The Sizewell C Project

6.3 Volume 2 Main Development Site

Chapter 14 Terrestrial Ecology and Ornithology

Appendix 14A8 Bats

Part 2 of 5

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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.

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EDF Developments Ltd
Sizewell Bat Survey Report 2009

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 new nuclear plant. This area, which covers 0.49km^2/49ha and has an approximate central grid reference of TM473640, is referred to in this document as the 'Strategic Site Area (SSA).' The access road is likely to run in an easterly direction before linking into the wider road network at Lover's Lane, although its exact route has not been determined. The indicative plant footprint and access road corridor are shown on **Figure 1.1**. In addition to these permanent development proposals there will also be a number of temporary construction activities and other associated developments but details of these areas are yet to be ascertained.

It was clear from early in the ecological desk study (which began in late 2006) that the Sizewell Estate supported foraging, commuting and roosting bat species. Survey work was undertaken in 2007 (report ref: 19801cb114) and 2008 (report ref: 19801cb205) to establish the nature of use of the site by the bat population present and following these studies, further surveys work was proposed 2009.

An initial desk study and site walkover undertaken by Entec (ibid) in 2007 provided site-based context with regard to the areas predominantly used by bats at Sizewell. The study concluded that in order to provide a more holistic picture of the importance of the development area to these species, and to inform mitigation and habitat management strategies, that a comprehensive suite of survey work and further desk study was required. The study summarised in this report therefore complements the initial work from 2007 and 2008, provides recommendations for further surveys work in 2010 and the combined reports can therefore be used as context for the Ecological Impact Assessment (EcIA) for the development proposal.

1.2 Legislation and Policy Guidance

1.2.1 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 (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

[1] Priority bat species in the UK BAP: barbastelle *Barbastella barbastellus*, Bechstein's bat *Myotis bechsteinii*, noctule *Nyctalus noctula*, soprano pipistrelle *Pipistrellus pygmaeus,* brown long-eared bat *Plecotus auritus,* greater horseshoe bat *Rhinolophus ferrumequinum* and lesser horseshoe bat *Rhinolophus hipposideros.*

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.

1.2.2 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 horseshoe bat *Rhinolophus hipposideros*, greater horseshoe bat *Rhinolophus 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.

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. Case law 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. 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 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 (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.

1.3 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 1.1** are known to occur in Suffolk:

Table 1.1 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 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/Brandt's bat	*Myotis mystacinus/brandtii*	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
Daubenton's bat	*Myotis 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
Leisler's bat	*Nyctalus leisleri*	Uncommon	Only three nursery colonies are known in the county. Appears to be confined to the north-west of Suffolk	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 hipposideros*	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

1.4 Summary of Baseline Survey Work, 2007-2008

The bat surveys carried out in 2009 form part of the baseline survey programme that has been ongoing since 2007 and is being conducted to inform the ecological assessment section of an Environmental Statement (ES) for the proposed development.

1.4.1 2007 Survey

Bat activity surveys in 2007 recorded nine species of bats in the survey 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.

1.4.2 2008 Survey

Survey work in 2008 was commissioned by British Energy (BE) to address recommendations made in the 2007 Sizewell bat survey report (Entec doc ref 19801cb114). The results of the 2008 surveys are detailed in the 2008 Sizewell bat survey report (Entec doc ref 19801cb205) which includes a revised evaluation of the importance of the survey area to bat populations and some overall conclusions regarding both the assessment of the importance of habitats for bats and the status of the barbastelle population within the survey area.

Roost Surveys

Building surveys established that roosts at Upper Abbey Farm currently support a low number of individuals of species that are widespread and common or fairly common in southern Britain (common pipistrelle, Natterer's bat *Myotis nattererii* and brown long-eared bat) and the roosts are considered to be of only local value. The large tithe barn is known to have supported low numbers of roosting barbastelle bats in the past but is unlikely to support a maternity colony, based on the lack of evidence of the species roosting there in sufficient numbers. The tithe barn was valued as being of district importance due to its potential to support roosting barbastelles.

Other buildings were surveyed for roosting bats including Lower Abbey Farm and Leiston Abbey. No evidence of bat activity was recorded in the barn at the former site. Although there are previous records of barbastelle bats roosting in the barn, they are unlikely to be roosting there currently due to changes in the use of the barn to house livestock as well as the change from thatched to corrugated roof and the presence of breeding owls, which are predators of bats. At the latter site, there are no buildings suitable for roosting barbastelles.

Further roost surveys of mature trees in 2008 confirmed the assessment made in 2007, that trees within the survey area are unlikely to support a maternity colony of barbastelle.

Activity Survey

The surveys in 2008 followed survey methods used in 2007, but also used Anabats as static detectors 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. The use of the site by bats probably did not change significantly between years because the character of the survey area and habitats did not alter. The consistency of the results between 2007 and 2008 allowed for the evaluation of habitats for bats within the survey areas to remain unchanged in 2008 and enabled a higher level of confidence than a single year's survey data would have given.

1.5 Aims of 2009 Survey

The 2009 survey work was commissioned by British Energy (now EDF Developments Ltd) to address recommendations made in the 2008 Sizewell bat survey report (Entec doc ref 19801cb205). The aims of the 2009 surveys were therefore:

- To establish whether lactating/breeding female barbastelle bats are using the site by attempting to catch and examine bats within the site early in the breeding season (late May/early June);

- To determine the need for more intrusive methods of survey (such as radio-tracking) to establish a higher level of certainty to inform an ecological impact assessment (EcIA). This may be necessary if the results of netting surveys are inconclusive;
- The continuation of monitoring work within the site using both walked transect and static detector surveys to support and enhance existing data from 2007/2008, and to permit a more robust assessment of the importance of the site for bats;
- To further establish the existence of potential commuting routes and foraging areas within the wider landscape that may be used by barbastelles. In particular, hedgerows which may be removed for heathland creation will be surveyed for evidence of use by bats;
- To undertake a landscape appraisal to provide information on roosting and commuting habitat of potential value to barbastelle within the wider countryside surrounding the site. Such a study will provide further information on the potential status of barbastelle bats within the survey area and will also inform future bat surveys. An improved understanding of the character of the landscape may help predict how barbastelle bats use the landscape, which in turn will help inform the design, methods and approach for any future radio-tracking study;
- To enable appropriate mitigation, enhancement and compensation measures to be recommended, to ensure the bat interest of the area is maintained and enhanced;
- To update the existing desk study information and extend the search area for bat records to a distance of 15km of the site.

2. Methods

2.1 Desk Study

2.1.1 Local Records Centre Data Search

The first step in the desk study involved collating readily available records of bat activity surrounding the site. For the 2007 bat report bat records were gathered from a 3km search area surrounding the site. In light of the presence of barbastelle, a species known to commute large distances to foraging grounds, and following good practice guidance on conducting data searches (Bat Conservation Trust, 2007a), a search area of 15km surrounding the site was requested from Suffolk Biological Records Centre, the main repository for biological records in Suffolk. This wider survey area included a search area which is located roughly between Dunwich to the north, and Aldeburgh to the south of the site.

2.1.2 Landscape Appraisal

1:25 000 Ordnance Survey maps were examined to identify woodland and large buildings in the landscape and these were marked on a base map. Web-based aerial photography and satellite imagery (www.earth.google.com) was then studied to distinguish the typical broad habitat types within the parcels of land. Interpretation of aerial photographs allowed the woodland to be categorised as broadleaved woodland, mixed woodland, scrub or coniferous plantation. Linear woodland features and watercourses were also plotted from aerial photographs to show connectivity for bats in the landscape. Farms, large rural properties and any other buildings

thought to have potential to support roosting barbastelles were also identified on the aerial photos and mapped in advance of a site visit.

2.2 Field Surveys

2.2.1 Landscape Appraisal

Ground-truthing and Habitat Characterisation

Following the desk study, a field-based ground-truthing exercise was carried out on 17-19 November 2009. Having identified particular habitats, features and buildings for further investigation from the desk-study, the presence or absence of these targets was then checked in the field. Each target was then characterised using a set of habitat criteria based on known habitat requirements of barbastelle bats. These habitat requirements and the field assessment methods are discussed in more detail in the Habitat Suitability Criteria Section below. That section includes reference to the latest research on barbastelle ecology.

Sites were either visited on foot or visually assessed from vantage points and appropriate details recorded onto a proforma for each parcel of land. Binoculars (Viking 10x42 Vistron) were used to survey the sites and wider landscape. It was usually possible to assess small blocks of woodland and linear woodland features from a convenient stopping point on the road or track, but a walkover of larger areas of woodland was taken to sample the interior of the woodland. Public footpaths and farm tracks were used to gain access to habitats and features not visible from the road.

Landowners were contacted to arrange access to private property when required. This was done by telephone prior to the site visit, if contact details were available, or calling at the property during the site visit. Landowners contacted were:

- Robin Harvey – Assistant warden at the RSPB Minsmere Reserve;
- Pro Corda (Music Academy) – Access to Lady Chapel, Leiston Abbey.

Visits to Sizewell have included correspondence with Alan Miller (SWT and Bat Group) and although not exclusively done as part of this landscape appraisal, BSG has been kept informed (and shared information) with Alan on the status of barbastelle in Suffolk.

Habitat Suitability Criteria

The criteria for habitat suitability are derived from studies on habitat preferences of female barbastelle bats in the UK. Much of the widely accepted knowledge on barbastelle bats in the UK is from studies on colonies in West Sussex located within semi-natural ancient woodland. The barbastelle bat is generally considered a woodland species and it will use hollow and storm damaged trees for roosting all year round (Greenaway, 2001; Greenaway, 2004). Paston Great Barn SAC in Norfolk is the only building in the UK known to support a barbastelle breeding roost. The studies of the Paston colony and the West Sussex colonies have shown that barbastelle will forage over a range of habitats including woodland, marshes, open habitats such as old meadows and heathland, and (in Norfolk) along the coastline, over cliffs and coastal grassland (Parsons *et al*., 2001). The Norfolk colony have adapted to having a single highly productive foraging habitat, and adults share the foraging area (Parsons *et al.,* 2001), unlike the West Sussex colony that defend individual key foraging areas despite sharing commuting routes (Greenaway, 2008). Given the status of the colony at Paston Great Barn and its coastal location in East Anglia, it is possible that within the wider landscape surrounding the Sizewell site that

large, thatched tithe barns surrounded by invertebrate rich foraging grounds may be used as barbastelle nursery roosts. Other old buildings, such as churches and timber framed agricultural buildings are known to be used by barbastelle bats, although none is known to be used for breeding.

Based upon this current knowledge, **Tables 2.1** and **2.2** identify characteristics that can be measured in the field to help define the suitability of woodland and buildings respectively as potential maternity colonies of barbastelle. **Table 2.3** outlines characteristics of commuting routes and foraging areas which may be suitable for barbastelle. The tables also list the function or importance of these characteristics based on the habitat preferences for female barbastelle bats listed by Greenaway (2001). The character of commuting routes has been taken from Greenaway (2004) and unpublished studies at Paston Barn (Parsons *et al*., 2001). These characteristics were used during surveys to define whether each habitat would be suitable for barbastelles.

Access was arranged for the most likely potential roost sites based upon the desk based map study. It was considered impractical to ground-truth all habitat and connecting features due the large numbers of such features. Where these habitats were not visible from public rights of ways further information and characterisation was not possible in the field.

Table 2.1 Woodland Characteristics of Importance for Barbastelle

Woodland habitats	Function/ importance for barbastelle
Abundance of old, damaged trees	A range of tree roosting opportunities in splits, cracks and bark. Barbastelles utilise storm cracks, narrow splits and loose bark. Roosts are usually over 25m from the woodland edge
Dense woodland canopy and/or understorey	A complex woodland structure to control the microclimate. Tree roosts in dense undergrowth may be utilised in extreme weather conditions
Wetland within the woodland	Provides damp and humid conditions. This influences the woodland climate and is important in controlling favourable roosting conditions in the more exposed tree roosts. Wet woodland also supports good quality foraging habitats.

Table 2.2 Building Characteristics of Importance for Barbastelle

Buildings	Features
Large tithe barns	A large, traditional timber frame construction provides roosting opportunities between supports and around lintels, or in splits in the beams. The size of the buildings is likely to be important because this will influence the range of microhabitats within the structure. A thatched roof provides damp conditions, especially if the barn has stone walls (such as Paston Barn).
Traditional agricultural buildings	These can be selected by barbastelle for roosting, although they are not likely to be used for breeding. A complex of buildings, especially if in proximity to, or incorporating, a tithe barn may provide the range of roost sites necessary to cater for the possible range of atmospheric conditions. Examples: Traditional timber frame barns, stone outbuildings, malt buildings, redundant industrial buildings.

Table 2.3 Commuting Routes and Foraging Habitat Characteristics of Importance for Barbastelle

Potential Commuting Routes and Foraging Habitats*	Function/ Importance for Barbastelle
Shaded woodland tracks and overgrown hedgerows. The structure and size of the hedgerow is more important than species composition.	Provides cover from avian predators. Particularly important close to the roost to provide dark corridors after emergence. Double hedgelines are ideal, whereas gappy and/or trimmed hedges may be avoided.
Watercourses with natural tree lines	Trees and scrub provide shade along wet habitats that support moth prey items.
Connectivity of potential flightlines	Barbastelle bats may avoid flying across breaks and gaps in flightlines, and may detour to avoid such areas[2].
Reed beds and sand dunes	Open foraging habitats, most likely to be visited after dark.
Unimproved grassland	Grasslands with abundance of moths. Open areas are likely to be avoided until after dark.
Small watercourses	Small rivers and streams, and drainage ditches. Tree or scrub lined watercourses are frequently used for foraging

*A key consideration when assessing the woodland habitat is the condition of potential flightlines between foraging habitats because the ability of a female to feed herself and her offspring is dependent to some extent on being able to feed throughout the night. Therefore, flightlines will ideally support foraging habitats.

