS Desk study records

1.3.1 **Table 1.2** details the desk-study records identified following a data request to SBIS:

Table 1.2: Roost records from SBIS within 10km of the proposed development site

Flight records are included for barbastelle, Daubenton's bat, Leisler's bat, Nathusius pipistrelle and serotine only. Place names are as provided by SBIS.

Species	Location	Date
Barbastelle	Wolsey House Farm, Yoxford, Suffolk.	2013
	Great Glemham.	2013
	Thorington Pit (close to woodland).	2013
	Great Glemham.	2013
	Great Glemham.	2013
	Sizewell Marshes SSSI.	2013
	Great Glemham.	2013
	Dunwich	2013
	Dunwich	2015
	Bramfield	2011
	Church Farm (Thorington).	2011
	Church Farm (Thorington).	2011
	Minsmere Nature Reserve.	2010
	Minsmere Nature Reserve.	2010
	Minsmere Nature Reserve.	2010
	Minsmere Nature Reserve.	2010
	Barns at King's Farm Wetleton.	2009
	Captains Wood, Sudbourne.	2005
	Captains Wood, Sudbourne.	2005
	Captains Wood, Sudbourne.	2005
	Captains Wood, Sudbourne.	2005
	Captains Wood, Sudbourne.	2005
	Upper Abbey Farm Barn.	2004
	Westleton	2003

Species	Location	Date
	Upper Abbey Farm.	1997
Brown long-eared.	Wolsey House Farm, Yoxford, Suffolk.	2013
	Upper Abbey Farm Workshop.	2016
	Old Manor House, Theberton.	2013
	Hall Field, Mill Lane, Stratford St Andrew, IP17 1LH.	2013
	Darsham Church Darsham.	2013
	Dunwich Forest hibernacula[3].	2013
	FrederickÆs Wood, Dunwich Rd, Westleton, IP17 3DB.	2013
	Former Leiston Contitutional Club.	2013
	Dunwich Church Dunwich.	2013
	Walnut Tree & Apple Tree Cottages, Sandy Lane, Dunwich IP17 3DY.	2012
	Everest, Blythburgh Rd., Westleton, Saxmundham, IP17 3AS.	2012
	Dunwich Forest.	2012
	IP17 3DY	2012
	Middleton	2011
	Ormonde House, Dunwich Rd, Westleton,.	2011
	Westwood Lodge , Blythburgh.	2011
	Westleton	2011
	Walk Barn Farm Westleton.	2010
	Leiston	2010
	Middleton	2010
	The Old Bowling Green High Street Yoxford IP17 3EP.	2010
	Harrow Corner Low Street Benhall IP17 1JE.	2010
	No 6 Ashwood Cottages, Eastbridge IP16 4SR.	2010
	Benhall	2009
	North Green Farm, Sibton.	2007
	Sandy Lane Farm Barn Dunwich.	2007

[3] A request for further information identified that Dunwich Shelter in Dunwich Forest (TM 475693) is a hibernation roost where regular monitoring takes place. Natterer's bat and brown long-eared bats have been recorded there by the Suffolk Bat Group in the following years: 2004, 3 Natterer's bat; 2005, 5 Natterer's bat, 1 brown long-eared bats; 2006, 5 Natterer's bat, 5 brown long-eared bats; 2011, 5 Natterer's bat, 1 brown long-eared bats; 2013, 20 Natterer's bat, 1 brown long-eared bats; 2014, 10 Natterer's bat, 1 brown long-eared bats; 2015, 14 Natterer's bat.

Species	Location	Date
	The Barn, Theberton House, Theberton.	2006
	Darsham House, Saxmundham, The Street, Darsham.	2004
	Depbella, Leiston Road, Aldeburgh.	2004
	Valley Farm Cottage, Low Rd, Bramfield.	2004
	Church Farm Blythburgh.	2003
	Potton hall Westleton.	2003
	Pembroke Cottage Walberswick.	2003
Common pipistrelle.	Wolsey House Farm, Yoxford, Suffolk.	2013
	Old Manor House, Theberton.	2013
	old estate cottage buildings now derelict.	2013
	Cliff House restaurant.	2013
	Middleton	2011
	Aldeburgh	2010
	Westleton	2010
	Town trust Cottage, Dunwich.	2006
	Village Hall. Westleton.	2006
	Catalpast, Saxmunham Rd, Aldeburgh.	2004
	Decoy Farm, Blackheath East, Friston, Saxmundham, Suffolk, IP17 1NX.	2004
	Darsham House, Saxmundham, The Street, Darsham.	2004
	Church Farm Blythburgh.	2003
	1,Walk Barn Cottage, Westleton.	2003
	Oakfield House.	2000
	Minsmere B. R.	1994
Daubenton's	Upper Abbey Farmhouse.	2012
	Dunwich Heath, Docwra's Ditch, Milennium Pond.	2011
	Cloisters Tunnel, Snape.	2000
	Thorington Road.	1997
	Blackheath Mansion, Friston.	1996
	Snape Marshes.	1996
	Westleton	2015
	BLACKHEATH MANSION.	1994
Leisler's bat	Sizewell Wents.	2013

Species	Location	Date
Nathusius' pipistrelle..	Sizewell Wents.	2013
	Westleton	2015
	Thorington Pit.	2013
Natterer's	Dunwich Forest hibernacula[3].	2013
	Upper Abbey Farm Barn, Leiston.	2013
	Kenton Hills Sizewell.	2013
	Kenton Hills Sizewell.	2012
	Kenton Hills Sizewell.	2016
	Dunwich Forest bat box project.	2012
	Kenton Hills Sizewell.	2012
	Upper Abbey Farm Barn Leiston.	2012
	Upper Abbey Farm Barn Leiston.	2016
	Dunwich Forest.	2012
	Kenton Hills, Sizewell.	2011
	Westwood Lodge barn, Blythburgh.	2011
	Middleton	2010
	Thorington Church Thorington.	2007
	Upper Abbey Farm barn Leiston.	2004
Noctule	Kenton Hills Sizewell.	2013
	Kenton Hills Sizewell.	2012
	Kenton Hills Sizewell.	2012
	Kenton Hills Sizewell.	2012
	Kenton Hills Sizewell.	2016
	Kenton Hills, Sizewell.	2011
Serotine	Great Glemham.	2013
	Upper Abbey Farmhouse.	2013
	Great Glemham.	2013
	Great Glemham.	2013
	Great Glemham.	2013
	Sizewell Wents.	2012
	Dunwich Forest, Dunwich.	2011
	Minsmere Nature Reserve.	2010

Species	Location	Date
	Minsmere Nature Reserve.	2010
	Home Reach, Golf Lane, Aldeburgh, IP15 5PY.	2009
	Thorington Church Thorington.	2007
	Captains Wood Sudbourne.	2005
	Captains Wood Sudbourne.	2005
	Captains Wood Sudbourne.	2005
	Captains Wood Sudbourne.	2005
	North Warren.	2002
	Theberton House.	2000
	Hall, IP19 9HX.	2000
	Aldringham Common and Walks/Thorpeness Golf Course.	1998
	Yoxford	1997
	Blackheath Mansion, Friston.	1996
	4 Shell Pits Cottage, Aldringham.	1994
	Aldringham Common and Walks/Thorpeness Golf Course.	1994
	Westleton.	2015
	Blackheath Mansion.	1994
Soprano pipistrelle.	Dunwich.	2013
	Kenton Hills, Sizewell.	2013
	Kenton Hills, Sizewell.	2012
	School House, Theberton, IP16 4SA.	2012

REFERENCES

1.1 Suffolk Biodiversity Partnership. 2012. Suffolk Local Biodiversity Action Plan – Grouped Plan for Bats. (Online) Available from https://www.suffolkbis.org.uk/sites/default/files/biodiversity/priorityspecieshabitats/actionplans/Suffolk%20Grouped%20Bat%20Action%20Plan%20final%20%2027_03_12.pdf (Accessed 20 February 2019)

1.2 Suffolk Bat Group. 2017. Bats in Suffolk: Distribution Atlas 1983 – 2016. (Online) Available from http://live-twt-d8-suffolk.pantheonsite.io/sites/default/files/2018-06/Bat%20Atlas%201983_2016%20final.pdf (Accessed 18 February 2019)

1.3 S. Bullion. 2009. The Mammals of Suffolk. Ipswich: Suffolk Wildlife Trust and Suffolk Naturalist' Society.

1.4 Wildlife and Countryside Act, as amended. 1981. (Online) Available from http://www.legislation.gov.uk/ukpga/1981/69 (Accessed 16 December 2015)

1.5 Conservation of Habitats and Species Regulations 2017. (Online) Available from: http://www.legislation.gov.uk/uksi/2017/1012/contents/made (Accessed 20 February 2019).

1.6 Natural Environment and Rural Communities Act. 2006. (Online) Available from http://www.legislation.gov.uk/ukpga/2006/16/contents (Accessed 16 December 2015)

1.7 Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive). 1992. (Online) Available from: http://www.legislation.gov.uk/uksi/2017/1012/contents/made (Accessed 20 February 2019)

1.8 Joint Nature Conservation Committee. Third Report by the United Kingdom under Article 17 on the implementation of the Directive from January 2007 to December 2012. (Online) Available from http://jncc.defra.gov.uk/page-6391 (Accessed 18 January 2016).

1.9 Bat Conservation Trust. 2018. National Bat Monitoring Programme. Annual Monitoring Report 2017. (Online) Available from: https://cdn.bats.org.uk/pdf/National-Bat-Monitoring-Programme-Annual-Report-2017.pdf?mtime=20181109145017 (Accessed 20 February 2019)

1.10 Mathews, F. *et al*. 2018. Britain's Mammals 2018: The Mammal Society's Guide to their Population and Conservation Status. London. The Mammal Society.

VOLUME 2, CHAPTER 14: APPENDIX 14A8 - BATS: ANNEX 14A8.3 METHODOLOGY

Contents

Tables

Plates

None provided.

Figures

All figures are found within **Annex 14A8.1**.

1. Methodology

1.1 Introduction

a) Purpose of annex

1.1.1 This annex sets out the methodologies employed during the bat surveys undertaken by Wood Group Wood Group (formerly Entec and Amec Foster Wheeler) and Arcadis Consulting (UK) Limited (formerly Hyder Consulting, and hereafter referred to as Arcadis) between 2007 and 2019 for the Sizewell C power station at the main development site (referred to throughout this volume as the "proposed development"). Where full details of the bat survey methodologies have been included within reports already produced for the proposed development site (hereafter referred to as the "site"), the full methodology has not been repeated here, although a summary has been provided. Published reports produced by Wood Group (and other secondary data sources) and Arcadis have been included within Annexes 14A8.5 and 14A8.6 respectively.

b) Survey area

1.1.2 Owing to changes in the likely proposed development layout, surveys have been undertaken across a range of study areas between 2007 and 2012 as illustrated on **Figure 14A8.1.1**; **Figure B2** (Ref. 1.1, **Annex 14A8.5**) and **Figure 1.1** (Ref. 1.2, **Annex 14A8.5**). It should be noted that the site boundary has changed, albeit not substantially, since the Wood Group surveys. However, the variation in the study areas for the different surveys has provided valuable contextual data regarding the local distribution of bat species, as well as providing data for the site as it stands in 2019. Within this annex, the term "study area" refers to the area specifically under consideration during the specified survey. Full details of the study areas are provided in the individual reports found in **Annex 14A8.5** and **Annex 14A8.6**. The different studies undertaken, including the desk-studies, have been used to make an assessment of bats within the Zones of Influence (ZoI) for the different species. The ZoI for each bat species is defined in **Appendix 14A8 – Bats**.

1.2 Wood Group surveys

a) Approach

1.2.1 A detailed suite of bat surveys were undertaken by Wood Group between 2007 and 2013, as set out in **Table 14A8.3.1**. The detailed methodologies, including relevant applied guidance, surveyor experience and licencing,

timings and results of these surveys are presented in the respective Wood Group survey reports which are provided within **Annex 14A8.5**.

Table 1.1: Wood Group bat surveys 2007-2012

Year	Surveys	Approximate Survey Location	Report Reference
2007	Tree assessments.	Northern edge of Kenton Hills and adjacent field margins and Dunwich Forest/Goose Hill.	1.3 (see **Annex 14A8.5**)
	Activity transect surveys.	The site.	
	Automated detector surveys.	The site.	
2008	Landscape assessments.	6km radius of main platform.	1.4 (see **Annex 14A8.5**)
	Tree assessments.	As 2007.	
	Roost surveys.	Upper Abbey Farm, Lower Abbey Farm, Leiston Abbey, trees within Goose Hill.	
	Activity transect surveys.	The site.	
	Automated detector surveys.	The site.	
2009	Landscape assessments.	The site.	1.5 (see **Annex 14A8.5**)
	Trapping surveys.	Fiscal Policy woodland and Nursery Covert.	
	Activity transect surveys.	The site.	
	Automated detector surveys.	The site.	
2010	Trapping and radio-tracking surveys.	EDF Energy estate.	1.6 (see **Annex 14A8.5**)
	Activity transect surveys.	Goose Hill; Northern Sizewell Marshes Site of Special Scientific Interest (SSSI), Fiscal Policy woodland, Kenton Hills, Nursery Covert, main platform and arable fields.	
	Automated detector surveys.	The site.	
	Emergence surveys.	EDF Energy estate.	
	Bat box surveys.	Kenton Hills.	
	Tree assessments.	The site.	
2011	Trapping and radio-tracking surveys.	EDF Energy estate.	1.1 (see **Annex**

Year	Surveys	Approximate Survey Location	Report Reference
	Activity transect surveys.	The site.	**14A8.5**)
	Automated detector surveys.	The site.	
	Building inspections.	Old Abbey Farm; Ash Wood Cottages; barn at Upper Abbey Farm.	
	Emergence surveys.	The site.	
	Bat box surveys.	Kenton Hills.	
	Hibernation roost surveys.	Barn at Upper Abbey Farm, WW II bunker.	1.7 (see **Annex 14A8.5**)
	Extended Phase 1 Tree Assessments.	Aldhurst Farm.	1.8 (see **Annex 14A8.5**)
2012	Activity transect surveys.	Coronation Wood.	1.2 (see **Annex 14A8.5**)
	Automated detector surveys.	Coronation Wood.	
	Tree assessments.	Coronation Wood.	
	Activity transect surveys.	Aldhurst Farm.	1.9 (see **Annex 14A8.5**)
	Automated detector surveys.	Aldhurst Farm.	
2012 / 2013	Building inspection.	Upper Abbey Farm.	1.10 (see **Annex 14A8.5**)

b) 2007 surveys

1.2.2 The 2007 surveys focused on the site, as defined in 2007 and illustrated on **Figure 1** (see 1.3, **Annex 14A8.5**), and aimed to provide an initial assessment of the value of the site for bats. The full details of the methodologies applied are provided in Ref. 1.3 (see **Annex 14A8.5**), summaries of these methodologies are provided in **sections 1.2b)i** to **1.2b)iii**.

i. Tree assessment

1.2.3 Visual inspections for tree features (including loose bark, dense ivy and cracks or splits) indicative of suitability for roosting bats and/or signs of bat use (including staining or droppings) were undertaken of mature deciduous trees along the northern edge of Kenton Hills, and nearby field margins

(see **Figure 2** (Ref. 1.3) on 7 to 9 June 2007. Samples of trees within conifer plantations at Dunwich Forest/Goose Hill were also assessed; this sampling approach was considered acceptable as the tress were assessed as being of even-age blocks, lacking in "double-leader" features of the type that can support roosts. Where suitable features were identified, a record of the tree location and feature height and aspect were made.

ii. Activity transect surveys

1.2.4 Five evening activity transect surveys were undertaken between June and September 2007 (7 June, 6 July, 16 August, 18 August and 12 September). Activity surveys were intended to provide a sample of the bat activity within different areas of the site; therefore, a different transect was undertaken on each survey visit, with all incorporating a number of designated listening points. The locations of these transects are illustrated on **Figures 3-7** (see Ref. 1.3, **Annex 14A8.5**).

1.2.5 Each transect commenced at sunset and was simultaneously walked by two surveyors for two to three hours post-sunset, using either a Batbox Duet connected to a mini-disc recorder or an Anabat SD1 to record bat activity.

iii. Automated detector surveys

1.2.6 During each of the activity transect surveys undertaken between June and September 2007 (as detailed in **section 1.2b)ii**), two Anabat SD1s were deployed along the transect route to record bat activity overnight. The locations of these automated detector survey locations are illustrated on **Figures 3-7** (Ref. 1.3).

1.2.7 Anabats were positioned between one and two metres above the ground to reduce background noise that might otherwise conceal bat echolocation calls (e.g. from crickets). Recordings were later analysed using Analook software.

c) 2008 surveys

1.2.8 The 2008 surveys were undertaken across an extended survey area as illustrated on **Figure 1** (see Ref. 1.4, **Annex 14A8.5**). The 2008 surveys aimed to build on the baseline data collected in 2007 relating to the level and nature of bat usage of the site, with particular focus on barbastelle (*Barbastella barbastellus*) roost locations and flight lines. Full details of the methodologies applied are provided in Ref. 1.4 (see **Annex 14A8.5**), summaries of these methodologies are provided in **sections 1.2c)i** to **1.2c)v**.

i. Landscape assessment

1.2.9 Aerial photos and Ordnance Survey (OS) maps were used to identify potential commuting routes for barbastelle bats within 3km of the main platform and proposed access track[1], and buildings that may have the potential to support barbastelle maternity colonies within 6km of the main platform and the proposed access track.

ii. Tree assessments

1.2.10 A second inspection (using close-focusing binoculars and high-powered Clulites) of trees surveyed in 2007 was undertaken on 6 March 2008. Inspections were undertaken from the ground to enable confirmation of the findings of tree assessments in 2007, which had been undertaken at a time of year when foliage may have prevented the identification of some features suitable for bats (i.e. loose bark, cracks or splits). The locations of the tree assessment areas are illustrated on **Figure 2** (Ref. 1.4).

iii. Roost surveys

1.2.11 Roost surveys were undertaken at four locations between April and August 2008: Upper Abbey Farm; Lower Abbey Farm; Leiston Abbey; and trees at Goose Hill and adjoining afforested areas.

1.2.12 Daytime inspections for fresh bat signs (droppings) within the barn at Upper Abbey Farm were undertaken by two surveyors on 28 April and 18 June 2008 (for licence details, see Ref. 1.4). The location of droppings was recorded, and the identification of collected droppings was verified by a second bat ecologist.

1.2.13 A single surveyor undertook a dusk emergence survey on 19 May 2008 for 1 hour 45 minutes after sunset to identify species roosting within the barn and the directions of flight on emergence. On 12 August 2008 two surveyors undertook a dawn re-entry survey. The survey equipment used during this survey work was not specified.

1.2.14 On 28 April 2008, a Batbox Duet was placed within the barn at Upper Abbey Farm to record dusk emergence bat activity for two hours after sunset. Additional automated surveys were undertaken between 20 and 27

[1] At this stage of the study, the boundaries of the site had not been established. The scope of survey work undertaken in each year is outlined in the individual Wood Group reports.

May and on 5 June 2008 using an Anabat SD1 located within the barn at Upper Abbey to record bat activity between dusk and dawn.

1.2.15 An external inspection of Leiston Abbey was undertaken by two surveyors on 29 April 2008.

1.2.16 A daytime inspection, to identify potential roost sites, evidence of bat occupation (i.e. droppings and staining), bat dropping accumulations and bat corpses, was undertaken by two surveyors at a large barn at Lower Abbey Farm on 18 June 2008.

iv. Activity transect surveys

1.2.17 Six evening activity transect surveys were undertaken between April and August 2008 (28 April, 19 May, 20 May, 18 June, 24 July and 11 August).

1.2.18 The aim of the activity transect surveys varied between survey visits to include consideration of potential flight lines, foraging habitat and the collection of additional baseline information; therefore, six distinct transect routes across different areas of the site were undertaken, each on a single occasion. The transect routes are illustrated on **Figures 2** and **3** (Ref. 1.4).

1.2.19 Transect surveys were undertaken both on foot and by car depending on the nature of the transect. Bat calls were recorded on Anabat SD1s or Batbox Duets connected to a mini-disc recorder.

v. Automated detector surveys

1.2.20 During each of the activity transect surveys undertaken between April and August 2008 (as detailed in **section 1.2c)iv**), Anabat SD1(s) and Batbox Duet(s) were deployed along the transect route to record bat activity. Anabat SD1(s) were left to record overnight, while Batbox Duet(s) were collected at the end of each transect. The locations of automated detectors are illustrated on **Figure 4** (Ref. 1.4).

1.2.21 In addition, three Anabat SD1s were deployed at a series of locations between April and August 2008 to enable further monitoring of the barn at Upper Abbey Farm and potential barbastelle flight lines and foraging areas. The location of these automated detectors are also illustrated on **Figure 4** (Ref. 1.4). Monitoring periods varied from a single night to one week, with Anabats recording bat activity between sunset and sunrise. Anabats were again positioned a minimum of one metre above the ground to reduce background noise that might otherwise conceal bat echolocation calls. Recordings were later analysed using Analook software.

d) 2009 surveys

1.2.22 Surveys undertaken in 2009 aimed to continue monitoring the level of use of the site by bats, to establish whether the site was being used by breeding female barbastelle and to further identify any potential commuting routes and foraging areas. Full details of the methodologies applied are provided in Ref. 1.5, (see **Annex 14A8.5**), summaries of these methodologies are provided in **sections 1.2d)i** to **1.2d)iv**.

i. Landscape assessment

1.2.23 OS maps (1:25 000) were used to identify woodland and large buildings within the survey area. Aerial photographs were considered to enable broad habitat types to be distinguished which, along with linear woodland features and watercourses, were also marked on the base map.

1.2.24 Ground-truthing, based on the findings of OS map and aerial photograph considerations, was undertaken in November 2009. The presence or absence of identified features was checked and, where present, habitat suitability criteria (see Ref. 1.5, **Annex 14A8.5**), determined based on known habitat requirements for barbastelle, were applied.

ii. Trapping surveys

1.2.25 Three nights of trapping, using harp-traps and mist-nets, were undertaken between 26, 27 and 28 May 2009. Trapping was undertaken within the plantation woodland and rides around Fiscal Policy woodland and Nursery Covert from sunset for approximately half the night. The locations of trapping sites are illustrated on **Figure 3.5** (Ref. 1.5).

1.2.26 Trapped bats were examined to enable determination of species, gender and, where possible, breeding status. A series of biometric measurements (including forearm length and weight) were also recorded. Examinations were undertaken in accordance with the measurement and identification protocols described in Dietz and von Helversen (Ref. 1.11). Recorded measurements and any distinguishing features of individuals were used to enable identification of any recaptured individuals.

iii. Activity transect surveys

1.2.27 Nine activity transects were undertaken between April and September 2009 (27 April, 29 April, 13 May, 25 May, 4 June, 25 June, 18 August, 25 August and 14 September), with two transects undertaken per month, with the exception of July (when no survey occurred) and September (during which

only a single survey occurred). Each transect was surveyed on a single occasion and incorporated a series of listening points.

1.2.28 Transect routes undertaken in 2009 covered a wider area than those undertaken in 2007 and 2008, including the following areas that had not previously been surveyed: Sizewell Marshes SSSI, Leiston Common, Sandy Lane and Reckham Pits Wood. Activity transect routes undertaken in 2009 are illustrated on **Figures 3.7** to **3.15** (Ref. 1.5).

1.2.29 Each transect was undertaken for two to three hours post-sunset by two surveyors, using either a Batbox Duet or Anabat SD1 to record bat activity.

iv. Automated detector surveys

1.2.30 Anabat SD1s were deployed at 11 locations between April and September 2009, recording from sunset until sunrise. The recording periods of each detector were variable and are detailed in **Table 14A8.3.2.**

Table 1.2: Recording periods for automated detector surveys in 2009

Detector Number	Recording Period
1	17 – 28 April.
2	17 – 28 April.
3	17 April – 5 July.
4	27 April – 4 May.
5	27 April – 13 May.
6	13 May – 6 June.
7	5 – 13 June.
8	26 June – 25 July.
9	26 June – 1 July.
10	19 August – 14 September.
11	19 August – 10 September.

1.2.31 The locations of static detector positions are illustrated on **Figure 3.17** (Ref. 1.5). Periods of static detector monitoring varied from three to 37 nights, dependent upon location. Recordings were later analysed using Analook software, and the number of bat passes per hour (B/h) was calculated as a measure of relative activity.

e) 2010 surveys

1.2.32 Survey work in 2010 was intended to enhance the baseline information in relation to the use of the site by all bat species, with particular focus on the

status of barbastelle bats and potential barbastelle roosts. **Figure B2** (see Ref. 1.6, **Annex 14A8.5**) illustrates the survey area for 2010 and 2011. Full details of the methodologies applied are provided in Ref. 1.6 (see **Annex 14A8.5**), summaries of these methodologies are provided **sections 1.2e)i** to **1.2e)vi**:

i. Trapping and radio-tracking surveys

1.2.33 Trapping was undertaken on the eight consecutive nights between 1 and 8 June 2010, with a focus on trapping barbastelle and/or female bats using harp-traps, mist-nets, and, on four nights, an acoustic lure (3 to 6 June 2010). Trapping was also undertaken by hand-netting from known tree roosts. Trapping locations are detailed in **Figure A2** (Ref. 1.6).

1.2.34 Trapped bats were examined to determine species, gender and where possible breeding status, in addition to the recording of biometric data (including forearm length and weight). Where suitable (i.e. where the bat was of the target species, was of the relevant gender, and was of sufficient weight and not in an advanced stage of pregnancy), bats were tagged with a radio transmitter.

1.2.35 Radio-tracking was undertaken for an additional four days (9 to 12 June 2010) using Australis and Sika radio-tracking scanning receivers, Yagi rigid directional aerials and whip omni-directional antenna, the latter attached to vehicles. Tagged bats were tracked throughout the night, using vantage points to record triangulation points ('fixes') until lost by surveyors.

1.2.36 A second team of surveyors undertook tracking during the day with the aim of identifying day-roosting locations. Suspected tree roosts were surveyed for emerging bats using static hand-nets and, where suitable, a cone trap. The tracking was focused on female bats and those that were recorded within the site.

1.2.37 Recorded 'fixes' were employed to provide a description of the areas utilised by each tagged bat and, where sufficient information had been gathered, an analysis of home ranges was undertaken. Analysis of home ranges utilised AutoCAD to transfer 'fixes' to geo-referenced maps. The co-ordinates of 'fixes' were then transferred into Range 7 software for home range analysis in the form of minimum convex polygons (MCPs)[2], clusters[3]

[2] The MCP enables the creation of a boundary around all fixes using the smallest possible convex polygon. This is a commonly used method, but may overestimate the size of home ranges. (Ref. 1.13)

and kernel[4] contours. Home range analyses were undertaken using 95% of data rather than the entirety of recorded data, so as not to give undue weight to outlier data points.

ii. Activity transect surveys

1.2.38 Eleven activity transects were undertaken between April and September 2010 (14 April, 4 May, 18 May, 2 June, 15 June, 7 July, 20 July, 2 August, 18 August, 2 September and 16 September), with two transects surveyed every month with the exception of April.

1.2.39 Each transect route was surveyed on a single occasion, and routes were focused on those areas considered to be at the most risk of being impacted by the proposed development (Goose Hill woodland, the northern areas of Sizewell Marshes SSSI, Fiscal Policy woodland, Kenton Hills, Nursery Covert, the main platform and arable fields). The activity transect routes undertaken in 2010 are illustrated on **Figures B2** to **B12** (Ref. 1.6).

1.2.40 Each transect was undertaken for two to three hours post-sunset by two surveyors, each using either a Batbox Duet or Anabat SD1 to record bat activity.

iii. Automated detector surveys

1.2.41 Fifty-six locations across the site were surveyed on a single occasion for between two and three weeks across two survey periods, 14 April to 6 July (Period 1 'Spring'[5]) and 7 July to 14 September (Period 2 'Summer'[5]). The locations of automated detector deployments are illustrated on **Figure C2** (Ref. 1.6).

1.2.42 For the purposes of analysis, the survey area was divided into six areas (as illustrated on **Figure C1** (Ref. 1.6)):

- Area 1 – Farmland – consisting of arable farmland north of plantation woodland; a pasture field adjacent to Leiston Old Abbey woodland;

[3] A type of multivariate analysis that uses records or measurements of a number of characteristics or features to group individuals into clusters or classes, so that individuals within each cluster/class are as alike each other as possible and as unlike individuals in other clusters/classes as possible. (Ref. 1.13)
[4] Kernel methods quantitatively determine areas which are intensively used by animals by converting position coordinates into lines or areas with varying probabilities of use and present these graphically. (Ref. 1.13)
[5] For details of the specific dates considered by period and season, please see Ref. 1.6 in **Annex 14A8.5**

and potential commuting and foraging features around the Upper Abbey Farm bridleway, Stonewall Belt and Ash Wood;

- Area 2 – Goose Hill and woodland at The Grove;
- Area 3 – Kenton Hills/Nursery Covert/Fiscal Policy woodland;
- Area 4 – Sizewell Marshes SSSI north;
- Area 5 – main platform; and
- Area 6 – Sizewell Marshes SSSI south.

1.2.43 These areas varied from those defined as Areas 1 – 5 during surveys undertaken in 2011, and are illustrated on **Figure C1** (Ref. 1.6).

1.2.44 Anabat SD1s were utilised for recording bat activity and were set to record from half an hour before sunset to half an hour after sunrise. All recorded bat calls were rapidly scanned for the presence of barbastelle calls. A sub-set of data from each deployment for the three nights of highest bat activity were analysed for all other species. All analysis was undertaken using Analook. Data was split into discrete time periods in relation to sunset or sunrise times and the number of B/h was calculated as a measure of relative activity.

iv. Emergence surveys

1.2.45 Simultaneous emergence surveys were undertaken on 6 July and 3 August 2010 of 11 barbastelle tree roosts identified during radio-tracking surveys, to enable a minimum population count. Eight trees were each surveyed by a single surveyor, while the remaining three tree roosts were monitored by infra-red video cameras (with illumination) and automated bat detectors.

v. Bat box surveys

1.2.46 All bat boxes located within Kenton Hills, normally monitored on an annual basis by Suffolk Wildlife Trust (SWT) each September, were surveyed by Wood Group on 3 June and 4 August 2010 to record the species and breeding status of any bats using the boxes.

1.2.47 The location of bat boxes within Kenton Hills are illustrated on **Figure D1** (Ref. 1.6).

vi. Tree assessments

1.2.48 An assessment of all mature trees within the EDF Energy estate, including those previously surveyed in 2007 and 2008, was undertaken in August and September 2010 to identify any trees with medium or higher potential for roosting bats, through consideration of the presence of tree features (including loose bark, dense ivy and cracks or splits) and/or signs of bat use (including staining, droppings or scratches).

1.2.49 For the purpose of tree assessments, the site was split into a number of zones, the locations of which are illustrated on **Figure D2** (Ref. 1.6).

1.2.50 Within broadleaved woodland, inspections were undertaken of accessible trees individually, while within plantations strip transects were walked through woodland blocks to identify any trees with signs of damage that may suggest potential suitability for roosting bats.

f) 2011 surveys

1.2.51 Although overlapping noticeably with the survey area considered in 2010, the survey area considered in 2011 was altered to reflect the changes in the site boundary. This altered survey area is illustrated in **Figure B2** (see Ref. 1.1, **Annex 14A8.5**).

1.2.52 Survey work in 2011 was intended to supplement and expand on the existing baseline data held for all bat species across the site, with a particular focus given to the status of barbastelle. Full details of the methodologies applied are provided in Ref. 1.1 (see **Annex 14A8.5**), summaries of these methodologies are provided **sections 1.2f)i** to **1.2f)viii**:

i. Trapping and radio-tracking surveys

1.2.53 Trapping was undertaken between 30 July and 3 August 2011 using harp-traps, mist-nets and a sky net, with additional hand-netting from tree roosts. Additionally, two sonic lures, playing synthesised barbastelle or Nathusius' pipistrelle (*Pipistrellus nathusii*) social calls, were utilised on some trapping nights. All trapping locations were within the EDF Energy estate and were partially determined in consideration of successful 2010 trapping locations. Trapping locations used in 2011 are illustrated on **Figure C2** (Ref. 1.1).

1.2.54 Trapped bats were examined to determine age, gender and where possible breeding status. Biometric data were also recorded, including forearm length and weight. Where trapped barbastelles were deemed to be in a healthy condition, and of a suitable weight, they were tagged with a radio transmitter.

1.2.55 Radio-tracking was undertaken for an additional seven days (4 to 10 August 2011) using Australis and Sika radio-tracking scanning receivers, Yagi rigid directional aerials and whip omni-directional antenna, the latter attached to vehicles. Tagged bats were tracked throughout the night, using vantage points to record 'fixes' until lost by surveyors. The tracking was focussed on female and/or juvenile bats and those that were recorded within the site.

1.2.56 Recorded 'fixes' were transferred to geo-referenced maps in AutoCAD to enable the determination of co-ordinates for the recorded 'fixes'. The co-ordinates of the 'fixes' were then transferred into Ranges 7 software for home range analysis in the form of minimum convex polygons, clusters and kernel contours, as before.

ii. Activity transect surveys

1.2.57 For the purpose of activity transects, the survey area was divided further into five sub-survey areas:

- Area 1 – Ash Wood and farmland – consisting of Ash Wood arable fields to the south, west and north; a hedgerow to the north of Ash Wood; part of Black Walks; and the northern section of Upper Abbey Farm bridleway;
- Area 2 – Farmland (north-east) – consisting of woodland at The Grove; pine plantation between Ash Wood and woodland at The Grove; and a number of arable fields;
- Area 3 – Farmland (west) – consisting of the barn at Upper Abbey Farm; much of Upper Abbey Farm bridleway; pasture fields west of Upper Abbey Farm bridleway; and arable fields north of Kenton Hills and west of the barn at Upper Abbey Farm;
- Area 4 – Goose Hill – consisting of plantation woodland at Goose Hill; Stonewall Belt; and arable fields to the north-west; and
- Area 5 – Sizewell Marshes SSSI (north-east) and the main platform – consisting of the north-eastern section of the Sizewell Marshes SSSI; part of the woodland within the Sizewell Marshes SSSI; the main platform; and adjacent bunds.

1.2.58 These areas varied from those defined as Areas 1 – 5 during surveys undertaken in 2010, and are illustrated on **Figure B1** (Ref. 1.1).

1.2.59 Twelve transects were undertaken between April and September 2011 (12 April, 26 April, 10 May, 23 May, 7 June, 21 June, 5 July, 18 July, 1 August, 22 August, 6 September and 29 September). The routes of these transects are illustrated on **Figures D2** to **D13** (Ref. 1.1). Transects within sub-survey Areas 1, 2 and 3 were completed on two occasions, while those in sub-survey Areas 4 and 5 were surveyed three times.

1.2.60 Each transect was surveyed simultaneously by two surveyors for two and a half to three hours following sunset. The exception to this was a single survey undertaken within sub-survey Area 5, which had to be undertaken in the two hours preceding sunrise due to poor evening weather.

1.2.61 A Batbox Duet or Griffin were used to listen for bat activity, and Anabat SD1 or SD2 detectors were used to record bat activity. The starting and finishing points along each transect were varied on each occasion, and most transects were completed twice during a survey to ensure that all areas of the transects were surveyed at a variety of times.

iii. Automated detector surveys

1.2.62 As detailed in **section 1.2f)ii** the survey area was further divided into five sub-survey areas, illustrated on **Figure B1** (Ref. 1.1). Six detectors were rotated through the five sub-survey areas for two- to three-week periods. Each sub-survey area was monitored by automated detectors on a total of two occasions across two survey periods: 12 April to 19 June 2011 (Period 1 'Spring'); and 20 June to 5 September 2011 (Period 2 'Summer'). An additional period between 6 and 28 September 2011 ('Autumn') was utilised to enable an additional period of surveying within sub-survey Area 5. The location of automated detectors is illustrated on **Figures E1** and **E2** (Ref. 1.1).

1.2.63 Anabat SD1(s) and SD2(s) were utilised for recording bat activity and were set to record from half an hour before sunset to half an hour after sunrise. Analysis of recorded data was undertaken using Analook software. All recordings of rarer species of potentially higher conservation significance (defined as barbastelle, Nathusius' pipistrelle and Leisler's bat (*Nyctalus leisleri*)) were analysed. A sub-set of data from each detector location on each deployment for the three nights of highest bat activity were analysed for all other species. Data was split into discrete time periods in relation to sunset or sunrise times, and the number B/h was calculated as a measure of relative activity.

iv. Building inspections

1.2.64 Six buildings were identified for internal and external inspections. Access was not obtained for two buildings: Leiston Old Abbey (OS Grid Reference (Grid Ref) TM 45022 64049); and Abbey Cottage (OS Grid Ref TM 44876 64408), and a third building, the Round House, was found to have no roof void available for inspection (OS Grid Ref TM 45416 65241).

1.2.65 An internal and external inspection of outbuildings and an external inspection of the main house at Old Abbey Farm (OS Grid Ref TM 45038 64174), and a partial internal inspection of Ash Wood Cottages (OS Grid Ref TM 46069 64987), were undertaken on 20 June 2011 to look for any evidence of bat usage (i.e. droppings, feeding remains, staining and scratch marks). (For licence details, see Ref. 1.1).

1.2.66 Two internal and external inspections of the barn at Upper Abbey Farm (OS Grid Ref TM 45317 64584) were undertaken by two surveyors on 8 June and 20 July 2011 (for licence details, see Ref. 1.1). Surveyors undertook inspections to identify any evidence for the presence of bats (i.e. droppings, feeding remains, staining and scratch marks) with a particular focus on any signs that might indicate that the building was used as by roosting barbastelle (i.e. accumulations of droppings or features suitable for a barbastelle maternity colony).

1.2.67 A dusk emergence survey of the barn at Upper Abbey Farm was undertaken by three surveyors on 20 June 2011, from 15 minutes prior to sunset to two hours after sunset. A dawn re-entry survey was undertaken by three surveyors on 3 August 2011, from two hours before sunrise to 15 minutes after sunrise. Bat activity was recorded by Batbox Duet or Anabat detectors.

1.2.68 Six automated detector surveys were undertaken at the barn at Upper Abbey Farm for between 11 and 14 nights between May and September 2011, totalling 82 nights of surveying. On each occasion, a single detector was positioned within the barn to record bat activity within the building. Non-pipistrelle recordings were later analysed using Analook.

v. Emergence surveys

1.2.69 Emergence surveys were undertaken at all trees identified as having been used by juvenile and/or female barbastelle during the course of 2011 radio-tracking surveys in August 2011.

1.2.70 A further emergence survey was undertaken of a single roost tree during the course of 2011 radio-tracking surveys (3 August 2011) as radio-tracking

surveyors awaited the emergence of three tagged bats from within this roost.

1.2.71 A simultaneous emergence survey of eight tree roosts was undertaken on 10 August 2011 to enable an estimate of a minimum population count to be calculated. Each roost tree was surveyed by a single surveyor, with the exception of two trees which were surveyed by two surveyors. Surveying at four tree roosts was supplemented with infra-red video cameras and infra-red illumination. Bat activity was monitored using Anabat, Batbox Duet or Pettersson D240x detectors.

1.2.72 Emergence surveys for Natterer's bat (*Myotis nattereri*) were undertaken at Leiston Abbey on 31 July and 10 August 2011, at a tree roost in woodland at The Grove on 8 August 2011, and a tree roost in Sandypytle Plantation on 9 August 2011. A re-entry survey focussing on Natterer's bat was undertaken at Leiston Abbey on 10 August 2011.

vi. Bat box surveys

1.2.73 Following the identification of a Natterer's bat maternity roost within a bat box in Kenton Hills during radio-tracking surveys, all bat boxes within Kenton Hills (normally monitored on an annual basis, in September, by SWT) were surveyed by Wood Group in September 2011.

1.2.74 For further details of the methodologies employed during the 2011 bat box surveys, please refer to Ref. 1.1 (see **Annex 14A8.5**). The location of bat boxes within Kenton Hills are illustrated on **Figure D1** (Ref. 1.1).

vii. Hibernation roost surveys

1.2.75 An inspection of the barn at Upper Abbey Farm (OS Grid Ref TM 45317 64584) was undertaken on 31 January 2011 to consider the suitability for, and evidence of use by, hibernating bats within this building.

1.2.76 A disused World War II (WWII) bunker (OS Grid Ref TM 45084 64051) was also inspected for its suitability as a bat hibernation site, on 31 January and 8 March 2011. Accessible crevices were inspected and temperature and humidity readings were taken for comparison to external conditions.

1.2.77 For further details of the methodologies employed during the 2011 bat hibernation surveys, please refer to Ref. 1.7 (see **Annex 14A8.5**).

viii. Extended Phase 1 – Tree Assessments

1.2.78 In 2011 an assessment of Wood Group's "Site 1" was undertaken for bats as part of Extended Phase 1 surveys (Ref. 1.8). Mature trees were

inspected for features that could be used by roosting bats (including cavities, splits, cracks, loose bark and dense and woody ivy). Buildings and structures on site were also assessed for suitable access points. All assessments were undertaken externally.

1.2.79 For further details of the methodologies employed during the 2011 Extended Phase please refer to Ref. 1.8 (see **Annex 14A8.5**).

g) 2012 Coronation Wood surveys

1.2.80 Survey work in 2012 was intended to provide baseline data for all bat species within Coronation Wood and its immediate surroundings. Full details of the methodologies applied are provided in Ref. 1.2 (see **Annex 14A8.5**), summaries of these methodologies are provided in **sections 1.2g)i** to **1.2g)iii**:

i. Activity transect surveys

1.2.81 A single transect route, illustrated on **Figure 2.1** (Ref. 1.2), was walked on three occasions (11 May, 10 July and 30 August 2012) within Coronation Wood.

1.2.82 Surveys were undertaken for two and a half hours after sunset. To ensure that all areas of the transect were surveyed at a variety of times, the start and finish points were varied on each survey occasion and two circuits of the transect were completed during each visit. The survey equipment used for this survey work was not specified.

ii. Automated detector surveys

1.2.83 Six locations were surveyed by Anabat SD1(s) and SD2(s) for a period of 10 nights on three occasions in 2012 (17 to 26 May, 21 to 30 June, and 30 August to 8 September). Anabat deployment locations are illustrated on **Figure 2.1** (Ref. 1.2). Anabats were set to record bat activity from half an hour before sunset until half an hour after sunrise.

1.2.84 Analysis of recorded data was undertaken using Analook software. All recordings of rarer species of potentially higher conservation significance (defined as barbastelle, Nathusius' pipistrelle and Leisler's bat) were analysed. A sub-set of data from the three nights of highest bat activity at each location from each deployment were analysed for all other species.

iii. Tree assessments

1.2.85 Tree assessments were undertaken of all mature trees within the Coronation Wood survey area to enable the identification of all trees with medium or high potential to support roosting bats.

1.2.86 The assessment was undertaken on 13 September 2012 with all accessible trees surveyed from the ground for the presence of tree features (including loose bark, cracks, splits and dense ivy) or bat signs (including staining and droppings) that may indicate suitability for, or use by, bats. Where such features and/or signs were identified, a record was made of the tree characteristics, including the aspect and height of the observed feature.

h) 2011 Aldhurst Farm surveys

1.2.87 Survey work in 2012 was intended to provide baseline data for all bat species within Aldhurst Farm and its immediate surroundings. Full details of the methodologies applied are provided in Ref. 1.9 (see **Annex 14A8.5**), summaries of these methodologies are provided in **sections 1.2h)i** and **1.2h)ii**:

i. Activity transect and emergence surveys

1.2.88 A transect route was walked on three occasions (May, July and August 2011) across the Wood Group's "Site 1" by two surveyors. Two transects were undertaken from dusk for a period of 2.5 to 3 hours, and the third from 2 hours before dawn until sunrise. Following the identification of evidence suggestive of a common pipistrelle (*Pipistrellus pipistrelleus*) roost within Gypsy Lodge, located adjacent to the survey area at the north-west corner, emergence counts were undertaken in July and August 2011. Emergence counts were undertaken from sunset for a period of approximately 20 minutes before surveyors began the transect. The survey equipment used for this survey work was not specified.

ii. Automated detector surveys

1.2.89 A single static detector was deployed on three occasions: May, June and August 2012. The location of the static detector varied on each occasion, with the locations illustrated on **Figure 2.1** (Ref. 1.9). Data relating to species considered to be of potentially greater nature conservation interest (barbastelle, Leisler's bat and Nathusuis' pipistrelle) was analysed for all survey nights. Data relating to remaining species was analysed for three survey nights per deployment.

1.2.90 A measure of relative bat activity was calculated for analysis purposes, based on the number of recorded bat passes per hour[6] for data collected both through activity transect surveys and static detector surveys.

i) 2012/2013 Upper Abbey Farm inspections

1.2.91 Following significant fire damage to Upper Abbey Farmhouse Wood Group undertook external and internal inspections of Upper Abbey Farmhouse and adjacent outbuildings to inform licence requirements prior to repair and restoration work. Full details of the methodologies and licence number(s) are provided in Ref. 1.10 (see **Annex 14A8.5**).

1.2.92 An initial external inspection was undertaken on 5 October 2012 with further internal and external inspections on 6 November, 20 November and 18 December 2012 and 28 January 2013. These surveys aimed to identify the suitability of the building(s) for roosting bats and to look for any evidence of bat usage (i.e. droppings, feeding remains, staining and scratch marks).

1.3 Arcadis surveys

a) Approach

1.3.1 The survey work undertaken by Wood Group between 2007 and 2012 was designed to answer particular questions, adapting to new survey information and changing proposals, options and layouts as they arose. While this work was both comprehensive and valuable for informing the impact assessment, it did not allow for the assessment of either the likely size of the barbastelle population or how its use of local habitats within and around the site, spatially and temporally, varies between years.

1.3.2 Arcadis surveys between 2013 and 2019 were therefore designed to fill any identified gaps in survey coverage, to gain a better understanding of population size(s) and to develop a better understanding of natural temporal and spatial variability in the use of different habitats, to better understand how barbastelle and other bat species might be affected by the proposed development.

1.3.3 The survey work included a comprehensive automated detector monitoring exercise, a series of activity transects, building and tree inspections, and a

[6] It is important to note that this measure of relative bat activity is an approximation.

further period of radio-tracking, as summarised in **Table 14A8.3.3**. The survey approach and methodology were presented to, and agreed with, key stakeholders in 2013 (see Ref. 1.12, **Annex 14A8.6**). Whilst targeted to barbastelle, the automated detector surveys and activity transects enabled a similar assessment to be undertaken for other species/species groups.

1.3.4 Data gathered from these surveys was intended to inform the impact assessment, and to also enable the comparison of the data collected pre-construction to that collected during construction and in the post construction period, as appropriate.

1.3.5 All surveys were undertaken in accordance with the most recent bat survey guidelines at the time of surveying (Ref. 1.13 and Ref. 1.14).

Table 1.3: Arcadis bat surveys 2012 - 2019

Year	Surveys	Approximate Survey Location	Report Reference
2013	Automated detector surveys.	The site.	1.15 (see **Annex 14A8.6**)
2014	Automated detector surveys.	The site.	1.15 (see **Annex 14A8.6**)
	Activity transect surveys.	Land east of Abbey Road and arable fields north of Kenton Hills and Fiscal Policy woodland.	**Annex 14A8.3** **Annex 14A8.4**
	Trapping and radio-tracking surveys.	EDF Energy estate and Royal Society for the Protection of Birds (RSPB) Minsmere Reserve.	1.16 (see **Annex 14A8.6**)
2015	Activity transect surveys.	Pillbox Field and access road to Sizewell A and B Stations and boundaries of Coronation Wood.	**Annex 14A8.3** **Annex 14A8.4**
	Building inspections.	Plantation Cottages; Walk Barn; Laboratory off Lovers Lane; Ash Wood Cottages; Lower Abbey Farm; Upper Abbey Farm.	**Annex 14A8.3** **Annex 14A8.4**
	Tree assessments.	The site.	**Annex 14A8.3** **Annex 14A8.4**
2016	Corridor activity surveys.	SM2 monitoring locations MS20 and MS35, Stonewall Belt, Black Walks, Fiscal Policy, Kenton Hills and Upper Abbey	**Annex 14A8.3** **Annex 14A8.4**

Year	Surveys	Approximate Survey Location	Report Reference
		Track.	
	Automated detector surveys.	Campus	**Annex 14A8.3** **Annex 14A8.4**
2019	Building inspections Building emergence/re-entry surveys.	Upper Abbey Farm; Lower Abbey Farm; Ash Wood Cottages.	**Annex 14A8.3** **Annex 14A8.4**
		Sizewell B relocated facilities	1.17 and 1.18 **(see Annex 14A8.6)**
	Bat activity surveys.	Sand Pits adjacent to Upper Abbey Farm Bridleway.	Ref. 14A8.3.[7] (see **Annex 14A8.6**)
	Tree assessments.	Arable fields between Abbey Road and the Fiscal Policy car park to the north of Lover's Lane.	**Annex 14A8.3** **Annex 14A8.4**
		Coronation Wood	1.17 (see **Annex 14A8.6**)

b) Activity transect surveys

1.3.6 Four activity transect surveys were undertaken, two on seven occasions (monthly between May and October 2014), one on two occasions (in September and October 2015) and one on two occasions (in August and September 2019). All transects were located within the site boundary, as illustrated on **Figures 14A8.2, 14A8.3, 14A8.4** (see **Annex 14A8.1**) and **Figure 2** of Ref. 1.19 (see **Annex 14A8.6**).

1.3.7 A single transect was undertaken of the proposed temporary accommodation campus site on seven occasions monthly between May and October 2014 (29 May, 18 June, 9 July, 4 August, 10 September, 7 October and 8 October), covering land to the east of Abbey Road, as illustrated on **Figure 14A8.2**.

1.3.8 Of the three transects undertaken along the footprint of the proposed Green Rail Route (GRR), only Transect 3 falls within the site boundary. This transect covered arable fields to the north of Fiscal Policy woodland and Kenton Hills, as illustrated on **Figure 14A8.3**, and was undertaken on seven occasions, monthly between May and October 2014 (28 May, 18 June, 9 July, 4 August, 10 September, 7 October and 8 October).

1.3.9 With the exception of a single additional dawn survey in October, all surveys in 2014 were undertaken at dusk.

1.3.10 In 2015, a single activity transect was undertaken on two occasions, once on 7 September and once on 12 October. This transect covered: Pillbox Field; the road at Sizewell Gap between Pillbox Field and the access road to Sizewell A and B power stations; the access road to Sizewell A and B power stations; and the boundaries of Coronation Wood (as illustrated on **Figure 14A8.4**).

1.3.11 In 2019, a single activity transect was undertaken, at dusk, on two occasions, once on 20 of August and once on 9 September. This transect covered the two sand pits located adjacent to the Upper Abbey Farm Bridleway. Further details, including the location of this transect route are provided in Ref. 1.19 (see **Annex 14A8.6**). Due to the extent of previous survey work on the Upper Abbey Farm Bridleway and the focus of these transects on the activity levels and use of the sand pits but the bat assemblage no recordings of activity along the bridleway were made as surveyors moved between the two sand pit locations.

1.3.12 Transects were undertaken for between 1.5 and 2 hours after sunset and for 1.5 hours before sunrise. Each transect was walked simultaneously by two surveyors each using a Pettersson D240x detector connected to a Roland R-05 MP3 digital recorder. Within each pair of surveyors, one surveyor listened at 30kHz and one surveyor listened at 50kHz, to ensure that all species present were recorded, in particular those echolocating at lower frequencies, including barbastelle.

1.3.13 The transects were walked in alternating directions on each survey visit, to ensure that all areas of the transects were surveyed at a variety of times after sunset.

1.3.14 The results of activity surveys were manually analysed using BatSound or Kaleidoscope Pro Viewer by experienced bat call analysts.

c) Automated static detector surveys

1.3.15 The automated detector surveys were intended principally to provide information on:

- the spatial and temporal patterns of barbastelle activity within the area directly affected by, and in the immediate vicinity of, the proposals;
- areas of high importance for barbastelle within these areas at different times of the year; and
- whether observed patterns differ between years.

1.3.16 The methodology for these surveys is fully described in Ref. 1.15 (see **Annex 14A8.6**), together with the associated limitations, and is not therefore repeated here.

1.3.17 Further automated detector surveys were undertaken between August and October 2016 inclusive within land to the west of the Abbey Road. Two Wildlife Acoustic SM2BAT+ automated detectors (hereafter referred to as automated detectors) were positioned in this area, as illustrated on **Figure 14A8.2**. Automated detectors were deployed on three occasions, monthly in August, September and October 2016, details of which are provided in **Table 14A8.3.4**. On each occasion, automated detectors were set to record between 20 minutes before sunset until 20 minutes after sunrise. The duration for which automated detectors were deployed varied on each occasion due to access restrictions (detailed in **section 1.4b)**) but on each occasion a minimum of 14 consecutive nights was ensured.

1.3.18 To ensure consistency between survey visits, as well as comparability to the automated detector surveys undertaken across the rest of the site in 2013 and 2014 only the first 14 nights of data from each survey visit were considered for analysis.

Table 1.4: Automated detector survey periods for temporary accommodation campus land in 2016

Survey visit	Survey Dates
1	23 August – 20 September.
2	20 September – 11 October.

1.3.19 Data collected during static detector surveys was analysed using SonoChiro auto-identification software and the results grouped into six species groups (barbastelle; "big bat"[8] spp., *Plecotus* spp. (assumed to be brown long-eared bat (*Plecotus auritus*)[9])), *Pipistrellus* spp.[10], *Myotis* spp., and Nathusius' pipistrelle) and the mean number of passes per night (mppn) calculated for further analysis.

1.3.20 Full details of the analysis process, as well as the trials undertaken to determine the suitability of SonoChiro as an analysis method and the manual verifications undertaken are provided in Ref. 1.15 (see **Annex 14A8.6**).

d) Radio-tracking survey

1.3.21 Trapping and radio-tracking undertaken in 2014 (see Ref. 1.16, **Annex 14A8.6**) aimed to build on the information gathered during trapping and radio-tracking studies in 2010 and 2011. Specific aims of the 2014 study were:

- to capture barbastelle within the EDF Energy estate later in the bats' active season to supplement the data gathered earlier in the season in 2010 and 2011, and to determine by radio-tracking the extent of habitat use;
- to capture bats beyond the EDF Energy estate (subject to landowner access) and determine by radio-tracking the extent to which individual barbastelle use areas that are outside of and within the EDF Energy estate;
- to identify further roosts through the location of tagged bats during the day;
- to determine if the activity of adult male barbastelle differs from that of adult females and juveniles; and

[8] The "big bat" species group includes calls identified specifically to noctule or serotine as well as those identified to the 'big bat' group (noctule, Leisler's bat and serotine).
[9] All long-eared bat recordings are considered to relate to brown long-eared bat echolocation calls due to the absence of grey long-eared bat from Suffolk based on their current known distribution (Ref. 1.10)
[10] The *Pipistrellus* spp. group includes calls identified specifically to common or soprano pipistrelle as well as those identified to the common/soprano pipistrelle group. This group excludes calls identified as Nathusius' pipistrelle.

- to examine any rings found on captured barbastelle to look at persistence.

1.3.22 The methodology for these surveys, including surveyor experience and licencing is fully described in Ref. 1.16 (see **Annex 14A8.6**) and is not therefore repeated here. Limitations experienced during the course of the radio-tracking survey are also provided within Ref. 1.16 (see **Annex 14A8.6**).

e) Tree assessments

1.3.23 Where access was available, an assessment of mature trees within areas not previously surveyed by Wood Group, as illustrated on **Figure 14A8.5**, was undertaken on 22 April 2015, 2 June 2015, 12 June 2019, 13 June 2019 and 14 August 2019 to enable the identification of all trees with medium or higher potential to support roosting bats.

1.3.24 All accessible trees were surveyed from the ground for the presence of tree features (including loose bark, cracks, splits, thick ivy stems or bat signs (including staining, droppings etc.)) that might indicate suitability for or use by bats. Where such features and/or signs were identified, a record was made of the tree characteristics, including the aspect and height of the observed feature.

1.3.25 As detailed in Ref. 1.17 (see **Annex 14A8.6**) a reassessment of trees within Coronation Wood was additionally undertaken in March 2019. Trees were assessed from the ground and subsequently climbed to identify roost suitability. Emphasis was given to trees that would be removed to accommodate the Sizewell B relocated facilities proposed work. Where potential roost features could be fully inspected and no evidence of use by bats was found these features were blocked with expanding foam to ensure they remain unsuitable for roosting bats for the foreseeable future.

f) Building inspections

1.3.26 Twenty-seven buildings, and associated outbuildings, were identified for updated and/or initial internal and external inspections for signs of use by bats. Fifteen of these buildings were located within the Sizewell B power station, the locations of which are shown in Figure 1 of Ref. 1.18 (see **Annex 14A8.6**). The location of the remaining 12 buildings are illustrated on **Figure 14A8.6, Figure 14A8.7** and **Figure 14A8.8**. Access was not obtained for six buildings, as detailed in **section 1.4b)**.

1.3.27 On 20 – 22 April 2015, external inspections were undertaken at the six buildings and associated outbuildings for which access was obtained.

Internal inspections were also undertaken of associated outbuildings, where permitted and considered safe to do so. These buildings were:

- Plantation Cottages (OS Grid Ref TM 45642 65752);
- Walk Barn (OS Grid Ref TM 466 650);
- Laboratory off Lovers Lane (OS Grid Ref TM 453 637);
- Ash Wood Cottages (OS Grid Ref TM 46073 65008);
- Lower Abbey Farm (OS Grid Ref TM 45890 65816); and
- Upper Abbey Farm (OS Grid Ref TM 45326 64545).

1.3.28 In April and May 2019 further external, and where safe to undertake internal, inspections were undertaken in three locations to determine whether any changes had occurred to the bat roost suitability of these buildings since initial surveys in 2015. These buildings were:

- Ash Wood Cottages (OS Grid Ref TM 46073 65008);
- Lower Abbey Farm (OS Grid Ref TM 45890 65816); and
- Upper Abbey Farm (OS Grid Ref TM 45326 64545).

1.3.29 In July 2019 external surveys were undertaken of 15 buildings associated with Sizewell B relocated facilities proposed work. These buildings were:

- Outage Car Park North (Building 1),
- Temporary Visitors' Centre (Building 3),
- Operations Training Centre (Building 4),
- Outage Store (Building 5),
- Civils Workshop & Store (container units) (Building 6.1),
- Civils Workshop & Store (Elliot pre-fab construction buildings) (Building 6.2),

- Civils Workshop & Store (Civils workshop) (Building 6.3),
- Base Area Facility (Building 8.1),
- Base Area Facility (transformer and container unit) (Building 8.2),
- Outage Portacabin City 2 (Building 9),
- Outage Office (Building 10),
- Projects Office (Building 11.1),
- Projects Office (two portacabins adjoined) (Building 11.2),
- Technical Training Centre (Building 12), and
- Rosary Cottage Garage (Building 20).

1.3.30 Access only permitted internal assessments of Buildings 6.3 and 20.

1.3.31 Surveyors (led by Patrick James: Licence WML-CL18/CLS01991) undertook inspections to identify the potential of assessed buildings to support bats and for any evidence of current or historical bat usage (i.e. droppings, feeding remains or staining).

g) Corridor activity surveys

1.3.32 A series of corridor activity surveys were undertaken in 2016 across the site. These surveys focused on those areas of the site which the results of automated detector surveys in 2013 and 2014 had indicated may be well-used as flight corridors. These surveys had two key aims:

- to compare the number of passes recorded by automated detectors to the number of bats observed by a surveyor thereby providing a comparison of the number of recorded passes to the likely number of individual bats; and
- to provide context to the data recorded by automated detectors.

1.3.33 Data collected by surveyors during corridor activity surveys was analysed in BatSound by experienced analysts. Data collected by automated detectors

during corridor activity surveys was analysed using SonoChiro auto-identification software.

1.3.34 Details of the areas covered by corridor activity surveys in 2016 are provided in **sections 1.3g)i** to **1.3g)vii** while the location of these survey areas are illustrated on **Figure 14A8.20**.

i. Black Walks

1.3.35 This survey area (Area A on **Figure 14A8.20**) is immediately south of Lower Abbey Farm and covered the MS03 automated detector location, which was monitored in 2013 and 2014. This area had been identified as a potential commuting corridor to the north.

1.3.36 Two survey visits were undertaken along Black Walks in 2016 (23 August and 21 September), with both surveys undertaken from sunset for a period of one and a half hours. Both surveys were undertaken by two surveyors positioned on the eastern side of the Black Walks tree line.

1.3.37 The survey area was split into a northern and a southern section, each covered by a surveyor, who walked their section using a Batlogger M bat detector and a Roland R-05 MP3 digital recorder. The surveyors were in contact throughout both survey periods to enable the identification of any bat passes commuting along the length of the survey area.

ii. Fiscal Policy/Kenton Hills crossroads

1.3.38 This survey area (Area B on **Figure 14A8.20**) is north of the Fiscal Policy carpark where to the east a track extends into Kenton Hills while to the north is the Upper Abbey Farm bridleway. This survey area covered the MS22 (TA and FP) automated detector location, which was monitored in 2013 and 2014. This area had been identified as a strong east-west commuting corridor.

1.3.39 Four survey visits were undertaken at the Fiscal Policy/Kenton Hills crossroads in 2016 (23 June, 12 July, 13 July and 14 July). Surveys were undertaken from sunset for a period of one and a half hours.

1.3.40 During the first survey visit (23 June 2016) one surveyor was stationary, located at the crossroads, while a second surveyor undertook a short transect along the initial 200m of the Kenton Hills track. Both surveyors used a Batlogger M bat detector and a Roland R-05 MP3 digital recorder and were in contact throughout the survey period to enable the identification of any bat passes commuting through the survey area. A

single automated detector, positioned in the approximate location of MS22, was also deployed for the survey period.

1.3.41 Following the information gained from the initial survey in June, a number of stationary survey points were used during the July 2016 surveys. These survey positions were entirely located on the north-south track within the survey area (not along the Kenton Hills track) and were located to enable an overall view of any commuting activity to be obtained. As in the June 2016 survey both surveyors used a Batlogger M bat detector and a Roland R-05 MP3 digital recorder and were in contact throughout the survey period to enable the identification of any bat passes commuting through the survey area. No automated detectors were deployed during surveys in July 2016.

iii. Kenton Hills track

1.3.42 This survey area (Area C on **Figure 14A8.20**) is located at the eastern end of the Kenton Hills track and covered the MS15 (TR) automated detector location, which was monitored in 2013 and 2014.

1.3.43 Two survey visits were undertaken in this survey area in 2016 (22 and 25 August). Surveys were undertaken from sunset for a period of one and a half hours.

1.3.44 The survey area was split into an eastern and a western section, each covered by a surveyor, who walked their section using a Batlogger M bat detector and a Roland R-05 MP3 digital recorder. The surveyors were in contact throughout to enable the identification of any bat passes commuting along the length of the survey area. No automated detectors were deployed during either of these surveys.

iv. MS20

1.3.45 This survey area (Area D on **Figure 14A8.20**) is located at the junction between the northern Sizewell Belt and Goose Hill and was designed to specifically cover the area of MS20 (monitored in 2013 and 2014) with a view over the adjacent reedbed.

1.3.46 Two survey visits were undertaken in this survey area in 2016 (16 May and 22 June). Surveys were undertaken from sunset for a period of one and a half to two hours.

1.3.47 Both surveyors were stationary, with one positioned at the MS20 location and the second surveyor located approximately 30m to the east. Both surveyors used a Batlogger M bat detector and a Roland R-05 MP3 digital

recorder and were in contact throughout to enable the identification of any bat passes commuting through the survey area. An automated detector was deployed at the MS20 location, for the length of the survey on both survey occasions.

v. MS35

1.3.48 This survey area (Area E on **Figure 14A8.20**) is located at the location of the proposed SSSI bridge and covers the MS35 automated detector location, with a view over the adjacent reedbed.

1.3.49 A single survey visit was undertaken in this survey area in 2016 (18 May) from sunset for a period of two hours.

1.3.50 Both surveyors were stationary, with one positioned at the MS35 location and the second surveyor located approximately 20m to the east on a pedestrian bridge over the ditch and reedbed. Both surveyors used a Batlogger M bat detector and a Roland R-05 MP3 digital recorder and were in contact throughout to enable the identification of any bat passes commuting through the survey area. An automated detector was deployed at the MS35 location, for the duration of the survey.

vi. Stonewall Belt

1.3.51 This survey area (Area F on **Figure 14A8.20**) is located between Hilltop Covert to the south and Ash Wood and Black Walks to the north and covers the MS10 (monitored in 2013 and 2014) and MS32 (east and west) (monitored in 2014) automated detector locations. This area has been identified as potential commuting route south from Ash Wood.

1.3.52 Three survey visits were undertaken in this survey area in 2016 (17 May, 20 September and 11 October). Surveys were undertaken from sunset for a period of one and a half to two hours.

1.3.53 During the first survey four surveyors were located in stationary positions on each corner of Stonewall Belt. Following the information gathered from this initial survey the visits undertaken in September and October were carried out by two stationary surveyors, one positioned on the north-eastern corner of Stonewall Belt and one on the south-eastern corner. During all surveys the surveyors used a Batlogger M bat detector and a Roland R-05 MP3 digital recorder and were in contact throughout to enable the identification of any bat passes commuting along Stonewall Belt. During the May survey visit a static detector was positioned at the MS10 automated detector location for the duration of the survey. No automated detectors were deployed during subsequent survey visits.

vii. Upper Abbey bridleway

1.3.54 This survey area (Area G on **Figure 14A8.20**). is located along the Upper Abbey Farm bridleway from MS09 in the north to a position approximately 320m to the south of Upper Abbey Farm. In addition to MS09 this survey area covers the MS14 automated detector location, both of which were monitored in 2013 and 2014. This area has been identified as an important commuting route.

1.3.55 Two survey visits were undertaken in this survey area in 2016 (21 June and 24 August). Surveys were undertaken from sunset for a period of one and a half hours.

1.3.56 During both surveys two surveyors were positioned at either extent of the survey area, while a third surveyor was located at the MS14 position at Upper Abbey Farm. During both surveys the surveyors used a Batlogger M bat detector and a Roland R-05 MP3 digital recorder and were in contact throughout to enable the identification of any bat passes commuting along the bridleway. Automated detectors were positioned at the MS09 and MS14 locations for the duration of the survey period during the first survey visit. No automated detectors were deployed during the second survey visit.

h) Building emergence/re-entry surveys

1.3.57 Emergence/re-entry surveys were undertaken between April and September 2019. Buildings assessed in 2019 as having low or greater suitability for roosting bats were subject to between one and three emergence/re-entry surveys, relative to the assigned roost suitability, in line with Bat Conservation Trust (BCT) bat survey guidelines (Ref. 1.14)

1.3.58 Emergence surveys were undertaken from 15 minutes before sunset until one and a half to two hours after sunset. Re-entry surveys were undertaken from two hours before sunrise until 15 minutes after sunrise. Each survey was undertaken by between two and four surveyors, depending on the number of surveyors required to appropriately cover the target building and associated features. Each surveyor used a Pettersson D240X handheld bat detector to detect echolocation calls and a Roland R-05 digital recorder to record the echolocation calls and associated voice commentaries. Surveyors were in contact with each other throughout the survey period to pinpoint any emergence/re-entry points.

1.3.59 Recorded data was analysed using BatSound.

1.4 Survey limitations

a) Wood Group surveys

1.4.1 Full details of the survey limitations experienced, and the associated impacts, during surveys undertaken by and on behalf of Wood Group are detailed in the relevant Wood Group reports provided in **Annex 14A8.5**.

b) Arcadis surveys

i. Activity transect surveys

1.4.2 Activity transect surveys of the temporary accommodation campus site, falling within the site, were constrained by access restrictions which prevented these surveys being undertaken over land to the west of Abbey Road. Due to the extent of survey data available elsewhere within the immediate vicinity of this survey location and the wider EDF Energy estate which covers a range of habitats it is not considered that these access restrictions would materially impact the ability to appropriate assess the bat activity in this area.

1.4.3 Limitations associated with sand pit activity transects are detailed in Ref. 1.19 (see **Annex 14A8.6**).

ii. Automated detector surveys

1.4.4 Full details of the survey limitations experienced during automated detector surveys undertaken by Arcadis in 2013 and 2014 are detailed in Ref. 1.15 (see **Annex 14A8.6**).

1.4.5 Automated detector surveys on land identified for the temporary accommodation campus and undertaken in 2016 were subject to significant land access restrictions which limited the time surveyors could be present on the land. As such the number of automated detectors deployed in this area was decreased to two. These detectors were placed within areas of suitable habitat where the automated detectors could be placed within the area of land to which access was granted. While this reduced the overall coverage of this area it is considered that the position of the two detectors deployed would be sufficient to ensure an accurate representation of the bat activity in this area.

iii. Radio-tracking survey

1.4.6 Full details of the survey limitations experienced during the radio-tracking study are detailed in Ref. 1.16 (see **Annex 14A8.6**).

iv. Building inspections

2015

1.4.7 Of the 12 buildings identified for building inspections, access restrictions prevented inspections being undertaken of six of the identified buildings;

- The Round House (OS Grid Ref TM 45416 65241);
- Potter's Farm (OS Grid Ref TM 44965 65207);
- Birchwood Farm (OS Grid Ref TM 44603 65222);
- Old Abbey Farm (OS Grid Ref TM 44997 64221);
- Leiston Old Abbey (OS Grid Ref TM 45022 64049) and;
- WWII bunker (OS Grid Ref TM 45084 64051).

1.4.8 Additional access restrictions prevented internal inspections of Walk Barn, Plantation Cottages, the laboratory off Lovers Lane, Ash Wood Cottages, and the main farm buildings at Upper Abbey Farm and Lower Abbey Farm.

1.4.9 Structural instability additionally prevented internal inspections of some of the associated outbuildings identified at Upper Abbey Farm and Lower Abbey Farm.

2019

1.4.10 Access restrictions including restrictions relating to health and safety prevented internal inspections of the following buildings (the location of these individual buildings within each building complex are illustrated on **Figure 14A8.6, Figure 14A8.7** and **Figure 14A8.8**):

- Upper Abbey Farm: Buildings 3, 4, 5, 6, 7 and 11,
- Lower Abbey Farm: Buildings 1, 2, 5, 5, 6, 7 and 8; and
- Sizewell B: Buildings 1, 3, 4, 5, 6.1, 6.2, 8.1, 8.2, 9, 10, 11.1, 11.2 and 12.

v. 2019 emergence/re-entry surveys

1.4.11 The emergence survey undertaken on Building 5 at Upper Abbey Farm on the 8 May 2019 and the emergence survey undertaken on Building 11 at Upper Abbey Farm on the 9 May 2019 were finished early due to adverse weather conditions.

1.4.12 Limitations associated with emergence/re-entry surveys undertaken on Sizewell B buildings are detailed in Ref. 1.18 (see **Annex 14A8.6**).

1.4.13 Species identification of bats observed emerging from or re-entering buildings was not always possible. This was due to a range of factors including:

- the emerging/re-entering bat not echolocating;
- the degree of background bat activity preventing the echolocation calls of emerging/re-entering bats from being distinguished; and/or
- the distance and/or angle of the surveyors from the emergence/re-entry point such that echolocation calls could not be heard.

vi. Tree assessments surveys

1.4.14 Tree assessment surveys of the site were constrained by access restrictions which prevented the assessment of trees in land to the west of Abbey Road.

1.4.15 Limitations associated with tree assessments within Coronation Wood in 2019 are detailed in Ref. 1.17 (see **Annex 14A8.6**).

1.5 Additional survey information

a) Survey periods

1.5.1 Barbastelle give birth from the middle of June. The young are suckled for up to six weeks (Ref. 1.11), i.e. until the end of July. They start to fly at around three weeks.

1.5.2 The information given in 'Bats of Britain, Europe and North Africa' (Ref. 1.11) may be from limited studies or based on a distribution other than the UK, but the capture data from radio tracking suggests these are reasonable assumptions for the UK, though peak birth dates vary with weather, and can shift by a couple of weeks at least.

i. Radio-tracking survey periods

1.5.3 Barbastelles caught in 2009 in the last few days of May were pregnant or parous (had previously given birth) but none were described as lactating. Details of bat activity and/or breeding status during catching and radio-tracking surveys in 2010, 2011 and 2014 are provided in **Table 14A8.3.5.**

Table 1.5: Bat activity during trapping and radio-tracking surveys

Year	Catching Period	Tracking Period	Bat Activity/Breeding Status
2010	1 – 8 June.	Until 12 June.	All females caught were pregnant.
2011	30 July – 3 August.	Until 10 August.	All breeding females were described as 'post-lactating'.
2014	9 – 15 August.	12 – 23 August.	Young bats independent.

ii. Automated detector survey periods

1.5.4 **Table 14A8.3.6** details the automated detector survey periods used by Wood Group in 2010 and 2011 and how these survey periods relate to the automated detector survey periods used by Arcadis in 2013 and 2014. The automated detector survey periods used by Arcadis in 2013 and 2014 are provided in **Table 14A8.3.7**.

Table 1.6: Wood Group automated detector survey periods and correspondence with Arcadis automated detector survey periods

Year	Spring	Summer	Autumn
2010	14 April – 6 July Occurring in the six weeks before, until the two weeks after, Arcadis S1, but does not encroach into S2.	7 July – 14 September Occurring from a week before Arcadis S2 until the start of Arcadis S3.	N/A
2011	12 April – 19 June Covering most, but not all, of Arcadis S1. A shorter period than the 'Spring' of 2010.	20 June – 5 September Commencing in Arcadis S1 and going beyond Arcadis S2, but not encroaching into Arcadis S3.	6 September – 28 September Covering the latter part of the 2010 'Summer' period occurring within Arcadis S3.

Table 1.7: Arcadis automated detector survey periods

Year	Season (S)	Session (s)	Dates	Activity
2013	S1	s1	29/05/2013 – 13/06/13	S1s1 - before birth (most years).
		s2	11/06/13 – 26/06/2013	S1s2 - covers early period after birth and early lactation.
	S2	s1	15/07/2013 – 29/07/2013	S2s1 - last two weeks of lactation.
		s2	30/07/2013 – 13/08/2013	S2s2 - young bats largely independent.
	S3	s1	10/09/2013 – 24/09/2013	Colonies breaking/broken up.
		s2	24/09/2013 – 08/10/2013	
2014	S1	s1	28/05/2014 – 12/06/2014	S1s1 - before birth (most years).
		s2	11/06/2014 – 26/06/2014	S1s2 - covers early period after birth and early lactation.
	S2	s1	15/07/2014 – 30/07/2014	S2s1 - last two weeks of lactation.
		s2	28/07/2014 – 13/08/2014	S2s2 - young bats largely independent.
	S3	s1	03/09/2014 – 16/09/2014	Colonies breaking/broken up.
		s2	16/09/2014 – 30/09/2014	

1.5.5 In 2011, the cut-off between Spring and Summer moved to a point earlier in the year by approximately four weeks. As a result, in 2010 the period equivalent to Arcadis S1 would have fallen entirely within Wood Group's Spring survey period but, in 2011, Arcadis's S1 would have straddled the boundary between Wood Group's 'Spring' and 'Summer' survey periods. These differences must be taken into account when comparing the different survey results.

b) Species identification parameters

1.5.6 Information on the parameters utilised by Wood Group for the identification of bat echolocation calls to the species or species group level are provided in the respective Wood Group reports (see **Annex 14A8.5**).

1.5.7 Detailed in **Table 14A8.3.8** are the criteria used by Arcadis for manual identification of bat echolocation calls, employed for data recorded during activity transect surveys. For each parameter in **Table 14A8.3.8** both a specific value (considered most indicative of a given species) and a range (over which the given species may also occur) are provided. These parameters are reproduced from those detailed in Russ (Ref. 1.20).

1.5.8 Data collected by Arcadis which were recorded by SM2 automated detectors were analysed using the auto-identification software SonoChiro, with manual verification undertaken as required. Details of this process are provided in Ref. 1.15 (see **Annex 14A8.6**).

Table 1.8: Parameters used for the identification of bat echolocation calls recorded during Arcadis activity transect surveys

Species	Shape[a]	Inter Pulse Interval (ms) [b]	Call Duration (ms) [c]	Peak Frequency (kHz) [d]	Start Frequency (kHz) [e]	End Frequency (kHz) [f]
Greater horseshoe bat (*Rhinolophus ferrumequinum*)	CF	90.2 (24.9 – 186.6)	50.5 (16.3 – 73.8)	81.3 (77.8 – 83.8)	70.2 (62.2 – 78.5)	67.3 (58.1 – 80.9)
Lesser horseshoe bat (*Rhinolophus hipposideros*)	CF	70.4 (14.1 – 113.7)	43.6 (11.9 – 61.4)	111.1 (107.3 – 114.0)	99.0 (92.3 – 107.8)	96.6 (83.4 – 110.3)
Noctule (*Nyctalus noctula*)	FM/qCF	216.9 (120.3 – 413.9)	14.7 (8.8 – 23.4)	24.5 (22.4 – 33.6)	37.9 (23.8 – 52.2)	23.7 (21.4 – 32.2)
	qCF	372.2 (120.2 – 807.2)	22.1 (13.2 – 29.9)	19.3 (17.5 – 23.6)	23.2 (18.2 – 30.4)	18.3 (17.1 – 23.0)
Leisler's bat	FM/qCF	118.9 (107.3 – 313.1)	8.3 (6.1 – 18.4)	27.1 (25.0 – 32.1)	42.9 (29.8 – 61.7)	26.5 (24.2 – 30.7)
	qCF	312.2 (100.2 – 801.2)	17.1 (10.5 – 25.1)	23.1 (21.9 – 24.6)	26.2 (23.5 – 29.9)	21.9 (20.9 – 24.1)
Serotine (*Eptesicus serotinus*)	FM-qCF	126.0 (65.1 – 159.0)	5.1 (1.6 – 12.3)	25.9 (24.1 – 32.2)	58.4 (39.1 – 78.0)	25.5* (22.4 – 32.0)
Common pipistrelle	FM-qCF	102.5 (59.9 – 211.0)	5.9 (3.2 – 8.6)	46.6 (41.6 – 50.6)*	68.8 (50.8 – 95.2)	45.9 (40.7 – 49.9)*
Soprano pipistrelle (*Pipistrellus pygmaeus*)	FM-qCF	89.1 (51.0 – 217.1)	5.5 (2.1 – 8.2)	55.1 (50.2 – 64.1)	79.6 (63.8 – 108.6)	54.7* (49.6 – 63.90)*
Nathusius' pipistrelle	FM-qCF	129.0 (88.6 – 237.0)	5.88 (3.0 – 7.9)	39.3 (35.5 – 41.9)	51.1 (40.0 – 66.8)	36.9 (35.2 – 38.9)

Species	Shape[a]	Inter Pulse Interval (ms) [b]	Call Duration (ms) [c]	Peak Frequency (kHz) [d]	Start Frequency (kHz) [e]	End Frequency (kHz) [f]
Greater mouse-eared bat (*Myotis myotis*)	Steep FM	109.6 (46.6 – 159.1)	4.6 (2.5 – 7.1)	36.1 (31.5 – 53.9)	79.6 (52.2 – 104.5)	27.9 (24.1 – 37.0)
Natterer's bat	Steep FM	80.1 (31.6 – 188.9)	4.7 (1.9 – 7.1)	46.9 (36.0 – 66.8)	106.8 (72.1 – 145.3)	22.8 (14.9 – 29.0)
Bechstein's bat (*Myotis bechsteinii*)	Steep FM	96.4 (79.4 – 188.9)	2.4 (1.6 – 3.5)	51.0 (45.1 – 55.9)	116.2 (65.0 – 130.9)	32.9 (28.0 – 40.4)
Daubenton's bat (*Myotis daubentonii*)	Steep FM	75.5 (27.5 – 186.0)	3.2 (1.4 – 5.8)	47.0 (41.8 – 56.5)	81.1 (50.3 – 109.7)	29.4 (22.4 – 38.6)
Whiskered bat (*Myotis mystacinus*)	Steep FM	113.0 (66.7 – 251.5)	4.2 (3.1 – 6.4)	47.5 (39.2 – 68.5)	88.3 (69.9 – 101.8)	32.4 (25.6 – 43.3)
Brandt's bat (*Myotis brandti*)	Steep FM	88.0 (56.7 – 161.0)	3.5 (1.5 – 5.0)	46.7 (38.0 – 78.4)	91.6 (59.0 – 121.9)	34.0 (25.8 – 41.8)
Alcathoe's bat (*Myotis alcathoe*)	Steep FM	Unknown (47.0 – 99.0)	<4.0	52.5 (42.9 – 61.9)	Unknown (111.0 – 120.0)	43.0 (40.0 – 50.0)
Brown long-eared bat	Short FM & harmonic	76.8 (21.8 – 172.4)	2.3 (1.2 – 3.8)	33.1 (25.5 – 42.1)	50.0 (31.9 – 63.8)	25.0 (19.1 – 30.9)
Grey long-eared bat (*Plecotus austriacus*)	Short FM & harmonic	105.0 (35.8 – 194.0)	3.8 (1.4 – 7.0)	32.6 (26.3 – 50.5)*	43.4 (35.4 – 55.9)	23.6 (17.0 – 31.7)
Barbastelle	qCF/FM	72.4 (43.2 – 144.9)	4.3 (2.0 – 6.6)	41.6 (33.5 – 43.8)	44.1 (36.8 – 55.9)	28.9 (25.4 – 31.9)
	FM	108.4	3.4	32.9	39.4	28.0

Species	Shape[a]	Inter Pulse Interval (ms) [b]	Call Duration (ms) [c]	Peak Frequency (kHz) [d]	Start Frequency (kHz) [e]	End Frequency (kHz) [f]
		(41.8 – 229.0)	(2.5 – 5.1)	(29.2 – 44.7)	(35.2 – 49.0)	(23.8 – 36.8)

a The shape of a bat echolocation call is defined as either frequency modulated (FM), constant frequency (CF) or quasi-constant frequency (qCF).
b The inter-pulse interval is the time period between the start of one call pulse and the start of the next call pulse measured in milliseconds.
c The call duration is the period of time over which one call pulse occurs measured in milliseconds.
d The peak frequency is the frequency within a call pulse which contains the highest concentration of energy measured in kHz.
e The start frequency is the frequency at which a call pulse begins measured in kHz.
f The end frequency is the frequency at which a call pulse ends measured in kHz.

All call parameters are as defined in Ref. 1.20. with the exception of those parameters indicated by the * which are as defined by Russ (pers. comm).

References

1.1 Amec. 2011. Sizewell Ecology Studies Bat Survey Report 2011.

1.2 Amec. 2012. Sizewell C New Nuclear Power Station: Terrestrial and Freshwater Ecology and Ornithology DRAFT Coronation Wood Bat Survey Report 2012.

1.3 Entec. 2007. Sizewell Bat Survey Report 2007. British Energy Group PLC.

1.4 Entec. 2008. Sizewell Bat Survey Report 2008. British Energy Group PLC.

1.5 Entec. 2009. Sizewell Bat Survey Report 2009. EDF Developments Ltd. 2009

1.6 Entec. 2010. Sizewell Bat Survey Report 2010. NNB Generation Company.

1.7 Amec. 2011. Sizewell Survey of Potential Bat Hibernation Sites in Buildings, January-March 2011.

1.8 Amec. 2011. Associated Development Site 1. DRAFT Extended Phase 1 Habitat Survey Report.

1.9 Amec. 2012. Aldhurst Farm West. Associated Development Site 1. DRAFT Bat Survey Report. NNB Generation Company.

1.10 Amec. 2013. Upper Abbey Farm, Leiston: Ecological Appraisal Report.

1.11 C. Dietz., O. van Helveson., and D. Nil. 2009. Bats of Britain, Europe and North-west Africa. London: A & C Black.

1.12 HyderCresswell. 2013. Barbastelle and Seabird Survey Strategy 2013.

1.13 Hundt.L. 2012. Bat Surveys: Good Practice Guidelines. 2nd edition. Bat Conservation Trust.

1.14 J. Collins (ed.). 2016. Bat Surveys for Professional Ecologists: Good Practice Guidelines. 3rd edition. London: The Bat Conservation Trust.

1.15 Arcadis. 2016. Sizewell C Ecology: Automated (SM2) bat detector monitoring report 2013/2014. Unpublished report to EDF.

1.16 Corylus Ecology. 2016. Sizewell Radio-tracking report.

1.17 Arcadis. 2019. Sizewell B Relocated Facilities – Bats and Badgers March 2019 Survey Technical Note. Unpublished report to EDF.

1.18 Arcadis. 2019. Arcadis. 2019. Sizewell B Relocated Facilities – Bat Building Emergence Surveys 2019 Technical Note. Unpublished report to EDF.

1.19 Arcadis. 2019. Sizewell C Sandpits – Targeted Surveys September 2019 Technical Note.

1.20 J. Russ. 2012. British bat calls: a guide to species identification. Exeter: Pelagic Publishing.

VOLUME 2, CHAPTER 14: APPENDIX 14A8 - BATS: ANNEX 14A8.4 RESULTS

Contents

Tables

Plates

None provided.

Figures

All figures are found within **Annex 14A8.1**.

1. Results

1.1 Introduction

1.1.1 This annex sets out the results of bat surveys undertaken by Wood Group (formerly Entec and Amec Foster Wheeler) between 2007 and 2012, and surveys undertaken by (or on behalf of) Arcadis Consulting (UK) Limited (formerly Hyder Consulting, and hereafter referred to as Arcadis) post-2012, for the Sizewell C power station at the main development site (referred to throughout this volume as the "proposed development"). Where full details of the bat survey results have been included within reports already produced for the proposed development site (hereafter referred to as the "site"), the full results have not been repeated here, although a summary has been provided. Published reports produced by Wood Group have been included within **Annex 14A8.5**. Reports on behalf of Arcadis are provided in **Annex 14A8.5** and reports produced by Arcadis are provided in **Annex 14A8.6**.

1.1.2 A summary of the methodologies employed during the bat surveys detailed within this Annex are provided in **Annex 14A8.3**.

1.2 Survey area

1.2.1 Owing to changes in the likely proposed development layout, surveys have been undertaken across a range of study areas between 2007 and 2012 and post-2012, as illustrated on **Figure 14A8.1, Figure B2** in Ref. 1.1 (see **Annex 14A8.5**), and **Figure 1.1** in Ref. 1.2 (see **Annex 14A8.5**). It should be noted that the site boundary has changed, albeit not substantially, since the Wood Group surveys.

1.2.2 However, the variation in the study areas for the different surveys has provided valuable contextual data regarding the local distribution of bat species as well as providing data for the site as it stands in 2019. Within this annex, the term "study area" refers to the area specifically under consideration during the specified survey.

1.2.3 Full details of the study areas are provided in the individual reports found in **Annexes 14A8.5** and **14A8.6**.

1.3 Wood Group surveys – secondary data

a) Approach

1.3.1 As detailed in **Annex 14A8.3,** a number of surveys were undertaken by Wood Group between 2007 and 2012 across and beyond the site (as it

stood at the time of Wood Group surveys). The methodologies and results of these surveys are presented in detail in the respective Wood Group reports (see **Annex 14A8.5**) and have been summarised in **Annex 14A8.3**. A summary of the results of these surveys is provided in **sections 1.1c)ii** to **1.1c)xi**.

b) 2007 surveys

i. Tree assessment

1.3.2 A total of 196 trees were assessed in 2007. No evidence of actual or potential roosts was recorded within areas of plantation, with the exception of a soprano pipistrelle roost located within three bat boxes attached to a Corsican Pine (*Pinus nigra maritima*) within Kenton Hills.

1.3.3 Due to the sub-optimal time of year during which these assessments were undertaken, all trees were re-assessed in 2008. Surveys undertaken in 2010 further superseded the findings of tree assessments in 2007. The results of the 2010 tree assessments are provided in detail in **section 0** and **Table 1.11**.

ii. Activity transect surveys

1.3.4 The results of the activity surveys undertaken across five transect routes (see **Figures 3** to **7** in Ref. 1.3 (see **Annex 14A8.5**) undertaken between June and September 2007 are summarised in **Table 1.1**. This details the number of bat passes recorded, by species. Full details of the results of activity transect surveys undertaken in 2007 are described in Ref. 1.3 (see **Annex 14A8.5**).

Table 1.1: Summary of the number of passes recorded, by species, during activity transect surveys in 2007

Approximate Transect Location	Transect Date	Common Pipistrelle (*Pipistrellus pipistrellus*)	Soprano Pipistrelle (*Pipistrellus pygmaeus*)	Leislers bat* (*Nyctalus leisleri*)	Noctule (*Nyctalus noctule*)	Serotine (*Eptesicus serotinus*)	Barbastelle (*Barbastella barbastellus*)	Brown long-eared bat** (*Plecotus auratus*)	*Myotis* spp.	Natterers bat (*Myotis nattereri*)	Whiskered/Brandts bat*** (*Myotis mystacinus*/*Myotis brandti*)
Kenton Hills, Dunwich Forest and east of the main platform.	07/06/2007	49	68	-	2	2	3	3	1	2	-
Kenton Hills, fields north of Kenton Hills, Dunwich Forest and south-west of the main platform.	06/07/2007	45	79	-	2	13	7	7	5	5	-
Kenton Hills, Dunwich Forest and south-west of the main platform.	16/08/2007	74	110	1	2	4	-	1	1	-	-
Kenton Hills, Dunwich Forest and south-west of main platform.	18/08/2007	76	74	-	1	8	3	-	1	-	2
Kenton Hills and northern section of Dunwich Forest.	12/09/2007	43	56	-	3	7	-	-	1	-	-
Total		287	387	1	10	34	13	11	9	7	2

** These data are as presented in 2007. In the intervening years, it has become apparent that there is significant overlap between the Leisler's bat, noctule and serotine group, and many calls cannot be identified to a species with confidence. Re-examination of a number of 'Leisler's bat' calls from 2010/2011 suggests these calls should be reclassified as belonging to this group, not to species.*

*** All long-eared bat recordings are considered to relate to brown long-eared bat echolocation calls due to the absence of grey long-eared (Plecotus austraicus) bat from Suffolk, based on their current known distribution. (Ref. 1.4 and Ref. 1.5)*

**** These data are as presented in 2007. These calls were later reassessed and reclassified (largely) as Myotis spp. Following this reassessment, whiskered/Brandt's bats were not considered to be present on site.*

1.3.5 Common pipistrelle (*Pipistrellus pipistrellus*) and soprano pipistrelle (*Pipistrellus pygmaeus*) were noted to be the most abundant species occurring along the majority of the transect lengths.

1.3.6 Regular, but more localised, recordings were made of noctule (*Nyctalus noctula*), serotine (*Eptesicus serotinus*) and *Myotis* spp., which were noted in particular along the tracks and rides within Dunwich Forest/Goose Hill. Unidentified *Pipistrellus* spp. and a single serotine pass were recorded within the main platform.

1.3.7 The location of all bat recordings (activity transects and automated detector surveys combined), with the exception of common and soprano pipistrelles, are illustrated on **Figure 8** in Ref. 1.3 (see **Annex 14A8.5**).

iii. Automated detector surveys

1.3.8 Detailed results from automated detector surveys are described in Ref. 1.3 (see **Annex 14A8.5**) and are summarised in **Table 1.2**.

Table 1.2: Summary of the number of passes recorded, by species, during automated detector surveys in 2007*

Detector Location	Survey Dates	Common Pipistrelle	Soprano Pipistrelle	Common/soprano Pipistrelle	*Pipistrellus* spp.	Noctule	Serotine	Barbastelle	Brown long-eared**	*Myotis* spp.
A – Dunwich Forest.	07-08/06/2007	5	23	-	-	-	-	-	-	-
B – Shelterbelt north of Sizewell B power station.	07-08/06/2007	3	-	-	-	-	-	-	-	-
C – North-south tree line east of Hilltop Covert.	06/07/2007	108	212	5	-	-	-	-	-	-
D – Southern edge of Goose Hill.	06/07/2007	151	229	14	5	5	3	-	-	1
E – Near Turf Pits woodland.	16/08/2007	24	171	-	-	1	-	-	-	-
F – Leiston Carr.	16/07/2007	42	17	-	-	-	7	11	-	-

Detector Location	Survey Dates	Common Pipistrelle	Soprano Pipistrelle	Common/soprano Pipistrelle	*Pipistrellus* spp.	Noctule	Serotine	Barbastelle	Brown long-eared**	*Myotis* spp.
G – North-eastern edge of Plantation woodland.	28/08/2007	263	271	-	1	34	-	1	-	-
H – Southern edge of Nursery Covert.	28/08/2007	31	34	-	-	-	-	-	1	-
I – South-western edge of Kenton Hills.	12/09/2007	-	-	-	-	-	-	-	-	-
J – Edge of grazing marsh between, east of Nursery Covert; north of Grimseys.	12/09/2007	13	347	-	2	1	-	-	-	-
Total		640	1,304	19	8	41	10	12	1	1

**Calls identified as unknown are not included in this summary.*

***All long-eared bat recordings are considered to relate to brown long-eared bat echolocation calls due to the absence of grey long-eared bat from Suffolk, based on their current known distribution. (Ref. 1.4 and Ref. 1.5).*

1.3.9 Common and soprano pipistrelles were again noted to be the most abundant species. It was noted that increased bat species diversity was recorded in areas of greater botanical diversity and where adjoining habitats were more varied.

1.3.10 Barbastelle (*Barbastella barbastellus*) passes were recorded during both automated detector surveys and activity transects along the southern edge of Kenton Hills (i.e. Leiston Carr), while a second area of barbastelle activity was noted during automated surveys at the eastern edge of Dunwich Forest/Goose Hill, as illustrated on **Figure 8** in Ref. 1.3 (see **Annex 14A8.5**).

1.3.11 Common pipistrelle were the only species recorded within the main platform during the course of automated detector surveys. Soprano pipistrelle and a single serotine pass were also recorded during activity transect surveys within this location.

c) 2008 surveys

i. Landscape assessment

1.3.12 As illustrated on **Figure 5** in Ref. 1.6 (see **Annex 14A8.5**), a number of potential flight lines were identified through consideration of aerial photographs and Ordnance Survey (OS) maps. Potential flight lines were identified in the form of woodland strips, hedgerows, rides, ditches and farm tracks in the vicinity of Goose Hill, Kenton Hills, Sizewell Marshes Site of Special Scientific Interest (SSSI) and Sandy Lane.

1.3.13 Known barns at Upper Abbey Farm and Lower Abbey Farm were the only buildings identified as having the potential to support a maternity colony of barbastelle.

1.3.14 No records of barbastelle were found to be held by the Royal Society for the Protection of Birds (RSPB) within the RSPB Minsmere Reserve; however, it was considered that was the result of a lack of survey effort rather than an absence of barbastelle from this location.

ii. Tree assessments

1.3.15 Three trees, in addition to those identified in 2007, were assessed as having medium potential for use by bats: two were located within a line of trees to the north of Nursery Covert, and one along the northern edge of Fiscal Policy woodland.

1.3.16 Tree assessments undertaken in 2008 were superseded by those undertaken across the entirety of the site in 2010. The results of the 2010 tree assessments are therefore provided in detail in **section 0** and **Table 1.11**.

iii. Roost surveys

1.3.17 Detailed results of roost surveys undertaken in 2008 are described in Ref. 1.6 (see **Annex 14A8.5**); while a summary of these results is provided here.

1.3.18 Internal inspections of the barn at Upper Abbey Farm in April and June 2008 identified the presence of fresh droppings at levels suggestive of use by low numbers of Natterer's bat (*Myotis nattereri*), brown long-eared bat (*Plecotus auritus*) and unidentified *Pipistrellus* spp.

1.3.19 Automated and manned surveys undertaken at the barn at Upper Abbey Farm were found to corroborate these findings, with brown long-eared bat, Natterer's bat, common and soprano pipistrelle passes recorded. Up to

three pipistrelle bats were recorded emerging from the barn at Upper Abbey Farm during the dusk emergence survey (19 May 2008). Natterer's, brown long-eared and common pipistrelle bats were recorded re-entering Upper Abbey Barn during dawn re-entry surveys (12 August 2008). A further brown long-eared bat roost was noted to be present within Suffolk Wildlife Trust (SWT) workshop buildings.

1.3.20 No evidence of use by bats was identified during the survey of the barn at Lower Abbey Farm. It was suggested that changes in the use of the barn, to hold livestock, may have resulted in barbastelle no longer roosting within this building (Alan Miller, pers. comm.). The conversion of barns at Leiston Abbey was considered to have rendered these buildings no longer suitable for use by bats.

d) Activity transect surveys

1.3.21 The results of activity surveys undertaken across six transect routes undertaken between April and August 2008 (see **Figures 2** and **3** in Ref. 1.6 (see **Annex 14A8.5**) for transect routes) are summarised in **Table 1.3**, which details the number of bat passes recorded, by species. Full details of the results of activity surveys undertaken in 2008 are described in Ref. 1.6 (see **Annex 14A8.5**).

Table 1.3: Summary of the number of passes recorded, by species, during activity transect surveys in 2008

Approximate Transect Location	Transect Date	Common Pipistrelle	Soprano Pipistrelle	Noctule	Serotine	Leislers bat*	*Myotis* spp.	Whiskered/Brandts**	Natterers bat	Brown long-eared bat***	Barbastelle
Walked - Land east of Abbey Lane from Lover's Lane north to Lower Abbey Farm.	28/04/2008****	48	23	-	1	-	4	-	4	1	-
Walked - Kenton Hills and Upper Abbey Farm track.	19/05/2008****	82	58	2	1	-	8	1	-	5	1
Walked - Southern edge of Dunwich Forest and proposed main platform.	20/05/2008	38	78	5	1	-	1	-	-	3	4
Driven – Abbey Road north to Lower Abbey Farm, down Upper Abbey Farm track. South on Lover's Lane to Reckham Pits Wood to east and Valley Road to west.	18/06/2008	30	15	1	-	1	1	-	-	-	1
Driven - Abbey Road north to Lower Abbey Farm, down Upper Abbey Farm track and east to Ash Wood Cottages. South on Lover's Lane to Reckham Pits Wood to east and Valley Road to west.	24/07/2008	50	42	-	4	-	2	-	-	-	-
Walked – Upper Abbey track, Kenton Hills and southern edge of Dunwich Forest.	11/08/2008	52	49	1	1	-	3	-	-	-	5
Total		300	265	9	8	1	19	1	4	9	11

**These data are as presented in 2008. In the intervening years, it has become apparent that there is significant overlap between the Leisler's bat, noctule and serotine group, and many calls cannot be identified to a species with confidence. Re-examination of a number of 'Leisler's bat' calls from 2010/2011 suggests that these calls should be reclassified as belonging to this group, not to species.*

***These data are as presented in 2008. These calls were later reassessed, and reclassified (largely) as Myotis spp. Following this reassessment, whiskered/Brandt's bats were not considered to be present on site.*

****All long-eared bat recordings are considered to relate to brown long-eared bat echolocation calls due to the absence of grey long-eared bat from Suffolk based on their current known distribution. (Ref. 1.4 and Ref. 1.5)*

*****Transect results include calls recorded from Batbox Duet detectors and were analysed using BatSound software. Remaining transect results were recorded by Anabat SD1 detectors and were analysed using Analook software.*

1.3.22 Common pipistrelle passes were noted to be the most numerous, followed by soprano pipistrelle. This is in contrast to activity survey results of 2007, which found that soprano pipistrelle were the most numerous species to be recorded. This variation is likely to relate to the differing transect routes, and habitats sampled, during transects undertaken in 2007 and 2008. Transects in 2007 focused primarily on woodland and adjacent habitat within the site, while the 2008 transects focused to a greater degree on habitats to the west of the site, between Leiston Common in the south and Lower Abbey Farm in the north. Both species were recorded across the majority of the survey area.

1.3.23 Other bat species (as identified in **Table 1.3**) were primarily recorded in two areas: between Fiscal Policy woodland and Upper Abbey Farm; and along the southern edge of Goose Hill. **Figures 7** to **10** in Ref. 1.6 (see **Annex 14A8.5**) shows the location of bat passes recorded during activity transect surveys.

i. Automated detector surveys

1.3.24 Detailed results from automated detector surveys undertaken in 2008 are described in Ref. 1.6 (see **Annex 14A8.5**), and are summarised in **Table 1.4**. The locations of automated detectors are illustrated on **Figure 4** in Ref. 1.6 (see **Annex 14A8.5**).

Table 1.4: Summary of the number of bat passes recorded by automated detectors, by species, in 2008*

Automated Detector Number	Bat species									
	Barbastelle	Serotine	Whiskered/Brandts**	*Myotis* spp.	Leislers bat***	Noctule	Common pipistrelle	Soprano pipistrelle	Pipistrellus spp.	Brown long-eared bat****
1	2	-	-	2	-	2	39	29	5	1
2	-	-	-	-	-	1	5	10	1	1
3	-	-	-	-	-	1	5	-	-	1
4	-	-	-	2	-	2	85	23	36	1
5	2	-	1	4	-	-	111	50	11	3
6	-	-	-	-	-	3	-	-	-	1
7	-	3	-	1	-	3	13	115	-	2
8	-	-	-	-	-	7	1	3	-	-
9	-	-	-	3	-	-	226	19	22	5

Automated Detector Number	Bat species									
	Barbastelle	Serotine	Whiskered/Brandts**	*Myotis* spp.	Leislers bat***	Noctule	Common pipistrelle	Soprano pipistrelle	Pipistrellus spp.	Brown long-eared bat****
10	-	-	-	-	-	-	96	93	1	-
11	3	-	-	-	2	22	78	22	3	1
12	-	-	-	-	-	7	1	3	-	-
13	-	-	-	-	-	-	55	41	-	-
14	-	-	-	-	-	-	12	2	2	7
15	1	1	7	7	-	3	629	825	78	3
16	-	-	-	7	-	1	24	18	-	2
17	-	-	2	3	-	2	63	17	-	-
Total	8	4	10	26	2	54	1,416	1,270	159	28

**Calls that were not identified to a species, genus or species group level are not included.*

***These data are as presented in 2008. These calls were later reassessed, and reclassified (largely) as Myotis spp. Following this reassessment, whiskered/Brandt's bats were not considered to be present on site.*

****These data are as presented in 2008. In the intervening years, it has become apparent that there is significant overlap between the Leisler's bat, noctule and serotine group, and many calls cannot be identified to a species with confidence. Re-examination of a number of 'Leisler's bat' calls from 2010/2011 suggests these calls should be reclassified as belonging to this group, not to species.*

*****All long-eared bat recordings are considered to relate to brown long-eared bat echolocation calls due to the absence of grey long-eared bat from Suffolk based on their current known distribution. (Ref. 1.4 and Ref. 1.5).*

1.3.25 Nine species were identified from the automated detector recordings and, as with activity transect surveys, common pipistrelle passes were noted to be the most abundant. As with activity transect surveys, the ratio of common to soprano pipistrelles was reversed in 2008 when compared to 2007. As with the transect surveys, this is likely to relate to the different placements of automated detectors in 2007 and 2008.

1.3.26 Low numbers of barbastelle passes were recorded during May, June and August 2008 along the Upper Abbey Farm bridleway, areas of plantation south of Goose Hill, Turf Pits woodland, and near to Leiston Carr. **Figure 12** in Ref. 1.6 (see **Annex 14A8.5**) shows the location of bat passes recorded during automated detector surveys.

e) 2009 surveys

i. Landscape assessments

1.3.27 The majority of woodland units that were identified and assessed by Wood Group were considered to be of low potential as habitat for roosting barbastelle.

1.3.28 Woodland units at three locations (Fred's Mount/Goose Hill, Osier Bed and The Wilderness) were of medium roost potential. Minsmere (specifically: 'south of car park') was of medium to high potential and Scotshall Covert was of high potential for roosting barbastelle. The locations of these woodland units are illustrated on **Figure 3.2** in Ref. 1.7 (see **Annex 14A8.5**).

1.3.29 Only three of the buildings identified for ground-truthing were considered to have high potential to support roosting barbastelle: St. Peter's Church in Theberton, Lady Chapel at Leiston Abbey, and a thatched barn in Thorpeness. No evidence of current occupation was identified at the thatched barn in Thorpeness, although a number of potentially suitable roosting locations were identified for a range of species, including barbastelle.

1.3.30 Evidence of use by bats was identified at both St. Peter's Church and Lady Chapel in the form of droppings. Droppings from both pipistrelle species, and from an unidentified species (with medium-sized droppings), were identified throughout the interior of Lady Chapel, while at St. Peter's Church pipistrelle spp. droppings were identified in the porch, and medium-sized droppings, considered likely to be from brown long-eared bats, were identified around the font and window sills. [Note: these surveys pre-dated the use of DNA confirmation.]

1.3.31 It was concluded that the EDF Energy estate and surrounding areas provide excellent connectivity for barbastelle, with Minsmere and the surrounding complex of woodland identified as offering the highest quality of habitat and connectivity. It was therefore considered that this location had the greatest potential as a colony core for barbastelle in the wider landscape.

ii. Trapping surveys

1.3.32 The results of the trapping surveys undertaken in May 2009 are summarised in **Table 1.5**. Full details of the results of the trapping surveys are detailed in Ref. 1.7 (see **Annex 14A8.5**).

Table 1.5: Summary of bats caught during trapping surveys in 2009

Bat Species	Gender	Trapping Date			Species Total
		26/05/2009	27/05/2009	28/05/2009	
Barbastelle	Male	1	-	-	5
	Female	1 (unknown breeding status).	2 (parous).	1	
Daubenton's bat. (*Myotis daubentonii*)	Male	2	-	-	2
	Female	-	-	-	
Common pipistrelle.	Male	-	2	2	12
	Female	4 (pregnant).	2 (pregnant).	2 (pregnant).	
Soprano pipistrelle.	Male	6	3	-	16
	Female	2 (1 possibly pregnant).	5 (4 pregnant).	-	
Natterer's bat.	Male		1	-	5
	Female	2 (pregnant).	-	2 (1 pregnant).	
Brown long-eared.	Male	-	1	-	2
	Female	-	-	1	
TOTAL		18	16	8	N/A

1.3.33 Individuals of six species were caught during the three days of trapping, including five barbastelle. A reduction in the number of trapped bats on the final night of trapping was suggested to be due to the increased detectability of the traps due to higher winds.

iii. Activity transect surveys

1.3.34 The results of activity surveys undertaken between April and September 2009 across nine transect routes (see **Figures 3.7** to **3.15** in Ref. 1.7 (see **Annex 14A8.5**) for transect routes) are summarised in **Table 1.6**, which details the number of bat passes recorded, by species. Full details of the results of activity transect surveys undertaken in 2009 are described in Ref. 1.7 (see **Annex 14A8.5**).

1.3.35 At least eight species were recorded during the activity transect surveys. Recorded activity peaked in August 2009 and was at its lowest level during April 2009. As in previous activity surveys (summarised in **sections 0** and **1.1c)iv**), common and soprano pipistrelle were encountered most

frequently: both species were recorded on every survey visit and throughout the survey area.

Table 1.6: Summary of the number of passes recorded, by species, during activity transect surveys in 2009

Bat Species	Transect date									Relative Activity (B/h)
	27/04/2009	29/04/2009	13/05/2009	25/05/2009	04/062009	25/06/2009	18/08/2009	25/08/2009	14/09/2009	
Common pipistrelle.	46	87	14	57	71	19	42	36	16	23.1
Soprano pipistrelle.	30	72	31	28	31	39	95	97	75	18.0
Common/Soprano pipistrelle.	3	47	7	1	9	31	54	8	7	7.7
Myotis spp.	-	-	1	2	1	3	4	1	4	0.7
Nathusius' pipistrelle. (*Pipistrellus nathusii*)	-	-	13	-	1	-	-	-	-	0.6
Serotine	-	-	-	-	-	9	-	3	-	0.6
Barbastelle	-	1	1	-	1	4	1	-	3	0.5
Noctule	-	2	2	-	2	1	1	-	-	0.4
Common/Nathusius' pipistrelle.	-	-	-	-	4	-	-	-	-	0.2
Brown long-eared bat*/Serotine.	-	-	-	-	-	2	1	-	-	0.1
Myotis spp./Brown long-eared bat*.	-	-	-	-	-	1	-	-	1	0.1
Brown long-eared bat*.	-	-	-	-	-	1	-	-	-	0.0
Nyctalus spp.	-	-	-	-	-	1	-	-	-	0.0

**All long-eared bat recordings are considered to relate to brown long-eared bat echolocation calls due to the absence of grey long-eared bat from Suffolk based on their current known distribution. (Ref. 1.4 and 1.5).*

1.3.36 **Figure 3.16** in Ref. 1.7 (see **Annex 14A8.5**) illustrates the distribution of those species identified as "less common" throughout the survey area (defined in Ref. 1.7 (see **Annex 14A8.5**) as barbastelle, serotine, *Myotis* spp, noctule, Nathusius' pipistrelle (*Pipistrellus nathusii*) and brown long-

eared bats). It was observed that all recorded barbastelle passes (within the 2009 survey area) were located within areas of plantation woodland, while *Myotis* spp. recordings were associated with the area around Goose Hill. Nathusius' pipistrelle were recorded for the first time within the survey area during the 2009 activity transect surveys, and were observed occurring primarily within the Sizewell Marshes SSSI.

1.3.37 The recording of only a single brown long-eared bat pass was suggestive of an under-representation of this species due to the quiet nature of the echolocation calls emitted by species of this genus.

iv. Automated detector surveys

1.3.38 Nine bat species were recorded over 133 nights of automated detector surveying, with species recorded corresponding with those recorded during the activity transect surveys, with the addition of a single Leisler's bat (*Nyctalus leisleri*) pass (see footnote to **Table 1.7**).

1.3.39 Full details of the results of the automated detector surveys in 2009 are described in Ref. 1.7 (see **Annex 14A8.5**), while a summary is provided in **Table 1.7**.

Table 1.7: Summary of the relative activity (bat passes per hour, B/h) of bat species recorded during automated detector surveys in 2009

Bat Species	Automated detector number											Total
	1	2	3	4	5	6	7	8	9	10	11	
Soprano pipistrelle.	0.1	2.2	45.8	<0.1	1.2	14.8	<0.1	35.6	2.9	1.4	2.0	12.2
Common pipistrelle.	0.1	5.8	26.0	0.7	4.0	23.0	0.1	20.2	2.6	2.5	0.3	9.0
Common/soprano pipistrelle.	0.1	0.2	10.4	<0.1	0.2	0.3	-	2.9	0.6	0.1	<0.1	2.2
Myotis spp.	-	0.7	2.9	-	1.0	0.3	<0.1	0.4	<0.1	0.1	<0.1	0.8
Barbastelle	<0.1	0.6	1.6	-	<0.1	0.6	-	<0.1	-	0.8	-	0.6
Myotis spp./Brown long-eared spp.*.	-	<0.1	0.6	-	0.1	-	-	<0.1	-	-	-	0.1
Noctule	-	<0.1	0.1	-	0.1	0.2	-	0.7	-	<0.1	<0.1	0.1
Nyctalus spp.	-	-	<0.1	-	-	0.5	-	0.9	-	<0.1	-	0.1
Common/Nathusius' pipistrelle.	-	-	-	-	<0.1	<0.1	-	0.1	-	-	-	<0.1
Nathusius' pipistrelle.	-	<0.1	<0.1	-	<0.1	-	-	<0.1	-	-	-	<0.1
Brown long-eared*.	-	-	<0.1	<0.1	<0.1	-	-	-	-	-	-	<0.1
Nyctalus spp./*Eptesicus* spp.	-	-	-	-	-	<0.1	-	-	<0.1	-	-	<0.1
Serotine	-	<0.1	<0.1	-	<0.1	-	-	0.1	-	-	-	<0.1
Serotine/Leisler's bat**.	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1
Brown long-eared bat*/*Eptesicus* spp.	-	-	-	-	-	<0.1	-	<0.1	-	-	-	<0.1

Bat Species	Automated detector number											Total
	1	2	3	4	5	6	7	8	9	10	11	
Leisler's bat**.	-	-	-	-	-	-	-	<0.1	-	-	-	<0.1
Minimum number of species recorded.	3	7	8	3	8	6	3	8	4	5	5	9
Total	0.3	9.6	87.4	0.8	6.7	39.8	0.2	60.9	6.2	4.9	2.4	25.2

**All long-eared bat recordings are considered to relate to brown long-eared bat echolocation calls due to the absence of grey long-eared bat from Suffolk based on their current known distribution (Ref. 1.4 and Ref. 1.5).*

***These data are as presented in 2009. In the intervening years, it has become apparent that there is significant overlap between the Leisler's bat, noctule and serotine group, and many calls cannot be identified to a species with confidence. Re-examination of a number of 'Leisler's bat' calls from 2010/2011 suggests these calls should be reclassified as belonging to this group, not to species.*

1.3.40 The greatest levels of overall activity were recorded by automated detectors located north of Nursery Covert and along the Upper Abbey Farm bridleway. Soprano pipistrelle was identified as the most abundant species, having been recorded at a rate of 12.2 bat passes per hour (B/h).

1.3.41 During these surveys, Nathusius' pipistrelle were recorded almost exclusively within the Spring months, and it was considered by Wood Group that this may represent migratory behaviour, with foraging occurring within the survey area prior to a northerly migration across the North Sea.

1.3.42 The timing of noctule and *Nyctalus* spp. passes, close to sunset and sunrise, as recorded by an automated detector located within a field to the north of Nursery Covert, was considered to be suggestive of a small number of individuals commuting to and from a roost location.

1.3.43 An automated detector located along the Upper Abbey Farm bridleway recorded the greatest abundance of barbastelle passes, with additional areas of notable barbastelle pass abundance recorded along the northern edge of Kenton Hills and Nursery Covert. The analysis of the timing of these passes identified two peaks in recorded barbastelle activity: the peak within one hour of sunset was considered to be suggestive of the potential for barbastelle to be roosting within Upper Abbey Farm; while the second peak, between 100 minutes and 60 minutes before sunrise, was considered indicative of an important north-south commuting route between Upper Abbey Farm and Fiscal Policy along the Upper Abbey Farm bridleway.

1.3.44 Activity recorded within the rest of the survey area was considered suggestive of the hedgerow located north-east of Upper Abbey Farm acting as a periodic foraging route of secondary importance.

f) 2010 surveys

i. Trapping and radio-tracking surveys

1.3.45 The results of trapping and radio-tracking surveys undertaken in June 2010 are summarised in **Table 1.8.** Full details of the results of these surveys are detailed in Ref. 1.8 (see **Annex 14A8.5**).

Table 1.8: Summary of bats caught during trapping surveys in 2010

Bat Species	Male	Female		Not sexed	Total
		Not Pregnant	Pregnant		
Soprano pipistrelle.	31	1	36	1	69
Common pipistrelle.	31	4	22	1	58

Bat Species	Male	Female		Not sexed	Total
		Not Pregnant	Pregnant		
Natterer's bat.	6	1	12	-	19
Brown long-eared bat.	6	-	7	-	13
Barbastelle	1	-	8	-	9
Pipistrellus spp.	-	-	-	5	5
Serotine	-	-	1	-	1
Noctule	2	-	-	-	2
Daubenton's bat.	1	-	-	-	1
Total	78	6	86	7	177

1.3.46 Seven barbastelle were tagged for the purpose of radio-tracking: a single male and six pregnant females. Since barbastelle was the main focus of the surveys, this species is discussed in more detail here.

Distribution and characteristics of barbastelle roosts located in radio-tracking surveys

1.3.47 During the course of radio-tracking surveys in 2010, 13 roosts (R) used by barbastelle were identified. These roosts were located along the northern edge of Kenton Hills (denoted by R1 and R2 on **Figure A2** in Ref. 1.9 in **Annex 14A8.6**), Ash Wood (R3, R9, and R13), Grimseys (R4), woodland at The Grove (R5, R7 and R8), Greenhouse Plantation (R6), Wood Barn Farm (R10), Nursery Covert (R11), and Hangman's Wood (R12). The locations of these roosts are illustrated on **Figure A2** in Ref. 1.9 (see **Annex 14A8.5**).

1.3.48 Eleven of the identified roosts were located within trees, ten within pedunculate oak (*Quercus robur*), including one dead tree, whilst the remaining tree roost was within a small elm (*Ulmus spp.*). The specific roosting location for eight of the identified tree roosts was behind loose, lifted or flaky bark. A single roost (R10) was found to be located within a barn at Wood Barn Farm, while the remaining roost type could not be confirmed.

Use of roosts

1.3.49 Twelve of the identified roosts were found to be used by pregnant females; 11 of these were confirmed to be tree roosts, while the remaining roost type could not be confirmed. The single tagged male barbastelle was recorded using the only building roost identified, located within a barn.

1.3.50 Five of the 13 barbastelle roosts identified (R1, R3, R8, R9 and R13) were found to be used by more than one of the tagged barbastelle during the course of the radio-tracking survey (use of these roosts by untagged barbastelles was monitored infrequently by emergence survey).

1.3.51 The distance travelled by tagged barbastelle between roost locations was found to be variable, ranging from 488m to 2,006m, with an average distance of 1,203m (this figure does not take into account days when bats did not move). The movement observed was considered to suggest that roost switches may occur over significant distances on a regular basis. Full details of roost switches are provided in Ref. 1.8 (see **Annex 14A8.5**).

Foraging areas and home ranges

1.3.52 Home range analyses could not be undertaken for males or non-breeding females due to the absence of tagged non-breeding females and insufficient triangulation data for the single tagged male.

1.3.53 Home range analyses were, however, undertaken for the four tagged breeding females that retained their tags long enough for the results to be meaningful. The results, in the form of minimum convex polygons (MCPs)[1], clusters[2] and kernel[3] contours, are illustrated in **Figures A11** to **A13** in Ref. 1.8 (see **Annex 14A8.5**).

1.3.54 These analyses identified nine key areas that were most commonly used by tagged barbastelle for foraging and/or commuting during the course of the radio-tracking study:

- Fiscal Policy woodland (Bat 1 and 2);
- Upper Abbey Farm bridleway (Bat 1, 2 and 6);
- Near Lover's Lane (Bat 1);
- Arable fields north of Kenton Hills (Bat 2, 3, 4 and 6);

[1] The MCP enables the creation of a boundary around all fixes using the smallest possible convex polygon. This is a commonly used method but may overestimate the size of home ranges. (Ref. 1.9, **Annex 14A8.6**).
[2] A type of multivariate analysis that uses records or measurements of a number of characteristics or features to group individuals into clusters or classes, so that individuals within each cluster/class are as alike each other as possible and as unlike individuals in other clusters/classes as possible. (Ref. 1.9, **Annex 14A8.6**).
[3] Kernel methods quantitatively determine areas which are intensively used by animals by converting position coordinates into lines or areas with varying probabilities of use and present these graphically. (Ref. 1.9, **Annex 14A8.6**).

- Sizewell Marshes SSSI (north-eastern area) (Bat 5 and 6);
- Greenhouse Plantation/pasture west of Abbey Lane (Bat 5);
- Theberton House parkland (Bat 5);
- Leiston Abbey area (Bat 6); and
- Buckle Wood (west of Leiston) (Bat 7 - the only male barbastelle).

1.3.55 Average home range areas were calculated at 221ha (through 95% MCPs) and 256ha (through 95% kernel analyses). Core areas, as defined by a 95% cluster analysis, of between 0.25 hectare (ha) and 172ha were calculated.

1.3.56 It was suggested that an element of foraging habitat partitioning was indicated by the radio-tracking results; in particular, between Bats 5 and 6. Immediately after sunset, an east-west partitioning of habitat within Sizewell Marshes SSSI to the north of Grimsey was indicated, with further partitioning suggested later in the night, with Bat 6 recorded around the Leiston Abbey area and Bat 5 recorded further to the north and west around Eastbridge Road.

1.3.57 Distances between roosts and the furthest recorded triangulation points travelled from those roosts ranged from 1.3km to 2.8km.

ii. Activity transect surveys

1.3.58 The results of activity transect surveys undertaken between April and September 2010 across 11 transect routes (see **Figures B2** to **B12** in Ref. 1.8) are summarised in **Table 1.9**, which details the number of bat passes recorded, by species. Full details of the results of activity transect surveys undertaken in 2010 are described in Ref. 1.8 (see **Annex 14A8.5**).

1.3.59 At least nine species were recorded during the activity transect surveys. Recorded activity peaked in June 2010, with relative activity of 104.6B/h, and was at its lowest level during May 2010, with relative activity of 5.2B/h. Low levels of activity during initial (Spring) surveys were considered to be due to the low temperatures experienced during these months.

Table 1.9: Summary of the number of passes recorded, by species, during activity transect surveys in 2010

Bat Species	Total Passes	Relative Activity (B/h)
Soprano pipistrelle.	459	17.4
Common pipistrelle.	403	15.3
Common/Soprano pipistrelle.	117	4.4
Myotis spp.	96	3.6
Noctule	16	0.6
Serotine	14	0.5
Barbastelle	12	0.5
Leisler's bat*.	9	0.3
Common/Nathusius' pipistrelle.	6	0.2
Brown long-eared bat**.	6	0.2
Leisler's bat*/Serotine.	3	0.1
Nathusius' pipistrelle.	1	<0.1
Nyctalus spp.	1	<0.1

**These data are as presented in 2010. In the intervening years, it has become apparent that there is significant overlap between the Leisler's bat, noctule and serotine group, and many calls cannot be identified to a species with confidence. Re-examination of a number of 'Leisler's bat' calls from 2010/2011 suggests these calls should be reclassified as belonging to this group, not to species.*

***All long-eared bat recordings are considered to relate to brown long-eared bat echolocation calls due to the absence of grey long-eared bat from Suffolk based on their current known distribution. (Ref. 1.4 and Ref. 1.5).*

1.3.60 As in previous activity transect surveys (detailed in **sections 0**, **1.1c)iv** and **0**), common and soprano pipistrelle were encountered most frequently, both species being recorded on every survey visit and throughout the survey area.

1.3.61 It was observed that all barbastelle passes recorded during five surveys (with the exception of one) were recorded within one hour of sunset. Following the first recording of Nathusius' pipistrelle within the survey area in 2009, this species was again recorded in 2010, on a single occasion at the northern edge of Sizewell Marshes SSSI.

1.3.62 Noctule passes, which were primarily recorded in September 2010, were noted to occur in the 15 to 25 minutes after sunset. It was considered that such passes were likely to relate to bats roosting within, or close to, the EDF Energy estate.

1.3.63 Passes by *Myotis* spp. were also considered to be suggestive of roosting within the EDF Energy estate. In particular, the flight of 20-25 *Myotis* bats

heading east along the northern edge of Fiscal Policy woodland in July 2010 was thought to suggest a recent emergence due to the timing of these flights 50 to 65 minutes after sunset. *Myotis* spp. recordings were also considered to be suggestive of a second roost within woodland at The Grove. While *Myotis* spp. recordings were not identified to the species level, Daubenton's bat (*Myotis daubentonii*) were known to be present within the survey area following the observation of foraging Daubenton's bat in the northern area of Sizewell Marshes SSSI.

1.3.64 Given and the presence of known brown long-eared bat roosts within the barn at Upper Abbey Farm and Ash Cottages, the recording of only six bat passes of this species was considered to be under-representation due to the quiet nature of the echolocation calls emitted by this species.

1.3.65 **Figure B13** in Ref. 1.8 (see **Annex 14A8.5**) illustrates the distribution of the recorded species, with the exception of common and soprano pipistrelle, across all transects routes undertaken in 2010.

iii. Automated detector surveys

1.3.66 Automated detector surveys in 2010 recorded over 7,000 hours of bat activity over 839 nights. Analysis of three nights of data for each detector location identified passes by at least nine bat species with the species recorded corresponding with those recorded during activity transect surveys, with the addition of a low number of brown long-eared bat passes.

1.3.67 Full details of the results of automated detector surveys in 2010 are described in Ref. 1.8 (see **Annex 14A8.5**), while a summary is provided in **Table 1.10**.

Table 1.10: Summary of relative activity (excluding barbastelle) during automated detector surveys in 2010

Bat Species	Total Passes	Relative Activity (B/h)
Soprano pipistrelle.	35,606	24.4
Common pipistrelle.	20,099	13.8
Common/soprano pipistrelle.	3,591	2.5
Nathusius' pipistrelle.	2,538	1.7
Myotis spp.	1,230	0.8
Leisler's bat*.	979	0.7
Noctule	477	0.3
Serotine	447	0.3

Bat Species	Total Passes	Relative Activity (B/h)
Brown long-eared bat**.	147	0.1
Nyctalus spp.	111	<0.1
Common/Nathusius' pipistrelle.	32	<0.1
Brown long-eared bat**/Serotine.	29	<0.1
Nyctalus spp./Serotine.	22	<0.1
Myotis spp/Brown long-eared bat**.	2	<0.1
Total	65,310	44.7

**These data are as presented in 2010 (with barbastelle reported separately). In the intervening years, it has become apparent that there is significant overlap between the Leisler's bat, noctule and serotine group, and many calls cannot be identified to a species with confidence. Re-examination of a number of 'Leisler's bat' calls from 2010/2011 suggests these calls should be reclassified as belonging to this group, not to species.*

***All long-eared bat recordings are considered to relate to brown long-eared bat echolocation calls due to the absence of grey long-eared bat from Suffolk based on their current known distribution. (Ref. 1.4 and Ref. 1.5).*

1.3.68 Barbastelle activity, presented separately from other species in the original report (see Ref. 1.8, **Annex 14A8.5**), and illustrated in **Figure C6** in Ref. 1.8 (see **Annex 14A8.5**), was noted to occur at higher levels during Summer (0.84B/h) rather than Spring (0.16B/h) months.

1.3.69 The highest levels of barbastelle activity were recorded within Area 1 (Farmland); however, it was considered that this was principally due to the presence of Ash Wood which contained an important barbastelle maternity roost, rather than to the suitability of habitat within this area, which was primarily arable. Several commuting features (including a hawthorn hedgerow at Black Walks, hedgerows leading east and west from the northern end of Ash Wood, Stonewall Belt, and the Upper Abbey Farm bridleway) were identified, and a field located adjacent to Leiston Old Abbey was considered to be of "general importance" for foraging and/or commuting barbastelle.

1.3.70 Areas 2 (Goose Hill and woodland at The Grove) and 3 (Kenton Hills/Nursery Covert/Fiscal Policy woodland) also recorded relatively high levels of barbastelle activity, with greater levels of activity identified along rides within and on the edge of woodland. The northern areas of Sizewell Marshes SSSI (Area 4) were considered to represent an important primary foraging area for small numbers of barbastelle due to the low but consistent number of barbastelle passes recorded within this area. This was in contrast to the southern areas of Sizewell Marshes SSSI (Area 6) which were noted to record lower levels of barbastelle activity. Area 5 (main platform) was considered to be of considerably lower value for barbastelle than other surveyed areas.

1.3.71 Bat activity, as recorded by automated detectors, is illustrated for the entire 2010 survey period (by species or species group) in **Figures C6**, **C10**, **C13**, **C16**, **C25**, **C28** and **C31** of Ref. 1.8 (see **Annex 14A8.5**). Overall areas of highest activity were noted within Area 2 (Goose Hill and woodland at The Grove), whilst the lowest levels of activity were recorded within Area 5 (main platform).

1.3.72 Analysis of Nathusius' pipistrelle passes, illustrated on **Figure C25** in Ref. 1.8 (see **Annex 14A8.5**), was considered suggestive of migratory behaviour, with greater abundance in April, May, August and September 2010. Activity in June and July 2010 was noted to be considerably reduced and local in distribution and was focused largely within Sizewell Marshes SSSI. However, it was considered that the Summer activity may suggest the presence of one or more Summer roosts within the EDF Energy estate area.

1.3.73 The frequency of brown long-eared bat and *Myotis* spp. passes, illustrated on **Figures C10** and **C31** in Ref. 1.8 (see **Annex 14A8.5**), respectively, was considered to be suggestive of these species being widespread throughout the survey area. Levels of serotine (see **Figure C28** in Ref. 1.8 (**Annex 14A8.5**)), noctule (see **Figure C13** in Ref. 1.8 (**Annex 14A8.5**)) and Leisler's bat (see **Figure C16** in Ref. 1.8 (**Annex 14A8.5**)) passes were considered to indicate that the EDF Energy estate did not support any large/significant roosts (see the footnote to **Table 1.10** in relation to Leisler's bat).

iv. Emergence surveys

1.3.74 The simultaneous emergence survey of 11 identified barbastelle roost trees identified the emergence of 11 barbastelle from three trees. It was considered that this may indicate a "small" barbastelle population within the survey area; however, it was noted that it may also indicate the use of a large number of tree roosts by female barbastelle and/or that only a small number of tree roosts had been identified.

v. Bat box surveys

1.3.75 Three species were recorded within bat boxes in 2010: noctule, common pipistrelle and soprano pipistrelle. Noctule, in a single box, and common pipistrelle, within three boxes, were recorded in low numbers. In addition to low numbers of soprano pipistrelle in a number of boxes, a maternity colony of soprano pipistrelle (estimated to comprise at least 50 individuals, including juveniles and post-lactating females), was identified on both surveys of bat boxes.

vi. Tree assessments

1.3.76 Approximately 500 trees were identified, during tree assessments in 2010, as being of medium or higher potential for roosting bats. It was noted that several areas contained clusters of suitable trees including: Ash Wood, woodland at The Grove, Leiston Old Abbey, Fiscal Policy woodland, Grimseys, woodland on the eastern edge of Sizewell Marshes SSSI, and a line of oaks along the northern edge of Kenton Hills.

1.3.77 The results of tree assessments undertaken in 2010 are illustrated on **Figure D3** in Ref. 1.8 (see **Annex 14A8.5**) and are summarised in **Table 1.11**. **Figure D2** in Ref. 1.8 (see **Annex 14A8.5**) illustrates the zones into which the site was divided for the purposes of the tree assessment surveys.

Table 1.11: Summary of tree roost potential in 2010

Zone	Name of Zone	Potential			Total
		Medium	High	Very High	
A	Ash Wood.	39	22	13	74
B	Woodland at The Grove.	8	22	7	37
C	Stonewall Belt.	6	0	1	7
D	Leiston Old Abbey.	16	9	1	26
E	Fiscal Policy woodland.	99	20	7	126
F + FA	Northern edge of Kenton Hills.	34	15	8	57
G	Leiston Carr.	2	6	5	13
H	Grimseys	5	26		32
I	Woodland on the eastern edge of Sizewell Marshes SSSI*.	4	2	6	12*
J	Kenton Hills/Nursery Covert.	8	12	0	20
K	Goose Hill.	38	13	0	51
L	Upper Abbey Farm bridleway and arable.	14	2	0	16
Total		273	149	49	471

**In addition, approximately 30-40 willow trees in this zone appeared from a distance to have at least high potential, but access difficulties meant that this could not be confirmed accurately.*

g) 2011 surveys

i. Trapping and radio-tracking surveys

1.3.78 The results of trapping and radio-tracking surveys undertaken in July and August 2011 are summarised in **Table 1.12**. Full details of these surveys are detailed in Ref. 1.1 (see **Annex 14A8.5**).

Table 1.12: Summary of bats caught during trapping surveys in 2011

Bat Species	Male		Female			Not Sexed	Total
	Adult	Juvenile	Adult (B)*	Adult (NB)**	Juvenile		
Soprano pipistrelle	26	2	20	2	1	-	51
Natterer's bat	10	2	8	5	1	-	26
Common pipistrelle	13	1	5	3	1	-	23
Brown long-eared bat	11	-	7	1	-	-	19
Barbastelle	1	6	7	2	2	-	18
Serotine	4	-	4	1	-	-	9
Pipistrellus spp.	-	-	-	-	-	1	1
Nathusius' pipistrelle***	-	1	-	-	-	-	1
Total	65	12	51	14	5	1	148

**Had bred in 2011*

***Had not bred in 2011*

****The data is as presented in 2011, but the identity of this bat in fact could not be confirmed as either common pipistrelle or Nathusius' pipistrelle.*

1.3.79 Twenty-two bats were tagged for the purpose of radio-tracking: 18 barbastelle (one adult male, six juvenile males and 11 females), four Natterer's (all female) and a single brown long-eared (female). Although more serotine were trapped, these had not been included on the licence application, and therefore could not be tagged. A summary of the results of this survey work is provided here, firstly for barbastelle and then for other species combined.

Barbastelle

Distribution and characteristics of roosts identified through radio-tracking surveys

1.3.80 During radio-tracking in 2011, eight new barbastelle roosts were identified, bringing the number of roosts known to be used by tracked barbastelle to a total of 21. In addition to the eight new roosts identified, tagged bats in 2011 were recorded using two roosts identified during radio-tracking in 2010 (R9 and R13).

1.3.81 The new roosts identified in 2011 were located in Ash Wood (R14), the north-eastern corner of Nursery Covert (R15), the southern edge of Kenton Hills/Leiston Carr (R16 and R18), the woodland copse at Plantation Cottages (R17 and R19), the northern edge of Nursery Covert/Kenton Hills (R20), and the woodland strip to the north of Leiston Old Abbey (R21). The locations of identified roosts are illustrated on **Figure A2** in Ref. 1.9 (see **Annex 14A8.6**).

1.3.82 A further two-night roosts (not provided with a roost number) were considered to have been used. The precise location of these roosts could not be determined, but were considered to be in the vicinity of Greenhouse Plantation and the Minsmere New Cut (i.e. to the west and north of the EDF Energy estate, respectively).

1.3.83 Of the eight new roosts identified in 2011, five were in oak trees, while the remaining three were in a pine tree (*Pinus* spp.) (R15), a large crack willow (*Salix fragilis*) (R16), and a mature sweet chestnut (*Castanea sativa*) (R17). Roosts R14, R17 and R18 were located behind loose, lifted or flaky bark.

Use of roosts

1.3.84 Only four roosts identified during radio-tracking surveys in 2011 were recorded to be used by only a single tagged bat (R15, R16 and the two unnumbered roosts that could not be precisely located). All remaining roosts identified as being in use during 2011 (including the six new roosts identified in 2011 and the two roosts originally identified in 2010 that were also in use in 2011) were found to be used by more than one tagged bat.

1.3.85 Unlike radio-tracking surveys in 2010, in 2011 no tagged barbastelle were recorded roosting within woodland at The Grove, Grimseys or Hangman's Wood.

Table 1.13: Distances travelled between roosts in roost switches in 2011

Roosts	Distance (m)
R14 – R9	264
R9 – R17	664
R17 – R21	1,688
R15 – R14	918
R9 – R13	287
R19 – R21	1,730
R9 – R18	1,137
R18 – R20	467
R9 – R19	615
R19 – R17	105
R17 – R20	1,581
R20 – R21	562
R18 – R17	1,741
R13 – R19	594

1.3.86 Movements between roosts by tagged barbastelle, as detailed in **Table 1.13**, ranged from 105m to 1,741m. Although the average distance travelled (841m for all tagged barbastelle and 690m when considering only juvenile tagged barbastelle), was less than that recorded in 2010 (1,203m), it was considered that this level of movement remained indicative of a population undertaking roost switches over significant distances on a regular basis.

Foraging areas and home ranges

1.3.87 Home range analyses were undertaken for all bats that retained their tags long enough for the results to be meaningful. The results, in the form of MCPs, clusters and kernel contours, are illustrated in **Figures C4** to **C19** in Ref. 1.1 (see **Annex 14A8.5**). Comparisons between different cohorts are shown in **Figures C25** to **C27** (breeding females), and **C28** to **C30** (juvenile barbastelles). A comparison between the 2010 and 2011 results is given in **Figures C31** to **C33** (for adult female barbastelles). The overlap between the areas used by breeding females and juveniles is explored in **Figures C34** to **C36**.

1.3.88 Radio-tracking identified 13 key areas used by tagged barbastelle in 2011. These areas are detailed in **Table 1.14**.

Table 1.14: Key areas in use by tagged barbastelle in 2011

Key Area	Gender and age of barbastelle recorded using the area		
	Adult Female(s)	Adult Male(s)	Juvenile(s)
Ash Wood/Black Walks.	Y	N	Y
Goose Hill	Y	N	Y
Upper Abbey Farm bridleway and Leiston Old Abbey woodland.	Y	N	Y
Woodland at The Grove and fields to the east of The Grove.	Y	N	Y
Kenton Hills and Nursery Covert.	Y	Y	Y
Arable fields north of Kenton Hills.	Y	N	Y
Sizewell Marshes SSSI (north-eastern area).	Y	Y	Y
Sizewell Marshes SSSI (south of Grimseys and Leiston Carr).	Y	Y	Y
Sandy Lane and area south of Sandy Lane.	Y	N	Y
Greenhouse Plantation and pasture west of Abbey Lane.	Y	N	N
Sandypytle Plantation and north of Lower Abbey Farm.	Y	N	N
Eastbridge and Minsmere New Cut.	Y	Y	N
Near Lover's Lane and sewage works.	Y	Y	Y

1.3.89 Home range analyses indicate that tagged breeding female barbastelle ranged over an average home range of 271.6ha (based on 95% MCP analyses), with the largest home range calculated at 547ha. Between one and six core areas (based on 95% cluster analyses) were identified, with an average core area of 142.3ha. It was noted that a degree of core area overlap occurred; however, an element of partitioning was considered to be indicated between certain individuals. In particular, this was noted between the main roosting and activity areas (around Ash Wood, Black Walks, Goose Hill and Leiston Old Abbey woodland) and the woodland adjacent to Plantation Cottages.

1.3.90 The 95% MCP analysis indicated that the single non-breeding female barbastelle that was tagged had a similar home range size (at 319.5ha) to the breeding female barbastelles; however, 95% cluster analyses indicated a smaller core area (of 63.9ha) compared to the average breeding female core area of 142.3ha.

1.3.91 The 95% MCP analysis for tagged juvenile barbastelle indicated a noticeably smaller home range (184.9ha) compared to that of breeding female barbastelle. However, when two juvenile barbastelle whose tags allowed for only limited fixes are excluded from this analysis, a home range of 263.8ha was calculated; this was considered to be more reflective of the true home range for tagged juvenile barbastelle. Between two and four core areas were identified for juvenile barbastelle through 95% cluster analysis, with foraging area overlap noted around Ash Wood, Black Walks and the woodland adjacent to Plantation Cottages. A potential area of habitat partitioning was noted around Goose Hill, Nursery Covert and Leiston Old Abbey woodland.

1.3.92 The single adult male barbastelle that was tagged was tracked only when it came close to, or flew within, the survey area. As such, this individual was not tracked to the full extent of its range, and a considerable degree of variation was found in home range size between the various analysis methods (663.6ha using 95% kernel analysis compared with 216ha using cluster analysis). The 95% cluster analysis identified two core areas: Sizewell Marshes SSSI and Kenton Hills; and Old Abbey Farm and the area to the west of Leiston Abbey.

Other species

Distribution, characteristics and use of roosts identified through radio-tracking surveys

1.3.93 In addition to barbastelle, four Natterer's bats and a single brown long-eared bat were also tagged. Four roost locations were found to be used by the tagged Natterer's. Leiston Old Abbey (denoted as RA on **Figure A2** in Ref. 1.9 (see **Annex 14A8.6**)) was accessed by two Natterer's bats, both caught and tagged at Fiscal Policy woodland. One individual from the second pair of Natterer's bats, which were caught in woodland at The Grove, was recorded using two tree roosts. One tree roost was located within a wound on an alder in woodland at The Grove (RF), whilst the second tree roost was within woodpecker holes in a small oak in Sandypytle Plantation (RE). The second individual caught within woodland at The Grove was recorded using a bat box at the southern end of Kenton Hills for the duration of the radio-tracking survey.

1.3.94 The single brown long-eared bat that was tracked was initially found to roost at an unidentified location within Rookyard Pits Wood. On subsequent nights it was recorded roosting about a kilometre away, within a residential building (RC) adjacent to Cliff House Caravan Park (about 2.5km south-east of the known roost at Ash Wood). An internal inspection found evidence of long-term use of the roof void by long-eared bats, with a dead

juvenile brown long-eared bat identified in addition to a number of piles of both old and new long-eared bat droppings.

Foraging areas and home ranges

1.3.95 The home range analyses for Natterer's bats found average home range sizes of 38.5ha (based on 95% cluster analysis) to 73.3ha (based on 95% MCP analysis). These results are illustrated in **Figures C20** to **C23** and **C37** in Ref. 1.1 (see **Annex 14A8.5**). A comparison of core areas (**Figure C37** in Ref. Ref. 1.1 (see **Annex 14A8.5**)) indicated no evidence of overlap between the home ranges of those individuals roosting in Leiston Abbey and the individuals trapped within The Grove. However, the tracking period was short, and insufficient fixes (30, 18, 35 and 24 combined joint and single fixes, respectively, for the four bats tagged) were obtained on all bats for this to be reliable indication of longer-term behaviour (at least 30 are required).

1.3.96 Analysis of home range size for the single tagged brown long-eared bat gave home range sizes varying from 50.5ha (95% cluster analysis) to 225.4ha (95% MCP analysis). These results are illustrated in **Figure C24** in **Ref.** 1.1 (see **Annex 14A8.5**). Four core areas were identified through 95% cluster analyses.

ii. Activity transect surveys

1.3.97 The results of the 12 activity transect surveys undertaken between April and September 2011 (see **Figures D2** to **D13** in Ref. 1.1 (see **Annex 14A8.5**)) are summarised in **Table 1.15**, which details the number of bat passes and relative activity, by species. Full details of the results of activity transect surveys undertaken in 2011 are described in Ref. 1.1 (see **Annex 14A8.5**).

1.3.98 At least nine species were recorded during the surveys. Recorded activity peaked in April 2011, with relative activity of 133.7B/h, although it was noted that these recordings consisted almost entirely of common and soprano pipistrelle echolocation calls. A low level of relative activity of 10.5B/h was recorded in September 2011.

Table 1.15: Summary of the number of passes recorded, by species, during activity transect surveys in 2011

Bat Species	Total Passes	Relative Activity (B/h)
Soprano pipistrelle.	766	24.9
Common pipistrelle.	388	12.6

Bat Species	Total Passes	Relative Activity (B/h)
Common/Soprano pipistrelle.	124	4.0
Barbastelle	71	2.3
Leisler's bat*/Serotine.	33	1.1
Serotine	28	0.9
Myotis spp.	24	0.8
Nathusius' pipistrelle.	23	0.7
Noctule	19	0.6
Nyctalus spp.	7	0.2
Brown long-eared bat**.	4	0.1
Leisler's bat*.	3	0.1
Common/Nathusius' pipistrelle.	2	0.1

**These data are as presented in 2011. In the intervening years, it has become apparent that there is significant overlap between the Leisler's bat, noctule and serotine group, and many calls cannot be identified to a species with confidence. Re-examination of a number of 'Leisler's bat' calls from 2010/2011 suggests these calls should be reclassified as belonging to this group, not to species.*

**All long-eared bat recordings are considered to relate to brown long-eared bat echolocation calls due to the absence of grey long-eared bat from Suffolk based on their current known distribution. (Ref. 1.4 and Ref. 1.5).*

1.3.99 As in previous activity transect surveys (see **sections 0**, **iv**, **0** and **0**), common and soprano pipistrelle were encountered most frequently, both species being recorded on every survey visit and throughout the survey area.

1.3.100 Barbastelle passes were noted to be most frequently recorded within sub-survey Areas 1 (Ash Wood and farmland, north-west) and 4 (Goose Hill), with a particular congregation of passes within areas of Ash Wood and Goose Hill. Also recorded within Ash Wood and Goose Hill were very low numbers of Leisler's bat passes.

1.3.101 It was noted that *Myotis* spp. passes were low in comparison to previous survey years, with the greater proportion recorded within Goose Hill. Noctule and Nathusius's pipistrelle were also recorded within Goose Hill, with additional passes recorded within areas of woodland at The Grove.

1.3.102 It was observed that serotine were not recorded in any location in 2011 prior to June 2011, when a number of passes were recorded within rides north of Goose Hill. Activity then dropped again in September 2011.

1.3.103 Very few passes of long-eared bats were recorded during 2011; those that were recorded were within areas of Ash Wood, Walk Barn and Goose Hill. As noted in previous years of activity transect surveys, this low number of

long-eared bat passes was considered to be an under-representation of this species due to the quiet nature of their echolocation calls.

1.3.104 **Figure D14** in Ref. 1.1 (see **Annex 14A8.5**) illustrates the distribution of recorded species, with the exception of common and soprano pipistrelle, across all transect routes undertaken in 2011.

iii. Automated detector surveys

1.3.105 Automated detector surveys in 2011 recorded nearly 8,500 hours of bat activity over 939 nights. All recorded data was scanned for the presence of rarer species of potentially higher conservation concern; such species were assigned to 'Group 1' and comprised barbastelle, Leisler's and Nathusius' pipistrelle. Remaining bat species (brown long-eared bat, common pipistrelle, *Myotis* spp., noctule, serotine and soprano pipistrelle) were assigned to 'Group 2'.

1.3.106 All recordings containing Group 1 species were analysed, while a sub-set of three nights of data per location per deployment was analysed for recordings containing Group 2 species. The latter analysis identified passes from at least six Group 2 species.

1.3.107 Full details of the results of automated detector surveys in 2011 are described in Ref. 1.1 (see **Annex 14A8.5**), while a summary is provided in **Table 1.16.**

Table 1.16: Summary of relative activity during automated detector surveys, by species or species group, in 2011

Bat Species	Total Passes Analysed*	Relative Activity (B/h)
Group 1 Species.		
Barbastelle	6,418	0.8
Leisler's bat**.	1,606	0.2
Nathusius' pipistrelle.	2,242	0.3
Group 2 Species.		
Soprano pipistrelle.	39,695	23.3
Common pipistrelle.	26,162	15.4
Myotis spp.	1,840	1.1
Common/soprano pipistrelle.	1,773	1.0
Noctule	1,323	0.8
Leisler's bat/serotine.	1,041	0.6
Serotine	846	0.5

Bat Species	Total Passes Analysed*	Relative Activity (B/h)
Brown long-eared bat***.	259	0.2
Common/Nathusius' pipistrelle.	115	0.1
Myotis spp./Brown long-eared bat***.	107	0.1
Nyctalus spp.	61	0.0
Brown long-eared bat***/serotine.	61	0.0
Nyctalus spp./serotine.	3	0.0
Total (Group 1 and Group 2).	83,525	44.7

**It is believed that the total number of passes cannot be compared between Group 1 and Group 2 designated species due to the variation in the number of nights of data analysed for each grouping, although it should be noted that the report from which this data is extracted (Ref. 1.1) is unclear.*

***These data are as presented in 2011. In the intervening years, it has become apparent that there is significant overlap between the Leisler's bat, noctule and serotine group, and many calls cannot be identified to a species with confidence. Re-examination of a number of 'Leisler's bat' calls from 2010/2011 suggests these calls should be reclassified as belonging to this group, not to species.*

****All long-eared bat recordings are considered to relate to brown long-eared bat echolocation calls due to the absence of grey long-eared bat from Suffolk based on their current known distribution. (Ref. 1.4 and Ref. 1.5).*

1.3.108 As in 2010, barbastelle activity, illustrated on **Figure E3** in Ref. 1.1 (see **Annex 14A8.5**), was noted to occur at higher levels during the Summer months, although this variation was not as marked as the difference noted in 2010. Additionally, this pattern was not noted in all sub-survey areas, with a higher level of activity noted during Spring surveys within Area 3 (Farmland west).

1.3.109 The highest levels of barbastelle activity were recorded within Area 1 (Ash Woods and Farmland), which included the most frequently used roost location by tagged bats during the course of radio-tracking surveys in 2011. A peak in activity during the middle of the night was suggestive of bats foraging intermittently close to night roosts. The Upper Abbey Farm bridleway was also noted to be a strong commuting/foraging feature.

1.3.110 Automated detectors located within Area 2 (Farmland north-east) were intended to enable a determination of the commuting routes used between the locations of two key maternity roosts located in 2010, Ash Wood and woodland at The Grove. However, the results were determined to be inconclusive, due to the high variability in relative activity at different detector locations and deployments within Area 2.

1.3.111 Area 3 (Farmland west) was noted to be the only area within which barbastelle activity was greater during Spring deployments, with highest activity levels during early periods of the night. Activity within Area 4 (Goose Hill) was similar to that recorded in 2010; the presence of activity peaks during the first and last periods of the night were considered to

indicate that Goose Hill represents a core foraging and/or commuting area for barbastelle. Data collected within Area 5[4] (eastern part of Sizewell Marshes SSSI and the proposed main platform combined), represented the lowest barbastelle activity across the survey area, but with a peak early on in the night. It was considered that this data confirmed the 2010 conclusion that parts of the northern Sizewell Marshes SSSI are core foraging areas for barbastelle during these early hours of the night. [Note: this may seem contradictory, but it is because part of the area represents an area where there is very little activity, and part where activity is high, but only for a short period of the night (and not in all seasons). This mirrors the findings from the later automated detector surveys in 2013/14.]

1.3.112 Despite an increase in noctule passes recorded, and the observation that four of the nine serotine bats trapped in 2011 had bred that year, it was considered that, as in 2010, the low relative activity levels and lack of recorded passes close to sunset were indicative of the EDF Energy estate not supporting any large and/or significant roosts of serotine, noctule or Leisler's bats (see the footnote to **Table 1.16** in relation to Leisler's bat). The locations of recorded serotine, noctule and Leisler's bat passes are illustrated on **Figures E8**, **E18** and **E27** in Ref. 1.1 (see **Annex 14A8.5**), respectively.

1.3.113 Analysis of Nathusius' pipistrelle passes (illustrated on **Figure 11** in Ref. 1.1 (see **Annex 14A8.5**)) identified a variation from the pattern observed in 2010, with only a single activity peak noted in April and May 2010. The greatest levels of activity were noted to occur in open areas near the coast.

1.3.114 Analysis of common and soprano pipistrelle passes identified small variations in the spatial distribution of these species, although a number of overlaps were noted to occur, as illustrated in **Figures E24** and **E27**, respectively, in Ref. 1.1 (see **Annex 14A8.5**).

1.3.115 During the period defined as Spring, common pipistrelle were noted to be recorded most numerously within Areas 3 (Farmland west) and 5 (eastern part of Sizewell Marshes SSSI and site combined), in particular in the northern Sizewell Marshes SSSI and the woodland edge near to Old Abbey Farm. Soprano pipistrelle were also noted to be most frequently recorded within the Sizewell Marshes SSSI, but were also recorded frequently within woodland at The Grove, the north-eastern area of Goose Hill and along the Upper Abbey Farm bridleway.

[4] Note that this area varies from that identified as Area 5 during 2010 Wood Group surveys.

1.3.116 Areas of greatest recorded activity for common and soprano pipistrelle were found to alter during the Summer months, with common pipistrelle recorded at overall reduced levels with an activity peak in Area 1 (Ash Wood and farmland, north-west). Area 2 (Farmland, north-east) was found to contain the activity peak for soprano pipistrelle during the Summer months, in particular across the grazing marsh and wet woodland habitats within this area. The locations of designated Areas 1 – 5 are illustrated on **Figure B1** in Ref. 1.1 (see **Annex 14A8.5**).

1.3.117 As identified in 2010, from the frequency of brown long-eared bat passes, it was considered that this species is widespread throughout the survey area. Relative brown long-eared bat activity is illustrated on **Figure E33** in Ref. 1.1 (see **Annex 14A8.5**).

1.3.118 Overall activity for Group 2 species was recorded at its highest levels in the Spring, in contrast to the Summer peak in activity recorded for this group in 2010. However, note that the periods covered by Spring and Summer differ in the two years (as discussed in **section 5** of **Annex 14A8.3**).

iv. Building inspections

1.3.119 Inspection of the barn at Upper Abbey Farm identified the presence of the droppings of Natterer's, *Pipistrellus* spp. and brown long-eared bat/barbastelle. Emergence and re-entry surveys confirmed these findings, with two soprano pipistrelle and one common pipistrelle recorded emerging, with a further possible emergence of a barbastelle. Two *Myotis* spp. bats and three soprano pipistrelle were recorded re-entering the barn prior to sunrise.

1.3.120 An automated detector located within the barn at Upper Abbey Farm recorded barbastelle activity, the timing of which was considered to be strongly suggestive of barbastelle roosting within the barn and light sampling prior to emerging. A similar pattern of activity was recorded for *Myotis* spp.

1.3.121 Inspection of Ash Wood Cottages identified large quantities of both old and relatively fresh brown long-eared bat droppings. It was therefore considered that these buildings continue to be used as a maternity roost for brown long-eared bats. Following an external inspection of Old Abbey Farm, it was considered that these buildings were of very little potential use for roosting bats.

v. Emergence surveys

1.3.122 Barbastelle were recorded emerging from six trees that had been identified as barbastelle roosts during radio-tracking. Initial emergence surveys of

two trees on 2 August 2011 recorded 31 emerging barbastelle (25 from one roost and six from the other). Simultaneous emergence surveys of eight identified barbastelle roost trees on 10 August 2011 identified between 13 and 27 bats emerging from six trees.

1.3.123 A maximum emergence count of 49 was recorded for Natterer's bats emerging from Leiston Abbey on 31 August 2011. A check (on 11 August 2011) of the bat box identified as being used by a tagged non-breeding female Natterer's bat, found 28 Natterer's bats, including adults and juveniles, to be present.

vi. Bat box surveys

1.3.124 Single soprano pipistrelles were recorded using five boxes during the bat box survey on 9 September 2011. A single male was recorded within each of four boxes (20, 28, 34 and 37) and a single female in one box (20). Despite a number of Natterer's bats identified as using a bat box during radio-tracking surveys, no Natterer's bats were identified within boxes at the time of the bat box survey; however, fresh *Myotis* spp. droppings were identified within three boxes (18, 19 and 21).

vii. Hibernation roost surveys

1.3.125 No bats were found during hibernation roost surveys of the barn at Upper Abbey Farm on 31 January 2011; however, it was noted that there were a large number of potential crevice roosts that could not be accessed. It was considered likely that some of these crevices would be used by bats in Winter. Repair work undertaken in February 2011 uncovered two bats, including one barbastelle.

1.3.126 Inspection of the World War II bunker, also on 31 January 2011, found the interior to be relatively well lit and draughty, and it was therefore considered that it would be unlikely to maintain a stable temperature or high humidity. This was confirmed by temperature and humidity measurements. No bats were found during the initial visit, but a single brown long-eared bat was identified during the second visit, on 8 March 2011, indicating that the structure does provide some shelter, even if it is unsuitable for full hibernation.

1.3.127 Full details of the results of hibernation roost surveys undertaken in 2011 are provided in Ref. 1.10 (see **Annex 14A8.5**).

Extended Phase 1 – tree and building assessments

1.3.128 The extended Phase 1 habitat survey (Ref. 1.11, **Annex 14A8.5**) identified 11 trees within or adjacent to Aldhurst Farm with the potential to support

roosting bats. It was also considered that areas of improved grazing pasture, field margins and hedgerows present within Aldhurst Farm provided a suitable foraging resource for bats.

1.3.129 Buildings within the survey area at Aldhurst Farm were considered to be in largely good condition. Some limited bat roost potential was identified for four buildings in the form of wooden cladding, a gap in a soffit box, gaps between a wooden gutter board and the wall, and a hole in a lintel.

1.3.130 Full details of the extended Phase 1 habitat Survey results are provided in Ref. 1.11 (see **Annex 14A8.5**).

h) 2012 Coronation Wood surveys

i. Activity transect surveys

1.3.131 Only two species were recorded during activity transect surveys within the Coronation Wood survey area: common and soprano pipistrelle. Both species were recorded throughout the survey area, with the exception of the floodlit car parking areas. Foraging was noted most commonly along the riparian woodland corridor on the western boundary.

ii. Automated detector surveys

1.3.132 Full details of the results of automated detector surveys in 2012 are described in Ref. 1.2 (see **Annex 14A8.5**), while a summary is provided in **Table 1.17**.

1.3.133 All recorded data were scanned for the presence of rarer species of potentially higher conservation concern. Such species were assigned to “Group 1” and comprised barbastelle, Leisler’s and Nathusius’ pipistrelle. Remaining bat species (brown long-eared bat, common pipistrelle, *Myotis* spp., noctule, *Nyctalus* spp. serotine and soprano pipistrelle) were assigned to “Group 2”.

1.3.134 All recordings containing Group 1 species were analysed, while a sub-set of three nights of data per location per deployment was analysed for recordings containing Group 2 species. This analysis identified passes from at least six Group 2 species.

Table 1.17: Summary of relative activity during automated detector surveys in 2012*

Bat Species	Static A	Static B	Static C	Static D	Static E	Static F	Total	Relative Activity (B/h)
Group 1 species								
Nathusius' pipistrelle	191	121	47	40	302	18	719	0.46
Barbastelle	11	126	4	-	7	3	151	0.10
Leisler's bat**	2	-	-	-	4	-	6	0.00
Group 2 species								
Common pipistrelle	2,809	3,278	2,121	406	7,605	5,127	21,346	45.71
Soprano pipistrelle	1,910	946	113	274	1,364	2,207	6,814	14.59
Common/soprano pipistrelle	37	64	350	12	206	118	787	1.69
Myotis spp.	5	42	9	79	66	66	267	0.57
Noctule	8	20	9	13	124	1	175	0.37
Brown long-eared bat***	1	17	5	11	70	10	114	0.24
Nyctalus spp.	6	6	1	3	6	-	22	0.05
Nyctalus/*Eptesicus*	-	1	2	2	3	-	8	0.02
Serotine	1	2	1	-	3	-	7	0.01
Serotine/Leisler's bat	2	-	1	-	2	-	5	0.01
Nathusius'/common pipistrelle	1	-	-	2	-	-	3	0.01
Myotis/Brown long-eared bat*	-	1	-	-	-	1	2	0.00

**It is believed that the total number of passes cannot be compared between Group 1 and Group 2 designated species due to the variation in the number of nights of data analysed for each grouping, although it should be noted that the report from which this data is extracted (Ref. 1.2) is unclear.*

***These data are as presented in 2012. In the intervening years, it has become apparent that there is significant overlap between the Leisler's bat, noctule and serotine group, and many calls cannot be identified to a species with confidence. Re-examination of a number of 'Leisler's bat' calls from 2010/2011 suggests these calls should be reclassified as belonging to this group, not to species.*

****All long-eared bat recordings are considered to relate to brown long-eared bat echolocation calls due to the absence of grey long-eared bat from Suffolk based on their current known distribution. (Ref. 1.4 and Ref. 1.5)*

1.3.135 Seven species not recorded during activity transect surveys were recorded during automated detector surveys: noctule, serotine, *Myotis* spp., brown long-eared bat, barbastelle, Leisler's bat and Nathusius' pipistrelle (see footnote to **Table 1.17** regarding the presence of Leisler's bats).

1.3.136 Barbastelle activity was noted to be most abundant in the second hour post-sunset, with no barbastelle or Leisler's bat activity recorded in the hour following sunset. Regular Nathusius' pipistrelle activity was recorded within the survey area, with a peak in activity levels recorded in May 2012. Unlike barbastelle and Leisler's bat, low numbers of passes were recorded within 40 minutes of sunset.

1.3.137 As with the activity transect survey results, common and soprano pipistrelle were recorded frequently throughout the survey area, with common pipistrelle recorded more frequently than soprano pipistrelle across all static survey locations. Both species were recorded in the 20 minutes after sunset and the 20 minutes before sunrise suggesting the presence of roosts.

1.3.138 Brown long-eared bat passes were also recorded widely across the survey area, while noctule and serotine were recorded infrequently, with low numbers of noctule passes recorded within 30 minutes of sunset and 20 minutes of sunrise.

iii. Tree assessments

1.3.139 Thirteen trees within the survey area were identified as having medium or high potential to support roosting bats. Ten trees were located along the riparian corridor to the south of Coronation Wood, while the remaining three were located within Coronation Wood. The locations of identified trees are illustrated on **Figure 3.1** in Ref. 1.2 (see **Annex 14A8.5**).

i) 2011 Aldhurst Farm surveys

i. Activity transect surveys

1.3.140 Four species were identified during activity transect surveys within Aldhurst Farm (barbastelle, common pipistrelle, Leisler's bat and soprano pipistrelle) as detailed in **Table 1.18**. However, as detailed in the footnote to **Table 1.18**, the overlap in the echolocation calls of Leisler's bat with noctule and serotine means that many calls cannot be identified to the Leisler's species with confidence.

Table 1.18: Number of passes and relative bat activity recorded during transect surveys in 2011

Species	Survey date			Total	Bat Passes Per Hour (B/h)
	24/05/2011	04/07/2011	03/08/2011		
Common pipistrelle.	19	53	48	120	16.8
Soprano pipistrelle.	7	15	7	29	4.1
Common/soprano pipistrelle.	0	0	3	3	0.4
Barbastelle	0	0	1	1	0.1
Leisler's bat*.	0	0	1	1	0.1
Total	26	68	60	154	
Survey duration (mins).	137	145	147	429	
Total bat passes per hour (B/h).	11.4	28.1	24.5	21.5	

** These data are as presented in 2011. In the intervening years, it has become apparent that there is significant overlap between the Leisler's bat, noctule and serotine group, and many calls cannot be identified to a species with confidence. Re-examination of a number of 'Leisler's bat' calls from 2010/2011 suggests these calls should be reclassified as belonging to this group, not to species.*

1.3.141 Common pipistrelle were the most frequently recorded species, at 16.8B/h, and accounted for over three-quarters of all recorded calls. Common pipistrelle were primarily recorded along the northern boundary of the survey area. Emergence surveys undertaken at Gypsy Lodge identified the presence of a common pipistrelle roost within buildings at this location, with twenty-three bats recorded emerging from under a barge-board on the north-west facing gable end of the northern house in July 2011. In August 2011, 24 were recorded emerging from the northern gable end of the southern house, and 7 from the southern gable end of the northern house.

1.3.142 Soprano pipistrelle accounted for nearly all of the remaining activity, at 4.1B/h. As with common pipistrelle, passes were primarily recorded along the northern boundary of the survey area, although chiefly in the eastern half. A single barbastelle pass was recorded, on the edge of Lover's Lane approximately two hours after sunset.

j) Static detector surveys

1.3.143 At least eight species were identified during static detector surveys at Aldhurst Farm. A summary of the results of static detector surveys undertaken by Wood Group in 2011 (Ref. 1.12 in **Annex 14A8.5**) are detailed in **Table 1.19**.

Table 1.19: Relative activity levels recorded during static detector surveys in 2011

Species	Deployment dates/locations			Total	Bat passes per hour (B/h)
	Location A	Location B	Location C		
	11/05/2011-22/05/2011	21/06/2011-03/07/2011	02/08/2011-16/08/2011		
Group 1 species (all nights)					
Barbastelle	3	42	25	70	0.2
Leisler's bat*	1	7	3	11	<0.1
Nathusius' pipistrelle	4	0	1	5	<0.1
Group 1 total	8	49	39	86	
Group 2 species (3x3 nights)					
Common pipistrelle	639	455	125	1,219	16.5
Soprano pipistrelle	41	241	64	319	4.3
Common/soprano pipistrelle	4	26	5	35	0.5
Myotis spp.	3	0	11	14	0.2
Noctule	0	6	2	8	0.1
Myotis spp./brown long-eared bat	0	0	5	5	<0.1
Nyctalus spp.	0	2	0	2	<0.1
Common/Nathusius' pipistrelle	0	1	0	1	<0.1
Brown long-eared bat	1	0	0	1	<0.1
Group 2 total	688	704	212	1,605	

** These data are as presented in 2011. In the intervening years, it has become apparent that there is significant overlap between the Leisler's bat, noctule and serotine group, and many calls cannot be identified to a species with confidence. Re-examination of a number of "Leisler's bat" calls from 2010/2011 suggests these calls should be reclassified as belonging to this group, not to species.*

1.3.144 As noted during activity transects, common pipistrelle were significantly more frequently encountered than other species, with activity levels remaining high throughout the night, peaking approximately two hours after sunset. Also as on transect surveys, soprano pipistrelle activity was moderate in comparison to other species (4.3B/h). Soprano pipistrelle activity levels peaked within an hour of sunset and sunrise, with limited activity during the middle period of the night.

1.3.145 Barbastelle passes were recorded at all three static detector locations, with the greatest levels of activity recorded at static detector location B in

June/July 2011. All recorded barbastelle passes were at least an hour after sunset and an hour before sunrise. Levels of activity recorded for brown long-eared bat, Nathusius' pipistrelle, noctule and *Myotis* spp. were consistently low, with no passes recorded within an hour of sunset or sunrise.

1.3.146 It was considered that the common pipistrelle roost identified at Gypsy Lodge was likely to be a single, mobile, maternity roost due to the timing and numbers recorded. It was also considered likely that a soprano pipistrelle roost was present in close proximity to the survey area. Both species were considered to use the survey area as a core foraging/commuting area.

1.3.147 No evidence was identified to suggest that barbastelle, brown long-eared bat, Nathusius' pipistrelle, *Myotis* spp., or noctule roost within or close to the survey area, nor that the site is an important foraging resource for these species.

1.3.148 Full details of bat surveys undertaken at Aldhurst Farm in 2011 are provided in Ref. 1.12 (see **Annex 14A8.5**).

k) 2012/2013 Upper Abbey Farm building inspections

1.3.149 Inspection of Upper Abbey Farmhouse found the building supported small autumn/winter roosts of at least three species:

- Natterer's bat: two individuals recorded roosting in two locations within the cellar on 28 January 2013;
- Daubenton's bat: one probable Daubenton's bat recorded roosting on 5 October 2012 and one confirmed Daubenton's bat recorded roosting on 6 November 2012; both individuals were recorded roosting within the cellar; and
- probable brown long-eared bat: one individual recorded roosting in the cellar on 28 January 2013.

1.3.150 A further individual (species undetermined) was recorded roosting in the cellar on 18 December 2012. In addition, small numbers of bat droppings were found throughout the property, in one location along with feeding remains, suggesting the presence of a feeding roost (likely, based on the droppings, used by brown long-eared bats).

1.3.151 The cellar was considered to offer a number of potential roost sites and suitable conditions for hibernating bats. The farmhouse was considered to

have the potential to support a number of the other bat species known to be present in the area, although the nature of the potential roost sites and the state of the building at the time of survey suggested that any summer roosts were likely to be very small, non-breeding, roosts.

1.3.152 A single outbuilding to the east of the farmhouse was considered to have some potential, primarily as a hibernation or feeding perch, although no evidence of recent use was identified.

1.3.153 Significant repairs and restoration work has been undertaken on Upper Abbey Farmhouse since these surveys.

1.3.154 Full details of the inspections undertaken at Upper Abbey Farm are provided in Ref. 1.13 (see **Annex 14A8.5**).

1.4 Arcadis surveys – primary data

a) Approach

1.4.1 A number of surveys were undertaken by Arcadis post-2012 across the site. The aims of this work were: to fill any identified gaps in survey coverage; to gain a better understanding of population size(s); and to develop a better understanding of natural temporal and spatial variability in the use of different habitats in order to better understand how barbastelle and other bat species might be affected by the proposals.

1.4.2 The detailed methodologies of these surveys are provided in **Annex 14A8.3**. A summary of the results of these surveys is provided in **sections 3.2** to **3.9**. Further detail on the results of these surveys are provided in Ref. 1.9, 1.14, Ref. 1.15, Ref. 1.16 and Ref. 1.17 (see **Annex 14A8.6**) and **section 1.1e)** of this annex.

b) Activity transect surveys

i. Campus transect route 2014

1.4.3 The results of the seven activity transect surveys undertaken at the proposed Campus site within the site between May and October 2014 (see **Figure 14A8.2** for the Campus transect route), are summarised in **Table 1.20**, which details the number of bat passes recorded, by species, and relative bat activity[5] (B/h). Full details of the results of the Campus site

[5] A measure of relative bat activity has been calculated in the form of the number of bat passes per hour. This measure has been calculated to reflect both the total number of calls experienced over the complete transect for all

activity transect surveys undertaken in 2014 are described in **section 0** of this Annex**.**

Table 1.20: Summary of the number of passes recorded, by species, during the Campus activity transect surveys in 2014

Species	Survey dates and effort (hours)							Total	Bat Passes Per Hour (B/h)
	29/05/2014 (2)	18/06/2014 (2.25)	09/07/2014 (2.25)	04/08/2014 (1.75)	10/09/2014 (2)	07/10/2014 (2.25)	08/10/2014 (1.50)*		
Common pipistrelle.	20	22	7	22	16	7	5	99	7.1
Soprano pipistrelle.	7	5	4	4	6	0	3	29	2.1
Barbastelle	2	1	0	1	5	0	0	9	0.6
Myotis spp.	0	0	0	0	4	0	2	6	0.4
Nathusius' pipistrelle.	0	4	0	0	0	0	0	4	0.3
Pipistrellus spp.	2	1	1	0	0	0	0	4	0.3
'big bat' spp.	2	0	0	2	0	0	0	4	0.3
Noctule	0	1	0	0	1	0	0	2	0.1
Nyctalus spp.	0	1	0	0	0	0	0	1	0.1
Brown long-eared bat**.	0	0	0	0	1	0	0	1	0.1
Brown long-eared bat**/*Myotis* spp.	1	0	0	0	0	0	0	1	0.1
TOTAL	34	35	12	29	33	7	10	160	
Bat passes per hour (B/h).	17	15.5	5.3	16.6	16.5	3.1	6.6		

**Dawn survey*

***All long-eared bat recordings are considered to relate to brown long-eared bat echolocation calls due to the absence of grey long-eared bat from Suffolk based on their current known distribution. (Ref. 1.4 and Ref. 1.5).*

bat species on each survey visit, and the total number of calls by a given species over the complete transect for all survey visits undertaken in 2014, combined. It is important to note that not all areas of the transect are recorded throughout; that calculations have been based on survey effort rounded to the nearest quarter of an hour; and that the passes per hour value has been provided to the nearest tenth.

1.4.4 At least seven species were recorded during the activity transect surveys. Common and soprano pipistrelle were the most frequently recorded species, corresponding with the results of surveys undertaken by Wood Group (see **section 1.1c)**), while all other species were recorded at only very low levels, as illustrated in **Table 1.20**.

1.4.5 Overall recorded activity peaked in May 2014 (17B/h), with similar levels of relative activity recorded in June 2014 (15.5B/h), August 2014 (16.6B/h) and September 2014 (16.5B/h). Activity was noticeably reduced in July 2014 (5.3B/h) and in the dusk (3.1B/h) and dawn (6.6B/h) October 2014 surveys. It is considered likely that the reduced number of bat passes recorded during the July 2014 survey were as a result of adverse weather conditions.

1.4.6 A possible emergence from Upper Abbey Farm was suggested from the timing of a soprano pipistrelle pass at 16 minutes after sunset.

1.4.7 The locations of recorded bat passes on the Campus transect route are provided in **Figures 13A8.7** to **13A8.11**.

ii. Green Rail Route transect route 3 activity surveys 2014

1.4.8 Part of the Green Rail Route (GRR) runs through the site, and the results of the transect surveys for this part of the GRR (i.e. Transect 3) are summarised in this section. This transect is illustrated on **Figure 14A8.3**. The results of the seven activity transect surveys are summarised in **Table 1.21**, which details the number of bat passes recorded by species between May and October 2014.

1.4.9 Full details of the results of the GRR transect route 3 activity surveys undertaken in 2014 are described in **section 0** of this Annex.

Table 1.21: Summary of the number of passes recorded, by species; during surveys of GRR transect route 3 in 2014

Species	Survey Dates and Effort (hours)							Total	Bat Passes Per Hour (B/h)
	28/05/2014 (2)	18/06/2014 (1.75)	09/07/2014 (2.25)	04/08/2014 (2)	10/09/2014 (2)	07/10/2014 (2.25)	08/10/2014 (1.50)*		
Common pipistrelle.	19	5	8	19	10	6	3	70	5.1
Soprano pipistrelle.	10	9	7	7	7	7	2	49	3.6

Species	Survey Dates and Effort (hours)							Total	Bat Passes Per Hour (B/h)
	28/05/2014 (2)	18/06/2014 (1.75)	09/07/2014 (2.25)	04/08/2014 (2)	10/09/2014 (2)	07/10/2014 (2.25)	08/10/2014 (1.50)*		
Pipistrellus spp.	5	5	0	2	1	2	0	15	1.1
Barbastelle	1	1	1	1	10	0	0	14	1.0
Myotis spp.	0	0	0	5	3	1	0	9	0.7
'big bat' spp.	4	0	1	2	1	0	0	8	0.6
Common/Soprano pipistrelle.	2	0	0	0	1	0	0	3	0.2
Noctule	2	0	0	0	1	0	0	3	0.2
Nyctalus spp.	0	0	0	2	0	0	0	2	0.1
Serotine	0	0	0	1	0	0	0	1	0.1
Nathusius' pipistrelle.	0	0	0	1	0	0	0	1	0.1
TOTAL	43	20	17	40	34	16	5	175	
Bat passes per hour (b/h).	21.5	11.4	7.5	20	17	7.1	3.3		

**Dawn survey*

1.4.10 At least seven species were recorded during the activity transect surveys. As noted on the Campus transect, common and soprano pipistrelle were the most frequently recorded species, while all other species were recorded at only very low levels, as illustrated in **Table 1.21**.

1.4.11 Recorded relative activity peaked in May 2014 (21.5B/h) with similar levels of activity recorded in August 2014 (20B/h) and September 2014 (17B/h). Activity levels in remaining months were noticeably reduced, in particular during the dawn October 2014 survey (3.3B/h) when only common and soprano pipistrelle passes were recorded.

1.4.12 The possible emergence of common and soprano pipistrelle were recorded from Kenton Hills or adjacent areas, with common pipistrelle passes between 10 minutes pre-sunset and 20 minutes post sunset, and soprano pipistrelle passes in the 20 minutes following sunset.

1.4.13 The location of recorded bat passes on the GRR transect route 3 are illustrated on **Figures 13A8.12** to **13A8.16**.

iii. Pillbox Field and Coronation Wood activity transect surveys

1.4.14 The results of the two activity transect surveys (see **Figure 14A8.4** for transect route) undertaken in Pillbox Field and the boundaries of Coronation Wood in September and October 2015 are summarised in **Table 1.22**. **Table 1.22** details the number of bat passes recorded, by species. Full details of the results of activity transect surveys in Pillbox Field and the boundaries of Coronation Wood in 2015 are provided in **section 0** of this Annex.

Table 1.22: Summary of the number of passes recorded, by species, during surveys of Pillbox Field and Coronation Wood in 2015

Species	Survey dates and effort (hours)		Total	Bat Passes Per Hour (B/h)
	28/09/2014 (2)	18/10/2014 (1.75)		
Common pipistrelle.	27	9	36	9.6
Soprano pipistrelle.	6	2	8	2.1
Noctule	5	0	5	1.3
Myotis spp.	1	3	4	1
Nyctalus spp.	2	0	2	0.5
Brown long-eared bat*.	1	0	1	0.3
Common/Soprano pipistrelle.	0	1	1	0.3
TOTAL	**42**	**15**	**57**	**15.2**
Bat passes per hour (b/h).	**21**	**8.6**		

**All long-eared bat recordings are considered to relate to brown long-eared bat echolocation calls due to the absence of grey long-eared bat from Suffolk based on their current known distribution. (Ref. 1.4 and Ref. 1.5)*

1.4.15 At least six species were recorded during the activity transect surveys. As noted during activity transect surveys undertaken in 2014, common and soprano pipistrelle were the most frequently recorded species; however, unlike surveys of the Campus transect and GRR transect route 3, no barbastelle were recorded.

1.4.16 Recorded relative activity was noticeably higher during the transect survey undertaken in September 2014 (28B/h) compared to October 2014 (8B/h).

1.4.17 As indicated in **Table 1.22**, only very low levels of activity were recorded for all species, with the exception of common pipistrelle. The location of recorded bat passes on the Pillbox Field and Coronation Wood transect are illustrated on **Figure 14A8.19**.

iv. Sand pit activity transect surveys

1.4.18 The results of the two activity transect surveys (see **Figure 2** in Ref. 1.15 (see **Annex 14A8.6**) for transect route) undertaken in the sand pits adjacent to Upper Abbey Farm Bridleway in August and September 2019 are summarised in **Table 1.23**. **Table 1.23** details the number of bat passes recorded, by species. Full details of the results of activity transect surveys in the sand pits are provided in the sand pit technical note (Ref. 1.15, **Annex 14A8.6**).

Table 1.23: Summary of the number of passes recorded, by species, during surveys of the sand pits in 2019

Species	Survey dates and effort (hours)		Total	Bat Passes Per Hour (B/h)
	20/08/2019 (2.25)	09/09/2019 (2)		
Common pipistrelle.	1	10	**11**	**2.6**
Soprano pipistrelle.	1	1	**2**	**0.5**
Barbastelle	0	1	**1**	**0.2**
Big Bat spp.	1	0	**1**	**0.2**
Myotis spp.	0	1	**1**	**0.2**
TOTAL	**3**	**0**	**3**	**0.7**
Bat passes per hour (b/h).	**1.3**	**6.5**		

1.4.19 As indicated in **Table 1.23**, although at least five species were recorded during the activity transect surveys, recorded activity was at only very low levels for all species during both the August and September 2019 visits.

1.4.20 Recorded relative activity was noticeably higher during the transect survey undertaken in September 2019 (6.5b/h) compared to August 2019 (1.2b/h), with this difference largely due to a greater number of common pipistrelle passes, as has been noted elsewhere on the EDF Energy estate in previous years. However, the greater level of activity remains low when compared to activity transect survey results undertaken elsewhere on the EDF Energy estate in previous years, as detailed in **sections 0** to **0**.

c) Automated detector surveys

1.4.21 The results of the automated detector surveys in 2013 and 2014 are provided in Ref. 1.14 (see **Annex 14A8.6**) and are not repeated here to avoid unnecessary duplication.

i. Campus automated detector surveys

1.4.22 The results of automated detector surveys at monitoring stations on the Campus site (Positions A and B, illustrated on **Figure 14A8.2**) surveyed in 2016 are summarised in **Table 1.24** in the form of the mean passes per night (mppn). Full details of the results of these surveys are provided in **section 1.1e)iii** of this Annex. As detailed in **Annex 14A8.3** recorded data has been grouped into six species groups (barbastelle, *Myotis* spp., "big bat" spp., long-eared bat spp., pipistrelle spp., and Nathusius' pipistrelle). Periods of peak activity, for both individual species groups, and overall, are indicated in green.

1.4.23 Based on the threshold of over 300mppn, determined in Ref. 1.14 (see **Annex 14A8.6**), neither of the monitoring positions surveyed in 2016 qualified as a 'bat hotspot' with a high of 133.79mppn recorded.

1.4.24 Throughout all three months during which these positions were monitored Position A consistently recorded greater levels of activity than those recorded at Position B. It is considered that this is due to the greater proportion of common and soprano pipistrelle activity recorded at Position A (84.58% to 93.71% of overall activity) compared to Position B (64.07% to 69.83% of overall activity).

1.4.25 Barbastelle, *Myotis* spp. and long-eared bat spp. groups recorded consistent low levels of activity at both positions, across all three months of surveying, with a small number of occasional passes recorded in the hour after sunset. Nathusius' pipistrelle was recorded at only very low levels throughout the survey period.

1.4.26 The "big bat" spp. group primarily recorded very low levels of activity, with the exception of activity levels recorded in August 2016, when a significant peak was recorded at Position B (20.74mppn, accounting for 27.86% of the total recorded activity). In combination with this activity peak a high number of passes (126 across both Position A and Position B) were recorded in the hour after sunset, potentially indicate the presence of a roost in the vicinity of this survey area at this time of the year.

Table 1.24: Summary of 2016 automated detector surveys undertaken on the Campus site

Month	Monitoring location	Mean passes per night (mppn)						
		Barbastelle	*Myotis* spp.	"Big Bat" spp.	Nathusius' Pipistrelle	Pipistrelle spp.	Long-eared bat spp.	Total
August	1	0.57	2.43	4.64	0.36	124.50	1.29	133.79
	2	2.00	2.00	20.74	0.32	47.68	1.68	74.42
September	1	1.29	3.64	0.71	0.64	45.07	1.93	53.29
	2	2.21	3.71	0.86	0.57	24.14	3.07	34.57
October	1	1.36	2.14	0.29	0.50	75.57	0.79	80.64
	2	3.71	2.43	0.07	0.50	17.21	1.29	25.21

d) Radio-tracking survey

1.4.27 Bats trapped in locations both inside and to the north of the EDF Energy estate were radio-tracked. The full results of trapping and radio-tracking surveys undertaken in August 2014 are detailed in Ref. 1.9 (see **Annex 14A8.6**) and are not repeated here to avoid unnecessary duplication.

1.4.28 The roosts used by barbastelle (and roosts used by other bats) during all studies (2010-2014) are collated and described in **section 1.1d)ix** of this Annex.

e) Building inspections

1.4.29 Three buildings were inspected on a single occasion in April 2015. Of these one building (Walk Barn) was assessed as having no suitability for roosting bats and two buildings (Plantation Cottages and Laboratory off Lover's Lane) were assessed as having low suitability for roosting bats. Details of the locations of these buildings are shown on **Figure 14A8.6**, **Figure 14A8.7** and **Figure 14A8.8** and the nature of the buildings and features potentially suitable for bats are provided in detail in **section 1.1e)v** of this Annex.

1.4.30 Three buildings and associated outbuildings (Ash Wood Cottages, Lower Abbey Farm and Upper Abbey Farm) were inspected on two occasions, in April 2015 and April/May 2019. A summary of the results of these inspections is provided in **Table 1.25**. Details of the locations of these

buildings are shown on **Figure 14A8.6**, **Figure 14A8.7** and **Figure 14A8.8** and the nature of the buildings and features potentially suitable for bats are provided in detail in **section 1.1e)v** of this Annex.

Table 1.25: Summary of building inspection results for Ash Wood Cottages, Lower Abbey Farm and Upper Abbey Farm in 2015 and 2019

Building	2015 Inspection Suitability	2019 Inspection Suitability
5 Ash Wood Cottages.	Historic brown long-eared bat roost. Identified features assessed as of High suitability.	Confirmed roost: Approx. 20 brown long-eared bats in loft apex.
6 Ash Wood Cottages.		Confirmed roost: DNA analysis of droppings as brown long-eared bat.
Lower Abbey Farm		
1	Moderate/High.	High.
2	Low.	Moderate.
2°	Low/None.	Low/None.
3	Low/None.	Negligible.
4	Low/None.	Negligible.
5	Low/None.	Negligible.
6	-	Moderate.
7	-	Low.
8	Low/None.	Low/None.
9	Very Low.	Very Low.
10	-	Low.
11	High.	Confirmed roost: DNA analysis of droppings as brown long-eared bat.
12	Low.	Negligible.
Upper Abbey Farm		
1	High.	Confirmed roost: DNA analysis of droppings as brown long-eared bat.
2	None.	None.
3	Low.	Low/None.
4	Very Low.	Very Low.
5	High.	High.
6	High.	High.

Building	2015 Inspection Suitability	2019 Inspection Suitability
7	Low.	Low.
8	-	Negligible.
9	Historic brown long-eared bat roost. Identified features assessed as of moderate suitability.	Confirmed roost: DNA analysis of droppings as brown long-eared bat.
10		Confirmed roost: DNA analysis of droppings as brown long-eared bat.
11	High.	High.

1.4.31 Fifteen buildings associated with Sizewell B relocated facilities proposed works were inspected in March 2019. A summary of the inspection results is provided in **Table 1.26**. Details of the locations of these buildings are shown on **Figure 1** in Ref. 1.16 (see **Annex 14A8.6**).

Table 1.26: Summary of Sizewell B relocated facilities building inspections from March 2019

Building Number	Building Name	Overall Building Suitability for Roosting Bats
1	Outage Car Park North	Negligible
3	Temporary Visitors Centre	Low
4	Operations Training Centre	Low
5	Outage Store	Negligible
6.1	Civils Workshop & Store (Container units)	Negligible
6.2	Civils Workshop & Store (Elliot pre fab construction buildings)	Negligible
6.3	Civils Workshop & Store (Civils workshop)	**Confirmed Roost** – Common pipistrelle dropping identified by eDNA testing (see Appendix B)
8.1	Base Area Facility	Negligible
8.2	Base Area Facility (Transformer and container unit)	Negligible
9	Outage Portacabin City 2	Negligible
10	Outage Office	Negligible
11.1	Projects Office	Negligible
11.2	Projects Office (two portacabins adjoined)	Negligible

Building Number	Building Name	Overall Building Suitability for Roosting Bats
12	Technical Training Centre	Low
20	Rosary Cottage Garage	Negligible

f) Emergence/re-entry surveys

1.4.32 Full details of the activity recorded during emergence/re-entry surveys at Upper Abbey Farm, Lower Abbey Farm and Ash Wood Cottages during 2019 are provided in **section 1.1e)vi** of this Annex. A summary of the conclusions drawn from this work is provided in **sections 1.1.6** and the locations of these buildings are illustrated on **Figure 14A8.6**, **Figure 14A8.7** and **Figure 14A8.8**.

i. Ash Wood Cottages

1.4.33 Three surveys of Ash Wood Cottages were undertaken between May and July 2019, consisting of two dusk surveys (May and June 2019) and one dawn survey (July 2019).

1.4.34 Between four and eight bats were observed emerging from the buildings during the May 2019 survey while a total of 32 bats were observed emerging from seven points on the buildings (primarily associated with the chimney and surrounding roof) during the June 2019 survey. No bats were confirmed to have re-entered the buildings during the July 2019 survey; however, there was considerable activity focused around the chimney and roof, and while it was not possible to visually confirm re-entries from the ground it was considered likely that a proportion of the activity in this location represented bats re-entering the buildings.

1.4.35 It was not possible to obtain definitive echolocation call recordings of the bats emerging or re-entering, either due to the absence of echolocation calls at the point of emergence/re-entry, or the degree of activity in the immediate vicinity that prevented the call(s) of the emerging/re-entering bats from being distinguished from the background activity. However, based on the confirmed presence of brown long-eared bats during internal building inspections it is considered that these emergences and likely re-entries represent brown long-eared bats.

ii. Lower Abbey Farm

1.4.36 In line with bat survey guidance (Ref. 1.18) no emergence/re-entry surveys were undertaken on Buildings 3, 4, 5 and 12 at Lower Abbey Farm due to the negligible bat roost suitability assigned to this buildings during the 2019

internal and external building inspections. No bats were recorded emerging from Buildings 2a or 9.

1.4.37 A single bat, the species of which could not identified due to a lack of echolocation calls at the point of re-entry, was observed re-entering Building 1 and a further bat was considered to have possibly re-entered Building 1 during the June 2019 survey. During the July 2019 survey a single common pipistrelle was considered likely to have emerged from Building 1

1.4.38 Two bats were observed re-entering Building 2 and a further two bats were considered likely to have re-entered the building during the June 2019 survey.

1.4.39 One confirmed and one possible emergence were observed from Building 6 during the June 2019 survey. On neither location were echolocation calls heard and as such it was not possible to confirm the species.