[2] Barbastelle bats at Paston Barn are known to follow a defunct hedgeline, and cross an open field to reach the coastal grassland

2.2.2 Trapping Surveys

Harp-trapping and mist-netting were carried out for three nights between 26 and 28 May 2009. Suitable locations had been pre-determined by a site walkover and from walked transect and static detector survey information gathered by BSG during 2007 and 2008. The trapping was undertaken by Corylus Ecology with assistance from BSG (see Section 2.3).

A series of mist nets and harp traps was set up in suitable locations using a variety of woodland habitats and rides within the plantation woodland areas around Fiscal Policy and Nursery Covert. Care was taken to position the traps in different locations on each night. The traps were set just before sunset and remained in place for half a night. The mist nets were checked for bats at least every 10 minutes, the harp traps approximately every 15 minutes. Biometric data including forearm length and weight of all bats caught were recorded, and bats were examined to determine species, gender and, where possible, breeding status. Protocols for the measurements and the identification of the bats followed Dietz & von Helversen (2004). Bats were not marked during the trapping as the survey was undertaken under a general license which did not included marking. Individual bats were distinguished (in most cases) by measurements and also any other salient distinguishing features that could be noted in the field.

The timing of surveys was influenced by ethical and licensing issues. Surveys could not be undertaken much later in the spring because of the risk of catching heavily pregnant bats which could be harmed through trapping. As a result, there was a risk that female barbastelles, which tend to give birth later in the year than most other common UK bat species, would not show signs of pregnancy. It would then be difficult to prove that the site could be of importance to a breeding population of females.

Although use of an acoustic lure was considered to attract barbastelles to nets this method has not been found to be very successful for this species during a number of previous surveys carried out by the survey team (Lucking, *pers comm*.) and it was considered that any limited benefits that may be accrued were unlikely to justify any potential disturbance to bat behaviour as a result of the use of lures.

2.2.3 Bat Activity Surveys

Walked Transects

A total of ten walked transect surveys were undertaken between April and September 2009. These were carried out twice a month except in July when no surveys were undertaken. During each transect two surveyors together (for health and safety reasons) walked a pre-determined transect route within the survey area. Surveyors used two different bat detectors on every survey: a Batbox Duet detector for listening to bat calls from the heterodyne output and an Anabat SD1 frequency division detector for recording calls for subsequent identification (see Section 2.2.5). Each transect started around sunset and typically took 2-3 hours to complete. The timing of the surveys covered the bat emergence period and the period of most intense foraging activity when invertebrate prey is most abundant (Altringham, 2003). Each transect route was covered once and incorporated regular listening stops of 1-3 minutes. Wherever possible, surveyors recorded the observed behaviour and numbers of bats onto field proformas. Notes were taken of all bat sightings (to assist with their subsequent identification) in conjunction with the Anabat recordings. Field notes included a record of the time of each bat encounter, allowing results to be cross-referenced with the recorded data.

Transect routes during 2009 were designed to cover a wider area than those in 2007 and 2008, with routes covering areas which had not previously been surveyed. These new areas included

Sizewell Belts, Leiston Common, Sandy Lane, Reckham Pits Wood and the SSSI marsh and dyke system immediately south of Goose Hill.

Static Detector Survey

Anabat detectors were used to assess bat activity at various fixed points throughout the site. The detectors were left *in situ* for a number of days or weeks at each survey point, which allowed continuous monitoring to take place during the period when bats are active. They were programmed to begin recording at sunset and finish at sunrise. Survey hours varied throughout the survey season according to daylight hours.

Detectors were placed in camouflaged water-proof 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 sound quality. With the microphone pointing downwards at 45 degrees the 90 degree bend in the pipe allows reception of calls from the upward-pointing, open end of the pipe. The pipe was then attached to a hedgerow, tree or other suitable habitat feature with the Anabat housing hidden on the ground. 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. Wherever possible the microphone was pointing along a potential commuting or foraging feature to record clear identifiable calls from bats echolocating along features and towards the microphone. The detector and microphone housing used at Sizewell has been tested in an acoustic laboratory at Bristol University using playbacks of calls from UK bat species. Although results are preliminary, the housing has been shown to record bat calls with only small apparent losses in detection distances of less than 10% in comparison to a microphone with no housing (BSG, unpublished data).

2.2.4 Recording Bat Activity

All bat surveys were undertaken using the Anabat SD1 frequency division bat detector which was used to record bat calls during 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 data produced by Anabats is then analysed used Zero-Crossings Analysis (ZCA) through an in-built interface module to prepare the data for use on a PC. ZCA enables rapid analysis of the frequency-time characteristics of bat calls and uses small amounts of data for storage.

The Anabat has internal storage and computing power that allows the unit to be used as a remote fixed-point detector. Although not as much information on the bat's echolocation is preserved as with some other bat detectors, such as time-expansion systems, frequency division detectors provide clear depictions of important call details that allow species identification to a similar level of accuracy to other methods. Recording is triggered by high frequency ultrasound, such as bat calls, in the vicinity of the detector, and any recordings are stored as discrete sound files on an internal Compact Flash Card. The Anabat creates discrete dated and timed 15 second long recordings when the unit is triggered. If bat activity continues for more than 15 seconds successive sound files are created until ultrasound is no longer detected.

Detection is thought to be most efficient between 7.5º either side of directly ahead (0º = on axis) of the Anabat microphone with detection distances decreasing with increasing angles from the axis (Larson & Hayes, 2000).

Although no published research exists to date, bat detectors are thought to detect calls from particular species of bats at greater distances than calls from others, for the following reasons:

- Calls containing lower frequencies become attenuated less over distance in the atmosphere than high frequencies;
- Calls which contain stronger constant frequency (CF) components tend to be detected at greater distances for two main reasons:
    1) The energy of the call is contained within a smaller frequency range and the call will therefore be louder at those frequencies;
    2) CF calls are generally used by bats to interpret open and less 'cluttered' environments where they are less likely to be impeded or distorted by physical barriers.
- Calls which contain a greater range of frequencies, i.e. frequency modulated (FM) calls, tend to be quieter than CF calls and therefore not detected over such long distances for the following reasons:
    1) The energy of the call is dissipated over a large frequency range;
    2) FM calls are generally used to interpret 'cluttered' environments at short range and are often impeded or distorted by physical barriers, such as hedgerows.

The Anabat is biased to detect loud bats more efficiently as well as those which call within the peak detection frequency range of the microphone (40-50 kHz). This will lead to a bias in the data which is difficult to correct for.

It is possible to categorise bat species according to how detectable their calls are; however, the ability of bat detectors to detect bats is affected by many different variables, for example, the ambient temperature and humidity, the angle of the sound source from the microphone, the habitat the bat is flying in, and the behaviour of the bat (commuting, foraging, etc.). In general, bats with calls that can be detected over greater distances are large bats which use low frequency CF/FM calls, such as noctule, and the quietest are those which use weak FM calls, such as the brown long-eared bat or high frequencies, such as horseshoe bats. In addition, recent research by Bristol University has shown that barbastelle is probably difficult to detect beyond c.5 metres, which is a very short detection distance (Holderied *et al*., unpublished data). Its characteristic short and directional echolocation call (Denzinger *et al.,* 2001), fast and far-travelling flight (Dietz *et al.,* 2009) make them difficult to detect using bat detectors. As a result numbers of barbastelle bats recorded from detector surveys may not reflect the true abundance of this species, especially in comparison to other easily detectable bats such as *Pipistrellus* and *Nyctalus* species. **Table 2.4** indicates the likely detectability of UK bat species or species groups based on preliminary research undertaken by BSG in collaboration with Bristol University.

Table 2.4 Estimated Detection Distances for Suffolk Bat Species.

English Name	Latin Name	Maximum Detection distance (m)
Pipistrelle species	*Pipistrellus sp.*	30
Brown long-eared bat	*Plecotus auritus*	<5 for typical foraging calls. 5 – 10 (for louder commuting call)
Myotis species	*Myotis sp.*	15
Noctule	*Nyctalus noctula*	>100 (CF call)
Leisler's bat	*Nyctalus leisleri*	50 (CF call)
Serotine	*Eptesicus serotinus*	30?
Barbastelle	*Barbastella barbastellus*	5
Lesser horseshoe bat	*Rhinolophus hipposideros*	5

2.2.5 Bat Call Analysis

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 (Swift & Entwistle, 2008). Species of the genus *Myotis* were grouped together due to many of the species having overlapping call parameters making species identification problematic (Bat Conservation Trust, 2007a).

For *Pipistrellus* species the following criteria, based on measurements of peak frequency, were used to classify calls:

P. pipistrellus ≥42 and ≤48 kHz

P. pygmaeus ≥52 kHz

P. nathusii <39 kHz

P. pipistrellus / *P. pygmaeus* >48 and <52 kHz

P. pipistrellus / *P. nathusii* <42 and ≥39 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.;
- *Nyctalus* sp. (either Leisler's bat or noctule);
- *E. serotinus/N. leisleri;*
- *Nyctalus/Eptesicus* sp.;

- *Plecotus/Eptesicus* sp.

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. Sound files 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 within a 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. Although relative abundance cannot be estimated from this analysis, 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 as a measure of relative activity.

2.3 Personnel

Trapping survey work was undertaken by Helen Lucking MIEEM[3] and Alastair Wrigley with assistance from Narawan Williams and Dr Edward Bodsworth MIEEM. Bat survey work during 2009 was carried out by a total of nine ecologists. Walked transect surveys were principally led by Dr Edward Bodsworth and Anton Kattan MIEEM, with single surveys led by Louise Mapstone MIEEM and Nathalie White AIEEM. In addition, Charlotte McDonald, Lisa Pitts, Kerry Elliot MIEEM, Gillian Catton MIEEM and Nathan Budd assisted on at least one survey. Six of the survey team are Natural England licensed bat surveyors[4].

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);

[3] MIEEM = Full member of the Institute of Ecology and Environmental Management; AIEEM = Associate member.

[4] Natural England licence numbers: Helen Lucking 20091142, Alastair Wrigley 20091216, Anton Kattan 2008049, Edward Bodsworth 20083959, Louise Mapstone 20083934 and Gillian Catton 20090915.

- Local (or Parish); or
- Site - within immediate zone of influence only (the development site and surrounds).

Where possible, formal criteria are used to assess the conservation importance of each feature of interest within a 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* (IEEM, 2006). 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 2007b).

2.5 Survey Limitations

A walked transect to sample areas of Nursery Covert, Goose Hill and the SSSI marsh south of Goose Hill on 13 May was curtailed after 92 minutes due to very heavy rain. Also, the Anabat detector used for a walked transect on 9 September failed to record data and results from this survey were not used in the analysis.

Some of the Anabat detector systems that were deployed with the intention of monitoring foraging habitats and flightlines failed to record successfully. Where this problem occurred Anabats were repaired and re-deployed to address any problems and it is considered that sufficient data have been collected to inform this assessment.

Identification of some bat species from recordings can be difficult or impossible (see Section 2.2.5) and some species are more detectable than others, resulting in an inherent bias in the results which is difficult to correct (see Section 2.2.4).

Weather conditions during April-September 2009 were reasonably typical of recent years, with above average temperatures notable throughout the active season for bats. However, despite a relatively dry spring and autumn, July and parts of August saw very high levels of rainfall during a critical period for the survival of juvenile bats. The summer of 2009 follows wet summers in both of the two preceding years and the recruitment and general abundance of bats may be affected by this trend.

3. Results

3.1 Desk Study

A total of 312 records were provided by Suffolk Biological Records Centre which included records of the following bat species: common pipistrelle, soprano pipistrelle, brown long-eared bat, Natterer's bat, Daubenton's bat *Myotis daubentonii*, noctule, serotine and barbastelle. The complete results are illustrated on **Figure 3.1** which shows approximate locations for the records (depending on the level of accuracy supplied). The data are summarised by species in **Table 3.1** and detailed results are outlined in **Appendix A**. The metadata with the records included the species, location, and year. Information regarding numbers of bats, whether bats were roosting or flying, or other such details were not provided.

Table 3.1 Summary of Bat Records from the 15km Search Area Surrounding the Sizewell Site

English Name	Scientific Name	Records with 15km	Notes in Relation to the Site
Common pipistrelle	*Pipistrellus pipistrellus*	126 records, widespread across the search area with some concentration of records around villages.	Five records within the nearby village of Leiston and one record within the south of the site.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Seven records, all located close to the site or further south.	
Brown long-eared bat	*Plecotus auritus*	109 records, widespread across the search area.	Records are widespread in the vicinity of the site.
Natterer's bat	*Myotis nattereri*	27 records, spread across the search area.	Nearby records include Lower Abbey Farm in Sizewell and Upper Abbey Farm in Leiston.
Daubenton's bat	*Myotis daubentonii*	10 records with a patchy distribution within the search area. . The distribution of this species at a national scale suggests the data search results underrepresented actual distribution.	The nearest record is located approximately 8km south west of the site at Cloisters Tunnel in Snape.
Noctule	*Nyctalus noctula*	Nine records, spread across the search area.	One record within the site itself in the Kenton Hills woodland, from 2004.
Serotine	*Eptesicus serotinus*	18 records spread evenly across the search area.	The nearest record is located less than 2km south of the site at Aldringham Common.
Barbastelle	*Barbastella barbastellus*	Six records, four of which are from Captains Wood south of Aldeburgh and the River Alde. The site is a Suffolk Wildlife trust reserve with seven species of bats recorded there although the roosting status of barbastelle is unknown (www.suffolkwildlife.co.uk).	Two records from the Upper Abbey Farm barn in Leiston, within 1km of the site. The first record is from 1997 and the second from 2004, suggesting long-term use of the barn.