1.4.40 Buildings 7 and 10 were surveyed together due to the close proximity of these buildings and the presence of fencing which prevented close access to either building for health and safety reasons. No confirmed emergences were recorded; however, there was low level intermittent bat activity within and around this location, the nature and origin of which could not be definitively identified and as such it was considered possible that occasional bats could be using these buildings for roosting.

1.4.41 A single common pipistrelle was observed re-entering Building 8 during the June 2019 survey while a further common pipistrelle was observed emerging from Building 8 during the July 2019 survey.

1.4.42 Between 12 and 14 bats were recorded emerging from Building 11 during the April 2019 survey. During the June 2019 survey, three bats were confirmed to have re-entered Building 11, while multiple possible re-entries were noted around the chimney (although numbers could not be confirmed) and three possible re-entries were noted elsewhere on Building 11. During the final survey visit in July 2019, 17 bats were observed emerging from the chimney, with a further two possible emergences occurring at this location. An additional two possible emergences were recorded on the southern side of the building. None of the bats recorded emerging or re-entering Building 11 during 2019 could be identified to species due to the absence of echolocation calls, the distance of the surveyors from the emergence points, or the extent of bat activity preventing separation of emergence/re-entering bats echolocation calls from the background activity. However, based on the confirmed presence of brown long-eared bats (via DNA analysis of droppings) during internal building inspections, it is considered

that these emergences and likely re-entries represent brown long-eared bats.

iii. Upper Abbey Farm

1.4.43 In line with bat survey guidance (Ref. 1.18) no emergence/re-entry surveys were undertaken on Buildings 2 and 8 at Upper Abbey Farm due to the negligible and/or absence of bat roost suitability identified for these buildings during the 2019 internal and external building inspections. No bats were recorded emerging from Buildings 3, 4, 6 or 7.

1.4.44 Three common pipistrelle and a single soprano pipistrelle were recorded emerging from the eastern gable end of Building 1 during the May 2019 survey. During the June 2019, survey two common pipistrelle, one common or soprano pipistrelle[6] and two bats (of unknown species due to the lack of echolocation calls at the time of re-entry) were observed re-entering Building 1 at the eastern gable end. During the final visit in July 2019, one common pipistrelle and one soprano pipistrelle were recorded emerging from the eastern gable end. A bat of unknown species, due to the absence of echolocation calls, was observed potentially emerging from the western gable end of Building 1.

1.4.45 Two bats of unknown species were observed re-entering Building 5 during the July 2019 survey.

1.4.46 One brown long-eared bat and one bat of unknown species, due to the absence of echolocation calls at the time of re-entry, were observed re-entering Building 10 during the June 2019 survey.

1.4.47 Two common pipistrelles were recorded emerging from Building 11 during the June 2019 survey. A further possible emergence, of a soprano pipistrelle, was also recorded during this survey. During the July 2019 survey, two common pipistrelle and one bat of unknown species, due to the absence of echolocation calls at the time of re-entry, were observed re-entering Building 11.

iv. Sizewell B relocated facilities associated buildings

1.4.48 Following building inspections (see **section 1.1d)v**) three buildings were assessed as having low suitability for roosting bats (Buildings 3, 4 and 12) and one building was confirmed as a common pipistrelle roost (Building

[6] Echolocation calls of both species were simultaneously recorded at the point that the bat was observed re-entering the building and as such it is not possible to confirm which species re-entered.

6.3). The locations of these buildings are illustrated on **Figure 1** in Ref. 1.17 (see **Annex 14A8.6**).

1.4.49 No bats were observed emerging from Buildings 3 or 12. The initial emergence survey (July 2019) of Building 4 recorded a single emerging bat (species unknown due to a lack of echolocation calls at the time of emergence). As such a further two surveys were undertaken on this building with a further single bat observed re-entering the building in August 2019 (again the species could not be identified due to a lack of echolocation calls). No bats were observed emerging from the building during the final survey in September 2019.

1.4.50 Building 6.3 was confirmed as a common pipistrelle roost following DNA analysis of droppings identified during the building inspection surveys in March 2019. Seven bats, including common pipistrelle and soprano pipistrelle were recorded emerging in July 2019, a further two common pipistrelle were observed re-entering the building during the August 2019 survey and a total of nine bats, including at least three soprano pipistrelle, were recorded emerging in September 2019. Full details of the results of these emergence surveys are provided in Ref. 1.17 (see **Annex 14A8.6**).

g) Tree assessments

1.4.51 The results of tree assessments in 2015 and 2019 are illustrated in **Figure 14A8.5** and Figure 1 of Ref. 1.16. Full details of identified trees are provided in **Table 1.34** in **section 1.1e)vii** of this Annex and in Ref. 1.16 (see **Annex 14A8.6**).

1.4.52 Access for tree assessments was restricted to approximately half of the survey area, as illustrated on **Figure 14A8.5**, with no permission to access to areas to the west of the Eastbridge Road.

1.4.53 Within the area surveyed in 2015, 35 trees were identified as having moderate or higher suitability to support roosting bats. Of these, 19 trees were identified as having high or very high potential to support roosting bats. A small number of likely bat droppings were identified at the base of a feature on a further tree (a mature Scots Pine), located within the wooded strip running north to south between Black Walks and Ash Wood.

1.4.54 A group of trees located to the south-west of the Round House could not be fully assessed due to access restrictions but appeared to have features potentially suitable for roosting bats from where access was available.

1.4.55 During tree assessment surveys in 2019 seven trees were identified as having moderate suitability to support roosting bats. No trees were

identified as having high suitability to support roosting bats and no evidence of current occupation by bats was identified.

1.4.56 The reassessment of trees in Coronation Wood in March 2019 identified three trees with moderate suitability for roosting bats. No evidence of use by bats was identified and these features were made unsuitable for bats by filling with expanding foam.

h) Corridor activity surveys

1.4.57 Full details of the activity recorded during corridor surveys across the site during 2016 are provided in **section 1.1e)viii.** A summary of the conclusions drawn from this work is provided in **sections 1.1d)viii**, and the locations of the survey areas are illustrated on **Figure 14A8.18**.

i. Black Walks

1.4.58 Despite recording at least eight bat species within this survey area, all, with the exception of soprano pipistrelle, were recorded at very low levels. Clear evidence of commuting activity was extremely limited with no indication of a regular or well-used commuting route, although the area appears to be used by a small number of foraging bats, primarily individual/single common and soprano pipistrelles.

ii. Fiscal Policy/Kenton Hills crossroads

1.4.59 Surveys indicate the use of this location by both foraging and commuting bats. Evidence of west to east commuting was recorded over the crossroads and extending into Kenton Hills, both along the track and within woodland to the south, as well as more limited evidence of north to south commuting down the Upper Abbey Farm bridleway. Commuting passes were recorded for common pipistrelle, soprano pipistrelle, “big bat” spp. and *Myotis* spp.

1.4.60 Foraging activity was also recorded, primarily by common and soprano pipistrelle, but also at low levels by barbastelle and *Myotis* spp. A particular area of foraging was noted around the entrance to Kenton Hills.

iii. Kenton Hills track

1.4.61 Activity at the eastern end of the Kenton Hills track was reduced compared to that recorded to the west, at the Fiscal Policy/Kenton Hills crossroads, with most of this activity heard but not observed by surveyors. It was considered that this may indicate the dispersal of bats more widely into the woodland by this point on the Kenton Hills track.

iv. MS20

1.4.62 Both foraging and commuting activity was recorded at this location including a number of primarily commuting barbastelle passes between 40 minutes and one hour after sunset. It was considered that the recorded foraging activity was likely to have been produced by a single individual of a given species, at any one point, with the exception of soprano pipistrelle where at least two individuals were simultaneously recorded. Much of this foraging activity was recorded between the tree line and reedbed or over areas of reedbed adjacent to treelines.

v. MS35

1.4.63 Activity at this survey location consisted primarily of foraging by both common and soprano pipistrelle over areas of reedbed and ditches, with at least two common pipistrelle recorded simultaneously. Commuting activity in this location during the survey period was extremely limited, with single, unseen, passes from brown long-eared bat, barbastelle, noctule and *Myotis* spp.

vi. Stonewall Belt

1.4.64 Commuting activity during the initial survey was limited to the more sheltered east facing side of the belt, with subsequent surveys focusing on this side. Commuting passes were recorded for barbastelle, common pipistrelle, soprano pipistrelle, 'big bat'/brown long-eared bat and *Myotis* spp. Foraging was also recorded, at the northern end in the vicinity of Ash Wood Cottages and at the southern end in areas of scrub and woodland to the south.

vii. Upper Abbey Farm bridleway

1.4.65 Consistent foraging activity, primarily by common and soprano pipistrelle, was recorded at all three surveyor positions, commuting activity; however, was primarily recorded from the mid-point of the bridleway southwards. Commuting activity was primarily recorded for common and soprano pipistrelle, although *Myotis* spp. and potentially commuting barbastelle passes were also recorded. Many of the commuting passes were recorded heading north to south as far as the southern end of the survey area, at which point a period of foraging activity would be recorded; this was particularly noted for common and soprano pipistrelle.

i) Combined roost use evidence

1.4.66 **Table 1.27** summarises the confirmed roost use by barbastelle tagged and tracked during radio-tracking surveys undertaken in 2010 and 2011 by

Corylus Ecology on behalf of Wood Group (Ref. 1.8 and Ref. 1.1, **Annex 14A8.5**) and on behalf of Arcadis (Ref. 1.9, **Annex 14A8.6**). **Table 1.28** summarises the confirmed roost use by species other than barbastelle that were tagged and tracked during radio-tracking surveys in 2010, 2011 and 2014. The location of roosts identified during radio-tracking surveys are illustrated in **Figure A2** in Ref. 1.9 (see **Annex 14A8.6**).

Table 1.27: Summary of confirmed roost locations used by barbastelle, identified during radio-tracking surveys in 2010, 2011 and 2014

Roost	Bat ID Number			Area/Location	Grid Ref.	Roost Type	Tree Diameter (cm)	Feature Height (m)	Roost Feature
	2010	2011	2014						
R1	1, 2	-	-	Northern edge of Kenton Hills.	N/A	Pedunculate Oak.	c. 90	5	Rotten branch with flaking bark on branch and trunk c. 5m above ground level south/south-east facing.
R2	2	-	-	Northern edge of Kenton Hills.	N/A	Pedunculate Oak.	80	c.4	Split bark on forked limb south/south-east facing. Both forks have potential.
R3	3, 4	-	-	Ash Wood.	N/A	Pedunculate Oak.	100	4-8	Peeling bark on northern forked limb (4 – 8m). Signal loudest on north-west side at 4.5m above the ground.
R4	3	-	-	Grimseys	N/A	Unknown	-	-	Area around Grimseys – roost location not known.
R5	3	-	-	Woodland at The Grove.	N/A	Pedunculate Oak.	38	3-6	Flaking bark on vertical stem.
R6	5	-	-	Greenhouse Plantation.	N/A	Unknown	40	7-8	Dead tree. Dead flaking bark on trunk. Bat on north-west side at c. 7m above the ground.
R7	1	-	-	Woodland at The Grove.	N/A	Pedunculate Oak.	90	10	Tree full of potential features from 3m above ground to top c. 16m above the ground. Main feature where bats roosting is torn off limb on north side with deep fissure, 10m above the ground.
R8	5, 6	-	-	Woodland at The Grove.	N/A	Pedunculate Oak.	60	3	Loose bark below split limb on eastern side. Several access holes noted.
R9	5, 6	5, 6, 8,	-	Ash Wood.	N/A	Pedunculate	c. 80	6-8	Key features are splitting limbs and loose

Roost	Bat ID Number			Area/Location	Grid Ref.	Roost Type	Tree Diameter (cm)	Feature Height (m)	Roost Feature
	2010	2011	2014						
		9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20				Oak.			bark towards the top of the tree (radio signal strongest higher up). Cracks in bark also noted lower down plus woodpecker hole on south face at c. 6-8m.
R10	7	-	-	Wood Farm Barn.	N/A	Barn	-	-	Barn with timber weatherboarding and corrugated metal roof.
R11	6	-	-	Nursery Covert.	N/A	Dead Elm.	c. 30	3-5	Loose bark towards the top of the tree and woodpecker hole on south face at c. 4m.
R12	5	-	-	Hangman's Wood.	N/A	Pedunculate Oak.	C. 100	3-4	Features throughout including splits and fissures. NB large cavity and split on the face of the main stem.
R13	5, 6	8, 13, 19	-	Ash Wood.	N/A	Pedunculate Oak.	C. 80	4-6	Main feature is split horizontal limb that extends north from main stem at c. 5m and then upwards.
R14	-	5, 6, 8, 10	-	Ash Wood.	N/A	Pedunculate Oak.	45	15+	Loose bark on horizontal limb to south c. 12.
R15	-	8	-	Nursery Covert.	N/A	Pinus spp.	35	8-15	Numerous woodpecker holes, unsure which feature is being used.
R16	-	7	-	Kenton Hills.	N/A	Salix spp.	100	6-10	Snapped off limb with woodpecker holes on north face, Cavity may extend south down limb. Another good feature adjacent in snapped limb.

Roost	Bat ID Number			Area/Location	Grid Ref.	Roost Type	Tree Diameter (cm)	Feature Height (m)	Roost Feature
	2010	2011	2014						
R17	-	5, 6, 9, 12, 13, 14, 16, 17, 18, 20	-	Plantation Cottages.	N/A	Sweet Chestnut.	45 each	8-12	Twin stem. Lots of dead wood and loose bark on both stems. Two woodpecker holes on face of north stem. Signal strongest 8-10m up north stem. Loose plate of bark here. Loose bark all way to base on north face of north stem.
R18	-	11, 20	-	Kenton Hills.	N/A	Pedunculate Oak.	70-80	c. 3-5	Likely feature is large split in snapped limb (main south-south-west limb). Probably extends. Lots of dead wood and loose bark on tree, twisted appearance.
R19	-	5, 8, 12, 13, 14, 16, 19	-	Plantation Cottages.	N/A	Pedunculate Oak.	150	-	Unsure of exact feature. Likely to be large snapped limb one side with horizontal split at 8m. Another snapped limb at c. 4-6m in one face and hung up tree with split.
R20	-	11, 17	-	Northern edge of Kenton Hills.	N/A	Sweet Chestnut.	65	-	Likely split limb on east face. Dying tree, stag headed but some foliage in canopy. Bracken understorey.
R21	-	5, 11, 13, 14, 16,17, 19	-	Old Abbey Farm Woodland..	N/A	Pedunculate Oak.	100	9-13	Large vertical split from 9-13m on northern face.
R22	-	7	-	Hill Farm.	N/A	Barn	-	-	Concrete breeze block and corrugated sheet modern agricultural barn. Strongest signal on north-eastern corner.

Roost	Bat ID Number			Area/Location	Grid Ref.	Roost Type	Tree Diameter (cm)	Feature Height (m)	Roost Feature
	2010	2011	2014						
R23	-	-	1	Sizewell: Woodland at The Grove – eastern side northern end.	TM 46438, 65519	Dead alder (*Alnus glutinosa).*	85	6-7	Large expanses of lifted bark with few holes on north-east and north-west side.
R24	-	-	2, 11, 19	Minsmere: Scottshall Covert. East of main ride.	TM 46785, 67324	Pedunculate Oak.	40	Huge split down entire length of main stem.	Large split down entire south face plus loose bark signal strongest and mid-point at 6m.
R25	-	-	10, 11	Minsmere: Scottshall Covert. West of main ride.	TM 46625, 67490	Pedunculate Oak.	96-100	20+	Large standard 3 main central limbs. The middle limb has loose bark on west and south-west face signal strong here near a dead pole (snapped) loose bark.
R26	-	-	1, 6, 14, 16, 17	Sizewell: Ash wood. South-east corner next just north of Ash Wood Cottage.	TM 46032, 65041	Pedunculate Oak.	60	6	Woodpecker hole and loose bark on north-west face, feature runs 2m in length.
R27	-	-	1 ,2, 7, 14, 15, 16, 17	Sizewell: Nursery Covert. North-west corner at the edge of track near bend of woodland ride.	TM 46404, 64411	Dead Scots pine pole (*Pinus sylvestris*).	110	15	Dead pole, decay holes, missing loose bark. Roost holes on NNW face.
R28	-	-	10, 11, 18	Minsmere: Located on the western edge of Scottshall Covert wood.	TM 46447, 67427	Pedunculate Oak.	40	6-8	The tree is approximately 10m high, single stem and intact, there are multiple areas of lifted bark on the north face of the stem between 6m and 8m, signal strongest at

Roost	Bat ID Number			Area/Location	Grid Ref.	Roost Type	Tree Diameter (cm)	Feature Height (m)	Roost Feature
	2010	2011	2014						
									this point.
R29	-	-	19	Minsmere: Located on the northern edge on Scottshall Covert towards the eastern side, right on edge of woodland with open grassland to the north.	TM 46899, 67439	Pedunculate Oak.	50	6	The top of the tree at approximately 8m high has snapped off completely; there is lifted bark from 4m high on the stem to the top on the southern face of the tree, facing the woodland. The signal was strongest from the lifted bark at appro14A8. 6m high.
R30	-	-	19	Scottshall Covert – north-west corner.	TM 46522, 67465	Pedunculate Oak.	60	9	Feature is a large split that runs the entire length of the stem, caused by possible lightning strike. Tag signal was strongest approximately 9m high on main stem and on the northern face.
R31	-	-	11,19	Scottshall Covert. West of main ride near Sheepwash Lane.	TM 46645, 67292	Pedunculate Oak.	80	12-14	At the top of the tree 12m within a large branch that's extends to the north, this limb has split with raised bark.
R32	-	-	1, 2, 6, 16	Sizewell: Area north of Lower Abbey - exact location not known.	Restricted Access.	Likely tree roost.	-	-	Restricted Access.
R33	-	-	5	Redhouse Farm Saxmundham – exact location not	Restricted Access.	Unknown	-	-	Restricted Access.

Roost	Bat ID Number			Area/Location	Grid Ref.	Roost Type	Tree Diameter (cm)	Feature Height (m)	Roost Feature
	2010	2011	2014						
				known.					
R34	-	-	5	New Plantation – Saxmundham – exact location not known.	Restricted Access.	Likely tree roost.	-	-	Restricted Access.
R35	-	-	5	Sizewell: Grimseys.	Restricted Access.	Likely tree roost.	-	-	Restricted Access.
R36	-	-	3 , 6	Sizewell: North Grimseys – exact location not known.	Restricted Access.	Likely tree roost.	-	-	Restricted Access.
R37	-	-	13	Close to Reckford Bridge/Eastbridge Marshes and East of Middleton.	Restricted Access.	Unknown			Restricted Access.

Table 1.28: Summary of confirmed roost locations, used by species other than barbastelle, identified from radio-tracking surveys in 2010, 2011 and 2014

Roost (Species)	Bat ID Number			Area/Location	Grid Ref.	Roost Type	Tree Diameter (cm)	Feature Height (m)	Roost Feature
	2010	2011	2014						
RA (Natterer's bat).	-	1, 2	-	Leiston Abbey.	-	Building	-	-	-
RB (Long-eared bat).	-	4	-	-	-	Likely tree roost.	--	-	Unknown specific roost – area towards the north of Rookyard Wood.
RC (Brown long-eared bat).	-	4	-	Small, brick bungalow.	-	Building	-	-	-
RD (Natterer's bat).	-	22	-	Bat box fixed to pine tree.	-	Bat box.	-	-	-
RE (Natterer's bat).	-	21	-	Sandypytle Plantation.	-	Alder	30	c. 5	Wet woodland with willow, alder and bracken understorey. Large wound at c. 5m one face. Looks like old snapped limb. Unclear how far cavity extends but lots of dead and rotting wood.
RF (Natterer's bat).	-	21	-	Woodland at The Grove.	-	Pedunculate Oak.	40-50	5-10	Mature oak with three woodpecker holes at 5-10m on south face and one further hole on north face. On the eastern edge of the grove woodland on the eastern bank of the stream.
S1 (Serotine).	-	-	9	Theberton House.	-	Building	-	-	Restricted Access – known maternity roost within a building at Theberton House.

1.5 Detailed results of Arcadis Field surveys

a) Purpose of this section

1.5.1 This section sets out the detailed results of bat surveys undertaken by Arcadis in 2014, 2015 and 2019 which have not previously been reported elsewhere. A summary of the results of these surveys is included in **section 1.1d)** of this Annex.

1.5.2 Full details of the methodologies employed during the surveys detailed here are provided in **Annex 14A8.3**.

b) Activity transect surveys

i. Campus transect

1.5.3 At least seven species were recorded during the activity transect surveys. Recorded activity peaked in May 2014, with relative bat activity[7] of 17B/h, with similar levels of activity recorded in June 2014 (15.5B/h), August 2014 (16.6B/h) and September 2014 (16.5B/h), with the majority of recordings during these months relating to common, and to a lesser degree, soprano pipistrelle echolocation calls. Activity levels were noticeably reduced in July 2014 (5.3B/h) and in the dusk (3.1B/h) and dawn (6.6B/h) October 2014 surveys.

1.5.4 Common and soprano pipistrelle were (as found in all other surveys) the most frequently encountered species. Common pipistrelle were recorded during all of the survey visits, most frequently in June and August 2014, and were the only species recorded during the dusk October 2014 survey. Activity was recorded across the entire transect, with no clearly discernible areas of higher activity, as illustrated on **Figure 14A8.9**. Low numbers of common pipistrelle passes were recorded in the 40 minutes after sunset.

1.5.5 Soprano pipistrelle were recorded during all of the survey visits with the exception of October 2014 (dusk), and occurred across the entire transect. Small groupings of activity were noted to occur close to the Round House at the northern end of the transect, in the vicinity of the disused pit and

[7] A measure of relative bat activity has been calculated in the form of the number of bat passes per hour. This measure has been calculated to reflect both the total number of calls experienced over the complete transect for all bat species on each survey visit, and the total number of calls by a given species over the complete transect for all survey visits undertaken in 2014, combined. It is important to note that not all areas of the transect are recorded throughout; that calculations have been based on survey effort rounded to the nearest quarter of an hour and that the passes per hour value has been provided to the nearest tenth, As such this measure of relative bat activity is an approximation.

along the Upper Abbey Farm bridleway, as illustrated on **Figure 14A8.10**. A single pass, recorded in May 2014, 16 minutes after sunset, was recorded at Upper Abbey Farm, where soprano pipistrelle have previously been recorded roosting, indicating a possible emergence at this location. Low numbers of soprano pipistrelle passes were also recorded in the 40 minutes after sunset.

1.5.6 Barbastelle were found to be the third most frequently recorded species across all survey visits, although at a significantly reduced frequency compared to common and soprano pipistrelle, at a relative activity level of 0.6B/h. As illustrated on **Figure 14A8.11**, barbastelle activity was recorded across the transect, with small groupings of activity noted around Upper Abbey Farm and associated buildings and the immediately adjacent Upper Abbey Farm bridleway. Activity recorded during transects, which were themselves limited to 1.5 to 2.25 hours after sunset, was predominantly between one and two hours after sunset, with the earliest recorded barbastelle pass occurring 43 minutes after sunset at Upper Abbey Farm.

1.5.7 Nathusius' pipistrelle activity was recorded on the Campus transect only in June 2014, with just four recorded passes. The passes, all more than an hour after sunset, were recorded within five minutes of each other along a section of track running to the west of Upper Abbey Farm and are likely, therefore, to represent multiple passes by only a single individual.

1.5.8 **Figure 14A8.12** illustrates the combined passes (seven) recorded for bats that have been grouped together as "big bats". This grouping accounts for passes identified as noctule (two passes), serotine (one pass), *Nyctalus* spp. (one pass) or "big bat" (three passes). Activity was noted to occur primarily in the south-eastern section of the transect, around the Upper Abbey Farm and associated buildings and southern section of the Upper Abbey Farm bridleway. Both noctule passes were recorded in the 40 minutes after sunset.

1.5.9 Passes identified as *Myotis* spp. were recorded only in September and October 2014 (dawn only), occurring at the southern end of the Campus transect, as illustrated on **Figure 14A8.13**. Of the six recorded *Myotis* spp. passes, none were recorded in the first hour after sunset or in the hour before dawn during the October 2014 dawn survey.

1.5.10 A single brown long-eared bat pass was recorded on the Campus transect, in September 2014. A further possible brown long-eared bat pass (identified as brown long-eared bat/*Myotis* spp.) was recorded in May 2014. Neither pass was recorded during the hour after sunset. It is considered likely that brown long-eared bat passes have, as noted during Wood Group

surveys (Ref. 1.7, **Annex 14A8.5**), been under-recorded due to the quiet nature of their echolocation calls.

ii. GRR transect route 3

1.5.11 At least seven species were recorded during the activity transect surveys of GRR transect route 3. As for surveys undertaken on the Campus Site transect, recorded relative activity on the GRR transect route 3 peaked in May 2014 (21.5B/h) with similar levels of activity recorded in August 2014 (20B/h) and September 2014 (17B/h). Similarly, recordings during these months predominantly related to common and soprano pipistrelle echolocation calls. Activity levels were noticeably reduced in the remaining months of surveys, in particular during the dawn October 2014 visit (3.3B/h), during which activity was restricted to only low levels of common and soprano pipistrelle activity.

1.5.12 As for all other surveys, common and soprano pipistrelle were the most frequently encountered species (as determined by relative activity).

1.5.13 Common pipistrelle was the most frequently recorded species, with a relative activity level across all survey visits of 5.1B/h. Common pipistrelle was recorded during all of the survey visits, most frequently in May and August 2014. Activity was recorded across the entire transect (as illustrated on **Figure 14A8.14**) with no clearly identifiable areas of greater than average activity. A single pass, in May 2014, was recorded 10 minutes prior to sunset; a further four passes, in May and June 2014, were recorded in the 20 minutes after sunset. These passes were recorded along the northern edge of Kenton Hills and at the south-western corner of the transect. It was considered that these passes may represent one or more individuals emerging from Kenton Hills or adjacent habitat. A further three passes were recorded in the north-western corner of the transect in the hour before sunrise during the October 2014 dawn survey.

1.5.14 Soprano pipistrelle was the second most frequently recorded species, with a relative activity level of 3.6B/h. As with common pipistrelle, soprano pipistrelle was also recorded throughout the transect, during all survey visits between May and October 2014, with the greatest levels of activity recorded in May and June 2014. As illustrated on **Figure 14A8.15**, no clearly identifiable areas of greater than average recorded activity were apparent. Unlike common pipistrelle, no activity was recorded prior to sunset; however, two passes (June and July 2014) were recorded in the 20 minutes following sunset, at the south-western corner of the transect and along the western edge of Hilltop Covert. It was considered that these passes may represent one or more individuals emerging from woodland within Kenton Hills and Hilltop Covert or adjacent habitat. A further pass

was recorded, in the north-western corner of the transect, in the hour before sunrise during the October 2014 dawn survey.

1.5.15 Barbastelle were again the third most frequently recorded species across all survey visits, with a relative activity level of 1B/h. However, as was identified for the Campus transect, barbastelle activity was considerably lower than that for common and soprano pipistrelle. As for the Campus transect, the frequency of barbastelle passes was greatest during September 2014. Barbastelle activity was recorded throughout the majority of GRR transect route 3. No areas indicative of a congregation in barbastelle activity were identified, as illustrated on **Figure 14A8.16**. No barbastelle activity was recorded along the northern edge of Kenton Hills. Activity recorded during activity transects, which were themselves limited to 1.5 to 2.25 hours after sunset, was predominantly between one and two hours after sunset, with the earliest recorded barbastelle passes occurring at 49 and 59 minutes after sunset through the arable field to the west of Hilltop Covert.

1.5.16 Only a single Nathusius' pipistrelle pass was recorded on GRR transect route 3. The pass, occurring over two hours after sunset, was recorded in August 2014 in the south-western corner of the transect.

1.5.17 **Figure 14A8.17** illustrates the combined passes (13) recorded for bats that have been grouped together as "big bats", with "big bat" activity recorded in all survey months with the exception of October 2014. As for the Campus transect, this grouping accounts for passes identified as noctule (three passes), serotine (six passes), *Nyctalus* spp. (two passes) or "big bats" (two passes). All three noctule passes were recorded along the northern edge of Kenton Hills at 15, 19 and 26 minutes after sunset. Activity recorded for serotine, *Nyctalus* spp. and "big bats" occurred in the one to two hours following sunset. Serotine activity, although spread across the transect, was noted to show a slight grouping of activity on the Upper Abbey Farm bridleway at Fiscal Policy woodland; these three passes, illustrated on **Figure 14A8.17** and occurring within five minutes of each other, may indicate a single individual.

1.5.18 Passes identified as *Myotis* spp. were recorded only in August 2014, September and October (dusk only) 2014. As illustrated on **Figure 14A8.18**, activity occurred primarily along the northern edge of Kenton Hills. Of the nine recorded *Myotis* spp. passes, two were recorded in the 40 minutes after sunset.

1.5.19 No brown long-eared bat passes were recorded on GRR transect route 3. This absence of recorded passes may be an artefact of the quiet nature of

brown long-eared bat echolocation calls, which, as noted in **section 0**, may result in this species being under-recorded.

iii. Pillbox Field and Coronation Wood Transect

1.5.20 Activity transects at Pillbox Field and Coronation Wood were undertaken during September and October 2015.

1.5.21 At least six species were recorded during the activity transect surveys. Recorded relative activity was noticeably higher in September 2015 (28B/h) compared to October 2015 (8.6B/h), in part due to a 5°C temperature difference that was noted between the two surveys from 15.1°C in September 2015 to 10°C in October 2015.

1.5.22 As noted during previous activity surveys within the site, common pipistrelle were the most frequently encountered species (as determined by relative activity), with a relative activity level across both survey visits of 11.1B/h. Common pipistrelle were recorded during both survey visits, with a notably higher relative activity level recorded in September 2015 (18B/h) compared to October 2015 (5.1B/h). Activity was recorded across the majority of the transect, with the exception of the arable land within Pillbox Field. Common pipistrelle activity was particularly noted along the access road to Sizewell A and B power stations and the area of scrub to the west of Coronation Wood, as illustrated on **Figure 14A8.19**. A single pass, in October 2015, was recorded in the 20 minutes after sunset. This pass was recorded at the south-west corner of Coronation Wood. Although not observed, it is considered that this pass may have represented a bat emerging from Coronation Wood.

1.5.23 Soprano pipistrelle was the second most frequently recorded species over the course of both surveys, with a relative activity level of 2.5B/h, noticeably lower than the most frequently recorded species, common pipistrelle. However, this pattern was not reflected when the two transects were considered separately, with soprano pipistrelle the third most frequently recorded species during the October 2015 transects at (1.1B/h) with *Myotis* sp. recorded slightly more frequently at 1.7B/h. Soprano pipistrelle remained the second most frequently recorded species during the September 2015 transect at 4B/h. As illustrated on **Figure 14A8.19**, no clearly identifiable areas of greater than average recorded activity for soprano pipistrelle were apparent, although the species was noticeably absent from the arable land within Pillbox Field. No soprano pipistrelle passes were recorded within 20 minutes of sunset. It was considered, based on the timings of these recordings, that a number of passes recorded along the eastern boundary of Coronation Wood are likely to represent a single individual (see **Figure 14A8.19**).

1.5.24 Noctule was the third most frequently recorded species, with a relative activity level across both survey visits of 1.5B/h. Noctule activity was solely recorded during the September 2015 survey. Noctule activity was predominantly recorded along the eastern boundary of Coronation Wood, as illustrated on **Figure 14A8.19**. All passes were recorded over an hour after sunset. An additional two passes identified as *Nyctalus* spp. were recorded during the September 2015 transect and, as illustrated in **Figure 14A8.19**, were recorded along the eastern and southern boundaries of Coronation Wood.

1.5.25 The *Myotis* spp. group was the only classification to show increased relative activity levels during the October 2015 transect (1.7B/h) compared to the September 2015 transect (0.6B/h). As illustrated on **Figure 14A8.19**, *Myotis* spp. activity was notably the only activity recorded within Pillbox Field during either survey month, with a single pass recorded during each of the survey visits. Activity elsewhere along the transect was limited to the access road to Sizewell A and B power stations. All *Myotis* spp. passes, during both surveying months, were recorded in the last 30 minutes of the activity transect.

1.5.26 A single brown long-eared bat pass was recorded, over an hour after sunset, on the Pillbox Field and Coronation Wood transect. The pass was recorded in September 2015 in the scrub area to the west of Coronation Wood, as illustrated on **Figure 14A8.19**.

1.5.27 No barbastelle or Nathusius' pipistrelle passes were recorded on the Pillbox Field and Coronation Wood transects in September or October 2015.

c) Automated detector surveys

i. Campus site

1.5.28 Automated detector surveys at two locations on the temporary accommodation campus site were undertaken in August, September and October 2016. The locations of these monitoring points are illustrated on **Figure 14A8.2**.

1.5.29 During automated detector surveys across the EDF Energy estate in 2013 and 2014, those monitoring locations which the overall level of bat activity (i.e. the mppn for a single recording season from all species combined) exceeded 300mppn were classified as "bat hotspots". This threshold was not met at either monitoring location in 2016 during any survey period, with overall activity levels ranging from a high of 133.79mppn at Position A in August 2016 to a low of 25.21mppn at Position B in October 2016. Throughout surveying in 2016 Position B recorded consistently lower levels of activity compared to Position A. Position B recorded 74.42mppn in

August 2016 compared to 133.79mppn at Position A, 34.57mppn in September 2016, compared to 53.29mppn at Position A and 25.21mppn in October 2016, compared to 80.64mppn at Position A.

1.5.30 Barbastelle activity ranged from a high of 3.71mppn at Position B in October 2016 to a low of 0.57mppn at Position A in August 2016, indicating consistent low-level barbastelle activity. With the exception of Position B in September 2016 (6.4%) and October 2016 (14.73%), barbastelle activity accounted for less than 3% of the total recorded activity. Eleven barbastelle passes were recorded in the hour following sunset, two in August 2016 at Position B, three in September 2016 at Position B and seven in October 2016, two at Position A and five at Position B. The earliest recorded barbastelle pass was recorded 31 minutes after sunset.

1.5.31 *Myotis* spp. activity was recorded at consistent low levels throughout surveys in 2016, ranging from a high of 3.64mppn at Position A in September 2016 to a low of 2.00mppn at Position B in August 2016. Despite this consistency in the recorded mppn, *Myotis* spp. showed a greater degree of variation when considered as a proportion of the overall activity ranging from a high of 10.74% of the total activity at Position B in September 2016 to a low of 1.82% of the total activity at Position A in August 2016. Only two *Myotis* spp. passes were recorded in the hour after sunset. The passes, recorded on separate days, were recorded 58 minutes after sunset at Position A during the August 2016 survey.

1.5.32 “Big bat” activity was primarily recorded at only very low levels, with the mppn at both positions in September and October 2016 less than one. However, in August 2016 a significantly greater number of passes were recorded at Position B (20.74mppn) with a smaller but still noticeably greater number of passes also recorded at Position A (4.64mppn). During August 2016 44 passes were recorded at Position A and 82 passes at Position B within one hour of sunset with the earliest pass recorded 12 minutes after sunset at Position A. Although “big bats” species are known to be amongst the earlier emerging species (Ref. 1.18) this number of passes within the hour after sunset, corresponding with a spike in the overall level of “big bats” activity, may indicate the presence of a temporary roost in the vicinity of the site. A low number of “big bats” passes continued to be recorded in the hour after sunset at both positions during September 2016 (seven at Position A and five at Position B) and October 2016 (two at Position A and one at Position B) with the earliest passes recorded at 17 minutes after sunset (one at Position B in September 2016 and one at Position A in October 2016).

1.5.33 As a proportion of the overall recorded activity, with the exception of Position B in August 2016 (27.86%), "big bats" activity did not exceed 4% at any position during the 2016 survey period.

1.5.34 Nathusius' pipistrelle activity, while recorded in at both positions in all three survey months, did not exceed 1mppn, with a high of 0.64mppn recorded at Position A in September 2016. Similarly, as a proportion of the total recorded activity Nathusius' pipistrelle activity accounted for less than 2% on all occasions throughout 2016. A small number of passes were recorded in the hour after sunset in September 2016 (one at Position B) and October 2016 (two at Position A and five at Position B) with the earliest pass recorded 31 minutes after sunset at Position B in October 2016.

1.5.35 As noted across the EDF Energy estate common and soprano pipistrelle accounted for the majority of the recorded activity at Positions A and B in August 2016, September and October 2016. However, common and soprano pipistrelle, as a percentage of the overall level of activity were not shown to be as dominant as recorded at many of the monitoring stations on the EDF Energy estate. Common and soprano pipistrelle accounted for more than 90% of the overall activity on two occasions, in August and October 2016, on both occasions at Position A. In September 2016 at Position A common and soprano pipistrelle accounted for 84.58% of the total activity, while a consistently lower proportion of the activity at Position B (64.07% to 69.83%) was accounted for by these species. When measured as mppn common and soprano pipistrelle activity showed considerable variation with a high of 124.50mppn recorded at Position A in August 2016 while a low of 17.21mppn was recorded at Position B in October 2016.

1.5.36 As noted for barbastelle and *Myotis* spp. long-eared bats (considered to relate exclusively to brown long-eared bats[8]) recorded consistently low levels of activity ranging from a high of 3.07mppn at Position B in September 2016 to a low of 0.79mppn at Position A in October 2016. As a proportion of the overall level of activity long-eared bats accounted for less than 4% of the total activity, with the exception of Position B in September 2016 (8.88%) and Position B in October 2016 (5.10%). Five long-eared bat passes were recorded in the hour after sunset. All five were recorded during September 2016, with the earliest recorded at Position A 43 minutes after sunset.

[8] All long-eared bat recordings are considered to relate to brown long-eared bat echolocation calls due to the absence of grey long-eared bat from Suffolk based on their current known distribution. (Ref. 1.4 and Ref. 1.5)

ii. North of Lover's Lane site

d) [FURTHER DETAILS TO FOLLOW]

e) Building inspections

1.5.37 **Figure 14A8.6**, **Figure 14A8.7** and **Figure 14A8.8** illustrates the locations of the buildings surveyed during building inspections in 2015 and 2019.

i. Walk Barn

1.5.38 Only a single feature was noted at Walk Barn, which was a single-storey block construction building with an unlined corrugated asbestos roof. The feature, a gap approximately 450mm wide by 100mm high, was located on the northern side of the building, was, however, considered to be of no potential to support roosting bats due to the open apex channel and unlined roof.

ii. Plantation Cottages

1.5.39 Plantation Cottages, two semi-detached Victorian cottages at the northern end of the EDF Energy estate, were found to be in good repair providing limited features suitable for use by bats. A low-potential access point was noted via a small section of lead flashing that was raised to allow for mains electric access at the south-eastern corner of the chimney stack. A further small gap of approximately 30mm by 30mm, where the soffit meets the wall, was noted at the south-eastern corner of No. 7 Plantation Cottages. This gap was found to lead to a void within the well-ventilated soffit.

iii. Laboratory

1.5.40 The Laboratory off Lovers Lane, consisting of a single-storey brick building with a pitched copper-clad roof with roof vents, was found to be in good condition providing limited features suitable for bats. An approximately 50mm hole underneath the soffit on the southern side of the building was identified as a low-potential access point. No evidence of current use of the hole as an access point for bats was identified.

iv. Ash Wood Cottages

1.5.41 Ash Wood Cottages consists of two attached properties, 5 Ash Wood Cottages (an occupied property) and 6 Ash Wood Cottages (an unoccupied property). Both properties are Victorian two storey double fronted brick cottages with a pitted pantile roof. A single chimney is present and a single storey extension with a pitched pantile roof is present at the rear of the property.

1.5.42 Previous surveys of Ash Wood Cottages identified its use as a brown long-eared bat maternity roost. The external surveys undertaken in April 2015 found no evidence of current occupation by bats, although a number of potential access points were identified.

1.5.43 A gap, located between brickwork and the back edge of the soffit at the front left dormer window, was identified as a high potential bat access point. Depending upon the internal structure, it was considered that this gap may enable access to the roof void. Further potential access points for bats were identified, as follows: loose tiles on the western aspect of the roof of the main building leading to a void between the tiles and boarding (medium to high potential); a rotten section of soffit at the north-eastern corner of the extension at the rear of the main building leading into the roof void (medium potential); and a broken tile on the north-western side of the extension building leading to a void between the tiles and boarding (low potential).

1.5.44 An update to this assessment was undertaken in April (external) and May (internal) 2019. During this survey it was identified that repair work had occurred since the last survey, including the re-roofing of 5 and 6 Ash Wood Cottages and associated porches such that the previously identified features in these locations were no longer present. In several locations on the roof of both buildings v-shaped vents which appeared to have been created from lead flashing were present. It was assumed that these were intended to provide access to the loft space for bats; however, it was not possible to confirm such access from the ground. In addition, the soffit box had been replaced with polyvinyl chloride (PVC) on the rear extension such that the feature previously identified in this location was no longer present. All remaining features identified during the 2015 surveys were found to still be present. In addition to these features, four gaps were identified at the bottom edge of the pantiles on the rear extension where the mortar had dropped out. These gaps lead to a space between the tiles and boarding, although no signs of current use by bats were observed.

1.5.45 During internal inspections a group of at least 20 brown long-eared bats were observed at the apex of the roof within the loft space of 5 Ash Wood Cottages along with a large number of droppings of various ages. DNA analysis of these droppings confirmed the presence of brown long-eared bats. The internal inspection of 6 Ash Wood Cottages also identified a large number of droppings of various ages which were identified through DNA analysis as brown long-eared bat droppings, although no bats were present at the time of inspection. Both loft spaces were open with a pitched roof and bitumen lining. Several holes in this lining were identified within the loft space of 6 Ash Wood Cottage.

v. Lower Abbey Farm

1.5.46 Building inspections at Lower Abbey Farm included the main farmhouse building and twelve associated outbuildings. **Table 1.29** provides details of the results of building inspections undertaken in 2015 and 2019. The location of each building is shown on **Figure 14A8.6**, **Figure 14A8.7** and **Figure 14A8.8**.

Table 1.29: Results of 2015 and 2019 building inspections at Lower Abbey Farm

Building Number	Description	2015 Inspection Results (21/04/2015)	2015 Roost Suitability Assessment	2019 Inspection Results (30/04/2019 – External & 08/05/2019 – Internal (Where Health and Safety Allowed))	2019 Roost Suitability Assessment
1	Large timber framed barn with corrugated tin roof.	Access points via holes in roof and windows. Appears fairly dark inside. No internal access for health and safety reasons.	Moderate/High	Replaced cladding has reduced the number of potential access points though access still possible via gaps in the roof and between the cladding and brickwork. Replaced cladding may increase suitability by making the interior darker and more weatherproof. No internal access due to health and safety reasons. Barn owls observed using barn via access point on eastern side leading either to interior or internally attached barn owl box.	High
2	Main section has brick base and timber cladding on northern side with corrugated tin roof. Lean to extension on east side with timber and tin cladding and pantile roof. Brick barn attached on southern side with pantile roof and open on west side.	Multiple access points via open/broken windows and doors and missing tiles. Interior very open and airy.	Low	Cladding and plywood have blocked the window and door access points identified in 2015. Access still possible via missing roof tiles and at the eaves. The addition of cladding and plywood have increased the suitability of the interior making it darker and more weatherproof.	Moderate
2a	Open sided brick stalls with tiled roof.	Access via open sides. Structure used by goats and geese and very light and airy.	None/Low	No change since 2015.	None/Low
3	Open sided shed/stable with corrugated asbestos cladding and steel frame.	-	None/Low	Structure is open with no suitable features.	Negligible

Building Number	Description	2015 Inspection Results (21/04/2015)	2015 Roost Suitability Assessment	2019 Inspection Results (30/04/2019 – External & 08/05/2019 – Internal (Where Health and Safety Allowed))	2019 Roost Suitability Assessment
4	Single storey breezeblock stable with unlined corrugated asbestos cement roofing sheets.	Multiple access points via the doors and roofing ridges but very open and airy.	None/Low	No change since 2015.	Negligible
5	Single storey barn with unlined pitched asbestos cement roof.	Access via open windows and doors but light and airy.	None/Low	No change since 2015.	Negligible
6	Timber-framed barn. Old frame with new cladding on eastern side, northern gable end and upper half of western side.	Open access on western side at ground level with three dividing sets of timber frames. A potentially boxed in section is present at the northern end.	Not available	Potential access points at eaves on western edge. A short section of missing roofing at the southern edge and midway along the western aspect of the roof pitch provide access to the interior. Much of interior will be light due to skylights but the boxed in section at the northern end would be more suitable for bats.	Moderate
7	Single storey brick farm stalls with pantile roof.	Many potential access points identified including extensive gaps in soffits and slipped pantiles but the interior may be too light and airy for bats.	Not available	A number of low suitability features as identified in 2015. Internally the structure is completely unlined, and some parts are clearly well used. Close inspection (internal and external) of some parts of this complex of outbuildings was not possible for health and safety reasons.	Low
8	Breezeblock milking shed with corrugated asbestos cladding and roofing.	Multiple access points via open doors and missing tiles but very light and airy inside.	None/Low	No change since 2015.	None/Low
9	Single storey brick shed with pantile roof lined with felt.	Structure in good condition. Potential for single pipistrelle bats to roost under tiles.	Very Low	Externally no change since 2015. Internally no droppings were found, and no obvious access points were identified.	Very Low
10	Single storey brick farm stalls	Many potential access points identified	Not available	A number of low suitability features as identified in	Low

Building Number	Description	2015 Inspection Results (21/04/2015)	2015 Roost Suitability Assessment	2019 Inspection Results (30/04/2019 – External & 08/05/2019 – Internal (Where Health and Safety Allowed))	2019 Roost Suitability Assessment
	with pantile roof.	including extensive gaps in soffits and slipped pantiles but the interior may be too light and airy for bats.		2015. Internally the structure is completely unlined, and some parts are clearly well used. Close inspection (internal and external) of some parts of this complex of outbuildings was not possible for health and safety reasons. Possible feeding remains and very deteriorated droppings were found near the gable end wall but identification through DNA analysis was not possible due to contamination.	
11	Three storey brick farmhouse with pitched tiled roof and larger dormer windows in roof on third storey.	On the southern aspect extensive gaps were identified on the soffit box leading to a large void in the roof, a small gaps was present between the lintel and brickwork of the first floor left-hand window potentially leading to a void, a small rot hole was present in side of the soffit where it ties into the roof on the left hand side of the right hand side dormer window and the soffit around the left hand side dormer window ended short of the main roof leaving a gap partially obscured by straw. On the western aspect a hanging soffit board on the underside of the soffit provided access to the soffit void. At the north-eastern corner a small gap in the soffit and a small gap in the facia	High	On the southern aspect gaps in the soffit and between the lintel and brickwork had been repaired baring a small purposely left gap in each location, with no evidence of use by bats. The remaining features on the southern aspect were unchanged since 2015. The feature on the western aspect had been repaired and was no longer present. The features on the north-east corner were unchanged since 2015. The features on the kitchen extension were still present. Bird mesh had been added but gaps in this meshing were identified. New features were identified with raised lead flashing in a number of locations around the left-hand dormer window on the southern aspect and gaps at the lower edge of roof tiles on the northern aspect.	Confirmed roost – brown long-eared bat (from droppings)

Building Number	Description	2015 Inspection Results (21/04/2015)	2015 Roost Suitability Assessment	2019 Inspection Results (30/04/2019 – External & 08/05/2019 – Internal (Where Health and Safety Allowed))	2019 Roost Suitability Assessment
		board under the guttering provided access to the soffit void and potentially into the roof space. On the kitchen extension at the rear of the property several gaps in the lower edge of the roof tiles provided access to the roof void between the tiles and felt.		Internal inspection found the central loft section to have been converted but scattered droppings were found throughout unconverted sections in the eaves. DNA analysis of droppings identified brown long-eared bat. No gaps in the internal brickwork or wooden beam frames were identified.	
12	Single storey brick outhouse with two stalls and sloping pantile roof.	No obvious bat roost locations or access into suitable roost locations.	Low	No evidence of bats with any possible features congested and very webby.	Negligible

vi. Upper Abbey Farm

1.5.47 Building inspections at Upper Abbey Farm included the main farmhouse building and ten associated outbuildings. **Table 1.30** provides details of the results of building inspections undertaken in 2015 and 2019. The location of each building is shown on **Figure 14A8.6**, **Figure 14A8.7** and **Figure 14A8.8**.

Table 1.30: Results of 2015 and 2019 building inspections at Upper Abbey Farm

Building Number	Description	2015 Inspection Results (21/04/2015)	2015 Roost Suitability Assessment	2019 Inspection Results (30/04/2019 – External & Internal (Where Health and Safety Allowed))	2019 Roost Suitability Assessment
1	Large timber barn with thatched roof and weatherboarding.	Multiple access points due to loose weatherboarding leading to barn interior which appears fark and well insulated. Multiple potential internal roosting sites including within timber frame joints. Gaps behind the lower edge of re-clad weatherboards on the northern side leading to space between cladding and felt with no signs of current occupation and obscured by vegetation. A few potential droppings were identified on the cladding at the eastern edge but not possible to collect these for DNA analysis. Bat box attached to north-east side with no signs of current occupation and observed by vegetation.	High	Access points due to loose weatherboarding still present as detailed in 2015. Gaps behind the lower edge of the re-clad weatherboarding are still present but vegetation has been removed making these more accessible. Gaps on eastern aspect as identified in 2015. Bat box still present and vegetation has been removed making it more accessible. Internally potential roost sites were still present as detailed in 2015 with a small number (10-20) of droppings present. DNA analysis identified these droppings as those of brown long-eared bat. New features were identified consisting of a gap in the corrugated asbestos roofing on the northern aspect and gaps at the base of weatherboarding on the northern aspect allowing direct internal access.	Confirmed roost – brown long-eared bat (from droppings)
2	Modern barn/workshop with steel frame and corrugated steel doors.	No features suitable for bats.	None	No change since 2015.	None
3	Open sided barn with timber frame, tin cladding on the northern side and a tin roof.	Limited roosting opportunities within the timber frame. Very light and airy. Barn owl box with no signs of current occupation.	Low	No change since 2015.	Negligible/Low
4	Open sided barn almost	Inaccessible to survey due to health and	Very Low	No change since 2015.	Very Low

Building Number	Description	2015 Inspection Results (21/04/2015)	2015 Roost Suitability Assessment	2019 Inspection Results (30/04/2019 – External & Internal (Where Health and Safety Allowed))	2019 Roost Suitability Assessment
	completely collapsed leaving a brick and stone wall on one side, a timber frame and pantile roof.	safety and heras fencing. Suitability derived from visual inspection from a distance.			
5	Brick and timber clad open sided barn.	Multiple low to medium suitability features internally within the timber joints. High suitability for roosting bats within the fully enclosed and weatherproof upper floor accessible via access hole cut into boarded northern gable end though no signs of current occupation from the ground. A 2m square of slipped/missing tiles on the western aspect of the roof with an associated gap in roofing felt leading to void.	High	Features identified in 2015 still present with no change barring increased vegetation growth on the western side. New features identified including missing brickwork on either side of the northern and southern aspects although vegetation cover is present and small gaps around the doorways and letter box slot on the eastern aspect.	High
6	Single storey brick store/shed with pitched pantile roof.	Small gap at the northern end below the gutter leading to the loft void above the ceiling but via a long and narrow channel. Several gaps were also identified between rafters along the back edge leading to the loft void above the ceiling. No evidence of current use.	High	No change since 2015 barring increased vegetation growth on the western side.	High
7	Open sided barn with brick/stone walls and corrugated asbestos sheet roof.	In good condition, recently re-felted and fairly light. Little in the way of suitable roosting sites and access to the open side partially obscured by dense elder.	Low	No change since 2015.	Low

Building Number	Description	2015 Inspection Results (21/04/2015)	2015 Roost Suitability Assessment	2019 Inspection Results (30/04/2019 – External & Internal (Where Health and Safety Allowed))	2019 Roost Suitability Assessment
8	Large open, ventilated, barn with timber frame.	Small gaps between each vertical wooden slate at southern end.	None	No change since 2015.	Negligible
9	Single storey brick and pantile barn extension to the rear of Building 10.	Access gaps between rafters beneath felt all around the building. An area of slipped tiles on the southern side allowing access to void between tiles and felt. Gap below felt leading to the interior of the building.	None	Access gaps between the rafters and below felt show no change since 2015. Tiles on the southern side have been repaired and the feature was no longer present. A small number of droppings were found below the ridge beam. DNA analysis identified brown long-eared bat.	Confirmed roost – brown long-eared bat (from
10	Two storey brick and pantile farm building with pitched pantile roof.	Gap at rafter all around the building. A low suitability gap due to missing mortar between bricks on the eastern side above the front door and a medium suitability gap in the lower edge of the 2nd floor hatch/door on the eastern side.	Moderate	Gap at the rafter and around the 2nd floor hatch show no change since 2015. Gap in the missing mortar as identified in 2015 with the additional of a small gap in the lower northern side of the hatch and a gap in the lower southern side of the associated lintel. A large number of droppings of various ages were found beneath the ridge beam. DNA analysis identified brown long-eared bat.	Confirmed roost – brown long-eared bat (from droppings)
11	Large brick building farmhouse building.	In semi-derelict condition enclosed in scaffolding preventing detailed inspection. Multiple access points on northern wing including raised tiles and a gap in the soffit. High suitability gap at apex of the northern gable under the soffit and several areas of broken/slipped tiles potentially allowing access to roof void.	High	Newly renovated with the exception of the northern wing although the roof and dormer windows in this location show signs of repair. Basement still has sign indicating the presence of bats with a letter box style access point. Gaps identified in the mortar on ridge tiles on northern, southern and eastern aspects which appear to have been purposely installed, possibly	High

Building Number	Description	2015 Inspection Results (21/04/2015)	2015 Roost Suitability Assessment	2019 Inspection Results (30/04/2019 – External & Internal (Where Health and Safety Allowed))	2019 Roost Suitability Assessment
		A sign on the basement door identified the presence of bats. Derelict "outhouse" with multiple access points in brick/stonework.		to allow for bat access. Additional gaps were present above the dormer window on the western aspect, behind the facia on the eastern gable end, between guttering and decorative brickwork on southern aspect and between the facia and brickwork at the north-eastern corner of the chimney. A small number of slightly raised tiles were present on the eastern aspect of an unrenovated section of the building and raised lead flashing was present above the guttering on the eastern aspect. The outbuilding had been replaced with a brick shed in good condition with no suitability.	

f) Emergence/Re-entry surveys

i. Ash Wood Cottages

1.5.48 Three emergence/re-entry surveys were undertaken at Ash Wood Cottages between May and July 2019.The results of these surveys are detailed in **Table 1.31**.

1.5.49 As detailed in **Table 1.31** emerging bats were found to either not echolocation on emergence or for the level of additional activity from foraging and/or commuting bats in the area to hamper the definitive identification of those bats emerging. However, brown long-eared bat was recorded on all three survey occasions and due to the confirmed presence of brown long-eared bat within these properties during internal building inspections it is considered reasonable to presume that emerging bats on these survey occasions were brown long-eared bat individuals.

Table 1.31: Results of 2019 emergence/re-entry surveys at Ash Wood Cottages

Survey Date	Survey Period	Weather Conditions	Emergence/Re-entry Activity	Other Activity
16/05/2019 (Dusk).	20:28 – 22:44	Start: Dry, moderate breeze, clear skies, 11ºC. End: Dry, moderate breeze, overcast, 11ºC.	Between four and eight bats were observed emerging from around the southern aspect of the chimney. It was not possible to definitively confirm the species of emerging bats due to the levels of other bat activity (foraging/commuting) in the area.	Soprano pipistrelle, common pipistrelle, noctule, brown long-eared bat and big bat spp. recorded.
06/06/2019 (Dusk).	20:50 – 22:50	Start: Dry, light breeze, 1/8 cloud, 13ºC. End: Dry, light breeze, clear skies.	Seven emergence points identified, with none of the emerging bats recorded echolocating. Thirteen bats from the main ridge to the west of the chimney. Three bats from the main ridge to the east of the chimney. One bat from loose tile on southern roof aspect. One bat from raised lead flashing of south-western hip ridge. Two bats from eaves of western aspect towards northern end. Six bats from raised lead flashing of north-western hip ridge on western aspect. Six bats from between the guttering and pipe work.	Reduced foraging activity compared to the previous survey with low levels of common pipistrelle, soprano pipistrelle and brown long-eared bat activity.
02/07/2019 (Dawn).	02:37 – 04:53	Start: Dry, still, clear skies, 8ºC. End: Dry, light breeze, clear skies, 10ºC.	No confirmed re-entries. High activity levels around the buildings, particularly the chimneys, with two to five bats seen at any one time. Considered by surveyors likely that re-entries occurred but this could not be visually confirmed.	Common pipistrelle, soprano pipistrelle, brown long-eared bat, barbastelle, *Nyctalus* spp, possible serotine and serotine/brown long-eared bat activity recorded.

ii. Lower Abbey Farm

1.5.50 Between one and three emergence/re-entry surveys were undertaken for buildings at Lower Abbey Farm dependent on the bat roost suitability level assigned in accordance with Bat Conservation Trust (BCT) bat survey guidelines (Ref. 1.18). Surveys were undertaken between April and July 2019. The results of these surveys are detailed in **Table 1.32**.

Table 1.32: Results of 2019 emergence/re-entry surveys at Lower Abbey Farm

Building Number(s)	Survey Date	Survey Period	Weather Conditions	Emergence/Re-entry Activity	Other Activity
1, 2 and 2a*.	29/04/2019 (Dusk).	20:13 – 22:15	Start: Dry, still, 10% cloud, 12ºC. End: Dry, still, 20% cloud, 8.4ºC.	No bats were recorded emerging. Foraging activity was recorded in the southern courtyard area and along the western side of Building 2a. Activity on the eastern side of Building 2 primarily consisted of single commuting passes.	Barn owls were observed in the vicinity with one individual emerging from Building 2.
	07/06/2019 (Dawn).	02:38 – 04:34	Start: Dry, clear, light breeze, 12ºC. End: Dry, 40% cloud, light breeze, 9ºC.	**Building 1** – One bat was recorded re-entering the building at the north-eastern corner. Due to the absence of echolocation calls species identified was not possible. A further possible re-entry was recorded in the south-easterly corner but not recorded. **Building 2** - One bat recorded emerging from the open southern end of the building (used as bike shed) as surveyors arrived on site. A large gap was noted between the bike shed section and the main part of Building 2 though which surveyors could hear bats assumed to be flying within Building 2. A further two bats were thought likely to have entered the open section of Building 2 but was not visually confirmed. One bat was observed re-entering at the northern end of the eastern aspect of Building 2, a further two bats were observed attempting to enter Building 2 but were prevented from doing so by heras fencing. **Building 2a** – No bats were observed re-entering the building.	Common pipistrelle were the only species recorded during this survey. Barn owls were observed in the vicinity during the survey re-entering/emerging the building on several occasions.
	02/07/2019 (Dusk).	21:05 – 23:15	Start: Dry, still, 40% cloud, 17ºC. End: Dry, still, clear skies.	The probable emergence of a single common pipistrelle was observed at the north-eastern corner of Building 1.	Low levels of common pipistrelle and soprano pipistrelle activity were recorded. Barn owls were observed in the vicinity during the survey.

Building Number(s)	Survey Date	Survey Period	Weather Conditions	Emergence/Re-entry Activity	Other Activity
6	02/05/2019 (Dawn).	03:27 – 05:37	Start: Dry, still, overcast, 9.9ºC. End: Dry though light drizzle at times during survey, overcast, light breeze, 10.7ºC.	No re-entry activity was recorded.	Low level intermittent activity was recorded for common pipistrelle, *Myotis* spp. and Big Bat spp.
	04/06/2019 (Dusk).	20:45 – 22:53	Start: Dry, light breeze, 90% cloud, 14ºC. End: Dry though occasional drizzle during the survey, 50% cloud.	One bat was observed emerging from the north-west corner of the building and a further possible emergence was observed from the western side of the building. No echolocation call recordings were made.	Low level, intermittent activity was recorded with only a single echolocation call recorded (soprano pipistrelle).
7 & 10	01/05/2019 (Dusk).	20:16 – 22:18	Start: dry, light breeze, 5% cloud, 7.7ºC. End: Dry, still, 70% cloud, 8.1ºC.	No confirmed emergences were recorded. Due to health and safety related access restrictions it was not possible to fully cover all aspects of these buildings and therefore the exact nature of some bat activity could not be confirmed as such it is considered possible that roosting bats could be using some aspects of these buildings.	Low level, intermittent activity was recorded for common pipistrelle, soprano pipistrelle and Big Bat spp.
8	13/06/2019 (Dawn).	02:33 – 04:47	Start: Dry, still, 50% cloud, 14.1ºC. End: Dry, still, 40% cloud, 10.7ºC.	A single common pipistrelle was observed re-entering the building on the western side between the asbestos sheeting and breezeblock wall.	Intermittent foraging activity was recorded throughout the survey including activity from common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle and noctule.
	04/07/2019 (Dusk).	21:02 – 23:17	Start: Dry, overcast, 20ºC. End:75% cloud.	A single common pipistrelle was observed emerging from the north-western corner of the building with a further two probable emergences recorded at this location.	Low level activity recorded from common pipistrelle.

Building Number(s)	Survey Date	Survey Period	Weather Conditions	Emergence/Re-entry Activity	Other Activity
9	04/07/2019 (Dusk).	21:02 – 23:17	Start: Dry, overcast, 20ºC. End:75% cloud.	No emergences recorded.	Low level activity recorded from common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle and possible *Myotis* spp.
11	30/04/2019 (Dusk).	20:07 – 22:17	Start: Dry, still, 5% cloud, 13ºC. End: Dry, still, clear skies, 4.5ºC.	12-14 bats were recorded emerging from the south-eastern corner of the chimney. No echolocation calls were recorded for these bats due to the distance of the surveyors from the emergence point/the bats not echolocating on emergence.	Foraging activity from common pipistrelle and soprano pipistrelle was also recorded.
	04/06/2019 (Dawn).	02:59 – 04:38	Start: Dry, overcast, light breeze. End: Dry, still, 60% cloud.	Two confirmed bat re-entries were recorded consisting of one bat re-entering under a roof tile on the western roof elevation and one bat re-entering on the western, ivy covered, aspect of the building. A further three possible re-entries were recorded including one bat possibly re-entering on the western side of the south facing dormer windows, one bat possibly re-entering under the roof tiles on the north-east side of the building and one bat possibly re-entering on the ivy-covered western aspect. In addition, multiple possible re-entries were noted around the chimney though numbers could not be confirmed. No echolocation calls could be definitively assigned to re-entering bats, rather than those foraging in the area, due to levels of activity.	Additional activity was dominated by common pipistrelle with individual passes by soprano pipistrelle and Nathusius' pipistrelle also recorded.
	01/07/2019 (Dusk).	21:08 – 23:18	Start: Dry, calm breeze, 50% cloud. End: Dry, still, clear skies.	Seventeen bats confirmed emerging from the base of the chimney and roof tiles to approximately halfway down the roof on the northern side. None of the emerging bats were echolocating. A further two possible emergences were recorded at this location.	Foraging and commuting activity from common pipistrelle, soprano pipistrelle, Nathuisus' pipistrelle and Big Bat spp. was also recorded.

Building Number(s)	Survey Date	Survey Period	Weather Conditions	Emergence/Re-entry Activity	Other Activity
				An additional two possible emergences were recorded from the dormer windows on the southern side.	

**Due to the positioning of these buildings all three were surveyed simultaneously. As such Buildings 2 and 2a received greater survey effort than prescribed by BCT bat survey guidelines given their assigned roost suitability to ensure that Building 1 was received the required number of survey visits.*

iii. Upper Abbey Farm

1.5.51 Between one and three emergence/re-entry surveys were undertaken for buildings at Upper Abbey Farm dependent on the bat roost suitability level assigned in accordance with BCT bat survey guidelines (Ref. 1.18). Surveys were undertaken between April and July 2019. The results of these surveys are detailed in **Table 1.33**.

Table 1.33: Results of 2019 emergence/re-entry surveys at Upper Abbey Farm

Building Number(s)	Survey Date	Survey Period	Weather Conditions	Emergence/Re-entry Activity	Other Activity
1	02/05/2019 (Dusk).	20:13 – 22:20	Start: dry, still to light breeze, 90% cloud, 11.4ºC. End: dry, still to light breeze, 10% cloud, 2ºC.	Three common pipistrelles and one soprano pipistrelle emerged from the eastern aspect of the building. The three common pipistrelles emerged from the top of the east-facing gable end and the single soprano pipistrelle emerged from a gap on the southern side of the eastern aspect.	Considerable foraging activity was recorded on the eastern side primarily from common pipistrelle and soprano pipistrelle. Activity elsewhere was notably lower. Noctule was also recorded.
	12/06/2019 (Dawn).	02:43 – 04:47	Start: dry, still, 100% cloud, 15.4ºC. End: dry, still, 100% cloud, 12.2ºC.	Two common pipistrelles were recorded re-entering, one at the top of the eastern gable end and one from under the eaves on the southern side of the building. One common or soprano pipistrelle bat (both were simultaneously recorded) was observed re-entering under the weatherboarding on the eastern aspect. Two bats of unknown species (due to the absence of echolocation at the time of entering) were observed re-entering at the top of the roof apex on the eastern gable end.	Considerable foraging activity was recorded from common pipistrelle, soprano pipistrelle and brown long-eared bats.
	08/07/2019 (Dusk).	21:10 – 23:13	Start: dry, 16ºC. End: dry, still, 100% cloud, 14ºC.	One common pipistrelle was recorded emerging from large gaps in the weatherboarding on the eastern aspect. One soprano pipistrelle was recorded emerging from between the weatherboarding on the south-eastern corner. A bat of unknown species (due to the absence of echolocation calls) was observed potentially emerging from the western aspect of the building.	Foraging and commuting activity was comparable to previous surveys and primarily consisted of common pipistrelle and soprano pipistrelle. *Myotis* spp. passes were also recorded.

Building Number(s)	Survey Date	Survey Period	Weather Conditions	Emergence/Re-entry Activity	Other Activity
3	09/07/2019 (Dusk).	20:59 – 23:02	Start: dry, still, 100% cloud, 15ºC. End: dry, light breeze, 100% cloud, 15ºC.	No emergences were recorded.	Intermittent foraging and commuting activity was recorded from common pipistrelle, soprano pipistrelle, noctule, serotine and big bat spp.
4				No emergences were recorded.	Intermittent foraging and commuting activity was recorded from common pipistrelle, soprano pipistrelle and serotine.
5	08/05/2019 (Dusk).	20:40 – 21:50*	Start: light rain. End: heavy rain.	No emergences were recorded.	Sporadic periods of continuous foraging were recorded on the western side of the building from common pipistrelle.
	03/07/2019 (Dusk).	21:02 – 23:17	Start: still, 10% cloud. End: calm breeze, clear skies.	No emergences were recorded.	Regular foraging activity, with occasional commuting passes was recorded from common pipistrelle, soprano pipistrelle and noctule.
	09/07/2019 (Dawn).	02:45 – 04:58	Start: dry, still, 100% cloud, 12ºC. End: dry, still, 100% cloud, 11ºC.	Two bats of unknown species were observed re-entering the building. One (not recorded but considered likely to have been a *Pipistrellus* spp. bat by the surveyor) emerged at the south-eastern corner of the building while the other bat was recorded emerging from the northern aspect of the building.	Intermittent foraging activity from a small number of bats was recorded, including activity from common pipistrelle, soprano pipistrelle and possible brown long-eared bats.

Building Number(s)	Survey Date	Survey Period	Weather Conditions	Emergence/Re-entry Activity	Other Activity
6	09/05/2019 (Dawn).	03:09 – 05:09	Start: dry, light breeze, 75% cloud. End: 100% cloud, dry but appears likely to start raining.	No emergences were recorded.	No bat activity recorded.
	11/06/2019 (Dusk).	20:59 – 23:14	Start: dry, still to light breeze, 60% cloud, 17.6ºC. End: dry, still to light breeze, 100% cloud, 13.5ºC.	No emergences were recorded.	Very low levels of foraging and commuting activity recorded from common pipistrelle, soprano pipistrelle and noctule.
	11/07/2019 (Dusk).	21:00 – 23:00	Start: dry, light wind, 40% cloud, 21ºC. End: dry, still, 18ºC.	No emergences were recorded.	Intermitted foraging and commuting activity recorded from common pipistrelle, noctule, big bat and *Myotis* spp.
7	09/05/2019 (Dawn).	03:09 – 05:09	Start: dry, light breeze, 75% cloud. End: 100% cloud, dry but appears likely to start raining.	No emergences were recorded.	No bat activity.

Building Number(s)	Survey Date	Survey Period	Weather Conditions	Emergence/Re-entry Activity	Other Activity
9 & 10	07/05/2019 (Dusk).	20:20 – 22:00	Not provided.	No emergences were recorded.	Regular foraging activity, primarily from the garden of Building 11 heard, including common pipistrelle, soprano pipistrelle and noctule activity.
	11/06/2019 (Dawn).	02:34 – 04:48	Start: dry, still, 100% cloud, 13ºC. End: dry, still, 100% cloud, 12ºC.	One brown long-eared bat and one bat of unknown species (due to the absence of echolocation calls on re-entry) were observed re-entering Building 10 around the hayloft door at the southern end of the eastern aspect of the building.	Foraging and occasional commuting activity was recorded from common pipistrelle, soprano pipistrelle, brown long-eared bat and noctule.
	10/07/2019 (Dusk).	20:58 – 23:12	Start: dry, still, 100% cloud. End: dry, still, 100% cloud, 18ºC.	No emergences were recorded.	Periods of consistent foraging activity were recorded including common pipistrelle, soprano pipistrelle and *Myotis* spp. passes.
11	09/05/2019 (Dusk).	20:20 – 22:12	Start: intermittent showers, 8ºC. End: light rain.	No emergences were recorded.	Common pipistrelle, soprano pipistrelle and noctule activity was recorded.
	13/06/2019 (Dusk).	21:04 – 23:15	Start: dry, moderate wind, 100% cloud, 13ºC. End: dry, light to moderate breeze, 100% cloud, 14ºC.	On the eastern aspect of the building the possible emergence of a single soprano pipistrelle from the roof was observed. On the south-eastern corner of the building a single common pipistrelle was observed emerging from the soffit box. On the southern side of the building a single common	Comparatively high levels of foraging activity, and occasional commuting passes were recorded from common pipistrelle, soprano pipistrelle, noctule, brown long-eared bat, serotine and *Nyctalus*

Building Number(s)	Survey Date	Survey Period	Weather Conditions	Emergence/Re-entry Activity	Other Activity
				pipistrelle was recorded emerging from the upper left-hand side of the main door frame.	spp.
	11/07/2019 (Dawn).	02:45 – 04:57	Start: dry, still, 50% cloud. End: dry, still, 20% cloud, 15ºC.	Two common pipistrelles and one non-echolocating bat were observed re-entering the building at the top of the roofline between the two chimneys.	Low levels of foraging activity were recorded from common pipistrelle, soprano pipistrelle, possible serotine and possible brown long-eared bats.

**Survey finished early due to heavy rain.*

g) Tree assessments

1.5.52 **Table 1.34** details the results of the tree assessments undertaken by Arcadis in 2015 within areas of the site that were not surveyed by Wood Group during tree assessments in 2007, 2009 or 2010, and the results of tree assessments undertaken by Arcadis in 2019 within an area of land between Abbey Road and the Fiscal Policy car park to the north of Lover's Lane. Only those trees assessed as of moderate or greater suitability for roosting bats as listed.

1.5.53 **Figure 14A8.5** illustrates the locations and results of bat tree assessment surveys in 2015 and 2019.

Table 1.34: Summary of results of tree assessments for bat roost potential in 2015 and 2019

Area/Location	Grid Reference	Tree Species	Description of Feature	Suitability of Feature	Additional Comments
Within a group of trees in the centre of an arable field to the north-west of Upper Abbey Farm.	TM 45188 64803	Pedunculate Oak	Several dead spurs with 'rams-horning' occurring. Partially occluded bark forming several cavities on east side of stem. Main cavity at 3.5 to 4m high.	Moderate	Tag 0537 Multi-stemmed from 2.5m with significant dead wood in crown. Dead co-dominate stem on east side. Dead and missing bark on east side of main stem.
Within a group of trees in the centre of an arable field to the north-west of Upper Abbey Farm.	TM 45176 64804	Mature Pedunculate Oak	Dense mat of ivy with foliage out to 1m from oak stem.	Low/ Moderate	Tag 0352.
Treeline to the north of Upper Abbey Farm.	TM 45243 64779	Dead Pedunculate Oak	Multiple splits in dead wood and cavity (knot hole) at 7m on south side.	High	Tag 0491 Bark missing from 80% of tree with deteriorating and loose bark on the remainder.
Treeline to the north of Upper Abbey Farm.	TM 45232 64739	Mature Pedunculate Oak	Delaminated and lifted bark from primary limb on west side of co-dominant stem at 7.5m high. Area of loose/lifted bark extends from stem to appro14A8. 2.5m along limb. Large partially occluded tear off wound (120mm by 200mm diameter) on lower west primary limb at 6m, partially occluded with shallow cavity. Small amount of delaminated and lifted bark on	Moderate	Barn owl box at 3m high on east side of main stem.

Area/Location	Grid Reference	Tree Species	Description of Feature	Suitability of Feature	Additional Comments
			secondary limb on south-eastern side of main stem at 9m.		
Treeline between Black Walks and Ash Wood.	TM 46076 65278	Mature Scots Pine	Large hazard beam feature in south co-dominant steam c. 12m high – 1m long split in underside extends through top of stem in places.	High	Multi stemmed at 10m high.
			Split c. 20mm wide in north-west co-dominant stem c. 11-13m high. Partially occluded extending into stem.	High	
Treeline between Black Walks and Ash Wood.	TM 46076 65278	Mature Scots Pine	Several small downwards facing pockets within partially occluded wound on hazard beam on underside of secondary limb at 10m high.	Moderate	Single stem.
Treeline between Black Walks and Ash Wood.	TM 46061 65292	Standing dead Scots Pine	Cavity (c. 50mm x 80mm) in tear out wound of blown out limb in dead south-west primary limb at 12m, extending in and upwards, facing west.	High	
Treeline between Black Walks and Ash Wood.	TM 46061 65303	Mature Scots Pine	Narrow chimney void (c. 120mm deep x 60mm wide) shared by a number of partially occluded wounds on stem. Potentially more complex void(s) within stem.	Confirmed roost	Small number of droppings (likely bat) found in detritus at base of feature.
Treeline between Black Walks and Ash Wood.	TM 46055 65326	Semi-mature Scots Pine	Partially occluded hole (c. 40mm wide x 70mm high) in south-east facing tear off wound at 8m high. Extends into larger void in stem possibly extending upwards and downwards.	High	Tag 0746 Single stem Void potentially enlarged by woodpecker.
Treeline between Black Walks and Ash Wood.	TM 46054 65327	Semi-mature Scots Pine	Split (c. 40mm wide x 400mm long) in dead south-west primary limb at 8m leading to 120mm wide cavity possibly extending downwards.	High	Tag 0713 Single stem with substantial

Area/Location	Grid Reference	Tree Species	Description of Feature	Suitability of Feature	Additional Comments
			Several splits in crown.	Low	dead wood throughout crown.
Treeline between Black Walks and Ash Wood.	TM 46042 65365	Mature Scots Pine	Split (c. 50mm wide x 200mm high) in east tear off wound at 9-10m high. Potentially extending upwards.	Moderate	Single stem.
Treeline between Black Walks and Ash Wood.	TM 46035 65391	Mature Scots Pine	Significant number of splits and fissures in dead wood especially on N side at 5m high. Splits c. 20-40mm wide potentially extending inwards/upwards.	Moderate	Twin stem at 30 high with extensive crown dieback on east stem.
Hedgerow along southern boundary of Black Walks.	TM 45738 65419	Mature Oak (*Quercus* spp.)	Hazard beam feature in primary limb on N side at 5m high. Tear off wound scar on top of limb with hazard beam split on secondary limb.	High	Tag 0608 Extensive dead wood throughout crown with numerous dead branch stubs.
			Hazard beam split within central/south facing canopy at 7m .	High	
			North-west facing tear off wound in secondary limb at 10m high.	Moderate	
			A number of splits and crevices within lower canopy.	Moderate/High	
Hedgerow along southern boundary of Black Walks.	TM 45620 65412	Mature Ash (*Fraxinus* spp.)	Large co-dominant stem at 0m leaving large wound on east side. Significant fungal infection with rot cavity into butt of stem, little space inside.	Low	Tag 0705. Multi-stemmed at 1.5m.
			Two large partially occluded wounds (c. 150mm opening) on east and south stems at 3-4m. Upwards facing, do not appear (from ground) to extend upwards.	Moderate	

Area/Location	Grid Reference	Tree Species	Description of Feature	Suitability of Feature	Additional Comments
			Two partially occluded wounds on east limb at 3m. Potential cavities on either end extending further.	High	
			Partially occluded wound on west side of east stem at 4m. Hole facing south-west (c.50mm).	High	
Hedgerow between Upper Abbey Farm and the Round House.	TM 45391 65149	Mature Oak	Snapped primary limb at 3m on north side, hazard beam split through full width of limb extending 2m from end.	High	Field side tag 0505. Track side tag 032933. Multi-stemmed at 2m. Minor ivy throughout lower canopy.
			Partially occluded wound (c.50mm diameter) at 6m high on underside of snapped primarily limb extending into large cavity.	High	
			Two vertical snapped branch stubs in centre of canopy with deadwood splits and rot holes.	High	
			Partially occluded wound on underside of primary limb.	High	
			Several stubs/deadwood limbs throughout canopy.	Moderate	
Hedgerow south/south-west of the Round House.	TM 45368 65288	Mature Oak	Large opening (c.150mm wide) leading up under thick ivy stems on south side of main stem at 2m high.	High	Multi-stemmed at 4m. Only inspected from west/south-west field – may be additional features.
			Area of mature ivy at 5-7m high on south side of south co-dominant stem with numerous pockets and cavities formed.	High	
			Tear-off wound on upper side of south-west limb at 4m. Potential cavity above spur of dead wood	Moderate	

Area/Location	Grid Reference	Tree Species	Description of Feature	Suitability of Feature	Additional Comments
			into horizontal limb.		
			Dead/delaminated bark on north side of primary limb at 6m.	Moderate	
Hedgerow south/south-west of the Round House.	TM 45363 65287	Semi-mature Oak	Thick ivy stems forming thick plates with potentially suitable voids and cavities on south side.	Moderate	Twin stemmed at 4m high. Only inspected from west/south-west field.
Hedgerow south/south-west of the Round House.	TM 45316 65313	Mature Oak	South-west facing central dead horizontal secondary limb at centre of crown with dead/delaminated/loose bark and limited voids beneath.	Moderate	Multi-stemmed at 5m high. Only inspected from south-west field.
Hedgerow west of Upper Abbey Farm.	TM 45092 64803	Early-mature Oak	Dead delaminated bark on primary limb stub on west side at 5m high. 15mm deep void between bark and dead wood on underside. Several cracks and fissures in dead wood but mostly upwards facing and open.	Moderate	Tag 0534. Only inspected from east field.
			Tear off wound at 9m on vertical secondary limb west of crown. Partially occluded wound (c. 100mm wide x 300mm high) extending up into convoluted void.	High	
			Partially occluded wound (c. 20mm) on east side of south limb at 8m high extending in and down.	Moderate	
			Delaminated bark and cavity (c. 100mm x 30mm) on top of pruned limb overhanging road at 7m. Extends into larger void within limb.	Moderate	
Hedgerow west of Upper	TM 45079 64782	Mature Oak	Large wound/hollow on south-east side of main	High	Multi-stemmed at 7m high.

Area/Location	Grid Reference	Tree Species	Description of Feature	Suitability of Feature	Additional Comments
Abbey Farm.			stem at 3m high from loss of co-dominant stem. Initially 100mm x 150mm but extending further up and narrowing.		Only inspected from east field.
			Several wounds/dead branch stubs in mid-crown with splits and cracks at 8-10m.	Moderate	
			South facing partially occluded wound at 13m high.	High	
Hedgerow west of Upper Abbey Farm.	Not provided.	Mature Oak	Dead and delaminated bark on pollarded primary limb at 3m high on east side. Gaps of up to 60mm between bark and wood extending on both sides around limb.	High	Tag 0313. Multi-stemmed at 5m high. Over carriageway. Only inspected from south-east field.
			Tear-off wound at 5m high on south side. Partially occluded would on west side of limb potentially extending down into limb.	High	
			Partially occluded tear off wound (c. 150mm x 200mm) at 10m high west of central crown facing north-east. Fairly open but may extend down into cavity.	Moderate	
			Large (c.400mm diameter) partially occluded tear off wound on top edge of south-west limb at 4m high. Complex open cavity probably extending up into enclosed cavity towards end of limb.	High	
			Numerous additional small branch stubs and pruning wounds.	Moderate	
Hedgerow south-west of	TM 45078 64519	Mature Sycamore	Dead wood/delaminated bark and large cavity at	High	Tag 0130

Area/Location	Grid Reference	Tree Species	Description of Feature	Suitability of Feature	Additional Comments
Upper Abbey Farm.		(*Acer pseudoplantanus*)	top of east co-dominant stem at 10m high.		Multi-stemmed at 5m.
			Loose bark plates with voids behind.	High	
			Large open cavity in centre of stem.	High	
			Several partially occluded primary wounds at top of smaller stems extending upwards into closed cavities.	High	
Hedgerow south-west of Upper Abbey Farm.	TM 45144 64529	Semi-mature Oak	Almost fully occluded hazard beam wound (c. 10-15mm wide x 80mm high) north of main crown at 8m high. Cavity probably extending 300mm and upwards inside limb (c.180mm diameter).	High	Single stem South side completely obscured by ivy.
			Almost fully occluded hazard beam wound (c. 10mm wide x 100mm long) north facing at end of limb at 4m high. Potentially leading to cavity behind edge of occluded bark above cavity.	High	
Hedgerow south-west of Upper Abbey Farm.	TM 45217 64525	Mature Horse Chestnut (*Aesculus hippocastanum*)	Partially occluded pruning wound (c. 50mm diameter) on north side at 7m. Potentially extending into larger cavity in co-dominant stem.	High	Tag 0539. Multi-stemmed at 7m.
			Partially occluded pruning wound (c. 50mm diameter) on south side at 10m high. Potentially extending into larger cavity in co-dominant stem.		
			Large pruning wound (300mm diameter) from removal of large stem of co-dominant stem over carriageway at 6m. Large, open and upwards facing cavity.		

Area/Location	Grid Reference	Tree Species	Description of Feature	Suitability of Feature	Additional Comments
			Several rot holes in recently cut pruning wounds in end of 20mm diameter stem at 7m high facing south.		
			Large tear-off wound on south side of east stem at 9m high.		
Hedgerow to north of Upper Abbey Farm.	TM 45367 64862	Semi-mature Ash	Old pruning wound (c. 180mm diameter x 1000m long) on west side of stem at 4m.	Moderate	Twin stem at 5m. On east edge of Disused pit.
			Vertical split tapering from 100m wide down to 0mm with some internal rot. Potentially extending downwards into stem.		
West side of track up track between Upper Abbey Farm and Ash Wood Cottages.	TM 45357 64779	Mature Oak	Large tear-off scars on several stems. Two at crown on south side at 4m, each wound c.3m long x 750mm wide. Extensive convoluted dead wood, splits, partial occlusion.	Very High	Main Stem at 4m.
			Pruning wound 250mm diameter on south side at 10m, with tear off wound below it partially occluded.	Low	
			Woodpecker hole 40mm diameter on north-east side at 5m leading to large hollow cavity in co-dominated stem, potentially up to 150mm diameter and extending up and down. Extensive staining on bark below woodpecker hole.	Very High	
			Snapped limb and tear-off scar 250mm diameter at 5m on north-west side with extensive convoluted dead wood.	Not available	

Area/Location	Grid Reference	Tree Species	Description of Feature	Suitability of Feature	Additional Comments
West side of track adjacent to field along track between Upper Abbey Farm and Ash Wood Cottages.	TM 45344 64709	Mature Oak	Extensive dead wood/scared stem from ground to 4m on south-west side/ Extensive cavity/hollow stem, dead wood with split fissure. Large (600mm diameter) cavity extending from 2.5m up into main stem. Owl pellets in base of cavity.	Very High	Single stem with well-balanced crown.
			Pruning scar with rot at 2.5m high on north side.	Not available	
Along track between Upper Abbey Farm and Ash Wood Cottages.	TM 45344 64664	Mature Oak	Two large pruning wounds where co-dominant stem removed on north-west side of crown. One partially occluded, one torn off with dead wood stub. Both extend into rot cavities into crown/stem, upwards facing.	Moderate	Multi-stem at 3m.
Along track between Upper Abbey Farm and Ash Wood Cottages.	TM 45343 64646	Mature Oak	Large (700m x 1100mm) pruning scar on north-west side at 2m high, with large cavity (400mm x 600mm) in centre leading to very large convoluted cavity in stem. Very complex extending up into stem with additional opening on north-east side.	Moderate	Minor ivy throughout crown.
Hedgerow to south-west of Upper Abbey Farm.	TM 45205 64447	Early-mature Oak	Snapped-off limb (200mm diameter) at 7m on north side. Dead wood at end of limb with lateral splits, extends up to 750mm along end of limb, but tight and tapering.	Moderate	Multi-stem at 4m.
			Snapped-off/dead limb (200mm diameter) on south side of crown at 6m, lateral splits (c.20mm wide tapering to 0) open at top, extending down into stub for up to 750mm.	Low/ Moderate	

Area/Location	Grid Reference	Tree Species	Description of Feature	Suitability of Feature	Additional Comments
Hedgerow to south-west of Upper Abbey Farm.	TM 45201 64390	Semi-mature Oak	Rot hole (c. 120-150mm diameter) into partially occluded pruning wound on west side at 4m. Potentially extending into larger cavity in stem.	Moderate	Multi-stem at 3m.
			Tear-out wound on main stem and several other smaller similar wounds. Unlikely to form cavities.	Low/ Moderate	
			Small self-pruning wound (c. 40mm diameter) on co-dominant stem on north-west side at 3m. Potentially extending into larger cavity in stem.	Moderate	
Hedgerow south-west of Upper Abbey Farm.	TM 45201 64371	Mature Oak	Very thick stemmed mature ivy (c.150 – 200mm diameter) on main stem forming thick mat with small cavities against bark.	High	Multi-stem at 7m.
			Several snap/tear-off wounds in mid crown.	Not available	
			Pruning wound (120mm diameter) at 1.8m high on south side of stem. Rot hole extends up into limb. No signs of current occupation.	Very High.	
			Snapped/dead limb (250mm diameter) on east side of crown at 6m. Lateral splits extending c. 1000mm down limb.	Moderate/High	
Hedgerow south-west of Upper Abbey Farm.	TM 45151 64249	Semi-mature Poplar (*Populus* spp.)	Pruning wound rot hole (50mm x 30mm) at 10m on south underside of co-dominant stem. Possibly extending into cavity in stem.	High	
			Pruning wound (40mm diameter) on underside of primary limb (120mm diameter) extending upwards into limb on east side at 4m out from crown.	High	

Area/Location	Grid Reference	Tree Species	Description of Feature	Suitability of Feature	Additional Comments
Hedgerow north-west of Old Abbey Farm.	TM 44984 64294	Semi-mature Beech (*Fagus* spp.)	Two self-pruning wounds on east side of south co-dominant stem at 7-8m high. Both partially occluded with rot hole (50-60mm x 100mm). Potentially extending into cavities.	Moderate	Twin stem at 3m. 3m from fence.
			One self-pruning wound 9m high on east side of primary limb on south co-dominant stem, hole partially occluded (40 x 60-80mm).	Low	
			Tear-off wound (500-600mm long x 100-150mm wide) on underside of limb north-west of crown at 10m. May extend into cavity.	Moderate	
			Small pruning wound (40mm x 80mm) possibly extending upwards into branch.	Moderate	
Hedgerow north-west of Old Abbey Farm.	TM 44969 64317	Semi-mature Beech (*Fagus* spp.)	Small pruning wound (30mm diameter) partially occluded on east side of north-east stem. May extend upwards into cavity.	Moderate	Multi-stem at 6m.
Eastern end of woodland block south of Old Abbey Farm.	TM 45277 64025	Dead (species unknown)	Several large woodpecker holes at 4m on the southern side of the stem.	Moderate	
Woodland block south of Old Abbey Farm.	TM 44994 63981	Mature Pedunculate Oak	Wound at 15m on the southern side of the stem.	Low	Multi-stem.
			Frost crack at 5m on the western side of a limb.	Moderate	
Western end of woodland block south of Old Abbey Farm.	TM 44846 63972	Mature Pedunculate Oak	Hazard beam at 10m on southern side of a limb 5m from the stem.	Moderate	

Area/Location	Grid Reference	Tree Species	Description of Feature	Suitability of Feature	Additional Comments
Tree line adjacent to the west of Abbey Road.	TM 44660 64023	Mature Pedunculate Oak	Lifting bark at 10m on the southern side of stem.	Low	Multi-stem.
			Frost crack at 15m on western side of stem.	Moderate	
Along field boundary adjacent to Abbey Road.	TM 44697 64096	Mature Pedunculate Oak	Hazard beam at 10m on western side of a limb 1m from the stem.	Moderate	
Along field boundary adjacent to Abbey Road.	TM 44730 64143	Mature Sycamore	Knot hole at 20m on southern side of stem.	Moderate	Multi-stem.
Along field boundary adjacent to Abbey Road.	TM 44779 64223	Mature Pedunculate Oak	Transverse snap at 20m on south-eastern side of a limb 1m from the stem.	Moderate	

h) Corridor activity surveys

i. Black Walks

1.5.54 At least eight species were recorded over the course of the two surveys undertaken along Black Walks (survey area illustrated on **Figure 14A8.20**), with soprano pipistrelle being the most frequently recorded species on both survey occasions. The results of these surveys are detailed in **Table 1.35**.

Table 1.35: Summary of bat activity recorded at Black Walks in 2016

Species	Number of passes	
	Survey Visit 1 23/08/2016	Survey Visit 2 21/09/2016
Soprano pipistrelle	14	13
Common pipistrelle	4	7
Noctule	2	4
Barbastelle	1	0
Brown long-eared bat	1	0
Nathusius' pipistrelle	0	1
Serotine	1	0
Nyctalus spp.	6	0
Myotis spp.	1	5
Common/Nathusius' pipistrelle	1	0

1.5.55 At the northern extent of the survey area a variation was observed between the survey undertaken in August 2016, where activity consisted primarily of foraging, and the survey undertaken in September 2016, when reduced levels of activity were recorded overall, and only a single, brief, period of foraging activity recorded. However, at the southern end of the survey area activity during both the August and September 2016 surveys consisted primarily of foraging. Foraging activity at both the northern and southern sections of the survey area was considered to have been produced by single representatives, at any given time, of the recorded species.

1.5.56 In August 2016, two soprano pipistrelles were observed flying from the treeline, one heading north up the track and one east across an arable field, 28 minutes after sunset. Although it could not be confirmed, it was considered possible that these bats had emerged from an ivy-covered conifer at the northern end of the survey area. No emerging bats were recorded from this section of the treeline following specific monitoring during the first half an hour after sunset during the September 2016 survey.

1.5.57 Over the course of both surveys only a single barbastelle pass was recorded. This pass was not observed but was considered most likely to represent a single commuting individual.

1.5.58 A small number of potential commuting passes were recorded by surveyors; however, only a single pass was observed to commute south to north along the track[9]. A large proportion of the activity recorded was considered to be present on the western side of the treeline, an area that could not be observed by the surveyors. It was therefore concluded that, at the time of the surveys, there was insufficient evidence to indicate the presence of a regular or well-used commuting route.

ii. Fiscal Policy/Kenton Hills crossroads

1.5.59 Consideration of the results of surveys at the Fiscal Policy/Kenton Hills crossroads has been split into the survey undertaken in June 2016, which covered both the crossroad and the initial 200m of the Kenton Hills track, and the July 2016 surveys which focused solely on the crossroad. The overall Fiscal Policy/Kenton Hills crossroads survey area is illustrated on **Figure 14A8.20**.

1.5.60 At least seven species were recorded during the June 2016 survey, with common pipistrelle and soprano pipistrelle the most frequently recorded species. The results collected by the surveyors and the automated detector are detailed in **Table 1.36**.

Table 1.36: Summary of recordings in June 2016

Species	Number of passes		
	Automated Detector on Kenton Track*	Surveyor on Kenton Track*	Surveyor on Crossroads
Common pipistrelle	17	22	26
Soprano pipistrelle	23	17	24
Barbastelle	4	2	6
Brown long-eared bat	1	0	0
Noctule	0	0	1
Serotine	0	0	1
Myotis spp.	1	10	16

[9] Both a soprano pipistrelle and *Myotis* spp. call were recorded at this time and the surveyor was unable to determine from a visual assessment which species was observed commuting.

Species	Number of passes		
	Automated Detector on Kenton Track*	Surveyor on Kenton Track*	Surveyor on Crossroads
"Big bat" spp.	0	0	1
Common/soprano pipistrelle	6	0	1

**Note that the automated detector was located in a single position approximately 20m from the entrance to Kenton Hills. The surveyor; however, walked a transect along the initial 200m of the Kenton Hills Track.*

1.5.61 Three common pipistrelle and one *Myotis* spp. commuting passes were confirmed by the surveyor located along the initial 200m stretch of the Kenton Hills track. A further two common pipistrelle, three soprano pipistrelle and one *Myotis* spp. passes were considered likely to represent commuting activity. Confirmed commuting passes were all recorded flying from west to east, with one of the common pipistrelle passes confirmed as having flown down the Upper Abbey Farm bridleway before entering Kenton Hills, by the surveyor at the crossroads. A further three common pipistrelle and two soprano pipistrelle passes were considered likely to have been recorded by both the surveyor at the crossroads and along the Kenton Hills track commuting west to east. Unconfirmed commuting passes were considered most likely to be occurring parallel to, rather than on the Kenton Hills track, within the woodland to the south, which prevented the observation of these passes by the surveyor.

1.5.62 Additional activity recorded along the Kenton Hills track was considered to represent foraging activity, primarily located within the woodland immediately to the south of the Kenton Hills track. It was considered by the surveyor that this activity was likely to have been produced by one to two individuals of each recorded species.

1.5.63 Early activity at the crossroad consisted primarily of commuting passes with common pipistrelle (seven passes), soprano pipistrelle (three passes) and "big bat" spp. (one pass) confirmed as commuting by the surveyor. A further five commuting bat passes were observed by the surveyor but occurred at too great a distance from the surveyor to enable them to be heard. A small number of additional commuting passes, including *Myotis* spp. passes, were inferred by the surveyor but could not be confirmed. Commuting activity at the crossroads was recorded both north-south, along the Upper Abbey Farm bridleway, with some turning east to enter Kenton Hills, as well as west-east between arable fields and Kenton Hills.

1.5.64 Levels of commuting activity dropped latterly in the survey period with foraging activity by a small number of individuals, including common pipistrelle, soprano pipistrelle, *Myotis* spp. and barbastelle then recorded.

Table 1.37: Summary of surveyor recordings at the crossroads in July 2016

Species	Number of passes		
	12/07/2016	13/07/2016	14/07/2016
Common pipistrelle	31	39	29
Soprano pipistrelle	20	20	13
Noctule	0	0	1
Barbastelle	3	0	4
Serotine	0	1	0
Big bat spp.	3	0	0
Myotis spp.	12	10	10
Common/soprano pipistrelle.	1	1	0

1.5.65 Surveys undertaken in July 2016 at this location, the results of which are detailed in **Table 1.37**, used a variety of surveyor positions at the crossroads, but not along the Kenton Hills track. These survey positions were based on the information gathered during the June 2016 survey and designed to obtain an overview of the use of this area by bats.

1.5.66 At least six species were recorded, with both foraging and commuting activity, primarily consisting of common and soprano pipistrelles, identified. The identification of commuting activity was complicated by the presence of foraging activity in the area, with many apparent commuting passes turning into foraging activity over habitats in this area. Despite this commuting passes by common pipistrelle (a maximum of five confirmed commuting passes per survey), soprano pipistrelle (a maximum of four confirmed commuting passes per survey), *Myotis* spp. (a maximum of four confirmed commuting passes per survey), big bat (a single confirmed commuting pass) and barbastelle (a single confirmed commuting pass) were identified both along the Upper Abbey Farm bridleway and between the arable fields to the west of the crossroads and Kenton Hills to the east.

1.5.67 Activity recorded in this area supports the suggestion, made following the June 2016 survey, that as well as bats commuting along the Kenton Hills track, bats may also be entering the woods further to the south of the Kenton Hills junction and commuting and/or foraging to the south of the Kenton Hills track within the woodland.

1.5.68 Foraging activity in this area was dominated by common and soprano pipistrelle with a maximum of two individuals of each species recorded simultaneously. As such it is considered that the foraging activity levels recorded during these surveys is likely to have been produced by a small number (one to five) of individuals on any given survey occasion. Additional

foraging activity was recorded *Myotis* spp. and "big bat" spp.. Given the more limited recording of this activity it is considered that this activity was produced by one to two individuals on any given survey occasion.

iii. Kenton Hills track

1.5.69 At least five species were recorded at the eastern end of the Kenton Hills track (survey area illustrated on **Figure 14A8.20**) during surveys in August 2016 as detailed in **Table 1.38**. Activity primarily consisted of common pipistrelles, with only low activity levels recorded for other species.

Table 1.38: Bat activity recorded on the Kenton Track in August 2016

Species	Number of passes	
	Survey Visit 1 22/08/2019	Survey Visit 2 25/08/2016
Common pipistrelle	30	29
Soprano pipistrelle	5	9
Noctule	0	6
Serotine	0	3
Myotis spp.	2	4
Nyctalus spp.	0	1

1.5.70 The greater proportion of the recorded bat activity was not observed by surveyors. This activity was considered likely to have been located within the woodland to the south of the Kenton Hills track. The confirmation of commuting passes was therefore problematic. Of those passes observed three soprano pipistrelles were confirmed as commuting north to south, or south to north across the track at the eastern end of the survey area, and a single common pipistrelle which was observed commuting west to east down the Kenton Hills track.

1.5.71 Remaining observed activity consisted of bats leaving or entering the woodland and therefore the separation of these as commuting passes from the largely unseen foraging passes considered to be occurring within the woodland was not possible.

1.5.72 As noted elsewhere in **section 1.1e)viii**, the greatest proportion of the recorded bat activity in this survey area was not observed by surveyors. This activity was considered most likely to be occurring within the woodlands to the south of the Kenton Hills track or, at the eastern end of the survey area, woodland to the north of the track. This activity is considered likely to represent a combination of foraging and commuting

activity and was primarily heard faintly suggesting the location of this activity at a distance from the access track.

1.5.73 Activity at this location was not as extensive as might have been expected given the ideal survey conditions, abundance of flying insects along the Kenton Hills track during the first survey, and the degree of activity recorded at the Fiscal Policy/Kenton Hills crossroads during previous surveys. As such it is considered that by this section of the Kenton Hills track, many of the bats recorded entering Kenton Hills have dispersed more widely within the woodlands, such that only a proportion of this activity can be recorded from the track.

iv. MS20

1.5.74 A mixture of foraging and commuting activity was recorded during surveys undertaken at MS20 (survey area illustrated on **Figure 14A8.20**), detailed of the species recorded are provided in **Table 1.39**. Extended periods of foraging by a single Nathusius' pipistrelle and at least one soprano pipistrelle were observed over scrub north of the reedbed and over the reedbed itself while a bout of barbastelle activity was recorded during the second survey.

1.5.75 The period of barbastelle activity, which was restricted to between 40 minutes and one hour after sunset, consisted of both foraging and commuting activity. The foraging behaviour appeared to be restricted to the end of woodland to the east of the survey area, with occasional very brief flights over immediately adjacent areas of the reedbed. Only a single individual was recorded at any one time. Eleven barbastelle passes were considered to represent commuting individuals with passes recorded in a variety of directions through primarily occurring from the south-east or west to the north-east or west.

1.5.76 A notable proportion of recorded activity was unobserved by the surveyors and included soprano pipistrelle, common pipistrelle, noctule, and *Myotis* spp.. This activity was considered to include both foraging and commuting passes, with very brief passes and passes containing feeding buzzes both recorded. With the exception of soprano pipistrelle, only single individuals of each of these species were recorded at any given point in the survey, therefore while it is likely that more than one individual of these species was present, this cannot be confirmed. In the case of soprano pipistrelle, a maximum of two individuals were simultaneously recorded. It is therefore considered that a significant proportion of the recorded passes, were produced by a small number (one to five) of individuals of the species recorded.

Table 1.39: Bat activity recorded at MS20 in 2016

Species	Survey Visit 1 16/05/2019		Survey Visit 2 22/06/2016
	Number of passes recorded by surveyors	Number of passes recorded by automated detector	Number of passes recorded by surveyors
Soprano pipistrelle	24	71	19
Common pipistrelle	37	28	10
Nathusius' pipistrelle	6	110	0
Noctule	5	2	0
Brown long-eared bat	1	0	0
Barbastelle	1	0	16
Myotis spp.	2	1	1
"Big bat"	2	0	0
Common/soprano pipistrelle	0	11	0
Common/Nathusius' pipistrelle	1	0	0
Total	79	223	43

v. MS35

1.5.77 At least six species were recorded during the single survey undertaken at MS35 (survey area illustrated on **Figure 14A8.20**), with common pipistrelle being the most frequently recorded species as detailed in **Table 1.40**. A maximum of two common pipistrelles were observed simultaneously and, based on surveyor observations it was considered that the recorded common pipistrelle activity was produced by a small (two to five) number of individuals. Similarly, soprano pipistrelle activity was considered to have been produced by one or two individuals. The combination of surveys (corridor activity and automated detector) at this location suggest that habitat surrounding the MS35 location, in particular the reedbed and ditches are well used by a small number of foraging *Pipistrellus* bats. At the time of this survey there was no evidence of foraging activity by additional species, while evidence of the use of this area as a commuting corridor was extremely limited.

1.5.78 Despite notable early "big bat" activity recorded by automated detectors in Season 1 of 2014 activity levels of non-*Pipistrellus* species were extremely low. Only single passes were recorded of noctule[10] (surveyors and automated detector), barbastelle, brown long-eared bat (surveyors) and *Myotis* spp. (automated detector). These passes were not observed but are considered to represent commuting activity and the frequency of these passes suggested that habitats in the vicinity of MS35 did not form part of a regularly, or well used, commuting route.

Table 1.40: Bat activity recorded at MS35 in 2016

Species	Number of passes recorded by surveyors	Number of passes recorded by automated detector
Common pipistrelle	93	185
Soprano pipistrelle	19	12
Barbastelle	1	0
Noctule	1	1
Brown long-eared bat	1	0
Common/soprano pipistrelle	1	7
Nathusius'/common pipistrelle	1	0
Myotis spp	0	1
Total	117	206

vi. Stonewall Belt

1.5.79 At least seven species were recorded across the three surveys undertaken at Stonewall Belt (survey area indicated on **Figure 14A8.20**) with soprano and common pipistrelle the most frequently recorded, as detailed in **Table 1.41**.

1.5.80 During the May 2016 survey activity was greatest at the south-eastern corner, although it was considered that passes recorded at this location may also represent activity within Hilltop Covert and other surrounding areas of woodland. Commuting activity along Stonewall Belt was solely recorded along the more sheltered east facing side with barbastelle (five), soprano pipistrelle (two), common pipistrelle (two), 'big bat'/long-eared bat (one) and *Myotis* spp. (one) probable commuting passes recorded north to

[10] The timing of the noctule pass recorded by surveyors and the automated detector correspond and it is therefore considered that both recorded the same individual.

south or south to north, by at least one surveyor at either end of the eastern side of Stonewall Belt.

1.5.81 Additional activity at the southern end of Stonewall Belt was considered to represent primarily foraging behaviour associated with adjacent areas of woodland while additional activity at the northern end of Stonewall Belt was associated with occasional east to west (a single barbastelle and two common pipistrelle) commuting passes along the east-west track as well as foraging activity associated with trees in the vicinity of Ash Wood Cottages and the track leading north to Black Walks. Activity between Ash Wood and Stonewall Belt was recorded from the north-eastern corner of Stonewall Belt only, with a single *Myotis* spp. pass from and single soprano pipistrelle pass too Ash Wood recorded.

1.5.82 Surveys in September and October 2016 focused on the east facing side of Stonewall Belt were shown to have been used by commuting bats during the May 2016 survey. Activity during both survey visits was comparable although October 2016 recorded a reduced number of probable commuting passes, with only two common pipistrelle passes recorded. Commuting activity during the September 2016 survey was slightly greater with probable commuting passes recorded by common pipistrelle (two passes), soprano pipistrelle (one pass) and *Myotis* spp. (one pass). The barbastelle passes recorded during the May 2016 survey were notably reduced being recorded in only the September 2016 survey. None of these passes (two recorded at the southern end of Stonewall Belt and one at the northern end) were observed by the surveyors, although a single pass recorded faintly by both surveyors within one minute of each other, may represent the same individual, although this cannot be confirmed.

1.5.83 Foraging activity was also recorded during both the September and October 2016 surveys with soprano pipistrelle, common pipistrelle and *Myotis* spp. recorded at the northern end of Stonewall Belt both in association with trees in the vicinity of Ash Wood Cottages and Stonewall Belt and the adjacent field to the east. At the southern end of Stonewall Belt foraging activity was recorded around the area of scrub between Stonewall Belt and woodland further south (soprano pipistrelle) as well as unobserved activity recorded in the vicinity (common pipistrelle, soprano pipistrelle, noctule, brown long-eared bat and *Myotis* spp.).

Table 1.41: Bat activity recorded at Stonewall Belts in 2016

Species	Survey Visit 1 17/05/2016		Survey Visit 2 20/09/2016	Survey Visit 3 11/10/2016
	Number of passes recorded by surveyors	Number of passes recorded by automated detector	Number of passes recorded by surveyors	Number of passes recorded by surveyors
Soprano pipistrelle	26	9	18	15
Common pipistrelle	17	5	13	11
Barbastelle	7	3	3	0
Nathusius' pipistrelle	2	2	0	0
Brown long-eared bat	0	1	0	1
Noctule	2	0	0	2
Common/soprano pipistrelle	0	1	0	0
Big bat/long-eared bat	4	0	0	0
Myotis spp	4	0	8	5
"Big bat"	4	0	0	0
Total	66	21	34	34

vii. Upper Abbey Farm bridleway

1.5.84 Three distinct points along the Upper Abbey Farm bridleway were surveyed for this survey area the location of which is illustrated on **Figure 14A8.20**. Each position is considered separately and in conjunction to the wider survey area.

1.5.85 The northern most survey position within the survey area was surveyed on only a single occasion, during the first survey visit, due to a technical fault which prevented the monitoring of this location during the second survey visit.

1.5.86 At least four species were recorded in this location from automated detector and surveyor monitoring, as detailed in **Table 1.42**, with the majority of the activity attributable to up to two common pipistrelle and at least one soprano pipistrelle for which continuous foraging activity, over the bridleway, was recorded. A brief period of noctule foraging was also recorded.

1.5.87 Commuting activity was limited, with only two *Myotis* spp. passes, recorded consecutively, confirmed to be commuting south from a point north of this surveyor position. One of these passes was recorded one minute later at

the mid surveyor point at Upper Abbey Farm, while both passes were recorded two minutes later at the southern surveyor point. A further two soprano and one common pipistrelle were considered to have potentially commuted south from this location although confirmation of this is not possible due to the extensive foraging activity that was also recorded. A single soprano pipistrelle pass was potentially matched with a soprano pipistrelle pass recorded at the mid surveyor position but could not be matched to a soprano pipistrelle pass at the southern surveyor point.

Table 1.42: Bat activity recorded along the Upper Abbey Farm bridleway in 2016: northern surveyor position

Species	Survey Visit 1 21/06/2016		Survey Visit 2 24/08/2016
	Number of passes recorded by automated detector	Number of passes recorded by surveyor	Surveyor
Common pipistrelle	52	32	N/A*
Soprano pipistrelle	4	11	
Noctule	2	2	
Common/soprano pipistrelle	3	1	
Myotis spp.	0	2	

**Due to an equipment failure, it was not possible for the second survey visit to be undertaken at this location.*

1.5.88 The mid surveyor position was monitored on both survey occasions with at least five species recorded across the two survey visits, as detailed in **Table 1.43**. As noted at the northern surveyor point, activity primarily consisted of common and soprano pipistrelles during both survey visits, with consistent, heavy foraging activity recorded from 20 minutes until one hour after sunset during the June 2016 survey, with at least three individuals identified at the height of this activity.

1.5.89 Due to the extent of foraging activity occurring during the June 2016 survey it was difficult to distinguish commuting passes from foraging loops being undertaken up and down the Upper Abbey Farm bridleway at this surveyor position. However, two soprano pipistrelle, two common pipistrelle and a *Myotis* spp. pass were identified as commuting. All commuting passes were recorded heading from the north along the bridleway to the south, except for a single soprano pipistrelle pass which was recorded heading north. Of these, only a single common pipistrelle pass (recorded at the southern surveyor point) and the *Myotis* spp. pass (recorded at both the northern and southern surveyor points) were found to correspond to commuting passes recorded at the other surveyor points.

1.5.90 Commuting activity accounted for a greater proportion of the activity recorded at the mid surveyor point during the second survey in August 2016. This commuting activity consisted of one soprano pipistrelle, three common pipistrelle, two barbastelle and six *Myotis* spp. passes. Commuting activity was primarily in a north to south direction, of which only the three common pipistrelle passes were found to correspond to commuting passes recorded by the surveyor at the southern surveyor position. A single barbastelle commuting pass was recorded from east to west across the bridleway, while a one *Myotis* spp. pass was recorded in a south to north direction. It was considered that a proportion of the recorded passes may have represented bats emerging from buildings within the Upper Abbey Farm complex.

1.5.91 Foraging activity during the August 2016 survey visit, consisted primarily of common and soprano pipistrelle, with at least two common pipistrelle recorded simultaneously. In addition to pipistrelle species. a small number of additional passes were recorded for barbastelle and *Myotis* spp.. These passes were not observed by the surveyor and the timings of the passes mean that they may relate either to foraging activity carried out while commuting or to the brief presence of single foraging individuals.

Table 1.43: Bat activity recorded along the Upper Abbey Farm bridleway in 2016: mid surveyor position

Species	Survey Visit 1 21/06/2016		Survey Visit 2 24/08/2016
	Number of passes recorded by automated detector	Number of passes recorded by surveyor	Surveyor
Soprano pipistrelle	235	21	15
Common pipistrelle	73	21	16
Barbastelle	1	0	5
Noctule	0	0	0
Myotis spp.	0	1	13
Common/soprano pipistrelle	17	0	0

1.5.92 The southern surveyor position was monitored on both survey occasions with at least six species recorded across both survey visits as detailed in **Table 1.44**, with activity dominated by common pipistrelle.

1.5.93 Early activity at this location included several clear commuting passes by common and soprano pipistrelles; however, the clarity of commuting passes was reduced as the survey periods continued with many bats coming from the north stopping at the surveyor position to forage. This

activity primarily consisted of common and soprano pipistrelle with a maximum of two representatives of each species recorded simultaneously.

1.5.94 In addition to commuting passes north to south along the Upper Abbey Farm bridleway, brief passes, which were heard but not seen, suggest that some bats may be using the outer edges of the bridleway as a flight line, out of sight, but within hearing range, of surveyors located along the bridleway. The surveyor at this position, over the course of both survey visits also recorded occasional commuting passes along a hedgerow to the west of the surveyor position onto the bridleway with limited serotine and *Myotis* spp. passes recorded in this manner.

1.5.95 Both barbastelle passes, although unseen, were considered to represent commuting passes due to the briefness of the recorded passes and the lack of additional barbastelle activity recorded in this area. These passes were not recorded by surveyors further to the north, suggesting that these bats may have passed onto the bridleway between the mid and southern surveyor positions.

Table 1.44: Bat activity recorded along the Upper Abbey Farm bridleway in 2016: southern surveyor position

Species	Survey Visit 1 21/06/2016	Survey Visit 2 24/08/2016
Common pipistrelle	13	22
Soprano pipistrelle	7	8
Barbastelle	2	0
Serotine	2	6
Myotis spp.	0	6
Brown long-eared bat	0	1

1.5.96 In overview, all three surveyor positions recorded regular foraging activity over the survey periods; however, commuting activity was most commonly recorded from the mid and southern surveyor positions. The lack of confirmed commuting passes recorded from the northern surveyor position, limited to two *Myotis* spp. passes, suggests that commuting activity recorded at the mid and southern surveyor positions may represent activity by bats either emerging from Upper Abbey Farm, although the surveyor positions used during this survey work cannot confirm this, or bats joining the Upper Abbey Farm bridleway from linear features to the east and west between these surveyor positions.

1.5.97 Not all the commuting passes were recorded by both of the surveyors at the mid and southern surveyor positions, and a number of passes were heard

but not seen by surveyors, it is considered that this may indicate bats using the outer edges of the tree line along the bridleway as a commuting feature, meaning that these bats would not be seen from the track, but may be heard. A notable feature at the southern surveyor position was the commuting of bats from the north to this position, at which point a period of foraging activity occurred.

References

1.1 Amec. 2011 Sizewell Ecology Studies Bat Survey Report 2011.

1.2 Amec. 2012. Sizewell C New Nuclear Power Station: Terrestrial and Freshwater Ecology and Ornithology DRAFT Coronation Wood Bat Survey Report 2012

1.3 Entec. 2007. Sizewell Bat Survey Report 2007. British Energy Group PLC.

1.4 Suffolk Biodiversity Partnership. 2012. Suffolk Local Biodiversity Action Plan – Grouped Plan for Bats. (Online) Available from https://www.suffolkbis.org.uk/sites/default/files/biodiversity/priorityspecieshabitats/actionplans/Suffolk%20Grouped%20Bat%20Action%20Plan%20final%20%2027_03_12.pdf (Accessed 20 February 2019)

1.5 Suffolk Bat Group. 2017. Bats in Suffolk: Distribution Atlas 1983 – 2016. (Online) Available from https://www.suffolkbis.org.uk/sites/default/files/Bat%20Atlas%201983_2016%20final.pdf (Accessed 18 February 2019)

1.6 Entec. 2008. Sizewell Bat Survey Report 2008. British Energy Group PLC.

1.7 Entec. 2009. Sizewell Bat Survey Report 2009. EDF Developments Ltd.

1.8 Entec. 2010. Sizewell Bat Survey Report 2010. NNB Generation Company.

1.9 Corylus Ecology. 2016. Sizewell Radio-tracking report.

1.10 Amec. 2011. Sizewell Survey of Potential Bat Hibernation Sites in Buildings, January-March 2011.

1.11 Amec. 2011. Associated Development Site 1. DRAFT Extended Phase 1 Habitat Survey Report.

1.12 Amec.2012. Aldhurst Farm West. Associated Development Site 1. DRAFT Bat Survey Report. NNB Generation Company.

1.13 Amec. 2013. Upper Abbey Farm, Leiston: Ecological Appraisal Report.

1.14 Arcadis. 2016. Sizewell C Ecology: Automated (SM2) bat detector monitoring report 2013/2014. Unpublished report to EDF.

1.15 Arcadis. 2019. Sizewell C Sandpits – Targeted Surveys September 2019 Technical Note

1.16 Arcadis. 2019. Sizewell B Relocated Facilities – Bat and Badger March 2019 Survey Technical Note. Unpublished report to EDF.

1.17 Arcadis. 2019. Sizewell B Relocated Facilities – Bat Building Emergence Surveys 2019 Technical Note. Unpublished report to EDF

1.18 J. Collins (ed.). 2016. Bat Surveys for Professional Ecologists: Good Practice Guidelines. 3rd edition. London: The Bat Conservation Trust.

VOLUME 2, CHAPTER 14: APPENDIX 14A8 – BATS: ANNEX 14A8.5 SECONDARY DATA

SIZEWELL C DEVELOPMENT – MAIN DEVELOPMENT SITE: VOLUME 2, CHAPTER 14, APPENDIX 14A8 – Bats:

Documents included within this Annex group are as follows:

- **ANNEX 14A8.5** - SECONDARY DATA
- Annex 14A8.5 Amec Phase 1 Aldhurst Farm 2011
- Annex 14A8.5 Amec Aldhurst Farm Bat Survey 2012
- Annex 14A8.5 Amec Coronation Wood Bat Survey 2012
- Annex 14A8.5 Amec Sizewell Bat Survey Report 2007
- Annex 14A8.5 Amec Sizewell Bat Survey Report 2008

NNB Generation Company

Associated Development Site 1

Associated Development Site 1

DRAFT Extended Phase 1 Habitat Survey Report

December 2011

AMEC Environment & Infrastructure UK Limited

Report for

Christine Blythe
NNB Generation Company
Barnett Way
Barnwood
Gloucester
GL4 3RS

Main Contributors

Chris Hill

[redacted]

Chris Hill

[redacted]

AMEC Environment & Infrastructure UK Limited

17 Angel Gate, City Road, London EC1V 2SH,
United Kingdom
Tel +44 (0) 207 843 1400
Fax +44 (0) 207 843 1410

Doc Reg No. 28130ca138

r:\projects\28130 sizewell ecology studies\reports\associated development sites\1 aldhurst farm west\28130 ad aldhurst (site 1) xp1 final draft i2.doc

NNB Generation Company

Associated Development Site 1

Associated Development Site 1

DRAFT Extended Phase 1 Habitat Survey Report

December 2011

AMEC Environment & Infrastructure UK Limited

Certificate No. FS 13881

Certificate No. EMS 69090

Disclaimer

This report has been prepared in a working draft form and has not been finalised or formally reviewed. As such it should be taken as an indication only of the material and conclusions that will form the final report. Any calculations or findings presented here may be changed or altered and should not be taken to reflect AMEC's opinions or conclusions.

Copyright and Non-Disclosure Notice

Third Party Disclaimer

Document Revisions

No.	Details	Date
1	Final Draft i1	July 2011
2	Final Draft i2	December 2011

Contents

1. Introduction

1.1 Background

An area of land directly north of the Sizewell 'B' Power Station has been identified as having the potential to accommodate a new nuclear plant. NNB Generation Company (EDF) has identified a number of additional sites for a variety of developments associated with the new build proposals at Sizewell that will be located beyond the current EDF landholding. AMEC has been commissioned by EDF to provide an initial ecological appraisal of each of these sites to inform the site selection process and support any future planning submissions.

Aldhurst Farm West, situated to the north of Leiston, Suffolk (National Grid Reference: TM 439 638) (Refer to **Figure 1.1** for location details) has been identified as a potential site for associated development. This report summarises the findings of an extended Phase 1 Habitat Survey for the site that includes a desk study exercise. This report identifies potential ecological receptors, should the site be re-developed and makes recommendations for further work where appropriate.

1.2 Site Context

The Site is situated on the north eastern extent of Leiston, Suffolk within a rural setting. The site is bordered to the north by Abbey Lane, to the east by Abbey Road with the remainder of the Site being bordered by arable land to the south. Residential housing is situated adjacent to the south eastern corner of the Site.

1.3 Scheme Description

The sites proposed for associated development are currently at a preliminary stage of scoping with detailed scheme plans yet to be confirmed. Notwithstanding this, current proposals for land at Aldhurst Farm West include the development of the Site to support industrial and warehousing facilities.

2. Methodology for Data Collection

2.1 Desk Study

A data-gathering exercise was undertaken to obtain information relating to statutory and non-statutory nature conservation sites, priority habitats and species, and legally protected and controlled species (see Boxes 1 and 2).

Box 1 Designated Wildlife Sites, and Priority Habitats and Species

Statutory nature conservation sites

Internationally important sites: Special Areas of Conservation (SACs) and candidate SACs, Special Protection Areas (SPAs) and proposed SPAs, Sites of Community Importance, Ramsar sites and European offshore marine sites.

Nationally important sites: Sites of Special Scientific Interest (SSSIs) that are not subject to international designations and National Nature Reserves (NNRs)

Local Nature Reserves (LNRs) are statutory sites that are of importance for recreation and education as well as nature conservation. Their level of importance is defined by their other statutory or any non-statutory designation (e.g. if an LNR is also an SSSI but is not an internationally important site, it will be of national importance). If an LNR has no other statutory or non-statutory designation it should be treated as being of district-level importance for biodiversity (although it may be of greater socio-economic value).

Non-statutory nature conservation sites

Sites of county importance: In Suffolk, County Wildlife Sites (CWS) are designated by the Suffolk CWS panel (which includes representatives from from Suffolk County Council, Suffolk Biological Records Centre (SBRC), Suffolk Wildlife Trust and Natural England). Suffolk Wildlife Trust (SWT) monitors all planning applications for any potential impact on County Wildlife Sites.

Priority habitats and species

In this report, the geographic level at which a species/habitat has been identified as a priority for biodiversity conservation is referred to as its level of 'species/habitat importance'. For example, habitats and species of principal importance for the conservation of biological diversity in England (see the first bullet point below) are identified as of national species/habitat importance reflecting the fact that these species/habitats have been defined at a national level. The level of importance therefore pertains to the species/habitat as a whole rather than to individual areas of habitat or species populations, which cannot be objectively valued, other than for waterfowl, for which thresholds have been defined for national/international 'population importance'.

- National importance: Habitats and species of principal importance for the conservation of biological diversity in England. These are listed on: http://www.defra.gov.uk/wildlife-countryside/pdf/biodiversity/s41-nerc-may2008species.pdf and http://www.defra.gov.uk/wildlife-countryside/pdf/biodiversity/s41-nerc-may2008habitats.pdf. These include those UK Biodiversity Action Plan (UK BAP) priority habitats and species that occur in England.
- National importance: Species listed as being of conservation concern in the relevant UK Red Data Book (RDB) or the Birds of Conservation Concern[1] Red List.
- National importance: Nationally Scarce species, which are species recorded from 16-100 10x10km squares of the national grid.
- National importance: Ancient woodland (i.e. areas that have been under continuous woodland cover since at least 1600).
- County importance: Species listed in the Suffolk LBAP.

[1] Eaton, M.A. et al. (2009). Birds of Conservation Concern 3: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. *British Birds* **102**:296-341.

Box 2 Legally Protected and Controlled Species

Legal protection

Many species of animal and plant receive some degree of legal protection. For the purposes of this study, legal protection refers to:

- Species included on Schedules 1, 5 and 8 of the *Wildlife and Countryside Act 1981* (as amended), excluding species that are only protected in relation to their sale (see Section 9[5] and 13[2]), reflecting the fact that the proposed development does not include any proposals relating to the sale of species;
- Species included on Schedules 2 and 5 of The *Conservation of Habitats and Species Regulations* 2010; and
- Badgers, which are protected under the *Protection of Badgers Act 1992*.

Legal control

Schedule 9 of the *Wildlife and Countryside Act 1981* (as amended) lists species of animal that it an offence to release or allow to escape into the wild and species of plant that it is an offence to plant or otherwise cause to grow in the wild.

Data were gathered for:

- European and Ramsar sites on or within 5km, of the site;
- Nationally statutory designated sites on or within 2km of the site;
- Non-statutory designated sites of nature conservation interest located on or within 1km of the site;
- Records of legally protected and priority species to a distance of 1km from the site boundary; and
- Water bodies within 500m of the site, not separated from the site by barriers to great crested newt (*Triturus cristatus*) movement (e.g. major roads, rivers, etc.).

This contextual information is important as it may point to notable species that could occur on the site itself. Sources of desk study information are listed in **Table 2.1**.

Table 2.1 Sources of Desk Study Information

Topic	Date	Source of Information
Statutory nature and non-statutory nature conservation sites.	2011	Suffolk Biological Records Centre (SBRC)
Records of priority and legally protected species	2011	SBRC
Ancient woodland	2011	SBRC
Potential great crested newt aquatic habitat	2011	1:10,000 Ordnance Survey maps

2.2 Field Surveys

2.2.1 Habitats

A Phase 1 Habitat survey of the Site and its surrounds was undertaken by an AMEC ecologist on the 24th of March 2011; during the survey, distinct habitats were identified and any features of interest subjected to a more detailed description in a target note (TN)[2]. As the standard Phase 1 Habitat survey methodology is mainly concerned with vegetation communities, the survey was extended[3] to allow for the provision of information on other ecological features, including identification of the presence/potential presence of legally protected and otherwise notable species.

2.2.2 Species

The methodologies used to establish the presence/potential presence of specific species/species groups are summarised below. These relate to those species/biological taxa that the desk study and habitat types present indicated could occur on the site.

Badgers

During the survey the on-site habitats were assessed for their potential to provide suitable areas for sett excavation and badger foraging. Any evidence of badger activity was also recorded, such as:

- Setts - comprising either single holes or a series of holes likely to be connected underground;
- Hairs - usually with a white root, black band, white tip (often caught in sett entrances/fences/vegetation);
- Footprints – located in soft mud, often in sett entrances;
- Evidence of foraging – usually in the form of 'snuffle holes' (small scrapes created by badgers searching for insects and earthworms);
- Latrines - badgers usually deposit faeces in holes or scrapes in the ground; and
- Paths - particularly around setts or leading to feeding areas.

Mammal paths and snuffle holes were assumed to be created by badgers if the character of the path (in terms of size) was appropriate, and if other field signs were in close vicinity.

Bats

A general assessment of the suitability of the habitats on the site to support roosting, foraging and commuting bats was made. Mature trees were inspected for evidence of cavities, splits, cracks, loose bark and dense and woody ivy (*Hedera helix*) growth that could be used by bats

[2] Joint Nature Conservation Committee (2007). *Handbook for Phase 1 habitat survey - a technique for environmental audit*. JNCC, Peterborough.

[3] Institute of Environmental Assessment (1995). *Guidelines for Baseline Ecological Assessment*. E&FN Spon, London.

for roosting. Furthermore, any buildings or structures on site were inspected externally for suitable access or egress points.

Birds

The habitats on site were assessed for their potential to support any nesting or foraging bird species or assemblages of notable species.

Great Crested Newts

Where access was possible, on and off-site water bodies (within 500m) identified by the desktop study, with their associated terrestrial habitats, were assessed for their potential to support great crested newt suitable habitats including generally still water bodies with adjacent woodland or grassland areas where there is invertebrate prey potential.

Reptiles

The Site and wider survey area were assessed for their potential to provide sheltering, foraging and breeding habitats for the four common reptile species: slow worm (*Anguis fragilis*), viviparous lizard (*Zootoca vivipara*), grass snake (*Natrix natrix*) and adder (*Vipera berus*). These native reptile species generally require open areas with mixed-height vegetation, such as heathland, rough grassland, open scrub or (in the case of grass snake) water body margins. Suitable well drained and frost free areas are needed so that they can survive the winter.

Other Species

In addition, an assessment was made of the potential for the Site to support any other species considered to be of value for biodiversity conservation, including those that were identified as occurring within the local area by the desk study.

3. Site Baseline

3.1 Policy and Legislative Context

3.1.1 Policy Context

Relevant policies are listed in **Table 3.1**, along with an outline of the issues included in these policies that would need to be taken into account when considering development of the site, and when undertaking an ecological appraisal.

Table 3.1 Policy Issues to be considered

Policy Reference	Policy Issue
National planning policies	
Planning Policy Statement 9 (PPS9)[4]: Biodiversity and geological conservation.	The identification of effects on: designated sites of international, national and local importance; protected species, habitats and species of principal importance for the conservation of biodiversity in England; and ancient woodland and veteran trees. The identification of measures to mitigate adverse effects and of opportunities for enhancing biodiversity.
Regional planning policies	
The East of England Plan[5]. **Policy ENV3 of the Regional Spatial Strategy (RSS) for the East of England**	Proper consideration should be given to the potential effects of development on the conservation of habitats and species outside designated sites, and on species protected by law. Planning authorities and other agencies should ensure that the region's wider biodiversity, earth heritage and natural resources are protected and enriched through the conservation, restoration and re-establishment of key resources. This will be achieved by ensuring new development minimises damage to biodiversity and earth heritage resources by avoiding harm to local wildlife sites and, wherever possible, achieving net environmental gains in development sites through the retention of existing assets, enhancement measures, and new habitat creation.

[4] Office of the Deputy Prime Minister (2005). *Planning Policy Statement 9: Biodiversity and Geological Conservation.* HMSO.

[5] Government Office for East of England (2008). *The East of England Plan*. Cambridge.

Policy Reference	Policy Issue
Local planning policies	
Suffolk Coastal Local Plan ("Saved" policies incorporating 1st and 2nd Alterations 2001 and 2006")	The council seek to protect, restore, maintain and enhance biodiversity interests. Planning permission would not be granted for development that results in significant harm to biodiversity interests unless there is no satisfactory alternative, all statutory and regulatory requirements are met and suitable mitigation and compensation measures are provided.
Reviewed Suffolk Coastal Core Strategy & Development Management Policies	**DM27 -** Development will not be permitted where there is an unacceptable impact on biodiversity and geodiversity having a regard to: the status and designation of sites habitats and species, the need to avoid the loss and fragmentation of important sites and habitats: and the impact and effectiveness of mitigation measures.
SP14 - Biodiversity and Geodiversity and **DM27 – Biodiversity and Geodiversity**	**SP14 -** Biodiveristy and geodiversity will be protected and enhanced using a framework based on a network of Wildlfie corridors; rivers coast and estuaries, idenitfied habitats and geodiversity features, landscape character areas and protected species.
Other policies	
UK Biodiversity Action Plan (UK BAP) (Biodiversity Reporting and Information Group, 2007)	Effects on priority habitats and species listed in the UK BAP.
The Suffolk Local Biodiversity Action Plan (LBAP).	Effects on priority habitats and species listed in the Suffolk LBAP.

3.2 Desk Study Results

3.2.1 European and Ramsar Sites

Four Sites are located within 5km of the site and these sites are listed and summarised in **Table 3.2** below.

Table 3.2 European and Ramsar Designated Conservation Sites within 5km of the Site

Site	Type of designation	Area (ha)	Ecological interest	Grid Reference	Approximate distance (m) and direction from site
Minsmere to Walberswick Heaths and Marshes	Ramsar Site,	2018.92	The site contains a mosaic of marine, freshwater, marshland and associated habitats complete with transition areas in between. It contains the largest continuous stand of reedbeds in England and Wales and rare transition in grazing marsh ditch plants from brackish to fresh water.	TM 477 747	3200m, E

Site	Type of designation	Area (ha)	Ecological interest	Grid Reference	Approximate distance (m) and direction from site
			This site supports nine nationally scarce plants and at least 26 red data book invertebrates. As well as an important assemblage of rare breeding birds associated with marshland and reedbeds.		
Minsmere to Walberswick Heaths and Marshes	Special Protection Area (SPA)	2019.55	The reserve is designated as an important breeding, roosting and feeding site for many bird species with over 100 resident species and around a further 240 species of migratory visitors being recorded at the site. The site is of particular conservation importance for great bittern (*Botaurus stellaris*), western marsh harrier (*Circus aeruginosus*), pied avocet (*Recurvirostra avosetta*), savi's warbler (*Locustella luscinioides*), bearded reedling (*Panurus biarmicus*) and reed bunting (*Emberiza schoeniclus*).	TM 456 666	3200m, E
Minsmere to Walberswick Heaths and Marshes	Special Area of Conservation (SAC)	1265.52	The principal reason for the designation of this site are the two Annex I habitats which it supports. Annual vegetation of drift lines occurs on a well developed beach strandline and is the best and most extensive example of this restricted geographical type. European dry heaths occupy an extensive area of this site on the east coast of England, which is at the extreme easterly range of heath development in the UK	TM 468 682	3200m, E
Sandlings	SPA	3405.71	The Sandlings SPA consists of a large area formerly dominated by heathland which has been used for commercial conifer forestry and arable agriculture resulting in remnant areas of heath. Recent restoration work has restored many areas with heathland supporting acid grassland and heather-dominated plant communities with dependent invertebrate and bird communities of conservation value. Woodlark (*Lullula arborea)* and Nightjar (*Caprimulgus europaeus)* have also adapted to breeding in the large blocks of conifer forest, using areas that have recently been felled and recent plantation, as well as areas managed as open ground.	TM 464 622	2500m, SE

3.2.2 Statutory Nature Conservation Sites

One statutory wildlife site was recorded within 2km of the site boundary and is listed and summarised in **Table 3.3** below.

Table 3.3 Statutory Nature Conservation Sites within 2km of the Site

Site	Type of designation	Area (ha)	Ecological interest	Grid Reference	Approximate distance (m) and direction from site
Sizewell Marshes	SSSI	105.39	Habitats consist of marsh, reedbed and wet woodland with adjacent heathland and beach with a broad range of wildflower species including four species of orchid, yellow rattle (*Rhinanthus minor*), ragged-robin (*Lychnis flos-cuculi*), bogbean (*Menyanthes trifoliata*) and lady's smock (*Cardamine pratensis*). The site also supports a broad range of faunal species including otter, water vole, kingfisher, water rail and barn owl, bittern and bearded tit.	TM 454 636	980m, E

3.2.3 Non-statutory Nature Conservation Sites

There are two non-statutory nature conservation sites within 1km of the site. These sites are listed and summarised in **Table 3.4**.

Table 3.4 Non-Statutory Nature Conservation Sites within 1km of the Site

Site	Type of designation	Area (ha)	Ecological interest	Grid Reference	Approximate distance (m) and direction from site
Buckle's Wood	CWS	4.62	Buckle's Wood is a mixture of ancient and semi natural woodland,containing old coppice stools consisting of hazel, with ash, field maple and hornbeam mixed with oak standards.A good ditch and bank boundary with a mixed species hedge, indicates a woodland of some considerable age.	TM 431 635	315m, SW

Site	Type of designation	Area (ha)	Ecological interest	Grid Reference	Approximate distance (m) and direction from site
Sizewell Levels and Associated Areas	CWS	105.33	A large area of land, consisting of woodland, plantation, wet meadow, osier beds and scrub considered to be of both regional and national importance for wildlife conservation. The whole site with its diversity of habitats, is considered to be one of the most important County Wildlife Sites in the county. In 1994 the area designated as a Site of Special Scientific Interest was extended to include a large proportion of this County Wildlife Site.	TM 463 640	750m, E

3.2.4 Protected or Notable Species

A number of protected or notable species have been recorded within 1km of the site as outlined in **Table 3.5**.

Table 3.5 Protected and Otherwise Notable Species Recorded within 1km of the Site

Species common name	Species biological name	Number of records	Date (most recent)	Distance of nearest recording from site (m)
Mammals				
Otter	*Lutra lutra*	1	2008	100, E
Common pipistrelle bat	*Pipistrellus pipistrellus*	4	1993	670, NE
Serotine bat	*Eptesicus serotinus*	1	1990	Exact location unknown.
Noctule bat	*Nyctalus noctula*	1	1990	Exact location unknown.
Reptiles and amphibians				
Great crested newt	*Triturus cristatus*	2	1998	400, E
Viviparous lizard	*Zootoca vivipara*	1	1999	800, NW
Grass snake	*Natrix natrix*	1	2008	1000, E

Species common name	Species biological name	Number of records	Date (most recent)	Distance of nearest recording from site (m)
Birds				
Barn owl	*Tyto alba*	3	1999	Exact location unknown.
Bittern	*Botaurus stellaris*	3	1999	Exact location unknown.
Bullfinch	*Pyrrhula pyrrhula*	2	2002	Exact location unknown.
Grasshopper Warbler	*Locustella naevia*	1	1992	Exact location unknown.
Grey Partridge	*Perdix perdix*	1	1998	Exact location unknown.
Lesser Spotted Woodpecker	*Dendrocopos minor*	1	1993	Exact location unknown.
Linnet	*Carduelis cannabina*	1	1999	Exact location unknown.
Reed Bunting	*Emberiza schoeniclus*	1	1991	Exact location unknown.
Skylark	*Alauda arvensis*	5	2002	Exact location unknown.
Song Thrush	*Turdus philomelos*	3	2002	Exact location unknown.
Spotted Flycatcher	*Muscicapa striata*	1	2002	Exact location unknown.
Turtle Dove	*Streptopelia turtur*	3	2004	Exact location unknown.
Woodlark	*Lullula arborea*	2	1999	Exact location unknown.
Wryneck	*Jynx torquilla*	1	1993	Exact location unknown.
Invertebrates				
Small Square-spot	*Diarsia rubi*	1	2002	500, E
Small Phoenix	*Ecliptopera silaceata*	1	2002	500, E
August Thorn	*Ennomos quercinaria*	1	2002	500, E
Oblique Carpet	*Orthonama vittata*	1	2002	500, E
Dark Spinach	*Pelurga comitata*	1	2002	500, E
Oak Hook-tip	*Watsonalla binaria*	1	2002	500, E

Species common name	Species biological name	Number of records	Date (most recent)	Distance of nearest recording from site (m)
Dark-barred Carpet	*Xanthorhoe ferrugata*	1	2002	500, E
White Letter Hairstreak	*Satyrium w-album*	1	2004	1000, E
Grey Dagger	*Acronicta pisi*	1	2007	Exact location unknown.

3.3 Field Survey Results

3.3.1 Habitats

Figure 3.1 presents the Phase 1 Habitat survey map. The following sections describe the habitats on and around the site.

Site Context and Surrounding Habitats

The Site is situated within a rural setting approximately 1km to the north east of Leiston, Suffolk. Abbey Lane, borders the north of the site with Abbey Road to the east. The wider landscape consists predominantly of large arable fields with boundary hedges and treelines with occasional copses, broom or gorse coverts.

On-site Habitats

The Site consists of a farmhouse and farm cottage located centrally to the north of the site with a number of associated agricultural and light industrial out-buildings. The remainder of the farm site comprises four large arable fields with two smaller fields of improved grazing pasture adjacent to the south of the farm buildings. Field margins are present around the arable fields and are formed by a non-continuous strip of rank semi-improved grassland between 0.5m and 3m wide, with occasional patches of bramble (*Rubus fruticosus agg*) and tall ruderal vegetation. Dominant grass species consist of cocks-foot (*Dactylus glomerata*), Yorkshire fog (*Holcus lanatus*) with some tufted hair grass (*Deschampsia cespitosa)* while the predominant ruderal species comprise Alexander's (*Smyrnium olusatrum),* common nettle (*Urtica dioica*) and spear thistle (*Cirsium vulgare)*.

Sections of species-poor hedgerow consisting predominately of hawthorn (*Crataegus monogyna*) with interspersed ash (*fraxinus excelsior*) are present around field and site boundaries in the northern half of the site. Dense sections of continuous mature hedgerow approximately 2m in height are present around the grazing pastures adjacent to the farm buildings and around Gipsy Lodge in the north western corner of the Site. A discontinuous scattered hedgerow also stretches along the north eastern and eastern boundary of the Site, following the edge of the Abbey Lane and Abbey Road with latter containing a greater proportion of oak and ash stands. A short stretch of Leyland cypress, (*Cupressocyparis leylandii)* hedge borders residential properties in the south eastern corner of the Site.

Drainage ditches form the Site boundary to the southern half of the site, however these were dry at the time of survey and support scattered ruderals and grasses of similar composition to the

field margins. Mature trees are scattered throughout the field edges and Site boundaries and are comprised in the main of oak (*Quercus sp*.) trees.

An access track branches off Abbey Lane, west of the farm buildings to an excavated area with a small copse of oak and elder (*Sambucus nigra*) trees located near the centre of the Site. This area has been used for waste storage which includes large piles of rubble and stone, and cut brash vegetation (TN1) with much of this area covered in bramble.

3.3.2 Species

Badger
See Appendix C.

Bats
The desk study contained records of common pipistrelle (*Pipistrellus pipistrellus*), serotine (*Eptesicus serotinus*) and noctule (*Nyctalus noctula*) in the local area; however results from the Sizewell Bat Survey Report 2010 (28130ca068) identified the following 8 species, including serotine, soprano pipistrelle (*Pipistrellus pygmaeus*) common pipistrelle, Leisler's bat (Nyctalus leisleri), Myotis bats (*Myotis sp.*), noctule , Nathusius' pipistrelle and brown long-eared bat (*Plecotus auritus*) occurring in the nearby locality with barbastelle (*Barbastella barbastellus*) known to roost in trees and a building approximately 1km from the site boundary.

A number of mature trees (c.11) located on or adjacent to the Site are considered to have potential to support roosting bats. These trees all exhibit features including broken limbs, cracks, crevices and bark flakes that would be suitable for bat roosts. The on-site grassland and hedgerow habitats could provide suitable foraging habitat for bats roosting in the vicinity, both in trees and in the residential buildings near to the site.

The farm houses and associated out-buildings located on the north of the site were assessed for their potential to support roosting bats. The majority of the buildings are thought to have low bat roosting potential as they are large storage sheds with unlined corrugated roofs and interspersed clear lighting sheets; there is however, some potential for occasional roosting in the wooden clad sides of these units. The farm house is a two-storey red brick building with pitched tiled roof; this building is in a good condition with no obvious holes in the roof or wooden gutter boards, and thus offering no entrance holes for bats. The adjacent smaller farm house to the west comprises two storeys and a hipped tiled roof, this building is in good condition apart from a hole in the soffit box which is full of bird nesting material. A small one-storey building situated between the two houses offers some roosting potential with gaps between the wooden gutter board and the wall. A long two-storey red brick building with attached single-storey lean-to is located centrally between the two farm house properties and offers some bat roosting potential with a hole in a lintel above an open door while the lean-to has gaps between the wooden gutter board and the wall.

Birds

Desk study results provided multiple records of notable bird species, including woodlark (*Lullula arborea*), skylark (*Alauda arvensis*), bittern (*Botaurus stellaris*), barn owl (*Tyto alba)* and wryneck (*Jynx torquilla*), which receive additional protection under Schedule 1 of the Wildlife and Countryside Act (1981). No protected or moderate to high conservation status

species however, were recorded nesting or potentially breeding within or around the site. In particular, no ground nesting birds, such as Skylark [BoCC[6] Red list].

The tree-lined hedgerows around the boundary of the site are likely to support several common or garden species, including the following which were recorded during the walkover: goldfinch (*Carduelis carduelis*), chiffchaff (*Phylloscopus collybita*), robin (*Erithacus rubecula*) and blue tit *(Cyanistes caeruleus).*

Great Crested Newt

Desk study results provided records of great crested newt within 500m of the site.

Multiple waterbodies within 500m of the Site were identified during the desk study that have ecological connectivity with the Site; 8 of these were potentially suitable to support great crested newt. Details of these waterbodies are provided in Appendix D. The on-site habitats provide limited habitat suitability for great crested newt, as waterbodies are absent and the majority of the site consists of intensively farmed arable fields, which is sub-optimal terrestrial habitat. Nevertheless, the field margins provide ruderals, tussocky grassland and scrub suitable to support newts, while the small woodland copse and pile of earth covered rubble could provide suitable hibernation sites.

Reptiles

Desk study results provided records of viviparous lizard and grass snake within 1km of the Site.

Suitable reptile habitats on-site were limited to the field margins of rank grassland, scrub and ruderal vegetation. These have the potential to provide sheltering and foraging habitat for reptile populations, although the lack of aquatic habitat may limit the suitability for grass snake. A suitable hibernation site was identified adjacent to the sunken wooded copse near the centre of the site, where piles of scrub covered brick hardcore and tarmac were present along with brash cuttings (TN1). The site lies within an area known to support relatively high populations of reptiles, and as such, any of the common reptile species may be found to be present..

Other Species

Desk study results provide records of .otter, approximately 100m to the east of the Site. The Site however, is unlikely to support this species, given the lack of wetland and/or aquatic habitat.

A number of notable moths were recorded within 1km of the Site. These were recorded east of the Site predominantly within the Sizewell Levels and Associated Areas, County Wildlife Site where the habitat consists of woodland, plantation, wet meadow and scrub and is considered to be one of the most important County Wildlife Sites in the county. The predominatley arable habitats, with limited marginal vegetation on site however are not thought suitable to support a similar community of notable invertebrates.

[6] Birds of Conservation Concern

4. Conclusions and Recommendations

4.1 Summary

An Extended Phase 1 Habitat Survey was undertaken for the Site in parallel with a desk top study of readily available ecological information. The following potential ecological receptors within the potential zone of influence of the development proposals are outlined below:

4.1.1 Designated Sites

International/European Statutory Designated Sites
Four international/European statutory designated sites are located within 5km of the Site:

- Sandlings SPA (2.5km south).
- Minsmere to Walberswick Heaths and Marshes Special Protection Area (SPA) (3.2km north east).
- Minsmere to Walberswick Heaths and Marshes Ramsar Site (3.2km north east).
- Minsmere to Walberswick Heaths and Marshes Special Area of Conservation (SAC)(3.2km north east).

Given the proximity of these sites, particularly the Sandlings SPA, and the absence of detailed proposals for the Site, there is potential for these sites to be affected by the proposed development and as such should be taken into account within any further design and assessment.

National Statutory Designated Sites
One national statutory designated sites are located within 2km of the Site:

- Sizewell Marshes SSSI (980m east).

Given the proximity of these sites and the absence of detailed proposals for the site, there is potential for these sites to be affected by the proposed development and as such should be taken into account within any further design and assessment.

Non-Statutory Designated Sites
Two non-statutory designated sites are located within 1km of the Site:

- Buckle's Wood CWS (315m south west); and
- Sizewell Levels and Associated Areas (CWS)(750m north).

Given the proximity of these sites, particularly Buckle's Wood, and the absence of detailed proposals for the Site, there is potential for these sites to be affected by the proposed development and as such should be taken into account within any further design and assessment.

4.1.2 Habitats

The Site comprises arable fields with two smaller fields of improved grazing pasture/amenity grassland adjacent to the south of the farm buildings. Field margins are formed by a non-continuous strip of rank improved grassland with interspersed patches of scrub and tall ruderals. The fields are fringed by overgrown drainage ditches and species-poor boundary hedges with interspersed mature tree stands. A small copse of mixed deciduous trees is located in the centre of the site.

4.1.3 Species

The following protected species and species groups have been identified as being potentially present on site:

- Bats (roosting, foraging and commuting);
- Great crested newt (foraging, commuting and hibernating);
- Reptiles; and
- Nesting birds.

Recommendations are provided below in order to inform any Ecological Impact Assessment (EcIA) and scheme design and also to ensure compliance with the relevant wildlife legislation and planning policy relating to these species.

4.2 Ecological Impact Assessment

It is recommended that this report (and future survey findings) is used to form the basis of an EcIA once additional information relating to the scheme design becomes available. This should assess the effects of the development on the biodiversity receptors identified in section 4.1, as well as informing any masterplanning and detailed design of an ecological enhancement and mitigation strategy where appropriate.

4.2.1 Habitats Regulations Assessment (HRA)

There are four European or ramsar sites within 5km of the Site, the nearest being 2.5km to the south (Sandlings SPA). At this stage, detailed development proposals for the site have not been established. It is considered unlikely that the development proposals will result in effects on these designated areas or the features for which they have been designated however, in the absence of more information this cannot be scoped out at this stage. As such, there is the potential that a Habitats Regulations Assessment (HRA) would need to be undertaken for the site.

The need for Habitat Regulations Assessment is set out within Article 6 of the EC Habitats Directive 1992, and interpreted into British law by the Conservation of Habitats and Species Regulations 2010. The ultimate aim of HRA is to "*maintain or restore, at favourable conservation status, natural habitats and species of wild fauna and flora of Community interest*" (Habitats Directive, Article 2(2)). This aim relates to habitats and species, not the European sites themselves, although the sites have a significant role in delivering favourable conservation status.

It is recommended that consultation should commence with Natural England in order to establish their expectations particularly in relation to the need for undertaking HRA for this site.

4.2.2 Masterplanning

Development proposals for the Site are still in their very early stages and as such, it is not appropriate at this stage to provide any detailed assessment of effects upon ecological receptors and protected species. As such, we have provided below a number of broad recommendations and principles that can be further refined once more detailed designs become available.

According to PPS93 there is a need to 'enhance biodiversity in green spaces and among developments so that they are used by wildlife and valued by people'. Furthermore, there is a requirement by policy to consider the BAP priority species that may occur on the Site. In order to adequately address these requirements, it is recommended that there is specialist ecological input into the development of the scheme design from the outset. This will ensure that the new development retains existing habitats used by protected and notable species on the site, as well as incorporating features within the design to enhance the habitats for biodiversity in general. Such features may include:

- Retention of tree and scrub lines which may be used by foraging and commuting bats;
- Increasing botanical diversity by planting native fruit and flower-bearing species (of local provenance): this will in turn increase invertebrate diversity and thus prey for bats and herpetofauna;
- Provision of artificial roost sites for bats through installation of appropriate boxes and other roost spaces incorporated within new buildings;
- Avoidance of excessive lighting, particularly around artificial bat roost sites and commuting and foraging habitat;
- Installing hibernacula – these involve loose, inert fill being dug into, and piled up above the ground. The material is then covered in top soil and turf with the edges left to expose the fill and allow access for reptiles and amphibians;
- Stag beetle pyramids - these consist of a number of logs half buried into the ground vertically. While providing a source of rotting dead wood and shelter for invertebrates, they also provide sheltering, hibernating and basking locations for herpetofauna;
- Retaining a graded edge to grassland habitats, with a long grass sward, ruderal species and scrub buffer between short sward grass and denser scrub/woodland; and
- Further guidance is provided in the publications 'Biodiversity by Design', 'Habitat Management for Bats' and 'Herpetofauna Workers' Manual'[7].

[7] Bullock, D. J., Oldham, R. and Corbett, K. (1998). Habitats and their management. In: Gent, A. H. and Gibson, S. D. eds. Herpetofauna workers' manual. Joint Nature Conservation Committee, Peterborough, pp61-73.

4.3 Further Studies

Further survey work is recommended to establish the status of any protected or otherwise notable species or assemblages of species present or potentially present on site. The findings of this additional survey work will inform the scheme design and any necessary mitigation strategy that may be required to comply with legislation of planning policy. Such information can also provide baseline data against which the success of future restoration and enhancement work can be measured through monitoring.

4.3.1 Bats

Due to the level of protection afforded to bats and the potential for them to be effected by the development proposals, it is recommended that building inspections, emergence and activity surveys are undertaken in order to ascertain the level of bat activity within and around the Site.

Detailed internal and external inspections of the buildings and trees should be undertaken in order to identify any direct evidence of usage by bats. If appropriate these should be followed up by emergence/re-entry surveys at dusk or dawn.

Activity surveys should also be undertaken across the site using a pre-defined transect. These surveys will aim to highlight which bat species use the area and where the highest areas of usage are.

Should bats be found to use the site there would be a requirement to design a mitigation strategy taking into account the available guidance and advice[8]. If roosts are identified It may be necessary to obtain a licence from Natural England to destroy the roost and to mitigate for its loss. This may also have an effect on the timing of the removal of trees and/or buildings, which may need to be scheduled to avoid breeding and/or hibernation periods (May-September and November-March respectively).

4.3.2 Birds

The site has the potential to support notable bird species. As such it is recommended that a suite of Common Bird Census (CBC)[9] surveys should be undertaken in order to determine the species assemblage utilising the Site and habitats in close proximity to the Site.

4.3.3 Great Crested Newts

It is recommended that all ponds within 500m of the site that have the potential to support great crested newt (pond details are provided in Appendix D) are subject to a great crested newt presence / likely absence survey. The survey methods should accord to best practice guidelines[10], and thus would involve four separate visits to the site under suitable weather conditions between mid-March and mid-June (two visits to be made between mid-April and mid-May).

[8] Mitchell-Jones, A. J. (2004) Bat mitigation guidelines. English Nature, Peterborough.

[9] Gilbert G, Gibbons, D.W. and Evans, J. (1998). Bird Monitoring Methods. RSPB, Sandy.

[10] English Nature (2001). *Great crested newt mitigation guidelines*. Peterborough, English Nature.

4.3.4 Reptiles

Due to the level of protection afforded to reptiles it is recommended that a presence/ likely absence survey is conducted to establish the presence of reptile species in suitable habitat on the site in line with best practice guidelines[11,12] should development proposals result in the direct loss of habitats with the potential to support these species. This will involve laying artificial reptile refugia across areas of suitable habitat. Refugia would then be examined on a subsequent seven survey visits combined with early-morning walkover surveys to search for basking animals. Surveys are seasonally constrained and must be undertaken between April and September, with optimal survey periods being late April-May and September. It is likely that, should the presence of reptiles be identified, the total number of survey visits may need to be increased to 20 in order to make population estimates.

4.4 Other Recommendations

4.4.1 Nesting Birds

All active bird nests are legally protected under the Wildlife and Countryside Act (1981, as amended). This means that, with certain exceptions, it is illegal to intentionally or recklessly destroy an actively used nest during the breeding season, which is considered to be between March and August inclusive.

In order to minimise this risk of contravening legislation, site clearance should be completed outside the breeding bird season when active nests are not present. Where site clearance outside the breeding bird season is not possible, an ecologist will need to carefully inspect vegetation prior to clearance to ensure that active nests are not present. Should an active nest be found, it will be left in-situ and undisturbed until the young have fledged.

[11] Griffiths, R. and Inns, H. (1998). Surveying. *In*: Gent, A. H. and Gibson, S. D. eds. *Herpetofauna workers' manual*. Peterborough, Joint Nature Conservation Committee, pp1-13.

[12] Froglife (1999). *Reptile survey: an introduction to planning, conducting and interpreting surveys for snake and lizard conservation*. Froglife Advice Sheet 10. Froglife, Halesworth.

643000 644000 645000

265000 264000 263000

N

House

Theberton House

Birchwood Farm

Greenhouse Plantation

Pit (dis)

The Forest

MS

Upper Abbey

Hill Farm

Harrow Farm

Abbey Farm

Pit (dis)

Spring Covert

Remains of Leiston Abbey (Premonstratensian)

Leiston Old Abbey

Old Abbey

Abbey Road

Aldhurst Farm

Gypsy Lodge

Abbey Lane

Fiscal Policy

Lover's Lane

Fisher's Farm

Buckle's Wood

Buckleswood Road

Crossing Farm

Pit (dis)

Wood Farm

Saxmundham Road Crossing

Pit (dis)

Brick Kiln Farm

Pit (dis)

Sewage Works

Valley Road

Leiston House Farm

Cemetery

Highbury Cottages

Saxmundham Road

Works

Caravan Park

Woodfield Pit

Leiston Hall

School

F Sta

LEIST

643000 644000 645000

REPRODUCED WITH THE PERMISSION OF ORDNANCE SURVEY ON BEHALF OF HER MAJESTY'S STATIONERY OFFICE. © CROWN COPYRIGHT (2011). ALL RIGHTS RESERVED. BRITISH ENERGY plc PART OF EDF ENERGY LICENCE 100019324

Key:

Site boundary

0 0.5 Kilometres

Scale: 1:10,000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\MapInfo\Workspaces

EDF

Associated Development Site 1
Extended Phase 1 Habitat Survey Report

Figure 1.1
Site boundary plan

November 2011
28130-A201.mxd tugwc

amec

644000

264000

N

Playing Field

Spring Covert

Path

Music School

Track

Aldhurst Farm

Gipsy Lodge

ABBEY LANE

Fisher's Farm

Buckleswood Nurseries

ABBEY ROAD

Path

Path

SI

A

I

1

644000

Key:

- Site boundary
- Native species-poor hedgerow
- Semi-natural broadleaved woodland
- A — Arable Land
- A — Amenity grassland
- SI — Poor semi-improved grassland
- I — Improved grassland
- Buildings
- Hardstanding
- Hedge and trees
- 1 — Target note

0 200 Meters

Scale: 1:4,000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\MapInfo\Workspaces

EDF

Associated Development Site 1
Extended Phase 1 Habitat Survey Report

Figure 3.1
Phase 1 Habitat Plan

November 2011
28130-A202.mxd tugwc

amec

Appendix A
Relevant Legislation

Badgers

The *Protection of Badgers Act 1992* consolidates previous legislation (including the *Badgers (Further Protection) Act 1991*). It makes it a serious offence to intentionally or recklessly:

- Kill, injure or take, or attempt to kill, injure or take a badger;
- To damage, destroy or obstruct access to a sett; and
- To disturb a badger when it is occupying a sett.

Bats

All British bat species are listed in Schedule 5 of *The Wildlife and Countryside Act 1981* (as amended). The Act transposes into UK law the Convention on the Conservation of European Wildlife and Natural Habitats (commonly referred to as the 'Bern Convention'). All British bat species are listed on Schedule 5 of the Act in respect of Section 9, which makes it an offence, *inter alia*, to:

- Intentionally or recklessly kill, injure, or take (handle) a bat;
- Intentionally or recklessly damage, destroy or obstruct access to any structure or place that a bat uses for shelter or protection; and
- Intentionally or recklessly disturb a bat while it is occupying a structure or place that it uses for shelter or protection.

British bat species receive further protection under Regulation 41 of the *The Conservation of Habitats and Species Regulations 2010*, which make provision for the purpose of implementing European Union Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora 1992. All British bat species are listed on Annex IV of the Directive, which means that member states are required to put in place a system of strict protection as outlined in Article 12, and this is done through inclusion on Schedule 2 of the Regulations, which makes it an offence, *inter alia*, to:

- Deliberately capture, injure or kill any bat;
- Deliberately disturb a bat, in particular any disturbance which is likely

  (a) to impair their ability

  (i) to survive, to breed or reproduce, or to rear or nurture their young, or

  (ii) to hibernate or migrate

  (b) to affect significantly the local distribution or abundance of the bat species; or
- Damage or destroy a breeding site or resting place of a bat.

In addition, five British bat species are listed on Annex II of the *Habitats Directive*. These are:

- Greater horseshoe bat (*Rhinolophus ferrumequinum*);
- Lesser horseshoe bat (*Rhinolophus hipposideros*);
- Bechstein's bat (*Myotis bechsteinii*);
- Barbastelle (*Barbastella barbastellus*); and
- Greater mouse-eared bat (*Myotis myotis*).

As Annex II species under the Habitats Regulations, the Directive requires the designation of Special Areas of Conservation (SACs) by EC member states to ensure that their populations are maintained at a favourable conservation status. Where bats occur outside SACs the level of legal protection that these species receive is the same as for other bat species, however their inclusion on Annex II serves to underline their conservation significance and it is therefore less likely that adequate mitigation for loss of roosts of these species will be possible.

For projects in England: Further details of the above legislation, and of the roles and responsibilities of developers and planners in relation to bats, can be found in Natural England's *Bat Mitigation Guidelines*, which can be downloaded from the NE website: http://naturalengland.etraderstores.com/NaturalEnglandShop/IN136

Birds

With certain exceptions[13], all wild birds, their nests and eggs are protected by the *Wildlife and Countryside Act 1981* (as amended). Therefore, it is an offence, *inter alia*, to:

- Intentionally take, damage or destroy the nest of any wild bird while it is in use or being built; and
- Take or destroy the egg of any wild bird.

Bird species listed on Schedule 1 of the Act receive further protection, thus for these species it is also an offence to:

- Disturb any bird while it is nest building, or is at a nest containing eggs or young; or disturb the dependent young of any such bird.

Great Crested Newts

The great crested newt is listed on Schedule 5 of the *Wildlife and Countryside Act 1981* (as amended) and is therefore afforded protection under Section 9 of this Act. In addition, the species is listed in Schedule 2 of *The Conservation (Natural Habitats, &c.) Regulations 1994 (SI 1994 No. 2716)* (as amended) (known as the Habitats Regulations) and is therefore protected under Regulation 39 of the Regulations. The Act and Regulations makes it an offence, *inter alia*, to

- intentionally kill, injure, take (handle), or capture a great crested newt;

[13] Some species, such as game birds, are exempt in certain circumstances.

- intentionally or recklessly damage, destroy or obstruct access to any place that a great crested newt uses for shelter or protection- under the Habitats Regulations it is an offence to damage or destroy a breeding site or resting place of any great crested newt; or
- intentionally or recklessly disturb a great crested newt while it is occupying a structure or place that it uses for shelter or protection - under the Habitats Regulations it is an offence to deliberately disturb a great crested newt (this applies anywhere, not just at its roost) in such a way as to be likely to significantly affect:
  - the ability of any significant group of great crested newts to survive, breed, or rear or nurture their young; or
  - the local distribution or abundance of great crested newts.

This relates to both the aquatic and terrestrial habitat that it may occupy. The legislation applies to all life stages of great crested newts.

Reptiles

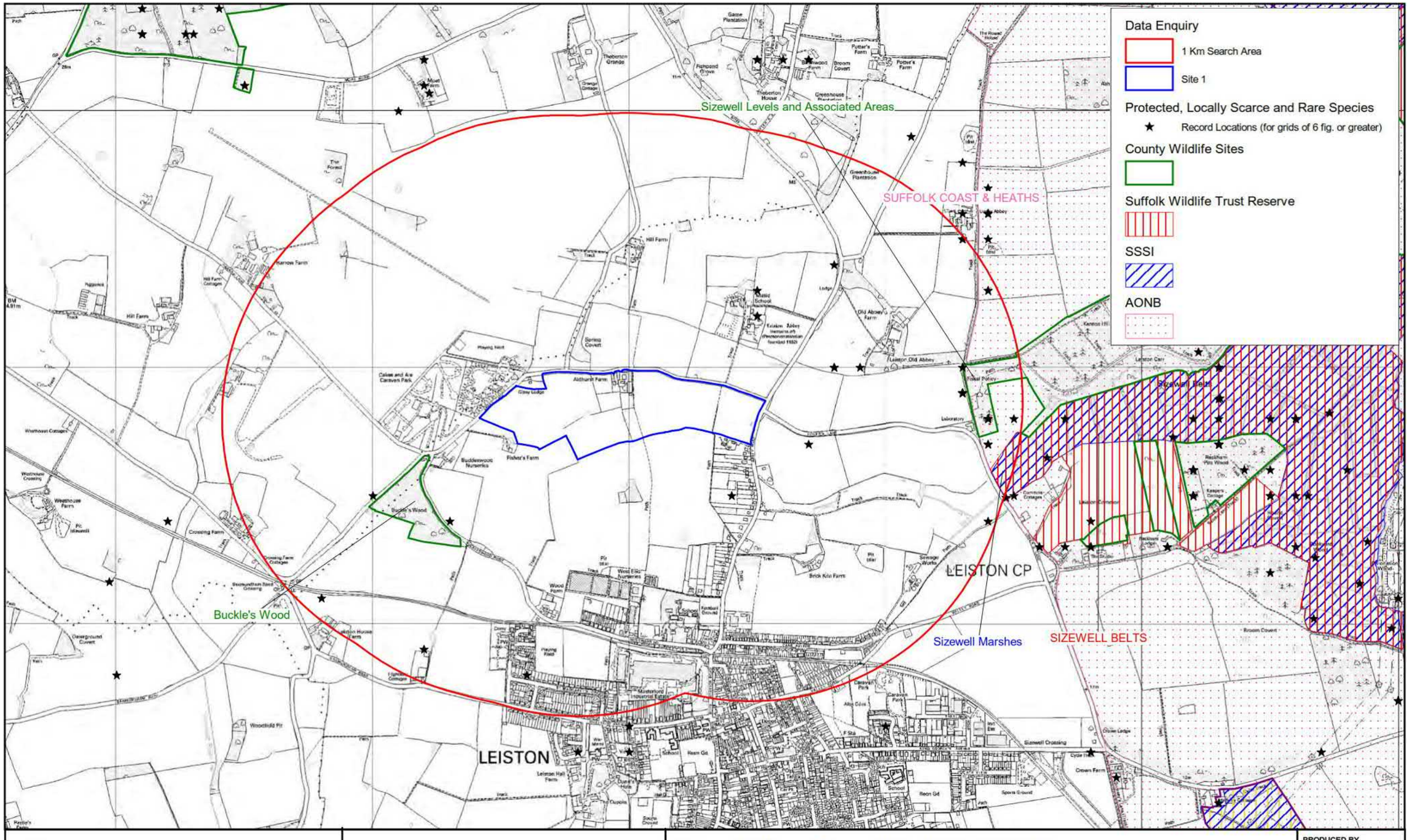
The four widespread[14] species of reptile that are native to Britain, namely viviparous lizard, slow worm, adder and grass snake, are listed on Schedule 5 of the *Wildlife and Countryside Act 1981* (as amended) and are afforded limited protection under Section 9 of this Act. This makes it an offence, *inter alia*, to:

- Intentionally kill or injure any of these species.

[14] The two other native species of British reptile (sand lizard *Lacerta agilis* and smooth snake *Coronella austriaca*) receive a higher level of protection under the *Wildlife and Countryside Act* 1981 (as amended). However, the distribution of these species is restricted to a limited number of sites in particular geographic locations.

Appendix B
Desk Study Data

December 2011
Doc Reg No: 28130ca138



SUFFOLK BIOLOGICAL RECORDS CENTRE

Suffolk Biological Records Centre
Ipswich Museum, High Street
Ipswich, IP1 3QH
Tel: 01473 433571

NORTH
Grid North

Scale 1:14000

Entec (Aldhurst Farm (West) TM 439 638)
1 Km Data Enquiry

PRODUCED BY	Ben Heather
CHECKED BY	
DRAWING No.	
DATE	10/02/2011

Appendix C
CONFIDENTIAL: Badger Survey

This appendix has been removed as it contains confidential information. This appendix is available on request to those who have legitimate need to view the information.

Appendix D
Assessment of Waterbodies

Table D.1 Waterbodies Located Within 500m of the Site Boundary

Ref no.	Water body	Nat Grid Ref	Distance/direction from Study area (m) - (WSA = within study area)	Approximate Area (m^2)	Description
WB1	Buckleswood Road Pond	TM432635	276m, SW	200	Still, supporting a range of aquatic plant life with 90% of the water surface being covered by pond weed (*Potamogeton sp*). Overshaded on 75% of its margins with adjacent habitat consisting of woodland and drainage ditches.
WB2	Fisher's Farm Pond 1	TM435637	51m, SW	-	A swimming pool.
WB3	Fisher's Farm Pond 2	TM435637	51m, SW	250	Assessed visually from 20m as access was not possible. Situated in a wooded garden the pond consisted of an open water body with well established aquatic vegetation.
WB4	Aldhurst Farm Pond	TM439639	WSA	-	Pond not present.
WB5	Spring Covert Pond	TM439641	100m, N	-	Pond not present.
WB6	Hill Farm Copse Pond	TM437644	451m, N	200	Still, supporting a range of aquatic plant life with 75% of the water surface being covered by pond weed. Overshaded on 80% of its margins with adjacent habitat consisting of a small woodland copse and hedgerows and field boundaries.
WB7	Hill Farm Field Pond	TM439643	400m, N	-	Access was not possible as on private land. Unable to make visual assessment.

Ref no.	Water body	Nat Grid Ref	Distance/direction from Study area (m) - (WSA = within study area)	Approximate Area (m^2)	Description
WB8	Hill Farm Pond	TM440644	432m, N	1200	A large farmyard pond with slurry running off into the water body. Waterfowl were present while macrophyte cover was limited to 5%. The pond was shaded around 15% of its margin by scrub.
WB9	Aldhurst Copse Pond 1	TM440635	146m, S	900	A large pond situated centrally within a large arable field and surrounded by a broadleaf copse. 65 % of the water body has macrophyte cover with 50% of the pond margin shaded.
WB10	Aldhurst Copse Pond 2	TM440634	230m, S	-	Pond not present.
WB11	Aldhurst Farm Field Pond	TM441635	275m, S	-	Pond not present.
WB12	Abbey Farm Pond 1	TM444643	386m, N	500	Assessed visually from 10m as access was not possible. Situated in a garden the pond consists of an open water body with well established aquatic vegetation and surrounding habitat including arable fields, amenity lawn and hedgerows.
WB13	Abbey Farm Pond 2	TM444642	400m, N	350	The pond is heavily over shaded by oak and willow trees with scrub under storey around 90% of its margins, with macrophyte cover dominating 70% of the waterbody. The surrounding vegetation consists of arable land with boundary hedgerows.

Ref no.	Water body	Nat Grid Ref	Distance/direction from Study area (m) - (WSA = within study area)	Approximate Area (m^2)	Description
WB14	Abbey Farm Garden Pond	TM444641	277m, N	250	The pond is over shaded by oak and willow trees with scrub under storey around 80% of its margins, with macrophyte cover present around 25% of the waterbody. The surrounding vegetation consists of arable land with boundary hedgerows.
WB15	Brick Kiln Garden Pond	TM447643	457m, SE	900	Located adjacent to Brick Kiln Farm this is a fishing pond stocked with fish with a number of wildfowl present. Minimal aquatic vegetation is present while the pond possesses a combination of sheer sides and deep water with fringing vegetation including common reed mace (Typha latifolia).
WB16	Brick Kiln Ditch Pond	TM446632	420m, SE	40	A ditch with no aquatic vegetation present and full of decaying leaf litter and heavily shaded fringes.

NNB Generation Company

Aldhurst Farm West

Associated Development Site 1

DRAFT Bat Survey Report

February 2012

AMEC Environment & Infrastructure UK Limited

NNB Generation Company

Aldhurst Farm West

Associated Development Site 1

DRAFT Bat Survey Report

February 2012

AMEC Environment & Infrastructure UK Limited

Report for

Christine Blythe
NNB Generation Company
Barnett Way
Barnwood
Gloucester
GL4 3RS

Main Contributors

Matt Hobbs

Issued by

[redacted]

Emma Toovey

[redacted]

Lynn Whitfield

AMEC Environment & Infrastructure UK Limited

17 Angel Gate, City Road, London EC1V 2SH,
United Kingdom
Tel +44 (0) 207 843 1400
Fax +44 (0) 207 843 1410

Doc Reg No. 28130 CR293

r:\projects\28130 sizewell ecology studies\reports\associated development sites\bat survey reports 2011\for issue\28130 ad site 1 2011 bat survey report draft i1 v2.doc

Disclaimer

This report has been prepared in a working draft form and has not been finalised or formally reviewed. As such it should be taken as an indication only of the material and conclusions that will form the final report. Any calculations or findings presented here may be changed or altered and should not be taken to reflect AMEC's opinions or conclusions.

Copyright and Non-Disclosure Notice

Third Party Disclaimer

Document Revisions

No.	Details	Date
1	Draft	Feb 12

Contents

1. Introduction

1.1 Background

An area of land directly north of Sizewell B Nuclear Power Station, which is located near Leiston in Suffolk, has been identified as having the potential to accommodate the proposed development of one or more new nuclear reactors. This proposed development is known as Sizewell C. The site of the proposed development has an approximate central National Grid Reference (NGR) of TM473640. NNB Generation Company (EDF) has identified a number of additional sites for a variety of developments associated with the new build proposals at Sizewell that will be located beyond the current EDF landholding. AMEC Environment & Infrastructure UK Ltd ('AMEC') has been commissioned to provide ecological services in relation to these sites, in order to inform the site selection process and support any future planning submissions. Baker Shepherd Gillespie (BSG) was commissioned to carry out bat surveys for these sites in 2011.

Aldhurst Farm West (Site 1), situated to the north of Leiston, Suffolk (approximate central NGR: TM439638) has been identified as a potential site for associated development. The sites proposed for associated development are currently at a preliminary stage of scoping with detailed scheme plans yet to be confirmed. Notwithstanding, current proposals for land at Aldhurst Farm West include the development of the site to support industrial and warehousing facilities.

1.2 Site Description and Value of Habitats for Bats

Site 1 is located on the north-eastern extent of Leiston, Suffolk within a rural setting (refer to Figure 1.11 for location details and a redline boundary of the site). The site is bordered to the north by Lover's Lane, and to the east by Abbey Road, with the remainder of the site bordered by arable land to the south. Residential housing is situated adjacent to the south-eastern corner of the site.

A brief description of the habitats present within the site in relation to the potential they have for supporting roosting, foraging or commuting bats is included below. For a full habitat description and habitat map, please refer to the Phase 1 Habitat Survey report for the site2.

Although the site is predominantly arable farmland, which is likely to be of low value to bats, much of the site is bordered by hedgerows with mature trees, principally oak (Quercus robur), present along the edge of Lover's Lane and in the southwest corner of the site. These habitats may be of value to foraging and commuting bats. There are also a number of ditches (dry at the time of the survey), particularly along the southern boundary, with areas of rank semi-improved grassland on the edge of arable fields and scrub habitat in the centre of the site that may provide

[1] All figures can be found at the end of the report.

[2] Report reference: 28130ca135.

suitable foraging habitat for bats. In addition, there are several buildings and mature trees within the site boundary that may provide potential roosting opportunities for bats.

1.3 Purpose of this Report

This report summarises the findings of bat activity surveys carried out within the site in 2011 and provides a summary of the bat interest of the site. The focus of the survey work was to examine spatial and temporal patterns of bat activity, and to identify areas of importance for bats through quantitative analysis of relative activity levels. The survey work did not attempt to identify potential roost locations, although an initial assessment of potential roosting features (buildings and trees) was carried out in the Phase 1 Habitat Survey report for the site[2].

1.4 Legislation and Policy Guidance

Details of national policies and legislation that relate to bats, as well as details of the draft Suffolk Biodiversity Action Plan (BAP) for bats are provided in **Appendix A.**

2. Methods

2.1 Walked Transects

Three walked transect surveys were undertaken within the survey area, with one in each of the three sampling periods (May, July and August 2011), in order to collect representative data on bat activity throughout the peak season for such. See **Figure 2.1** for transect routes. During each transect survey two surveyors together (for health and safety reasons) walked a pre-determined transect route.

Two surveys were undertaken at dusk and one before dawn. The dusk survey visits started around sunset and typically took 2.5-3 hours to complete, and the dawn survey was carried out throughout the two hours prior to sunrise. The same (or a similar) transect route was walked on each survey visit with the start and end points changed on each visit to ensure that different parts of the site were surveyed at different times of the night. This approach was adopted to remove a bias that could be introduced if any given point on the transect route was sampled at approximately the same interval after sunset during the two dusk surveys. In addition, during the dusk transects, surveyors completed two circuits of the route to ensure sampling at each part of the site at two different intervals after sunset.

Surveys were carried out only when weather conditions were suitable for bats to be active, avoiding temperatures below 9°C, rain and high wind speeds. The dawn transect survey on 24 May was a little cold with the temperature dropping to 6°C by sunrise, but reasonable bat activity was recorded and this is not considered a significant constraint to the overall results.

Evidence of a common pipistrelle (*Pipistrellus pipistrellus*) roost (a number of bats were seen emerging from the building) was noted at a house at Gipsy Lodge on the northwest boundary of the site during the walked transect survey on 4 July. As a result, an emergence count of the exit point/s was undertaken on that date. Two surveyors watched the northwest facing gable end of the northern-most building (from where bats were emerging) for around 20 minutes. The transect survey was resumed when no further bats had been seen emerging for five minutes. Another short emergence survey was carried out on 3 August at sunset with two surveyors. One surveyor watched the same building while another walked around the perimeter of Gipsy Lodge watching for bats emerging from any other exit points. The watch lasted around 20 minutes and the transect survey again resumed when no further bats had been seen emerging for five minutes.

2.2 Static Bat Detector Survey

Anabat SD1 bat detectors were used to assess bat activity at three locations, thought to represent potentially high quality commuting or foraging habitat for bats (see **Figure 2.1** for locations). **Table 2.1** provides details of static detector deployment.

Table 2.1 Static Detector Dates (in 2011) and Locations

Static	Location (Figure 2.1)	Start	Finish	Nights	Dates analysed for Group 2 bats
A	Oak tree on south side of Lover's Lane	11/05	22/05	12	18, 19 and 20 May
B	Hedge east of Fisher's Farm	21/06	03/07	13	21, 22 and 25 June
C	Southern hedge	03/08	22/08	20	5, 17 and 22 August

The detectors were programmed to begin recording half an hour before sunset and finish half an hour after sunrise. The number of survey hours therefore varied throughout the survey season according to night length.

All recordings were checked for rarer species of potentially higher conservation significance by scanning sound files for these species. The species selected were: barbastelle (*Barbastella barbastellus*), Nathusius' pipistrelle (*Pipistrellus nathusii*) and Leisler's bat (*Nyctalus leisleri*) (hereafter referred to as Group 1). However, because a very large amount of data is likely to be recorded during static detector surveys, the majority of which will represent the common pipistrelle species, it is not cost-efficient or necessary to check and label every pass of all species of bats. For all other species, therefore, termed here Group 2, a sub-set of three nights of data from each deployment (as detailed in **Table 2.1**) - those with the highest number of bat calls recorded – were analysed in detail.

Full details of equipment used for bat surveys and analysis methods are included in **Appendix B**.

2.3 Personnel

Walked transect and static detector survey work during 2011 was carried out by a total of four ecologists. These surveys were all led by either Matthew Hobbs (MH) or Vilas Anthwal (VA; Natural England bat survey licence number 20110076) of BSG with another two experienced bat surveyors assisting[3].

[3] Stephanie Boocock (SB; Natural England bat survey licence number 20113031) of BSG and Iain Hysom (IH; freelance: Natural England bat survey licence number 20110086).

3. Results

3.1 Walked Transects

3.1.1 Weather Conditions

Table 3.1 Weather Conditions during Walked Transect Surveys

Date	Temperature (°C, start-end)	Wind strength[4]	Cloud cover (%)	Rainfall
24/05	9-6	3-4	10	0
04/07	15-13	0	0	0
03/08	16	0	20	0

3.1.2 Relative Activity Levels of Bats

The total numbers of passes and relative activity levels recorded for each species are shown in **Table 3.2**.

Table 3.2 Numbers of Passes and Relative Bat Activity Recorded during Walked Transects in 2011

Species	Survey date					
	24/05	04/07	03/08	Total	B/h[5]	% of total
Leisler's bat	0	0	1	1	0.1	0.6
Common pipistrelle	19	53	48	120	16.8	77.9
Common/soprano pipistrelle	0	0	3	3	0.4	1.9
Soprano pipistrelle	7	15	7	29	4.1	18.8
Barbastelle	0	0	1	1	0.1	0.6
Grand Total	26	68	60	154		
Survey duration (min)	137	145	147	429		
Total B/h	11.4	28.1	24.5	21.5		

[4]Wind strength is given in the Beaufort scale and wind direction is abbreviated to an eight point compass (e.g. NE = north-east). The Beaufort scale is an empirical measure that relates wind speed to observed conditions at sea or on land.

[5] Number of bat passes per hour (see **Appendix B**).

In summary, 154 passes of four species of bats were recorded during the walked transect surveys. Common pipistrelle was the most frequently encountered species representing almost 80% of all passes recorded. Soprano pipistrelle (*Pipistrellus pygmaeus*) was the second most frequent, representing about 20% of the recorded activity. Just one pass of each of the other two species, **b**arbastelle and Leisler's bat, was recorded, both on 3 August**.**

Bat activity levels varied between transects, with similar levels of 28.1 and 24.5 B/h on 4 July and 3 August respectively, and 11.4 B/h during the dawn May survey.

3.1.3 Spatial Distribution of Bats

The spatial distribution of the bat species recorded is shown in **Figure 3.1**. The majority of common pipistrelle passes were recorded along the northern boundary of the site, as far as the western point of the site boundary. A few passes were also recorded in the southern part of the site: south of Aldhurst Farm and on the eastern boundary and south-eastern corner of the site. Around 15 minutes after sunset on 3 July surveyors observed at least three bats flying southwest down Abbey Lane from the direction of Gipsy Lodge. By back-tracking in the direction from which they came the surveyors observed another 23 common pipistrelle bats emerging from the northern house at Gipsy Lodge. The bats all emerged from under a barge-board high on the north-west facing gable end of the building. On 3 August another short emergence watch was undertaken and 24 bats emerged from the northern gable of the southern house with a further seven from the south gable of the northern house.

Soprano pipistrelles were also recorded primarily from the northern boundary of the site, although most were in the eastern half of the site with only one west and four south of Aldhurst Farm respectively. The single passes of barbastelle and Leisler's bat were recorded close to each other on the edge of Lover's Lane just to the east of Aldhurst Farm. Both were recorded around two hours after sunset.

3.2 Static Bat Detector Survey

3.2.1 Relative Activity Levels of all Bats

The relative activity level recorded at each static detector for all species or grouped species categories are shown in **Table 3.3**.

Table 3.3 Number of Passes and Relative Activity Level Recorded during Static Bat Detector Survey

Species	Static no. and deployment dates				
	Static A 11-22/05	Static B 21/06-03/07	Static C 02-16/08	Total	B/h
Group 1 (all nights)					
Leisler's bat	1	7	3	11	<0.1
Nathusius' pipistrelle	4	0	1	5	<0.1
Barbastelle	3	42	25	70	0.2

Species	Static no. and deployment dates				
	Static A	Static B	Static C	Total	B/h
	11-22/05	21/06-03/07	02-16/08		
Group 1 total	8	49	39	86	
Group 2 (3x3 nights)					
Noctule	0	6	2	8	0.1
Nyctalus sp.	0	2	0	2	<0.1
Common/Nathusius' pipistrelle	0	1	0	2	<0.1
Common pipistrelle	639	455	125	1219	16.5
Common/soprano pipistrelle	4	26	5	35	0.5
Soprano pipistrelle	41	214	64	319	4.3
Myotis sp.	3	0	11	14	0.2
Myotis sp./brown long-eared bat	0	0	5	5	<0.1
Brown long-eared bat	1	0	0	1	<0.1
Group 2 total	688	704	212	1605	

In the nine nights selected for analysis of all species a total of 1605 bat passes of Group 2 species were recorded at an average of 21.7 B/h with a further 86 passes (0.3 B/h) of three Group 1 species: barbastelle, Leisler's bat and Nathusius' pipistrelle. An additional four species were recorded during static surveys that were not recorded during walked transects: noctule (*Nyctalus noctula*), Nathusius' pipistrelle, *Myotis* sp. and brown long-eared bat (*Plecotus auritus*).

3.2.2 Relative Activity Levels of Group 1 Species

Barbastelle was recorded from all three detector locations with the highest activity rate from Static B to the east of Fisher's Farm in June/July (0.3 B/h; n[6] = 42). A lower level of activity was recorded from Static C along the southern boundary of the site in August (0.2 B/h; n = 25), and just three passes from Static A on the edge of Lover's Lane in May. Nocturnal activity patterns show that most activity occurred within the site at least an hour after sunset or more than an hour before sunrise (TC[7]3 = 0.3 B/h; TC9 = 0.5 B/h).

Only 11 Leisler's bat passes and five Nathusius' pipistrelle passes were recorded throughout the survey periods. Nathusius' pipistrelle passes were recorded during the period 11-19 May (n= 4) and on 15 August (n = 1). None of the passes of either species were recorded within an hour of sunset or sunrise.

[6] Number of passes (refer to **Appendix B**).

[7] Time Code (refer to **Appendix B**).

3.2.3 Relative Activity of Group 2 Species

A very low activity level of *Myotis* sp. were recorded with just 14 passes: 11 from Static C and three from Static A. All passes were recorded during the middle period of the night (TC6-7).

Eight noctule passes were recorded with six from Static B and two from Static C. All records were from TC3-7 (not within 40 minutes of sunset). A further two *Nyctalus* sp. passes were also recorded.

Relatively high activity levels were recorded for common pipistrelle (16.5 B/h), with moderate activity levels recorded for soprano pipistrelle (4.3 B/h). Common and soprano pipistrelle bats were recorded from all detectors, with higher activity rates recorded from Statics A (27.1 B/h) and B (20.9 B/h) than from Static C (4.4 B/h) for common pipistrelle. Higher activity rates were recorded from Static B (9.8 B/h) than Statics A (1.7 B/h) and C (2.3 B/h) for soprano pipistrelle.

Activity levels of common pipistrelle were high throughout the night with a peak recorded at around two hours after sunset (TC6; 42.3 B/h) across all detector locations. Highest activity levels for soprano pipistrelle were recorded within an hour of sunset and sunrise (TC3 = 14.7 B/h; TC11 = 22.7 B/h) with little activity recorded during the middle of the night.

A single pass of brown long-eared bat was recorded at Static A in May. This was at 72 minutes before sunrise.

4. Conclusions

Bat surveys were carried out by BSG at Site 1 during May-August 2011 and included three walked transect surveys of the site and the deployment of static bat detectors in three locations in May, June/July and August. Four species of bats were recorded during transect surveys: Leisler's bat, common pipistrelle, soprano pipistrelle and barbastelle. A further four species were only recorded during static bat detector surveys: noctule, Nathusius' pipistrelle, *Myotis* sp. and brown long-eared bat.

In summary, the site supports an assemblage of bat species that is typical of the area and, with the exception of common and soprano pipistrelle bats, most species recorded during surveys do not appear to use the site frequently. The following sections provide further details of the status of each species.

4.1 Barbastelle

A maternity colony of barbastelle was discovered on the Sizewell Estate as a result of radio-tracking surveys carried out in 2010[8] and 2011[9]. The northeast corner of Site 1 is c630m from a barbastelle maternity roost tree adjacent to Leiston Old Abbey, which is part of a wider network of roost trees largely contained within the Sizewell Estate. Also, a single male barbastelle roosted in a barn 420m north of the site boundary in August 2011. The low activity levels recorded for this species in combination with the lack of records close to sunset and/or sunrise indicate that the site is unlikely to be a core foraging area for individuals of this species although it is used by occasional bats for foraging and/or commuting.

4.2 Nathusius' Pipistrelle

Very few passes of Nathusius' pipistrelle were recorded, and the surveys provided no evidence to suggest that the site is of importance for foraging/ commuting, or is located close to roosts of this species. Furthermore, all activity was recorded within the migratory period for this species, which may suggest that these records refer to transitory individuals.

4.3 Leisler's Bat

Very few passes of Leisler's bat were recorded, and the surveys provided no evidence to suggest that the site is of importance for foraging/ commuting. None of the records were close to sunset or sunrise and it is unlikely that the site is close to a roost.

[8] Report reference: 28130ca68.

[9] Draft report at time of writing.

4.4 Common and Soprano Pipistrelle

Formal roost surveys were not carried out but a roost of common pipistrelle was found at Gipsy Lodge. Although three exit points and two roof spaces were used by bats the counts probably represent a single mobile roost rather than two separate roosts. Given the moderately high numbers of bats involved and the season it is likely that the roost was a maternity roost.

Activity levels of common and soprano pipistrelles were relatively high and moderate respectively with some evidence that the site may be a core foraging area for both species. The timing of soprano pipistrelle passes suggests that there may be a roost relatively close to the site. The nearest known roost of soprano pipistrelle is a maternity colony of this species that uses bat boxes in woodland at Kenton Hills, 1km to the east of the closest point of the site boundary.

4.5 Brown Long-Eared Bat

The very low level of activity recorded for brown long-eared bat indicates that the site is not of importance for this species. The nearest known roost for this species is at the Suffolk Wildlife Trust workshop at Upper Abbey Farm, approximately 1km to the northeast of the site[10].

4.6 Myotis sp

Very few passes of *Myotis* bats were recorded and the surveys provided no evidence to suggest that the site is of importance for foraging/ commuting or located close to roosts of any of these species. Nonetheless, the northern boundary of Site 1 is 300m south of a maternity roost of Natterer's bats (*Myotis nattereri*) at Leiston Abbey ruins, where up to 49 bats were seen emerging in August 2011[9].

4.7 Noctule

The site does not appear to be regularly used by noctule, and there is no evidence that the site is close to any roosts of this species.