3.2 Field Surveys

3.2.1 Landscape Appraisal

The details of survey timings and conditions are presented in **Table 3.2**.

Table 3.2 Details of Woodland Habitat Assessment and Buildings Inspection Surveys

Date	Time	Woodland code**/ Building name	Weather
17/11/09	16:00-16:45	1, 2	14°C, light wind, cloud 100%, no rain
18/11/09	09:30 -12:30	3, 4, 5, 6,	15°C, light to moderate wind, cloud 80%, no rain.
	12:30 -13:00	7	
	13:45-14:30	St Peter's Church, Therberton	15°C, light wind, cloud 100%, no rain
	15:00-16:00	Lady Chapel and Leiston Abbey	15°C, light wind, cloud 100% no rain
	16:00-17:30	8, 9, 10	14°C, light wind, cloud 100%, light rain (from about 17:00 onwards)
19/11/09	09:00- 10:30	11, 12	14°C light wind, cloud 100% occasional showers, dying out by 10:30
	10:30-11:45	Thorpeness Barn***	16°C, light wind, cloud 100%, no rain
		13 (Margaret wood)	
	12:45-16:30	14, 15, 16, 17	16°C, light wind, cloud 100%, heavy shower at 16:00
20/11/09	09:00-10:30	Potential commuting habitat and farm buildings around Wilderness and west of leiston	15°C, no wind, cloud 50%, no rain.

**Woodland code is given on the Woodland Habitat Assessment sheets under 'number code'.

*** The date on the building survey form incorrectly gives the date as the 18/11/09. The date in this table is correct.

Ground Truthing Results

Woodland Habitats

Tables of data collected from each woodland are provided in **Appendix B** and correspond to **Figures 3.2**. Photographs of the woodland units are also provided in **Appendix B**.

Of the woodland units surveyed, the majority (12 out of 17 units) were assessed as having low potential habitat for roosting barbastelle. Three woodland units were assessed as having medium roosting potential: Fred's Mount/Goose Hill (1), Osier Bed (7) and The Wilderness (10); one of medium/high roosting potential (Minsmere, 3) and one of high roosting potential (Scotshall Coverts, 4).

Buildings

The assessment of buildings within the wider survey area was not extensive and should not be considered as a comprehensive assessment of buildings with bat roosting potential in the area. Although there are hundreds of buildings present within the search area, with large concentrations within Leiston, Aldeburgh, Coldfair Green, Thorpeness and Westleton, the only buildings that were investigated in the field and considered to have a high potential for roosting barbastelle (following the characteristics in **Table 2.1**) were St Peter's Church in Theberton, Lady Chapel at Leiston Abbey and a thatched barn at Thorpeness (**Figures 3.3 and 3.4**). Owing to the presence of bat droppings within the buildings, two were confirmed as roosts for pipistrelle, long-eared bats and potentially another medium-sized bat species although the status of these roosts was unknown. Other buildings with negligible or low potential for roosting barbastelles were noted during the field survey and plotted on **Figures 3.3 and 3.4** although again this information is not comprehensive.

Connecting Habitats for Commuting and Foraging in the Landscape

Study of OS maps and aerial photographs reveals that the wider landscape surrounding the Sizewell site offers excellent connectivity when compared to the conditions considered suitable for barbastelle to disperse through the countryside. Travelling north to south from Dunwich and the woodlands at Fred's Mount, the strongest networks of connecting habitat are located close to the coast between Dunwich Heath and Minsmere and also along field boundaries to the east of Westleton. The Wilderness woodland located west of Westleton is well connected with Darsham Marshes but has more limited connectivity south towards Minsmere on the south side of Westleton.

Minsmere Nature Reserve and the surrounding complex of woodland offer the highest quality habitat and connectivity and therefore the greatest potential for a colony core of barbastelle in the wider landscape surrounding the site. This area contains woodland within the nature reserve as well as Scotshall Coverts, which are connected to the north as described above and are also well connected to the south through the Minsmere Levels and Eastbridge area including the Ossier Bed (Woodland 7 on **Figure 3.3**). This connectivity continues with high quality connections (following **Table 2.2**) to Theberton to the west and Leiston Old Abbey to the south where two of the three buildings with high potential for roosting barbastelle are located.

Close to the site there is limited connectivity to the west of Leiston although a number of shelter belts and coverts maintain some connection to the low potential woodlands of Margaret Wood, Hundred River Wood, Foxburrow and Portobello Coverts and Great Wood to the south of the site (units 13, 14, 16 and 17). The one feature of higher potential in this area south of the Sizewell site is the thatched barn at Thorpeness. This barn is located within a village centre and connections up and down the coast are limited. The nearest high quality habitat to the barn include the coastline and the Thorpeness Mere 500m south-west.

3.2.2 Trapping Survey

A summary of the survey details for each of the three consecutive evening surveys is provided in **Table 3.3** and a summary of the results in **Table 3.4**. The trapping locations are shown on **Figure 3.5.**

Table 3.3 Details of Trapping Surveys in 2009

Date	Sunset	Surveyors	Weather
26/05/2009	20:58	HL, AW, NW, EB	Clear skies, light breeze, 15-14°C
27/05/2009	20:59	HL, AW, NW, EB	Clear skies, light breeze, 14°C
28/05/2009	21:00	HL, AW, NW, EB	Clear skies, moderate breeze, 14-8°C

26 May 2009

A total of two harp traps and three mist nets were installed. A single harp trap was installed along the small path from the car park with another and three mist nets set across the wider track to the north. A total of 18 bats were caught, including two barbastelles. The first barbastelle was a male bat removed from harp trap 2 at 21:45, within an hour of sunset. The grid reference for harp trap 2 was TM 45387 63962. The second barbastelle was a female caught in harp trap 2 which was removed from the trap at 00:35. It was not possible to determine if this bat was pregnant but it was recorded that she was parous (she had given birth in previous years). These were the only bats of any species caught in harp trap 2. Other bats caught included two pregnant female Natterer's bats, two male Daubenton's bats, four pregnant female common pipistrelles and eight soprano pipistrelles. Of the soprano pipistrelles, six were male and two female, one of which was possibly pregnant.

27 May 2009

Two harp traps and three mist nets were installed in Nursery Covert at approximate grid reference TM 46210 64418. A total of 16 bats were caught, including two barbastelles. The first barbastelle was a female taken out from harp trap 1 at 21:55 just within an hour of sunset. The second was removed also from harp trap 1 at 00:45. Both of the two females were recorded as parous. These two bats could not be distinguished from each other with certainty on measurements although the second female had less fur around the reproductive organs than any of the other females and was considered to be a different individual. The other bats caught included a single male brown long-eared bat, a single male Natterer's bat, four common pipistrelles (two pregnant females and two males), and eight soprano pipistrelles (four pregnant females, one non-breeding female and three males). The forearm length and weights for the final three pipistrelle bats caught were not taken as they were caught whilst the traps were being taken down.

28 May 2009

Only eight bats were caught in total. An increase in wind meant that the mist nets were less effective due to their increased visibility. Two harp traps were set down the path from the car park, the first path where a barbastelle bat was caught on the first evening. A mist net was erected in conjunction with one of the harp traps and a second mist net was installed on the edge of an opening near some good quality scrub habitat. A single female barbastelle was caught in harp trap 2 and was removed from the trap at 22:15. This bat was not obviously pregnant or obviously parous. A single female brown long-eared bat, two female Natterer's bats (one pregnant) and four common pipistrelles, consisting of two males and two pregnant females, were also caught.

Table 3.4 Details of Bats Caught During Trapping Surveys, 26-28 May 2009.

Date	Time	Species	Sex	Breeding Status	Forearm length (mm)	Weight (g)	Trap*
26/05/2009	21:45	***B. barbastellus***	Male	-	39.1	7.5	H2
26/05/2009	21:45	*P. pygmaeus*	Male	-	31.7	5	H1
26/05/2009	21:45	*P. pygmaeus*	Female	Pregnant?	32	5	H1
26/05/2009	21:45	*P. pygmaeus*	Female		33.2	4	H1
26/05/2009	21:45	*P. pygmaeus*	Male		31.2	4	H1
26/05/2009	21:45	*P. pygmaeus*	Male		31.2	4.5	H1
26/05/2009	21:45	*P. pygmaeus*	Male		31.7	4.5	H1
26/05/2009	21:45	*P. pygmaeus*	Male		29	4	H1
26/05/2009	22:10	*Myotis species*	Female	Pregnant	38.6	8.5	H1
26/05/2009	22:1	*M. daubentonii*	Male		37.8	8.5	H1
26/05/2009	22:1	*M. daubentonii*	Male		39.2	8	H1
26/05/2009	22:1	*M. nattererii*	Female	Pregnant	40.4	8	H1
26/05/2009	22:35	*P. pipistrellus*	Female	Pregnant	32.3	5	MN3
26/05/2009	22:40	*P. pygmaeus*	Male		32.5	5	H1
26/05/2009	23:00	*P. pipistrellus*	Female	Pregnant	32	6	H1
26/05/2009	23:25	*P. pipistrellus*	Female	Pregnant	31.5	6	MN3
26/05/2009	0:15	*P. pipistrellus*	Female	Pregnant	-	-	H1
26/05/2009	0:35	***B. barbastellus***	Female	Parous	37.4	8.5	2
27/05/2009	21:40	*P. pygmaeus*	Male	-	30.7	4.5	H2
27/05/2009	21:40	*P. pygmaeus*	Female	-	31.2	6	H2
27/05/2009	21:55	***B. barbastellus***	Female	Parous	40	9.5	H1
27/05/2009	22:05	*P. pygmaeus*	Female	Pregnant	31.8	6	H2
27/05/2009	22:15	*M. nattererii*	Male	-	37.7	7	H1
27/05/2009	22:45	*P. auritus*	Male	-	38.8	9.5	MN2
27/05/2009	23:15	*P. pygmaeus*	Female	Pregnant	31.7	7	H2
27/05/2009	23:15	*P. pygmaeus*	Female	Pregnant	32.2	6.5	MN2
27/05/2009	23:20	*P. pipistrellus*	Male	-	32.1	5	H1
27/05/2009	23:20	*P. pygmaeus*	Male	-	31.4	4.5	H1
27/05/2009	23:40	*P. pipistrellus*	Female	Pregnant	32.8	6.5	H2
27/05/2009	0:00	*P. pygmaeus*	Female	Pregnant	31.5	7.5	MN1
27/05/2009	0:20	*P. pygmaeus*	Male	-	-		H2
27/05/2009	0:45	*P. pipistrellus*	Male	-	-		H1

Table 3.4 (continued) Details of Bats Caught During Trapping Surveys, 26-28 May 2009.

Date	Time	Species	Sex	Breeding Status	Forearm length (mm)	Weight (g)	Trap*
27/05/2009	0:45	*P. pipistrellus*	Female	Pregnant	-		H1
27/05/2009	0:45	***B. barbastellus***	Female	Parous	40.5	9.5	H1
28/05/2009	22:15	*M. nattererii*	Female	Pregnant	39.9	8	H2
28/05/2009	22:15	*M. nattererii*	Female	-	37.5	8	H2
28/05/2009	22:15	***B. barbastellus***	Female	Not clear	41	9	H2
28/05/2009	22:40	*P. pipistrellus*	Male	-	30.6	5.5	MN1
28/05/2009	22:40	*P. pipistrellus*	Female	Pregnant	32.6	5.5	H2
28/05/2009	23:00	*P. auritus*	Female	-	39.9	8	MN2
28/05/2009	23:20	*P. pipistrellus*	Male	-	30.3	5.5	H2
28/05/2009	0:00	*P. pipistrellus*	Female	Pregnant	-		H2

*H = harp trap; MN = mist net.

3.2.3 Bat Activity Surveys

Walked Transects

Survey Effort

Details of transect surveys are included in **Table 3.5** and a map of all walked transect survey routes is presented in **Figure 3.6**. Individual maps of each transect survey route are presented in **Figures 3.7** to **3.15**.

Table 3.5 Details of Walked Transect Surveys in 2009

Date (2009)	Sunset time	Start time	Finish time	Surveyors*	Weather conditions
27/04	20:13	20:08	22:00	TB+NB	11-8°C, Beaufort 0-1, 5-7/8 cloud, light rain
29/04	20:16	20:01	22:52	LM+CM	13-12°C, Beaufort 1, 6-7/8 cloud, dry
13/05	20:39	20:46	22:18	TB+AK	Heavy rain - no other notes
25/05	20:57	20:53	23:10	TB+LP	14°C, Beaufort 1, 8/8 cloud, dry
04/06	21:08	21:20	00:15	TB+AK	12-10°C, Beaufort 1, 7-8/8 cloud, dry
25/06	21:19	21:15	00:00	AK+NW	16-12°C, Beaufort 1, 2/8 cloud, dry
18/08	20:12	20:20	23:00	TB+AK	16°C, Beaufort 1, 1/8 cloud, dry
25/08	19:57	19:45	22:19	NW+KE	15°C, Beaufort 2, 8/8 cloud, showers
14/09	19:11	19:05	21:50	AK+GC	15-16°C, Beaufort 3, 7/8 cloud, dry

Relative Activity of Bats

In total 1125 bat passes of at least eight species of bats were recorded during walked transect surveys in 2009, including Nathusius' pipistrelle, a species that has not been recorded previously during site surveys in 2007 and 2008. Across the survey season, soprano pipistrelle was the most frequently encountered species on walked transects with 23.1 B/h and 44.3% of all passes recorded as this species (n = 498). The common pipistrelle was the second most numerous with 18 B/h and *P. pipistrellus* / *P. pygmaeus* the third with 7.7 B/h. Relative activity of less than 1 B/h was recorded for all other species or grouped species categories. The relative activity level recorded during walked transects for all species or grouped species categories is summarised in **Table 3.6**. Full details of the number of passes and species recorded during each transect survey are included in **Appendix C**.