[10] Report reference: 19801cb114.

644000

264000

N

Music School

Path

Spring Covert

Playing Field

Track

Aldhurst Farm

Gipsy Lodge

ABBEY LANE

Fisher's Farm

Buckleswood Nurseries

Path

ABBEY ROAD

Path

644000

Key:

Site boundary

0 50 100 Metres

Scale: 1:4,000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

EDF

Aldhurst Farm West
(Associated Development Site 1)
Bat Survey Report

Figure 1.1
Site boundary

February 2012
28130-A336.mxd tugwc

amec

644000

264000

N

Playing Field

Spring Covert

Path

Music School

Track

Aldhurst Farm

Gipsy Lodge

A

B

C

Fisher's Farm

Buckleswood Nurseries

Path

ABBEY ROAD

Path

644000

Key:

- Site boundary
- Walked transect route
- Static location

0 50 100 Metres

Scale: 1:4,000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

Aldhurst Farm West
(Associated Development Site 1)
Bat Survey Report

Figure 2.1
Combined 2011 walked transect bat survey routes and static bat detector locations

February 2012
28130-A337.mxd tugwc

644000

264000

N

Playing Field

Spring Covert

Path

Music School

Track

Aldhurst Farm

Gipsy Lodge

ABBEY LANE

Fisher's Farm

Buckleswood Nurseries

Path

Path

ABBEY ROAD

644000

Key:

- Barbastelle
- Leisler's bat
- Common pipistrelle
- Soprano pipistrelle

0 37.5 75 150 Metres

Scale: 1:4,000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

EDF

Aldhurst Farm West
(Associated Development Site 1)
Bat Survey Report

Figure 3.1
Locations of bat passes recorded during 2011 walked transect surveys

February 2012
28130-A338.mxd tugwc

amec

Appendix A
Policy and Legislation relating to Bats in Suffolk

Legislation and Policy Guidance

Biodiversity Action Plan

Seventeen[11] species of bat are known to be resident in the UK, seven of which are on the new list of priority species[12] in the UK Biodiversity Action Plan (UK BAP), adopted by the Government in 2007. Species included on this list have been identified by the UK Government as needing special conservation effort because of their rarity and/or decline in numbers over recent decades. Species Action Plans (SAPs) have been developed to identify conservation priorities, propose action, and set targets to try and maintain and restore populations. Bat populations are at risk from changes to the landscape (such as those caused by agricultural practices or land development), which can cause loss of roosting, foraging or commuting habitat and be a contributing factor to population decline.

A clear understanding of the level and nature of use of a site by bats is necessary to ensure that environmental measures (mitigation, enhancement and offsetting) associated with a development can be appropriately targeted, and put in the context of local and National conservation priorities. The SAPs promote the favourable management of land, especially in the vicinity of known roost sites, and aim to maintain and enhance existing bat populations. These can lead to the designation of important sites for rarer species and notification to the local authority of important roosts such as maternity or hibernation sites.

Most of the Species Action Plans (SAPs) in the Suffolk Biodiversity Action Plan are based on National Biodiversity Action Plans. The process of identifying BAP priorities in Suffolk began in 1997, and an initial plan (Tranche 1) was produced in 1998. Priority species included the common pipistrelle bat. Tranche 2, published in 2000, was withdrawn and a new list was published in June 2010, with a new combined BAP for all bat species due for completion in autumn 2010. Although this had not been issued at the time of writing some data from the draft BAP for bats is included in **Table A1** below.

[11] This does not include greater mouse-eared bat (*Myotis myotis*), which is considered resident by some, but only a single individual has been recorded in recent years after the species was officially declared extinct in the UK.

[12] Priority bat species in the UK BAP: barbastelle, Bechstein's bat (*Myotis bechsteinii*), noctule, soprano pipistrelle, brown long-eared bat, greater horseshoe bat (*Rhinolophus ferrumequinum*) and lesser horseshoe bat (*Rhinolophus hipposideros*).

Table A1 Status of Bat Species in Suffolk[13]

Species	Number of occupied 1 km squares	Range & abundance	Notes	Source
Noctule	86	Uncommon but widespread		Suffolk BAP
Leisler's bat	14	Rare and locally distributed	Only three nursery colonies are known in the county. Appears to be confined to the northwest of Suffolk.	Suffolk BAP Suffolk Bat Group
Serotine	109	Uncommon but widespread	There are approximately 45 known colonies in Suffolk.	Suffolk BAP Suffolk Bat Group
Nathusius' Pipistrelle	2	Rare and locally distributed	There are only a few records from Suffolk currently; more may come to light from a new BCT survey, initial results of which are due to be published in February 2010.	Suffolk BAP Suffolk Bat Group
Soprano Pipistrelle	74	Uncommon but widespread		Suffolk BAP
Common pipistrelle	682	Common and widespread		Suffolk BAP
Lesser horseshoe bat	1	Rare and very local	A single bat (presumed to be the same individual) has been recorded at a hibernation site in most winters between 1996 and at least 2008.	Suffolk BAP Suffolk Bat Group
Natterer's bat	131	Uncommon but widespread		Suffolk BAP
Daubenton's bat	50	Locally common and widespread		Suffolk BAP
Whiskered/ Brandt's/ Alcathoe* whiskered bat	?	Rare and very local	Until January 2000 all records were from two hibernation sites, and refer to single animals. A breeding roost has yet to be discovered in the county.	Suffolk Bat Group
Brown-long eared bat	624	Common and widespread		Suffolk BAP
Barbastelle	40	Uncommon but widespread		Suffolk BAP

[13] Information provided from the Suffolk BAP is draft and unpublished at the time of writing (13/12/2011).

- Whiskered (*Myotis mystacinus*) and Brandt's (*Myotis brandtii*) bats are cryptic species (i.e. very similar to each other and therefore difficult to distinguish), so all previous hibernation site records would have been recorded as "whiskered/Brandt's". However, a third cryptic species, Alcathoe whiskered bat (*Myotis alcathoe*), was confirmed to occur in the UK in 2010, and is now thought to have been resident and probably widespread here for some time. Hibernation records could therefore represent any of these three.

Protective Legislation relating to Bats

All bat species and their roosts are protected in the UK under *The Conservation of Habitats and Species Regulations 2010* which implements the EC Directive 92/43/EEC (the Habitats Directive). In addition, the lesser horseshoe, greater horseshoe bat, Bechstein's bat and barbastelle are listed in Annex II of the Habitats Directive, which requires sites to be designated by member states for their protection.

All bat species and their roosts are also protected under Schedule 5 of the *Wildlife and Countryside Act 1981* (as amended), and under the *Countryside and Rights of Way Act 2000*. Taken together, these Acts and Regulations make it illegal to:

- Intentionally or deliberately kill, injure or capture bats;
- Deliberately or recklessly disturb bats;
- Damage, destroy or obstruct access to bat roosts;
- Possess or transport a bat or any part of a bat, unless acquired legally; and
- Sell, barter or exchange bats or parts of bats.

The Natural Environment and Rural Communities Act 2006 (NERC Act) states, in Section 40(1), that

> *"every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity".*

Section 40(3) of the NERC Act 2006 goes on to state that

> *"conserving biodiversity includes, in relation to a living organism or type of habitat, restoring or enhancing a population or habitat".*

Section 41(1) of the NERC Act 2006 states that

> *"the Secretary of State must, as respects England, publish a list of the living organisms and types of habitat which in the Secretary of State's opinion are of principal importance for the purpose of conserving biodiversity".*

All seven species of bats that are priority species in the UK Biodiversity Action Plan (see Section 2.4.1) are also considered Species of Principal Importance for the Conservation of Biodiversity under Section 41 of the NERC Act.

In paragraph 16 of Planning Policy Statement 9, the Government indicates that local authorities should take steps to further the conservation of species of principal importance for the conservation of biodiversity in England and should ensure that that these species and their habitats are protected from adverse effects of development, where appropriate, by using planning conditions or obligations.

Developments that compromise the protection afforded to bats under the provisions of *The Conservation of Habitats and Species Regulations 2010* almost invariably require a licence from Natural England. Three tests must be satisfied before a licence to permit otherwise prohibited acts can be issued:

- Regulation 53(2) (e) states that licences may be granted by Natural England to '*preserve public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment*';
- Regulation 53(9) (a) states that a licence may not be granted unless Natural England is satisfied '*that there is no satisfactory alternative*'; and
- Regulation 53(9) (b) states that a licence cannot be issued unless Natural England is satisfied that the action proposed '*will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range*'.

In conclusion, a licence permits otherwise unlawful actions and it is the responsibility of the developer, or their appointed advisor, to decide whether a licence is required for work that has the potential to affect bat populations. It is important that the developer carries out a thorough survey and accurate assessment to help avoid committing offences. It is also the responsibility of the developer to design and implement a mitigation scheme that meets the licensing requirements and ensures, as far as possible, the long-term maintenance of any bat population affected. Licence applications (under Regulation 53(2) (e) of the Habitats Regulations) will be determined by Natural England.

Appendix B
Materials and Data Analysis

Use of Bat Detectors

Walked Transects

Surveyors used two different bat detectors on every survey: a Batbox Duet or BatBox Griffin detector for listening to bat calls from the combined heterodyne/frequency division output and an Anabat SD1 or SD2 frequency division detector for recording calls for subsequent identification. Wherever possible, surveyors recorded the observed behaviour and numbers of bats onto field proforma. Notes were taken of all bat sightings in conjunction with the Anabat recordings. This was to aid in identification and also to provide additional detail on the behaviour of observed bats. Field notes included a record of the time of each bat encounter, allowing results to be cross-referenced with the recorded data.

Static Bat Detector Survey

Anabat SD1 bat detectors were placed in camouflaged waterproof boxes with a 12V battery attached. The microphone was attached to a 2m cable which was connected to the detector. The microphone was housed inside a sealed curved pipe to keep water off the microphone without incurring significant loss in sensitivity. The pipes were positioned at 1-2m height without any solid objects present close to the microphone to prevent interference or impedance to recording bat calls.

Assessment of Data From Bat Detectors

The Anabat SD1 and SD2 frequency division bat detectors were used to record bat calls during walked transect and static bat detector activity surveys. The Anabat provides a frequency down conversion which generates audible audio signals with frequencies directly related to those the bat is producing.

The likelihood of detecting bats acoustically depends on the propagation of sound through air, the characteristics of bat calls, and the way sound is received and processed by the bat detector. Recent collaborative research by BSG and Bristol University has shown that bat detectors detect calls from some species of bats at greater distances than others. In general, bats with calls that can be detected over greater distances are larger bats which use calls that are both high amplitude and low frequency such as the noctule and the most difficult to detect are those which use low amplitude calls, such as the brown long-eared bat and barbastelle, or high frequencies, such as horseshoe bats *Rhinolophus* spp. **Table B1** shows the mean frontal detection range of Anabats for echolocation calls from UK bat species based on research undertaken by BSG in collaboration with Bristol University[14].

[14] Holderied *et al*. (2011), unpublished data.

Table B1 Estimated Mean Frontal Detection Ranges for Selected Bat Species using Anabat Detectors at Standard 'Field' Settings

Species	Mean frontal detection range (m)
Soprano pipistrelle	24
Brown long-eared bat	9
Natterer's bat	13
Noctule	47
Leisler's bat	38
Barbastelle	7
Lesser horseshoe bat	7

Data Analysis

Selection of Data for Analysis

Because a very large amount of data is likely to be recorded during a full field season of static bat detector recording, the majority of which will represent the common pipistrelle species, it is not cost-efficient or necessary to check and label every pass of all species of bats. All recordings were checked for rarer species of potentially higher conservation significance by scanning sound files for these species. The species selected were: barbastelle, Nathusius' pipistrelle and Leisler's bat (Group 1).

For all other species of bats (Group 2), a sub-set of three nights of data from each deployment - those with the highest number of bat calls recorded – were analysed in detail. By choosing the nights with the highest activity levels it is assumed that nights with optimal conditions for recording bat activity were also chosen. In this sense, the bias inherent to selecting data for analysis non-randomly in this way is similar to the bias when selecting nights with favourable conditions for carrying out other bat surveys. The only bias which is likely to result is that the activity rates for Group 1 species will be higher than if all the data within the relevant recording period were analysed (as for Group 2 species). As the data have been used to determine relative activity levels and not to provide a measure of abundance, this upward bias is unlikely to make any difference to the evaluation of the importance of bat populations at Sizewell.

Bat Call Identification

Recorded bat calls were analysed using Analook software to confirm the identity of the bats present. Where possible, the bat was identified to species level. For species of long-eared bats records were not identified to species level due to the overlapping call parameters of each species but were assumed to refer to brown long-eared bats. It is unlikely that grey long-eared bat *Plecotus austriacus* occurs in Suffolk, given the species' known distribution and rarity (Harris & Yalden, 2008). Species of the genus *Myotis* were grouped together as many of the species have overlapping call parameters, making species identification problematic (BCT, 2007).

For *Pipistrellus* species the following criteria, based on measurements of peak frequency, were used to classify calls:

Common pipistrelle	≥42 and <49 kHz
Soprano pipistrelle	≥51 kHz
Nathusius' pipistrelle	<39 kHz
Common pipistrelle / Soprano pipistrelle	≥49 and <51 kHz
Common pipistrelle / Nathusius' pipistrelle	≥39 and <42 kHz

In addition, the following categories were used for calls which could not be identified with confidence due to the overlap in call characteristics between species or species groups:

- *Myotis/Plecotus* sp; and
- *Nyctalus* sp. (either Leisler's bat or noctule).

Bat calls which could not be ascribed to any of these categories were not used in the analysis.

Calculation of Relative Activity

The Analook software enables analysis of the relative activity of different species of bats by counting the minimum number of bats recorded within discrete sound files. Once triggered by ultrasound, the Anabat records sound files with a duration of 15 seconds, which may contain a number of individual bat passes, or discrete groups of ultrasound 'pulses'. For the purposes of this analysis, the recording of one or more passes by a single species of bat within a 15 second sound file is counted as a single bat pass (B). More than one pass of the same species was counted within a sound file if multiple bats were recorded calling simultaneously. During analysis of sound files, it was possible to estimate the minimum number of bats recorded on individual sound files but not whether consecutive sound files had recorded, for example, a number of individual bats passing as they commute to a feeding habitat or one bat calling repeatedly as it flies up and down a hedgerow. Therefore, relative abundance of bats cannot be estimated from this analysis, but the number of bat passes does reflect the relative importance of a feature/habitat to bats by assigning a level of bat activity that is associated with that feature, regardless of the type of activity. In this analysis, bat passes per hour (B/h) has been used a measure of 'relative activity'.

Analysis by Sunset-Sunrise Times

As part of the analysis of nocturnal patterns of behaviour for bats at Sizewell the data were split into discrete time periods relating to their proximity to sunset or sunrise. The time categories (time codes: TC) were as follows:

TC 0 = before sunset

TC 1 = 0-20 min after sunset

TC 2 = 20-40 min after sunset

TC 3 = 40-60 min after sunset

TC 4 = 60-80 min after sunset

TC 5 = 80-100 min after sunset

TC 6 = 100-120 min after sunset

TC 7 = Middle of night (varies across seasons)

TC 8 = 120-100 min before sunrise

TC 9 = 100-80 min before sunrise

TC 10 = 80-60 min before sunrise

TC 11 = 60-40 min before sunrise

TC 12 = 40-20 min before sunrise

TC 13 = 20-0 min before sunrise

For each of these categories B/h was calculated to allow a comparison between the activity level recorded in different time periods and TC7 was corrected to allow for variation in night length throughout the survey season.

Data Analysis

Selection of Data for Analysis

Because a very large amount of data is likely to be recorded during a full field season of static bat detector recording, the majority of which will represent the common pipistrelle species, it is not cost-efficient or necessary to check and label every pass of all species of bats. All recordings were checked for rarer species of potentially higher conservation significance by scanning sound files for these species. The species selected were: barbastelle, Nathusius' pipistrelle and Leisler's bat (Group 1).

For all other species of bats (Group 2), a sub-set of three nights of data from each deployment - those with the highest number of bat calls recorded – were analysed in detail. By choosing the nights with the highest activity levels it is assumed that nights with optimal conditions for recording bat activity were also chosen. In this sense, the bias inherent to selecting data for analysis non-randomly in this way is similar to the bias when selecting nights with favourable conditions for carrying out other bat surveys. The only bias which is likely to result is that the activity rates for Group 1 species will be higher than if all the data within the relevant recording period were analysed (as for Group 2 species). As the data have been used to determine relative activity levels and not to provide a measure of abundance, this upward bias is unlikely to make any difference to the evaluation of the importance of bat populations at Sizewell.

Bat Call Identification

Recorded bat calls were analysed using Analook software to confirm the identity of the bats present. Where possible, the bat was identified to species level. For species of long-eared bats records were not identified to species level due to the overlapping call parameters of each species but were assumed to refer to brown long-eared bats. It is unlikely that grey long-eared bat *Plecotus austriacus* occurs in Suffolk, given the species' known distribution and rarity (Harris & Yalden, 2008). Species of the genus *Myotis* were grouped together as many of the species have overlapping call parameters, making species identification problematic (BCT, 2007).

For *Pipistrellus* species the following criteria, based on measurements of peak frequency, were used to classify calls:

Common pipistrelle	≥42 and <49 kHz
Soprano pipistrelle	≥51 kHz
Nathusius' pipistrelle	<39 kHz
Common pipistrelle / Soprano pipistrelle	≥49 and <51 kHz
Common pipistrelle / Nathusius' pipistrelle	≥39 and <42 kHz

In addition, the following categories were used for calls which could not be identified with confidence due to the overlap in call characteristics between species or species groups:

- *Myotis/Plecotus* sp; and
- *Nyctalus* sp. (either Leisler's bat or noctule).

Bat calls which could not be ascribed to any of these categories were not used in the analysis.

Calculation of Relative Activity

The Analook software enables analysis of the relative activity of different species of bats by counting the minimum number of bats recorded within discrete sound files. Once triggered by ultrasound, the Anabat records sound files with a duration of 15 seconds, which may contain a number of individual bat passes, or discrete groups of ultrasound 'pulses'. For the purposes of this analysis, the recording of one or more passes by a single species of bat within a 15 second sound file is counted as a single bat pass (B). More than one pass of the same species was counted within a sound file if multiple bats were recorded calling simultaneously. During analysis of sound files, it was possible to estimate the minimum number of bats recorded on individual sound files but not whether consecutive sound files had recorded, for example, a number of individual bats passing as they commute to a feeding habitat or one bat calling repeatedly as it flies up and down a hedgerow. Therefore, relative abundance of bats cannot be estimated from this analysis, but the number of bat passes does reflect the relative importance of a feature/habitat to bats by assigning a level of bat activity that is associated with that feature, regardless of the type of activity. In this analysis, bat passes per hour (B/h) has been used a measure of 'relative activity'.

Analysis by Sunset-Sunrise Times

As part of the analysis of nocturnal patterns of behaviour for bats at Sizewell the data were split into discrete time periods relating to their proximity to sunset or sunrise. The time categories (time codes: TC) were as follows:

TC 0 = before sunset

TC 1 = 0-20 min after sunset

TC 2 = 20-40 min after sunset

TC 3 = 40-60 min after sunset

TC 4 = 60-80 min after sunset

TC 5 = 80-100 min after sunset

TC 6 = 100-120 min after sunset

TC 7 = Middle of night (varies across seasons)

TC 8 = 120-100 min before sunrise

TC 9 = 100-80 min before sunrise

TC 10 = 80-60 min before sunrise

TC 11 = 60-40 min before sunrise

TC 12 = 40-20 min before sunrise

TC 13 = 20-0 min before sunrise

For each of these categories B/h was calculated to allow a comparison between the activity level recorded in different time periods and TC7 was corrected to allow for variation in night length throughout the survey season.

EDF Energy

Sizewell C New Nuclear Power Station: Terrestrial and Freshwater Ecology, and Ornithology

DRAFT Coronation Wood Bat Survey Report 2012

December 2012

AMEC Environment & Infrastructure UK Limited

Report for

Christine Blythe
NNB Generation Company
Barnett Way
Barnwood
Gloucester
GL4 3RS

Main Contributors

Matt Hobbs

Issued by

[redacted]

pp Lynn Whitfield

Approved by

pp [redacted]

Kathryn Leggat

AMEC Environment & Infrastructure UK Limited

Northumbria House, Regent Centre, Gosforth,
Newcastle upon Tyne NE3 3PX, United Kingdom
Tel +44 (0) 191 272 6100
Fax +44 (0) 191 272 6592

Doc Reg No. 28130-CR426

r:\projects\28130 sizewell ecology studies\reports\sizewell main sites\bats\coronation wood\coronation wood draft bat survey report - 06-12-12.doc

EDF Energy

Sizewell C New Nuclear Power Station: Terrestrial and Freshwater Ecology, and Ornithology

DRAFT Coronation Wood Bat Survey Report 2012

December 2012

AMEC Environment & Infrastructure UK Limited

Certificate No. FS 13881 Certificate No. EMS 69090

Disclaimer

This report has been prepared in a working draft form and has not been finalised or formally reviewed. As such it should be taken as an indication only of the material and conclusions that will form the final report. Any calculations or findings presented here may be changed or altered and should not be taken to reflect AMEC's opinions or conclusions.

Copyright and Non-Disclosure Notice

Third Party Disclaimer

Document Revisions

No.	Details	Date
01	DRAFT Report	December 2012

Contents

1. Introduction

1.1 Purpose of Report

An area of land directly north of the Sizewell 'B' Power Station has been identified as having the potential to accommodate one or more new nuclear reactors. This area has an approximate central grid reference of TM473640.

AMEC Environment & Infrastructure UK Ltd ('AMEC') has been commissioned to provide ecological services to support the development of new build proposals at Sizewell. This included undertaking a bat activity survey of Coronation Wood (a block of woodland located adjacent to the west of Sizewell 'A' Power Station).

This report details the findings of a bat activity survey carried out within and around Coronation Wood, and provides a summary of the bat interest of this area. The focus of the survey work was to examine spatial and temporal patterns of bat activity, and to identify parts of the survey area that are of importance for bats through quantitative analysis of relative activity levels; as well as to identify potential roost locations for bats in trees within the survey area. Ultimately this report is to be used to inform the design of Sizewell 'C' and the Environmental Statement for the scheme.

1.2 Site Context

The survey area is illustrated in **Figure 1.1**[1] and is c.8.5ha in size. The survey area is a narrow strip of land delimited by a sewage processing site to the north, a wet drain to the west, Sizewell Gap and the site entrance to the south, and the site access road to the east.

A brief description of the habitats present within the site in relation to the potential they have for supporting roosting, foraging or commuting bats is included below. For a full habitat description and habitat map, please refer to the Phase 1 Habitat Survey Report for the site (report ref: 28130ca365).

There are several habitat types within the survey area that may provide potential commuting and/or foraging habitat for bats. There is a long strip of semi-natural broad-leaved woodland on either side of the drain that forms the western site boundary. This comprises a mix of mature trees and recently planted (particularly alder *Alnus glutinosa*) trees including willow (*Salix* sp)., pedunculate oak (*Quercus robur*), alder, ash (*Fraxinus excelsior*) and sycamore (*Acer pseudoplatanus*). The understorey is dominated by common nettle (*Urtica doica*), with the drain is over-shaded by the woodland. The drain is c.3m wide, and remains largely dry at its southern end. The woodland has been cleared below two overhead line towers to the east of the drain and along the banking that leads up to Coronation Wood, where ruderal and scrub habitats now dominate.

Coronation Wood itself is a medium-age mixed plantation woodland with Corsican pine (*Pinus nigra*) and occasional European silver fir (*Abies alba*), beech (*Fagus sylvatica*) and pedunculate

[1] All figures can be found at the end of the report.

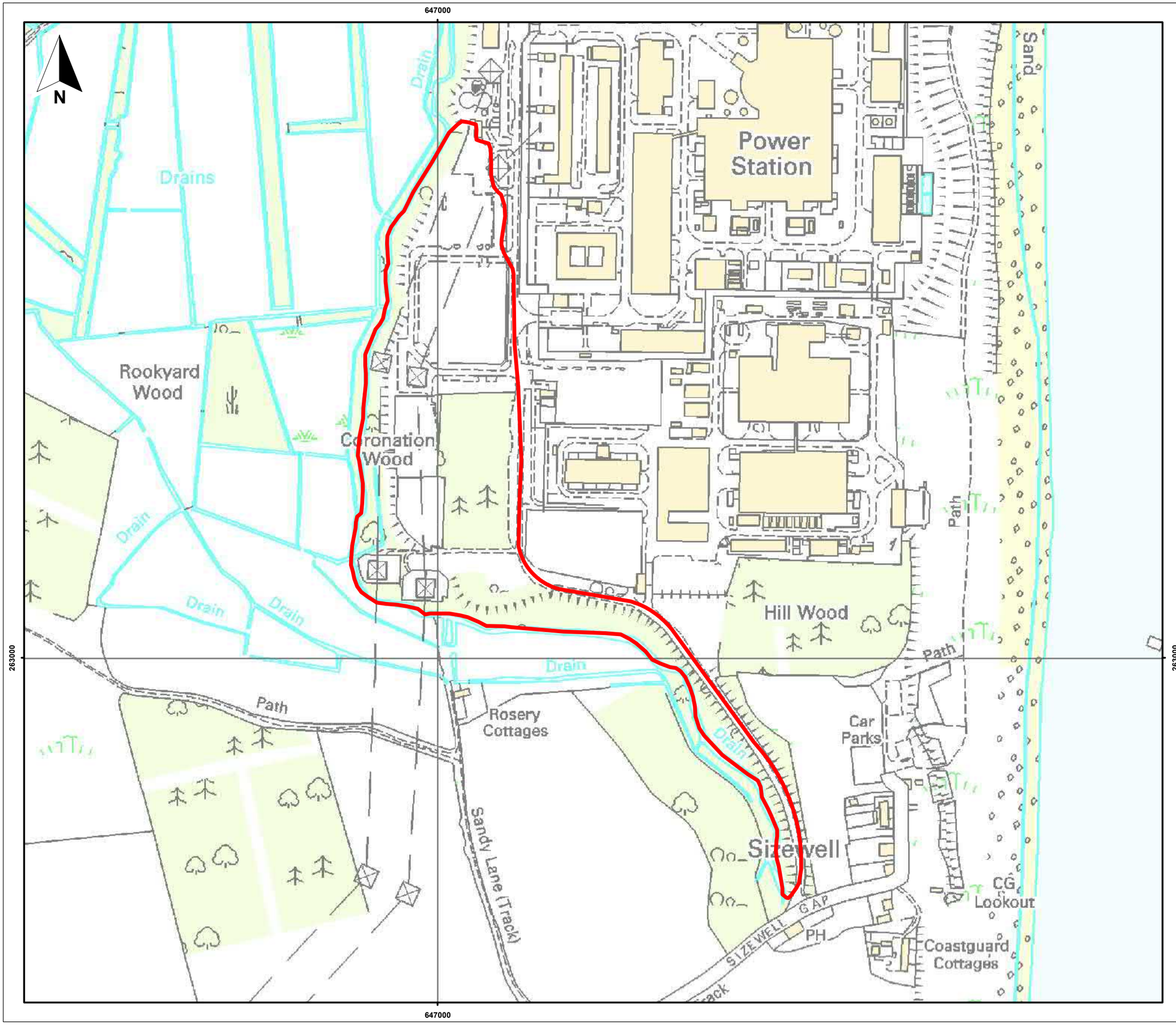
oak, with some recently planted sweet chestnut (*Castanea sativa*) also present. The understorey is dominated by bracken (*Pteridium aquilinum*).

To the north of Coronation Wood, within the survey area, there are large areas of hardstanding car parks, bordered with young ornamental trees and shrubs and small areas of short, rabbit-grazed amenity grassland.

There are no buildings within the survey area, although potential roosting habitat for bats is provided within mature trees across the site.

1.3 Legislation and Policy Guidance

Details of national policies and legislation that relate to bats, as well as details of the grouped Suffolk Biodiversity Action Plan (BAP) for bats are provided in **Appendix A**.



Key:

Survey area

0 25 50 100 150 200
Metres

Scale: 1:4,000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

DRAFT Coronation Wood Bat Survey Report 2012

Figure 1.1
Survey Area Boundary

December 2012
28130-A475.mxd tugwc

2. Methods

2.1 Walked Transects

A transect route was walked in each of three sampling periods (May, June/July and August/September 2012), in order to collect representative data on bat activity throughout the peak season for such. See **Figure 2.1** for the transect route. During each survey visit two surveyors together (for health and safety reasons) walked the pre-determined transect route.

Survey visits started around sunset and typically took 2.5 hours to complete. The same (or a similar) transect route was walked on each survey visit with the start and end points varied on each visit to ensure that different parts of the site were surveyed at different times of the night. This approach was adopted to remove a bias that could be introduced if any given point on the transect route was sampled at approximately the same interval after sunset during the three dusk surveys. In addition, surveyors completed two circuits of the route to ensure sampling at each part of the site at two different intervals after sunset.

Survey visits were carried out only when weather conditions were suitable for bats to be active, avoiding temperatures below 10°C, heavy rain and high wind speeds.

2.2 Static Bat Detector Survey

Anabat SD1 and SD2 bat detectors were used to assess bat activity at six locations that were thought to be represent potentially high quality commuting or foraging habitat for bats (see **Figure 2.1** for locations). A detector was deployed at each location for ten consecutive nights in each recording period: May, June/July and August/September. **Table 2.1** provides details of static bat detector deployment. The detectors were programmed to begin recording half an hour before sunset and finish half an hour after sunrise. The number of survey hours therefore varied throughout the survey season according to night length.

Table 2.1 **Static detector dates and locations[2].**

Static	Location (see Figure 2.1)	Start	Finish	No. nights recording	Dates analysed for Group 2 bats
A	Clearing at north end of survey area	17/05 21/06 30/08	26/05 30/06 08/09	10 10 10	17, 25 and 26 May 22, 24 and 28 June 1, 6 and 7 September
B	Fence to west of Coronation Wood	17/05 21/06 30/08	26/05 30/06 08/09	10 10 10	18, 19 and 22 May 22, 28 and 30 June 4, 6 and 7 September
C	On northwest edge of Coronation Wood	17/05 11/07 30/08	26/05 20/07 08/09	10 10 10	17, 18 and 23 May 13, 17 and 19 July 31 August, 3 and 4 September
D	Beneath overhead line towers in ruderal/scrub to southwest of Coronation Wood	17/05 21/06 30/08	26/05 30/06 08/09	10 10 10	17, 22 and 24 May 27-29 June 31 August, 1 and 6 September

[2] The table also lists the three dates analysed from each deployment for Group 2 species.

Static	Location (see Figure 2.1)	Start	Finish	No. nights recording	Dates analysed for Group 2 bats
E	On lit road lamp south of the power station	17/05 21/06 30/08	26/05 30/06 08/09	10 10 10	18, 23 and 26 May 21, 22 and 29 June 1, 7 and 8 September
F	By drain in woodland south of the power station	17/05 21/06 30/08	26/05 30/06 08/09	10 10 10	22, 23 and 24 May 24, 29 and 30 June 30 August, 1 and 6 September

All recordings were checked for rarer species of potentially higher conservation significance by scanning sound files for these species. The species selected were: barbastelle (*Barbastella barbastellus*), Nathusius' pipistrelle (*Pipistrellus nathusii*) and Leisler's bat (*Nyctalus leisleri*) (hereafter referred to as Group 1). For all other species, therefore, termed here Group 2, a sub-set of three nights of data from each deployment - those with the highest number of bat calls recorded – were analysed in detail.

Full details of equipment used for bat surveys and analysis methods are included in **Appendix B**.

2.3 Tree Survey

The aim of the tree survey was to identify all trees with medium or high potential to support roosting bats. This followed the method used during a similar survey of the Sizewell Estate in 2010[3]. The current survey area was identified as Zone M, for the purposes of continuity with the wider tree survey carried out in 2010, which identified Zones A-L.

The survey was undertaken on 13 September 2012 in good weather conditions. All accessible trees within the survey area were individually inspected from the ground using binoculars. The following parameters were collected for each tree considered to have the potential to support roosting bats:

- GPS location (national grid reference);
- Species;
- Height (m);
- Diameter at breast height (DBH) (cm);
- Type of potential roost feature, e.g. lifted bark, woodpecker hole;
- Aspect of potential roost feature (e.g. NW);
- Extent of potential roost feature (small, moderate, large);
- Height of feature (m), which could be given as a range e.g. 2-6m;
- Canopy cover (%);
- Under-storey cover (%);

[3] Full details of this survey can be found in the Sizewell Bat Survey Report 2010 (report ref: 28130ca068).

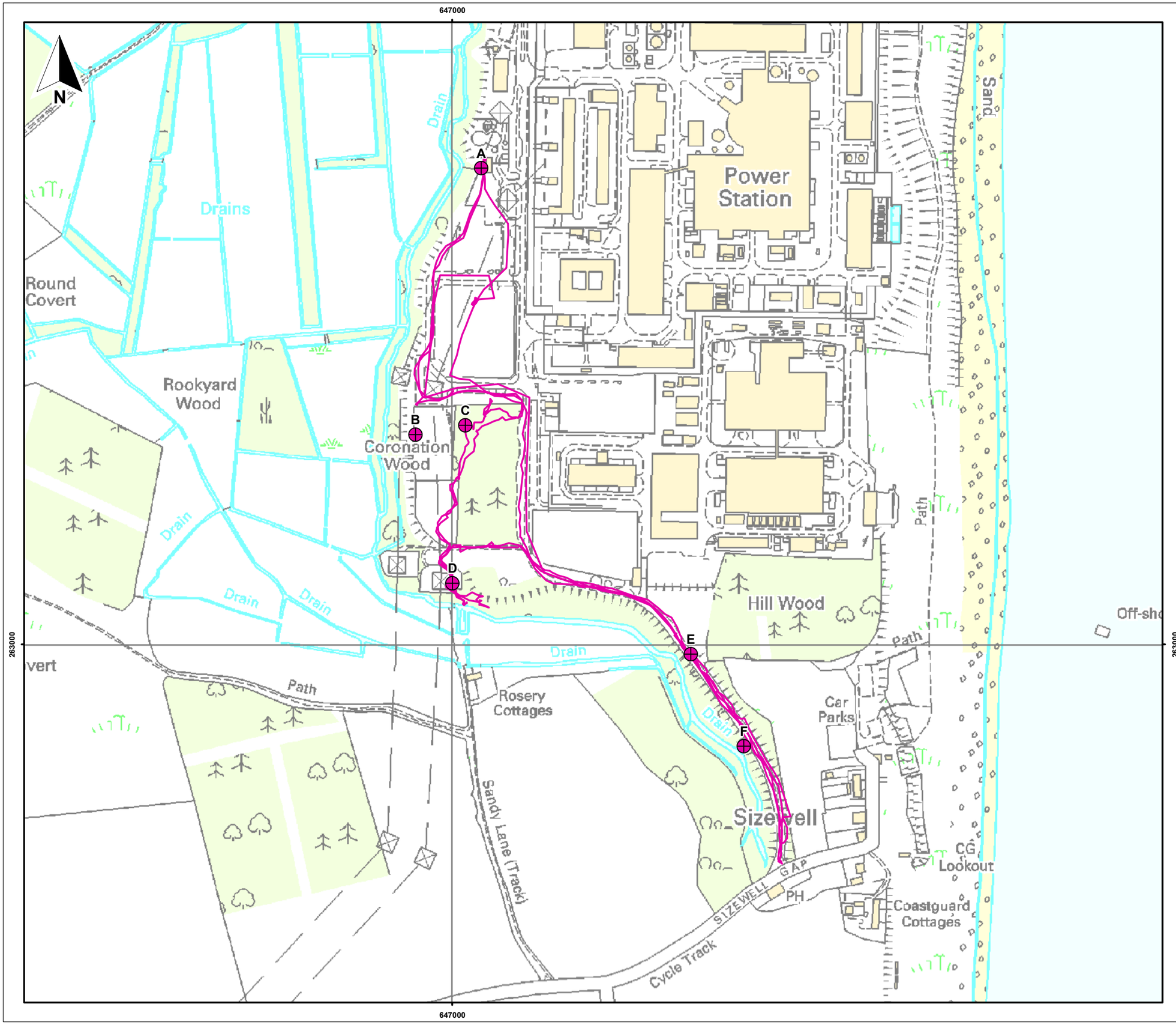
- Digital image no.;
- Necessity for winter re-check (Y/N); and
- Assessment of potential for roosting bats (medium, high, very high).

The tree survey was undertaken at a time of year that may be sub-optimal, as the presence of foliage may conceal potential roost features. However, in all cases a sufficient extent of woody material was visible, and sufficient detail could be seen, to enable a judgement to be made as to the potential for bat roosts to be present.

2.4 Personnel

Walked transect, static detector survey work and tree survey during 2012 was carried out by a total of four ecologists. These surveys were all led by either Matthew Hobbs (MH) or Vilas Anthwal (VA; Natural England bat survey licence number 20110076) of BSG Ecology with another two experienced bat surveyors assisting[4].

[4] Iain Hysom (IH; freelance: Natural England bat survey license number 20110086) and Trudy Seagon (TS; freelance).



Key:

Transect route

Static bat detector location

0 25 50 100 150 200

Metres

Scale: 1:4,000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

DRAFT Coronation Wood Bat Survey Report 2012

Figure 2.1
Combined Walked Transect Routes And Static Bat Detector Locations

December 2012
28130-A475.mxd tugwc

3. Results

3.1 Walked Transects

Details of weather conditions during the survey work are provided in **Table 3.1**.

Table 3.1 Weather Conditions during active bat survey work

Date	Temperature (°C, start-end)	Wind strength[5]	Cloud cover (%)	Rainfall
11/05	10.5	1-2	100	0
10/07	16-13	2-1	100	Some light rain after 22:30
30/08	13-13	3	80	0

3.1.1 Relative Activity Levels of All Bats

Table 3.2 Numbers of passes and relative bat activity recorded during walked transects

	Survey date					
Species	**16/05**	**10/07**	**30/08**	**Total**	**B/h[6]**	**% of total**
Common pipistrelle	54	53	70	177	24.1	68.9
Common/soprano pipistrelle	2		13	15	2.0	5.8
Soprano pipistrelle	20	15	30	65	8.9	25.3
Grand Total	76	68	113	257		
Survey duration (min)	151	140	149	440		
Total B/h	30.2	29.1	45.5	35.0		

In summary, 257 bat passes of two species of bats were recorded during walked transect surveys. Common pipistrelle (*Pipistrellus pipistrellus*) was the most frequently encountered species on walked transects, representing around 70% of all recorded activity. The soprano pipistrelle (*Pipistrellus pygmaeus*) represented about 25% of recorded activity, with another 5% of passes not attributed to species level, but confirmed as one or other of these two species.
Bat activity levels varied between recording preiods, with a low of 29.1 B/h recorded on 10 July and a high of 45.5 B/h recorded on 30 August.

[5]Wind strength is given in the Beaufort scale. This is an empirical measure that relates wind speed to observed conditions at sea or on land.

[6] Number of bat passes per hour (see **Appendix B**).

3.1.2 Spatial Disruption of Bats

Passes of both pipistrelle species were recorded widely throughout the survey area, with the only part of the survey area in which they were not recorded being the floodlit hard-standing areas of car parking to the north of Coronation Wood. Foraging activity was recorded most frequently within and above the canopy of the semi-natural woodland, along the riparian woodland corridor bordering the drain on the western boundary of the site. During the visit on 16 May the first bat pass (a soprano pipistrelle) was recorded foraging 16 minutes after sunset along the stream corridor in the central part of the site, and on 10 July the first bat (a common pipistrelle) was recorded foraging in the north-western corner of Coronation Wood at 11 minutes after sunset. On both occasions it was not possible to determine likely roost locations by the flight direction of the bats. No bats were recorded within 30 minutes of sunset on 30 August.

3.2 Static Bat Detector Survey

3.2.1 Relative Activity Levels of All Bats

The relative activity level recorded at each static detector for all species or grouped species categories are shown in **Table 3.3**.

In the 54 nights selected for analysis of all species a total of 29,550 bat passes of at least six Group 2 species (noctule, serotine, common pipistrelle, soprano pipistrelle, *Myotis* sp. and brown long-eared bat) were recorded at an average of 63.3 B/h. A further 876 passes of the three Group 1 species were recorded at an average of 0.6 B/h. At least seven additional species were recorded during static surveys that were not recorded during walked transects: noctule, serotine, *Myotis* sp., brown long-eared bat, barbastelle, Nathusius' pipistrelle and Leisler's bat

Table 3.3 Number of passes and relative activity level recorded during static bat detector survey

Species		Group 1(all nights)				Group 2 (3 nights)												
		Leisler's bat	Nathusius' pipistrelle	Barbastelle	Group 1 total	Noctule	*Nyctalus* sp.	*Nyctalus/Eptesicus*	Serotine	Serotine/Leisler's bat	Nathusius'/common	Common pipistrelle	Common/soprano	Soprano pipistrelle	*Myotis* sp.	*Myotis/Plecotus*	Brown long-eared bat	Group 2 total
Static A	17-26/05		158	2	160	1						600	1	404				1006
	21-30/06		10		10					2	1	1545	12	984				2544
	30/08-08/09	2	23	9	34	7	6		1			664	24	522	5		1	1230
Static B	17-26/05		80		80	6	2	1				540	2	361	3		2	917
	21-30/06		16	111	127							2099	15	155	5		1	2275
	30/08-08/09		25	15	40	14	4		2			639	47	430	34	1	14	1185
Static C	17-26/05		43		43							581	13	43	3			640
	11-20/07		1		1	3						444	40	29				516
	30/08-08/09		3	4	7	6	1	2	1	1		1096	297	41	6		5	1456
Static D	17-26/05		25		25						1	65	1	18	6		2	93
	21-30/06		5		5	3						291	7	206	9		2	518
	30/08-08/09		10		10	10	3	2			1	50	4	50	64		7	191
Static E	17-26/05		160		160	2						1044	9	656	20		10	1741
	21-30/06		124		124	3	4					3237	187	413	9		5	3858
	30/08-08/09	4	18	7	29	119	2	3	3	2		3324	10	295	37		55	3850

		Group 1(all nights)				Group 2 (3 nights)												
Species		**Leisler's bat**	**Nathusius' pipistrelle**	**Barbastelle**	***Group 1 total***	**Noctule**	***Nyctalus* sp.**	***Nyctalus/Eptesicus***	**Serotine**	**Serotine/Leisler's bat**	**Nathusius'/common**	**Common pipistrelle**	**Common/soprano**	**Soprano pipistrelle**	***Myotis* sp.**	***Myotis/Plecotus***	**Brown long-eared bat**	***Group 2 total***
Static F	17-26/05		17		17							974	5	482	19		7	1487
	21-30/06		0		0	1						2538	36	1294	24		3	3896
	30/08-08/09		1	3	4							1615	77	431	23	1		2147
Total		6	719	151	876	175	22	8	7	5	3	21346	787	6814	267	2	114	29550
B/h		0.00	0.46	0.10	0.57	0.37	0.05	0.02	0.01	0.01	0.01	45.71	1.69	14.59	0.57	0.00	0.24	63.27

3.2.2 Relative Levels of Group 1 Species

Barbastelle was recorded from 7 of 18 detector deployments, in all periods, with activity recorded at all static detector locations except for Static D. Only two passes were recorded in May, with an increase in activity recorded in the second two recording periods. Although more static detectors recorded barbastelle in August/September (5) than in June/July (1) the highest level of activity was recorded in late-June at Static B. At this location 111 passes were recorded (1.4 B/h) in comparison to just 33 passes recorded in August/September across all static detector locations. Analysis of activity levels and patterns throughout the night show that most activity occurred in the second hour after sunset (TC5[7] = 0.4 B/h) with no passes recorded within an hour of either sunset or sunrise.

A total of six passes were recorded of Leisler's bat at two locations (Static A and Static E), both in August/September. None of the records were within an hour of sunset or sunrise.

Nathusius' pipistrelle was recorded from 17 of 18 detector deployments, with regular activity recorded for this species (0.5 B/h; n[8]=719). The highest level of activity was recorded in May (1 B/h), with the lowest in August/September (0.1 B/h) and moderate activity levels recorded in June/July (0.4 B/h). The high activity levels were recorded during three deployments in particular; Static E in May (2 B/h: n=160) and June (1.7 B/h; n=124); and Static A in May (2 B/h: n=158). Nine passes were recorded within 40 minutes of sunset with the earliest at 27 minutes after sunset (all at Static D on 17 May). The latest pass recorded was at Static A, 36 minutes before sunrise on 19 May.

3.2.3 Relative Levels of Group 2 Species

Regular activity from *Myotis* sp. was recorded with a mean of 0.6 B/h recorded from all deployments and 15 of 18 deployments recording this species. Three of the deployments recorded less than 0.1 B/h and the highest level of activity was recorded at three detectors in August/ September as follows: Static C in Coronation Wood (1.4 B/h; n=34); Static D (2.7 B/h; n=64); and Static E (1.6 B/h; n=37. The highest activity levels across all static detector locations were recorded during the middle period of the night, with one pass within 28 minutes after sunset, and none within 40 minutes of sunrise.

Noctule activity was irregular at most locations, with a total of 175 passes of this species (0.4 B/h) recorded from 12 deployments. Another 22 passes of unidentified *Nyctalus* sp. were also recorded, which may have been either noctule or Leisler's bat. Nearly 70% of the noctule activity was recorded at Static E in August/September (n=119). Two passes were recorded within 30 minutes of sunset, and two within 20 minutes of sunrise.

Seven passes of serotine were recorded from four deployments in August/September with none recorded in other periods. All passes were recorded during TC7, except one, 56 minutes after sunset at Static C in Coronation Wood.

Frequent activity was recorded for both common pipistrelle (45.7 B/h; n=21,346) and soprano pipistrelle (14.6 B/h; n= 6814) across the survey area with both species recorded from all detectors. A further 787 passes were identified as being either common pipistrelle or soprano pipistrelle. The highest average activity rates for common pipistrelle were recorded at Static E (98 B/h) and Static F (66.6 B/h); and at Static A (24.7 B/h) and Static F (28.7 B/h) for soprano

[7] Time Code (refer to **Appendix B**).

[8] Number of passes (refer to **Appendix B**).

pipistrelle. The highest levels of activity at single deployments were recorded for common pipistrelle at Static E in June (136.8 B/h) and in August/ September (140 B/h); at Static F in August/September (107.2 B/h); at Static E in May (27.7 B/h); and at Static F in June (54.7 B/h).

Activity levels of common pipistrelle were high throughout the night, with a peak at around 40-60 minutes after sunset. The activity pattern for soprano pipistrelles showed continuous activity throughout the night and the highest activity level recorded during TC3. Both species were recorded close to sunset and sunrise. Twenty passes were recorded within 20 minutes of sunset and eight passes within 20 minutes of sunrise for common pipistrelle; while 65 soprano pipistrelle passes were recorded within 20 minutes of sunset and 31 passes within 20 minutes of sunrise.

Brown long-eared bat activity was recorded widely across the survey area (0.2 B/h; n=114), with 13 of 18 deployments recording this species. Nearly 50% of the activity was however recorded at Static E in August/September (2.3 B/h; n=55). Activity levels were relatively constant throughout the night, with the earliest pass of this species recorded 45 minutes after sunset and the latest at 31 minutes before sunrise.

3.3 Tree Survey

Thirteen trees (trees M1-13) within the survey area, shown in **Figure 3.1**, were identified as having medium or high potential for roosting bats, although no trees of very high potential were found. . The full results of the tree survey are provided in **Table 3.4**. Ten of the trees were found along the riparian corridor south of Coronation Wood, with a further three trees within the woodland itself.

Table 3.4 Tree survey results.

Key to Assessment: H = high, M = moderate

Key to Species: A.g =alder, A.c = horse chestnut, B. sp = birch species, C.s = sweet chestnut, S.sp = willow species, T. sp = lime species, U..sp – elm species.

Key to Feature type: WPH=woodpecker hole, HB=hanging bark, SOT=snapped off trunk, VS=vertical split, HS=horizontal split.

Key to Aspect: N = north, NE = northeast, E = east, SE = southeast, S = south, SW = southwest, W = west, NW = northwest, M = multiple.

Key to Extent: S = small, M = moderate, E = extensive.

							Feature data																	
Location				**Tree data**			**Type**												**Height**		**% cover**			
ID	**Assessment**	**Eastings**	**Northings**	**Species**	**Height**	**DBH(m)**	WPH	HB	SOT	VS	HS	Hollow	Rot hole	Dense Ivy	Epicormic growth	**Aspect**	**Extent**	**lower extent**	**upper extent**	**Canopy**	**Understorey**	**Image no.**	**Winter re-check?**
M001	M	647376	262738	S. sp	18	0.99		Y								N	S	3	3	70	30	792	N
M002	H	647373	262742	S. sp	17	1.7		Y			Y					Multiple	S	1	5	70	30	793	N
M003	M	647377	262758	S. sp	18	1.8		Y								E	S	8	8	70	40	795	N
M004	H	647378	262804	Po. sp.	17	1.4				Y						SE	M	4	6	50	50	796	N
M005	H	647370	262834	S. sp	18	1	Y									WNW	E?	8	8	80	30	798	N
M006	H	647366	262859	S. sp	18	1.3		Y		Y						NE	S	8	10	50	20	799	N
M007	M	647353	262864	S. sp	16	1.2		Y				Y?				E	M	3	4	60	30	800	N
M008	H	647134	263035	B. sp.	7	1						Y?	Y			SE	M?	6	6	20	50	801	N
M009	H	647123	263040	A.g.	12	0.8	Y									E	S	4	12	50	70	802	N
M010	M	647091	263054	Po. sp.	17	1.4					Y					E	E	4	4	60	20	804	N

							Feature data																	
Location				Tree data			Type									Aspect	Extent	Height		% cover				
ID	Assessment	Eastings	Northings	Species	Height	DBH(m)	WPH	HB	SOT	VS	HS	Hollow	Rot hole	Dense Ivy	Epicormic growth			lower extent	upper extent	Canopy	Understorey	Image no.	Winter re-check?	
M011	M	647080	263267	U. sp.	12	1.2		Y								Multiple	M	0	6	40	10	805	N	
M012	M	647077	263242	U. sp.	10	1		Y								N	S	4	7	40	10	806	N	
M013	M	647043	263238	C.s.	15	1.5		Y								W	S	4	10	30	70	807	N	

647000

263000

N

Drains

Drain

Rookyard Wood

Coronation Wood

Power Station

Sand

Path

M11

M12

M13

M10

M9

M8

Hill Wood

Path

Drain

Rosery Cottages

Car Parks

M7

M6

M5

M4

M3

M2

M1

AP

Sizewell

SIZEWELL

PH

CG Lookout

Coastguard Cottages

Sandy Lane (Track)

263000

647000

Key:

Survey area

Tree with High potential for roosting bats

Tree with Medium potential for roosting bats

0 25 50 100 150 200

Metres

Scale: 1:4,000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

EDF

DRAFT Coronation Wood Bat Survey Report 2012

Figure 3.1
Location of Trees With Medium or Higher Potential for Roosting Bats

December 2012
28130-A477.mxd tugwc

amec

4. Conclusions

Bat surveys were carried out within the area around Coronation Wood during May-September 2012 and included three walked transects on the site and the deployment of static bat detectors in six locations in May, June/July, and August/September. A ground-based assessment of the potential for trees within the site to support roosting bats was also undertaken. Two species of bats were recorded during transect surveys: common pipistrelle and soprano pipistrelle. At least seven additional species were recorded during static surveys: noctule, serotine, *Myotis* sp., brown long-eared bat, barbastelle, Nathusius' pipistrelle and Leisler's bat.

The tree survey indicated that there are thirteen mature trees within the survey area that could be used by bats for roosting. There is also a very large number of potential roost trees within the wider Sizewell Estate identified during previous surveys that could be used by bats visiting the survey area[9].

In summary, the site supports an assemblage of bat species that is thought to be typical of the area (based on the results of surveys of the wider Sizewell Estate during 2007-2011) and, with the exception of common and soprano pipistrelle bats, high levels of activity were not recorded within the survey area. The following sections provide further details of the status of each species.

4.1 Barbastelle

A maternity colony of barbastelle was discovered within the Sizewell Estate as a result of radio-tracking surveys carried out in 2010[9] and 2011[10]. The 2012 survey area is close to a network of roost trees that are largely contained within the Sizewell Estate, principally in Ash Wood, The Grove, Leiston Old Abbey Wood and near Plantation Cottages. It is also close to areas where high levels of barbastelle activity have been recorded during surveys in previous years, for example at Upper Abbey track, Fiscal Policy, Goose Hill, Kenton Hills and areas of the Sizewell Belts. No barbastelle bats were radio-tracked within the 2012 survey area in 2010/11, although they were recorded in the adjacent Sizewell Belts area. The low activity levels recorded for this species within the 2012 survey area, in combination with the lack of records close to sunset and/or sunrise indicate that the site is unlikely to be part of the core foraging area of the colony[11] although it is used by occasional bats for foraging and/or commuting.

4.2 Leisler's Bat

Very few passes of Leisler's bat were recorded, and the surveys provided no evidence to suggest that the site is of importance for foraging/ commuting. None of the records were close to sunset or sunrise and it is unlikely that the site is close to a roost.

[9] Full details of this survey can be found in the Sizewell Bat Survey Report 2010 (report ref: 28130ca068).

[10] AMEC report ref. 28130cr309.

[11] As provisionally identified in the 2011 bat survey report (report ref. 28130ca078)

4.3 Nathusius' Pipistrelle

Regular Nathusius' pipistrelle activity was recorded on site, with peak activity levels during May and, to a lesser extent, June/July. Although records from May and August/September may be attributable to migrant bats it is likely that the records from June/July originate from a breeding population or summering non-breeding individuals, as previously noted for the Sizewell Belts[12]. The high activity levels recorded from a lit area along the access road (Static E) indicates that bats were feeding on insects attracted to the lights. Records close to sunset and sunrise were not recorded for this species and surveys provided no clear evidence that the site is close to any roosts of Nathusius' pipistrelle, although there is potential for roosts to occur in trees within the survey area.

4.4 *Myotis* Bats

Activity levels of *Myotis* bats indicate that the site is not likely to be of primary importance for foraging, although the site is regularly used by *Myotis* species. The surveys provided no clear evidence that the site is close to any roosts of *Myotis* bats although there is potential for roosts to occur in trees within the survey area.

4.5 Noctule

A low level of noctule activity was recorded at most locations with a clear peak in activity at Static E in August/September, indicating that bats were feeding around the lights on the road at this location. The surveys provided no clear evidence that the site is close to any roosts of this species although there is some potential for noctule bats to roost in trees within the survey area.

4.6 Serotine

Very few passes of serotine were recorded, and the surveys provided no evidence to suggest that the site is of importance for foraging/commuting. None of the records were close to sunset or sunrise and it is unlikely that the site is close to a roost or that there is suitable habitat for this species to roost within the survey area[13].

4.7 Common and Sporano Pipistrelle

Activity levels of common and soprano pipistrelles were high with some evidence that the survey area may be a productive foraging area for both species. The timing of passes for both species suggests that there may be a roost relatively close to or within the survey area. The nearest known roost of soprano pipistrelle is a maternity colony of this species that uses bat boxes in woodland at Kenton Hills, in the Sizewell Estate c.800m northwest of the survey area. No roosts of common pipistrelle have been identified close to the survey area, although there is potential for both species to roost in trees within the site.

[12] Report reference: 28130ca68.

[13] Serotine bats generally prefer to roost in buildings.

4.8 Brown Long Eared Bat

The low levels of activity recorded for brown long-eared bat indicates that the survey area does not appear to be of particular importance for this species. That said, around half of the activity was recorded at Static E in August/September and this location may be of some importance to individuals of this species for short periods seasonally. Although it is generally thought that brown long-eared bats avoid lit areas it is apparent that bats may have been attracted to insects around the lights along the road at this location. The timing of passes for this species indicate that there may be a roost nearby and there is some potential for this species to roost in trees within the survey area.

Appendix A
Policy and Legislation Relating to Bats in Suffolk

Legislation and Policy Guidance

Biodiversity Action Plan

Seventeen[14] species of bat are known to be resident in the UK, seven of which are on the list of priority species[15] in the UK Biodiversity Action Plan (UK BAP), adopted by the Government in 2007. Species included on this list have been identified by the UK Government as needing special conservation effort because of their rarity and/or decline in numbers over recent decades. Species Action Plans (SAPs) have been developed to identify conservation priorities, propose action, and set targets to try and maintain and restore populations. Bat populations are at risk from changes to the landscape (such as those caused by agricultural practices or land development), which can cause loss of roosting, foraging or commuting habitat and be a contributing factor to population decline.

A clear understanding of the level and nature of use of a site by bats is necessary to ensure that environmental measures (mitigation, enhancement and offsetting) associated with a development can be appropriately targeted, and put in the context of local and National conservation priorities. The SAPs promote the favourable management of land, especially in the vicinity of known roost sites, and aim to maintain and enhance existing bat populations. These can lead to the designation of important sites for rarer species and notification to the local authority of important roosts such as maternity or hibernation sites.

Most of the Species Action Plans (SAPs) in the Suffolk Biodiversity Action Plan are based on National Biodiversity Action Plans. The process of identifying BAP priorities in Suffolk began in 1997, and an initial plan (Tranche 1) was produced in 1998. Priority species included the common pipistrelle bat. Tranche 2, published in 2000, was withdrawn and a new list was published in June 2010, with a new combined BAP for all bat species completed in March 2012. A table adapted from the Suffolk BAP for bats is included in **Table A1** below.

[14] This does not include greater mouse-eared bat (*Myotis myotis*), which is considered resident by some, but only a single individual has been recorded in recent years after the species was officially declared extinct in the UK.

[15] Priority bat species in the UK BAP: barbastelle, Bechstein's bat (*Myotis bechsteinii*), noctule, soprano pipistrelle, brown long-eared bat, greater horseshoe bat (*Rhinolophus ferrumequinum*) and lesser horseshoe bat (*Rhinolophus hipposideros*).

Table A1 This is an auto-numbering Autotext entry – T then F3

Species	Number of occupied 1 km squares	Range & abundance	Notes	Source
Noctule	86	Uncommon but widespread		Suffolk BAP
Leisler's bat	14	Rare and locally distributed	Only three nursery colonies are known in the county. Appears to be confined to the north-west of Suffolk.	Suffolk BAP Suffolk Bat Group
Serotine	109	Uncommon but widespread	There are approximately 45 known colonies in Suffolk.	Suffolk BAP Suffolk Bat Group
Nathusius' Pipistrelle	2	Rare and locally distributed	There are only a few records from Suffolk currently; more may come to light from a new BCT survey, initial results of which are due to be published in February 2010.	Suffolk BAP Suffolk Bat Group
Soprano Pipistrelle	74	Uncommon but widespread		Suffolk BAP
Common pipistrelle	682	Common and widespread		Suffolk BAP
Lesser horseshoe bat	1	Rare and locally distributed	A single bat (presumed to be the same individual) has been recorded at a hibernation site in most winters between 1996 and at least 2008.	Suffolk BAP Suffolk Bat Group
Natterer's bat	131	Uncommon but widespread		Suffolk BAP
Daubenton's bat	50	Locally common and widespread		Suffolk BAP
Whiskered/Brandt's/Alcathoe* whiskered bat	?	Rare and very local	Until January 2000 all records were from two hibernation sites, and refer to single animals. A breeding roost has yet to be discovered in the county.	Suffolk Bat Group
Brown-long eared bat	624	Common and widespread		Suffolk BAP
Barbastelle	40	Uncommon but widespread		Suffolk BAP

and therefore difficult to distinguish), so all previous hibernation site records would have been recorded as "whiskered/Brandt's". However, a third cryptic species, Alcathoe whiskered bat (*Myotis alcathoe*), was confirmed to occur in the UK in 2010, and is now thought to have been resident and probably widespread here for some time. Hibernation records could therefore represent any of these three.

Protective legislation relating to bats

All bat species and their roosts are protected in the UK under *The Conservation of Habitats and Species Regulations 2010* which implements the EC Directive 92/43/EEC (the Habitats Directive). In addition, the lesser horseshoe bat, greater horseshoe bat, Bechstein's bat and barbastelle are listed in Annex II of the Habitats Directive, which requires sites to be designated by member states for their protection.

All bat species and their roosts are also protected under Schedule 5 of the *Wildlife and Countryside Act 1981* (as amended), and under the *Countryside and Rights of Way Act 2000*. Taken together, these Acts and Regulations make it illegal to:

- Intentionally or deliberately kill, injure or capture bats;
- Deliberately or recklessly disturb bats;
- Damage, destroy or obstruct access to bat roosts;
- Possess or transport a bat or any part of a bat, unless acquired legally; and
- Sell, barter or exchange bats or parts of bats.

The Natural Environment and Rural Communities Act 2006 (NERC Act) states, in Section 40(1), that

> *"every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity".*

Section 40(3) of the NERC Act 2006 goes on to state that

> *"conserving biodiversity includes, in relation to a living organism or type of habitat, restoring or enhancing a population or habitat".*

Section 41(1) of the NERC Act 2006 states that

> *"the Secretary of State must, as respects England, publish a list of the living organisms and types of habitat which in the Secretary of State's opinion are of principal importance for the purpose of conserving biodiversity".*

All seven species of bats that are priority species in the UK Biodiversity Action Plan[15] are also considered Species of Principal Importance for the Conservation of Biodiversity under Section 41 of the NERC Act.

The National Planning Policy Framework (paragraph 117) indicates that local authorities should take measures to "*promote the preservation, restoration and re-creation of priority habitats, ecological networks and the protection and recovery of priority species*" linking to national and local targets through local planning policies.

Developments that compromise the protection afforded to bats under the provisions of *The Conservation of Habitats and Species Regulations 2010* almost invariably require a licence from Natural England. Three tests must be satisfied before a licence to permit otherwise prohibited acts can be issued:

- Regulation 53(2) (e) states that licences may be granted by Natural England to *'preserve public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment';*
- Regulation 53(9) (a) states that a licence may not be granted unless Natural England is satisfied *'that there is no satisfactory alternative';*
- Regulation 53(9) (b) states that a licence cannot be issued unless Natural England is satisfied that the action proposed *'will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range'.*

In conclusion, a licence permits otherwise unlawful actions and it is the responsibility of the developer, or their appointed advisor, to decide whether a licence is required for work that has the potential to affect bat populations. It is important that the developer carries out a thorough survey and accurate assessment to help avoid committing offences. It is also the responsibility of the developer to design and implement a mitigation scheme that meets the licensing requirements and ensures, as far as possible, the long-term maintenance of any bat population affected. Licence applications (under Regulation 53(2) (e) of the Habitats Regulations) will be determined by Natural England.

Appendix B
Material and Data Analysis

Use of Bat Detectors

Walked Transects

Surveyors used two different bat detectors on every survey: a Batbox Duet detector for listening to bat calls from the combined heterodyne/frequency division output and an Anabat SD1 or SD2 frequency division detector for recording calls for subsequent identification. Wherever possible, surveyors recorded the observed behaviour and numbers of bats onto field proforma. Notes were taken of all bat sightings in conjunction with the Anabat recordings. This was to aid in identification and also to provide additional detail on the behaviour of observed bats. Field notes included a record of the time of each bat encounter, allowing results to be cross-referenced with the recorded data.

Static Bat Detector Surveys

Anabat SD1 bat detectors were placed in camouflaged waterproof boxes with a 12V battery attached. The microphone was attached to a 2m cable which was connected to the detector. The microphone was housed inside a sealed curved pipe to keep water off the microphone without incurring significant loss in sensitivity. The pipes were positioned at 1-2m height without any solid objects present close to the microphone to prevent interference or impedance to recording bat calls.

Assessment of Data from Bat Detectors

The Anabat SD1 and SD2 frequency division bat detectors were used to record bat calls during walked transect and static bat detector activity surveys. The Anabat provides a frequency down conversion which generates audible audio signals with frequencies directly related to those the bat is producing.

The likelihood of detecting bats acoustically depends on the propagation of sound through air, the characteristics of bat calls, and the way sound is received and processed by the bat detector. Recent unpublished collaborative research by BSG Ecology and Bristol University has shown that bat detectors detect calls from some species of bats at greater distances than others. In general, bats with calls that can be detected over greater distances are larger bats which use calls that are both high amplitude and low frequency such as the noctule and the most difficult to detect are those which use low amplitude calls, such as the brown long-eared bat and barbastelle, or high frequencies, such as horseshoe bats (*Rhinolophus* spp.). **Table B1** shows the mean frontal detection range of Anabats for echolocation calls from UK bat species based on research undertaken by BSG Ecology in collaboration with Bristol University[16].

[16] Holderied *et al*. (2011), unpublished data.

Table B.1 Estimated mean frontal detection ranges for selected bat species using Anabat detectors at standard 'field' settings.

Species	Mean frontal detection range (m)
Soprano pipistrelle	24
Brown long-eared bat	9
Natterer's bat	13
Noctule	47
Leisler's bat	38
Barbastelle	7
Lesser horseshoe bat	7

Data Analysis

Selection of Data for Analysis

Because a very large amount of data is likely to be recorded during a full field season of static bat detector recording, the majority of which will represent the common pipistrelle species, it is not cost-efficient or necessary to check and label every pass of all species of bats. All recordings were checked for rarer species of potentially higher conservation significance by scanning sound files for these species. The species selected were: barbastelle, Nathusius' pipistrelle and Leisler's bat (Group 1).

For all other species of bats (Group 2), a sub-set of three nights of data from each deployment - those with the highest number of bat calls recorded – were analysed in detail. By choosing the nights with the highest activity levels it is assumed that nights with optimal conditions for recording bat activity were also chosen. In this sense, the bias inherent to selecting data for analysis non-randomly in this way is similar to the bias when selecting nights with favourable conditions for carrying out other bat surveys. The only bias which is likely to result is that the activity rates for Group 1 species will be higher than if all the data within the relevant recording period were analysed (as for Group 2 species). As the data have been used to determine relative activity levels and not to provide a measure of abundance, this upward bias is unlikely to make any difference to the evaluation of the importance of bat populations at Sizewell.

Bat Call Identification

Recorded bat calls were analysed using Analook software to confirm the identity of the bats present. Where possible, the bat was identified to species level. For species of long-eared bats records were not identified to species level due to the overlapping call parameters of each species but were assumed to refer to brown long-eared bats. It is unlikely that grey long-eared bat (*Plecotus austriacus*) occurs in Suffolk, given the species' known distribution and rarity (Harris & Yalden, 2008). Species of the genus *Myotis* were grouped together as many of the species have overlapping call parameters, making species identification problematic (BCT, 2012).

For *Pipistrellus* species the following criteria, based on measurements of peak frequency, were used to classify calls:

Common pipistrelle	≥42 and <49 kHz
Soprano pipistrelle	≥51 kHz

Nathusius' pipistrelle	<39 kHz
Common pipistrelle / Soprano pipistrelle	≥49 and <51 kHz
Common pipistrelle / Nathusius' pipistrelle	≥39 and <42 kHz

In addition, the following categories were used for calls which could not be identified with confidence due to the overlap in call characteristics between species or species groups:

- *Nyctalus* sp. (either Leisler's bat or noctule).
- *Eptesicus serotinus/N. leisleri* (either serotine or Leisler's bat)

Bat calls which could not be ascribed to any of these categories were not used in the analysis.

Calculation of Relative Activity

The Analook software enables analysis of the relative activity of different species of bats by counting the minimum number of bats recorded within discrete sound files. Once triggered by ultrasound, the Anabat records sound files with a duration of 15 seconds, which may contain a number of individual bat passes, or discrete groups of ultrasound 'pulses'. For the purposes of this analysis, the recording of one or more passes by a single species of bat within a 15 second sound file is counted as a single bat pass (B). More than one pass of the same species was counted within a sound file if multiple bats were recorded calling simultaneously. During analysis of sound files, it was possible to estimate the minimum number of bats recorded on individual sound files but not whether consecutive sound files had recorded, for example, a number of individual bats passing as they commute to a feeding habitat or one bat calling repeatedly as it flies up and down a hedgerow. Therefore, relative abundance of bats cannot be estimated from this analysis, but the number of bat passes does reflect the relative importance of a feature/habitat to bats by assigning a level of bat activity that is associated with that feature, regardless of the type of activity. In this analysis, bat passes per hour (B/h) has been used a measure of 'relative activity'.

Analysis by Sunset-Sunrise Times

As part of the analysis of nocturnal patterns of behaviour for bats at Sizewell the data were split into discrete time periods relating to their proximity to sunset or sunrise. The time categories (time codes: TC) were as follows:

TC 0 = before sunset

TC 1 = 0-20 min after sunset

TC 2 = 20-40 min after sunset

TC 3 = 40-60 min after sunset

TC 4 = 60-80 min after sunset

TC 5 = 80-100 min after sunset

TC 6 = 100-120 min after sunset

TC 7 = Middle of night (varies across seasons)

TC 8 = 120-100 min before sunrise

TC 9 = 100-80 min before sunrise

TC 10 = 80-60 min before sunrise

TC 11 = 60-40 min before sunrise

TC 12 = 40-20 min before sunrise

TC 13 = 20-0 min before sunrise

For each of these categories B/h was calculated to allow a comparison between the activity level recorded in different time periods and TC7 was corrected to allow for variation in night length throughout the survey season.

British Energy Group PLC
Sizewell Bat Survey Report 2007

1. Introduction

1.1 Background to Development

British Energy (BE) is at the early stages of investigating the feasibility of building new nuclear power stations at a range of sites within their UK land holding. Sizewell has been identified as one potential site for investigation and likely progression to EIA. Entec UK Ltd has been appointed by BE to lead and co-ordinate the baseline ornithological and terrestrial ecological work and assessment for Sizewell and has subcontracted Baker Shepherd Gillespie (BSG) to undertake baseline bat surveys of the area. This report presents the results of survey work undertaken within the BE land holding by BSG in 2007.

1.2 Proposed Works

An area of land directly north of the Sizewell 'A' and 'B' Power Stations has been identified as having the potential to accommodate nuclear new build. This area, which covers 0.32km2/32ha and has an approximate central grid reference of TM473640, is referred to in this document as 'the preliminary works area'. It should be noted that this initial development footprint is purely indicative, as environmental, landscape and visual, hydrological and other constraints have not yet been considered and taken into account. These would all be addressed as a matter of course as part of an EIA.

No detailed information on the exact nature of the proposed nuclear power station can be provided at this stage, but it is assumed for the present that the power station would be water-cooled and that there would be a requirement for additional works associated with this in the sub-tidal zone. Due to the presence of statutorily designated sites of nature conservation importance to the north and east of the preliminary works area, it is likely that the route of any access road to this block of land will be through the area of plantation forestry (Dunwich Forest and Goose Hills) to the west. Further, it is likely that any construction compounds for the build would adjoin this access road, taking in further areas of plantation and adjacent arable land.

Figure 1 shows the proposed footprint of the new power station (the preliminary works area). The positions of associated infrastructure such as access tracks and construction compounds are indicative at this stage.

1.3 Preliminary Works Area Description and Context

The preliminary works area comprises open sheep grazed pasture, fringed by reinstated coastal dune vegetation parts of which have been planted with trees and scrub. The hydrology and pedology of the site were irreversibly altered as a result of works associated with the building of the Sizewell 'A' and 'B' Stations (adjacent to its southern boundary), and as a result it has lost much of its botanical merit. Habitats adjoining or in close proximity to the site are of considerable ecological interest however. These include wet meadows (and associated wetland

habitats and ditch systems), dune systems, shingle plant communities and wet semi-natural woodland. The quality of the shingle, grazing marsh and associated wetland habitats have led to substantial areas of these in close proximity to the site being designated for their ecological interest. Previous bat surveys have recorded seven bat species on the Sizewell Estate including barbastelle (*Barbastella barbastellus*), one of the UK's rarest species, and one of only five UK bat species listed on Annex II of the EU Habitats Directive.

1.4 Legislation and Policy Guidance

1.4.1 Biodiversity Action Plan

Seventeen species of bat are known to be resident in the UK, seven of which are on the new list of priority species in the UK Biodiversity Action Plan, adopted by the Government in 2007. Species included on this list have been identified by the UK Government as needing special conservation help because of their rarity and/ or decline in numbers over recent decades. Species Action Plans (SAPs) have been developed to identify conservation priorities, propose action, and set targets to try and maintain and restore populations. Bat populations are at risk from changes to the landscape (such as agricultural practices), and developments can cause loss of roosting, foraging or commuting habitat and be a contributing factor to population decline.

A clear understanding of the level and nature of use of a survey area by bats is necessary to ensure that environmental measures (mitigation, enhancement and offsetting) associated with a development can be appropriately targeted, and put in the context of local and national conservation priorities. The SAPs promote the favourable management of land, especially in the vicinity of known roost sites, and aim to maintain and enhance existing bat populations. These can lead to the designation of important sites for rarer species and notification to the local authority of important roosts such as maternity or hibernation sites.

Most of the Species Action Plans (SAPs) in the Suffolk Biodiversity Action Plan are based on National Biodiversity Action Plans. The process of identifying BAP priorities in Suffolk began in 1997, and an initial plan (Tranche 1) was produced in 1998. Priority species included the common pipistrelle (*Pipistrellus pipistrellus*). Tranche 2, published in 2000 has been withdrawn and revised plans are in production. Priority species on Tranche 2 included barbastelle.

1.4.2 Protective Legislation Relating to Bats

All bat species and their roosts are protected in the UK under the Conservation (Natural Habitats, &c.) (Amended) Regulations 2007 (Schedule 2), which implements the EC Directive 92/43/EEC (the Habitats Directive). In addition, lesser and greater horseshoe bat, Bechstein's bat and barbastelle are listed in Annex II of the Habitats Directive, which requires sites to be designated in member states for their protection.

All bat species and their roosts are also protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended), and under the Countryside and Rights of Way Act 2000. Taken together, these Acts and Regulations makes it illegal to:

- Intentionally or deliberately kill, injure or capture bats;
- Deliberately or recklessly disturb bats;
- Damage, destroy or obstruct access to bat roosts;
- Possess or transport a bat or any part of a bat, unless acquired legally; and

- Sell, barter or exchange bats, or parts of bats.

In response to a European Court Judgement that ruled the United Kingdom had not correctly transposed the Habitats Directive into UK law in a number of areas, recent changes have been made to the Habitats Regulations. Caselaw driving these changes included a judgement in 2005 which ruled that existing species protection provisions in the Habitats Regulations were not fully compatible with the strict species protection regime required by the Habitats Directive (www.defra.gov.uk). Subsequently, the Conservation (Natural Habitats, & c.) (Amendment) Regulations 2007 entered into force in August 2007. In summary, the Amended Regulations have:

- Removed the majority of defences originally put into the Habitats Regulations, including the 'incidental result of an otherwise lawful action' defence;
- Placed greater emphasis on individuals and organisations involved in works that could affect European Protected Species to give more careful consideration to their presence, their breeding sites and resting places.

To ensure that these changes to the Habitat Regulations are practical and realistic, it is intended that the threshold level at which significant disturbance occurs will be raised such that low level disturbance that affects an animal rather than the species as a whole, or that only affects "*a small number*" of a "*larger*" population, will not require an European Protected Species licence. Further information can be found at:

http://www.naturalengland.org.uk/conservation/wildlife-management licensing/docs/Disturbance_of_protected_species.pdf.

The Natural Environment and Rural Communities Act 2006 (NERC Act) states, in Section 40(1), that "*every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity*". Section 40(3) of the NERC Act 2006 goes on to state that "*conserving biodiversity includes, in relation to a living organism or type of habitat, restoring or enhancing a population or habitat*".

Section 41(1) of the NERC Act 2006 states that "*the Secretary of State must, as respects England, publish a list of the living organisms and types of habitat which in the Secretary of State's opinion are of principal importance for the purpose of conserving biodiversity*".

In paragraph 16 of Planning Policy Statement 9, the Government indicates that local authorities should take steps to further the conservation of species of principal importance for the conservation of biodiversity in England and should ensure that that these species are protected from adverse effects of development, where appropriate, by using planning conditions or obligations. Species of principal importance include priority bat species in the UK Biodiversity Action Plan[1].

The Bat Mitigation Guidelines published by English Nature state, *'It is the responsibility of the developer, usually via a consultant, to produce evidence on the presence of bats on a site at which works are proposed'*.

[1] In 2007, the Government has published a new list of UK Biodiversity Action Plan priority species and habitats. This has not currently been adopted under the NERC Act 'Section 41 list', but it is expected that most, or all, priority species and habitats will be included.

Developments that compromise the protection afforded to bats under the provisions of the Conservation (Natural Habitats, &c.) Regulations 1994 almost invariably require a licence from Natural England. Three tests must be satisfied before a licence to permit otherwise prohibited acts can be issued:

- Regulation 44(2)(e) states that licences may be granted by Natural England to 'preserve public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment';
- Regulation 44(3)(a) states that a licence may not be granted unless Natural England is satisfied 'that there is no satisfactory alternative';
- Regulation 44(3)(b) states that a licence cannot be issued unless Natural England is satisfied that the action proposed 'will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range'.

In conclusion, a licence permits otherwise unlawful actions and it is the responsibility of the developer, or their appointed advisor, to decide whether a licence is required for work that has the potential to affect bat populations. It is important that the developer carries out a thorough survey and accurate assessment to help avoid committing offences. It is also the responsibility of the developer to design and implement a mitigation scheme that meets the licensing requirements and ensures, as far as possible, the long-term future of any bat population affected. Licence applications (under Regulation 44(2)(e) of the Habitats Regulations) will be determined by Natural England.

1.5 Status of Bats in Suffolk

Of the 16 species of bat that are known to be resident in the UK, the species listed in **Table 1** are known to occur in Suffolk:

Table 1 Status of Bat Species in Suffolk

English Name	Scientific Name	Status in Suffolk	Notes	Source of Information
Common pipistrelle	*Pipistrellus pipistrellus*	Common and widespread	-	Richardson (2000)
Soprano pipistrelle	Pipistrellus pygmaeus	Common and widespread	-	Richardson (2000)
Brown long-eared bat	*Plecotus auritus*	Common and widespread	Second only to pipistrelles in terms of number of 10km squares occupied in the county	Suffolk Bat Group
Natterer's bat	*Myotis nattereri*	Regularly recorded	The number of records trebled following the bats in barns survey in 1996. The species uses most of the known hibernation sites in the county.	Suffolk Bat Group

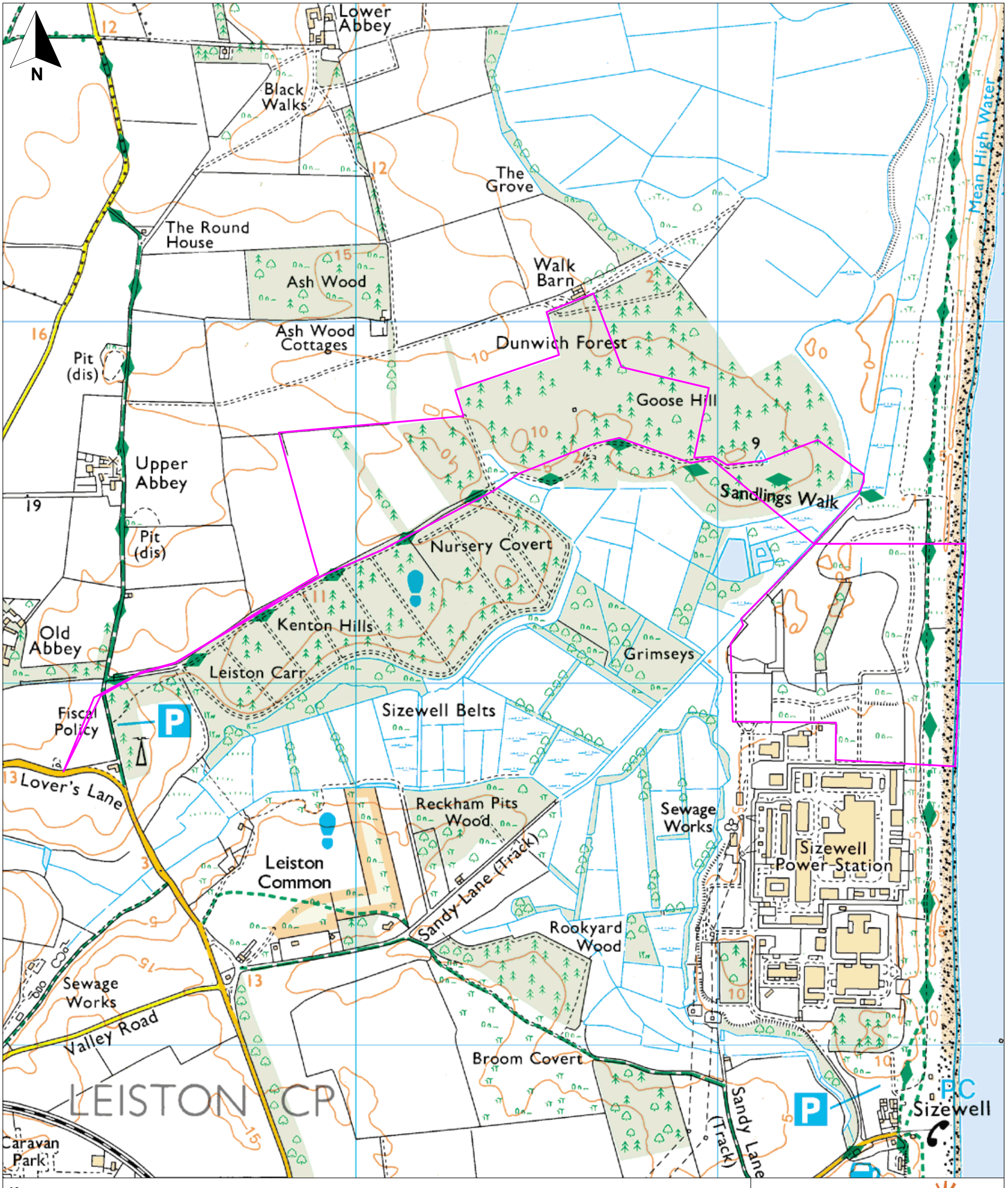
Table 1 (continued) Status of Bat Species in Suffolk

English Name	Scientific Name	Status in Suffolk	Notes	Source of Information
Whiskered bat	*Myotis mystacinus*	Extremely scarce	Until January 2000 all records were from two hibernation sites, and refer to single animals. A breeding roost has yet to be discovered in the county	Suffolk Bat Group
Brandt's bat	*M. brandtii*	Extremely scarce		Richardson (2000)
Daubenton's bat	*M daubentonii*	Widespread and locally common		Richardson (2000)
Noctule	*Nyctalus noctula*	Widespread (in low numbers)	Widespread throughout the county albeit in small numbers	Richardson (2000) and Suffolk Bat Group
Leislers	*N. leisleri*	Uncommon	Only three nursery colonies are known in the county. Appears to be confined to the north-west of the county	Suffolk Bat Group
Serotine	*Eptesicus serotinus*	Widespread (in low numbers)	There are approximately 45 known colonies in Suffolk.	Suffolk Bat Group
Barbastelle	*Barbastella barbastellus*	Scarce		Richardson (2000)
Lesser horseshoe bat	*Rhinolphus ferrumequinum*	Very rare (very few records)	A single bat (presumed to be the same individual) has been recorded at a hibernation site in February for the last nine to fourteen years.	Suffolk Bat Group and Alan Miller of the Suffolk Wildlife Trust

1.6 Purpose of Survey Work

The bat surveys carried out in 2007 form part of the baseline survey programme that is being conducted to inform the ecological assessment section of an Environmental Statement (ES) for the proposed development. The aims of the surveys were to:

- Identify tree roosts or trees with the potential to support roosting bats which could be affected by the proposals. This was achieved by carrying out a visual inspection of trees and the woodland within the preliminary works area and Dunwich Forest;
- Determine the level and nature of bat use of the survey area by:
  - Undertaking five evening bat activity surveys from June to September using walked transects with listening stations positioned along the route and;
  - Setting up static Anabats at selected locations to record from dusk to dawn at the time of each survey visit;
- Provide a preliminary evaluation of the value of the survey area to bats;



Key:

Preliminary Works Area

0 m 250 m

British Energy

Sizewell Bat Report 2007

Figure 1
Preliminary Works Area

February 2008
19801-R122 tugwc

Entec

- Identify information gaps that need to be addressed through further appropriate survey; and,
- Identify appropriate mitigation, enhancement and compensation measures to ensure the bat interest of the area is maintained and enhanced.

2. Methods

2.1 Desk study

2.1.1 Records of Bats

A desk study of ecological information was carried out by Entec for the proposed development. Sources of available information that have been identified to date are:

- The results of a data search of all wildlife records carried out by Suffolk Biological Records Centre (SBRC) (March, 2007) for a 3km radius search area around the preliminary works area.

Historical information was also obtained from the following reports:

- The Decommissioning ES for Sizewell A Power Station (British Nuclear Group, 2005);
- Greater Gabbard Offshore Windfarm 132kV Underground Cable Route Options. Report to National Grid (Entec UK Ltd, 2007).

In addition, prior to undertaking the surveys, methods were discussed with Alan Miller of Suffolk Wildlife Trust, a prominent member of the local bat group[2], who is involved with the implementation of habitat management on the Sizewell Estate and has many years of knowledge of the local area.

2.2 Field Surveys

2.2.1 Tree Survey

Mature deciduous trees along the route of the indicative east-west access track and trees along the field margin to the north of the access track and west of Hilltop Covert were visually inspected on the 7th and 8th June 2007. The locations of these trees are shown on **Figure 2**. Features which could support roosting bats, such as holes, cracks, splits, loose bark and dense ivy covering were noted, and their height and aspect were recorded, as were any signs of actual use by bats such as droppings, scratches, smudge marks or urine staining. The position of trees exhibiting one or more of these features was noted on a plan. The weather conditions at the time of the tree survey were: 22°C, clear, light wind and dry.

There are many other trees which could be affected by the development proposals. However, these were all plantation pine trees which had few or no roosting features. Some were felled during the survey period as part of ongoing forest management. Although sample areas within

[2] Suffolk Bat Group have been contacted for information, but no response had been received at the time of issue of this report.

the conifer plantation at Dunwich Forest / Goose Hills were examined, the area was not the subject of a 'tree-by-tree assessment' (as the conifers had been planted in even-age woodland blocks and were of a similar structural condition). No double leadered trees[3] were noted.

2.2.2 Evening Bat Activity Surveys

A total of five evening bat activity surveys were undertaken. Surveys were conducted on 7th June 2007, 6th July 2007, 16th August 2007, 28th August 2007 and 12th September 2007 respectively. The survey timing corresponds to the active season for bats and spans the months in which bats rear their young. The surveys were timed to provide a sample of activity through this important period in the annual cycle of bats. For each survey a different transect route was walked incorporating up to 16 listening stops. Each transect route was walked once and consisted of a loop section and an 'out and back' section. Varying transect routes were used in order to sample all areas of the survey area for bat activity at different times of the evening within the narrow time window of greatest bat activity. The prevailing weather conditions, sunset times, start and finish times and duration of each survey are set out in **Table 2**. During each survey two surveyors walked a circuit of the transect routes together (for health and safety reasons) listening to bat echolocation calls using heterodyne detectors and continuously recording bat calls using frequency division detectors (either a Duet bat detector in conjunction with a mini disc recorder or an Anabat SD1 recorder). Regular stops were made at 'listening stations' along the route. Bat activity was recorded for between one and three minutes and the time of arrival at each station was noted so that the recorded bat calls could be assigned to the surveyor's location when the recording was made.

Figures 3-7 show the transect routes and the transect points walked on the five dates.

Table 2 Times, Dates and Weather Conditions During Bat Activity Surveys

Date	Sunset time	Temperature	Wind	Rain	Cloud	Start /finish	Transect walk duration
07June 07	21.15	17-140C	light	dry	clear	21.09-23.15	2hrs 06mins
06 July 07	21.16	16-140C	light	dry	60% clearing	21.20 – 00.46	3hrs 26mins
16 Aug 07	20.20	15-110C	still	dry	clear	20.05-22.55	2hrs 50mins
28 Aug 07	19.55	14-130C	still	dry	clear	19.50-22.57	3hrs 03mins
12 Sept 07	19.30	15-120C	still	misty	80% cloud	19.35-21.24	1hr 49mins

[3] Double leadered trees are those where the trunk divides into two. Cavities developing in trees with this type of trunk have been seen to contain bat roosts in at least one study (Mortimer, 2005).

2.2.3 Automated Overnight Activity Surveys

On each of the five survey visits two Anabat SD1s (automated recording bat detectors with timed sound file feature) were left to record overnight. These were positioned in a variety of habitats and in different parts of the survey area. The locations of the Anabats are shown on **Figures 3-7,** and are labelled **A-J**. The Anabats were located just above ground level (1m above) or in the fork of a tree at approximately 1.5 to 2m above ground level. The reason for this positioning was to avoid recording the calls of crickets which would mask bat recordings.

2.3 Personnel

All the survey work (with the exception of the bat activity survey work on 6th July 2007) was undertaken by Dr Sandie Sowler MIEEM and Gerry Westmacott. Both surveyors are experienced Natural England licensed bat workers (Natural England licence numbers 20071050 and 20071049). The bat activity survey work undertaken on 6th July 2007 was carried out by Helen Lucking MIEEM and Alastair Wrigley, also experienced Natural England licensed bat surveyors (licence numbers 20070144 and 20070090),

2.4 Evaluation Methodology

In order to evaluate the importance of ecological features identified in the desk study and field surveys, a set of standard measures are outlined in guidance produced by the Institute of Ecology and Environmental Management (2006). For each site, habitat and species/assemblage, a summary grade is determined based on the levels of value recommended in the guidance. This places the importance of each feature in a geographical context, using the following hierarchy:

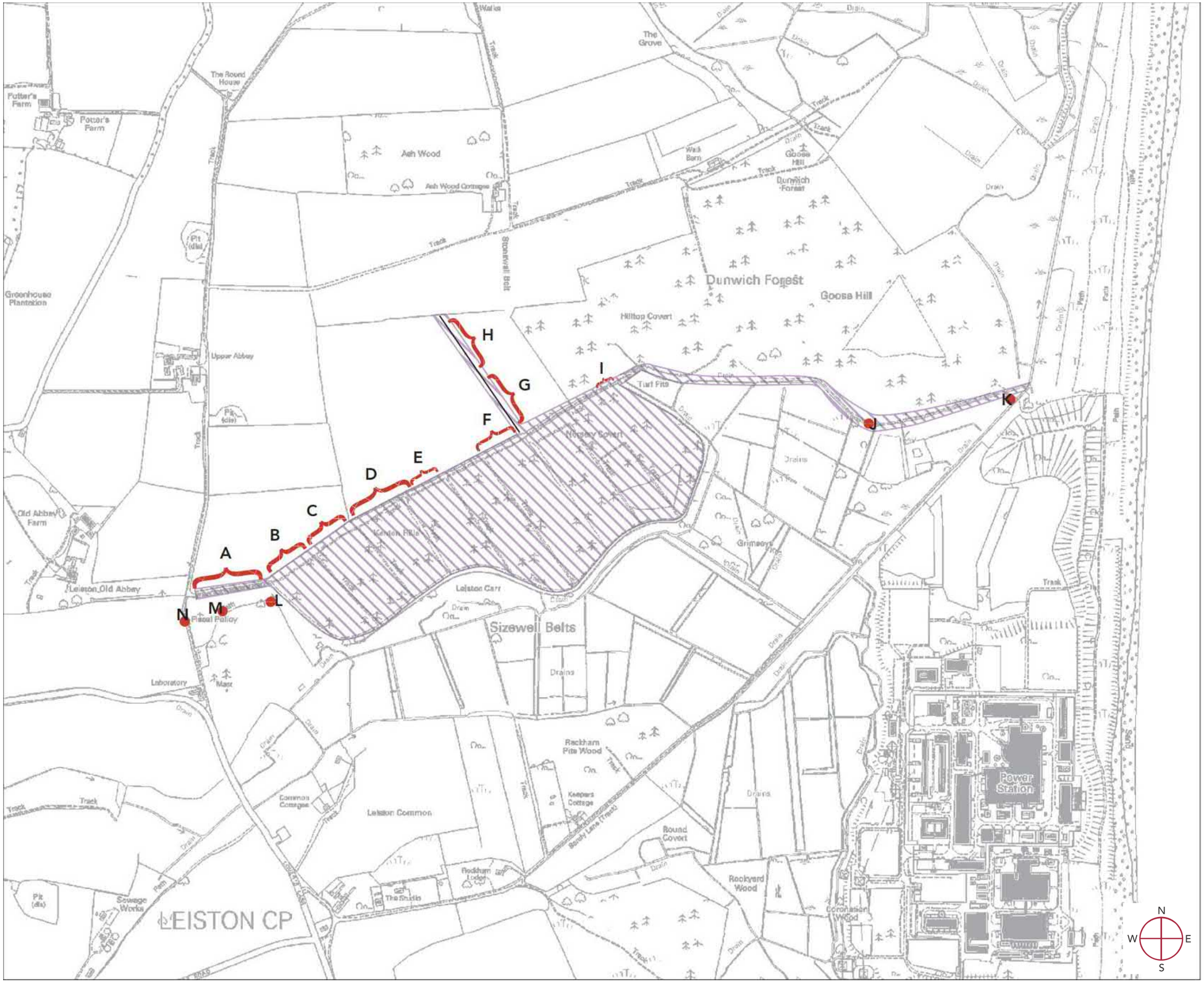
- International;
- UK;
- National (i.e. England, Northern Ireland, Scotland or Wales); ;
- County (or Metropolitan - e.g. in London);
- District (or Unitary Authority, City or Borough);
- Local (or Parish); or
- Site - within immediate zone of influence only (the development site and surrounds).