Table 3.6 Relative Bat Activity Recorded During Walked Transects

Species	Total Passes	B/h	% of total
P. pygmaeus	498	23.1	44.3
P. pipistrellus	388	18.0	30.0
P. pipistrellus / P. pygmaeus	167	7.7	14.8
Myotis species	16	0.7	1.4
P. nathusii	14	0.6	1.2
E. serotinus	12	0.6	1.1
B. barbastellus	11	0.5	1.0
N. noctula	8	0.4	0.7
P. pipistrellus / P. nathusii	4	0.2	0.4
Plecotus/Eptesicus	3	0.1	0.3
Myotis/Plecotus	2	0.1	0.2
Plecotus species	1	0.0	0.1
Nyctalus species	1	0.0	0.1

General bat activity levels varied each month, with a minimum of 33.1 B/r (27 April) and a maximum of 79.2 B/h (18 August). The overall relative activity level for transect surveys was 52.2 B/h. Fluctuations between surveys are normal, being influenced by short-term variations in weather conditions and prey availability and seasonal variations such as the increase in general abundance due to the presence of juvenile bats in the late summer.

Spatial Distribution of Bats

Figure 3.16 illustrates the distribution of records of less common species recorded during walked transects throughout the survey season and their spatial distribution along walked transect routes. Four UK BAP bat species, noctule, brown long-eared bat, soprano pipistrelle and barbastelle (which is also on Annex 2 of the Habitats Directive), were recorded in 2009.

A total of eight noctule passes were recorded at Kenton Hills, Leiston Carr, Turf Pits, the east side of Goose Hill and SSSI marsh south of Goose Hill (see **Figure 3.16**), with the earliest record only 18 minutes after sunset.

Only one record of brown long-eared bat, which are known to roost at Upper Abbey Farm, was obtained, from the track on the east side of Nursery Covert on 25 June. This species is very difficult to detect and is likely to be more abundant than the lack of records suggest.

Barbastelles were recorded in all months during 2009. All 11 passes of barbastelle were recorded from areas of plantation woodland, with eight of these recorded from the Goose Hill area, two from the northern track between Fiscal Policy and Nursery Covert and one from the edge of Leiston Carr. Of these records, six were recorded within an hour after sunset.

Common and soprano pipistrelle bats were recorded on every visit between April and August 2008 and occurred in most of the survey area. Nathusius' pipistrelle was recorded during two transect surveys. On 13 May one pass was recorded in the Kenton Hills area and 12 passes over the SSSI marshes south of Goose Hill during heavy rain. The single pass recorded on 4 June was over the proposed site for the new power station. The presence of this species during the spring may indicate that these bats were migrating through the area and feeding before crossing the North Sea to Scandinavia (Russ *et al*., 2001).

Serotine was recorded during two surveys. On 25 June several passes of one or more bats were recorded from tracks within Kenton Hills and on 25 August several passes were recorded on the north-west edge of Kenton Hills. A total of 16 passes of *Myotis* species were recorded with most of these from the Goose Hill area.

Static Detector Survey

A total of 11 static survey locations were employed during April – September, with the locations shown on **Figure 3.17**. Static detectors were numbered chronologically with reference to the date of their deployment. The static detectors were located to establish fine temporal detail of bat activity at fixed locations. During 2009, different locations were selected in an attempt to answer particular questions. The key purpose of all static detector surveys was to examine patterns of bat, and in particular barbastelle, activity and to identify areas of high importance for bats through quantitative analysis of relative activity. The locations of each static detector in turn were selected for the following reasons:

- Detectors 1, 4, 7, 9, 10 were located to monitor bat activity along hedgerows to the north of the site and within arable farmland, as there is potential for these hedgerows to be affected or removed as a result of plans for heathland creation in this area. These locations have not been monitored using static detectors previously in this study;
- Static detectors 3 and 8 were located to monitor potential flightlines for bats to the north of the site on features which would not be removed for heathland creation but may be affected by it. Both of these features may also be affected if the new access road is routed through arable land. Both of these features contain mature trees and scrub and are potentially high quality foraging and commuting habitats for bats. Static detectors were previously located further north along this track from detector 3 near Upper Abbey in 2008;

- Static detectors 2, 5 and 6 were located along the east-west track on the northern edge of the plantation woodland between Fiscal Policy and Nursery Covert. This track may form part of the route for the proposed new access track. This track was previously monitored with static detectors in 2008;
- Static detector 11 was located on the edge of a copse within Sizewell Belts to monitor bat activity in an area of accessible SSSI marshland. A static detector was located c.200m south of here on the edge of Reckham Pits Wood in 2008.

Of these static detectors, some were left for substantial periods of time and in areas with very high bat activity. Not all of the data from detectors 3, 6 and 8 were analysed fully due to the volume of data. All barbastelle calls but only a sample of all other bat calls from detectors 3 and 6 were analysed. Detector 8 which recorded very low levels of barbastelle activity, and a sample of nights were analysed for all bat calls. For full details of static survey analysis see **Table 3.7**.

Table 3.7 Details of Static Detector Deployment Dates and Bat Call Analysis

		No. of nights (sunset to sunrise)		
Detector no.	**Period of Recording**	**With bat data**	**All bats counted**	**Barbastelle only counted**
1	17-28 April	3	3	
2	17-28 April	11	11	
3	17 April - 5 July	37	21	16
4	27 April - 4 May	4	4	
5	27 April - 13 May	16	16	
6	13 May - 6 June	17	7	10
7	5 - 13 June	8	8	
8	26 June - 25 July	30	7	
9	26 June - 1 July	5	5	
10	19 August - 14 September	11	11	
11	19 August - 10 September	14	14	

Relative Activity and Spatial Distribution of Bats

Static bat detectors were deployed for a total of 133 nights, equating to 1137.5 hours of survey time (sunset-sunrise each night) throughout the survey season. In total 23,745 bat passes of nine species were recorded at an average rate of 25.2 B/h. The same species recorded during walked transects were recorded during static surveys including Nathusius' pipistrelle and just one pass of an additional species, Leisler's bat *Nyctalus leisleri*, which was also recorded in very low numbers in both 2007 and 2008.

Overall, the static detectors that recorded the highest relative activity were Nos 3 (87.4 B/h), 6 (39.8 B/h) and 8 (60.9 B/h) with all others recording <10 B/h. The relative activity level recorded during static surveys for all species or grouped species categories is summarised in **Table 3.8**. Full details of the relative activity for all species during each static survey are included in **Table 3.9**. The relative activity and spatial distribution of each species or species group is described in turn below.

Table 3.8 Relative Activity Level Recorded During Static Detector Survey

Species	Total Passes	B/h	% of total
P. pygmaeus	11450	12.2	48.2
P. pipistrellus	8426	9.0	35.5
P. pipistrellus / P. pygmaeus	2033	2.2	8.6
Myotis species	774	0.8	3.3
B. barbastellus	726	0.6	3.1
Myotis/Plecotus	114	0.1	0.5
N. noctula	96	0.1	0.4
Nyctalus species	81	0.1	0.3
P. pipistrellus / P. nathusii	11	<0.1	<0.1
P. nathusii	8	<0.1	<0.1
Plecotus auritus	7	<0.1	<0.1
Nyctalus/Eptesicus	7	<0.1	<0.1
E. serotinus	6	<0.1	<0.1
E. serotinus / N. leisleri	3	<0.1	<0.1
Plecotus/Eptesicus	2	<0.1	<0.1
Nyctalus leisleri	1	<0.1	<0.1
Total	**23745**	**25.2**	

Table 3.9 Relative Activity for all Species During Each Static Survey

	Static Detector No.											
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**All detectors**
P. pygmaeus	0.1	2.2	45.8	<0.1	1.2	14.8	<0.1	35.6	2.9	1.4	2.0	**12.2**
P. pipistrellus	0.1	5.8	26.0	0.7	4.0	23.0	0.1	20.2	2.6	2.5	0.3	**9.0**
P. pipistrellus / P. pygmaeus	0.1	0.2	10.4	<0.1	0.2	0.3		2.9	0.6	0.1	<0.1	**2.2**
Myotis species		0.7	2.9		1.0	0.3	<0.1	0.4	<0.1	0.1	<0.1	**0.8**
B. barbastellus	<0.1	0.6	1.6		<0.1	0.6		<0.1		0.8		**0.6**
Myotis/Plecotus		<0.1	0.6		0.1			<0.1				**0.1**
N. noctula		<0.1	0.1		0.1	0.2		0.7		<0.1	<0.1	**0.1**
Nyctalus species			<0.1			0.5		0.9		<0.1		**0.1**
P. pipistrellus / P. nathusii					<0.1	<0.1		0.1				**<0.1**
P. nathusii		<0.1	<0.1		<0.1			<0.1				**<0.1**
Plecotus auritus			<0.1	<0.1	<0.1							**<0.1**
Nyctalus/Eptesicus						0.1			<0.1			**<0.1**
E. serotinus		<0.1	<0.1		<0.1			0.1				**<0.1**
E. serotinus / N. leisleri											<0.1	**<0.1**
Plecotus/Eptesicus						<0.1		<0.1				**<0.1**
Nyctalus leisleri								<0.1				**<0.1**
Minimum number of species recorded	**3**	**7**	**8**	**3**	**8**	**6**	**3**	**8**	**4**	**5**	**5**	**9**
All species	**0.3**	**9.6**	**87.4**	**0.8**	**6.7**	**39.8**	**0.2**	**60.9**	**6.2**	**4.9**	**2.4**	**25.2**

Across the survey season, soprano pipistrelle was the most frequently recorded species from static detectors with 12.2 *B/h* and 48.2% of all passes recorded as this species (n = 11,500). Soprano pipistrelle was recorded most frequently from detectors 3, 6 and 8. Common pipistrelle was the second most numerous with 9 B/h and *P. pipistrellus / P. pygmaeus* the third with 2.2 B/h. Relative activity of less than 1 B/h was recorded across static locations for all other species or grouped species categories. Nathusius' pipistrelle was again recorded almost exclusively in the spring with a total of seven passes (from detectors 2, 3 and 5) between 20 April and 10 May and a single pass from detector 8 on 10 July. This is likely to indicate northerly migration and that bats may be feeding before crossing the North Sea.

Myotis bats were recorded from nine of the 12 static locations. They were most frequently recorded from detector 3 (2.9 *B/h*) along the track which leads towards Upper Abbey Barn, where there is a known colony of Natterer's bats. They were also recorded regularly from detectors 2, 5 and 6 in the Fiscal Policy – Nursery Covert area.

Barbastelles were recorded from seven static locations with detectors 4, 7, 9 and 11 recording no barbastelles. Of these, the first three were located along hedgerows in arable land and no. 11 was located in Sizewell Belts. Detectors 1, 5 and 8 had very low levels of barbastelle activity of <0.1 *B/h*. The highest level of activity was recorded at detector 3 on a track leading from Fiscal Policy towards Upper Abbey. A total of 477 passes of barbastelle were recorded (1.63 *B/h*) with a clear pattern of activity through the night. The first peak in activity occurred between 20 and 60 minutes after sunset with a total of 36.4% of all passes during this period at a rate of 7.1 *B/h*. The second, less pronounced peak occurs 100-60 minutes before sunrise when 18% of passes were recorded at a rate of 3.6 *B/h*, which may correspond to bats returning to roosts. Barbastelle is a species which often does not show a pronounced pattern of returning to roosts close to dawn as others do, such as pipistrelles or *Nyctalus* bats (BSG, unpublished data). This pattern of activity indicates that the location of detector 3 is on a significant north-south commuting route for barbastelle. The track provides a green corridor of high quality commuting and foraging habitat for large numbers of several species of bats and is bordered on both sides by mature trees, principally oak *Quercus robur,* and mature hedgerows. The early peak suggests that bats may be leaving roosts early and/or roosting nearby. However, barbastelles are known to be capable of travelling large distances quickly (e.g. Greenaway, 2008)) and it is difficult to be sure how far they are likely to have travelled. One possibility is that at least some bats are roosting in Upper Abbey and then commuting south towards the plantation woodland to forage.

Reasonably high levels of barbastelle activity were also recorded at detectors 2 (0.6 *B/h*), 6 (0.6 *B/h*) and 10 (0.8 *B/h*). Nos 2 and 6 are located along the main track at Fiscal Policy and Nursery Covert respectively and are areas where barbastelles are known to occur. At both of these locations, small peaks in activity were recorded between 20 and 60 minutes after sunset. Static 10 was located on a hedgerow just north-east of Upper Abbey which is connected to the track where detector 3 was located. Barbastelles recorded from detector 10 were primarily recorded during the middle of the night during 10-14 September which suggests that this hedgerow may be of periodic secondary importance for foraging. The relative activity of barbastelles at each static detector is illustrated in **Figure 3.18**.

Records of large bats were not frequent from any of the static detectors with just one record of Leisler's bat, 6 passes of serotine and 10 passes of unidentified *Nyctalus* / *Eptesicus* species. They were most frequently recorded at detector 8 where very high relative bat activity was recorded along a line of mature trees running north-west across arable fields. Noctule and unidentified *Nyctalus* bats were recorded here (1.6 *B/h* combined) with regular passes close to

both sunset and sunrise on most nights, indicating that small numbers of bats were commuting to and from a roost.

Very few records of brown long-eared bat were recorded from static detectors, which is likely to be due to the difficulty in detecting this species.

4. Evaluation

4.1 Revision of the Evaluation of the Importance of the Survey Area to Bat Populations

This section updates the preliminary evaluation and revised evaluation of the importance of the bat assemblage following surveys in 2007 and 2008 respectively. The evaluation of resources has been conducted in accordance with IEEM EcIA guidance (see Section 2.4). For the purpose of clarity, the revised evaluation follows the same arrangement for dividing the survey area into sectors for evaluation that is presented in both the 2007 bat survey report (Entec doc ref 19801cb114) and the 2008 bat survey report (Entec doc ref 19801cb205). 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 and as far south as Leiston Carr and Sizewell Belts;
- The north-south tree-line north of Nursery Covert which was surveyed by Static 8.

The preliminary works area was not surveyed extensively in 2009 and its evaluation has not been re-assessed in this report.

In addition, it is possible to provide preliminary evaluations of two new areas following the results of 2009 surveys. These are:

- The area of arable land, including hedgerows, which may be affected by plans for heathland creation. This includes the area north from Fiscal Policy, Kenton Hills and Nursery Covert to the northern limit of the survey area at the hedgerow boundary where static detectors 1 and 10 were located, and east to the edge of Hilltop Covert;
- The track running from Fiscal Policy to Upper Abbey, where static detector 3 was located. This area is clearly of importance to bats and there is some potential for this feature to be affected by heathland creation and/or works associated with the proposed new access track.

It is worth noting that there have been no significant changes in habitat or habitat management during 2009 in any of these areas which might affect their importance to populations of bats. Other new areas have also been surveyed during 2009 including those around Sizewell Belts and Leiston Common to the south. However, these are not considered in the evaluation section for two reasons:

1. It is currently unlikely that the bat population in these areas will be directly affected by the proposed works;

2. Insufficient survey work has been carried out during 2009 to provide a robust conclusion for the purposes of evaluation.

4.1.1 Goose Hill / Goose Hill

Transect routes in 2009 sampled the southern section of the plantation woodland at Goose Hill on four occasions with one survey (29/04) also sampling more northerly areas of Goose Hill. As in previous years, a high proportion of all barbastelle passes during walked transects were recorded along the rides through Goose Hill, with five of 11 (45%) in 2009, with another three passes recorded just to the south along the corridor of east-west access track through Goose Hill (See Section 3.3.3). This area is also of importance to a range of other bat species including soprano pipistrelle and noctule. The continued presence of barbastelles and large numbers of other bat species recorded from surveys in 2009 reinforces previous assessments in 2007 and 2008 of this area as being of **county value** to bats.

4.1.2 Corridor of East-West Access Track

This area was found to support high activity levels of several bat species from both walked transect and static detector results. A total of seven species were recorded along the track with an eighth, brown long-eared bat, caught during trapping surveys along the track and probably present but not detected during activity surveys. Therefore, it is considered that this area remains of **county value** for bats.

4.1.3 Kenton Hill and Nursery Covert

A total of nine species of bat were recorded in plantation woodland between Fiscal Policy and Nursery Covert south of the east-west access track. This large number of species includes two confirmed species of *Myotis* bats from trapping surveys, Natterer's bat and Daubenton's bat. Although no static survey was carried out in this area during 2009, the results of the walked transect and trapping surveys confirm that there does not appear to have been any significant change in bat populations in 2009. It is considered that this area remains of **county value** for bats.

4.1.4 Tree-line North of Nursery Covert

Although this area was regarded as having value in the zone of immediate influence only in the 2007 bat report, a static detector (Static 8) was deployed at the southern end of this feature for 30 nights in June and July 2009 to assess whether the tree line may be used as a commuting feature for barbastelle as well as other species of bats. Although low numbers of barbastelles were recorded, a total of eight species of bats were recorded along this feature which included Leisler's bat, Nathusius' pipistrelle and regular passes by noctules. Static detector 8 also recorded a very high level of activity (60.9 *B/h*), mainly from *Pipistrellus* species, which was noticeably higher than any other static detector has recorded with the exception of no. 3. As a consequence of this further survey the value of this feature for bats should be revised upwards and it is considered to be of **local or possibly district value** for bats. The size and extent of the feature in combination with the lack of barbastelle use may not justify the higher level of importance.

4.1.5 Arable Land for Heathland Creation

This area was surveyed through the use of five static detectors (Statics 1, 4, 7, 9 and 10) during 2009. All of these static detectors recorded low levels of bat activity and low numbers of

species (see **Table 3.4**) with the exception of no. 10. As discussed in Section 3.2.3, detector 10 recorded the second highest level of barbastelle activity with a total of 91 passes (0.8 *B/h*). The location of detector 10 was close to (c. 20m from) the north-south track beyond Upper Abbey, where high levels of barbastelle activity were recorded. It is likely that this hedgerow provides some secondary foraging habitat for barbastelle and it is currently unclear whether other hedgerows within the arable landscape may also provide foraging resources for barbastelle at times. Static detector 10 was the only detector deployed within this area during the late summer with all others active during April-June. It has been noted that barbastelles may use more open landscapes later in the summer, possibly due to warmer night-time temperatures and the higher abundance of prey species (BSG, unpublished data). The presence of barbastelle bats may increase the value of this area overall for bats but the apparently localised (and potentially seasonal) nature of their presence in combination with the generally low activity levels and species diversity found in this area justifies a preliminary assessment of this area as being of **local importance** to bats.

4.1.6 Track from Fiscal Policy to Upper Abbey

This track was surveyed through the use of a single detector which collected 37 nights of data between 17 April and 5 July. This detector recorded an extremely high level of bat activity with almost constant activity recorded every night (see Section 3.2.3). A total of eight species of bats were recorded. Of particular note was the high level of barbastelle activity which strongly suggests that this track is a commuting route for this species. Although this feature is limited in extent, it is not clear exactly how many barbastelles are using it and there may be other features of importance to barbastelle which have not been found yet it is likely to be of **district importance** to bats.

5. Conclusions

5.1 Baseline Data

Bat surveys at Sizewell have been undertaken so far over a three year period. Activity surveys in 2009 followed survey methods used in 2007 and 2008, but also Anabats were used more intensively as detectors to monitor habitats during the periods between site visits.

The use of the site by bats has probably not changed significantly because the character of the survey area and habitats has not altered. The results over the three year period 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 3.3). It should be noted that the survey methods used were designed to establish baseline information and are not designed to monitor change in bat populations.

5.1.1 Landscape Appraisal

The desk study and ground truthing exercise has identified habitats, including woodland and a single building, which are considered on the basis of this study to be of high potential to support a breeding colony of barbastelle. The woodland around Minsmere and Scotshall Coverts has been identified as capable of supporting a breeding colony due to the high percentage of canopy cover, diversity of broadleaved tree species, diverse age-structure, associated water features and a well developed understorey. These are advantageous qualities to a breeding colony of barbastelle as they help maintain humidity and support a diversity of prey species, the latter being of particular importance when young bats are volant but have not been weaned, around

early August. During this time the young are vulnerable to predation and require good cover for flight, and mothers will range only a few kilometres from the roost (Greenaway & Hill, 2004). The criteria used for selecting potential sites for woodland maternity colonies have been based largely upon the results of detailed research in West Sussex. However, it should be noted that a study carried out by BSG in Norfolk in 2009 located a number of maternity roosts (some containing more than 50 bats) which showed some deviation from the West Sussex model. The roosts were located in smaller woodland blocks, often close to the edge of woodland (<30m) and even close to roads. In addition, the woodlands were dry with limited understorey (BSG, unpublished data). These new data may indicate that where roosting opportunities are limited bats may exploit habitats which seem less favourable and that reliance on a model based on limited samples will not match all situations.

The field study of connectivity found networks of suitable (see **Table 2.3**) habitat that would allow barbastelle to range between open or wooded foraging areas across the majority of the wider study area. This includes good connectivity both north-south and east-west.

This study has found a particular concentration of well connected, higher potential breeding sites in the area approximately bound by Minsmere and associated woodland to the north, and Leiston Old Abbey and the Sizewell site to the south. In addition to the surveyed sites and the high levels of connectivity this area also contains potentially high quality foraging areas for barbastelle associated with the Minsmere River and Minsmere Levels. A review of UK Biodiversity Action Plan Priority Habitats on the Natural England website (www.natureonthemap.org.uk) reveals that Coastal and Floodplain Grazing Marsh, Lowland Dry Acid Grassland, Lowland Heathland and Purple Moor Grass and Rush Pasture are all prevalent in this area around Minsmere and are likely to provide a suitable foraging habitat for barbastelle. The Minsmere Nature Reserve contains extensive areas of reedbeds and freshwater habitats of exceptional quality. It is thought likely, despite a lack of assessment on the ground, that these habitats are of high enough quality to support core foraging habitat for a maternity colony of barbastelle.

In consideration of the above, if a breeding colony core of barbastelle is present in the wider study area surrounding the Sizewell site it is more likely to be present in the Minsmere and Leiston Old Abbey area where suitable roosting, features, habitat connectivity and foraging areas are found. Areas further south and north within the wider study area do contain some suitable features such as woodland of medium potential to support a breeding colony core and a high potential building for barbastelle roosting (Thorpeness barn) but the number of suitable features, proximity to the site, and connectivity within the surrounding landscape in these areas results in a decreased likelihood of a breeding colony core being present in comparison to the Minsmere and Leiston Old Abbey area.

5.1.2 Trapping Survey

The results of the trapping surveys in 2009 have provided a significant amount of new information to the baseline. Two areas, in Fiscal Policy and Nursery Covert, were used for trapping over three nights in late May. A total of 42 bats of six species were caught in harp traps or mist-nets, including four female and one male barbastelles. Although pregnancy could not be confirmed in the females, at least three of the four had given birth in previous years and could reasonably be assumed to be adult bats which may be breeding. Barbastelles are known to be a species which becomes pregnant and gives birth later in the year than most UK bat species and several of the other bats caught were pregnant.

5.1.3 Walked Transects

The results of the 2009 bat activity surveys were largely consistent with those undertaken in 2007 and 2008 in terms of the species assemblage found. Although calculations of relative activity have not yet been made for 2007 and 2008, the number of passes and spatial distribution of records of each species during walked transects have remained reasonably consistent over the three year period. In 2009, Nathusius' pipistrelle was added to the species list and it seems possible that this was not recorded in previous years due to its apparently transitory presence on migration during a narrow window in the spring. The distribution of barbastelle bats shows quite clear patterns from walked transect data which have remained broadly similar between years.

5.1.4 Static Detector Survey

The data from static detectors have shown some variation between the two years, where they have been used intensively, in 2008 and 2009. Although calculations of relative activity (B/h) have not yet been made for the 2008 data, a comparison can be made between the number of bat passes recorded per night (B/N) between the two years. In 2008, 87 nights of static monitoring were carried out in comparison to 107 nights when all data were analysed and a further 26 when just barbastelle data was analysed in 2009. If all other species excluding barbastelle are considered then 2008 static surveys recorded 5127 bat passes (59 B/N) in comparison to 23126 in 2009 (216 B/N) or a 366% increase between years. For barbastelle, the increase between 2008 and 2009 is more dramatic with 12 passes recorded in 2008 (0.1 B/N) in comparison to 726 in 2009 (5.5 B/N) or an increase of 3957% between years. First impressions indicate that levels of bat activity may have significantly increased between years. However, there are a number of reasons why this apparent trend may be misleading:

- The study was not designed as a monitoring study to detect change over years;
- Detectors were located in different areas. The two locations with very high relative activity (static detectors 3 and 8) were not monitored in 2008;
- Our understanding of the survey area has improved and enabled more effective deployment of static detectors in areas with high bat activity in 2009;
- BSG has developed a new method of water-proofing and housing Anabats which has been tested in a sound laboratory. We have also reviewed and improved the deployment of microphones for Anabats to ensure that they are positioned correctly during static surveys. Positioning is crucial to enhance the detection efficiency of static bat detectors.

5.2 Status of Barbastelle within the Survey Area

From the results of surveys in 2009, it is possible to refine elements of the previous assessments of the status of barbastelle within the survey area from the 2007 and 2008 reports.

The 2008 report concluded that:

1. Upper Abbey Farm does not appear to be occupied by barbastelles on a regular basis and it is unlikely that a maternity colony is present in the barn. This was based on previous building and emergence surveys undertaken in 2008.

Static surveys in 2009 identified that a significant commuting route for barbastelle exists along the track between Fiscal Policy and Upper Abbey. Although it is not possible to draw firm

conclusions it seems likely given the early recordings of barbastelle shortly after sunset that barbastelles are roosting relatively close to the static detector location. As such, the use of Upper Abbey as a roost location should not be dismissed. If barbastelle are not using Upper Abbey then they are considered to be roosting nearby and commuting into the plantation woodland along the track.

2. Although the availability of good quality foraging habitat for barbastelles in the survey area may attract both male and female (including pregnant female) bats, it is considered that the survey area is probably not within a core foraging area for a maternity colony due to the potential distance that females may have to travel and the low number of records of this species recorded during surveys.