Where possible, formal criteria are used to set features of conservation importance within this geographical context. For example, the Guidelines for the Selection of Biological SSSIs (Nature Conservancy Council, 1989) can be used as a basis for the assessment of features at national level. Similarly, published guidelines for the selection of SINCs can be used as a basis for assessing features of county level importance.

The significance of bat populations has been determined using the principles described in the IEEM *Guidelines for Ecological Impact Assessment in the United Kingdom* (www.ieem.net). Particular consideration has been given to distribution and rarity at different geographical levels. In this case, reference has been made to:

- UK BAP;

Location of Surveyed Trees – 7th June 2007



Legend

A-N	Tree Blocks and Locations
	Survey Area
A	1-5 Tree Numbers
B	6-10 Tree Numbers
C	11-25 Tree Numbers
D	26-56 Tree Numbers
E	57-64 Tree Numbers
F	65-66 Tree Numbers
G	67-85 Tree Numbers
H	86-124 Tree Numbers
I	125-126 Tree Numbers
J	127-180 Tree Numbers
K	181-184 Tree Numbers
L	185-188 Tree Numbers
M	189-194 Tree Numbers
N	195-196 Tree Numbers

baker shepherd gillespie
ECOLOGICAL CONSULTANTS
Limited Liability Partnership

Office: Oxford
Tel: 01865 883833

Date	**OCT'07**	Checked	**SS**	Scale	**NTS**
Drawn	**SW**	Approved	**SS**	Job Ref	**3040**
Status	**FINAL**				

Dwg No. **FIGURE 2**

- Suffolk Local BAP;
- Distribution atlas of bats in Britain and Ireland 1980-1999 (Richardson, 2000)
- The state of the UK's bats: National Bat Monitoring Programme Population Trends (Bat Conservation Trust 2007).

2.5 Survey Limitations

The tree survey was undertaken at a sub-optimal time of the year, as the deciduous trees had leaves on them and some roosting signs or potential roosting features could have been obscured by foliage. It has been recommended that trees numbered 86-115 and 136-149 (see **Appendix A)** are re-checked in the winter months, as these had the potential to support bats.

Identification of some species, especially bats of the *Myotis* genus, from recordings can be difficult. Where the identification to species has been made this has been done using 'the slope' feature of the analysis software 'Analook' and has only been recorded to species where the identification confidence is greater than 60%.

Finally, certain bat species are especially difficult to detect – in particular, long-eared bats have a very quiet echolocation call and therefore tend to be under-reported in surveys using aural bat detectors.

3. Results

3.1 Desk Study

Barbastelle, one of the UK's rarest species has been recorded roosting in barns at Upper Abbey Farm and Lower Abbey (Leiston) on several occasions; these locations are approximately 1.85km west and 1.94km north-west, respectively of the preliminary works area. Barbastelle was first recorded in the barns in 1997 by Alan Miller (SWT), and visits by the local bat group over subsequent years established that small numbers were present on an annual basis. In 2004 barbastelle were recorded roosting in the same barn complex as a maternity colony of Natterer's bats at Upper Abbey. Barbastelle have not been proven to breed on the Sizewell Estate to date, and any breeding colony located would be highly important, as very few maternity roosts are known in the UK.

Brown long-eared bats were recorded at Upper Abbey Farm in 2000 where a maternity roost is present (Alan Miller, pers comm., SBRC, 2007). Pipistrelles *Pipistrellus* sp. are known to roost in the barns at Upper Abbey Farm and in the bat boxes at Kenton and Goose Hills. Maternity roosts of soprano pipistrelles are found in several of the domestic properties and agricultural buildings within the estate, including at Rosary Cottages and the barn at Upper Abbey Farm (Alan Miller, pers comm).

Noctules have been recorded in the area around Sandy Lane and Grimsey's Wood, and roost in bat boxes in Kenton Hills, where a recent count of 22 individuals has been made (Alan Miller, pers comm). Daubenton's bat has been recorded hibernating in Dunwich Forest, and is known to forage over the Sizewell Marshes. Surveys of bat boxes at Sizewell show a 75% occupancy of the trees; i.e. there are 20 trees with 3 boxes on each tree and bats have occurred with regularity in boxes on 15 of these trees (these have been found to contain bats or bat droppings).

Noctules have occupied two boxes regularly and the remainder have all been occupied by pipistrelle species (Alan Miller, pers comm).

Suffolk Biological Records Centre holds records for noctule at Kenton Hills in 2004, at Ordnance Survey Grid Reference (OSGR) TM 460 642 This is approximately 900m west of the preliminary works area. Suffolk Biological Records Centre also holds records of brown long-eared bats at Theberton, 2.8 km from the preliminary works area. Records of brown long-eared bats in 1993 and 2002 are at properties within Theberton, which suggests these may be records of roosts, although no further details are available.

Surveys conducted by Cresswell Associates (2005) as part of the decommissioning EIA of Sizewell A, recorded the two commoner species of pipistrelle as well as brown-long eared bats in Hill Wood, Coronation Wood and in the strip of woodland adjacent to the eastern boundary of the SSSI. Trees within these woodlands were considered to offer good opportunities for roosting.

Work undertaken in support of the Environmental Statement for Sizewell Wents Substation recorded brown long-eared bat, common pipistrelle bat and one species of *Myotis* bat along a footpath between the woodland and Sandy Lane. Noctule, serotine and soprano pipistrelle were also recorded in the survey area, which is immediately south-west of the existing power stations.

3.2 Field Surveys

3.2.1 Tree Survey for Bats

The detailed results of the tree survey are presented in tabular form in **Appendix A** (the locations of the trees are shown in **Figure 2**). In summary, 196 trees were surveyed on an individual tree basis. The majority were pedunculate oak *Quercus robur* and birch *Betula pendula* with a small number of other species notably ash *Fraxinus excelsior*, lime *Tilia* x. *europaea,* Scots pine *Pinus sylvestris* and willow *Salix* sp. No bat roosts were noted. A total of 13 trees were identified as having high potential, 5 medium to high potential, 14 medium potential, 39 low to medium potential, 75 low potential, 36 low to no potential and 14 no potential to contain bat roosts.

No signs of either actual bat roosts or features potentially suitable to support roosting bats were noted in the sample areas of plantation pine that were assessed.

One roost of soprano pipistrelles was located in three bat boxes attached to a Corsican pine (*Pinus nigra maritima*) in the plantation pine forest of Kenton Hills. The location is marked on **Figure 4**.

3.2.2 Evening Bat Activity Surveys (Walked Transects)

The detailed results of the evening activity surveys are presented in **Appendix B**. Summary information is presented in **Table 3**. This table shows the number of sound files (or bat passes) that were generated by each species recorded.

Table 3 Number of Bat Passes Generated for Each Species During Bat Activity Surveys

Date	No of sound files	No. of species	Common pip	Soprano pip	Noctule	Serotine	Leislers	Myotis	Whisk'ed/ Brandt's	Natter's	Long-eared	Barbastelle
7 June 07	131	8	49	68	2	2	0	1	0	2	3	3
6 July 07*	187	8	45	79	2	13	0	5	0	5	7	7
16 Aug 07	203	7	74	110	2	4	1	1	0	0	1	0
28 Aug 07	174	7	76	74	1	8	0	1	2	0	0	3
12 Sept 07	120	5	43	56	3	7	0	1	0	0	0	0

* **For this transect the calls were analysed using BatSound software and the number of bat passes (totals and for each species) are listed, instead of number of Anabat files.**

Common and soprano pipistrelle were recorded during all five survey visits and occurred along most of the five transect lengths. Noctule, serotine and *Myotis* species were recorded on all five visits, mainly along the access tracks and rides in Dunwich Forest. Leisler's and whiskered bats were only recorded on one survey visit each. Barbastelle and long eared bats were recorded on three survey visits each and Natterer's bats on two survey visits.

Of the nine species recorded in the survey area barbastelle was the most notable, being a National BAP species, a Suffolk BAP species and an Annex 2 (Habitats Directive) species. A total of six Anabat sound files and seven bat passes analysed through BatSound, showed this species to be present. **Figure 8** show the locations of serotine, noctule, Leisler's, *Myotis* sp., whiskered, Natterer's, long eared bat and barbastelle encounters during the walked transects. The locations of common and soprano pipistrelle encounters are not illustrated, as these species were widespread.

3.2.3 Automated Overnight Activity Surveys (Static Survey Points)

The detailed results of the overnight activity surveys as recorded by static Anabats are presented in **Appendix C**, with the positions of the Anabats are shown on **Figures 3-7**. **Text Figure 1** illustrates the bat species recorded at each Anabat location (A-J) indicating the bat species expressed as a percentage of the species recorded by that Anabat.

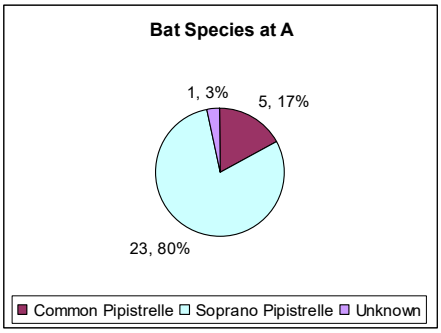
In summary, results from the ten static Anabats found that:

- Common and soprano pipistrelles were the most common species within the survey area;
- Common pipistrelles were the only species recorded in the preliminary works area; and
- The greater the diversity of tree species and variety of adjacent habitats, the greater the number of bat species that were recorded.

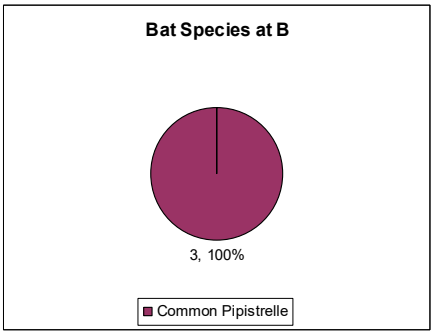
Barbastelles were recorded by static anabats in positions F and G. Static anabat F correlates to the area barbastelle were recorded during the walked transects. Static anabat G was on the eastern edge of Dunwich Forest, close to the coast.

Text Figure 1 (A-J) **Pie charts showing % of species detected by static overnight Anabats(see figures 3-7 for location within the survey area)**

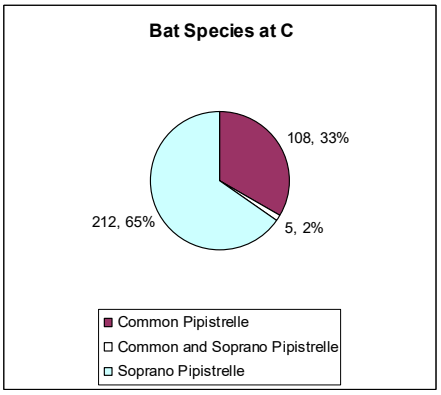
A – Dunwich Forest 7th June 2007 (see Figure 3 for location)



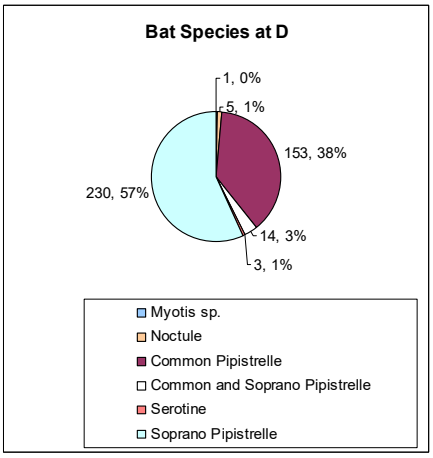
B – Shelter belt north of Sizewell B 7th June 2007 (see Figure 3 for location)

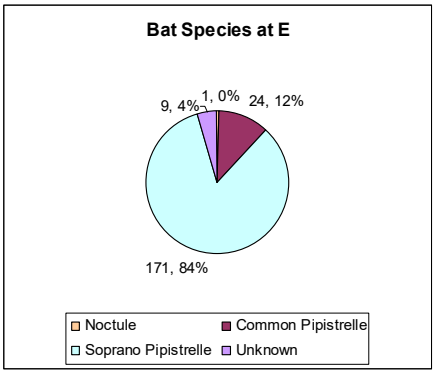
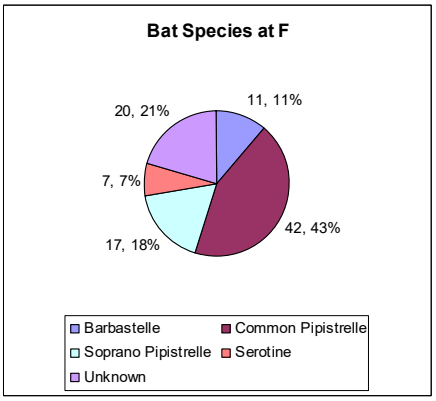


C - The north-south tree line east of Hilltop Covert 6th July 2007(see Figure 4 for location)

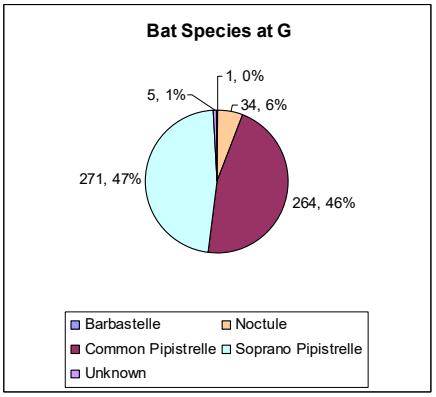
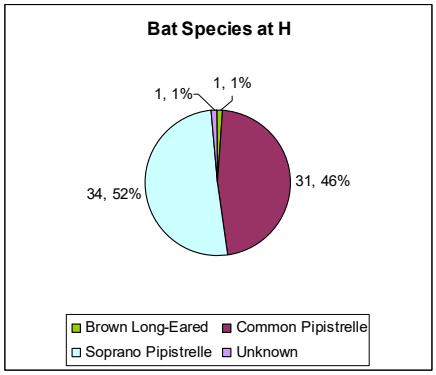


D – Southern edge of Goose Hill 6th July 2007 (see Figure 4 for location)



E – Near turf pits opposite gate into marsh 16th August 2007 (see Figure 5 for location)	F - Leiston Carr 16th August 2007 (see Figure 5 for location)
	

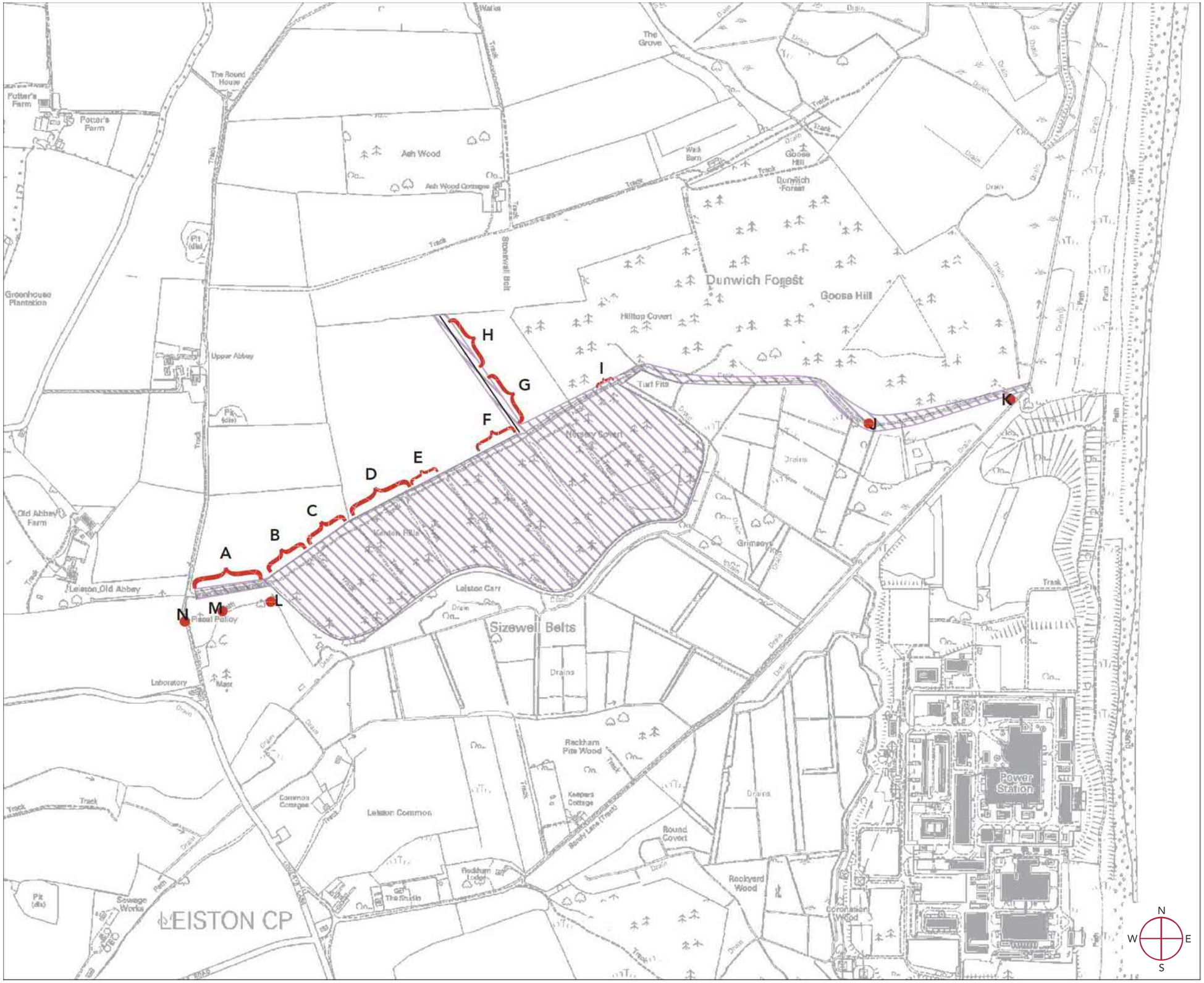
*** Where 0% is present this indicates the presence of a species that made up less than 1% of records. Unknown indicates echolocation recordings with insufficient information to allow identification to species level.**

G - North eastern edge of plantation 28th August 2007 (see Figure 6 for location)	H – Southern edge of Nursery Covert (facing south toward Grimseys) 28th August 2007(see Figure 6 for location)
	

***Where 0% is present this indicates the presence of a species that made up less than 1% of records. Unknown indicates echolocation recordings with insufficient information to allow identification to species level.**

The Anabat located at **Location I** (on the south-western edge of Kenton Hills near a pond on Sizewell Belts trail) on 12th September 2007 (see Figure 7 for location) recorded no bat vocalisations.

Location of Surveyed Trees – 7th June 2007



Legend

A-N	Tree Blocks and Locations
	Survey Area
A	1-5 Tree Numbers
B	6-10 Tree Numbers
C	11-25 Tree Numbers
D	26-56 Tree Numbers
E	57-64 Tree Numbers
F	65-66 Tree Numbers
G	67-85 Tree Numbers
H	86-124 Tree Numbers
I	125-126 Tree Numbers
J	127-180 Tree Numbers
K	181-184 Tree Numbers
L	185-188 Tree Numbers
M	189-194 Tree Numbers
N	195-196 Tree Numbers

baker shepherd gillespie
ECOLOGICAL CONSULTANTS
Limited Liability Partnership

Office: Oxford
Tel: 01865 883833

Date	**OCT'07**	Checked	**SS**	Scale	**NTS**
Drawn	**SW**	Approved	**SS**	Job Ref	**3040**
Status	**FINAL**				

Dwg No. **FIGURE 2**

Transect Route and Position of Static Anabat
A & B – 7th June 2007

Legend

Direction of Transect Walk

Transect Listening Station

Position of Static Anabat

Start/Finish

Dunwich Forest

Goose Hill

Sizewell Belts

LEISTON CP

Power Station

Crown copyright reserved **OS Licence No:**

baker shepherd gillespie
ECOLOGICAL CONSULTANTS
Limited Liability Partnership

Office: Monmouth
Tel: 01600 891576

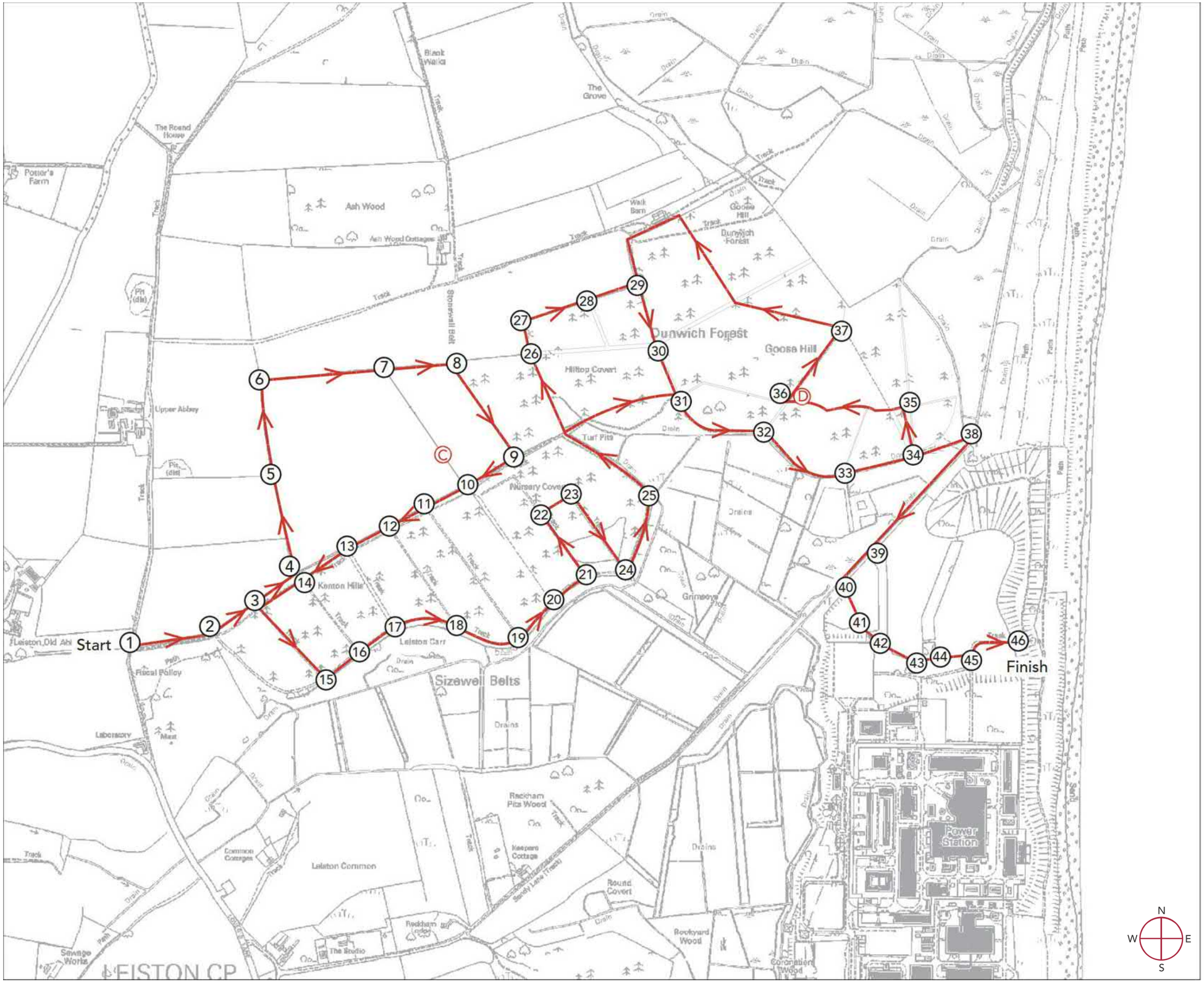
Date	**OCT'07**	Checked	**SS**	Scale	**NTS**
Drawn	**SW**	Approved	**SS**	Job Ref	**3040**
Status	**FINAL**				

Dwg No. **FIGURE 3**

Transect Route and Position of Static Anabat
C & D – 6th July 2007

Legend

- Direction of Transect Route
- 1 — Transect Listening Stations
- Ⓒ Ⓓ — Position of Static Anabat



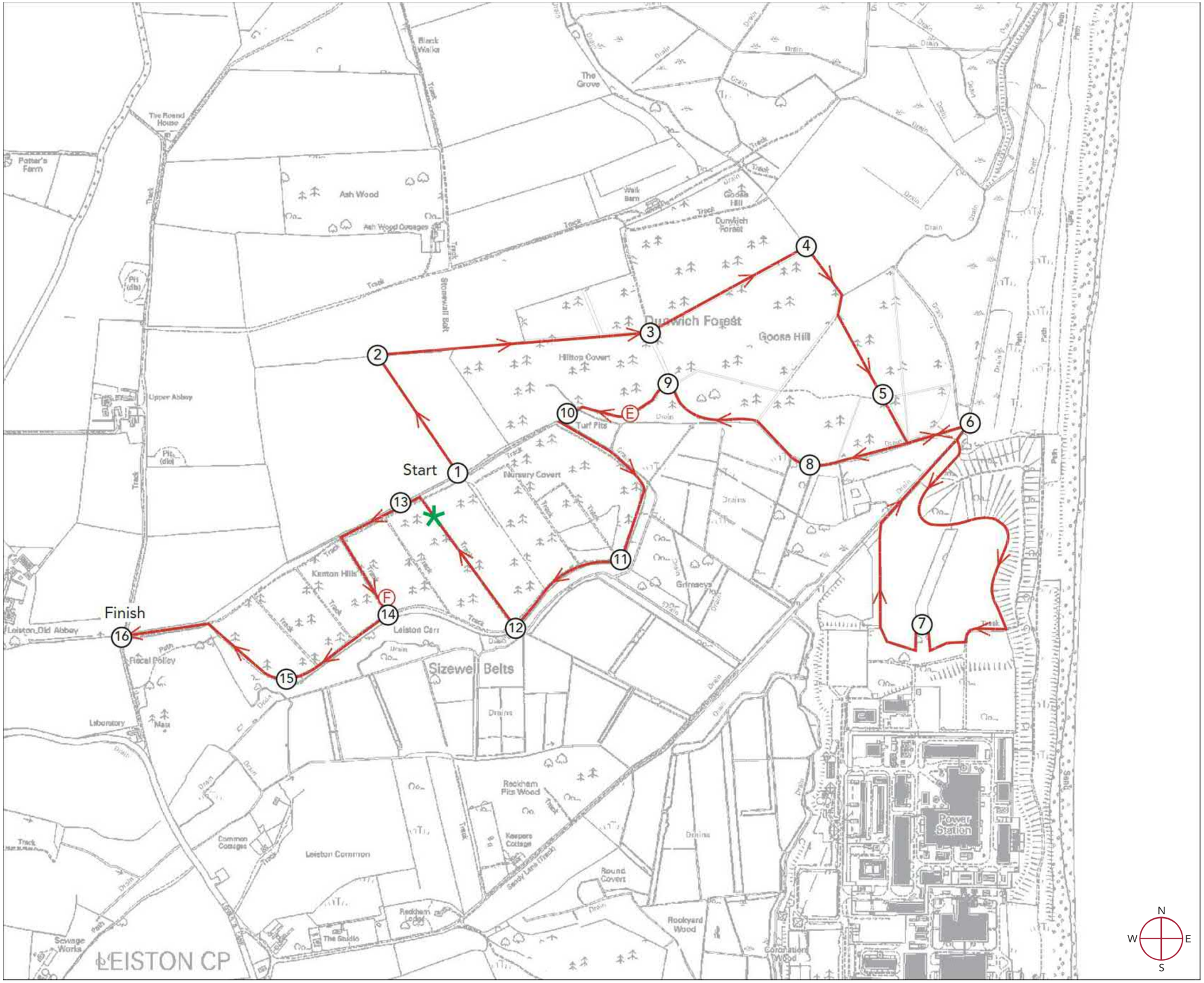
Crown copyright reserved **OS Licence No:**

baker shepherd gillespie
ECOLOGICAL CONSULTANTS
Limited Liability Partnership

Office: Monmouth
Tel: 01600 891576

Date	**OCT'07**	Checked	**SS**	Scale	**NTS**
Drawn	**SW**	Approved	**SS**	Job Ref	**3040**
Status	**FINAL**				

Dwg No. **FIGURE 4**



Crown copyright reserved **OS Licence No:**

Transect Route and Position of Static Anabat
E & F – 16th August 2007

Legend

- Direction of Walked Transect
- 1 — Transect Listening Station
- E F — Position of Static Anabat
- * — Bat boxes on Pine trees containing Soprano Pipistrelle roost

baker shepherd gillespie

ECOLOGICAL CONSULTANTS
Limited Liability Partnership

Office: Monmouth
Tel: 01600 891576

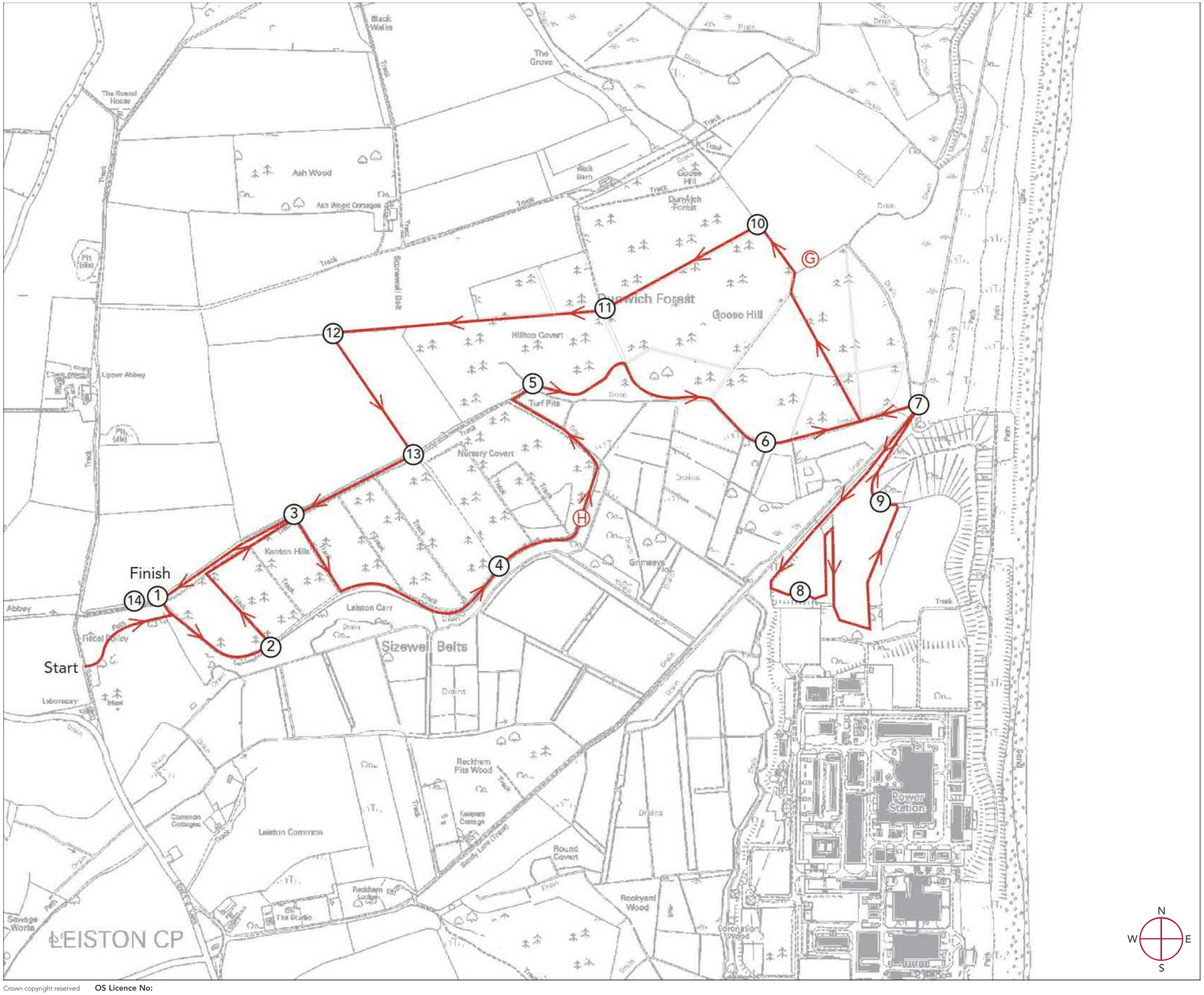
Date	**OCT'07**	Checked	**SS**	Scale	**NTS**
Drawn	**SW**	Approved	**SS**	Job Ref	**3040**
Status	**FINAL**				

Dwg No. **FIGURE 5**

Transect Route and Position of Static Anabat
G & H – 18th August 2007

Legend

- Direction of Walked Transect
- ① Transect Listening Station
- Ⓖ Ⓗ Position of Static Anabat



Crown copyright reserved **OS Licence No:**

baker shepherd gillespie

ECOLOGICAL CONSULTANTS
Limited Liability Partnership

Office: Monmouth
Tel: 01600 891576

Date	**OCT'07**	Checked	**SS**	Scale	**NTS**
Drawn	**SW**	Approved	**SS**	Job Ref	**3040**
Status	**FINAL**				

Dwg No. **FIGURE 6**

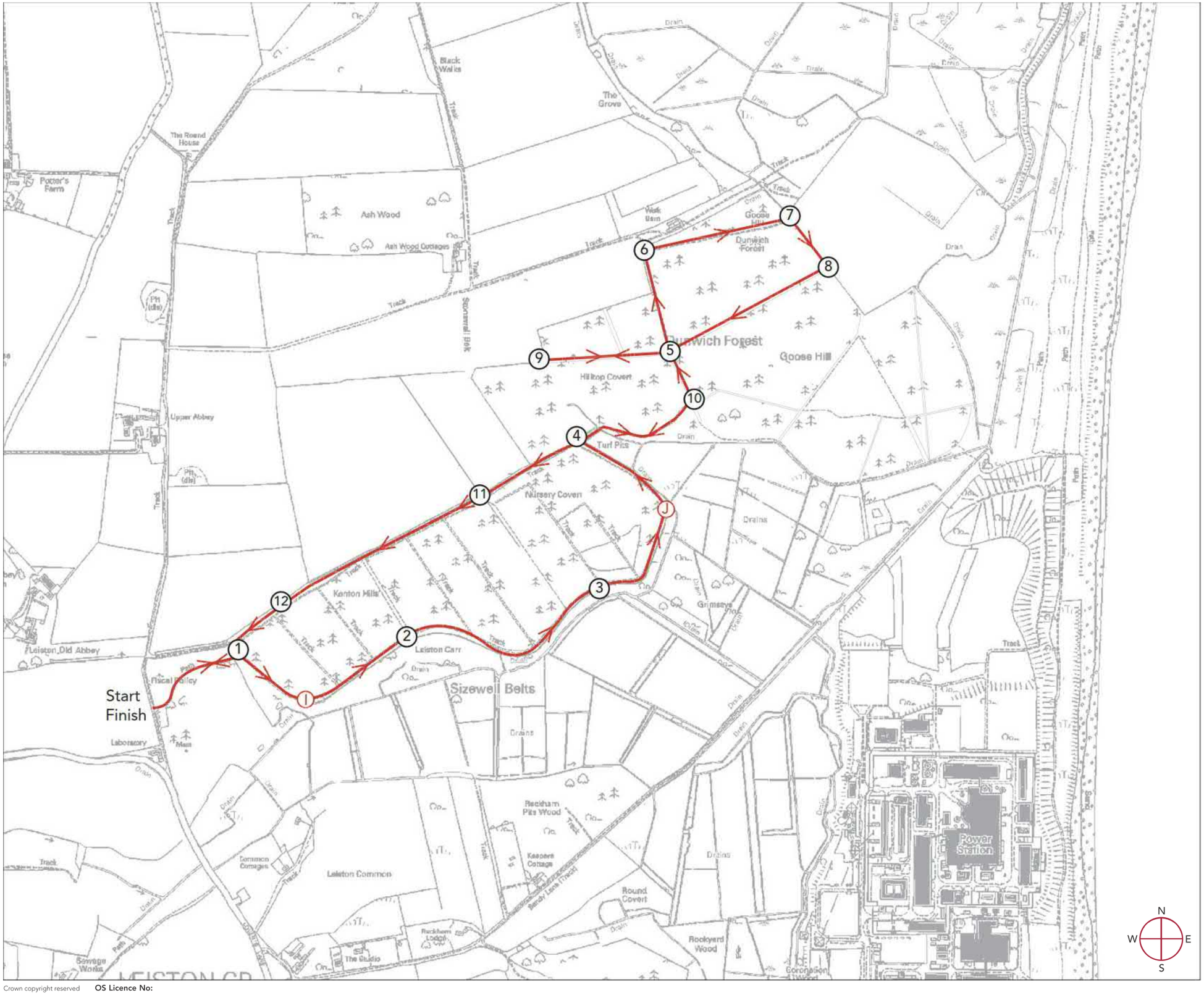
Transect Route and Position of Static Anabat
I & J – 12th Sept 2007

Legend

Direction of Walked Transect

Transect Listening Station

Position of Static Anabat



baker shepherd gillespie
ECOLOGICAL CONSULTANTS
Limited Liability Partnership

Office: Monmouth
Tel: 01600 891576

Date	OCT'07	Checked	SS	Scale	NTS
Drawn	SW	Approved	SS	Job Ref	3040
Status	FINAL				

Dwg No. **FIGURE 7**

Location of serotine, Leisler's, noctule, *Myotis* sp., whiskered, Natterer's, long-eared, and barbastelle commuting & foraging. combined results of all visits (transects and static anabats)

Legend

- Serotine
- Noctule
- *Myotis* sp.
- Whiskered
- Natterer's
- Long-eared
- Barbastelle
- Leisler's

baker shepherd gillespie

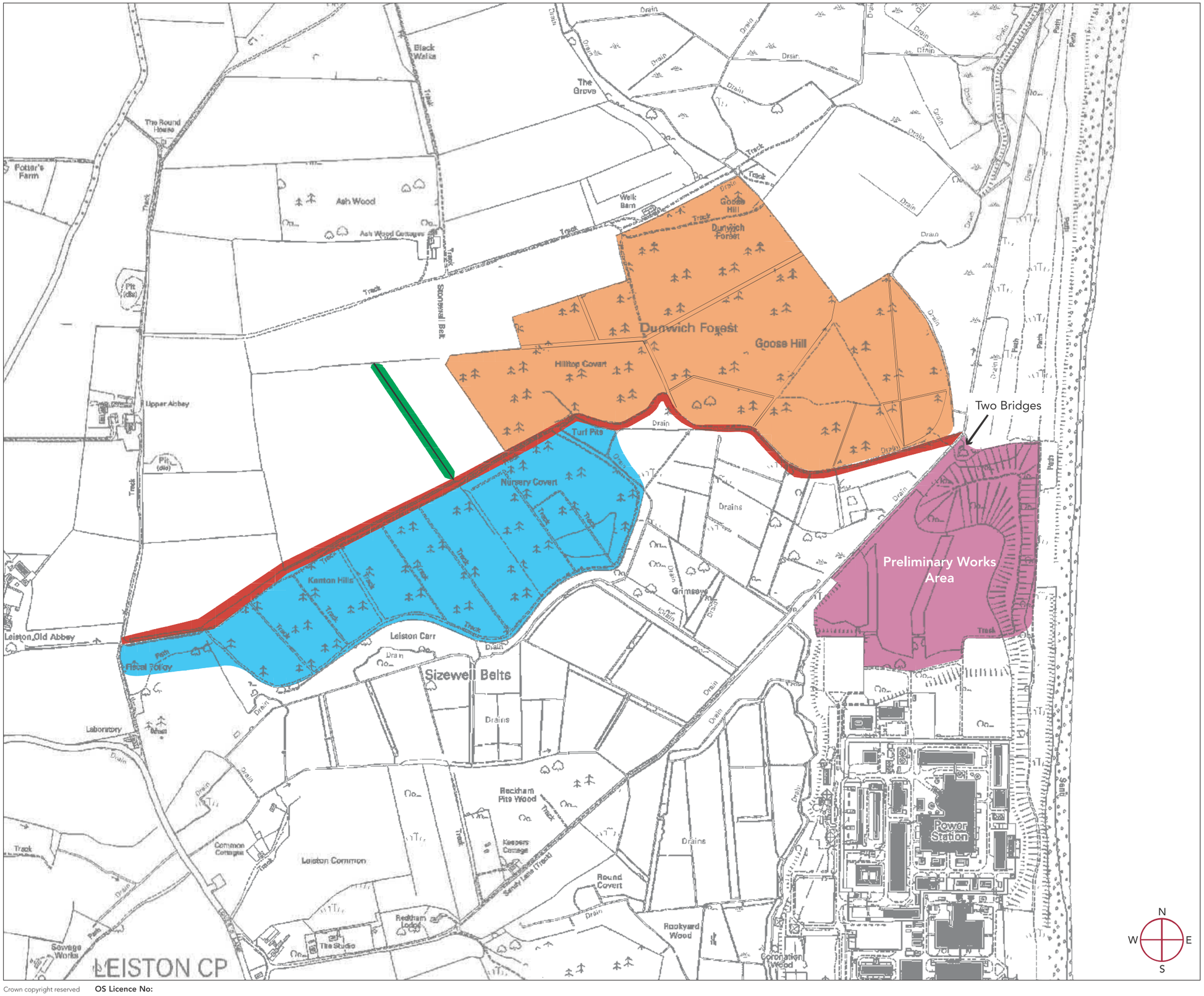
ECOLOGICAL CONSULTANTS
Limited Liability Partnership

Office: Monmouth
Tel: 01600 891576

Date	**OCT'07**	Checked	**SS**	Scale	**NTS**
Drawn	**SW**	Approved	**SS**	Job Ref	**3040**
Status	**FINAL**				

Dwg No. **FIGURE 8**

Survey Site Regions for Purpose of Evaluation



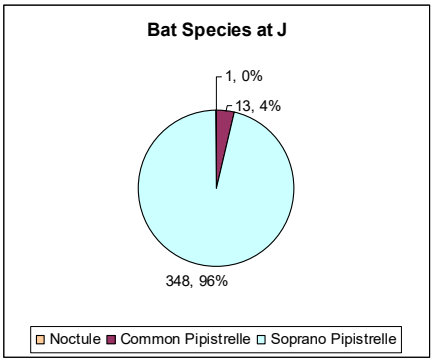
baker shepherd gillespie
ECOLOGICAL CONSULTANTS
Limited Liability Partnership

Office: Monmouth
Tel: 01600 891576

Date	**OCT'07**	Checked	**SS**	Scale	**NTS**
Drawn	**SW**	Approved	**SS**	Job Ref	**3040**
Status	**FINAL**				

Dwg No. **FIGURE 9**

J- Western edge of grazing marsh 12th September 2007 (see Figure 7)



4. Preliminary Evaluation of the Importance of the Survey Area to Bat Populations

4.1 Evaluation of Foraging and Commuting Habitat for Bats

An evaluation of resources has been made in accordance with IEEM EcIA guidance (see 2.2 Evaluation Methodology).

The survey area has been divided into five sectors for the purpose of evaluation (see **Figure 9**). These are:

- Dunwich Forest north of the east–west access track;
- The corridor of the east-west access track from Fiscal Policy to the preliminary works area;
- Kenton Hills and Nursery Covert south of the existing east-west access track which runs from Fiscal Policy in a Northeast direction towards Goose Hill;
- The north-south tree line east of Hilltop Covert; and
- The preliminary works area.

These sections have been evaluated at a geographic level according to their value for commuting and foraging bats.

4.1.1 Dunwich Forest

The pine plantation of Dunwich Forest was found to support two foraging and commuting pipistrelle species, commuting noctule and serotine bats. Noctule and serotine activity was predominantly along the main central rides of the woodland. The wide rides and the eastern edge of the forest where it adjoins the area of arable reversion to heathland (at Retsoms), have regular commuting and foraging bat activity, especially of pipistrelles. Although this sector is not used by many species, it has relatively high levels of activity along its margins and wide rides. It is regarded as having value at the local level.

4.1.2 Corridor of East-West Access Track

This permissive footpath, which runs from Fiscal Policy, along the north side of Kenton Hills and the southern edge of Dunwich Forest to the preliminary works area, has the greatest diversity of tree species of the five sectors. Parts of the track are adjacent to arable fields, coniferous plantation woodland, deciduous woodland, a small area of wetland carr with pools and an area of grazing marsh. The surveys indicate that this variety of adjacent habitats, vegetative diversity and likely consequent invertebrate diversity, is directly linked to bat diversity and activity levels. A total of nine bat species (including barbastelle) were recorded along this track. Although barbastelle is more widespread in Suffolk than in many other counties, this is a rare species at national level. The numbers of other bat species using this sector of the survey area were high, with both commuting and foraging by most species noted. A total of approximately 600 bat sound files (75% of all bat sound files for the survey area) were recorded during the transect walks in this section of the survey area over the five survey visits. On average approximately 100 sound files were recorded per visit. For this reason, but also taking into account the local context of the species recorded in Suffolk, the regular commuting presence of UK BAP species (noctule, soprano pipistrelle and brown long eared bat) and the records of Suffolk BAP species (barbastelle and common pipistrelle), this sector of the survey area is regarded as being of county value to commuting and foraging bats.

4.1.3 Kenton Hill and Nursery Covert

The southern margins of this sector have mature deciduous trees and are adjacent to grazing marsh. Seven bat species, including barbastelle, and high levels of bat activity were recorded (approximately 200 sound files were recorded during the transect walks in this section of the survey area over the five survey visits.). This is likely to be due to high invertebrate numbers resulting from habitat diversity, especially along the margins of the woodland. This section of the survey area is regarded as being of county value to bats.

4.1.4 North-South Treeline East of Hilltop Covert

This mainly deciduous treeline was used by two pipistrelle species, mostly for commuting. It is regarded as having value in the zone of immediate influence only.

4.1.5 Preliminary Works Area (the likely location of the new plant)

Soprano and common pipistrelles were very occasionally recorded in the preliminary works area (as well as one serotine bat pass). This section of the survey area is regarded as having negligible value to bats.

4.2 Evaluation of Tree Roosting Across the Survey Area

No tree roosts were found during the survey. Three bat boxes were recorded on a Corsican pine, and their positions are shown on **Figure 4**. Only 7% of the 196 trees surveyed showed high potential to support roosting bats, although some features with high potential to support bats may have been missed because of the foliage present. The majority of trees with high potential to support bat roosts were located along the margins of the east-west permissive footpath. The potential tree roosts within the survey area, including the large percentage of pine plantation, are considered to be important in a local context as they offer possible shelter to a range of bat species in the area.

5. Conclusions

5.1 Key Species

Common and soprano pipistrelle were recorded during all five survey visits and occurred, geographically, throughout most of the five transect lengths. Both species were recorded feeding and commuting throughout the survey area; social calls were recorded along the east-west permissive footpath (running along the northern fringe of Kenton Hills and Nursery Covert and the southern edge of Dunwich Forest).

Noctule, serotine and *Myotis* species were recorded on all five visits but were more localised in occurrence. Noctule was recorded flying, and occasionally feeding, at the edge of Dunwich Forest, along the main east-west ride of the forest, and along the east-west permissive footpath. Serotine was recorded commuting across the site; the majority of the activity being along the main east-west ride in Dunwich Forest.

Leisler's bat was noted on one survey visit, commuting along the southern edge of Dunwich Forest. Long eared bats were recorded on three survey visits, along a stretch of the east-west permissive footpath. Natterer's bats were recorded on two survey visits, along the southern edge of Dunwich Forest, and barbastelle on three survey visits; commuting along the east-west permissive footpath and a parallel ride in Dunwich Forest.

The key bat species in the study area are barbastelle, noctule, brown long eared, common and soprano pipistrelle. Of the nine species recorded within the survey area, barbastelle is the most notable, being a Suffolk BAP species and an Annex 2 (Habitats Directive) species. Noctule, soprano pipistrelle and brown long eared bat are UK BAP species.

5.2 Key Areas

Two sectors of the survey area have been evaluated as being of county importance. They are the corridor of the east-west permissive footpath and Kenton Hill and Nursery Covert:

The corridor of the east-west permissive footpath

The variety of adjacent habitats along the corridor of the east-west track, with its vegetation diversity and likely consequent invertebrate diversity, has been shown by the surveys to support the greatest numbers of species and highest levels of bat activity, especially along the eastern half of the track. A total of nine bat species have been recorded along this track including barbastelle, and a total of approximately 600 sound files (75% of all bat sound files recorded) were recorded here.

The southern margins of Kenton Hill Nursery Covert have mature deciduous trees and are adjacent to grazing marsh. The sector was similar to the permissive footpath, and a greater diversity of bat species were recorded (up to seven) than elsewhere in the survey area. These included barbastelle. Bat activity levels were high (approximately 200 sound files were recorded during the transect walks in this section of the survey area over the five survey visits). This is likely to be due to high invertebrate numbers as a result of habitat diversity, especially along the margins of the plantation woodland

5.3 Preliminary Assessment of the Potential Effect of Development Proposals on Bat Assemblage

5.3.1 Use of Dunwich Forest for Location of Site Compounds

Dunwich Forest is considered of local importance to bats, largely because of the use of its rides and edges by commuting and feeding noctule and serotine as well as two pipistrelle species. Depending on how the site compounds are located within the forest, the proposals may have a significant effect on local bat populations and environmental measures to address these effects will be required.

5.3.2 Widening of Parts of the East-West Permissive Footpath from Fiscal Policy to Preliminary Works Area

The east-west permissive footpath has been valued at the county level, because of the presence of nine bat species, out of the twelve bat species known to occur in Suffolk. Most of these species were recorded as commuting and foraging along this track and most of the high potential roost trees are adjacent to it. Any development that might degrade or reduce the value of this 'corridor', could significantly affect bat populations of importance at county level and environmental measures will be required to address this.

5.4 Preliminary Works Area (the likely location of the built plant)

This preliminary works area has been valued as having negligible interest for bats, with low levels of activity in both the commoner pipistrelle species noted, and one record of serotine. Given the low levels of activity and limited bat diversity recorded it is considered that development of the preliminary works area is unlikely to have a significant impact on bat populations.

6. Recommendations

The current survey work has enabled the survey area to be valued in terms of bat usage with some degree of confidence. The results of the survey are likely to remain valid, for the purpose of ecological impact assessment, for approximately two years. However site usage by bats can change as a result of tree felling, woodland maturation and conditions beyond the margins of a site. There were some constraints to survey resulting from the time of year when the tree survey was undertaken. For these reasons the following recommendations have been made in order that a reasoned judgement as to the value of the survey area to bats can be reached:

- If more than two years elapses before a planning application is submitted, it is recommended that all bat activity and roost survey work is repeated. Bats are highly mobile and their colonies dynamic;
- The tree roost surveys were undertaken when trees were in leaf. Surveys of all deciduous trees, especially in key areas, should be repeated between November and March in order to have confidence that trees with signs of actual bat roosts or high potential were not missed;
- Transect surveys should be carried out in April and May 2008 to extend the survey period over spring. The transect surveys should be comparable to those already undertaken in 2007, thereby extending the period covered by bat activity surveys.

It is recommended that the status of the barbastelle roosts at Upper Abbey Farm and Lower Abbey is determined in 2008. It is considered necessary to establish if a breeding colony is present when determining the value of habitats within the BE landholding and the level of impact on the local population. The suggested approach would be to survey Upper Abbey Farm and Lower Abbey in April to look for fresh droppings that would indicate bats are likely to have used the site in winter. Subsequent surveys in May and June should be carried out to help determine if bats are roosting in the buildings in summer, with possible successive counts until August to assess the breeding status of the colony. It may also be necessary to establish if other buildings are being used by barbastelle. If access is permitted, surveys in April of other suitable buildings, such as Theberton House, should be undertaken.

The 2007 survey results suggest barbastelle are travelling across the survey area and therefore the proposed works may sever commuting routes. It is therefore recommended that important flight paths around roosts are identified. It is proposed that non-intrusive survey techniques are used in 2008 to monitor possible flight paths. Fixed location data loggers, such as Anabats, could be positioned on linear routes around the roosts: one on the lane to the north of Upper Abbey Farm; one on the lane to the south of Upper Abbey Farm; and one on Abbey Road to the south of Theberton House. Driven and walked transects to survey linear features in the landscape are also suggested. Transects should be short enough to allow repeat sampling of given points along the route throughout the period of peak bat activity after dusk. The time and location of bat records can then be plotted to build up a picture of how barbastelle are using the landscape[4]. Flight paths should be monitored between April and July/ August.

The results of the 2008 surveys will inform the need to undertake further detailed survey work in 2009. This is likely to be required if additional information is required to determine how breeding female barbastelle bats are using the site.

7. References

Bat Conservation Trust (2007). *Bat Surveys – Good practice guidelines*. Bat Conservation Trust. London

Bat Conservation Trust (2007). *The state of the UK's bats: National Bat Monitoring Programme Population Trends*. The Bat Conservation Trust.

Entec UK Ltd. (2007). Greater Gabbard Offshore Windfarm 132kV Underground Cable Route Options. Report to National Grid.

Mitchell-Jones, A.J. (2004). *Bat mitigation guidelines*. English Nature.

Richardson, P. (2000). *Distribution atlas of bats in Britain and Ireland 1980-1999*. Bat Conservation Trust.

www.jncc.gov.uk

www.english-nature.org.uk

[4] Barbastelle cover great distances, often over 10km, when foraging at night and may fly in large circuits across the landscape, covering many different habitats (Dr. Peter Shepherd, pers comm).

Mortimer, G. (2005). Natterer's bat, *Myotis natteri*, and commercial coniferous plantations. Abstract presented at the 10th European Bat Research Symposium, Galway, Ireland, 21-26 August 2005.

Author:

.....

Sandie Sowler

Internal Reviewer (Baker Shepherd Gillespie):

.....

James Gillespie

Entec Reviewer:

.....

Lynn Whitfield

Appendix A
Tree Survey Results (See Figure 2 for Tree Locations)

10 Pages

Key to abbreviations appear the first time the abbreviation has been used.

Figure 1 shows the location of all tree numbers.

Table A1. Sizewell Tree Survey Results (07/06/2007)

Weather: Cloud 100% **Precipitation:** heavy rain, thunderstorm **Temperature:** 12degC rising to 18degC

Zone	Tree No	Species	Feature	Height (m)	Aspect	Bat Potential	Notes
A	1	*Quercus. robur*	Hole (H)	8	S	Med (M)	
	2	*Tilia europea*	Epicormic Growth (EG)	-	All	Low (L)	
	3	*Q. robur*	H	1	E	High (H)	Possible droppings
	4	*T. europea*	EG	-	All	L	
	5	*Q. robur*	Loose Bark LB)	1	S	L	
B	6	*Q. robur*	Split (S), LB	2	W	M	
	7	*Q. robur*	EG	1.5	All	L	
	8	*Fraxinus excelsior*	Downward H (DH)	0.5	W	H	
			S, LB	5	E	H	
	9	*Q. robur*	LB, S	2 - 5	SE	L/M	
	10	dead *Q. robur*	LB, H	All	All	H	
C	11	*Q. robur*	LB, S, H	1 -7	All	L/M	
	12	*Q. robur*	LB, S, H	1 -7	All	L/M	
	13	*Q. robur*	LB, S, H	1 -7	All	L/M	
	14	*Q. robur*	LB, S, H	1 -7	All	L/M	
	15	*Q. robur*	LB, S, H	1 -7	All	L/M	

Table A1 (continued) Sizewell Tree Survey Results (07/06/2007)

Zone	Tree No	Species	Feature	Height (m)	Aspect	Bat Potential	Notes
	16	*Q. robur*	LB, S, H	1 -7	All	L/M	
	17	*Q. robur*	LB, S, H	1 -7	All	L/M	
	18	*Q. robur*	LB, S, H	1 -7	All	L/M	
	19	*Q. robur*	LB, S, H	1 -7	All	L/M	
	20	*Q. robur*	LB, S, H	1 -7	All	L/M	
	21	*P. canescens*	LB,	-	All	L	
	22	*Populus canescens*	upward H	1	S	H	
	23	*Q. robur*	LB, DH	3-5		M	
	24	*Q. robur*	LB, DH	3-5		M	
	25	*Q. robur*	LB, DH	3-5		M	
D	26	*Q. robur*	LB, S branches			L	
	27	*Q. robur*	LB, S branches			L	
	28	*Q. robur*	LB, S branches			L	
	29	*P. canescens*	Broken Branches(BB)			None (N)/L	
	30	*P. canescens*	BB			N/L	
	31	*Q. robur*	LB, DH, S	2+	S	M	
	32	*Q. robur*	LB, DH, S	2+	S	M	
	33	*Q. robur*	LB	3	NE	L	
	34	*P. canescens*	LB, Cracks(C)	4+	All	L	
	35	*Q. robur*	LB, BB	-	All	L	
	36	*Q. robur*	LB, BB	-	All	L	

Table A1 (continued) Sizewell Tree Survey Results (07/06/2007)

Zone	Tree No	Species	Feature	Height (m)	Aspect	Bat Potential	Notes
	37	*Q. robur*	vertical H, Ivy(I)	0.5+		poss H	Too much ivy to determine
	38	*Q. robur*	LB, C	1+		L	
	39	*Q. robur*	LB, C	1+		L	
	40	*Q. robur*	LB, C	1+		L	
	41	*P. canescens*	LB, S, C			L/M	
	42	*Q. robur*	EG, LB, S	1	All	L/M	
	43	*Q. robur*	LB, S, occ. DH	1+		M	
	44	*Q. robur*	LB, S, occ. DH	1+		M	
	45	*Q. robur*	LB, S, occ. DH	1+		M	
	46	*Q. robur*	LB, S, occ. DH	1+		M	
	47	*Q. robur*	LB, C			L	
	48	dead *Q. robur*				M	Potential downward H
	49	*Q. robur*	EG			L	
	50	dead *Q. robur*	LB	1+		L	
	51	*Q. robur*	LB, DH		SW	H	
	52	*Q. robur*	LB, DH		SW	H	
	53	*Q. robur*	LB, DH		SW	H	
	54	*Q. robur*	LB, DH		SW	H	
	55	*Q. robur*	LB, DH		SW	H	
	56	dead *Q. robur*	LB	All	All	L/M	
E	57	*Q. robur*	LB, S	1+		L/M	

Table A1 (continued) **Sizewell Tree Survey Results (07/06/2007)**

Zone	Tree No	Species	Feature	Height (m)	Aspect	Bat Potential	Notes
	58	*Q. robur*	LB, S	1+		L/M	
	59	*Q. robur*	LB, S	1+		L/M	
	60	*Q. robur*	LB, S	1+		L/M	
	61	*Q. robur*	LB, S	1+		L/M	
	62	*Q. robur*	LB, S	1+		L/M	
	63	*Q. robur*	LB, S	1+		L/M	
	64	*Q. robur*	LB, S	1+		L/M	
F	65	*Q. robur*	LB, DH			L/M	
	66	*Q. robur*	LB, DH			L/M	
G	67	*Q. robur*	LB, BB, S			L/M	
	68	*Q. robur*	LB, BB, S			L/M	
	69	*Q. robur*	LB, BB, S			L/M	
	70	*Q. robur*	LB, BB, S			L/M	
	71	*Q. robur*	LB, BB, S			L/M	
	72	*Q. robur*	LB, BB, S			L/M	
	73	*Q. robur*	LB, BB, S			L/M	
	74	*Q. robur*	LB, BB, S			L/M	
	75	*Q. robur*	LB, BB, S			L/M	
	76	*Q. robur*	LB, BB, S			L/M	
	77	*Q. robur*	LB, BB, S			L/M	
	78	*Q. robur*	LB, BB, S			L/M	

Table A1 (continued) **Sizewell Tree Survey Results (07/06/2007)**

Zone	Tree No	Species	Feature	Height (m)	Aspect	Bat Potential	Notes
	79	*Q. robur*	LB, BB, S			L/M	
	80	*Q. robur*	LB, BB, S			L/M	
	81	*Pinus. sylvestris*	LB	5		L	
	82	*P. sylvestris*	LB	5		L	
	83	*P. sylvestris*	LB	5		L	
	84	dead ?	LB			L	
	85	dead ?	I, S, LB			H	
H	86	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	87	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	88	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	89	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	90	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	91	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	92	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	93	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	94	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	95	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	96	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	97	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	98	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	99	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)

Table A1 (continued) **Sizewell Tree Survey Results (07/06/2007)**

Zone	Tree No	Species	Feature	Height (m)	Aspect	Bat Potential	Notes
	100	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	101	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	102	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	103	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	104	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	105	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	106	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	107	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	108	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	109	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	110	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	111	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	112	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	113	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	114	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	115	*Q. robur*	LB, BB, S			L	Mostly intact (recheck winter)
	116	*P. sylvestris*				N/L	Mostly intact
	117	*P. sylvestris*				N/L	Mostly intact
	118	*P. sylvestris*				N/L	Mostly intact
	119	*P. sylvestris*				N/L	Mostly intact
	120	*P. sylvestris*				N/L	Mostly intact

Table A1 (continued) Sizewell Tree Survey Results (07/06/2007)

Zone	Tree No	Species	Feature	Height (m)	Aspect	Bat Potential	Notes
	121	dead *Q. robur*	LB, H			M/H	
	122	dead *Q. robur*	LB, H			M/H	
	123	dead *Q. robur*	LB, H			M/H	
	124	dead *Q. robur*	LB, H			M/H	
I	125	*T. europea*	LB, multi stem			L	Dense central growth
	126	*T. europea*	LB, multi stem			L	Dense central growth
J	127	*Salix sp.*	DH	10	N	L	
	128	*Salix sp.*	DH	10	N	L	
	129	*Betula pendula*	LB,			N/L	
	130	dead *B. pendula*	LB			N/L	
	131	dead *B. pendula*	LB			N/L	
	132	dead *B. pendula*	LB			N/L	
	133	dead *B pendula*	LB			N/L	
	134	dead *B. pendula*	LB			N/L	
	135	dead *B. pendula*	LB			N/L	
	136	*B. pendula*	BB, H			L	Some multistem, (recheck winter)
	137	*B. pendula*	BB, H			L	Some multistem, (recheck winter)
	138	*B. pendula*	BB, H			L	Some multistem, (recheck winter)
	139	*B. pendula*	BB, H			L	Some multistem, (recheck winter)
	140	*B. pendula*	BB, H			L	Some multistem, (recheck winter)
	141	*B. pendula*	BB, H			L	Some multistem, (recheck winter)

Table A1 (continued) **Sizewell Tree Survey Results (07/06/2007)**

Zone	Tree No	Species	Feature	Height (m)	Aspect	Bat Potential	Notes
	142	*B. pendula*	BB, H			L	Some multistem, (recheck winter)
	143	*B. pendula*	BB, H			L	Some multistem, (recheck winter)
	144	*B. pendula*	BB, H			L	Some multistem, (recheck winter)
	145	*B. pendula*	BB, H			L	Some multistem, (recheck winter)
	146	*B. pendula*	BB, H			L	Some multistem, (recheck winter)
	147	*B. pendula*	BB, H			L	Some multistem, (recheck winter)
	148	*B. pendula*	BB, H			L	Some multistem, (recheck winter)
	149	*B. pendula*	BB, H			L	Some multistem, (recheck winter)
	150	*Pinus spp*				N/L	Mostly intact
	151	*Pinus spp*				N/L	Mostly intact
	152	*Pinus spp*				N/L	Mostly intact
	153	*B. pendula*				No	Grove of trees
	154	*B. pendula*				No	Grove of trees
	155	*B. pendula*				No	Grove of trees
	156	*B. pendula*				No	Grove of trees
	157	*B. pendula*				No	Grove of trees
	158	*B. pendula*				No	Grove of trees
	159	*B. pendula*				No	Grove of trees
	160	*B. pendula*				No	Grove of trees
	161	*B. pendula*				No	Grove of trees
	162	*B. pendula*				No	Grove of trees

Table A1 (continued) **Sizewell Tree Survey Results (07/06/2007)**

Zone	Tree No	Species	Feature	Height (m)	Aspect	Bat Potential	Notes
	163	*B. pendula*				No	Grove of trees
	164	*B. pendula*				No	Grove of trees
	165	*B. pendula*				No	Grove of trees
	166	*B. pendula*				No	Grove of trees
	167	*Q. robur*				N/L	Mostly intact
	168	*Q. robur*				N/L	Mostly intact
	169	*B. pendula*				N/L	Mostly intact
	170	*B. pendula*				N/L	Mostly intact
	171	*B. pendula*				N/L	Mostly intact
	172	*B. pendula*				N/L	Mostly intact
	173	*B. pendula*				N/L	Mostly intact
	174	*B. pendula*				N/L	Mostly intact
	175	*B. pendula*				N/L	Mostly intact
	176	*B. pendula*				N/L	Mostly intact
	177	*B. pendula*				N/L	Mostly intact
	178	*B. pendula*				N/L	Mostly intact
	179	*B. pendula*				N/L	Mostly intact
	180	*B. pendula*				N/L	Mostly intact
K	181	*Pinus spp*				N/L	Mostly intact
	182	*Pinus spp*				N/L	Mostly intact
	183	*Pinus spp*				N/L	Mostly intact

Table A1 (continued) Sizewell Tree Survey Results (07/06/2007)

Zone	Tree No	Species	Feature	Height (m)	Aspect	Bat Potential	Notes
	184	*Pinus spp*	S branches	7	E	M/H	
L	185	*Q. robur*				N/L	Intact
	186	dead *Q. robur*	LB, vert S	5	E	H	
	187	*Q. robur*	I (dead)			L	
	188	*Q. robur*				N/L	Intact
M	189	*Aesculus hippocastanum*	LB, DH			L	
	190	dead *A. hippoca.*	LB, S			L	
	191	*A.hippocastanum*	I, LB, S		All	L/M	
	192	*A.hippocastanum*	DH	2	S	M	
	193	*A.hippocastanum*	I	1+	All	L	
	194	*Q. robur*	I	6	N	M	
N	195	*Q. robur*	I, H, LB, S	2+	All	H	
	196	*T. europea*	I		All	L	

Appendix B
Bat Echolocation Call Analysis Spreadsheets from Five Evening Activity Surveys

28 Pages

Table B1. Anabat recordings 07/06/2007 (Presented as Sound Files Containing Bat Species and Analysed Using Analook Software)

For location of transect point referred to in Table B1 see Figure 3

Sizewell Transect

Sum of Number

		Label								
Time	**Transect Pt**	**Barbastelle**	**Long-eared**	**Myotis**	**Natterer's**	**Noctule**	**Common pipistrelle**	**Soprano pipistrelle**	**Serotine**	**Grand Total**
09:10	1							1		1
09:11								3		3
09:14								1		1
09:15								3		3
09:24								1		1
09:25								2		2
09:26							1	1		2
09:28	3							1		1
09:34						1		2		3
09:35	4							1		1
09:38								1		1
09:40	5								1	1
09:41								1		1
09:45								1		1
09:48		1								1
09:50								2		2
09:51	6		2				1	1		4
09:52							1	1		2

Table B1 (Continued) **Anabat recordings 07/06/2007 (Presented as Sound Files Containing Bat Species and Analysed Using Analook Software)**

Time	Transect Pt	Barbastelle	Long-eared	Myotis	Natterer's	Noctule	Common pipistrelle	Soprano pipistrelle	Serotine	Grand Total
09:53								2		2
09:55		1	1	1	1		1			5
09:56							2	1		3
09:57							3	2		5
09:58	7						2	3		5
09:59							3	2		5
10:00							1			1
10:01							1	1		2
10:25							2	2	1	5
10:26							3	3		6
10:27	7						4	4		8
10:28							3	4		7
10:29							2	1		3
10:30							2	1		3
10:31	6						3			3
10:33							1			1
10:34							1	3		4
10:36								1		1
10:37						1				1
10:39								1		2
10:40							1			1

Table B1 (Continued) **Anabat recordings 07/06/2007 (Presented as Sound Files Containing Bat Species and Analysed Using Analook Software)**

Time	Transect Pt	Barbastelle	Long-eared	Myotis	Natterer's	Noctule	Common pipistrelle	Soprano pipistrelle	Serotine	Grand Total
10:47					1					1
10:53								1		1
10:54								2		2
10:55	3						1	1		2
11:02	2							1		1
11:04							1			1
11:05		1					1	2		4
11:06							1	4		5
11:07							3	1		4
11:08							2	1		3
11:11								1		1
23:13	1						2			2
Grand Total		**3**	**3**	**1**	**2**	**2**	**49**	**68**	**2**	**13o**

Table B2 Duet Recordings of Bat Passes 06/07/2007 (Bat Passes per Species Analysed Using Batsound Software)

The transect/points and numbers referred to in this table are shown in **Figure 4**.

Site	**Sizewell**		**Sunset time**		**21.16**							
Date	**6th July 2007**		**Weather conditions**		**Temp start**	**16 degrees**	**60% cloud reducing to 5% cloud becoming blustery**					
Surveyor	**ADW**			**Temperature end**		**14 degrees**						
Transect /Point	**Time**		**Track No.**	**Species**	**Time of record**		**Comments**					**Call duration**
	From	**To**			**24 Hour**	**Track Time**		**Max**	**Min**	**Peak kHz**	**Inter pulse**	**ms**
	21.2	21.46	1									
x - 1J	21.46	21.48	2	Pip	21.48		Along wood edge			50		
1J	21.48	21.51	3	Pip	21.48		Seen foraging constant socia calling on woodland/field edge			50.9		
				P55	21.5	2.28						
				P55	21.51	3	Foraging heard not seen					
1J - 1V	21.51	21.56	4	P55	21.52	0.3	2x passes up and down					
				P45	21.55	4.15	Commuting along ride					
				P45	21.56	4.5						
1V	21.56	21.59	5	P45	21.59	2.45	By large pine foraging					
1V - 1U	21.59	22.02	6	P55	22	0.26						

Table B2 (continued) **Duet Recordings of Bat Passes 06/07/2007 (Bat Passes per Species Analysed Using Batsound Software)**

Transect /Point	Time		Track No.	Species	Time of record		Comments						Call duration
	From	To			24 Hour	Track Time		Max	Min	Peak kHz	Inter pulse		ms
				P55	22.01	1.14	Foraging						
1U	22.02	22.05	7	Pip	22.02	0.4	Faint						
				P45	22.03	1.3	Heard not seen						
				P55	22.04	2.23							
				P45	44.04	3							
1U - 1X	22.05	22.11	8	Pip	22.05	0.45	Glow worms						
				P55	22.06	1.46							
1X	22.11	22.14	9	-									
1X - 1S	22.14	22.22	10	LEB	22.17	3.27	Missing frequencies	76	31	43	108	108	148
1S	22.22	22.21	11	Myotis	22.18	0.35	Along ride	76	25	41.3	85	68	102
				P45	22.19	1.29							
				Barb	22.2	2.3	90% confidence	36	30.9	33	111	115	118
1S - 1R	22.22	22.25	12	P55	22.24	2							
				LEB	22.24	2.49		57	24	34	38	71	80
1R	22.25	22.28	13	P45	22.27	1.5							
				P45	22.28	2.5							
				P55	22.28	3.2	Social calling						

Table B2 (continued) **Duet Recordings of Bat Passes 06/07/2007 (Bat Passes per Species Analysed Using Batsound Software)**

Transect /Point	Time		Track No.	Species	Time of record		Comments						Call duration
	From	To			24 Hour	Track Time		Max	Min	Peak kHz	Inter pulse		ms
1R - 1K	22.29	22.37	14	P55	22.29	0							
				Ser	22.31	1.49		52.9	22	28.8	91	167	207
				Ser	22.34	4.2	Two bats			29	108	109	115
				P45	22.34	5	Commuting						
1K	22.37	22.4	15	P45	22.38	0.2							
				P45	22.39	2.1	Commuting 2x passes						
				LEB	22.4	3	Faint and rapid	44.7	25	30	44	78	94
				LEB	22.4	3.18	Faint and rapid			41	68	74	83
1K - 1L	22.4	22.44	16	-									
1L	22.44		17	Ser	22.44	0.2				31.2			
				Ser	22.44	0.45							
				Ser	22.44	0.57							
				Ser	22.45	1.45	Seen on ride			29.8			
				P55	22.45	2.25							
				Ser	22.46	2.45	Foraging	45	27	28.8	177	73	
				Bat	22.47	3.3							
1L - 1Q	22.47	22.55	17	P45	22.49	5.5							

Table B2 (continued) **Duet Recordings of Bat Passes 06/07/2007 (Bat Passes per Species Analysed Using Batsound Software)**

Transect /Point	Time		Track No.	Species	Time of record		Comments							Call duration
	From	To			24 Hour	Track Time		Max	Min	Peak kHz	Inter pulse			ms
			18	Myotis + P55	22.5	0.27				41.8				
				P55	22.51	1.25	Foraging , 3X Passes over open glade							
				P45 + P55	22.51	2.15	Faint							
				Bat	22.53	3.5	2x passes							
				P45	22.54	4.45								
1Q	22.55		19	Pip	22.55	0.2								
				Pip	22.55	0.42								
				P45	22.56	1	Foraging							
				P45	22.57	2.15	Foraging							
				P45	22.58	3								
1Q - 1P	22.58	23	20	P45	22.58	0.4								
				P55	22.59	1.2								
				P55	22.59	1.35	Foraging							
1P	23	23.04	21	P55	23.02	1.55	Foraging							
1P - 1M	23.04	23.08	22	Myotis	23.07	3.3		75	26	30 - 45	66	76	59	
1M	23.08	23.12	23	Natterer's	23.09	1	Pass at 1M on main pass	102.5	23.5					

Table B2 (continued) **Duet Recordings of Bat Passes 06/07/2007 (Bat Passes per Species Analysed Using Batsound Software)**

Transect /Point	Time		Track No.	Species	Time of record		Comments						Call duration
	From	To			24 Hour	Track Time		Max	Min	Peak kHz	Inter pulse		ms
				Myo	23.09	1.19	Foraging - poor sonogram						
				Natterer's	23.09	1.35	Shorter pass	76	23.5		105	117	114
				Myo	23.1	2.4	Poor sonogram						
1M - 1L	23.12	23.14	24	P55	23.13	1.20+							
				P45	23.13	2	Foraging at 1L						
1L	23.14	23.17	25	Natterer's	23.14	0.00+	Commuting along ride	140	17.8	61	68.7	70	
				Pip	23.15	1.3							
1L - 1K - 1J	23.17	23.21	26	LEB	23.19	2.29							
				P45	23.2	3	Foraging at 1J						
1J	23.21	23.23	27	P45 x2	23.21	0.00+	Foraging together						
				Nyct	23.21	0.22							
				P45 x2	23.23	1.56	Foraging together						
1J - 1I - 1Z	23.23	23.26	28	-									
1Z	23.26	23.3	29	Ser	23.28	0.45	Canopy pass			30			
				Barb	23.28	1.33	70% confidence			31.7	101	97.6	
				LEB	23.28	1.5	Foraging			39.4			
				Barb	23.29	2.1	90% confidence	34	28	30.7	110	115	

Table B2 (continued) **Duet Recordings of Bat Passes 06/07/2007 (Bat Passes per Species Analysed Using Batsound Software)**

Transect /Point	Time		Track No.	Species	Time of record		Comments					Call duration
	From	To			24 Hour	Track Time		Max	Min	Peak kHz	Inter pulse	ms
				Barb	23.29	2.4	80% confidence			41		
				Bat	23.29	2.4	Faint sonogram			30.7		
				LEB/Myo	23.29	2.4						
				Barb	23.3	3	Faint - 90% confidence	34	28	31.2	242	
1Z - 2F	23.3		29	P55	23.31	4	Foraging up and down					
			30	Pip	23.35	3.23						
				P55	23.35	3.45	3x passes					
2F	23.38		30	-								
2F - 2E	23.42		31	P45	23.42	0	Faint					
				Bat	23.46	3.5	Faint					
2E	23.44		31	-								
2E - 2F	23.47		31	Ser	23.47	5.3				26		
			32	P55	23.48	1						
				Pip + Ser	23.49	1.3						
2F - 2G	23.5		33	-								
2G	23.55		34	-								
2G - 2N	23.58		35	-								

Table B2 (continued) **Duet Recordings of Bat Passes 06/07/2007 (Bat Passes per Species Analysed Using Batsound Software)**

Transect /Point	Time		Track No.	Species	Time of record		Comments					Call duration
	From	To			24 Hour	Track Time		Max	Min	Peak kHz	Inter pulse	ms
2N - anabat 2	0.01		36	P55	0.01	0.00+	3x passes foraging					
Anabat 2				Pip	0.03	2.3	Social calling					
			37	P55	0.45							

Surveyor Total			
P45	24	Myotis	4
P55	29	Natterer's	3
Pip	10	Long-eared	6
Serotine	11	Myo/LEB	1
Nyctalus	1	Bat	4
Barbastelle	5	Total	98
Surveyor	HL		

Table B2 (continued) **Duet Recordings of Bat Passes 06/07/2007 (Bat Passes per Species Analysed Using Batsound Software)**

Transect /Point	Time		Track No.	Species	Time of record		Comments					Call duration
	From	To			24 Hour	Track Time		Max	Min	Peak kHz	Inter pulse	ms
2F1 -2F	21.35	21.4	2	Pip	21.35	beg	2x bats along ride					
				P55	21.36	1.45	1 bat foraging, 2x passes					
2F			3	P55	21.45	4						
			Grp2 Tr1	Pip	21.51	3.5						
				P45	21.54	7.3						
				Pip + P55	21.56	9.15	2x passes by P55					
			2	P55	21.59	0.15	3x passes					
				P55	22.03	5.30 - 6.30	5x passes					
				LEB	22.03	4.4						
2F - 2G	22.05	22.1	3	P55	22.05	0.3	Foraging					
				P55	22.06	1.3						
				noctule	22.08	3.19	3x glow worms		<20			
				Bat	22.08	3.19	Faint					
				P55	22.09	4.15	Flying west to east					
				P55	22.1	end	2x bats foraging					
2G	22.1	22.14	4	P55	22.1	0.2						

Table B2 (continued) **Duet Recordings of Bat Passes 06/07/2007 (Bat Passes per Species Analysed Using Batsound Software)**

Transect /Point	Time		Track No.	Species	Time of record		Comments					Call duration
	From	To			24 Hour	Track Time		Max	Min	Peak kHz	Inter pulse	ms
				P55	22.12	1.5	Constant foraging over drain and field social calling					
2G - 2H	22.14	22.24	5	Poss barb		1.08	Flying east - 66% confidence, FD only			33.5	34	
				P55 + P45 + barb		1.57	75% confidence on barb					
				P45								
			6	P55	22.18	1.05	Flying East to west					
				P55	22.21	3.48	Heard not seen					
				P55	22.21	4.05						
				P55	22.22	5.13						
2H	22.24	22.27	8	Natt	22.24	0.15			23			
				P55	22.25	2	Several passes and constant feeding					
				Myotis	22.27	2.5						
2H - 2J	22.27	22.31	9	P55	22.27	0						
				P55 + bat	22.27	0.16						
				P45 + bat	22.28	0.53						

Table B2 (continued) **Duet Recordings of Bat Passes 06/07/2007 (Bat Passes per Species Analysed Using Batsound Software)**

Transect /Point	Time		Track No.	Species	Time of record		Comments					Call duration
	From	To			24 Hour	Track Time		Max	Min	Peak kHz	Inter pulse	ms
				P55	22.29	1.4						
				P55 + P45	22.29	1.5						
2J	22.31	22.33	10	P45	22.32	1.5	Foraging					
2J - 2N	22.33	22.42	11	P55	22.35	2.01	Commuting					
				P55	22.35	2.3	Social calling					
2N	22.42	22.45	12	-								
2N - 2K	22.45	22.51	13	-								
2K	22.51	22.54	14	-								
2K - 2M	22.54	22.57	15	-								
2M	22.57	23	16	-								
2M - 2Q	23	23.09	17	-								
2Q	23.09	23.12	18	P55	23.12	3	Commuting along drain to north					
2Q - 2P	23.12	23.16	19	-								
2P	23.16	23.19	20	-								
2P - 2J	23.19	23.27	21	-								
2J	23.27	23.2	22	-								

Table B2 (continued) **Duet Recordings of Bat Passes 06/07/2007 (Bat Passes per Species Analysed Using Batsound Software)**

Transect /Point	Time		Track No.	Species	Time of record		Comments						Call duration	
	From	To			24 Hour	Track Time		Max	Min	Peak kHz	Inter pulse		ms	
2J - 2I	23.2	23.33	23	bat	23.3	0.18	Faint							
				P45	23.31	0.4								
				P45	23.32	1.16	Faint							
				P45	23.32	1.36								
				P45	23.32	2.1	Foraging - 2x passes							
2I	23.33	23.38	24	Bat	23.34	0.05	Faint							
				Bat	23.34	0.5	Very faint							
				P45	23.36	3								
				P45	23.36	3.2								
2I - 2U	23.38	23.4	25	P45	23.38	0.38	Foraging							
2U	23.4	23.44	26	P55	23.42	1.2	Heard not seen							
				Natterer's	23.42	1.58			21.9					
				P55	23.43	2.48	2x passes							
2U - 2W	23.44	23.47	26	-										
2W	23.47	23.5	27	-										
2W - 2N	23.5	23.55	28											
2N	23.55	23.58	29	Ser + P55	23.58	2.59				29.3	123	126	5.7	6.9

Table B2 (continued) **Duet Recordings of Bat Passes 06/07/2007 (Bat Passes per Species Analysed Using Batsound Software)**

Transect /Point	Time		Track No.	Species	Time of record		Comments					Call duration
	From	To			24 Hour	Track Time		Max	Min	Peak kHz	Inter pulse	ms
2N - Anabat	23.58	0.02	1	P55	0.02	1.03	3x passes					
Anabat - 2F	0.02	0.08	2	P55	0.25	0.16	Foraging					
2F	0.08	0.12	3	-								
2F - 1J	0.12	0.2	4	P55		4.2						
				P45		8.03	2x passes					
1J	0.2	0.25	5	P45	0.21	1.05						
				P45	0.22	2.05	Commuting 6x passes					
				Ser + P45	0.23	3.3						
1J - 1K	0.25	0.27	6	P45	0.25	beg						
				P55	0.26	1.04						
				P45	0.26	1.4						
				P55	0.27	2.02						
1K	0.27	0.3	7	P55	0.27	0.05						
				P55	0.28	0.2						
1K - 1L	0.3	0.32	8	-								
1L	0.32	0.35	9	P55	0.32	0.05						
1L - car	0.35	0.46	10	P55	0.39	4						

Table B2 (continued) **Duet Recordings of Bat Passes 06/07/2007 (Bat Passes per Species Analysed Using Batsound Software)**

Transect /Point	Time		Track No.	Species	Time of record		Comments					Call duration
	From	To			24 Hour	Track Time		Max	Min	Peak kHz	Inter pulse	ms
				P55	0.39	4.39						
				P55	0.4	5.05						
				P55	0.44	8.58						
				P55	0.46	10.3						

Surveyor Total number of passes

P45	21	Myotis	1
P55	50	Natterer's	2
Pip	3	Long-eared	1
Serotine	2	Myo/LEB	0
Nyctalus	1	Bat	6
Barbastelle	2	Total	89

Grand Total

Table B2 (continued) **Duet Recordings of Bat Passes 06/07/2007 (Bat Passes per Species Analysed Using Batsound Software)**

Species	No passes	Species	No passes
P45	45	Myotis	5
P55	79	Natterer's	5
Pip	13	Long-eared	7
Serotine	13	Myo/LEB	1
Nyctalus	2	Bat	10
Barbastelle	7	Total	187

Table B3 Anabat Recordings 16/08/2007 (Presented as Sound Files Containing Bat Species and Analysed Using Analook Software)

For location of transect point referred to in table see **Figure 5**.

Time	Transect pt	Brown long eared	Leislers	*Myotis sp*	Noctule	Pip social calls	Common pip	Soprano pip	Serotine	Not speciated	Grand Total
20:37								2			2
20:41	3							1			1
20:42								1			1
20:43								1			1
20:45								1			1
20:48					2		3	4			9
20:49							1				1
20:50								2			2
20:51	4						1	4			5
20:52							3	4			7
20:53								1			1
20:54								1			1
20:55								4			4
20:56							2	3			5
20:57							2				2
20:58								4			4

Table B3 (continued) **Anabat recordings 16/08/2007 (Presented as Sound Files Containing Bat Species and Analysed Using Analook Software))**

Time	Transect pt	Brown long eared	Leislers	*Myotis sp*	Noctule	Pip social calls	Common pip	Soprano pip	Serotine	Not Speciated	Grand Total
20:59							1	5			6
21:01	5							1			1
21:02								3			3
21:03							1	2			3
21:04							1	1		1	3
21:05	6							1			1
21:06								3			3
21:11								1			1
21:34							1				1
21:35										1	1
21:36							2	1			3
21:37							3	2			5
21:38								2			2
21:39								1			1
21:40							2	4			6
21:41							3	2			5
21:42							4	3			7
21:43							3	3			6
21:44		1					5	2			8

Table B3 (continued) **Anabat Recordings 16/08/2007 (Presented as Sound Files Containing Bat Species and Analysed Using Analook Software)**

Time	Transect pt	Brown long eared	Leislers	*Myotis sp*	Noctule	Pip social calls	Common pip	Soprano pip	Serotine	Not Speciated	Grand Total
21:45							3	2			5
21:46								1			1
21:47							3	4			7
21:48	8						3	2			5
21:49							2	3			5
21:50	9		1			1	2	3			7
21:51							1	3		1	5
21:52							2	1			3
21:53				1			1	1			3
21:54							1				1
21:55							2				2
21:56							1				1
21:57							2				2
21:58							2				2
22:00	10						1				1
22:05							2				2
22:06	11							1			1
22:12							2				2
22:18	12							4			4

Table B3 (continued) **Anabat Recordings 16/08/2007 (Presented as Sound Files Containing Bat Species and Analysed Using Analook Software)**

Time	Transect pt	Brown long eared	Leislers	*Myotis sp*	Noctule	Pip social calls	Common pip	Soprano pip	Serotine	Not Speciated	Grand Total
22:19								2			2
22:20								2			2
22:21						1		1			2
22:22						2					2
22:23								5			5
22:28							1				1
22:29	13						1				1
22:31									1		1
22:34									1		1
22:35	14						1		1		2
22:39						2	1	1			4
22:40						1		1			2
22:41	15							3			3
22:46							1				1
22:48									1		1
22:51	16						1				1
Grand Total		**1**	**1**	**1**	**2**	**7**	**74**	**110**	**4**	**3**	**203**

Table B4 Duet Recordings of Bat Passes 28/08/2007 (Bat Passes per Species Analysed Using Batsound Software)

For location of transect point referred to in table see **Figure 6**.

28aug07 (All)

Sizewell transect

Time	Transect pt	Barbastelle	*Myotis* sp	Noctule	Pip social calls	Common pip	Soprano pip	Serotine	Not Speciated	Whiskered	Grand Total
19.59	1						1				1
20.00							1				1
20.07	2					1	1				2
20.08						1	2				3
20.09						1	1				2
20.11						3	1				4
20.13						2	2				4
20.14						3					3
20:15					1	3					4
20:16	3						1				1
20:17						2					2
20:22							5				5
20:24							2				2
20:25							4				4
20:26	4						3				3
20:30							1				1
20:31						1	1				2

Table B4 (Continued) **Duet Recordings of Bat Passes 28/08/2007 (Bat Passes per Species Analysed Using Batsound Software)**

Time	Transect pt	Barbastelle	*Myotis* sp	Noctule	Pip social calls	Common pip	Soprano pip	Serotine	Not Speciated	Whiskered	Grand Total
20:32						1					1
20:33		1				3	1				5
20:34							2		1		3
20:35						1					1
20:38						2	1				3
20:39						1					1
20:40						3					3
20:41	5					1					1
20:42		1									1
20:43		1									1
20:46						1					1
20:47						4	2				6
20:48						1	2				3
20:49					1		2				3
20:50						2	2				4
20:51						1	1		1		3
20:52						1	2				3
20:53							1				1
20:54						1					1

Table B4 (Continued) **Duet Recordings of Bat Passes 28/08/2007 (Bat Passes per Species Analysed Using Batsound Software)**

Time	Transect pt	Barbastelle	*Myotis* sp	Noctule	Pip social calls	Common pip	Soprano pip	Serotine	Not Speciated	Whiskered	Grand Total
20:55	6					1	1				2
20:56				1		1	3				5
20:57						1	1				2
20:58						4	2				6
20:59							1				1
21:01						3	1				4
21:02	7						2				2
21:38							2				2
21:39							2				2
21:42						1					1
21:43						3	1				4
21:44						1	4				5
21:45						1					1
21:46							1				1
21:47							2				2
21:48					1						1
21:49						3					3
21:50						4	1				5
21:51						4	4				8
21:52	10						1	2			3

Table B4 (Continued) **Duet Recordings of Bat Passes 28/08/2007 (Bat Passes per Species Analysed Using Batsound Software)**

Time	Transect pt	Barbastelle	*Myotis* sp	Noctule	Pip social calls	Common pip	Soprano pip	Serotine	Not Speciated	Whiskered	Grand Total
21:53							1	2			3
21:54								2			2
21:55						1		1			2
21:56						1					1
21:57						1					1
21:58						1					1
21:59								1			1
22:01	11					2					2
22:04					1						1
22:11			1							1	2
22:31	12					1					1
22:38	13						1				1
22:41					1						1
22:43						1					1
22:48					2						2
22:49	14				1						1
22:53						1	1				2
Grand Total		**3**	**1**	**1**	**8**	**76**	**74**	**8**	**2**	**1**	**174**

Table B5 Anabat Recordings 12/09/2007 (Presented as Sound Files Containing Bat Species and Analysed Using Analook Software)

For location of transect point referred to in table see **Figure 7**.