From the results of the trapping survey, it is proven that the site does support female barbastelles and that they are likely to be from a maternity colony, given the presence of mature adult females which have bred in previous years. The sample size of bats caught is relatively small and only two trapping locations were used in one three day period in the spring. Although these data may not be representative of the overall bat populations using the site throughout the active season for bats, it has been noted by ecologists experienced in trapping barbastelles that the number of barbastelles caught at Sizewell seems high given the difficulty in catching this species and the relative proportion of barbastelles in comparison to other species (12% of total) (Billington, *pers comm*.).

Barbastelle flight paths and foraging areas tend to be well-established and used by one or more bats over many years (Greenaway 2004). Breeding female barbastelles in particular will undertake long nightly commutes from their nursery roosts along specific and unvarying flight paths to their foraging areas, although weather and prey abundance may alter the foraging areas which are utilised (Greenaway 2008). There may be several females which commute along the same features when close to the roost, but generally females will have individual flight paths which lead to foraging areas which are not shared (Greenaway 2004). The length of the commute may be up to 16km (Billington 2002). Greenaway (2008) recorded commuting barbastelles in two locations in Sussex, with bats commuting an average of 7.1km (range 2.64-12.2km) at one site, and an average of 5.2km (range 1.17-10.46km) at the other. The average flight lengths for pregnant or lactating females at the same locations were 7.67km and 5.09km respectively (Greenaway 2008). Studies of the barbastelle maternity roost at Paston Barn SAC (near Cromer in North Norfolk) involved radio-tracking female barbastelle bats from the roost 2.75km to their foraging site, while males were tracked 4.75km (Parsons *et al*. 2001). Radio-tracking of seven breeding females in Norfolk in 2009 showed that females travelled a maximum distance of 9.4km with an average maximum distance of 4.7km (BSG, unpublished data). From these data, it seems that females may well continue to use established core foraging areas throughout the active season and that these areas may be quite substantial distances from a maternity colony. It is important to consider that even if adult females may not breed in some years they may still be likely to visit the same foraging areas as when they are breeding due to the site fidelity typically shown in this species.

The results of surveys in 2009 have shown that barbastelles occur more frequently within the survey area than concluded in the 2008 report (see Section 4.1.2). In addition, considering what is now known about the detectability of barbastelles (See Section 2.2.4), it is possible that their real numbers may be significantly higher than the activity survey data suggest. This possibility is supported by the relatively high numbers caught during trapping surveys.

5.3 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. Government planning guidance as set out in PPS9 does guide planning authorities to have regard to the conservation of species of principal importance for the conservation of biodiversity and their habitats, which could be interpreted as including foraging habitat and key flightlines.

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, which is repeated in the 2008 report, is still considered relevant to this report and will not be updated until further details of the scheme can be considered.

6. Recommendations

The survey work undertaken in 2009 has enabled the survey area to be valued in greater detail in terms of its importance for bats with some degree of confidence. The results of the survey are likely to remain valid, for the purpose of EcIA, for approximately two years.

The survey work so far has established the following with a good degree of confidence:

- Barbastelle bats are probably not breeding within the survey area or close to the preliminary works area;
- It is likely that the areas of plantation woodland do provide foraging habitat for breeding female bats and potentially a core area for a maternity colony, although the status and size of the barbastelle population has not been firmly established;
- A significant commuting route exists which leads into the west of the site and may indicate that some bats are arriving from the north;
- There is little evidence that barbastelles are using arable and marshland areas for foraging or commuting and that habitats within the plantation woodland areas seem to be of greatest importance for barbastelle. However, there has been insufficient survey work within marshland areas to come to robust conclusions;
- The most likely area for maternity colonies of barbastelle to be located in the surrounding landscape is in woodland in the Minsmere area, 2-3 km from the site.

In spite of the results obtained from three years of survey work, there is some further baseline information which may need to be established through further survey work in 2010 in order to permit a robust assessment within the framework of an EcIA. The information required is:

- Confirmation of whether the site a core foraging area for a maternity colony of barbastelles;
- The locations of areas of the site that are of greatest importance for commuting and foraging female barbastelles, and that may be negatively affected by proposed works;
- The locations of maternity colonies;
- The locations of other key commuting routes.

6.1 Recommendations for Further Surveys

To establish the information considered to be necessary for EcIA, the following further survey work in 2010 is recommended.

6.1.1 Trapping and Radio-Tracking Surveys

Although activity survey for bats will provide a strong indication of the importance of the site for barbastelles, a trapping and radio-tracking study is the best available survey method for gathering sufficiently detailed information to inform a robust assessment for this species within the framework of an Ecological Impact Assessment (EcIA). If the survey proceeds the aims will be to trap barbastelle bats, determine the breeding status of the bats, and radio-track them to determine the location, status and size of roosts. This will tell us if the bats using the site are breeding females that are coming from a local maternity roost. Depending on the results this will fundamentally affect the assessment of impacts, hence the reason for recommending the work.

The survey would involve up to eight nights trapping on site and possibly from identified roost sites, with the objective of catching 15-20 barbastelles. Priority would be given to trapping and tracking female bats. Surveyors would attach radio-transmitters to bats and track their movements throughout the night using a team of surveyors to triangulate the locations of bats, with teams probably tracking 2-3 bats per night. During the day, effort will concentrate on locating and accessing roost sites. This survey should enable the location of any maternity site/s to be identified and, subject to access being available, the size of the breeding colony to be determined. It will also provide detailed information on the core foraging area for barbastelles from any maternity colonies. This will enable an assessment of how important the site is for foraging females from maternity colonies.

6.1.2 Activity Surveys

The aim of the surveys is to provide up to date information for the EcIA and to supplement existing information. Continuation of walked transect and static detector surveys is necessary to fill any gaps that may not be answered through radio-tracking, particularly in the event of bats not being caught or maternity roosts not being located successfully. In particular, the following areas would be targeted for further survey:

- Areas of plantation woodland likely to be affected by the footprint of the proposed works, with further static monitoring of woodland rides in Goose Hill and central rides within Leiston Carr, Kenton Hills and Nursery Covert;
- Static monitoring and continued walked transects within the proposed area for the new power station;
- Further static monitoring of SSSI marshland areas for bats and particularly those close to or within the proposed area for the new power station;
- Potential commuting routes from central and eastern areas of the site; these have not yet been established and should be monitored with static detectors;
- New areas outlined for development, e.g. the new car park area and temporary works areas near Leiston Abbey.

The level of survey and the focus of survey work can be defined with greater accuracy if more details of the extent and location of proposed works, particularly the areas in which the new

plant approach road and associated temporary works, can be provided in advance. These surveys will add to the overall knowledge of bat activity, but will be focussed on those areas likely to be directly affected by construction, in particular the plantation areas through which the access road may travel (and associated temporary works may be located) and the footprint of the new power station. With regard to the power station site it is considered important to confirm previous findings of low bat activity within this part of the site and that there is not regular commuting of bats through this area. The approach that will be taken in the meantime is to collect survey information which is designed to inform a worst case scenario in terms of potential impacts on bats and which can be used to provide an adequate baseline if radio-tracking studies are not as successful as anticipated and do not provide all the information that we expect them to provide.

As in 2009, two visits a month will be planned to deploy, collect and then re-deploy detectors (two weeks apart) and on both evenings undertake a transect walk. The one exception will be during April when a single visit in mid-April will be followed by a visit in early May. Two surveyors are required for each visit for health and safety reasons. Anabats will be collected prior to the walked transect and the data checked the following morning to inform the location of re-deployment later that day. Up to six Anabats will be used throughout the field season to systematically monitor all features of interest 2-3 times per survey season. A total of 24 monitoring locations will be selected to ensure systematic coverage of the key areas and each of these will be covered by a static detector for 2-3 fortnightly periods throughout the survey period. By allowing sampling of 2-3 fortnight long periods at specific locations in both the spring (April-June) and summer (July-September), any seasonal variation in bat activity at monitoring locations should be accounted for.

6.1.3 Roost Surveys

Surveys of existing bat boxes in woodland areas is appropriate to inform the potential loss of large areas of trees within the works boundary. We recommend checking all boxes (there are apparently 20 clusters of three boxes on trees) 2-3 times during the active season to ascertain the species and numbers of bats that are present as well as the status of any bat roosts found. The boxes were originally deployed by Suffolk Wildlife Trust and they may hold some recent monitoring data which we can use. Before beginning surveys we will check on the status of any recent data and any plans they have for monitoring boxes in 2010. If we can reduce the number of surveys required as a result of these enquiries then we will do so.

In addition, we propose to continue monitoring the tithe barn at Upper Abbey where small numbers of barbastelle have been recorded roosting in recent years by the Suffolk Wildlife Trust. Although the presence of small numbers of male bats is unlikely to be of concern given the likely lack of impacts on Upper Abbey and any bat roost present there, there is a small potential for a maternity colony to be present and we intend to determine whether barbastelles are roosting in the barn and what the status of any roosts are during 2010. The initial stages of the work will involve deployment of a static detector in the barn during two fortnightly periods in the latter half of both May and June. Following these static surveys we will undertake an internal inspection of the barn in early July. If the static detector surveys and first internal inspection do not find evidence of roosting barbastelle, then no further survey will be undertaken. If evidence of barbastelles is found we will undertake two dawn re-entry watches in July and August, a further internal inspection in early August, and continuation of static detector survey to attempt to establish the status of the roost and the numbers of bats using it.

6.2 Mitigation and Enhancement

The extent of mitigation which may be required depends on the status of the barbastelle population using the site and the importance of habitats within the site for that population. If the site forms part of a core foraging area used by breeding female bats, the maintenance of the quality of both commuting routes and foraging areas will be necessary to avoid a potential decline in any breeding colonies which may be using the site.. If any losses of such habitat occur, 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. Given the faithfulness of female barbastelles to particular commuting routes and foraging areas it may be necessary to provide long-term enhancement of the habitat within the site for barbastelle to balance any losses of important habitat.

The appropriate location of the proposed access road may be crucial to the maintenance of commuting routes for barbastelle, as its potential location within areas of plantation woodland may lead to the severance of a number of potential flight routes used by the bats. Although there is some evidence to show that barbastelles will readily cross unlit motorways in Germany (Kerth & Melber, 2009) and unlit A-roads in Norfolk (BSG, unpublished data), it is considered less likely, although not proven, that barbastelles will cross lit roads, and as such lit roads my present a barrier to movement between roosts and foraging areas, or effectively reduce the foraging area of a breeding colony. Barbastelles, and other species (in particular *Myotis* and long-eared bats), generally avoid lit areas. If there is some potential for the access road to be unlit, as has been suggested, then this will mitigate potential impacts very significantly for all species of bats. In addition, if it is possible to locate the access road in arable land along its western section then this is likely to mitigate any impacts on plantation woodland areas. Static survey results have shown that areas of arable land, with the exception of the north-south tree line at the location of detector 8, support low numbers of bat species and low levels of relative activity. Another mitigation option may be to reduce or remove lighting at key crossing points such as at the location of static detector 8.

It is likely that heathland creation on arable land will be part of the environmental management plan at the site. Although it was initially thought likely that this would necessitate the removal of hedgerows, it is understood that existing hedgerows could be incorporated within the scheme. As a result it is likely that heathland creation would provide an enhancement of the site for bats through the provision of potential foraging habitat which would in turn enhance the quality of the hedgerows for bats.

7. References

Altringham, J.D. (2003). *British Bats*. HarperCollins. London.

Bat Conservation Trust (2007a). *Bat Surveys – Good Practice Guidelines*. Bat Conservation Trust, London

Bat Conservation Trust (2007b). *The State of the UK's Bats: National Bat Monitoring Programme Population Trends.* Bat Conservation Trust, London.

Billington, G. (2002). *Report on further research of Barbastelle bats associated with Pengelli Forest Special Area of Conservation.* Greena Ecological Consultancy for CCW.

Denzinger, A., Siemers, B.M., Schaub, A. & Schnitzler, HU. (2001). Echolocation by the Barbastelle bat *Barbastella barbastellus*. *Journal of Comparative Physiology* **A 187**: 521-528.

Dietz, C., von Helversen, O. & Nill, D. (2009). *Bats of Britain, Europe and Northwest Africa*. A&C Black, London.

Dietz, C. and von Helversen, O. (2004). *Illustrated Identification key to the bats of Europe.* Electronic Publication. Tuebingen and Erlangen.

Entec UK Ltd (2007). Report 19801cb114 *Sizewell Bat Survey Report 2007*. Unpublished.

Entec UK Ltd (2008). Report 19801cb205 *Sizewell Bat Survey Report 2008*. Unpublished.

Greenaway F. (2001). The barbastelle in Britain. *British Wildlife,* June, pp. 327-334.

Greenaway F. (2004). *Advice for the management of flightlines and foraging habitats of the barbastelle bat* Barbastella barbastellus. English Nature Research Report 657. English Nature, Peterborough.

Greenaway, F. (2008). *Barbastelle bats in the Sussex West Weald 1997-2008*. Sussex Wildlife Trust Report.

Greenaway, F. & Hill, D. (2004). *Woodland management advice for Bechstein's bat and barbastelle bat*. English Nature Research Report 658. English Nature, Peterborough.

Hill, D. A. & Greenaway, F. (2005) Effectiveness of an acoustic lure for surveying bats in British woodlands. *Mammal Review* **35**: 116-122.

Institute of Ecology and Environmental Management. 2006. *Guidelines for Ecological Impact Assessment in the United Kingdom.* Institute of Ecology and Environmental Management, 2006.

Kerth, G. & Melber, M. (2009). Species-specific barrier effects of a motorway on the habitat use of two threatened forest-living bat species. *Biological Conservation* **142**: 270-279.

Larson, D.J. & Hayes, J.P. (2000). Variability in sensitivity of Anabat II detectors and a method of calibration. *Acta Chiropterologica*, **2**(2): 209-213.

Parsons, S.M., George, B.P. & George, E.L. (2001). Barbastelle bats at Paston Great Barn. *Transactions of the Norfolk and Norwich Naturalists Society* **34 (2)**: 307-317.

Richardson, P. (2000). *Distribution Atlas of Bats in Britain and Ireland 1980-1999*. Bat Conservation Trust.

Russ, J. M., Hutson, A.M., Montgomery, W. I., Racey, P.A., & Speakman, J. R. (2001). The status of Nathusius' pipistrelle (*Pipistrellus nathusii*, Keyserling & Blasius, 1839) in the British Isles. J*ournal of Zoology* **254**: 91-100.

Swift, S. M. & A. C. Entwistle. 2008. Grey long-eared bat Plecotus austriacus in Mammals of the British Isles: Handbook, 4th Edition (Harris, S., Yalden, D. W. Eds.). The Mammal Society.

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N

House
Ash Wood
Ash Wood Cottages
Walk Barn
Dunwich Forest
Goose Hill
Sandlings Walk
Minsmere Haven
Pit (dis)
Upper Abbey
Pit (dis)
Nursery Covert
Old Abbey
Kenton Hills
Grimseys
Leiston Carr
Fiscal Policy
Sizewell Belts
Lover's Lane
Reckham Pits Wood
Leiston Common
Sandy Lane (Track)
Sewage Works
Sizewell Power Station
Rookyard Wood
Sewage Works
Valley Road
Broom Covert
Tower
LEISTON CP
Caravan Park
Sizewell Crossing
Sandy Lane (Track)
PC Sizewell

Key

SSA boundary

0 m 500 m

Scale 1:10,000 @ A3

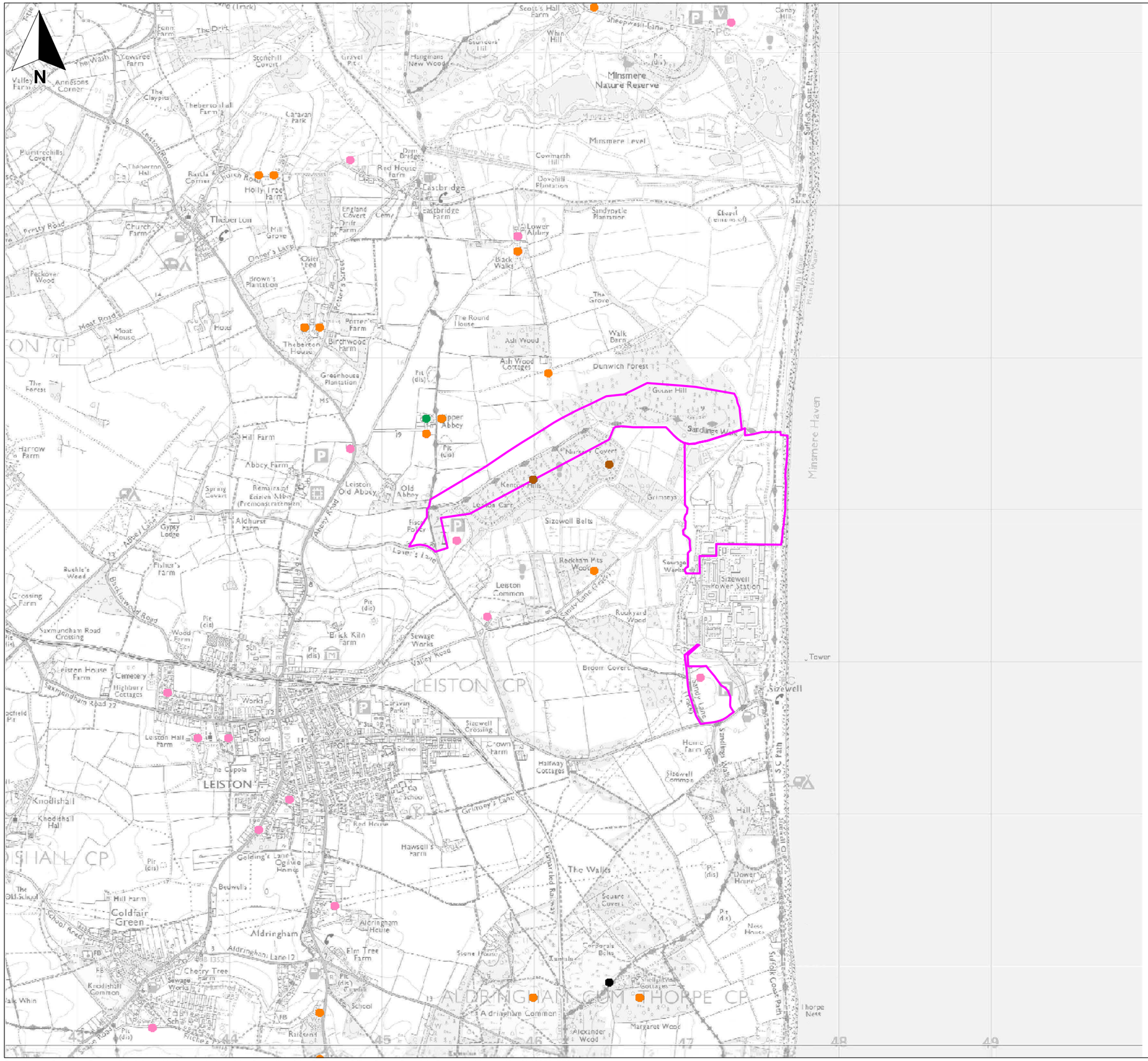
Sizewell Bat Survey Report 2009

Figure 1.1

SSA boundary

March 2010
19801-R683.wor tugwc

Entec



Key

- SSA boundary

Location of Bat Foraging and Communiting Passes

- Barbastelle
- Brown Long-Eared Bat
- Daubenton's bat
- Natterer's Bat
- Noctule
- Pipistrelle
- Serotine
- Soprano Pipistrelle

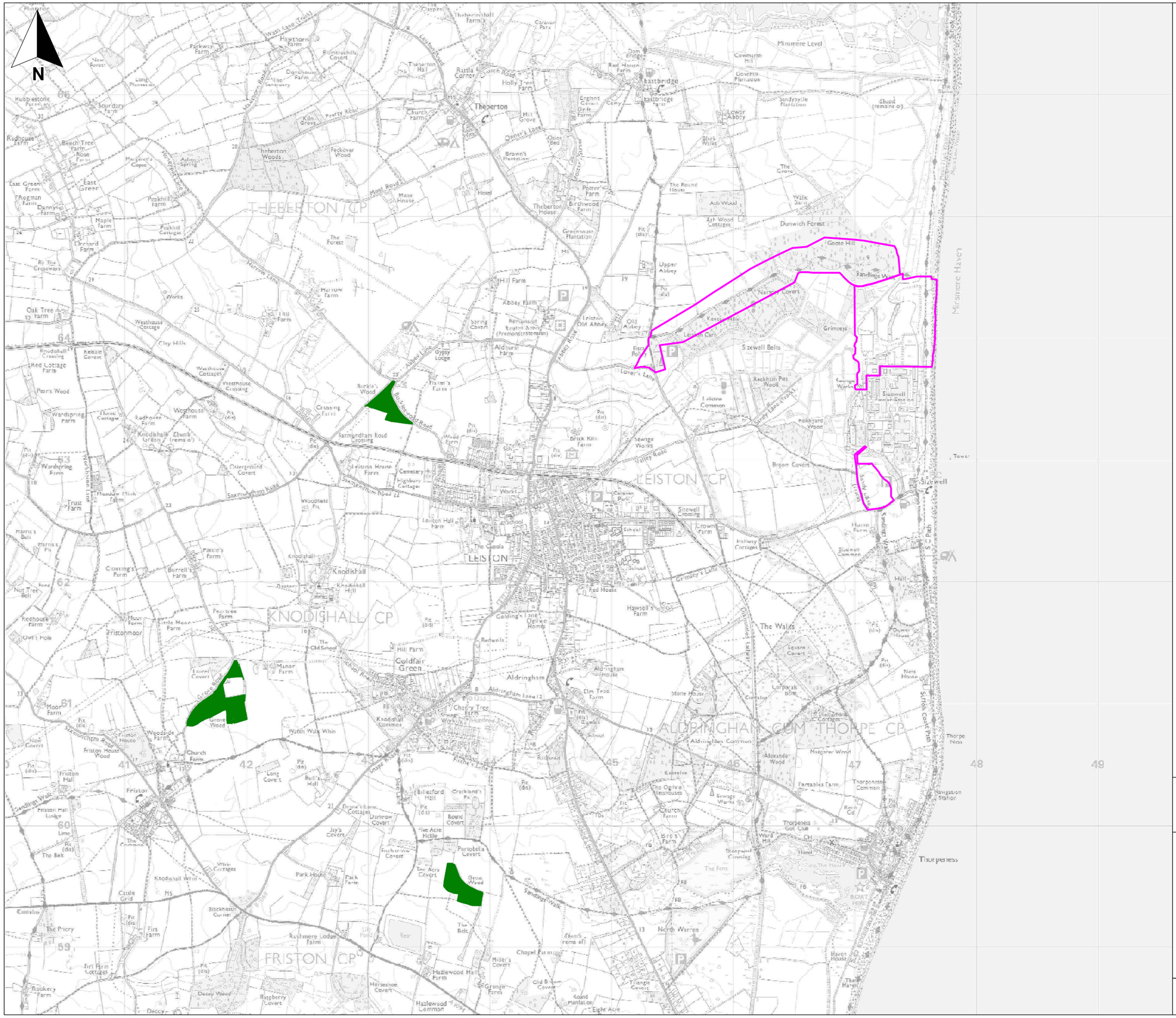
Sizewell Bat Survey Report 2009

Figure 3.1a

Locations of SBRC bat records from within 15km of the site

March 2010
19801-R684a.wor tugwc

Entec



Sizewell Bat Survey Report 2009

Figure 3.2
Location of ancient woodland within 15km of the site

March 2010
19801-R685.wor tugwc

Entec

N

Key

- SSA boundary
- Barbastelle habitats

0 m 1000 m

Scale 1:30,000 @ A3

Sizewell Bat Survey Report 2009

Figure 3.3

Key habitats for barbastelle identified from the results of the landscape appraisal (northern area)

March 2010
19801-R686.wor tugwc

Entec

Key

SSA boundary

Barbastelle habitats

0 m 1000 m

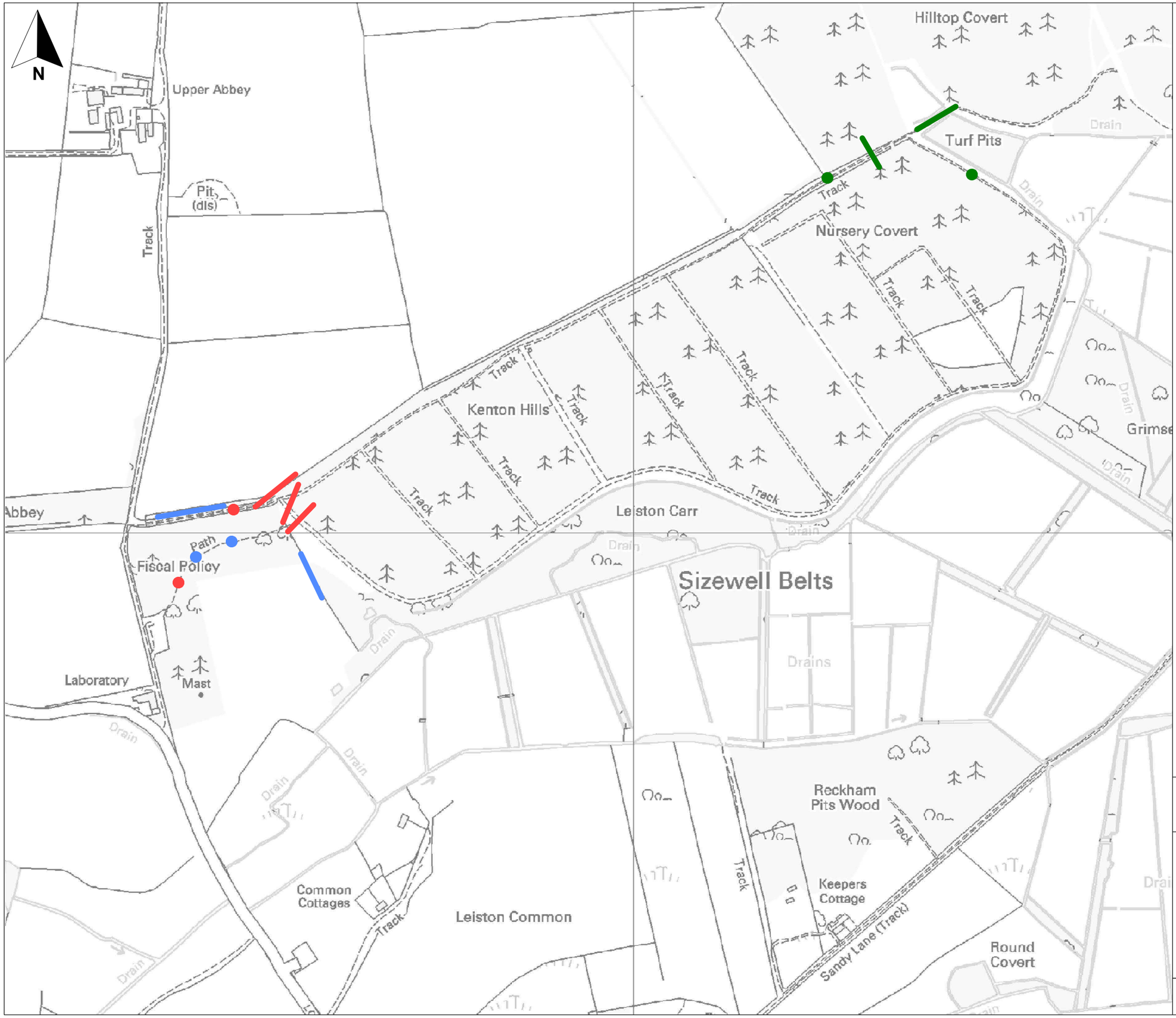
Scale 1:30,000 @ A3

Sizewell Bat Survey Report 2009

Figure 3.4
Key habitats for barbastelle identified from the results of the landscape appraisal (southern area)