Time	Transect pt	*Myotis* sp	Noctule	pip.social calls	Common Pipistrelle	Soprano Pipistrelle	Serotine	Not Speciated	Grand Total
19:32						1			1
19:36	1					1			1
19:40					1	1			2
19:42						1			1
19:43						2			2
19:44						4			4
19:45	2					1			1
19:55	3		1						1
20:00						1			1
20:01					2				2
20:06					2				2
20:07					1	1			2
20:08	4				1	1			2
20:14						1			1
20:15		1			1	1			3
20:16						1			1
20:17	5					2			2
20:23						1			1
20:24	6		1				1		2
20:25						1	1		2

Table B5 (continued) **Anabat Recordings 12/09/2007 (Presented as Sound Files Containing Bat Species and Analysed Using Analook Software)**

Time	Transect pt	*Myotis* sp	Noctule	pip.social calls	Common Pipistrelle	Soprano Pipistrelle	Serotine	Not Speciated	Grand Total
20:28					2	1			3
20:29				2	4	3			9
20:30				2	4	4			10
20:31	7			2	3	4			9
20:32					1	4		1	6
20:33						2			2
20:34						1			1
20:35	8				1	1			2
20:38					1	1			2
20:41			1						1
20:43						1			1
20:46				1		1			2
20:48	9					1			1
20:50						1	1		2
20:51					1				1
20:53						2			2
20:55	10					1			1
21:02					1				1
21:03					1	1			2
21:06	11				1				1
21:07					1				1

Table B5 (continued) **Anabat Recordings 12/09/2007 (Presented as Sound Files Containing Bat Species and Analysed Using Analook Software)**

Time	Transect pt	*Myotis* sp	Noctule	pip.social calls	Common Pipistrelle	Soprano Pipistrelle	Serotine	Not Speciated	Grand Total
21:08					1				1
21:11					1				1
21:12	12						1		1
21:13					2	1	1		4
21:14				1	2	3	1		7
21:15					2				2
21:16				1	2	2			5
21:17					1				1
21:18					2				2
21:19							1		1
21:20					1				1
Grand Total		**1**	**3**	**9**	**43**	**56**	**7**	**1**	**120**

Appendix C: Anabat Analysis Spreadsheets from 10 Static Overnight Anabats

40 Pages

See **Figures 3-7** for location of Anabats

Table C1 Location A (Dunwich Forest) 07/06 & 08/06 2007

Time	Common Pipistrelle	Soprano Pipistrelle	Unknown	Grand Total
21:17	1			1
21:23		1		1
21:27		1		1
21:28		1		1
21:31		1		1
23:33	1			1
23:37		1		1
23:38		1		1
23:41		1		1
23:46		1		1
00:32		3		3
00:38	1			1
01:44	1			1
02:46		1		1
03:02		1		1
04:00		1		1
04:07		1		1
04:15		1		1
04:16		5		5
04:17	1	1		2
04:34		1		1
05:03			1	1
Grand Total	**5**	**23**	**1**	**29**

Table C2 Location B (Shelter Belt North of Sizewell B) 07/06 & 08/06 2007

Shelter belt north of Sizewell B

Time	Common Pipistrelle	Grand Total
22:03	1	1
22:12	1	1
23:01	1	1
Grand Total	**3**	**3**

Table C3 Location C (The North-South Tree Line East of Hilltop Covert) 06/07/2007

Time	Not speciated	Common Pipistrelle	Common & Soprano Pipistrelle	Soprano Pipistrelle	Grand Total
21:47		1			1
21:48		1	1		2
21:49			1	3	4
21:50			1	2	3
21:51				6	6
21:52				1	1
21:58		1			1
21:59		1			1
22:00				1	1
22:01		1			1
22:02		4			4
22:03		3			3
22:04		3			3
22:05		4	1		5
22:06	1			3	4
22:07				3	3
22:08	1				1
22:10				3	3
22:11				2	2
22:12	1	1			2
22:13	1			3	4
22:14		1			1
22:15				1	1
22:17	1			3	4
22:18			1		1
22:19				2	2
22:20				2	2
22:21				3	3
22:22				1	1

Table C3 (continued) **Location C (The North-South Tree Line East of Hilltop Covert) 06/07/2007**

Time	Not speciated	Common Pipistrelle	Common & Soprano Pipistrelle	Soprano Pipistrelle	Grand Total
22:23				4	4
22:24				4	4
22:25		1			1
22:26		2			2
22:27		4			4
22:28		5			5
22:29		5			5
22:30		4			4
22:31		4			4
22:32		5			5
22:33		6			6
22:34		5			5
22:35		4			4
22:36		5			5
22:37		3			3
22:39		3			3
22:40		3			3
22:41				4	4
22:42				3	3
22:45				1	1
22:46				2	2
22:47				2	2
22:48				1	1
22:49				4	4
22:50				1	1
22:51				4	4
22:52				2	2
22:53	1			1	2
22:54				3	3
22:55				3	3

Table C3 (continued) **Location C (The North-South Tree Line East of Hilltop Covert) 06/07/2007**

Time	Not speciated	Common Pipistrelle	Common & Soprano Pipistrelle	Soprano Pipistrelle	Grand Total
22:56	1			2	3
22:57				2	2
22:58				3	3
22:59		1		1	2
23:00		2			2
23:02		5			5
23:03		3			3
23:04		4			4
23:05		4			4
23:13		2			2
23:14		1			1
23:16		4			4
23:24				6	6
23:25				3	3
23:26				6	6
23:27				1	1
23:28				6	6
23:29				5	5
23:30				3	3
23:31				3	3
23:32				5	5
23:35				4	4
23:36				6	6
23:37				7	7
23:38				4	4
23:39				6	6
23:40				4	4
23:41				5	5
23:42				4	4
23:43				4	4

Table C3 (continued) **Location C (The North-South Tree Line East of Hilltop Covert) 06/07/2007**

Time	Not speciated	Common Pipistrelle	Common & Soprano Pipistrelle	Soprano Pipistrelle	Grand Total
23:44				6	6
23:45				5	5
23:46				3	3
23:47				7	7
23:48				5	5
23:49				5	5
23:50				3	3
23:51				4	4
23:52				5	5
23:57		2			2
00:22	5				5
00:23	1				1
00:24	2				2
00:38				1	1
00:41	1				1
00:43	2				2
Grand Total	**18**	**108**	**5**	**212**	**343**

Table C4 Location D (Southern Edge of Goose Hill) 06/07/2007

Time	Myotis	Not Speciated	Noctule	Common Pipistrelle	Common & Soprano Pipistrelle	Serotine	Soprano Piipstrelle	Soprano Pipistrelle and Serotine	Pipistrelle spp.	Grand Total
20:06		1								1
20:26		1								1
20:51		3								3
21:03		1								1
21:06		2								2
21:09		1								1
21:11		1								1
21:15		1								1
21:18		1					1			2
21:23		1								1
21:25		1								1
21:27		4								4
21:41							1			1
21:42							4		1	5
21:43							4		1	5
21:44							3		1	4

Table C4 (continued) **Location D (Southern Edge of Goose Hill) 06/07/2007**

Time	Myotis	Not Speciated	Noctule	Common Pipistrelle	Common & Soprano Pipistrelle	Serotine	Soprano Piipstrelle	Soprano Pipistrelle and Serotine	Pipistrelle spp.	*Grand Total*
21:45							5			5
21:46							3			3
21:48							4			4
21:49							1			1
21:51							3			3
21:52							2			2
21:53							5			5
21:54							6			6
21:55							5			5
21:56							1			1
21:57							1			1
21:58							1			1
21:59							1			1
22:00							2			2
22:01							3			3
22:02				1			2			3
22:03				1	1					2

Table C4 (continued) **Location D (Southern Edge of Goose Hill) 06/07/2007**

Time	Myotis	Not Speciated	Noctule	Common Pipistrelle	Common & Soprano Pipistrelle	Serotine	Soprano Piipstrelle	Soprano Pipistrelle and Serotine	Pipistrelle spp.	*Grand Total*
22:04				5						5
22:05				2	1					3
22:06				3			1			4
22:07				2			1			3
22:08				1						1
22:09				4			1			5
22:10				3						3
22:12				3						3
22:13				1			1			2
22:14				2						2
22:15				2						2
22:16				1						1
22:17				1	2		1			4
22:18				2			1			3
22:19					1		3			4
22:20							1			1
22:21				2	1					3

Table C4 (continued) **Location D (Southern Edge of Goose Hill) 06/07/2007**

Time	Myotis	Not Speciated	Noctule	Common Pipistrelle	Common & Soprano Pipistrelle	Serotine	Soprano Piipstrelle	Soprano Pipistrelle and Serotine	Pipistrelle spp.	*Grand Total*
22:22							2			2
22:23				1						1
22:24							3			3
22:25			1	3				1		5
22:26			1				3			4
22:27							2			2
22:28							4			4
22:29				1			1			2
22:30			1	1			3			5
22:31				1			2			3
22:32				1						1
22:33				2						2
22:34				3		1				4
22:35				1			1			2
22:36				1						1
22:37							1			1
22:38				1					1	2

Table C4 (continued) **Location D (Southern Edge of Goose Hill) 06/07/2007**

Time	Myotis	Not Speciated	Noctule	Common Pipistrelle	Common & Soprano Pipistrelle	Serotine	Soprano Piipstrelle	Soprano Pipistrelle and Serotine	Pipistrelle spp.	*Grand Total*
22:39				1			2			3
22:40					1		1			2
22:41				1			1			2
22:42				3			1			4
22:43				5			1			6
22:44							2			2
22:45							1			1
22:46							2			2
22:47							1			1
22:48							3			3
22:49				1					1	2
22:50				1						1
22:51							3			3
22:52							4			4
22:53							2			2
22:54		1					1			2
22:55	1						1			2

Table C4 (continued) **Location D (Southern Edge of Goose Hill) 06/07/2007**

Time	Myotis	Not Speciated	Noctule	Common Pipistrelle	Common & Soprano Pipistrelle	Serotine	Soprano Piipstrelle	Soprano Pipistrelle and Serotine	Pipistrelle spp.	*Grand Total*
22:56				1			4			5
22:57				1			1			2
22:58					1		1			2
22:59				2	1		1			4
23:00		2					1			3
23:01				3						3
23:02				1			1			2
23:03					1		2			3
23:04				3	1					4
23:05				1			1			2
23:06				1			2			3
23:07				2			3			5
23:08				1			1			2
23:09				2						2
23:10				3			1			4
23:11				3						3
23:12				3			1			4

Table C4 (continued) **Location D (Southern Edge of Goose Hill) 06/07/2007**

Time	Myotis	Not Speciated	Noctule	Common Pipistrelle	Common & Soprano Pipistrelle	Serotine	Soprano Piipstrelle	Soprano Pipistrelle and Serotine	Pipistrelle spp.	*Grand Total*
23:13				2			2			4
23:14				4						4
23:15				3						3
23:16				2			3			5
23:17				2			2			4
23:18				2			1			3
23:19				2	1					3
23:20				2			1			3
23:21		1		2			2			5
23:22				1			3			4
23:23				1			4			5
23:24				1			2			3
23:25				5						5
23:27							3			3
23:28							3			3
23:29							2			2

Table C4 (continued) **Location D (Southern Edge of Goose Hill) 06/07/2007**

Time	Myotis	Not Speciated	Noctule	Common Pipistrelle	Common & Soprano Pipistrelle	Serotine	Soprano Piipstrelle	Soprano Pipistrelle and Serotine	Pipistrelle spp.	*Grand Total*
23:30				1			1			2
23:31				2						2
23:32				1			2			3
23:33				2	1		1			4
23:34				1			1	1		3
23:35				1			2			3
23:36							3			3
23:37							1			1
23:38				1			2			3
23:39				3			2			5
23:40				3						3
23:41				2			1			3
23:42				4			2			6
23:43				3	1		1			5
23:44							2			2
23:45							3			3

Table C4 (continued) **Location D (Southern Edge of Goose Hill) 06/07/2007**

Time	Myotis	Not Speciated	Noctule	Common Pipistrelle	Common & Soprano Pipistrelle	Serotine	Soprano Piipstrelle	Soprano Pipistrelle and Serotine	Pipistrelle spp.	*Grand Total*
23:46							2			2
23:47							3			3
23:48							3			3
23:49							2			2
23:50							3			3
23:51							3			3
23:52							3			3
23:53							2			2
23:54				1			4			5
23:55							2			2
23:56							3			3
23:57		2	2							4
23:58							4			4
23:59							2			2
00:15				1						1
00:16		1								1

Table C4 (continued) **Location D (Southern Edge of Goose Hill) 06/07/2007**

Time	Myotis	Not Speciated	Noctule	Common Pipistrelle	Common & Soprano Pipistrelle	Serotine	Soprano Piipstrelle	Soprano Pipistrelle and Serotine	Pipistrelle spp.	*Grand Total*
00:18				1						1
00:19				1						1
00:20		1		3						4
00:21		1					1			2
00:22		2					1			3
00:23		2					1			3
00:37		2								2
00:38		1								1
00:43		1								1
00:45		1								1
Grand Total	**1**	**36**	**5**	**151**	**14**	**1**	**227**	**2**	**5**	**442**

Table C5 Location E (Near Turf Pits [opposite gate into marsh]) 16/08/2007

Time	Noctule	Common Pipistrelle	Soprano Pipistrelle	Not Speciated	Grand Total
20:14	1				1
20:16			1		1
20:17			1		1
20:23			1		1
20:24			1	1	2
20:29		2	3		5
20:33		1			1
20:36				1	1
20:38			1		1
20:39			5		5
20:40			1		1
20:41			2		2
20:42			1		1
20:43			3	1	4
20:44		1	1	1	3
20:45			3		3
20:46			3	1	4
20:47			1		1
20:48			2		2
20:49			3		3
20:50			3		3
20:54			2		2
20:55			1		1
20:56			1		1
20:59			1		1
21:02		1	1		2
21:08		2			2
21:09			1		1
21:14		1			1
21:19				1	1

Table C5 (continued) **Location E (Near Turf Pits [Opposite Gate into Marsh]) 16/08/2007**

Time	Noctule	Common Pipistrelle	Soprano Pipistrelle	Not Speciated	Grand Total
21:25		1			1
21:26		1			1
21:28				1	1
21:29			1		1
21:30			1		1
21:32			1		1
21:38			1		1
21:40			3		3
21:41		1	2		3
21:47			1		1
21:51			1		1
21:52		1			1
21:54		1			1
21:56		1			1
21:57		2			2
21:59		2			2
22:02			1		1
22:03			1		1
22:04			2		2
22:05		2			2
22:06		1			1
22:07		2			2
22:08			1		1
22:10			1		1
22:14			1		1
22:15			1		1
22:16			1		1
22:17			1		1
22:18			1		1
22:21		1			1

Table C5 (continued) **Location E (Near Turf Pits [Opposite Gate into Marsh]) 16/08/2007**

Time	Noctule	Common Pipistrelle	Soprano Pipistrelle	Not Speciated	Grand Total
22:22			3		3
22:23			1		1
22:24			1		1
22:26			1		1
22:28			1		1
22:29			1		1
22:30			3		3
22:31			1		1
22:32			3		3
22:33			1		1
22:34			1		1
22:35			2		2
22:36			1		1
22:37			3		3
22:38			3		3
22:40			3		3
22:42			1		1
22:47			1		1
22:52			2		2
22:53			1		1
22:55			1		1
22:56			1		1
23:07			1		1
23:08			1		1
23:09			1		1
23:10			2		2
23:11			1		1
23:12			2		2
23:13			1		1
23:14			2		2

Table C5 (continued) **Location E (Near Turf Pits [Opposite Gate into Marsh]) 16/08/2007**

Time	Noctule	Common Pipistrelle	Soprano Pipistrelle	Not Speciated	Grand Total
23:15			3		3
23:16			3		3
23:17				1	1
23:18			1		1
23:19			2		2
23:24			1	1	2
23:25			1		1
23:26			2		2
23:27			2		2
23:28			2		2
23:29			1		1
23:30			4		4
23:31			2		2
23:35			2		2
23:36			2		2
23:37			2		2
23:38			1		1
23:44			2		2
23:45			1		1
23:46			1		1
23:47			2		2
23:49			2		2
23:50			3		3
23:51			1		1
00:03			1		1
00:07				1	1
00:08			1		1
00:09			1		1
00:10			1		1
00:19				1	1

Table C5 (continued) **Location E (Near Turf Pits [Opposite Gate into Marsh]) 16/08/2007**

Time	Noctule	Common Pipistrelle	Soprano Pipistrelle	Not Speciated	Grand Total
00:20			1		1
00:38			1		1
00:49			1		1
00:50			3		3
05:02			1		1
05:10			1		1
05:14			1		1
05:15			3		3
Grand Total	**1**	**24**	**171**	**11**	**207**

Table C6 (continued) **Location F (Leiston Carr [Hazel Tree]) 16/08/2007**

Time	Barbastelle	Common Pipistrelle	Soprano Pipistrelle	Serotine	Not Speciated	Grand Total
20:22			1			1
20:25			1			1
20:27			1			1
20:34			1			1
20:35			1			1
20:40		1				1
20:45		1				1
20:55		1				1
21:00		2				2
21:08		1				1
21:10		1				1
21:13		1		1		2
21:13		3				3
21:15		1				1
21:16		2				2
21:18		1				1
21:23				1		1
21:31				1	1	2
21:34	1					1
21:34	1	1				2
21:35		1				1
21:36					1	1
21:36	1				1	2
21:39	1				1	2
21:40			1			1
21:44	1					1
21:44	2		1			3
21:45		1		1	1	3
21:45	1				1	2
21:48					1	1

Table C6 (continued) **Location F (Leiston Carr [Hazel Tree]) 16/08/2007**

Time	Barbastelle	Common Pipistrelle	Soprano Pipistrelle	Serotine	Not Speciated	Grand Total
21:49		2				2
21:51		1				1
21:51		1				1
21:52		1	1			2
21:52					1	1
21:52					2	2
21:53		2	1		2	5
21:53					1	1
21:54					1	1
21:59	1					1
22:00		1				1
22:02	1					1
22:04					1	1
22:04					1	1
22:05					1	1
22:06		1		1		2
22:07		3				3
22:07					1	1
22:07		1				1
22:08		1				1
22:09				1		1
22:10				1		1
22:11					1	1
22:12					1	1
22:13	1					1
22:14			1			1
22:18		1				1
22:20		1				1
22:20		1				1
22:23		1				1

Table C6 (continued) **Location F (Leiston Carr [Hazel Tree]) 16/08/2007**

Time	Barbastelle	Common Pipistrelle	Soprano Pipistrelle	Serotine	Not Speciated	Grand Total
22:25		1				1
22:26		1				1
22:27			1			1
22:28		1				1
22:31		1				1
22:33		1				1
22:36			1			1
22:37			1			1
22:47			1			1
02:04			1			1
02:12		1				1
02:17			1			1
02:22			1			1
Grand Total	**11**	**42**	**17**	**7**	**20**	**97**

Table C6 Location G (North-Eastern Edge of Plantation) 28/08/2007

Time	Barbastelle	Noctule	Pipistrelle spp.	Common pipistrelle	Soprano pipistrelle	Not Speciated	Grand Total
20:19				2	4		6
20:20				1	3		4
20:21					4		4
20:22				4	4		8
20:23				4	5		9
20:24				4	4		8
20:25				3	3		6
20:26				3	4		7
20:27				4	4		8
20:28				3	4		7
20:29					4		4
20:30				4	4		8
20:31				2	3		5
20:32				3	4		7
20:33				4	4		8
20:34				2	4		6
20:35				4	5		9
20:36					3		3
20:37				2	4		6
20:38					4		4
20:39					3		3
20:40				1	3		4
20:41					4		4
20:42					1		1
20:43					1		1
20:44					2		2
20:45				1	2		3
20:46				1			1
20:47				1	1		2
20:48				1			1

Table C6 (continued) **Location G (North-Eastern Edge of Plantation) 28/08/2007**

Time	Barbastelle	Noctule	Pipistrelle spp.	Common pipistrelle	Soprano pipistrelle	Not Speciated	Grand Total
20:49				2			2
20:50				1	3	1	5
20:51				1			*1*
20:54				1	1		*2*
20:55					1		*1*
20:56					1		*1*
20:57				1			*1*
20:58				1			*1*
20:59					1		*1*
21:02				1	1		*2*
21:03					1		*1*
21:04					1		*1*
21:06					2		*2*
21:07				1			*1*
21:08		1			1		*2*
21:09				3			*3*
21:11				1	1		*2*
21:12				4			*4*
21:13		1		3			*4*
21:14				3			*3*
21:15				3	1		*4*
21:21				1			*1*
21:22					1		*1*
21:24				1			*1*
21:25				2	1		*3*
21:26					2		*2*
21:27	1			2	1		*4*
21:28				1			*1*
21:29		1			1		*2*
21:30				1			1

Table C6 (continued) **Location G (North-Eastern Edge of Plantation) 28/08/2007**

Time	Barbastelle	Noctule	Pipistrelle spp.	Common pipistrelle	Soprano pipistrelle	Not Speciated	Grand Total
21:31				2			2
21:32				1	1		2
21:33				1			1
21:34				3			3
21:37					2		2
21:38				1	1		2
21:39					1		1
21:41				1			1
21:42				1			1
21:43				1			1
21:45				1			1
21:47					1		1
21:48				2	2		4
21:53		1		1	1		3
21:55				1			1
21:56				1			1
21:59				1			1
22:00				1			1
22:02		1			1		2
22:03				1			1
22:04				1			1
22:05					2		2
22:06					2		2
22:07		2			2		4
22:08		2			3		5
22:09					2		2
22:10					1		1
22:11					2		2
22:12		1			1		2
22:14		2		1	2		5

Table C6 (continued) **Location G (North-Eastern Edge of Plantation) 28/08/2007**

Time	Barbastelle	Noctule	Pipistrelle spp.	Common pipistrelle	Soprano pipistrelle	Not Speciated	Grand Total
22:15		1		2			3
22:16				1	1		2
22:21					1		1
22:22					1		1
22:23		1			1		2
22:24		1			1		2
22:25				1			1
22:26					1		1
22:28					1		1
22:29				1	1		2
22:32		1		2			3
22:33				1			1
22:35				1	1		2
22:36		1			1		2
22:37				1	1		2
22:39					1		1
22:40		1			1		2
22:41		1			1		2
22:45				1			1
22:49				1			1
22:50				3		1	4
22:51				2			2
22:56				1			1
23:04				2			2
23:06				2	1		3
23:08					1		1
23:09				2	1		3
23:10					1		1
23:11				1			1
23:13				1			1

Table C6 (continued) **Location G (North-Eastern Edge of Plantation) 28/08/2007**

Time	Barbastelle	Noctule	Pipistrelle spp.	Common pipistrelle	Soprano pipistrelle	Not Speciated	Grand Total
23:14					1		1
23:16				1	1		2
23:17				1			1
23:18				2			2
23:19				3			3
23:20				3			3
23:21				4			4
23:22				1			1
23:23				2			2
23:24				2			2
23:25				2			2
23:27				1			1
23:28				2			2
23:30				1			1
23:32			1	2	1		4
23:34					1		1
23:35					2		2
23:36		1		2	3	1	7
23:37				2	1		3
23:38				3	1		4
23:39		1		3	1		5
23:40				1			1
23:41				3			3
23:43				4			4
23:44				2			2
23:45				1			1
23:46				2			2
23:47				3			3
23:48				2			2
23:49					1		1

Table C6 (continued) **Location G (North-Eastern Edge of Plantation) 28/08/2007**

Time	Barbastelle	Noctule	Pipistrelle spp.	Common pipistrelle	Soprano pipistrelle	Not Speciated	Grand Total
23:50				2			2
23:52					2		2
23:53				1			1
23:54				1			1
23:56				1			1
23:57				2			2
23:59				1			1
00:00				1			1
00:01				2			2
00:03				1			1
00:04				1			1
00:05				1			1
00:06					1		1
00:07		1			1		2
00:18				1			1
00:19					1		1
00:20				2			2
00:23				1			1
00:24				1			1
00:25				2			2
00:26					3		3
00:27				1	1		2
00:28					1		1
00:29					1		1
00:30				2			2
00:31					1		1
00:32					1		1
00:33					1		1
00:34				2	2		4
00:35				1			1

Table C6 (continued) **Location G (North-Eastern Edge of Plantation) 28/08/2007**

Time	Barbastelle	Noctule	Pipistrelle spp.	Common pipistrelle	Soprano pipistrelle	Not Speciated	Grand Total
00:36				3			3
00:40					3		3
00:41					3		3
00:42		1			4		5
00:43					4		4
00:44					4		4
00:45					2		2
00:46					2		2
00:50					1		1
00:51				2			2
00:52				1			1
00:53					1		1
00:54				2			2
00:55					1		1
00:56				1			1
00:57				1	1		2
00:59					1		1
01:00		1			1		2
01:01		1			1		2
01:02					1		1
01:03					1		1
01:05		1		1	1		3
01:06				2			2
01:07				2	1		3
01:08				3	1	1	5
01:09				2			2
01:10		1		2	1		4
01:11		1		2			3
01:12				1			1
01:13				2	1		3

Table C6 (continued) **Location G (North-Eastern Edge of Plantation) 28/08/2007**

Time	Barbastelle	Noctule	Pipistrelle spp.	Common pipistrelle	Soprano pipistrelle	Not Speciated	Grand Total
01:14					2		2
01:15				2			2
01:16				2	2		4
01:17		1			1		2
01:19		1			1		2
01:20		1		2			3
01:21		1		1	2		4
01:23				2	1		3
01:24					1		1
01:25				1	1		2
01:26				1	1		2
01:28					2		2
01:29				1	1		2
01:30					1		1
01:31				2			2
01:33				1	1		2
01:35				1			1
01:36		1			1		2
01:43				1			1
01:45				1			1
01:58					1		1
02:00		1			2		3
04:39					1		1
05:04					1		1
05:11					1		1
05:12					1		1
05:14					1		1
05:16					1		1
05:18					1		1
05:19					1		1

Table C6 (continued) **Location G (North-Eastern Edge of Plantation) 28/08/2007**

Time	Barbastelle	Noctule	Pipistrelle spp.	Common pipistrelle	Soprano pipistrelle	Not Speciated	Grand Total
05:20					2		2
05:21					1		1
05:23					1		1
05:24					2		2
05:28					1		1
05:32					1		1
05:33					2		2
05:34					1		1
05:35					2		2
05:36					1		2
05:37					2		2
Grand Total	**1**	**34**	**1**	**263**	**271**	**5**	**575**

Table C8 **Location H (Southern edge of Nursery Covert [Facing South Towards Grimseys]) 28/08/2007**

Time	Long-eared	Common Pipistrelle	Soprano Pipistrelle	Query	Grand Total
20:03			2		2
20:04			2		2
20:05			1		1
20:08			1		1
20:16			1		1
20:18		1			1
20:23		1	2		3
20:26			1		1
20:27			1		1
20:28			1		1
20:35		1			1
20:37		1			1
20:45		2			2
20:47		1			1
20:48		1			1
20:51		1			1
20:52		1			1
20:53		1			1
20:54		1			1
21:03				1	1
21:09		1			1
21:10		1			1
21:11		2			2
21:13		1			1
21:20		1			1
21:22			1		1
21:29		1			1
21:30		2	1		3
21:31		2	1		3

Table C8 (Continued) **Location H (Southern edge of Nursery Covert [Facing South Towards Grimseys]) 28/08/2007**

Time	Long-eared	Common Pipistrelle	Soprano Pipistrelle	Query	Grand Total
21:32		1	1		2
21:33		1			1
21:34		1			1
21:37		1			1
21:38		1			1
21:50			1		1
21:55			1		1
22:02			1		1
22:08			1		1
22:20			1		1
22:21			1		1
22:22			1		1
22:27		1			1
22:28		1			1
22:44			1		1
22:45			1		1
23:26			1		1
23:35			1		1
23:54			1		1
00:12			1		1
00:22			1		1
00:46	1	1			2
04:50			1		1
05:48			3		3
Grand Total	**1**	**31**	**34**	**1**	**67**

Location I (South-western edge of Kenton Hills [near pond on Sizewell Belts Trail]) 12/09/2007

No bat encounters

Table C9 Location J (Western Edge of Grazing Marsh) 12/09/2007

Time	Noctule	Pipistrelle social calls	Common pipistrelle	Soprano pipistrelle	Grand Total
19:43				1	1
19:47				3	3
19:57				1	1
20:32				1	1
20:42				2	2
20:43				3	3
20:44				1	1
20:45				1	1
20:46		1		5	6
20:47				5	5
20:48				5	5
20:49				4	4
20:50				3	3
20:51				3	3
20:52				5	5
20:53				6	6
20:54				3	3
20:55				3	3
20:56				3	3
20:57				4	4
20:58				3	3
20:59				4	4
21:00				3	3
21:01				3	3
21:02			1	2	3
21:03			1	6	7

Table C9 (continued) **Location J (Western Edge of Grazing Marsh) 12/09/2007**

Time	Noctule	Pipistrelle social calls	Common pipistrelle	Soprano pipistrelle	Grand Total
21:04				3	3
21:05				3	3
21:06				2	2
21:07			1	4	5
21:08				2	2
21:09				2	2
21:10				5	5
21:11				4	4
21:12				3	3
21:13	1			2	3
21:14				4	4
21:15			1	5	6
21:16				5	5
21:17				3	3
21:18				4	4
21:19				2	2
21:20				5	5
21:21				3	3
21:22				6	6
21:23				2	2
21:24				4	4
21:25				5	5
21:26				4	4
21:27			1	4	5
21:28			2	3	5
21:29				2	2
21:30				4	4
21:31			1	4	5
21:32				4	4
21:33				3	3

Table C9 (continued) **Location J (Western Edge of Grazing Marsh) 12/09/2007**

Time	Noctule	Pipistrelle social calls	Common pipistrelle	Soprano pipistrelle	Grand Total
21:34				4	4
21:35				4	4
21:36			1	2	3
21:37				6	6
21:38				4	4
21:39				6	6
21:40				5	5
21:41				5	5
21:42				5	5
21:43			1	3	4
21:44			1	2	3
21:45				3	3
21:46				4	4
21:47				5	5
21:48				5	5
21:49				4	4
21:50		1		4	5
21:51				3	3
21:52				5	5
21:53				3	3
21:54				5	5
21:55				4	4
21:56				3	3
21:57				4	4
21:58			1	4	5
21:59			1	4	5
22:00				2	2
22:01				3	3
22:02				5	5
22:03				1	1

Table C9 (continued) **Location J (Western Edge of Grazing Marsh) 12/09/2007**

Time	Noctule	Pipistrelle social calls	Common pipistrelle	Soprano pipistrelle	Grand Total
22:04				3	3
22:05				4	4
22:06				3	3
22:09				2	2
22:10				1	1
22:11				4	4
22:12				4	4
22:13				3	3
22:14				2	2
22:15				3	3
22:16				3	3
22:17				2	2
22:37				1	1
22:38				1	1
23:12				1	1
23:13				2	2
00:20				1	1
00:25				1	1
Grand Total	**1**	**2**	**13**	**347**	**363**

British Energy Group PLC
Sizewell Bat Survey Report 2008

1. Introduction

1.1 Background to Development

British Energy (BE) is at the early stages of investigating the feasibility of building new nuclear power stations at a range of sites within their UK land holding. Sizewell has been identified as one potential site for investigation and likely progression to EIA. Entec UK Ltd has been appointed by BE to lead and co-ordinate the baseline terrestrial ecological work and assessment for Sizewell and has subcontracted Baker Shepherd Gillespie (BSG) to undertake baseline bat surveys of the area. This report presents the results of survey work undertaken within the BE land holding by BSG in 2008 to progress the baseline assessment for bats.

1.2 Proposed Works

An area of land directly north of the Sizewell 'A' and 'B' Power Stations has been identified as having the potential to accommodate nuclear new build. This area, which covers 0.32km2/32ha and has an approximate central grid reference of TM473640, is referred to in this document as 'the preliminary works area'. It should be noted that this initial development footprint is purely indicative; environmental, landscape and visual, hydrological and other constraints have not yet been considered and taken into account. These would all be addressed as a matter of course as part of an EIA.

No detailed information on the exact nature of the proposed nuclear power station can be provided at this stage, but it is assumed for the present that the power station would be water-cooled and that there would be a requirement for additional works associated with this in the sub-tidal zone. Due to the presence of statutorily designated sites of nature conservation importance to the north and east of the preliminary works area, it is likely that the route of any access road to this block of land will be through the area of plantation forestry (Goose Hill and surrounding afforested areas) to the east. Further, it is likely that any construction compounds for the build would adjoin this access road, taking in further areas of plantation and adjacent arable land.

Figure 1 shows the proposed footprint of the new power station (the preliminary works area) and the area covered by the 2007 (Entec report reference 19801cb114) and 2008 bat surveys (referred to as the 'study area') for the baseline ecological assessment for bats. The positions of the access track and construction compounds are indicative at this stage.

1.3 Preliminary Works Area Description and Context

The preliminary works area comprises open sheep grazed pasture, fringed by reinstated coastal dune vegetation, parts of which have been planted with trees and scrub. The hydrology and pedology of the site were irreversibly altered as a result of works associated with the building of the Sizewell 'A' and 'B' Stations (adjacent to its southern boundary), and as a result it has lost

much of its botanical merit. Habitats adjoining or in close proximity to the site are of considerable ecological interest however. These include wet meadows (and associated wetland habitats and ditch systems), dune systems, shingle plant communities and wet semi-natural woodland. The quality of the shingle, grazing marsh and associated wetland habitats have led to substantial areas of these in close proximity to the site being designated for their ecological interest. Previous bat surveys have recorded nine bat species on the Sizewell Estate including barbastelle *Barbastellus barbastellus*, one of the UK's rarest species, and one of only five UK bat species listed on Annex II of the EU Habitats Directive.

1.4 Legislation and Policy Guidance

1.4.1 Biodiversity Action Plan

Seventeen species of bat are known to be resident in the UK, seven of which are on the new list of priority species[1] in the UK Biodiversity Action Plan (BAP), adopted by the Government in 2007. Species included on this list have been identified by the UK Government as needing special conservation help because of their rarity and/ or decline in numbers over recent decades. Species Action Plans (SAPs) have been developed to identify conservation priorities, propose action, and set targets to try and maintain and restore populations. Bat populations are at risk from changes to the landscape (such as those caused by agricultural practices or land development), which can cause loss of roosting, foraging or commuting habitat and be a contributing factor to population decline.

A clear understanding of the level and nature of use of a site by bats is necessary to ensure that environmental measures (mitigation, enhancement and offsetting) associated with a development can be appropriately targeted, and put in the context of local and National conservation priorities. The SAPs promote the favourable management of land, especially in the vicinity of known roost sites, and aim to maintain and enhance existing bat populations. These can lead to the designation of important sites for rarer species and notification to the local authority of important roosts such as maternity or hibernation sites.

Most of the Species Action Plans (SAPs) in the Suffolk Biodiversity Action Plan are based on National Biodiversity Action Plans. The process of identifying BAP priorities in Suffolk began in 1997, and an initial plan (Tranche 1) was produced in 1998. Priority species included the common pipistrelle bat *Pipistrellus pipistrellus*. Tranche 2, published in 2000 has been withdrawn and revised plans are in production. Priority species on Tranche 2 included barbastelle.

1.4.2 Protective Legislation Relating to Bats

All bat species and their roosts are protected in the UK under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) which implements the EC Directive 92/43/EEC (the Habitats Directive). In addition, the lesser and greater horseshoe bat *Rhinolophus hipposideros, R ferrumequinum* Bechstein's bat *Myotis bechsteinii* and barbastelle are listed in Annex II of the Habitats Directive, which requires sites to be designated by member states for their protection.

[1] Priority bat species in the UK BAP: *Barbastelle Barbastellus* barbastellus, Bechstein's *Myotis bechsteinii*, noctule *Nyctalus noctula*, soprano pipistrelle *Pipistrellus pipistrellus,* brown long-eared *Plecotus auritus,* greater horseshoe *Rhinolophus ferrumequinum* and lesser horseshoe *R. hipposideros.*

All bat species and their roosts are also protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended), and under the Countryside and Rights of Way Act 2000. Taken together, these Acts and Regulations make it illegal to:

- Intentionally or deliberately kill, injure or capture bats;
- Deliberately or recklessly disturb bats;
- Damage, destroy or obstruct access to bat roosts;
- Possess or transport a bat or any part of a bat, unless acquired legally; and
- Sell, barter or exchange bats or parts of bats.

In response to a European Court Judgment (ECJ) that ruled the United Kingdom had not correctly transposed the Habitats Directive into UK law in a number of areas, recent changes have been made to the Habitats Regulations. Caselaw driving these changes included judgments in 2004 and 2005 which ruled that existing species protection provisions in the Habitats Regulations were not fully compatible with the strict species protection regime required by the Habitats Directive (www.defra.gov.uk). The Conservation (Natural Habitats, &c.) (Amendment) Regulations 2007 made changes to the Habitats Regulations to meet this judgment. Further amendments have been made in 2009 (the Conservation (Natural Habitats, &c.) (Amendment) Regulations 2009) and came into force on the 30th January 2009.

The Natural Environment and Rural Communities Act 2006 (NERC Act) states, in Section 40(1), that "*every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity*". Section 40(3) of the NERC Act 2006 goes on to state that "*conserving biodiversity includes, in relation to a living organism or type of habitat, restoring or enhancing a population or habitat*".

Section 41(1) of the NERC Act 2006 states that "*the Secretary of State must, as respects England, publish a list of the living organisms and types of habitat which in the Secretary of State's opinion are of principal importance for the purpose of conserving biodiversity*". All seven species of bats that are priority species in the UK Biodiversity Action Plan (see Section 1.4.1) are also considered Species of Principal Importance for the Conservation of Biodiversity under Section 41 of the NERC Act.

In paragraph 16 of Planning Policy Statement 9, the Government indicates that local authorities should take steps to further the conservation of species of principal importance for the conservation of biodiversity in England and should ensure that that these species are protected from adverse effects of development, where appropriate, by using planning conditions or obligations.

Developments that compromise the protection afforded to bats under the provisions of the Conservation (Natural Habitats, &c.) Regulations 1994 almost invariably require a licence from Natural England. Three tests must be satisfied before a licence to permit otherwise prohibited acts can be issued:

- Regulation 44(2)(e) states that licences may be granted by Natural England to 'preserve public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment';

- Regulation 44(3)(a) states that a licence may not be granted unless Natural England is satisfied 'that there is no satisfactory alternative';
- Regulation 44(3)(b) states that a licence cannot be issued unless Natural England is satisfied that the action proposed 'will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range'.

In conclusion, a licence permits otherwise unlawful actions and it is the responsibility of the developer, or their appointed advisor, to decide whether a licence is required for work that has the potential to affect bat populations. It is important that the developer carries out a thorough survey and accurate assessment to help avoid committing offences. It is also the responsibility of the developer to design and implement a mitigation scheme that meets the licensing requirements and ensures, as far as possible, the long-term future of any bat population affected. Licence applications (under Regulation 44(2)(e) of the Habitats Regulations) will be determined by Natural England.

1.5 Status of Bats in Suffolk

Of the seventeen species of bat that are known to be resident in the UK, the species listed in **Table 1** are known to occur in Suffolk:

Table 1 Status of Bat Species in Suffolk

English name	Scientific name	Status in Suffolk	Notes	Source of information
Common pipistrelle	*Pipistrellus pipistrellus*	Common and widespread	-	Richardson (2000)
Soprano pipistrelle	*Pipistrellus pygmaeus*	Common and widespread	-	Richardson (2000)
Brown long-eared bat	*Plecotus auritus*	Common and widespread	Second only to pipistrelles in terms of number of 10km squares recorded in, in the county	Suffolk Bat Group
Natterer's bat	*Myotis nattereri*	Regularly recorded	The number of records trebled following the bats in barns survey in 1996. The species uses most of the known hibernation sites in the county.	Suffolk Bat Group
Whiskered bat	*Myotis mystacinus*	Extremely scarce	Until January 2000 all records were from two hibernation sites, and refer to single animals. A breeding roost has yet to be discovered in the county	Suffolk Bat Group
Brandt's bat	*M. brandtii*	Extremely scarce		Richardson (2000)
Daubenton's bat	*M daubentonii*	Widespread and locally common		Richardson (2000)
Noctule	*Nyctalus noctula*	Widespread (in low numbers)	Widespread throughout the county albeit in small numbers	Richardson (2000) and Suffolk Bat Group

Table 1 (continued) Status of Bat Species in Suffolk

English name	Scientific name	Status in Suffolk	Notes	Source of information
Leisler's bat	*N. leisleri*	Uncommon	Only three nursery colonies are known in the county. Appears to be confined to the north-west of the county	Suffolk Bat Group
Serotine	*Eptesicus serotinus*	Widespread (in low numbers)	There are approximately 45 known colonies in Suffolk.	Suffolk Bat Group
Barbastelle	*Barbastella barbastellus*	Scarce		Richardson (2000)
Lesser horseshoe bat	*Rhinolphus ferrumequinum*	Very rare (very few records)	A single bat (presumed to be the same individual) has been recorded at a hibernation site in February for the last nine to fourteen years.	Suffolk Bat Group and Alan Miller of the Suffolk Wildlife Trust

1.6 Purpose of Survey Work

The bat surveys carried out in 2008 form part of the baseline survey programme that commenced in 2007[2] and is being conducted to inform the ecological assessment section of an Environmental Statement (ES) for the proposed development. Bat activity surveys in 2007 recorded nine species of bats in the study area, including soprano pipistrelles, brown long-eared bats, noctule bats and the rare barbastelle bat. Barbastelle bats are known to have roosted in a barn at Upper Abbey Farm and have previously roosted in a barn at Lower Abbey, both of which are within the Sizewell Estate. Noctules and soprano pipistrelles have been recorded in bat boxes in Kenton Hills.

The 2008 survey work was commissioned by BE to address recommendations made in the 2007 Sizewell bat survey report (Entec doc ref 19801cb114). The aims of the 2008 surveys were therefore:

- To determine the status of the barbastelle bat roosts at Upper Abbey Farm and Lower Abbey and establish if a breeding colony is likely to be present;
- To establish if other buildings close to the study area are suitable roost sites for barbastelle;
- To determine the level and nature of bat use in the study area in April and May (through undertaking baseline surveys early in the year, using comparable survey methods as employed in 2007, thereby extending the overall survey period);

[2] A programme of ecological survey work began at Sizewell in April 2007. An ecological scoping report was issued to consultees in June 2007, since which time there has been a series of meetings and teleconferences to discuss ecological issues and survey results.

- To monitor known flightlines for barbastelle bats and to survey potential flightlines in and around the study area to help determine the nature and level of barbastelle activity in habitats within the study area;
- To monitor Goose Hill, Kenton Hills and Nursery Covert plantation woodlands to help determine the nature and level of use by barbastelle bats and the likelihood the woodland supports maternity roosts and is therefore a core area for the colony;
- To survey trees in the study area when they are not in leaf, to confirm the number of trees with bat roost potential;
- To identify information gaps that need to be addressed through further appropriate survey and determine the need to use more intrusive methods of survey (such as mist netting) to establish a higher level of certainty to inform ecological impact assessment and;
- To recommend appropriate mitigation, enhancement and compensation measures to ensure the bat interest of the area is maintained and enhanced.

2. Methods

2.1 Desk Study

2.1.1 Landscape Appraisal

An appraisal of the landscape using aerial photographs and Ordnance Survey maps was carried out in March 2008 to identify potential commuting routes for barbastelle bats, and buildings with the potential to support a maternity colony of barbastelle bats. Female barbastelles will travel several kilometres to foraging areas. Distances are likely to vary depending on the availability of roosts and favourable foraging habitats. Females from a colony on Dartmoor were found to forage up to 4km from their roost (www.dartmoor–npa.gov.uk), whilst studies in Sussex found the average length of flightlines of females was 8km. However, the distance individuals travel to forage is influenced by the connectivity and layout of available flightlines in the landscape. Changes in the landscape, typically brought about by human influences, can drastically increase the distance an individual bat may have to fly between its roost and favoured foraging areas and distances of 16-18 kilometres have been recorded occasionally in some studies. The landscape appraisal in the current study considered buildings within approximately 6km and potential commuting and foraging habitats within approximately 3km of the preliminary works area and proposed access track.

Examination of the aerial photographs for buildings that may support a maternity colony of barbastelle bats involved looking for large, old agricultural buildings such as the barn at Upper Abbey Farm. Studies in Sussex indicate that breeding clusters of barbastelle bat in woodlands will regularly move from one roost to another and will divide into sub-groups (Greenaway, 2001). Therefore, it is likely that any buildings that support a breeding colony of barbastelle bats must be timber framed and large enough to provide a variety of roosting opportunities. Observations of barbastelle bats roosting in Paston Great Barn, Norfolk (the only known breeding colony of barbastelle bats in a building in Britain) have revealed that barbastelles display roost switching behaviour, indicating that the combination of roost sites available in the barn and associated buildings is a probable reason why these buildings are used for breeding (LDA, 2003). Local workers for the Suffolk Wildlife Trust (SWT) at Upper Abbey Farm with

knowledge of the area were asked if they knew of any such barns in the local area. Alan Miller of the SWT was able to explain recent changes in land use within the study area. Robin Harvey, the assistant warden at the RSPB Minsmere reserve, was contacted in January 2009 to enquire if they had any records of barbastelle bats, which may suggest barbastelles are foraging in habitats associated with the reserve. The reserve is approximately 6km from the preliminary works area.

The appraisal of the landscape for potential flightlines used by barbastelle bats involved identifying hedge lines, woodland strips and woodland edges, and natural features such as the coastline.

2.1.2 Analysis of 2007 Baseline Data for Barbastelle Bats

The baseline survey data for bats gathered in 2007 (to inform the early stages of an Environmental Impact Assessment at Sizewell (Entec doc ref 19801cb114)) has been included in this assessment. As part of the 2008 study, the time of night that each of the barbastelle bat records was obtained in 2007 was investigated to determine how long after sunset the bats were on site. Records of barbastelles soon after dusk would indicate there may be a roost close to the study area.

2.2 Field Surveys

2.2.1 Roost Surveys

Upper Abbey Farm

Barbastelle bats were first recorded in the large threshing barn at Upper Abbey Farm (hereafter referred to as Upper Abbey Barn) by the Suffolk Wildlife Trust in 1997 (Alan Miller SWT, pers. comm.). Small numbers of barbastelle bats were recorded in subsequent years, but there has been no evidence of breeding. To determine if barbastelle bats are breeding in Upper Abbey Barn the barn was monitored between April and August 2008.

A daytime inspection of the interior of the barn to look for fresh bat droppings was carried out by Anton Kattan, with assistance from Laura Jennings, on the 28th April 2008 between 14:30hrs and 15.45hrs. Fresh droppings are generally shiny, whilst older droppings become dull and greyish. The size, shape and texture of bat droppings can provide a good indication of species identity, although there is a wide range of variation in these parameters within species. Droppings were collected from the barn for analysis and verification by a second bat ecologist[3]. The structure and size of bat droppings collected from Upper Abbey Barn were compared to measurements published in *Which Bat is it? A guide to bat identification in Great Britain and Ireland* (Stebbings, Yalden & Herman, 2007). A second daytime inspection was carried out by Anton Kattan and Dr Sandie Sowler on the 18th June 2008 between 14:30hrs and 15:45hrs. Evidence of fresh droppings was searched for and the location of accumulations of droppings was recorded. Close focusing binoculars and a powerful Clulite torch were used to examine the roof of the barn.

A Batbox Duet bat detector connected to a Sony minidisk recorder was placed in Upper Abbey Barn on the 28th April 2008 to record dusk emergence bat activity. The bat detector was positioned in the middle of the barn, between the two large south facing double doors, approximately 1.5m off the ground. The bat detector microphone pointed towards the roof and

[3] Dr Sandie Sowler MIEEM, an experienced bat surveyor with over 20 years of experience carrying out roost visits, verified the species identification

was positioned in a location that was considered most likely to record bats flying in the barn. Recording commenced at 20:10hrs and ended at 22:15hrs. Sunset time was 20:17hrs and weather conditions for the evening are shown in **Table 3**.

One surveyor was stationed at the south-eastern end of Upper Abbey Barn on the 19th May 2008 for 1 hour 45 minutes after dusk to identify bats flying from the direction of the barn towards the farm track that leads to Fiscal Policy.. The aims of the survey were to record species that may be roosting in the barn and commuting towards Goose Hill and the adjoining afforested areas. A dawn re-entry watch was undertaken by Anton Kattan and Sandie Sowler on the 12th August 2008. The prevailing weather conditions, surveyors' location, sunset times, start and finish times and duration of each survey are set out in **Table 2**.

Table 2 Upper Abbey Barn Dusk Exit and Dawn Re-Entry Surveys

Date	Surveyor	Position	Start/ finish times	Sunset/ sunrise time	Duration	Temperature (°C)	Wind speed (mph)	Rain	Cloud cover (%)
19/05/08	Laura Jennings	SE end of the barn	20:30 - 22:15	20:50	1hr 45mins	10.2-8.10	1	No	35
12/08/08	Anton Kattan	Eastern end of barn	04:10-05:50	05:40	1hr 40mins	16	2	Very light	90
	Sandie Sowler	NW corner of barn							

An Anabat SD1 (an automated recording frequency division bat detector with timed sound file feature) was used as a datalogger to monitor bat activity in Upper Abbey Barn in May and June. Recordings were made from the 20th to 27th May and on the 5th June 2008. The Anabat unit was attached to a wooden pillar near the centre of the barn at a height of approximately 2m with the microphone pointing up towards the roof and programmed to record bat activity between dusk and dawn each night.

Lower Abbey Farm

A daytime inspection of the large threshing barn at Lower Abbey Farm was carried out by Anton Kattan and Sandie Sowler on the 18th June 2008 between 11:45hrs and 12:55hrs. An assessment to identify potential roost sites and the likelihood of them having been occupied by bats was made. Particular attention was paid to mortice joints and junctions between timbers and walls. Evidence of occupancy by bats, such as droppings, urine staining, scratch marks and staining from fur oil on the timber was searched for. A search was also made of the ground for accumulations of droppings or bat carcasses. A high powered Clulite torch and close-focusing binoculars were used to inspect upper areas of the barn.

Leiston Abbey

An external examination of Leiston Abbey was carried out by Anton Kattan and Laura Jennings on 29th April 2008. The desk based assessment of the buildings from aerial photographs and a website for the venue (www.leistonabbey.co.uk) indicated that the all the buildings, including the old barn, had been converted for use as a conference centre and wedding venue. The purpose of the visit was to confirm that the buildings no longer offered suitable shelter for barbastelle bats.

Trees in Goose Hill Plantation and Adjoining Afforested Areas

The 2007 Sizewell Bat Report (Entec doc ref 19801cb114) included a list of trees with potential as bat roost sites, with each tree graded according to its level of potential in this respect (low-high). However, the 2007 inspection of the trees was carried out in June when foliage may have masked some features (holes, splits etc.) with potential as roost sites. A further inspection of these trees was therefore carried out by Lynn Whitfield, an Entec ecologist (Natural England bat licence no. 20073526) on 6 March 2008, before the leaves had regrown (on the deciduous trees).

Trees were inspected from ground level using close-focusing binoculars and, where appropriate, a high-power lamp. Features that could be used as bat roosts were searched for, including woodpecker holes, rot holes, splits and loose bark. Any trees considered to have potential in this respect and not noted in the previous report were recorded.

2.2.2 Bat Activity Surveys

Walked and Driven Transects

Six evening bat activity surveys were undertaken between the 28th April and 11th August 2008. Walked and driven transects were used to sample habitats within the study area and connecting habitats between Lower Abbey Farm, Upper Abbey Farm, and the study area. Both driven and walked transects are recognised methods for bat activity surveys (Bat Conservation Trust, 2007). The decision as to whether to carry out walked or driven transects was determined by the distance of the proposed transect route, with the intention of sampling each section of the transect route for an equal amount of time. Driven transect speeds were between 5 and 10mph. Each transect route was covered once and incorporated regular listening stops of 1-3 minutes. Bat activity was recorded for between 1 and 3 minutes and the time of arrival at each listening stop was noted so that the recorded bat calls could be assigned to the surveyor's location when the recording was analysed. Surveys commenced around sunset and lasted between 2 and 3 hours. The prevailing weather conditions, sunset times, start and finish times and duration of each survey are set out in **Table 3**.

Figures 2 and **3** show the transect routes covered for each month.

Table 3 Times, Dates and Weather Conditions during Bat Activity Surveys

Date	Surveyor*	Sunset time	Temperature (^{O}C)	Wind	Rain	Cloud	Start/ finish	Duration	Bat detector
28/04/08	AK and LJ	20:17	12 -10.5	2	No	95%	20:35-22:25	2hrs50mins	Batbox Duet and Sony minidisk
19/05/08	AK	20:50	10.2-8.1	1	No	35%	20:40-23:15	2hrs35mins	Batbox Duet and Sony minidisk
19/05/08**	LJ	20:50	10.2-8.1	1	No	35%	22:15-23:22	1hr7mins	Anabat
20/05/08	AK and LJ	20:50	10-8.7	6-9	No	60%	20:46-23:42	3hrs12mins	Anabat
18/06/08	AK and SS	21:20	15-14.5	2	Light	100%	21:32-23:50	2hrs18mins	Anabat
24/07/08	AK and EB	21:00	17.5	1	No	10%	21:11-23:30	2hrs19mins	Anabat
11/08/08	AK and SS	20:31	16	1-2	Occasional	100%	20:46-22:52	2hrs6mins	Anabat

*AK Anton Kattan, EB Edward Bodsworth, LJ Laura Jennings, SS Sandie Sowler.

** This transect was a short transect carried out after a dusk exit watch at Upper Abbey Farm.

The purpose of the bat activity survey varied each month. The purpose of the walked transect on the 28th of April 2008 was to monitor possible barbastelle flightlines around the known roost at Upper Abbey Farm and to provide survey data in spring when female barbastelles congregate to form breeding colonies. The surveys on the 19th and 20th May followed the survey methodology used to gather baseline data in 2007 for the Environmental Impact Assessment at Sizewell (Entec doc ref 19801cb114), thereby providing baseline information early in the year. Driven transects on the 18thJune and 24th July surveyed potential flightlines that may be used by barbastelle bats as commuting routes between the study area and other areas of their home range. The walked transect on the 11th August concentrated on surveying the plantation woodland within the study area to determine if there are high levels of barbastelle activity that may suggest that the woodland is a foraging habitat for female and juvenile barbastelles. Juvenile barbastelles in colonies that have been studied[4] in the UK seem to use large productive foraging zones close to the core area of the maternity colony where the breeding roosts are located (Greenaway, 2004).

During each survey, surveyors used an Anabat SD1 frequency-division detector to record bat sound onto a Compact Flash (CF) card or a Batbox Duet frequency-division detector connected

[4] Most of what is known about foraging habitats and flightlines of barbastelles in the UK is based on studies of two colonies in West Sussex by Frank Greenaway. Recent studies by Matt Zeale (Bristol University) on the foraging behaviour of barbastelles in a colony on Dartmoor appear to show similar patterns of behaviour to those recorded in Sussex (Anton Kattan pers. comm.).

to a Sony minidisk recorder. The bat detector system used to record bat sound during each survey is shown in **Table 3**. Batbox Duet detectors were used on every survey to allow surveyors to listen to the heterodyne output, which allowed field notes to be made about species presence and activity at various points along the transect. Notes were taken of all bat sightings (to assist with their subsequent identification) in conjunction with the Anabat and Batbox Duet recordings. Field notes included a record of the time of each bat encounter, allowing results to be cross-referenced with the recorded data.

Anabats and Batbox Duets with minidisk recorders were also used as automated, fixed location bat detectors. The Batbox Duets were collected at the end of the transect (because each minidisk can only store approximately 2-3 hours of continuous recording) and the Anabats, which can record for much longer, were left to record overnight. The fixed location bat detectors were positioned in a variety of habitats and in different parts of the survey area. The locations of the automated, fixed location bat detectors are shown on **Figure 4**.

Automated Datalogger Bat Detectors

The Anabat SD1 unit can be set up as an unmanaged recording unit (also referred to as a datalogger) and will record bat sound on successive nights for several days (subject to battery power). Three Anabats were deployed in a variety of locations across the site to monitor Upper Abbey Barn, and potential flightlines and foraging habitats for barbastelle bats between April and August. The locations of the Anabats are shown on **Figure 4**. Each unit was programmed to be active each night between dusk and dawn. Alan Miller of SWT replaced batteries and moved units to new positions to help maximise the number of locations monitored. The Anabat units were positioned in buildings, in the canopy of trees or in vegetation at least 1m from the ground. The period of monitoring for each Anabat unit is detailed in **Table 4**; the positions of the Anabats are shown on **Figure 4**.

Table 4 Monitoring Periods for Anabat Dataloggers

Date	Monitoring period	Figure 4 label	Location
28/04/08	28-29/04	6	North of Upper Abbey on track
28/04/08	28/04/08	16	South of Upper Abbey on track
28/04/08	28-29/04	7	West of Upper Abbey on farm track
30/04/08	30/04-07/05/08 and 15-19/05/08	15	North of Upper Abbey, in large oak tree on track
30/04/08	30/04-05/05/08 an07/05-19/05/08	4	Junction of tracks at Old Abbey Farm
20/05/08	21-27/05/08 and 05/06/08	9	In Upper Abbey Barn
20/05/08	20/05/08	17	Junction of tracks at Old Abbey Farm
21/05/08	21-22/05/08 and 26-27/05/08	8	Track by Ash Wood, TM4590664910
02/06/08	02-08/06/08	10	The Grove, TM4663765262

Table 4 (continued) Monitoring Periods for Anabat Dataloggers

Date	Monitoring period	Figure 4 label	Location
13/06/08	13,16&18/06/08	14	Track by Ash Wood
19/06/08	19-28/07/08	11	Ash tree with roost potential on access track
25/07/08	25/07/08-01/08/08	12	Reckham Pits Wood

2.3 Personnel

The survey work in April and May was undertaken by Anton Kattan MIEEM[5] Full member of the Institute of Ecology and Environmental Management. and Laura Jennings (Assistant Ecologist). Survey work in June and August was carried out by Dr Sandie Sowler MIEEM and Anton Kattan. Survey work in June was undertaken by Anton Kattan and Dr Edward Bodsworth MIEEM. Dr Lynn Whitfield MIEEM is a specialist bat ecologist with Entec. All surveyors, with the exception of Laura Jennings, are experienced Natural England licensed bat ecologists[6].

2.4 Bat Detector Systems

The Anabat SD1 and Batbox Duet are both frequency division bat detectors. This method uses a device called a zero-crossing circuit to identify the fundamental frequency component of a bat's echolocation call (Altringham, 2003). They are broadband detectors and are able to pick up species echolocating between 10 and 150 kHz (without the need for the operator to tune the detector). Although not as much information on the bat's echolocation is preserved as with other bat detectors, such as time-expansion systems, frequency division detectors provide clear depictions of important call details that allow species identification. Frequency division bat detectors record continuously, unlike time-expansion detectors that capture the signal from the bat's echolocation and play it back to the operator at a slower speed, during which time it is not recording. This enables frequency division detectors to record all bat calls captured by the microphone, rather than only the first signal received (as in the case of time-expansion detectors), or only the frequency the detector is tuned to (as with heterodyne bat detectors). This is considered to be a significant advantage, particularly when trying to detect barbastelle bats that have a fast, directional flight and short call lengths.

The Anabat SD1 creates dated and timed sound files when a bat's echolocation is detected. Each sound file records for 15 seconds when the unit is triggered. If bat activity continues for more than 15 seconds successive sound files are created and in so doing provides a series of recordings of the continuous bat activity.

[5] Full member of the Institute of Ecology and Environmental Management.

[6] Natural England licence numbers: Anton Kattan 2007049, Edward Bodsworth 20083291, Lynn Whitfield 20073526 and Sandie Sowler 20071050.

2.5 Evaluation Methodology

In order to evaluate the importance of ecological features identified in the desk study and field surveys, a set of standard measures are outlined in guidance produced by the Institute of Ecology and Environmental Management (2006). For each site, habitat and species/assemblage, a summary grade is determined based on the levels of value recommended in the guidance. This places the importance of each feature in a geographical context, using the following hierarchy:

- International;
- UK;
- National (i.e. England, Northern Ireland, Scotland or Wales); ;
- County (or Metropolitan - e.g. in London);
- District (or Unitary Authority, City or Borough);
- Local (or Parish); or
- Site - within immediate zone of influence only (the development site and surrounds).

Where possible, formal criteria are used to set features of conservation importance within this geographical context. For example, the Guidelines for the Selection of Biological SSSIs (Nature Conservancy Council, 1989) can be used as a basis for the assessment of features at a National level. Similarly, published guidelines for the selection of SINCs (Sites of importance for nature conservation) can be used as a basis for assessing features of county level importance.

The significance of bat populations has been determined using the principles described in the IEEM *Guidelines for Ecological Impact Assessment in the United Kingdom* (www.ieem.net). Particular consideration has been given to distribution and rarity at different geographical levels. In this case, reference has been made to:

- UK BAP;
- Suffolk Local BAP;
- Distribution atlas of bats in Britain and Ireland 1980-1999 (Richardson, 2000)
- The state of the UK's bats: National Bat Monitoring Programme Population Trends (Bat Conservation Trust 2007).

2.6 Survey Limitations

A walked transect to sample Goose Hill and surrounding afforested areas on the 29th April 2008 was abandoned due to heavy rain, which made the recording of bats in the field impossible. However, surrounding habitats were sampled on the 28th April.

Weather conditions in 2007 and 2008 have been unusually cold and are likely to have affected the breeding behaviour and breeding success of bats. Continued monitoring of the site will therefore help provide an accurate appraisal of the use of the site by bats

One to two surveyors were used to carry out roost watches at Upper Abbey Barn. The barn is a very large structure and there are numerous exit and entry points for bats. Therefore it was not

possible to watch all possible exit points. Surveys in previous years by the Suffolk Bat Group using 10-15 surveyors failed to pick up all exit points (Alan Miller SWT, pers. comm.). However, the aim of the survey was to pick up the presence of barbastelle, on the assumption that any barbastelle flying around the barn (especially close to dusk) would indicate possible roosting. Other methods of monitoring the barn (such as fixed position bat detectors within the barn) could be used to corroborate the findings of the roost watches.

The Anabat bat detectors datalogger systems that were deployed from April to August, with the intention of monitoring foraging habitats and flightlines, failed to record continuously despite the use of 12-volt batteries (to provide power for up to 1 month) and Alan Miller changing standard AA batteries weekly. Two Anabats failed to record any data between July and August. Despite this, the deployment of dataloggers within the study area has allowed flightlines, potential roost sites and foraging habitats to be monitored throughout the period from April to August and contributed sufficient data to inform this assessment.

Identification of some species, especially bats of the Myotis genus, from recordings can be difficult. Where the identification to species has been made this has been done using 'the slope' feature of the analysis software ('Analook'), and has only been recorded to species where the identification confidence is greater than 60%.

Finally, certain bat species are especially difficult to detect – in particular, long-eared bats have a very quiet echolocation call and therefore tend to be under-reported in surveys using aural bat detectors.

3. Results

3.1 Desk Study

3.1.1 Landscape Appraisal

A number of potential flightlines that extend north from Goose Hill and Kenton Hills plantation woodland were identified from aerial photographs and OS maps. These were mainly strips of woodland that connect to the plantation, and farm tracks bordered by hedgerows. These potential flightlines connect to the access track along the northern edge of Kenton Hills and Nursery Covert plantation, which has been identified as a flightline for barbastelle bats (Entec doc ref 19801cb114). A number of rides interconnect through the plantation woodlands within the study area, and barbastelle bats have been recorded on the southern margins of Kenton Hills and Nursery Covert. Sizewell Belts, to the south of the plantation woodlands, contains multiple potential flightlines along the network of drainage ditches associated with the grazing marsh, and along hedgerows and woodland strips. Sandy Lane to the south of Sizewell Belts presents a potential east-west flightline through the grazing marsh. To the south of Sizewell B Power Station the landscape changes character and is dominated by arable fields.

Potential flightlines that were identified as possible commuting routes for barbastelle bats are illustrated on **Figure 5**.

The examination of aerial photographs for buildings with suitability for barbastelle bats to roost revealed that only the known barns at Upper Abbey Farm and Lower Abbey Farm had potential as roost sites. No records of barbastelle bats are held by the RSPB for their Minsmere reserve, but this is possibly because of a lack of surveys for bats at the reserve.

3.1.2 Analysis of 2007 Baseline Data for Barbastelle Bats

The distribution of barbastelle bat records from the baseline surveys in 2007 has been plotted on **Figure 6**. A code from 1 to 10 against each record indicates the length of time after sunset the bat was recorded. The 'sunset codes' represent 20 minute periods after sunset, 1 being 0-20minutes and 10 being 181-200 minutes after sunset. The results show that the two earliest records are between 20-40 minutes after sunset. These records are along the southern edge of the plantation woodland at Goose Hill and Nursery Covert. Six barbastelle passes were recorded between 31-40 minutes after sunset, one was recorded 101-120 minutes after sunset and four were recorded 121-140 minutes after sunset.

Thirteen sound files[7] with barbastelle calls were recorded between the 7th June and 28th August 2007. Seven sound files were recorded on the night of the 6th July, with a further three sound files on each of the nights in June and August.

3.2 Field Surveys

3.2.1 Roost Surveys

Upper Abbey Farm

Upper Abbey Barn is approximately 32m long by 8m wide. It has a wooden beam frame and queen-post structure with traditional mortice joints. The thatched pitched roof is approximately 15m high at the apex and sections of the thatched roof on the northern side of the barn have been repaired with corrugated metal sheets. The walls are constructed from overlapping boards and there are two large double doors on the southern side of barn.

The daytime internal inspections of Upper Abbey Barn in April and June recorded Natterer's, brown long-eared and pipistrelle bat droppings in the barn. Accumulations of Natterer's bat droppings were recorded in two locations at the eastern end of the barn directly under mortice joints of the roof beams. Alan Miller (SWT) has recorded Natterer's bats in these locations for several years. The droppings were not fresh and were unlikely to be from bats roosting in 2008. An accumulation of brown long-eared bat droppings was noted on the northern edge of the barn along with some old Natterer's bat droppings. Old and fresh brown long-eared, pipistrelle and Natterer's bat droppings were scattered throughout the barn, confirming that the barn has been a bat roost for many years and is still used by these species. The number of fresh droppings suggests that low numbers of bats shelter in the barn.

The Batbox Duet bat detector placed in Upper Abbey Farm on the 28th April 2008 recorded brown long-eared bats in the barn at 21:02hrs, 45 minutes after sunset. Common and soprano pipistrelle bats were recorded at 21:15hrs to 21:30hrs and later in the evening at approximately 21:56hrs. Pipistrelle activity was recorded constantly from 21:56hrs until recording stopped at 22:15hrs.

The exit watch on the 19th May 2008 recorded two common pipistrelle bats exiting from the top of the gable end on the eastern side of the barn. The first bat exited at 20:56hrs and the second bat emerged at 21:13hrs. Both bats stayed in the vicinity of the barn and were recorded feeding. At 21:46hrs a pipistrelle bat was seen returning to the barn and at 21:56hrs a pipistrelle bat emerged from the barn. Pipistrelle bats appeared to be foraging in and around the barn during

[7] The Anabat SD1 creates a sound file when a bat's echolocation is detected. Each sound file records for 15 seconds when the unit is triggered. For further details refer to Section 2.4.

most of the survey. Two noctule bats were recorded at 21:20, but they did not emerge from the barn.

Four or five Natterer's bats, one common pipistrelle bat and a brown long-eared bat were recorded returning to roost in Upper Abbey Barn on the 12th August 2008. The Natterer's bats foraged around the barn for around 40 minutes before entering the barn through two gaps under the roof on the eastern gable end at 04:38hrs. The brown long-eared bat was seen entering a gap approximately 3m from the ground on the corner of the southern and eastern walls at 04:58hrs. The common pipistrelle bat returned to the roost at 05:15hrs, entering a gap in the middle of the gable end wall.

There is a brown long-eared bat roost in the loft of the SWT workshops at Upper Abbey Farm. The roost is monitored by Alan Miller at the SWT. 12 brown long-eared bats were recorded in the roost by Anton Kattan on 29th April 2008.

The Anabat datalogger recorded a total of 276 sound files between the 20th and 27th May and on 5th June. 226 of these sound files contained recordings of common pipistrelle activity and 19 sound files were recordings of soprano pipistrelles; a further 22 recordings of pipistrelle calls could not be split into species. In total, five sound files of brown long-eared bats were recorded in the barn on the 22nd and 24th May. *Myotis* species were recorded on the 21st and 22nd May on three sound files. One sound file contained bat sound that could not be identified to genus level, but was thought to be either a brown long-eared bat or species of *Myotis*. The high number of sound files generated by pipistrelle bats is thought to be a result of bats flying in the barn.

Lower Abbey Farm

The barn at Lower Abbey Farm has a similar construction and is of comparable size to Upper Abbey Barn. It measures approximately 30m by 5m and is timber framed with queen-post roof construction and wooden walls. The thatched roof has been replaced with corrugated iron.

The barn is currently used to house livestock; at the time of the inspection goats were being kept in the barn. The doors of the barn are left open all day (and possibly at night). The owner Anne Mann reported that owls bred in the barn in 2007, but she was unable to confirm which species.

Gaps in the mortice joints of the timber frame and between overlapping boards that form the walls of the barn are considered to offer suitable shelter for bats, but the presence of owls in the barn is a serious deterrent to bats. The open barn doors, which allow predators such as owls to enter the barn, is also likely to alter the microclimate of potential roost spaces. The thermal qualities of the corrugated metal roof are far less favourable for bat roosts than a thatched roof because of poorer insulating qualities. Without a thatched roof on the barn, roost spaces in the barn are very unlikely to provide the constant humid microclimate required by barbastelle bats (pers comm. Dr Peter Shepherd).

No evidence of bat activity was recorded in the barn. Alan Miller believes that barbastelle bats may no longer be roosting at Lower Abbey Farm because of the changes in the use of the barn to house livestock (Alan Miller, pers. comm.).

Leiston Abbey

The visit to Leiston Abbey on the 29th April 2008 confirmed that there were no suitable buildings that could offer shelter for a breeding colony of barbastelles. All the barns have been

converted for alternative use, therefore the internal spaces of the barns are no longer suitable for bats.

Trees in Goose Hill and Surrounding Afforested Areas

The survey results confirmed the assessment of potential of the trees in the previous bat survey report. In addition, three further trees considered to have potential as possible roost sites were noted: these are listed in **Table 5**.

Table 5 Results of Winter Tree Survey

Zone	Tree species	Feature	Height (m)	Aspect	Potential as a bat roost site	Notes
A	*Acer pseudoplatanus*	Loose bark		All	Medium	
H	*Pinus sylvestris*	Holes – possible cavities	Various	Various	Medium	Dead stump (one of a pair)
H	*Pinus sylvestris*	Large split in upper side of east-facing limb	3	E	Medium	Third large pine from N end of Zone H[8]

A plan showing the location of each zone is provided in Appendix A.

3.2.2 Bat Activity Surveys

The following sections of this report should be read with reference to Figures 7 to 12, which show the distribution of bat activity within the study area and the 'sunset code' (see Section 3.1.2) for time after sunset that barbastelle bats were recorded. The distribution of barbastelle bat records from the baseline surveys in both 2007 and 2008 are displayed on **Figure 1**3.

Walked and Driven Transects

The detailed results of the walked and driven transect surveys are presented in Appendix B. Summary information is presented in **Table 6**. This table shows the number of sound files that were generated by each species recorded

[8] The zones are defined within the original report.

Table 6 Number of Bat Passes Generated for Each Species During Bat Activity Surveys

Date	No. of sound files	No. of species	Common pipistrelle	Soprano pipistrelle	Noctule	Serotine	Leisler's bat	*Myotis* sp.	Whiskered/ Brandt's bat	Natterer's bat	Long-eared bat	Barbastelle
28/04/08*	81	6	48	23		1		4		4	1	
19/05/08*	166	8	82	58	2	1	0	8	1	0	5	1
20/05/08	140	7	38	78	5	1	0	1	0	0	3	4
18/06/08	49	6	30	15	1	0	1	1	0	0	0	1
24/07/08	98	4	50	42	0	4	0	2	0	0	0	0
11/08/08	116	6	52	49	1	1	0	3	0	0	0	5

* These transect results include calls recorded from Batbox Duet detectors and were analysed using BatSound software. The number of bat passes (totals and for each species) are listed, instead of number of Anabat sound files.

Four UK BAP bat species, noctule, brown long-eared, soprano pipistrelle and barbastelle (which is also on Annex 2 of the Habitats Directive) were recorded in 2008.

Noctule bats were recorded at Upper Abbey Farm, on the track from Upper Abbey Farm to Fiscal Policy, and in Kenton Hills and Nursery Covert plantation woodland (see **Figure 7**). In May, they were recorded as early as 20:31hrs near Upper Abbey Farm, some 20 minutes before sunset.

Brown long-eared bats, which are known to roost at Upper Abbey Farm, were recorded on the track between Upper Abbey Farm and Fiscal Policy and throughout the plantation woodlands.

Barbastelle bats were recorded in May, June and August 2008 (see **Figures 2** and **3**). Barbastelle were recorded on the track between Upper Abbey Farm and Fiscal Policy, at Leiston Carr, on the footpath to the south of Goose Hill and (a single recording) within the preliminary works area. The earliest recording after sunset of a barbastelle bat was on the 18th June 2008, when a bat was recorded 71 minutes after sunset at the junction between the track from Upper Abbey Farm and the access track through the plantation woodland. The first recording of barbastelle on the 20th May was at 21:47hrs, 91 minutes after sunset, over the coastal dune vegetation within the preliminary works area. In August, the first recorded barbastelle was 88 minutes after sunset. The location and 'sunset code' for all barbastelle bat passes recorded during transect surveys and with datalogger bat detectors are shown on **Figure 11**.

Common and soprano pipistrelle bats were recorded on every visit between April and August 2008 and occurred in most of the study area. Common pipistrelle was the most numerous species. High levels of soprano pipistelle activity were recorded on the access track along the northern edge of Nursery Covert. Serotine were recorded from the footpath that passes through the southern part of the plantation woodland at Goose Hill. Myotis species were recorded along the track from Upper Abbey Farm, and in the plantation woodland south of Goose Hill. Natterer's bats were recorded and seen foraging along the track in the vicinity of Upper Abbey Barn on the 28th April, when four bats were noted flying together.

Automated Datalogger Bat Detectors

The period of monitoring, location of each datalogger and a summary of the species recorded are displayed on **Figure 12.**

Table 7 provides a summary of the bat species recorded by each of the dataloggers. The datalogger label corresponds to the label given to each datalogger on **Figure 12**.

Table 7 Summary of Species Recorded by Dataloggers

Datalogger label on Figure 4	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**Total**
Species																		
Barbastelle	2				2						3				1			9
Serotine							3								1			4
Whiskered/Brandt's bat					1										7		2	10
Myotis species	2			2	4		1		3						7	7	3	29
Leisler's bat											2							2
Noctule	2	1	1	2		3	3	7			22	7			3	1	2	54
Common pipistrelle	39	5	5	85	111		13	1	226	96	78	1	55	12	629	24	36	1416
Soprano pipistrelle	29	10		23	50		115	3	19	93	22	3	41	2	825	18	17	1270
Pipistrelle species	5	1		36	11				22	1	3			2	78			159
Long-eared bat	1	1	1	1	3	1	2		5		1			7	3	2		268
Unidentified			1	4	4		3	4	1	7	21	4			8	13		70
Total	**81**	**18**	**8**	**151**	**187**	**4**	**137**	**15**	**276**	**197**	**156**	**15**	**96**	**23**	**1562**			**2926**

Barbastelle bats were recorded on dataloggers in May, June and August 2008. The results are as follows:

- Datalogger 2 - recorded a barbastelle bat at 03:37hrs on the 12th May. This is at the junction between the track from Upper Abbey Farm and the access track through the plantation woodland. This is 95 minutes before sunrise.
- Datalogger 5 - recorded barbastelles at 22:05hrs, 44 minutes after sunset, and then again at 01:41hrs on the footpath through the plantation woodland south of Goose Hill on the 20th May.
- Datalogger 11 – recorded barbastelles on the 22nd and 26th June. The bats were recorded at 22:22hrs on the 22nd June, and 22:14 hrs and 00:08hrs on the 26th June. The first calls on each evening were between 53 and 61 minutes after sunset.
- Datalogger 1 – near the turf pits recorded two barbastelle calls 30 minutes apart, one at 22:07hrs and the second at 22:37hrs, on the 11 August. These calls were 96 and 126 minutes after sunset, respectively.

3.2.3 Summary of weather conditions and breeding success of bats in 2008

2008 began with slightly above average temperatures. Spring was wet, with May having above average temperatures. There was heavy rainfall in August, and this could adversely affect the development of juvenile bats born in 2008. The breeding success of some species of bats has been attributed to poor weather conditions in 2008. Surveys of 47 target woodlands for the Bat Conservation Trust's Bechstein's Bat Project found that colonies dispersed before most of the bats gave birth. Observations from Bechstein's bat populations in Sussex that are part of a long-term monitoring programme found only an estimated 20% of females with reproductive capacity actually continued the pregnancy on to parturition (www.bats.org.uk).

3.3 Evaluation

3.3.1 Revision of the Preliminary Evaluation of the Importance of the Survey Area to Bat Populations

This section revises the preliminary evaluation of the importance of the bat assemblage undertaken in 2007. The evaluation of resources has been conducted in accordance with IEEM EcIA guidance (see Section 2.5 Evaluation Methodology). For the purpose of clarity, the revised evaluation follows the same arrangement for dividing the study area into sectors for evaluation that is presented in the 2007 bat survey report (Entec doc ref 19801cb114). These are:

- Goose Hill plantation, north of the east–west access track;
- The corridor of the east-west access track from Fiscal Policy to the preliminary works area;
- Kenton Hills and Nursery Covert south of the existing east-west access track which runs from Fiscal Policy in a Northeast direction towards Goose Hill;
- The preliminary works area.

It was not considered necessary to survey the north-south tree line north of Nursery Covert in 2008 because this feature was not found to be used extensively by bats in 2007.

3.3.2 Goose Hill and Surrounding Afforested Areas

Transect routes in 2008 did not sample the Goose Hill as extensively as in 2007. However, transect routes that pass through the southern section of the plantation woodland recorded regular barbastelle bat activity along the wide open ride and footpath leading towards the preliminary works area. Soprano pipistrelle bats forage along the ride, with high levels of activity being recorded near the turf pits. Large bats (*Nyctalus* sp.) were also recorded on two occasions. Barbastelle bats were recorded commuting along the corridor of the east-west access track from Fiscal Policy to the preliminary works area in 2007 and it now appears that they also use rides through Goose Hill plantation between the access track and the coastline.

Goose Hill and surrounding afforested areas is a large plantation woodland comprising mainly Corsican pine *Pinus nigra* ssp. *laricio* and Scots pine *P. sylvestris* of uniform age (NVC report, Entec doc ref 19801cb145). Goose Hill accounts for approximately 53ha of the 85.34ha of dry coniferous woodland within the study area. The trees are planted on heathland where the underlying soil is sandy and free draining (NVC report, Entec doc ref 19801cb145). Plantation coniferous woodland accounts for the majority of the woodland in the locality of Sizewell. The bulk of the plantation woodland in the Suffolk Coast and Heaths Natural Area is concentrated in large blocks, those being Dunwich Forest and Aldewood Forest (English Nature, 1997), but there are small plantations in privated ownership scattered throughout the Natural Area The plantation was established to partially screen the built nuclear plant (a planning condition), although there is small scale commercial felling and restocking and management objectives with respect to public recreation and nature conservation (Alan Miller pers. comm.). The majority of medieval parks and wood pasture in Suffolk are on clay. Ancient woodlands of the Suffolk Coast and Heaths Natural Area are located mostly in the parishes of Sudbourne, Wantisden, Rendlesham and Iken (English Nature, 1997). A search on MAGIC, the government's interactive countryside information system (www.magic.gov.uk), revealed that there are no ancient and semi-natural or ancient replanted woodland sites within 5km of the preliminary works area. Therefore, plantations are the only significant woodland habitat available to bats.

Rides through Goose Hill and surrounding afforested areas appear to provide important commuting routes for bats. Although large areas of the plantation do not appear to be favoured by bats, the size of the woodland is considered important because it allows bats to move to new areas when existing foraging and commuting habitats are lost, for a example, as a result of woodland management operations. This is particularly important in woodlands such as Goose Hill where areas are periodically clear felled and restocked.

The wide rides with short woody vegetation (such as that along the southern boundary of Leiston Carr, Kenton Hills and Nursery Covert) are likely to be of greatest value for bats because gradual vegetation transition of the glade provides a wide range of invertebrate habitats (Kirby, 1992). Flying insects congregate in sheltered areas along the ride providing favourable foraging habitats for bats.

Taking into account the presence of the nationally rare barbastelle bat and the possible presence of noctules (a UK BAP species) this sector of the survey area is regarded as being of county value to bats.

3.3.3 Corridor of East-West Access Track

This permissive footpath, which runs from Fiscal Policy, along the north side of Kenton Hills and the southern edge of Goose Hill to the preliminary works area was found to support the highest levels of bat activity in 2008. Fewer species were recorded than in 2007, but barbastelle, brown long-eared, soprano pipistrelle and common pipistrelle bats were noted along

the track. Soprano pipistrelle were recorded on every visit and foraged constantly in areas with deciduous trees. Other species of bat noted along the access track during the 2007 surveys were recorded in nearby habitats, confirming their continued presence. The habitat structure and character of the access track has not changed since the surveys in 2007. There remains a variety of adjacent habitats and a vegetative diversity that is likely to support a high insect biomass. Therefore, it is considered that this sector remains of county value for bats.

3.3.4 Kenton Hill and Nursery Covert

Five species of bat, including the four UK BAP species (barbastelle, noctule, soprano pipistrelle and brown long-eared bats) known to occur in the study area, were recorded in Kenton Hill and Nursery Covert plantation woodland. The southern edge of the woodland that fringes Sizewell Belts grazing marsh attracts high levels of bat activity. The character and diversity of the habitat has not changed since the bat surveys in 2007. Therefore, it is considered that this sector remains of county value for bats.

3.3.5 Preliminary Works Area

A barbastelle and a noctule were recorded over the preliminary works area on the 20th May 2008. These are the first recordings of the barbastelle and noctule in this area. Surveys in 2007 recorded two bat species, the common and soprano pipistrelle. Levels of bat activity within the preliminary works area in 2007 and 2008 were consistently very low with only occasional bat passes being recorded.

Barbastelle bats from the colony at Paston Barn, Norfolk are known to use productive coastal habitats along sheltered coastal cliffs at Mundesley (Sizer, 2002). It is possible that barbastelles at Sizewell are using the coastline in a similar way. The area within the preliminary works area is made ground and comprises shrub, tree stock and areas of rough grassland (NVC report, Entec doc ref 19801cb145). It is therefore questionable how valuable the area is as a foraging resource for bats. There is no evidence that any bat species forages over the site for a substantial amount of time, although tall vegetation such as continuous lines of scrub may offer cover for commuting bats . However, taken together the 2007 and 2008 surveys have identified three UK BAP species, including the nationally rare barbastelle. The preliminary works area is therefore considered to be of site / local value.

3.4 Evaluation of Roosts in Buildings

3.4.1 Upper Abbey Farm

One or two common pipistrelle and brown long-eared bats, and four to five Natterer's bats were recorded roosting in Upper Abbey Barn in 2008. Accumulations of droppings indicate these species have occupied roosts in the barn in previous years. The Suffolk Bat Group monitors the barn and has recorded barbastelle bats in the barn in previous years. Daytime roost inspections, dawn and dusk surveys and monitoring with Anabat dataloggers did not find any evidence to suggest barbastelle bats have occupied the barn in 2008. Whilst the survey work in 2008 cannot discount the possibility that barbastelles roost in the barn on an occasional basis, the barn does not appear to be used by a maternity colony. Barbastelles will return to a favoured area to breed (as will other bat species). Females will change roost frequently even once the maternity colony has formed, but when roosting in buildings they will seek a variety of roost sites within the buildings that meet specific roost requirements. Similar behaviour has been recorded with barbastelles that roost in trees in woodland. Research on a colony in a woodland in Sussex has shown the group rarely moves more than 150m and frequently moves to roosts no more than a few metres away (Greenaway, 2001). Therefore, if barbastelles were breeding at Upper Abbey

Farm it would be expected that frequent recordings would have been made throughout the breeding season from May to August.

The roosts at Upper Abbey Farm currently support a low number of species that are widespread and common in southern Britain and the roosts are considered to be of local value. The large tithe barn is also known to have supported low numbers of barbastelle bats, which is probably due to the variety of roosting opportunities in the building. Tithe barns, particularly ones that are still used for agricultural purposes, and can offer a variety of roosting opportunities and accommodate species such as barbastelle bats are uncommon in the district. Upper Abbey Barn is therefore considered to be of at least district value.

4. Conclusions

4.1 Baseline Data

Habitats within the study area for the proposed footprint of the new power station at Sizewell have been surveyed for bats over a two year period. Frequency division bat detectors were used in both years. The surveys in 2008 followed survey methods used in 2007, but also used Anabats as dataloggers to monitor habitats and roosts for the periods between site visits. The results of the 2008 bat activity surveys for species assemblages and levels of bat activity were consistent with those recorded in 2007. This is clearly illustrated by comparing the number of bat passes per species for 2008 in **Table 6**, to the number of bat passes per species for 2007, shown in Appendix C. The use of the site by bats has probably not changed significantly because the character of the study area and habitats has not altered. The consistency of the results between 2007 and 2008 allows the evaluation of habitats for bats within the survey areas to be carried out with a greater level of confidence than a single year's survey data would have given (see Section 4.1).

4.2 Assessment of Habitats for Bats within the Study Area

The landscape and habitats within the study area are typical of those found in the parishes of Leiston and Aldringham Cum Thorpe, in which Sizewell is situated. Large swathes of land have been turned over to arable production. There are also some areas of grazing marsh and pasture. Plantation woodlands are the most frequent woodland habitat and are therefore likely to be important for local bat populations such as barbastelles whose key foraging habitats include scrub and woodland rides.

Goose Hill and surrounding afforested areas dominate the study area. The rides and glades through the woodland are considered to be the most important habitats within the woodland because they support the greatest diversity of invertebrate habitats. The open area at the intersection of the ride network near the turf pits, an area identified as supporting high levels of bat activity, proved to be species-rich in terms of rare and uncommon invertebrate species when sampled in 2007 for the Invertebrate Survey Report, 2007 (Entec doc ref 19801cb183). Goose Hill and surrounding afforested areas are dominated by Corsican pine (around 50 years old), but deciduous trees and scrub create a diverse woodland edge around the periphery of the pine plantation, which attracts foraging and commuting for bats. The following areas are considered to be key areas for bats in the study area:

- The corridor of the east-west permissive footpath: the variety of adjacent habitats along the corridor of the east-west track, by virtue of their vegetative diversity and

likely consequent invertebrate diversity, have been shown by the surveys in 2007 and 2008 to support the greatest numbers of bat species and highest levels of activity, especially along the eastern half of the track. The lower levels of bat activity on the western end of the track is likely to be a consequence, in part, of the lower vegetative diversity

- The southern margins of Kenton Hill Nursery Covert have mature deciduous trees and are adjacent to grazing marsh. The woodland edge has similar qualities to the east-west permissive footpath. The wet grassland over Sizewell Marshes SSSI and the watercourse of the dyke system make ideal foraging habitats for barbastelle bats because they support a high diversity and abundance of micro-moths, the major prey of barbastelles. The southern edge of the plantation woodland is likely to benefit from the drift of insects from the adjacent fields of Sizewell Marshes.
- Footpaths through the southern section of Kenton Hills and Nursery Covert linked to the east-west permissive footpath provide a series of flight paths through the woodland. Several barbastelle records were obtained here in 2008.

The value of the preliminary works area has been revised from negligible to site value because of records of barbastelle and noctule bats from within the area. The presence of these species was discovered from sound files recorded during a walked transect. The bats were not observed in the field, so no additional information to determine the type of behaviour being displayed, or the exact location of the bat, is available. Further sampling of the preliminary works area (and the coastline) may be necessary to further refine the value and establish in greater detail how bats are using the area.

4.3 Status of Barbastelle within the Study Area

Upper Abbey Barn does not appear to be occupied by barbastelle bats on a regular basis. Natterer's bats, brown long-eared bats and pipistrelle bats regularly roost in the barn in small numbers. The absence of frequent use by barbastelle bats in the months between May and August suggest that they are not breeding in the barn. No other buildings within 6km of the study area have been identified as suitable breeding sites for barbastelle. As with most species of bat, males will shelter in roosts with less favourable environmental conditions than females because they do not have the same energetic demands or thermoregulatory requirements. It is possible that the barbastelle roost in Upper Abbey Barn supports male bats. Males will visit a series of scattered roost sites, sometimes forming loose associations with other males. These groups of males seem to be located some distance from female nursery roosts (Greenaway, 2004). This may account for the presence of barbastelle bats without the presence of a nursery colony, or evidence of a suitable roost site for a maternity colony.

The plantation woodland in the study area is unlikely to have a sufficient number and diversity of tree roosting opportunities required to support a maternity colony of barbastelles. Unlike most species, barbastelles utilise storm cracks, narrow splits and loose bark (Greenaway, 2001); vertical v-shaped splits are a typical feature that they will select. These features have less favourable microclimates than deep holes and crevices selected by other species of bats and consequently the local microclimate of the woodland has greater importance. Roosts therefore tend to be at least 25m from the woodland edge (Greenaway, 2001). The interior of the plantation is dominated by pine trees that are approximately 50 years old. Damage to these trees (which could provide roosting opportunities) is scarce, probably because of the commercial management practices in the woodland, protection from strong winds by the dense

woodland planting and the young age of the trees. Many of the trees identified as having potential bat roosts are deciduous trees that are at the edge of the woodland and therefore unlikely to have a suitable microclimate.

Ancient oak woods and wood pastures, a favoured habitat of barbastelle bats, are located mainly in southern parishes in Suffolk (Iken, Wantisden, Rendlesham and Sudbourne). These habitats have the potential to support a breeding colony of barbastelle bats. Bats from these southern parishes would have to commute at least 7km to reach the study area. This area is the nearest location to Sizewell with the potential to support a barbastelle colony that was identified by desk study. Barbastelle bats at Snape Maltings (grid reference TM 392574) have been observed flying directly towards the estuary (Dr Peter Shepherd, pers. comm.). They could then fly the 6-7km up the coastline. Although barbastelle bats can travel up to 16-18km in a night, females in maternity colonies tend to have smaller ranges, typically around 6-8km from the colony core (where the roosts are located). Frank Greenaway (a leading expert on the species) likens the arrangement of flightlines of the colony studied in Sussex as resembling tall, branching trees with several bats sharing the path along the trunk and major limbs, but separating off into smaller branches, each of which ends in a discrete individual foraging area. High quality foraging areas closest to the roost are usually shared between the colony members and may seasonally be left clear by adults as exclusive juvenile foraging zones (Greenaway, 2004). Juvenile bats are not able to fly the long distances covered by adults and most colonies seem to have one large productive foraging zone very close to the core area of the breeding colony.

Male bats will forage in a wide range of woodland types, including dry woodland such as that found in the study area. Females require habitats that support higher insect biomasses, especially habitats that are productive in micro-lepidoptera, the major prey of barbastell[9] . Pregnant females must forage all night in productive habitats. Established, unfertilized wet grassland meadows such as Sizewell Belts fulfil this requirement because they are highly productive invertebrate habitats. Barbastelle bats primarily catch their prey on the wing (Altringham, 2003). Sheltered areas in productive habitats, such as the boundary between Kenton Hill Nursery Covert plantation and Sizewell Belts, are likely to attract aggregations of flying insects, which increases insect availability for bats. The availability of good quality foraging habitat near the study area may thus attract both male and female barbastelle bats to feed. It is considered unlikely that females with dependent juveniles are foraging within the study area or over Sizewell belts because these habitats do not appear to be close enough to a breeding roost, although this does depend on the availability of good quality foraging in the area around the maternity roost sites.

The number of survey records of barbastelle bats from the study area supports the theory that the plantation woodland is not a core foraging area for a maternity colony. Females are thought to defend areas of woodland, typically hundreds of metres square, that have productive invertebrate habitats and prey availability to allow juveniles to feed (Sandie Sowler pers comm.). Low numbers of bat were recorded in 2007 and 2008: 13 records were obtained in 2007 and 20 records (9 of which were from dataloggers) in 2008. If females with juveniles were using the woodland, higher numbers of records would have been expected. In addition, records of barbastelle within the study area in 2008 were picked up more than 70 minutes after sunset. This is 10-20 minutes after barbastelles tend to emerge from their roost; bats could cover several kilometres in this time. Earlier records of barbastelle on the southern edge of

[9] Barbastelle are moth specialists and micro-lepidoptera account for over 90% of their diet

Kenton Hills Nursery Covert from surveys in 2007, between 20-40 minutes after sunset, could be males that are roosting nearby, such as at the roost in Upper Abbey Barn. However, foraging barbastelles are spread very thinly across the landscape (Greenaway, 2004). Both male and female bats fly rapidly, even when foraging, and travel in a single direction moving on to new areas. The result of this foraging strategy is that relatively low numbers of bat passes tend to be recorded by bat detectors, even in productive foraging habitats. Consequently, it is difficult to determine with any confidence from bat detector surveys alone the importance of a habitat as a feeding area for barbastelles. The only way of determining if breeding females are feeding or commuting in the woodland is to catch individual bats from known flightlines and determine their sex and reproductive status in the hand.

It is currently unclear how barbastelle bats are reaching the study area. Monitoring of hedgerows and woodland edges in 2008 failed to identify new commuting routes. A single barbastelle pass was recorded near the coastline within the preliminary works area, suggesting they may commute along the coast, but it cannot be concluded with any certainty that this is a flight path at this juncture. The value of the commuting route along the east-west permissive footpath from Fiscal Policy to the preliminary works area is dependent on whether breeding females are using the route or whether it is predominantly males.

4.4 Potential Impacts

The protection afforded to bats and their roosts under the Conservation (Natural Habitats & c.) Regulations 1994 (as amended 2009), may include key seasonal flightlines and flightlines between breeding sites and core foraging areas of species including barbastelle.

The assessment of the potential impacts on Goose Hill and surrounding afforested areas and the east-west permissive footpath from Fiscal Policy to the preliminary works area in the 2007 Bat Survey Report ((Entec doc ref 19801cb114) is considered relevant to this report. That is:

- Use of Goose Hill for location of site compounds

  Goose Hill and surrounding afforested areas is considered of county importance to bats, largely because of the use of its rides and edges by commuting and feeding barbastelle, noctule and serotine as well as two pipistrelle species. Depending on how the site compounds are located within the forest, the proposals may have a significant effect on bat populations and environmental measures to address these effects would therefore be required. Barbastelle bats are very faithful to their commuting routes. Anecdotal evidence from radio tracking studies by Matt Zeale at Bristol University has demonstrated this by tracking a single individual using the same commuting route on subsequent years (Matt Zeale, *pers. comm.*).

- Widening of parts of the east-west permissive footpath from Fiscal Policy to the preliminary works area

  The east-west permissive footpath has been valued at the county level, because of the presence of nine bat species (of the twelve bat species known to occur in Suffolk). Most of these species were recorded as commuting and foraging along this track and most of the high potential roost trees are adjacent to it. Any development that might degrade or reduce the value of this 'corridor', could significantly affect bat populations of importance at county level. The loss of this corridor may disrupt an important commuting route for barbastelle bats.

- Lighting the proposed access track to the preliminary works area

Several bat species, including barbastelles, avoid lit areas, therefore lighting associated with the proposed access route to the preliminary works area could deter bats from using the commuting routes through Goose Hill and surrounding afforested area. Breaks in commuting routes can delay the onset of foraging by bats, and might even prevent the use of important feeding areas. Male barbastelles are likely to adapt more easily to changes in flight paths than females because they do not have the energetic requirements associated with breeding. Breeding females need to forage all night in productive habitats (Greenaway, 2004). Therefore, the magnitude of the impact from the proposed access route will be greater if females are present.

- Removal of hedgerows for heathland creation

It is currently unknown if any of the hedgerows in the surrounding arable fields are bat flightlines. The level of impact from the removal of flightlines will depend on whether breeding females, in particular barbestelles, use them, because changes in the landscape that may delay them reaching core foraging areas may have a severe impact on their breeding success. If males alone are using the flightlines, the impact is considered to be far lower and the availability of existing alternative routes for the bats would need to be considered when assessing the impact. If alternative routes are available the impact is likely to be negligible to low (and mitigation may not be necessary). Mitigation would be required for the loss of flightlines used by breeding females and this is likely to require the provision of good quality foraging habitat for the bats.

5. Recommendations

The current survey work has enabled the survey area to be valued in terms of bat usage with some degree of confidence. The results of the survey are likely to remain valid, for the purpose of ecological impact assessment, for approximately two years.

5.1 Further Survey

The survey work has also established with a good degree of confidence that barbastelle bats are not breeding within the study area or close to the preliminary works area. The juxtaposition of the plantation woodland and Sizewell Belts grazing marsh provides productive foraging habitats for barbastelle bats and therefore may attract males and breeding females from colonies over 6-7km from the study area. Disruption to commuting routes, such as those Goose Hill and surrounding afforested areas, can cause dramatic alteration to the breeding success of barbastelle colonies. The value of the commuting routes and the level of impact on barbastelle bats from the loss or disruption to commuting routes is dependent on whether female bats are using it. Therefore, if the proposed access route to the preliminary works area follows the current alignment, it is considered necessary to determine whether the east-west permissive footpath is used by lactating/breeding female barbastelles. To establish this information with sufficient confidence for a robust EIA, a mist netting exercise to catch barbastelle bats and determine the sex of individuals is recommended. The mist netting exercise should be undertaken in late May and early June. Mist nets would be set up in three locations along the alignment of the proposed access track, in areas with the highest number of barbastelle records. Barbastelle bats are very adept at avoiding mist nets. To address this, an acoustic lure would be

used to attract bats into the net; this has proved successful in a number of studies, including those by Frank Greenaway and Matt Zeale.

The opportunity to continue monitoring the woodland rides and Upper Abbey Barn by extending the bat detector survey in 2009 is recommended. This would provide a third season of results, to support the current conclusions, especially given the poor weather conditions in 2007 and 2008. This is considered important for a species such as barbastelle that commute and forage over a wide area and continually move through the landscape all night. Their fast, directional flight means they can be easily missed. As already mentioned, barbastelles are good at avoiding mist nets and therefore successfully catching them in the mist net cannot be guaranteed in one survey season. The additional bat detector surveys will therefore provide supporting data for 2009 in the event bats are not caught by mist netting.

The requirement for further survey work in 2009 is dependent on the level of impact on Goose Hill and surrounding afforested areas. Further field survey work in this area is not considered necessary if the access track is re-aligned to avoid commuting routes used by barbastelles, and the Environmental Statement is submitted in the next two years.

If hedgerows are to be removed, such as for heathland creation, they should be monitored in 2009 to determine if they are barbastelle flightlines. Static Anabat dataloggers should be deployed on hedgerows to be removed to obtain data from April to August, the months when females are moving between breeding roosts and foraging areas.

It is recommended that local land owners within 15km of the study area are contacted to help confirm if there are any suitable buildings or woodland that could support a breeding colony of barbastelle. Dialogue with statutory and non-statutory consultees and the local bat group to exchange information and ideas to define the task should be maintained. A site visit may then be required to verify the information.

5.2 Mitigation and Enhancement

The extent of mitigation required for the loss of foraging and commuting routes depends on whether they are used by breeding female bats. If only males are present, providing alternative commuting routes to direct bats around the preliminary works area and over the access track will be appropriate. This can be achieved by planting new hedgerows, or providing some other type of linear landscape feature that will provide cover for them as they fly. If female barbastelle bats are present, maintaining connectivity in the landscape alone is unlikely to be adequate. Females require flightlines that they can feed along, allowing them to forage throughout the night as they move towards core foraging areas. An appropriate package of measures to create habitats that both support a high biomass of insect prey and connect existing foraging habitats would need to be determined through consultation with national experts and Natural England.

The proposed access road will almost certainly be lit, although the specification for the lighting is not known. Barbastelle bats, and other species, generally avoid lit areas. Therefore the road may act as a barrier and could delay bats trying to reach foraging areas. Unlit crossing points may therefore be required to prevent habitat fragmentation. These crossing point are likely to need to be approximately 10m wide.

It is likely that heathland creation on arable land will be part of the environmental management plan at the site. This will necessitate the removal of hedgerows, which may have an impact on the availability of flightlines for bats including barbastelles. Providing alternative flightlines

may therefore be necessary and research into the opportunities of providing features in the heathland, to satisfy the interests of both heathland creation and a landscape for bats, may be required. Barbastelle colonies in the New Forest, Hampshire occupy territories with large areas of heath and any studies/observations of these animals may provide useful information when considering habitat enhancement opportunities for barbastelles.

6. References

Altringham, J.D. (2003). *British Bats*. HarperCollins. London.

Bat Conservation Trust (2007). *Bat Surveys – Good practice guidelines*. Bat Conservation Trust. London

Bat Conservation Trust (2007). *The state of the UK's bats: National Bat Monitoring Programme Population Trends.* The Bat Conservation Trust.

English Nature (1997): *Natural Area 49: Suffolk Coast and Heaths.* English Nature. Peterborough

Entec UK Ltd. (2007). Report 19801cb114 *Sizewell Bat Survey Report 2007*. Unpublished.

Greenaway F. (2001). *The barbastelle in Britain.* British Wildlife. June 2001. pp 327-334.

Greenaway F. (2004). *Advice for the management of flightlines and foraging habitats of the barbastelle bat Barbastellus barbastellus*. English Nature Research Report 657.

Kirby P. (1992). *Habitat Management for Invertebrates: A practical handbook.* RSPB. Sandy

Mitchell-Jones, A.J. (2004). *Bat mitigation guidelines*. English Nature.

Richardson, P. (2000). *Distribution atlas of bats in Britain and Ireland 1980-1999*. Bat Conservation Trust.

Sizer J. (2002) An investigation into food habitats of the barbastelle bat *Barbastellus barbastellus* within the county of Norfolk. Unpublished

Stebbings R.E., Yalden D.W. and Herman J.S. (2007). *Which bat is it ? A guide to bat identification in Great Britain and Ireland.* 3rd Ed. The Mammal Society. Pp37-39

www.bats.org.uk

www.dartmoor–npa.gov.uk

www.defra.gov.uk

www.english-nature.org.uk

www.jncc.gov.uk

www.leistonabbey.co.uk

www.magic.gov.uk

Author:

[redacted]

Anton Kattan (Principal Ecologist, Baker Shepherd Gillespie)

Internal Reviewer:

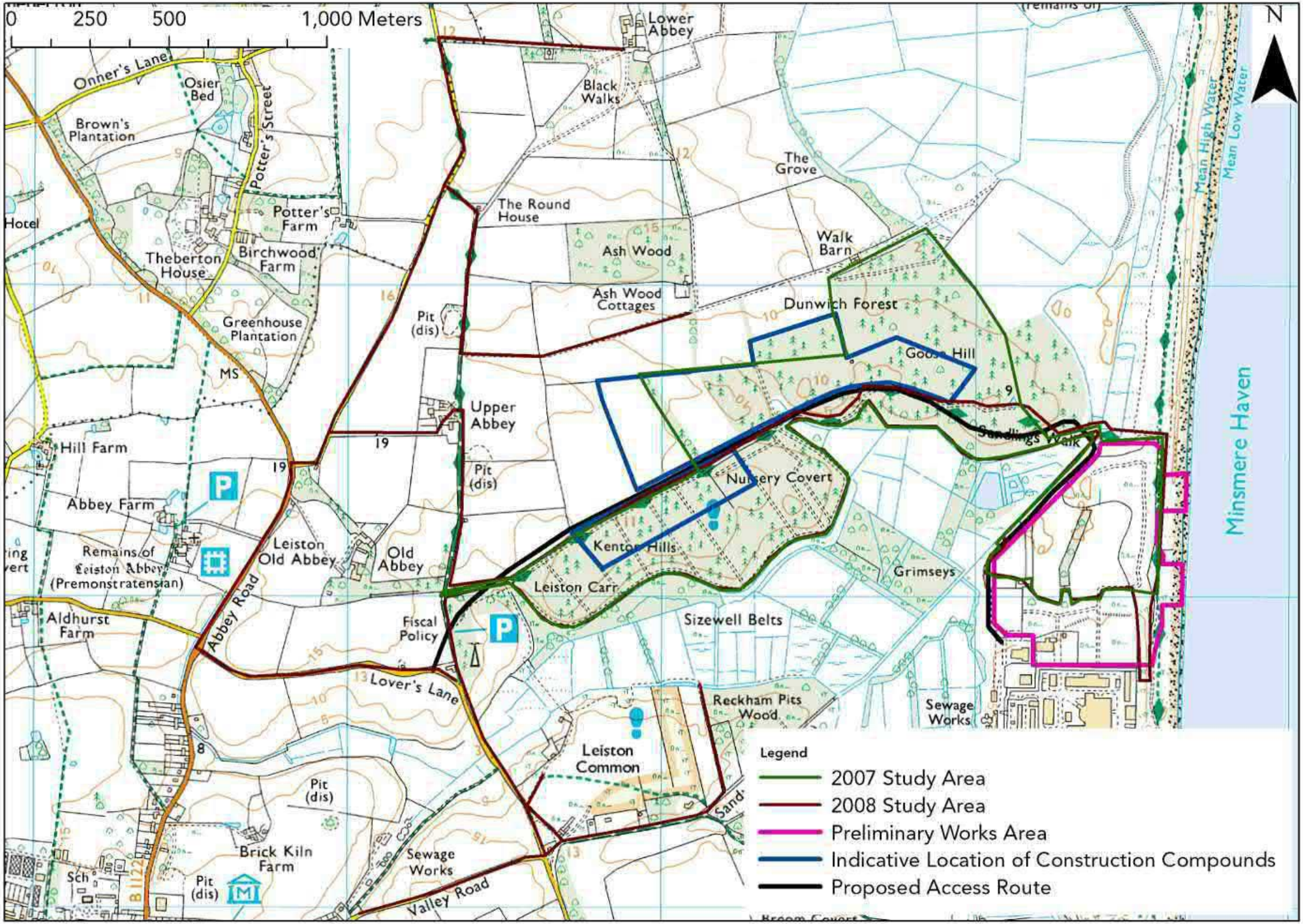
[redacted]

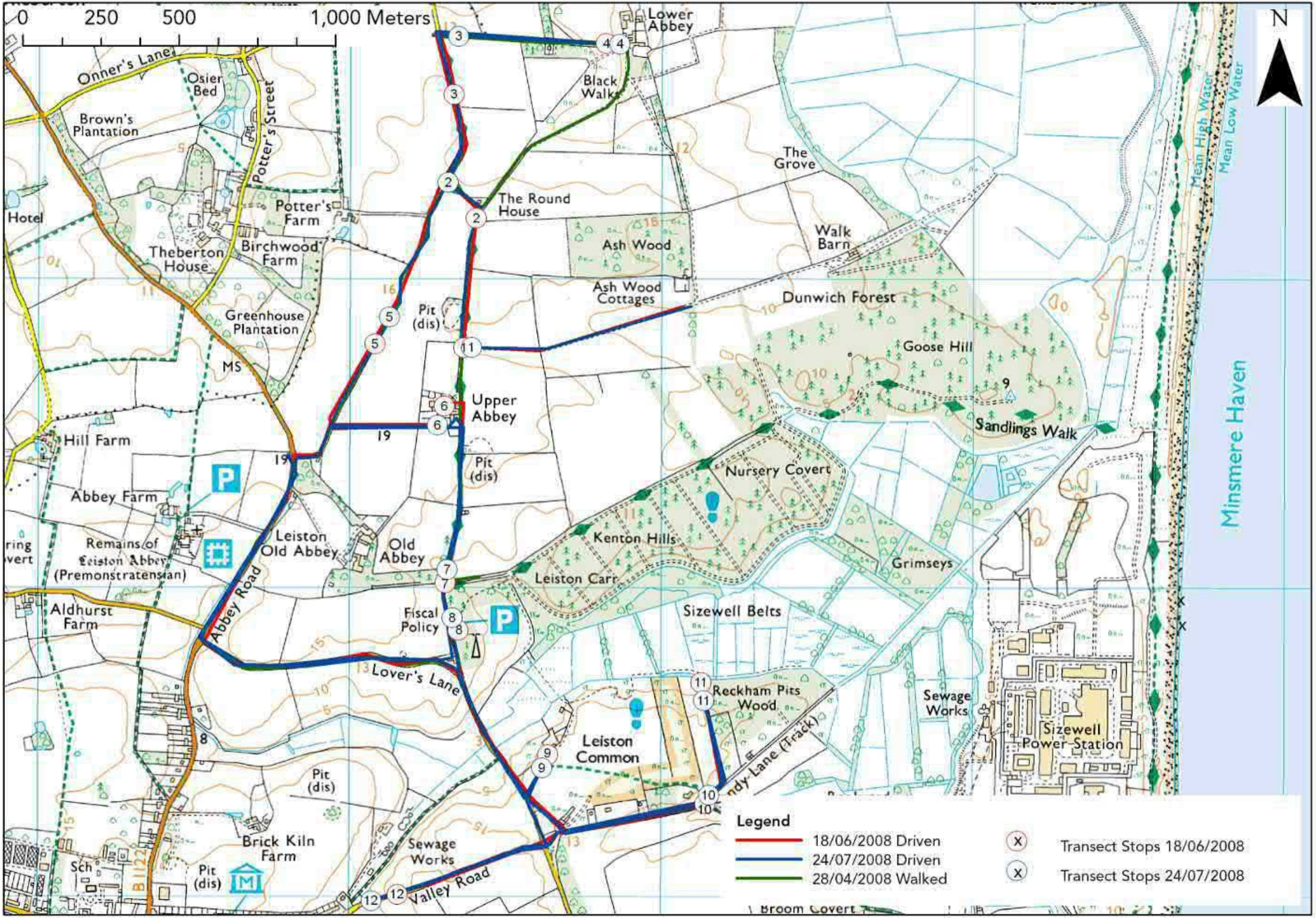
Peter Shepherd (Partner, Baker Shepherd Gillespie)

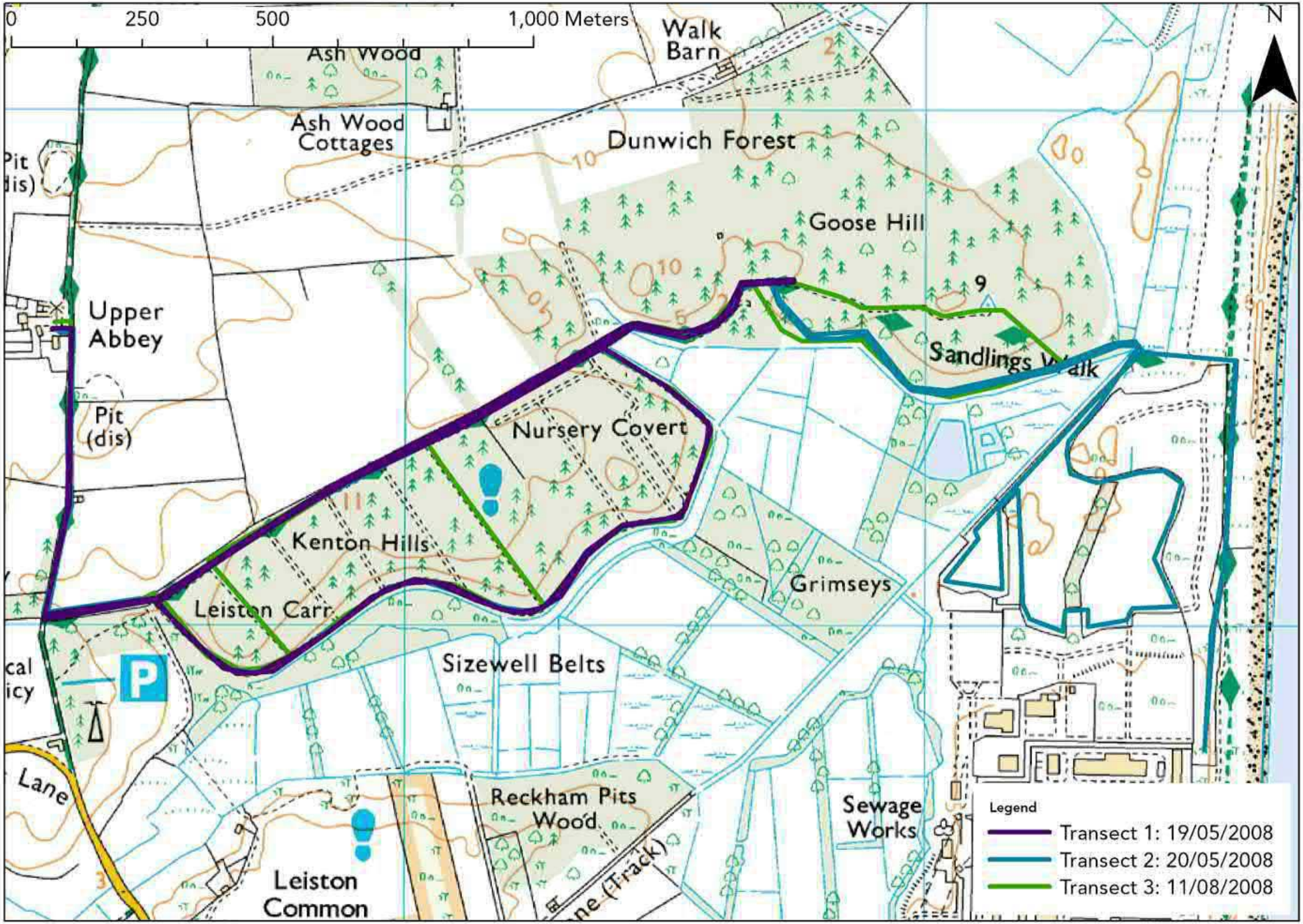
External Reviewer:

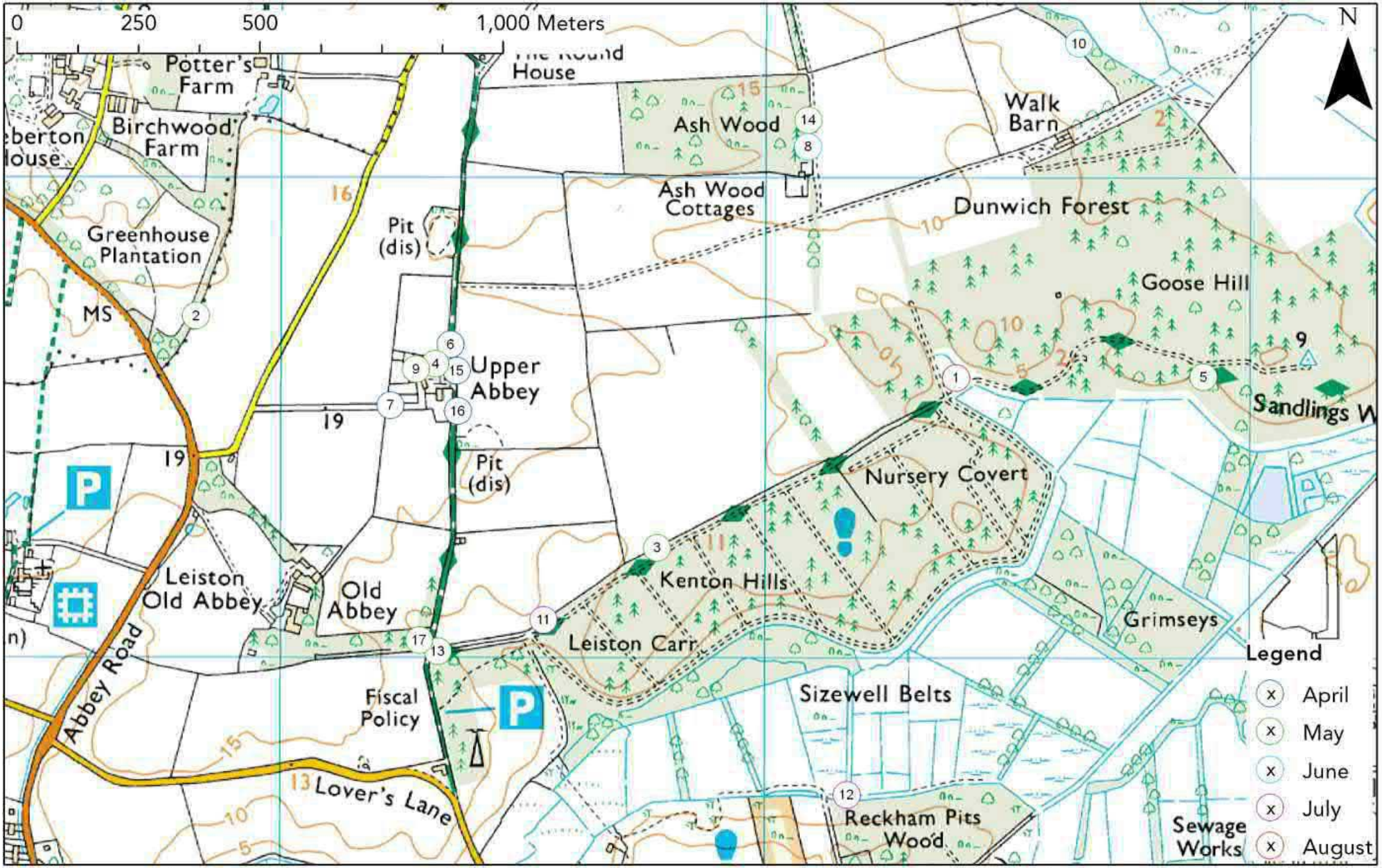
[redacted]

Lynn Whitfield (Senior Consultant, Entec UK Ltd)

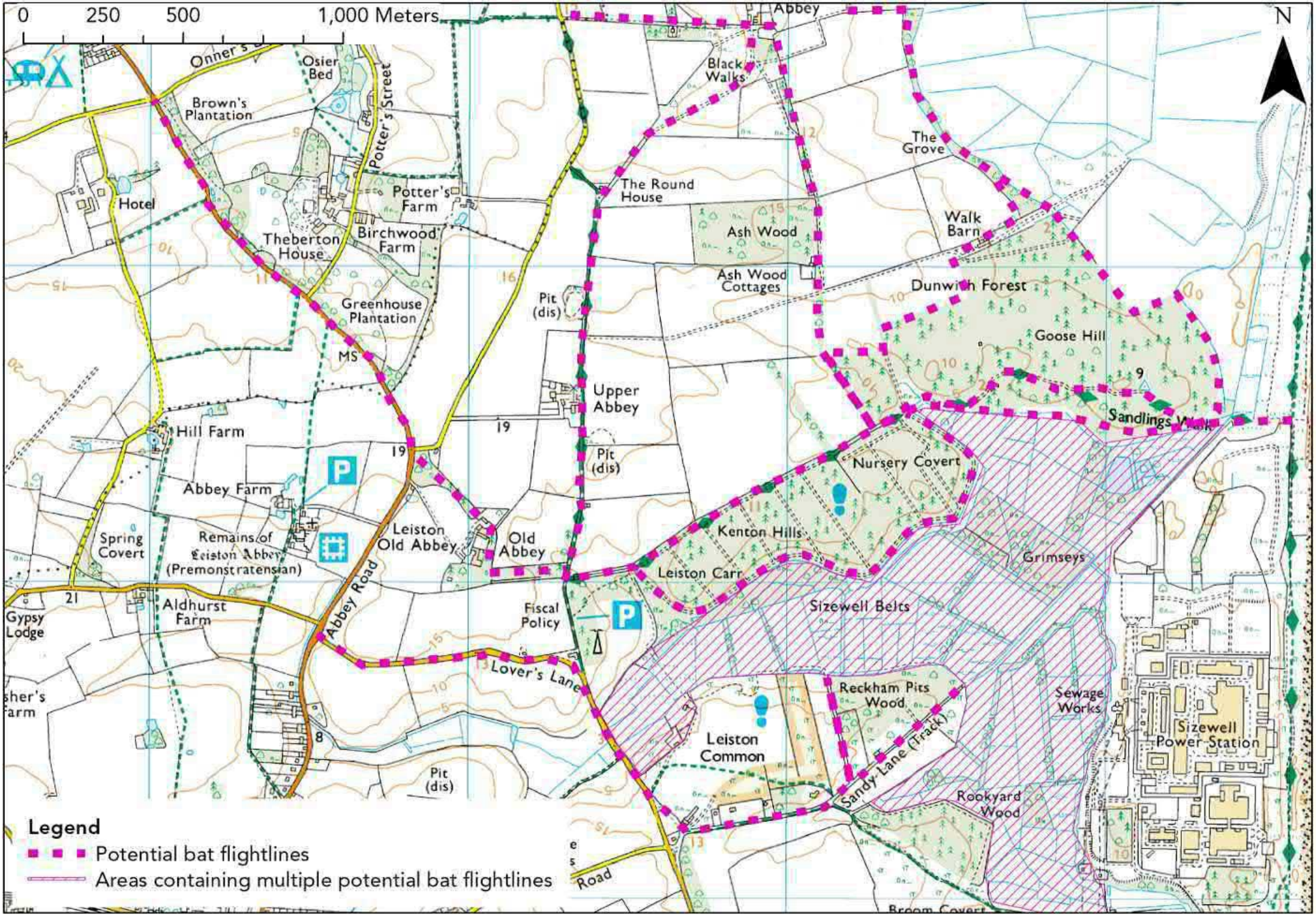

0
250
500
1,000 Meters
N
Onner's Lane
Osier Bed
Brown's Plantation
Potter's Street
Potter's Farm
Hotel
Theberton House
Birchwood Farm
Greenhouse Plantation
MS
Hill Farm
Abbey Farm
Remains of Leiston Abbey (Premonstratensian)
Leiston Old Abbey
Old Abbey
Abbey Road
Aldhurst Farm
Fiscal Policy
Lover's Lane
Brick Kiln Farm
Sch
Pit (dis)
Sewage Works
Valley Road
B1122
Lower Abbey
Black Walks
The Round House
The Grove
Walk Barn
Ash Wood
Ash Wood Cottages
Pit (dis)
Upper Abbey
Dunwich Forest
Good Hill
Sandlings Walk
Nursery Covert
Kenton Hills
Leiston Carr
Grimseys
Sizewell Belts
Reckham Pits Wood
Sewage Works
Leiston Common
Broom Covert
Mean High Water
Mean Low Water
Minsmere Haven
Legend
2007 Study Area
2008 Study Area
Preliminary Works Area
Indicative Location of Construction Compounds
Proposed Access Route

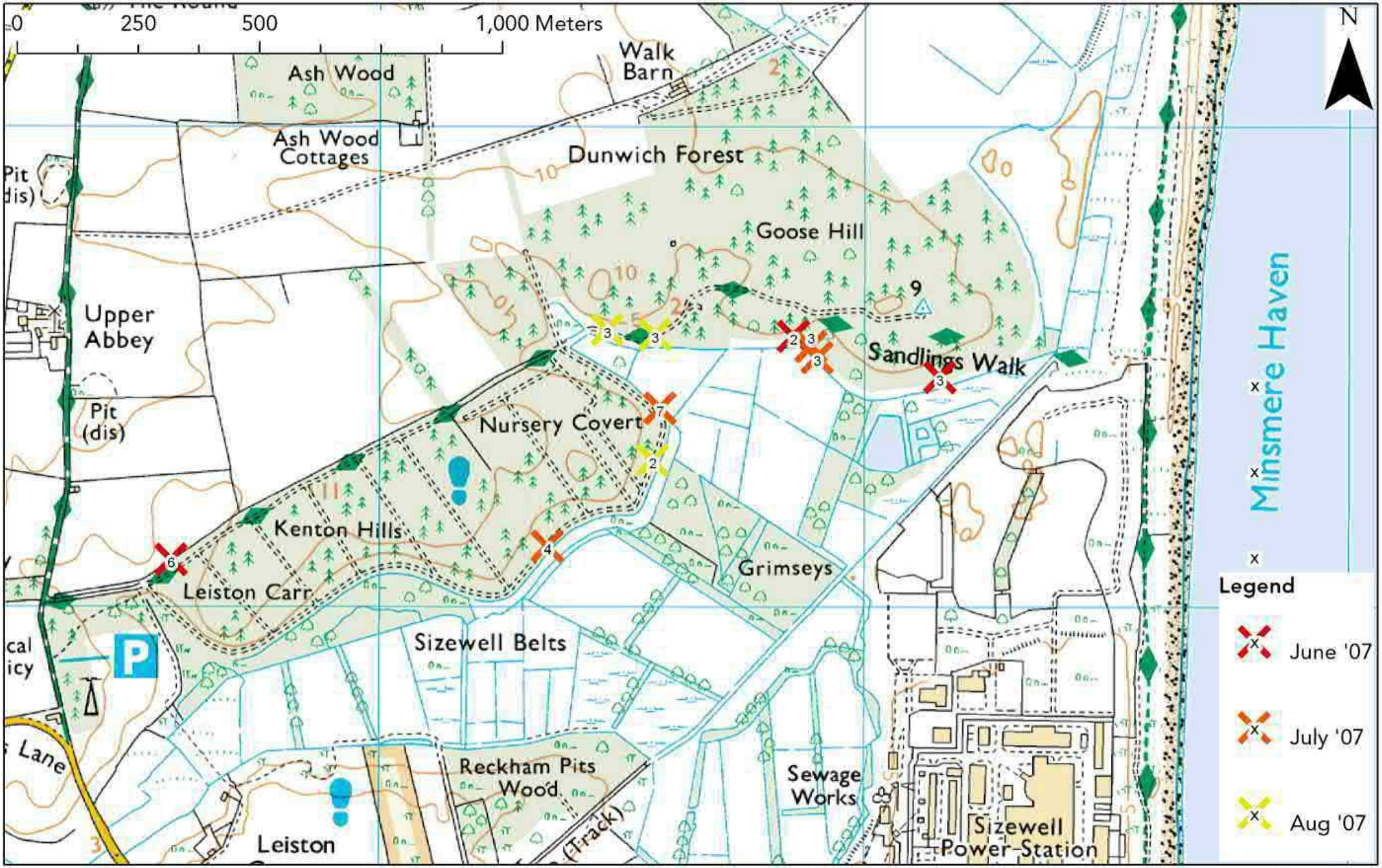

0 250 500 1,000 Meters
N
Onner's Lane
Osier Bed
Brown's Plantation
Potter's Street
Potter's Farm
Hotel
Theberton House
Birchwood Farm
Greenhouse Plantation
MS
Hill Farm
Abbey Farm
Remains of Leiston Abbey (Premonstratensian)
Leiston Old Abbey
Old Abbey
Aldhurst Farm
Abbey Road
Lover's Lane
Fiscal Policy
Pit (dis)
Upper Abbey
The Round House
Lower Abbey
Black Walk
Ash Wood
Ash Wood Cottages
The Grove
Walk Barn
Dunwich Forest
Goose Hill
Sandlings Walk
Nursery Covert
Kenton Hills
Leiston Carr
Grimseys
Sizewell Belts
Reckham Pits Wood
Leiston Common
Sewage Works
Sizewell Power Station
Minsmere Haven
Mean High Water
Mean Low Water
Brick Kiln Farm
Valley Road
Broom Covert
Legend
18/06/2008 Driven
24/07/2008 Driven
28/04/2008 Walked
Transect Stops 18/06/2008
Transect Stops 24/07/2008


0
250
500
1,000 Meters
N
Walk Barn
Ash Wood
Ash Wood Cottages
Dunwich Forest
Goose Hill
Upper Abbey
Pit (dis)
Nursery Covert
Kenton Hills
Leiston Carr
Grimseys
Sizewell Belts
Reckham Pits Wood
Sewage Works
Leiston Common
Sandlings Walk
Legend
Transect 1: 19/05/2008
Transect 2: 20/05/2008
Transect 3: 11/08/2008



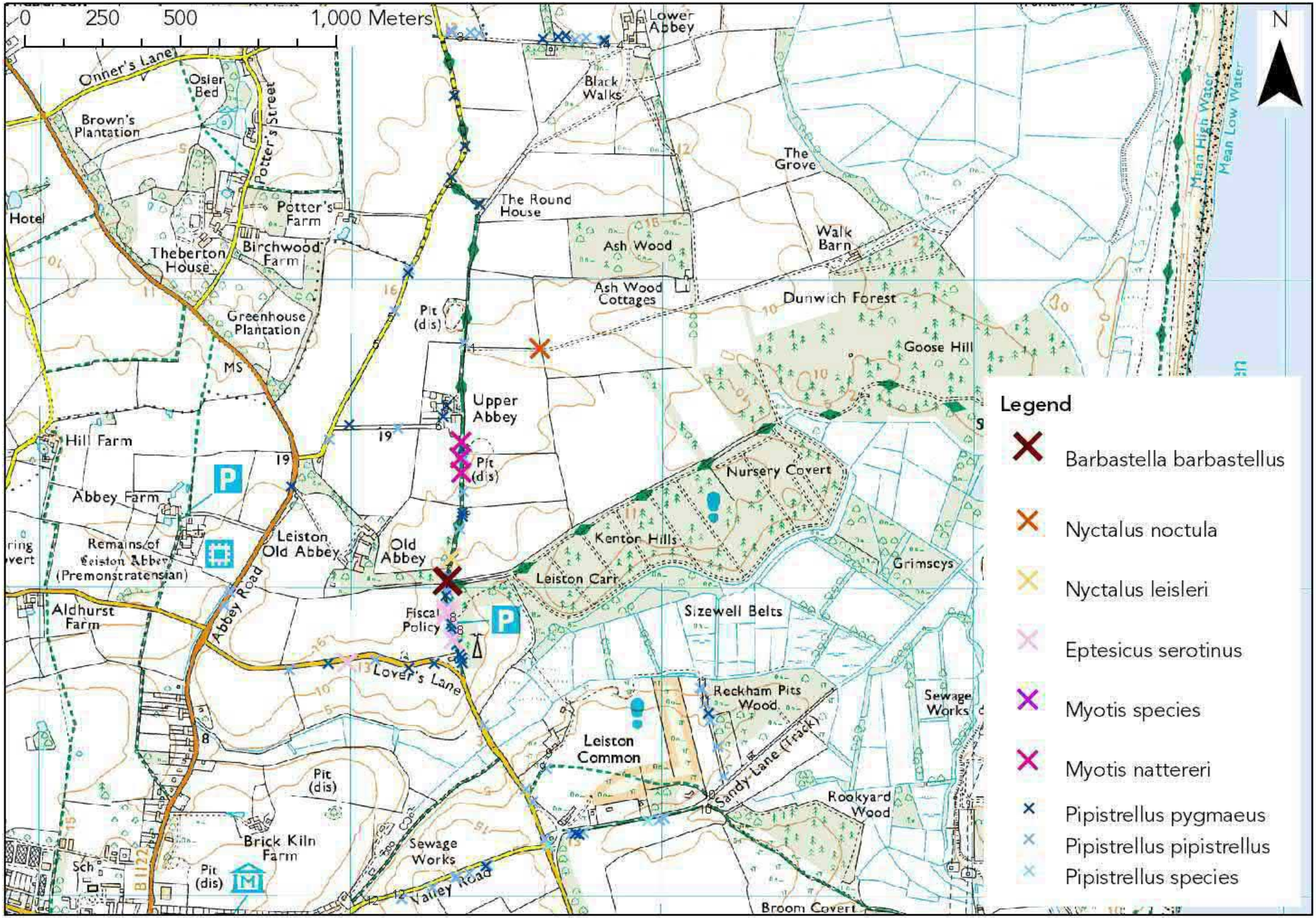
Month	April				May									June		July		Aug.
Static No.	6	7	15	16	3	4	5	2	9	13	14	18	17	8	10	11	12	1
No. of Nights	2	1	13	2	1	1	1	1	9	19	4	1	1	3	7	10	8	1

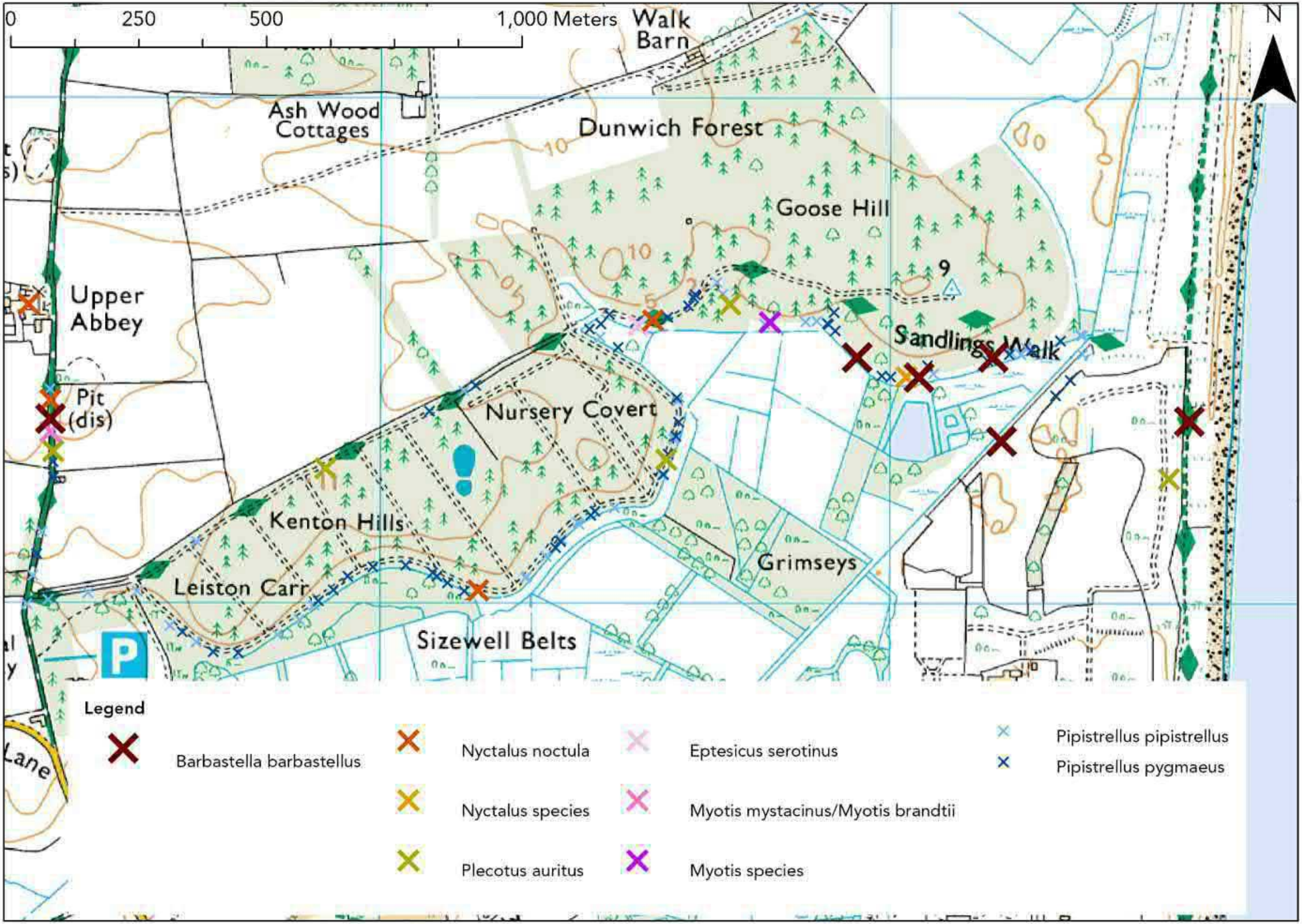

0
250
500
1,000 Meters
N
Onner's
Osier Bed
Brown's Plantation
Potter's Street
Hotel
Theberton House
Potter's Farm
Birchwood Farm
Greenhouse Plantation
MS
Hill Farm
Abbey Farm
Spring Covert
Remains of Leiston Abbey (Premonstratensian)
Leiston Old Abbey
Old Abbey
Abbey Road
Gypsy Lodge
Aldhurst Farm
Fiscal Policy
Lover's Lane
Pit (dis)
Upper Abbey
Pit (dis)
Pit (dis)
The Round House
Black Walks
Abbey
The Grove
Walk Barn
Ash Wood
Ash Wood Cottages
Dunwich Forest
Goose Hill
Sandlings Walk
Nursery Covert
Kenton Hills
Leiston Carr
Grimseys
Sizewell Belts
Reckham Pits Wood
Leiston Common
Sandy Lane (Track)
Rookyard Wood
Sewage Works
Sizewell Power Station
Broom Covert
Road
Legend
Potential bat flightlines
Areas containing multiple potential bat flightlines

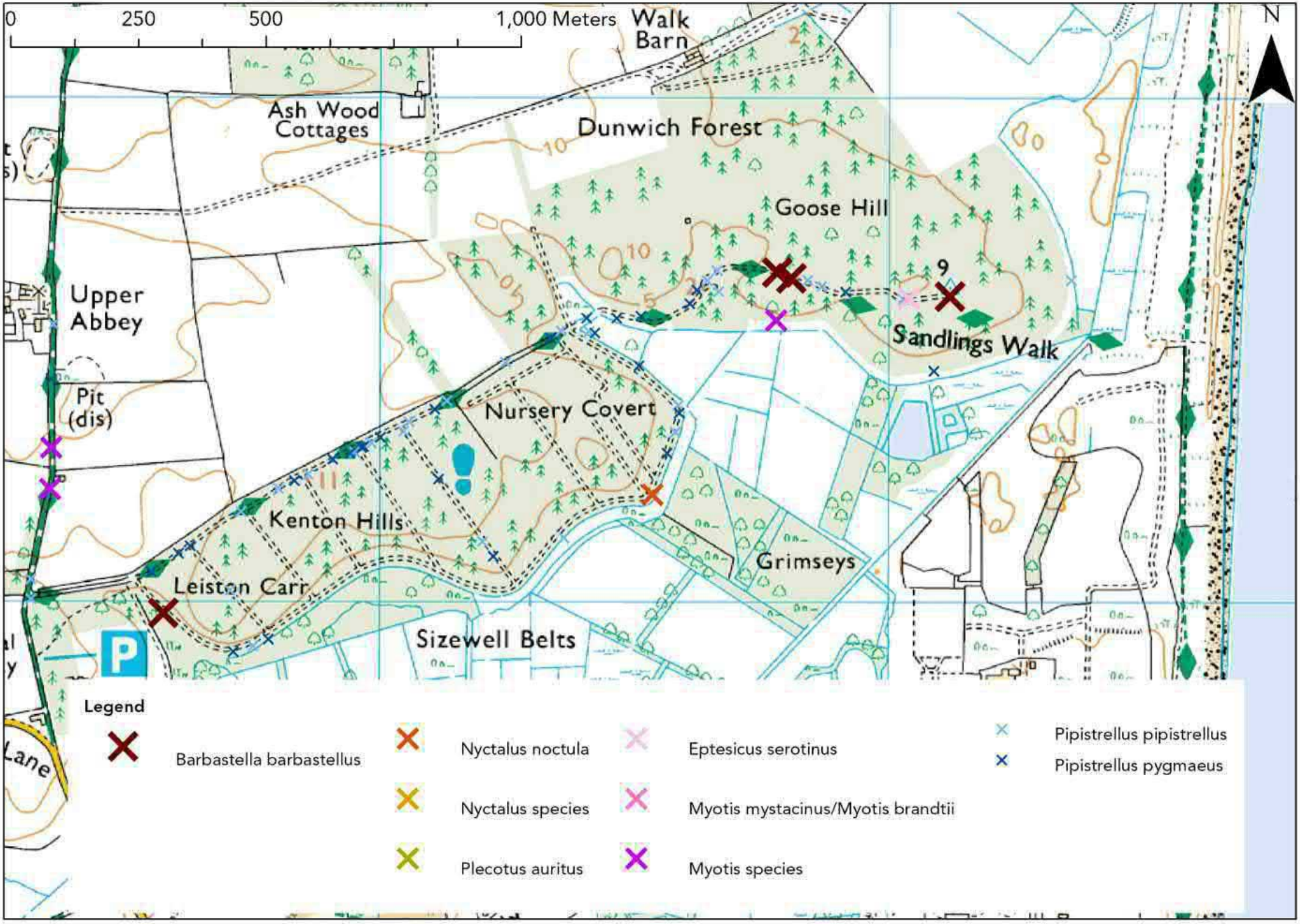


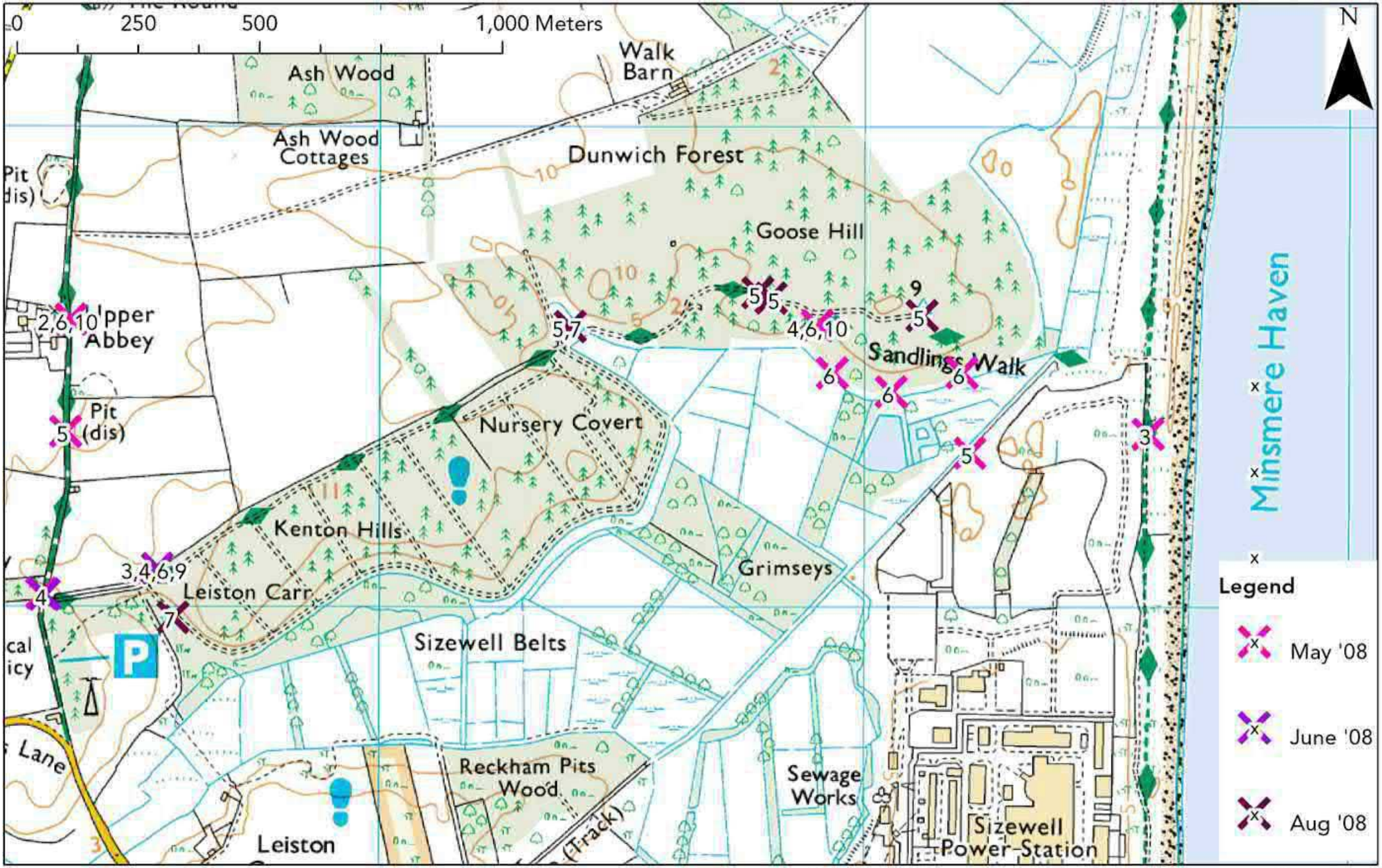
Sunset Code	0	1	2	3	4	5	6	7	8	9	10
Minutes after sunset	Before sunset	1-20	21-40	41-60	61-80	81-100	101-120	121-140	141-160	161-180	181+


0
250
500
1,000 Meters
N
Legend
Barbastella barbastellus
Nyctalus noctula
Nyctalus species
Plecotus auritus
Eptesicus serotinus
Myotis mystacinus/Myotis brandtii
Myotis species
Pipistrellus pygmaeus
Pipistrellus pipistrellus
Abbey
Black Walks
The Grove
Onner's
Osier Bed
Brown's Plantation
Potter's Street
Hotel
Potter's Farm
The Round House
Theberton House
Birchwood Farm
Ash Wood
Walk Barn
Ash Wood Cottages
Dunwich Forest
Greenhouse Plantation
Pit (dis)
MS
Goose Hill
Upper Abbey
Hill Farm
Sandlings Walk
Nursery Covert
Leiston Old Abbey
Old Abbey
Kenton Hills
Grimseys
Leiston Carr
Fiscal Policy
Sizewell Belts
Lover's Lane
Reckham Pits Wood
Sewage Works
Leiston Common
Sizewell Power Station
Sandy Lane (Track)
Rookyard Wood
Brick Kiln Farm
Valley Road
Broom Covert

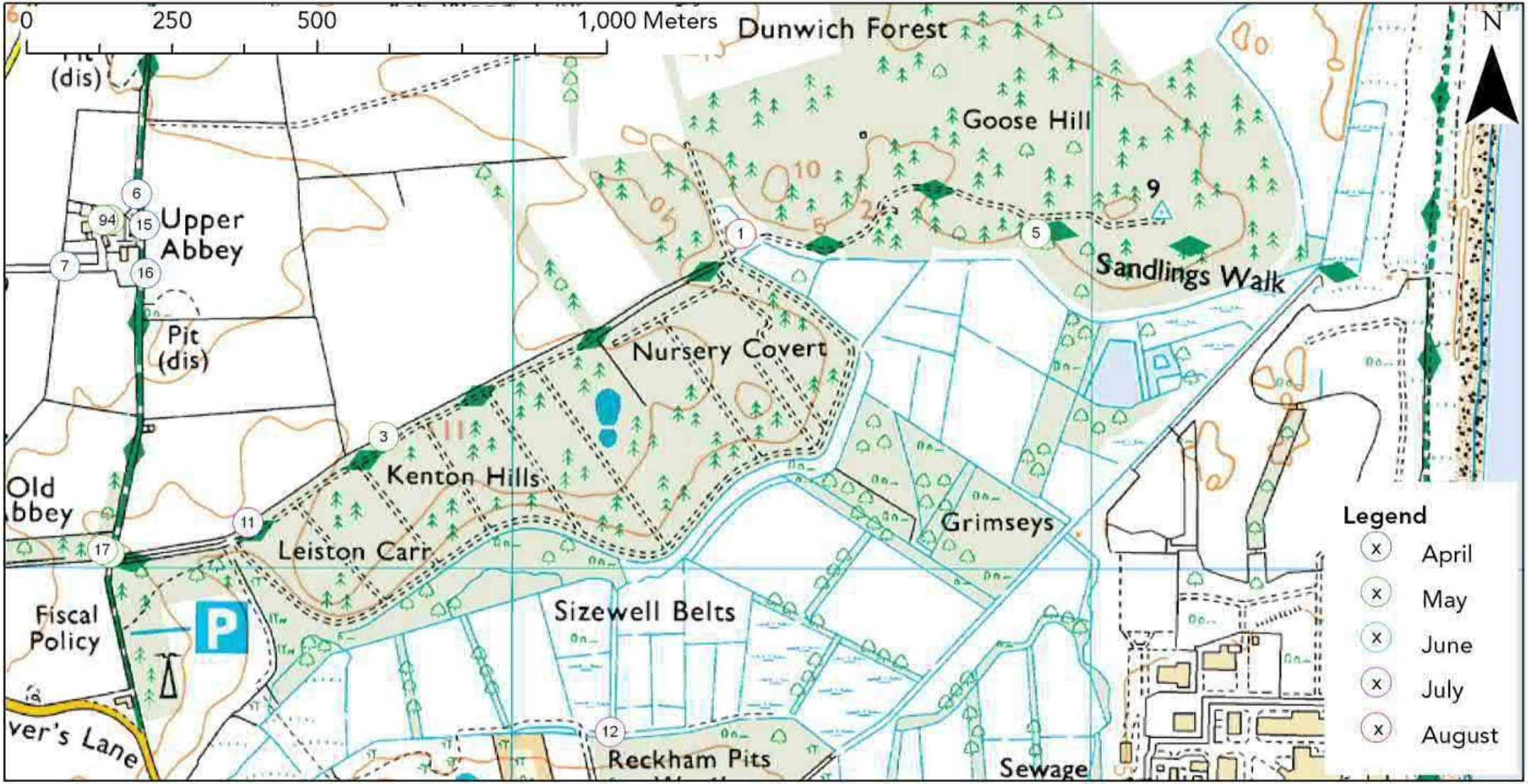

0
250
500
1,000 Meters
N
Legend
Barbastella barbastellus
Nyctalus noctula
Nyctalus leisleri
Eptesicus serotinus
Myotis species
Myotis nattereri
Pipistrellus pygmaeus
Pipistrellus pipistrellus
Pipistrellus species
Onner's Lane
Osier Bed
Brown's Plantation
Potter's Street
Potter's Farm
Hotel
Theberton House
Birchwood Farm
Greenhouse Plantation
MS
Hill Farm
Abbey Farm
Remains of Leiston Abbey (Premonstratensian)
Leiston Old Abbey
Old Abbey
Aldhurst Farm
Abbey Road
Fiscal Policy
Lover's Lane
Pit (dis)
Brick Kiln Farm
Sewage Works
Valley Road
Sch
Lower Abbey
Black Walks
The Round House
Ash Wood
Ash Wood Cottages
Pit (dis)
Upper Abbey
Pit (dis)
The Grove
Walk Barn
Dunwich Forest
Goose Hill
Nursery Covert
Kenton Hills
Leiston Carr
Grimscys
Sizewell Belts
Reckham Pits Wood
Leiston Common
Sandy Lane (Track)
Rookyard Wood
Sewage Works
Broom Covert
Mean High Water
Mean Low Water


0
250
500
1,000 Meters
N
Walk Barn
Ash Wood Cottages
Dunwich Forest
Goose Hill
Upper Abbey
Pit (dis)
Nursery Covert
Sandlings Walk
Kenton Hills
Grimseys
Leiston Carr
Sizewell Belts
Legend
Barbastella barbastellus
Nyctalus noctula
Nyctalus species
Plecotus auritus
Eptesicus serotinus
Myotis mystacinus/Myotis brandtii
Myotis species
Pipistrellus pipistrellus
Pipistrellus pygmaeus

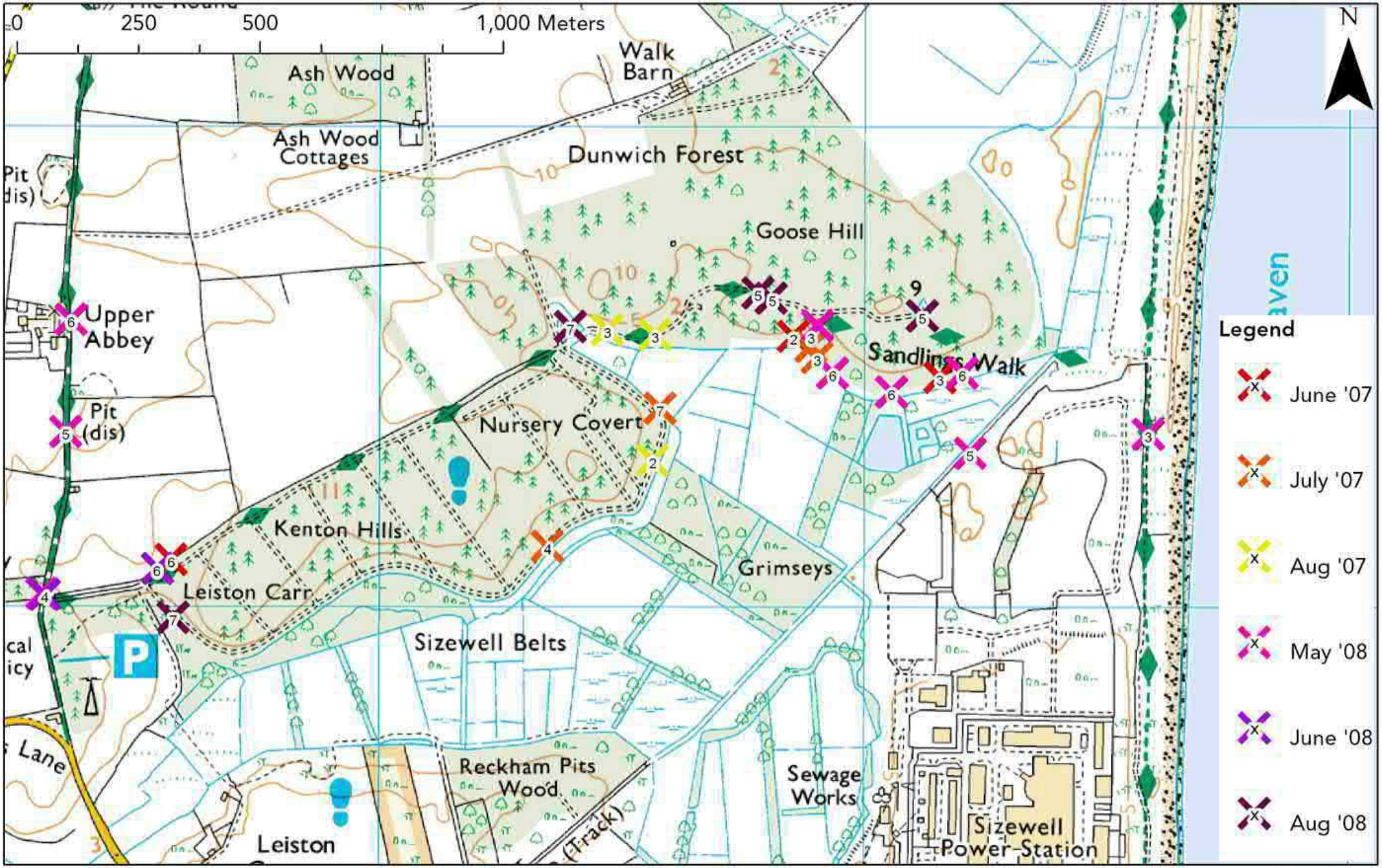

0
250
500
1,000 Meters
N
Walk Barn
Ash Wood Cottages
Dunwich Forest
Goose Hill
9
Sandlings Walk
Upper Abbey
Pit (dis)
Nursery Covert
Kenton Hills
Grimseys
Leiston Carr
Sizewell Belts
Lane
Legend
Barbastella barbastellus
Nyctalus noctula
Nyctalus species
Plecotus auritus
Eptesicus serotinus
Myotis mystacinus/Myotis brandtii
Myotis species
Pipistrellus pipistrellus
Pipistrellus pygmaeus



Sunset Code	0	1	2	3	4	5	6	7	8	9	10
Minutes after sunset	Before sunset	1-20	21-40	41-60	61-80	81-100	101-120	121-140	141-160	161-180	181+



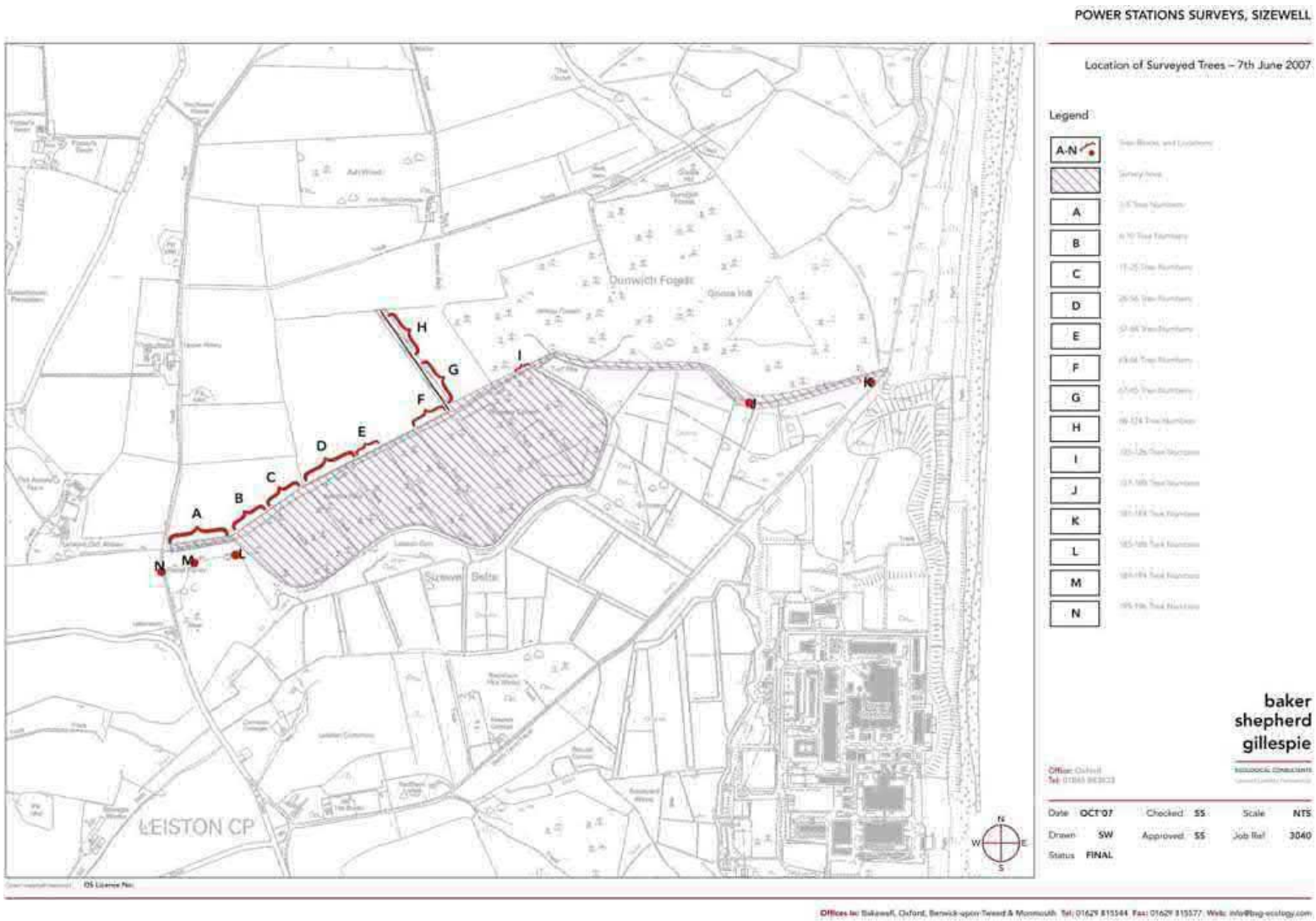
Static No.	No. of Nights	Month	*Barbastella barbastellus*	*Eptesicus serotinus*	*Myotis mystacinus/Myotis brandtii*	*Myotis* species	*Nyctalus leisleri*	*Nyctalus noctula*	*Pipistrellus pipistrellus*	*Pipistrellus pygmaeus*	*Pipistrellus* species	*Plecotus auritus*	Unidentified
6	2	April						3				1	
7	1	April		3		7		3	13	115		2	
15	13	April	3		1	14		1	1998	90	69	36	4
16	2	April											
3	1	May						1	5			1	1
4	1	May				2		3	85	23	36	1	1
5	1	May	2		1	4			113	50	11	3	1
2	1	May						1	5	10	1	1	
9	9	May				3			226	19	22	5	1
13	19	May	1	1	7	7		3	629	825	78	3	8
14	4	May							12	2	2	7	
18	1	May											
17	1	May											
8	3	June						7	1	3			4
10	7	June						22	78	22	3	1	17
11	10	July	3				9		96	93	1		7
12	8	July							55	41			
1	1	August	3			2		2	39	29	5	1	



Sunset Code	0	1	2	3	4	5	6	7	8	9	10
Minutes after sunset	Before sunset	1-20	21-40	41-60	61-80	81-100	101-120	121-140	141-160	161-180	181+

Appendix A
Plan of Zones in the Plantation Woodland showing Locations of Trees Surveyed

1 Page



Appendix B
Bat Detector Results for the Walked and Driven Transect Surveys

18 Pages

Batbox Duet Results (Note: 45 kHz pip – common pipistrelle; 55 kHz pip – soprano pipistrelle, ble – long-eared bat.)

Sizewell	**28/04/2008**	**Sizewell_28Apr08_ walked**	**10306**	**152**	**55 kHz pip. Single pass**
				285 - 450	55 kHz pip. Numerous passes with some social calling
				520 - 546	45 kHz and 55 kHz pips present
				581 - 630	55 kHz pip only
				670	Pip sp.
				727	45 kHz pip
				781 - 830	45 kHz pip
				851 - 870	45 kHz and 55 kHz pips present
				993	Distant Pip sp.
				1079 - 1156	55 kHz pip. Numerous passes with feeding buzzes
				1242	Pip sp. single pass
				1315	Distant Pip sp.
				1451	45 kHz pip
				1519	55 kHz pip. Several passes
				1551	*55 pips feeding ?unclear?*
				1603	Myotis sp. or loud ble Single pass
				1622 - 1654	55 kHz pip
				1665	Myotis sp.
				1680	*Approaching Upper Abbey Farm. Myotis bat flying up and down track*
				1757	Pip sp. Single pass

Sizewell	**28/04/2008**	**Sizewell_28Apr08_ walked**	**10306**	**152**	**55 kHz pip. Single pass**
				1830	Myotis sp. or loud ble. Single pass
				1920	Myotis sp. or loud ble. Single pass
				1927	*Possibly the same bat or two bats feeding up and down the track*
				1964 -2103	Myotis sp. (probably Natterer's due to 90 kHz max). Multiple passes
				2174	*Just walking past upper Abbey Farm on the track*
				2772	Distant Pip sp.
				3261 - 3360	Pip sp. Several passes
				3505	Distant 55 kHz pip
				3806	Distant Pip sp.
				3826	*45 pip ?unclear?*
				4285	*Just joined the track just outside Lower Abbey*
				4328 - 4350	45 KHz pip
				4366 - 4555	55 kHz pip joined 45 kHz pip. Numerous passes of both
				4611	*?unclear? Plantation ?unclear?*
				4622 - 4710	45 kHz pip. Numerous passes
				4845 - 4877	Pip sp. Several passes
				5373 - 5550	45 kHz pip. Two bats at various point. Numerous passes
				5564	*All pip activity on the track to the round house*
				5800	45 kHz pip
				5995	55 kHz pip. Two passes
				6047	55 kHz pip

Sizewell	**28/04/2008**	**Sizewell_28Apr08_ walked**	**10306**	**152**	**55 kHz pip. Single pass**
				6086	55 kHz pip
				6144 - 6270	Pip sp. Several passes
				6549	*Approaching main road*
				6790	45 kHz pip. Several passes
				7135	Probable serotine or Leisler's using single frequency. Single pass
				7172	*Approaching lights at ?Leesden?*
				7255	Distant unidentified bat
				7277	Distant unidentified bat
				7319	Pip sp. Single pass
				7335	*On the road from ?Beasdon? to Sizewell*
				7486 - 7590	45 kHz pip. Several passes with feeding buzz. Joined by 55 kHz pip at 7537 secs
				7805 - 7830	45 kHz pip. Three passes
				7919 - 7960	55 kHz pip
				7999	Pip sp. Distant pass
				8027	*On track towards the car park*
				8309 - 8332	55 kHz pip
				8408	45 kHz pip
				8445 - 8674	Both 45 kHz and 55 kHz pips present
				8768	45 kHz pip
				8877	55kHz pip
				8912 - 9060	45 kHz pip. At least two 45 kHz pips for some of the time

Sizewell	**28/04/2008**	**Sizewell_28Apr08_ walked**	**10306**	**152**	**55 kHz pip. Single pass**
				9103	45 kHz pip
				9277	Pip sp.
				9338 - 9345	Both 45 kHz and 55 kHz pips present
				9406 - 9455	55 kHz pip. Two passes
				9463	Stop
Site	Date	Track no.	Duration (Sec)	Time (Sec)	Event
Sizewell	19/05/2008	Sizwell_19may08_walk ed	8771	0	Sizewell B walked transit on the 19th March. Time is 21:02. Been recording since 20:45 but no bat passes
				60	Pip sp. Single close pass using FM call
				1231	45 kHz pip. Single close pass
				1357	45 kHz pip. Single close pass
				1372	55 kHz pip Single pass
				1382	Interesting bat pass there
				1426 - 1435	Pip sp. (prob 45 kHz). Several more distant passes
				1475	Time is 21:26 and I'm back at the turf bits having walked up and down the access track
				1610	Distant pip
				1618	I'm now off the access track leading in to the woods from the turf bits
				1696 - 1740	55 kHz pip. Several passes
				1775 - 1785	55 kHz pip. Several passes
				1792	45 kHz pip. Single distant pass
				1805	21:31

Sizewell	**28/04/2008**	**Sizewell_28Apr08_ walked**	**10306**	**152**	**55 kHz pip. Single pass**
				1814	Pip sp. Single pass
				1860	Unknown quiet bat could be ble or barbastelle. Some indication of CF call. Some components at about 40 kHz
				1877	Probable 55 kHz pip with approach phase call
				1880	Still at location 21:31
				1922 - 2044	55 kHz pip using FM call and approach phase 55 kHz and Pip sp. at 2035 sec
				1966 -1993	45 kHz pip using FM call
				2050	21:35
				2067	55 kHz pip
				2085 - 2217	55 kHz pip with numerous feeding buzzes and brief contact with Pip sp.
				2160	45 kHz pip
				2220	45 kHz pip
				2225	55 pips flying down canopy of Corsican pines
				2390 - 2462	55 kHz pip. Several passes with approach phase
				2497	21:43
				2535	55 kHz pip. Two passes
				2763 - 2780	55 kHz pip. Three passes
				2834 - 2845	55 KHz pip. Three passes
				2847	Bats flying over the top of the access track shown on the plan at 21:48
				2870 - 2880	55 kHz pip. Several passes
				2920 - 2970	Pip sp. Numerous passes
				2972 - 2990	Pip sp joined by 45 kHz pip with social calling

Sizewell	**28/04/2008**	**Sizewell_28Apr08_ walked**	**10306**	**152**	**55 kHz pip. Single pass**
				3055 -3085	55 and 45 kHz pip briefly together followed by 45 alone
				3120	21:53
				3135 - 3155	45 kHz pip. Several passes
				3205	55 kHz pip. Several passes
				3239	45 kHz pip. Single pass
				3250	Unclear memo ??? 55
				3306	45 kHz pip. Single pass
				3342	Pip sp. Single pass
				3390	55 kHz pip. Single pass
				3396	21:58
				3401	45 kHz pip. Single pass
				3422 - 3480	55 kHz pip. Several passes
				3486	Feeding up and down track (unclear). Just approaching clear felled area
				3520	55 kHz pip. Two passes
				3649	Pip sp. Single pass
				3690 - 3735	55 kHz pip. Numerous passes
				3740	22:04
				3788	55 kHz pip. Distant passes
				3880	55 kHz pip. FM call
				3890	45 KHz pip. Quiet call
				3905	22:06

Sizewell	**28/04/2008**	**Sizewell_28Apr08_ walked**	**10306**	**152**	**55 kHz pip. Single pass**
				3920 - 3970	55 kHz pip. Several passes
				4020	Myotis sp. or less likely ble. Single pass
				4028	55 kHz pip. Single pass
				4076	Distant Pip sp.
				4130	45 kHz pip. CF call
				4160 - 4225	Pip sp. Numerous passes
				4232	22:12
				4280	55 kHz pip. Distant pass
				4305 - 4325	Pip sp. Several passes
				4403	45 kHz pip. Single pass
				4407 - 4440	55 kHz pip. Several passes
				4585	55 kHz pip. Single pass
				4790 - 4810	45 kHz pip. Two passes
				4815	Time is 22:22
				4853	45 kHz pip. Single pass
				5215	45 kHz pip. Single pass
				5237	22:29
				5307	Pip sp. Distant pass
				5325	45 kHz pip with feeding buzz
				5418 - 5436	55 kHz pip. Two passes
				5441	22:32

Sizewell	**28/04/2008**	**Sizewell_28Apr08_ walked**	**10306**	**152**	**55 kHz pip. Single pass**
				5455	Pip sp. Distant pass
				5535 - 5585	45 kHz pip. Several passes including feeding buzz
				5584	55 kHz pip. Possibly with serotine
				5600 - 5652	45 kHz pip. Several passes with feeding buzz
				5616	22:35
				5657 - 5747	55 kHz and 45 kHz pip present
				5860	Pip sp. One loud and several distant passes. Probable social calling
				5985 - 6145	Pip sp. Distant passes but probably including 45 kHz pips. Some social calling
				6405	45 kHz pip. Single pass
				6445	22:50
				6590	Pip sp.
				6879	22:56
				7008 - 7105	45 kHz pip. Several passes with approach phase
				7418	Pip sp. Single pass
				7480	55 kHz pip. Single pass
				7510	23:07. Back at the junction with the access track and the track to Upper Abbey Farm
				7550	45 kHz pip. Single pass
				7565	23:18. Standing at a fixed point having collected in the static Anabat
				7595	45 kHz pip. Single pass
				7719	Distant Pip sp.
				8307	End of transect. Time is 23:30 exactly

Anabat Results

Night	Time	Label	Number	
19/05/2008	20:53	Ppip	1	May19th roost watch and transect
19/05/2008	20:54	Ppip	2	May19th roost watch and transect
19/05/2008	21:09	Ppip	1	May19th roost watch and transect
19/05/2008	21:14	Ppip	1	May19th roost watch and transect
19/05/2008	21:16	Nnoc	1	May19th roost watch and transect
19/05/2008	21:17	Ppip	1	May19th roost watch and transect
19/05/2008	21:42	Pp	1	May19th roost watch and transect
19/05/2008	21:43	Pp	1	May19th roost watch and transect
19/05/2008	21:47	Ppip	1	May19th roost watch and transect
19/05/2008	21:48	Ppip	1	May19th roost watch and transect
19/05/2008	21:49	Pa	1	May19th roost watch and transect
19/05/2008	21:49	Ppyg	1	May19th roost watch and transect
19/05/2008	22:01	Ppip	1	May19th roost watch and transect
19/05/2008	22:04	Nnoc	1	May19th roost watch and transect
19/05/2008	22:04	Ppip	1	May19th roost watch and transect
19/05/2008	22:04	Ppyg	1	May19th roost watch and transect
19/05/2008	22:05	Ppip	2	May19th roost watch and transect
19/05/2008	22:09	Pp	1	May19th roost watch and transect
19/05/2008	22:20	Pa	1	May19th roost watch and transect
19/05/2008	22:21	Bb	1	May19th roost watch and transect
19/05/2008	22:21	Mmy/Mbr	1	May19th roost watch and transect
19/05/2008	22:21	Paur	1	May19th roost watch and transect
19/05/2008	22:21	Ppy	1	May19th roost watch and transect
19/05/2008	22:21	Ppyg	2	May19th roost watch and transect
19/05/2008	22:22	Ppyg	1	May19th roost watch and transect
19/05/2008	22:27	Ppip	1	May19th roost watch and transect
19/05/2008	22:29	Ppip	1	May19th roost watch and transect
19/05/2008	22:30	Ppip	1	May19th roost watch and transect
19/05/2008	22:31	Pp	1	May19th roost watch and transect
19/05/2008	22:34	Ppip	1	May19th roost watch and transect
19/05/2008	22:36	Pp	1	May19th roost watch and transect
19/05/2008	22:39	Ppip	3	May19th roost watch and transect

Night	Time	Label	Number	
19/05/2008	22:39	Ppyg	1	May19th roost watch and transect
19/05/2008	22:40	Pp	1	May19th roost watch and transect
19/05/2008	22:40	Ppyg	2	May19th roost watch and transect
19/05/2008	22:41	Ppyg	1	May19th roost watch and transect
19/05/2008	22:43	Pp	1	May19th roost watch and transect
19/05/2008	22:44	Ppip	1	May19th roost watch and transect
19/05/2008	22:45	Ppip	1	May19th roost watch and transect
19/05/2008	22:48	Ppy	1	May19th roost watch and transect
19/05/2008	22:48	Ppyg	1	May19th roost watch and transect
19/05/2008	22:49	Ppyg	1	May19th roost watch and transect
19/05/2008	22:50	Ppyg	2	May19th roost watch and transect
19/05/2008	22:51	Ppyg	1	May19th roost watch and transect
19/05/2008	22:52	Ppyg	3	May19th roost watch and transect
19/05/2008	22:53	Ppy	1	May19th roost watch and transect
19/05/2008	22:53	Ppyg	1	May19th roost watch and transect
19/05/2008	22:54	Ppyg	2	May19th roost watch and transect
19/05/2008	22:55	Ppip	2	May19th roost watch and transect
19/05/2008	22:56	Pp	1	May19th roost watch and transect
19/05/2008	22:56	Ppip	1	May19th roost watch and transect
19/05/2008	22:57	Ppip	2	May19th roost watch and transect
19/05/2008	22:57	Ppyg	1	May19th roost watch and transect
19/05/2008	22:58	Ppip	3	May19th roost watch and transect
19/05/2008	22:58	Ppyg	1	May19th roost watch and transect
19/05/2008	23:02	query	1	May19th roost watch and transect
19/05/2008	23:03	Pa	1	May19th roost watch and transect
19/05/2008	23:03	query	2	May19th roost watch and transect
19/05/2008	23:04	Ppip	2	May19th roost watch and transect
19/05/2008	23:04	Ppyg	1	May19th roost watch and transect
19/05/2008	23:06	Pp	1	May19th roost watch and transect
19/05/2008	23:14	Ppip	1	May19th roost watch and transect
19/05/2008	23:16	Pa	1	May19th roost watch and transect
19/05/2008	23:27	Pp	1	May19th roost watch and transect
20/05/2008	20:31	Nnoc	1	May20walked
20/05/2008	20:37	Nnoc	1	May20walked

Night	Time	Label	Number	
20/05/2008	20:37	Paur	1	May20walked
20/05/2008	20:37	Ppip	2	May20walked
20/05/2008	20:45	Pp	1	May20walked
20/05/2008	20:59	Pp	1	May20walked
20/05/2008	21:09	Ppyg	2	May20walked
20/05/2008	21:10	Ppyg	3	May20walked
20/05/2008	21:14	Es	1	May20walked
20/05/2008	21:14	Nnoc	2	May20walked
20/05/2008	21:15	Ppyg	1	May20walked
20/05/2008	21:16	Ppyg	2	May20walked
20/05/2008	21:17	Ppyg	2	May20walked
20/05/2008	21:18	Ppip	1	May20walked
20/05/2008	21:18	Psp	1	May20walked
20/05/2008	21:23	Pp	1	May20walked
20/05/2008	21:24	Ppip	1	May20walked
20/05/2008	21:25	Ppy	1	May20walked
20/05/2008	21:26	Ppyg	4	May20walked
20/05/2008	21:27	Ppyg	2	May20walked
20/05/2008	21:30	Ppyg	1	May20walked
20/05/2008	21:31	Ppyg	4	May20walked
20/05/2008	21:32	Ppyg	3	May20walked
20/05/2008	21:33	Ppip	1	May20walked
20/05/2008	21:33	Ppyg	1	May20walked
20/05/2008	21:47	Bb	1	May20walked
20/05/2008	21:56	Paur	1	May20walked
20/05/2008	22:21	Bb	1	May20walked
20/05/2008	22:37	Ppyg	2	May20walked
20/05/2008	22:38	Ppyg	3	May20walked
20/05/2008	22:39	Ppyg	2	May20walked
20/05/2008	22:40	Ppip	1	May20walked
20/05/2008	22:42	Ppip	3	May20walked
20/05/2008	22:43	Pp	1	May20walked
20/05/2008	22:43	Ppip	1	May20walked
20/05/2008	22:44	Bbarb	1	May20walked

Night	Time	Label	Number	
20/05/2008	22:44	Ppip	3	May20walked
20/05/2008	22:44	Ppyg	4	May20walked
20/05/2008	22:45	Ppip	2	May20walked
20/05/2008	22:45	Ppyg	3	May20walked
20/05/2008	22:46	Bb?	1	May20walked
20/05/2008	22:46	Pp	1	May20walked
20/05/2008	22:46	Ppip	1	May20walked
20/05/2008	22:46	Ppy	1	May20walked
20/05/2008	22:46	Ppyg	3	May20walked
20/05/2008	22:46	queryNsp	1	May20walked
20/05/2008	22:47	Ppyg	2	May20walked
20/05/2008	22:49	Ppyg	2	May20walked
20/05/2008	22:50	Bb	1	May20walked
20/05/2008	22:50	Ppyg	2	May20walked
20/05/2008	22:50	Psp	1	May20walked
20/05/2008	22:51	Myotis	1	May20walked
20/05/2008	22:52	Pp	1	May20walked
20/05/2008	22:52	Ppip	2	May20walked
20/05/2008	22:52	Psp	1	May20walked
20/05/2008	22:54	Pa	1	May20walked
20/05/2008	22:54	Psp	1	May20walked
20/05/2008	22:55	Pp	1	May20walked
20/05/2008	22:56	Ppyg	1	May20walked
20/05/2008	22:59	Ppip	1	May20walked
20/05/2008	22:59	Ppyg	1	May20walked
20/05/2008	23:00	Ppyg	1	May20walked
20/05/2008	23:01	Ppyg	1	May20walked
20/05/2008	23:05	Ppip	2	May20walked
20/05/2008	23:05	Ppyg	1	May20walked
20/05/2008	23:06	Ppip	1	May20walked
20/05/2008	23:07	Ppyg	2	May20walked
20/05/2008	23:07	Psp	1	May20walked
20/05/2008	23:08	Ppyg	2	May20walked
20/05/2008	23:09	Ppyg	4	May20walked

Night	Time	Label	Number	
20/05/2008	23:10	Ppip	1	May20walked
20/05/2008	23:10	Ppyg	4	May20walked
20/05/2008	23:11	Ppyg	4	May20walked
20/05/2008	23:12	Ppip	2	May20walked
20/05/2008	23:12	Psp	1	May20walked
20/05/2008	23:14	Ppip	1	May20walked
20/05/2008	23:14	Ppyg	2	May20walked
20/05/2008	23:15	Ppip	2	May20walked
20/05/2008	23:15	Ppyg	1	May20walked
20/05/2008	23:16	Ppyg	1	May20walked
20/05/2008	23:16	Psp	1	May20walked
20/05/2008	23:17	Ppip	1	May20walked
20/05/2008	23:18	Nnoc	1	May20walked
20/05/2008	23:18	Ppip	2	May20walked
20/05/2008	23:18	Ppyg	1	May20walked
20/05/2008	23:19	Psp	1	May20walked
20/05/2008	23:35	Ppyg	2	May20walked
18/06/2008	09:37	Noctule	1	18thJune_driven
18/06/2008	09:41	Pip45	1	18thJune_driven
18/06/2008	09:42	Pip45	1	18thJune_driven
18/06/2008	09:47	Pip55	1	18thJune_driven
18/06/2008	09:48	Pip55	1	18thJune_driven
18/06/2008	09:52	Pip55	2	18thJune_driven
18/06/2008	09:55	Pip45	1	18thJune_driven
18/06/2008	09:57	Pip45	1	18thJune_driven
18/06/2008	09:59	Pip55	1	18thJune_driven
18/06/2008	10:00	Pip55	3	18thJune_driven
18/06/2008	10:01	Pip45	3	18thJune_driven
18/06/2008	10:01	Pip55	1	18thJune_driven
18/06/2008	10:03	Pip45	1	18thJune_driven
18/06/2008	10:06	Pip55	1	18thJune_driven
18/06/2008	10:21	Pip55	1	18thJune_driven
18/06/2008	10:25	Leislers	1	18thJune_driven
18/06/2008	10:27	Myotis	1	18thJune_driven

Night	Time	Label	Number	
18/06/2008	10:31	Barb	1	18thJune_driven
18/06/2008	10:50	Pip55	1	18thJune_driven
18/06/2008	10:51	pip	1	18thJune_driven
18/06/2008	10:58	Pip45	1	18thJune_driven
18/06/2008	10:59	Pip45	1	18thJune_driven
18/06/2008	10:59	Pip55	1	18thJune_driven
18/06/2008	11:03	Pip45	1	18thJune_driven
18/06/2008	11:04	Pip45	2	18thJune_driven
18/06/2008	11:05	Pip45	1	18thJune_driven
18/06/2008	11:10	Pip45	1	18thJune_driven
18/06/2008	11:16	Pip45	1	18thJune_driven
18/06/2008	11:17	Pip45	2	18thJune_driven
18/06/2008	11:18	Pip45	1	18thJune_driven
18/06/2008	11:19	Pip45	1	18thJune_driven
18/06/2008	11:39	Pip	1	18thJune_driven
18/06/2008	11:39	Pip45	1	18thJune_driven
18/06/2008	11:43	Pip45	1	18thJune_driven
18/06/2008	11:46	Pip45	2	18thJune_driven
18/06/2008	11:47	Pip45	5	18thJune_driven
18/06/2008	11:48	Pip45	1	18thJune_driven
24/07/2008	21:25	Ppy	1	24July_driven
24/07/2008	21:30	Pp	2	24July_driven
24/07/2008	21:32	Pp	1	24July_driven
24/07/2008	21:34	Pp	1	24July_driven
24/07/2008	21:40	Pp	1	24July_driven
24/07/2008	21:41	Pp	2	24July_driven
24/07/2008	21:42	Pp	1	24July_driven
24/07/2008	21:45	Ppy	1	24July_driven
24/07/2008	21:46	Ppy	2	24July_driven
24/07/2008	21:51	Pp	1	24July_driven
24/07/2008	21:51	Ppy	1	24July_driven
24/07/2008	21:54	Pp	1	24July_driven
24/07/2008	22:01	Pp	1	24July_driven
24/07/2008	22:02	Ppy	1	24July_driven

Night	Time	Label	Number	
24/07/2008	22:03	Pp	1	24July_driven
24/07/2008	22:08	Pp	1	24July_driven
24/07/2008	22:09	Ppy	1	24July_driven
24/07/2008	22:11	Ppy	3	24July_driven
24/07/2008	22:12	Pp	1	24July_driven
24/07/2008	22:12	Ppy	3	24July_driven
24/07/2008	22:13	Pp	1	24July_driven
24/07/2008	22:13	Ppy	1	24July_driven
24/07/2008	22:14	Ppy	1	24July_driven
24/07/2008	22:18	Pp	1	24July_driven
24/07/2008	22:20	Pp	1	24July_driven
24/07/2008	22:21	Pp	2	24July_driven
24/07/2008	22:26	Ppy	1	24July_driven
24/07/2008	22:30	Pp	2	24July_driven
24/07/2008	22:36	Pp	1	24July_driven
24/07/2008	22:37	Pp	1	24July_driven
24/07/2008	22:38	Pp	1	24July_driven
24/07/2008	22:42	Pp	3	24July_driven
24/07/2008	22:45	Pp	1	24July_driven
24/07/2008	22:47	Pp	1	24July_driven
24/07/2008	22:52	Pp	1	24July_driven
24/07/2008	22:53	Pp	1	24July_driven
24/07/2008	22:54	Pp	2	24July_driven
24/07/2008	22:58	Pp	2	24July_driven
24/07/2008	22:58	Ppy	1	24July_driven
24/07/2008	23:01	Ppy	2	24July_driven
24/07/2008	23:07	Ppy	1	24July_driven
24/07/2008	23:09	Ppy	2	24July_driven
24/07/2008	23:10	Pp	1	24July_driven
24/07/2008	23:10	Ppy	1	24July_driven
24/07/2008	23:12	Pp	3	24July_driven
24/07/2008	23:12	Ppy	3	24July_driven
24/07/2008	23:13	Pp	1	24July_driven
24/07/2008	23:13	Ppy	3	24July_driven

Night	Time	Label	Number	
24/07/2008	23:14	Pp	3	24July_driven
24/07/2008	23:14	Ppy	3	24July_driven
24/07/2008	23:14	query	1	24July_driven
24/07/2008	23:15	Pp	1	24July_driven
24/07/2008	23:16	ES	1	24July_driven
24/07/2008	23:16	Es	1	24July_driven
24/07/2008	23:17	Pp	1	24July_driven
24/07/2008	23:17	Ppy	3	24July_driven
24/07/2008	23:18	Pp	1	24July_driven
24/07/2008	23:19	Es	1	24July_driven
24/07/2008	23:19	Pp	1	24July_driven
24/07/2008	23:20	Ppy	2	24July_driven
24/07/2008	23:21	Pp	1	24July_driven
24/07/2008	23:21	Ppy	1	24July_driven
24/07/2008	23:21	query	1	24July_driven
24/07/2008	23:22	Ppy	1	24July_driven
24/07/2008	23:23	Ppy	2	24July_driven
24/07/2008	23:24	Pp	1	24July_driven
24/07/2008	23:25	Es	1	24July_driven
24/07/2008	23:25	Ppy	1	24July_driven
24/07/2008	23:26	Pp	1	24July_driven
11/08/2008	21:01	Ppgy	1	11Aug_walked transect
11/08/2008	21:02	Ppgy	1	11Aug_walked transect
11/08/2008	21:09	Ppip	1	11Aug_walked transect
11/08/2008	21:10	Ppgy	1	11Aug_walked transect
11/08/2008	21:10	Ppip	1	11Aug_walked transect
11/08/2008	21:15	Ppgy	2	11Aug_walked transect
11/08/2008	21:16	Ppip	1	11Aug_walked transect
11/08/2008	21:17	Ppgy	1	11Aug_walked transect
11/08/2008	21:17	Ppip	3	11Aug_walked transect
11/08/2008	21:18	Ppgy	1	11Aug_walked transect
11/08/2008	21:18	Ppip	2	11Aug_walked transect
11/08/2008	21:19	Ppgy	2	11Aug_walked transect
11/08/2008	21:21	Ppip	3	11Aug_walked transect

Night	Time	Label	Number	
11/08/2008	21:22	Psp	1	11Aug_walked transect
11/08/2008	21:23	Ppip	3	11Aug_walked transect
11/08/2008	21:25	Ppgy	1	11Aug_walked transect
11/08/2008	21:25	Ppip	2	11Aug_walked transect
11/08/2008	21:26	Ppgy	5	11Aug_walked transect
11/08/2008	21:27	Ppgy	2	11Aug_walked transect
11/08/2008	21:28	Ppgy	4	11Aug_walked transect
11/08/2008	21:32	Ppgy	3	11Aug_walked transect
11/08/2008	21:34	Ppip	1	11Aug_walked transect
11/08/2008	21:37	Myotis	1	11Aug_walked transect
11/08/2008	21:45	Ppgy	1	11Aug_walked transect
11/08/2008	21:52	Ppip	1	11Aug_walked transect
11/08/2008	21:59	Bbarb	1	11Aug_walked transect
11/08/2008	22:02	Eser	1	11Aug_walked transect
11/08/2008	22:02	Ppip	2	11Aug_walked transect
11/08/2008	22:06	Ppgy	1	11Aug_walked transect
11/08/2008	22:07	Ppip	1	11Aug_walked transect
11/08/2008	22:07	Ppip	3	11Aug_walked transect
11/08/2008	22:08	Bbarb	1	11Aug_walked transect
11/08/2008	22:09	Bbarb	1	11Aug_walked transect
11/08/2008	22:10	Ppip	1	11Aug_walked transect
11/08/2008	22:11	Ppip	4	11Aug_walked transect
11/08/2008	22:11	Ppgy	2	11Aug_walked transect
11/08/2008	22:12	Ppip	1	11Aug_walked transect
11/08/2008	22:12	Ppgy	2	11Aug_walked transect
11/08/2008	22:12	Psp	1	11Aug_walked transect
11/08/2008	22:14	Ppgy	2	11Aug_walked transect
11/08/2008	22:15	Ppip	2	11Aug_walked transect
11/08/2008	22:15	Ppgy	2	11Aug_walked transect
11/08/2008	22:16	Ppip	1	11Aug_walked transect
11/08/2008	22:17	Ppgy	1	11Aug_walked transect
11/08/2008	22:19	Nnoc	1	11Aug_walked transect
11/08/2008	22:20	Ppip	1	11Aug_walked transect
11/08/2008	22:23	Ppgy	3	11Aug_walked transect

Night	Time	Label	Number	
11/08/2008	22:23	Ppip	1	11Aug_walked transect
11/08/2008	22:24	Ppgy	1	11Aug_walked transect
11/08/2008	22:26	Ppip	4	11Aug_walked transect
11/08/2008	22:27	Ppgy	2	11Aug_walked transect
11/08/2008	22:27	Ppgy	1	11Aug_walked transect
11/08/2008	22:29	Ppip	3	11Aug_walked transect
11/08/2008	22:30	Ppgy	1	11Aug_walked transect
11/08/2008	22:32	Ppip	1	11Aug_walked transect
11/08/2008	22:34	Ppgy	4	11Aug_walked transect
11/08/2008	22:35	Ppip	1	11Aug_walked transect
11/08/2008	22:35	Ppgy	1	11Aug_walked transect
11/08/2008	22:37	Bbarb	2	11Aug_walked transect
11/08/2008	22:43	Psp	1	11Aug_walked transect
11/08/2008	22:43	Ppip	3	11Aug_walked transect
11/08/2008	22:44	Ppip	4	11Aug_walked transect
11/08/2008	22:48	myotis	1	11Aug_walked transect
11/08/2008	22:49	myotis	1	11Aug_walked transect
11/08/2008	22:50	Psp	1	11Aug_walked transect
11/08/2008	22:50	Ppgy	1	11Aug_walked transect
11/08/2008	22:51	Psp	1	11Aug_walked transect
11/08/2008	22:51	Ppip	1	11Aug_walked transect

Appendix C
Results from the 2007 Bat Activity Surveys

Date	No. of sound files	No. of species	Common pipistrelle	Soprano pipistrelle	Noctule	Serotine	Leisler's bat	*Myotis* species	Whiskered/ Brandt's bat	Natterer's bat	Long-eared bat	Barbastelle
7 June 07	131	8	49	68	2	2	0	1	0	2	3	3
6 July 07*	187	8	45	79	2	13	0	5	0	5	7	7
16 Aug 07	203	7	74	110	2	4	1	1	0	0	1	0
28 Aug 07	174	7	76	74	1	8	0	1	2	0	0	3
12 Sept 07	120	5	43	56	3	7	0	1	0	0	0	0