March 2010
19801-R687.wor tugwc

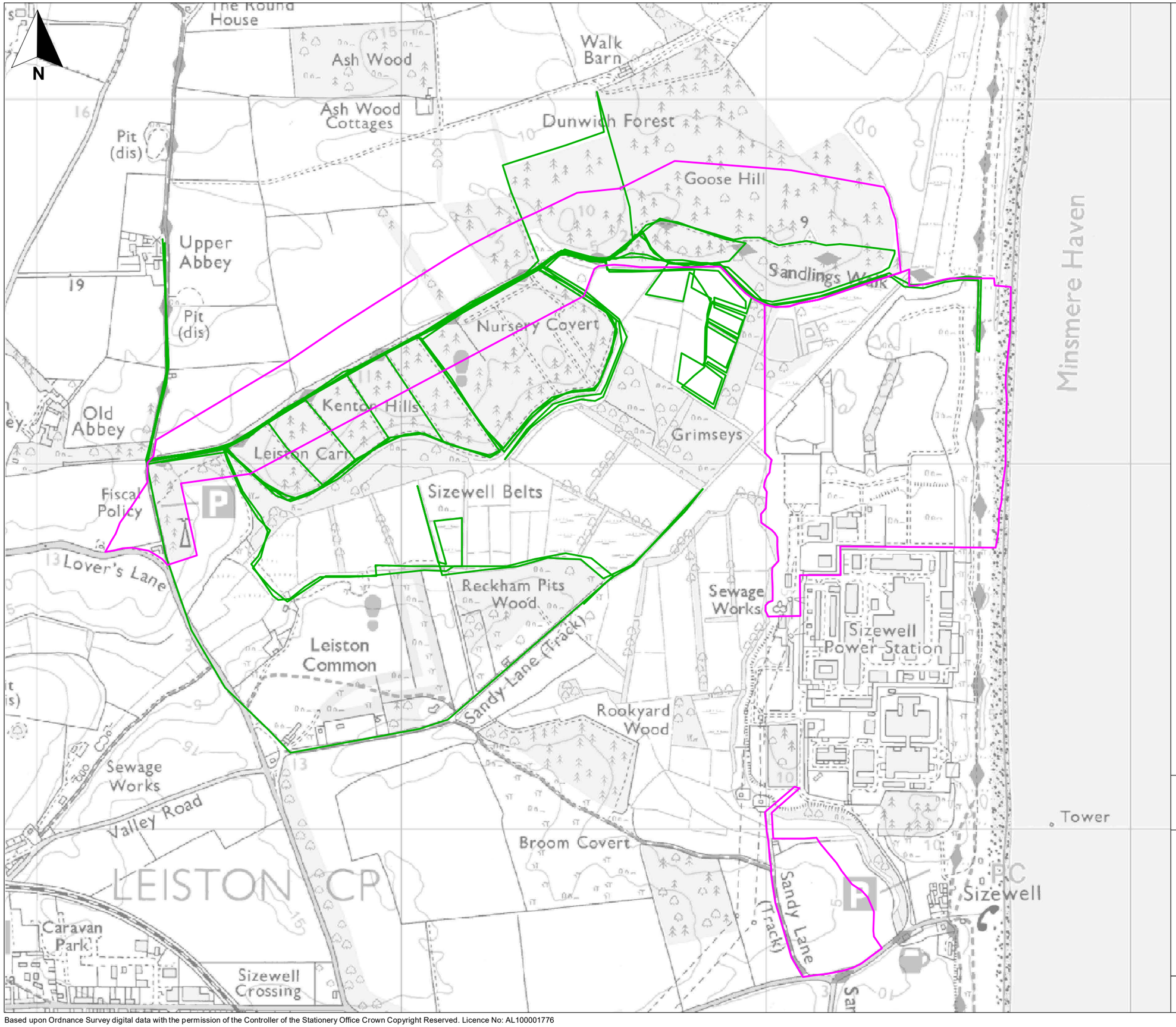
Entec



Sizewell Bat Survey Report 2009

Figure 3.5
Trapping locations, dates of survey and nets used

March 2010
19801-R688.wor tugwc



Key

- SSA boundary
- Walked transect routes

0 m — 500 m

Scale 1:10,000 @ A3

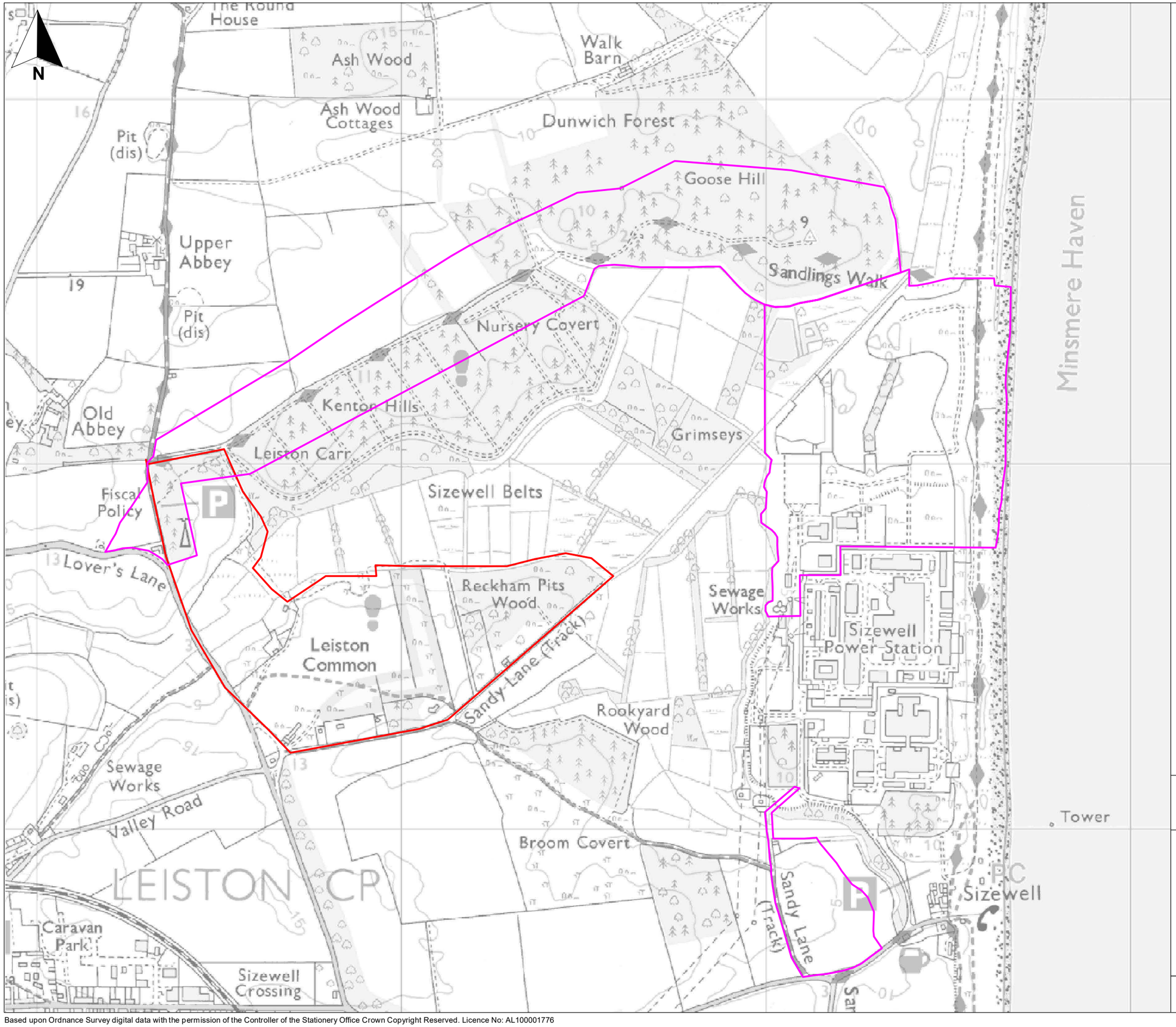
Sizewell Bat Survey Report 2009

Figure 3.6

Walked transect routes from April – September 2009

March 2010
19801-R689.wor tugwc

Entec



Key

- SSA boundary
- Transect route - 27th April 2009

0 m — 500 m

Scale 1:10,000 @ A3

Sizewell Bat Survey Report 2009

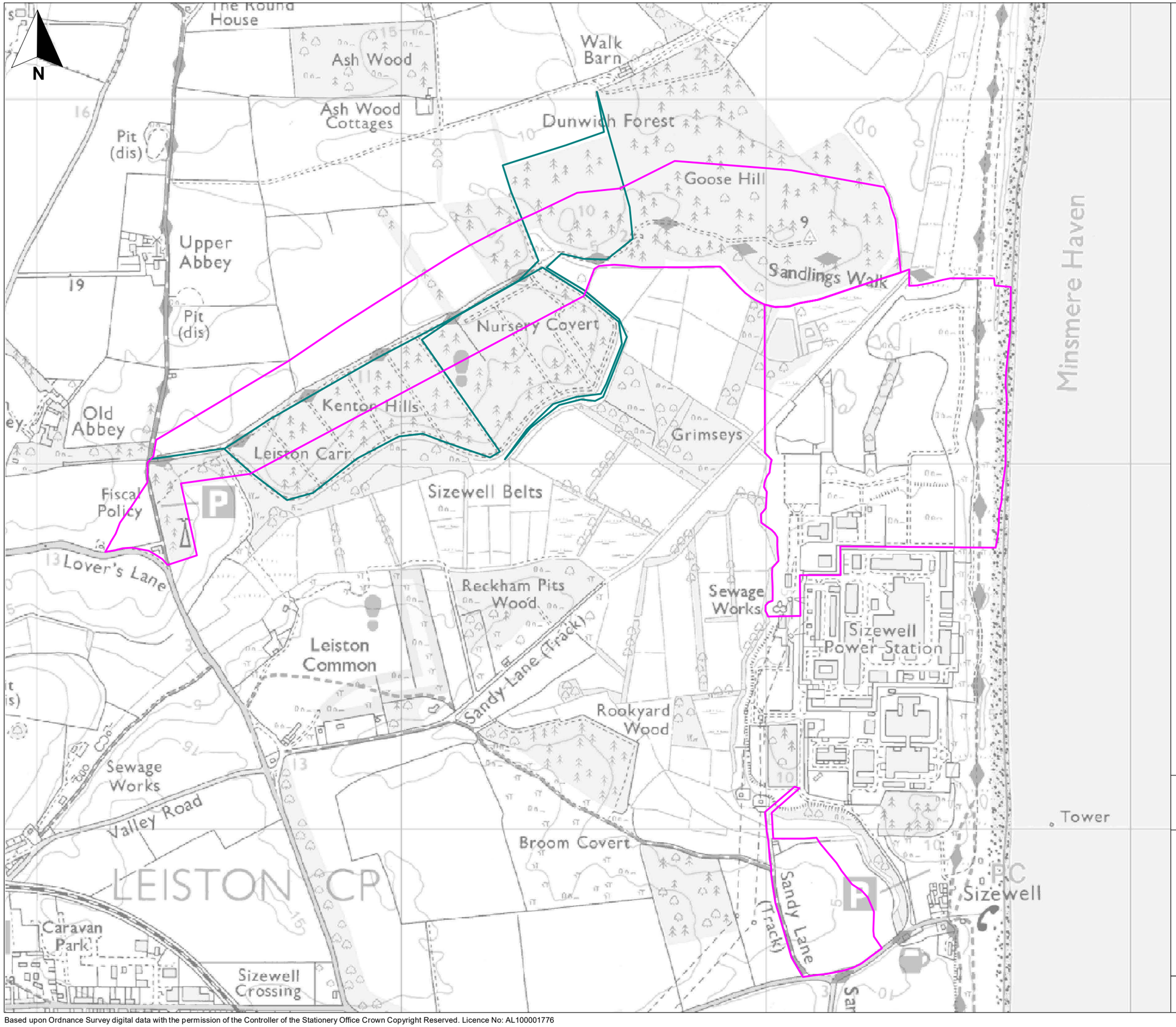
Figure 3.7

Walked transect route for

27th April 2009

March 2010
19801-R690.wor tugwc

Entec



Key

- SSA boundary
- Transect route - 29th April 2009

0 m — 500 m

Scale 1:10,000 @ A3

Sizewell Bat Survey Report 2009

Figure 3.8

Walked transect route for

29th April 2009

March 2010
19801-R691.wor tugwc

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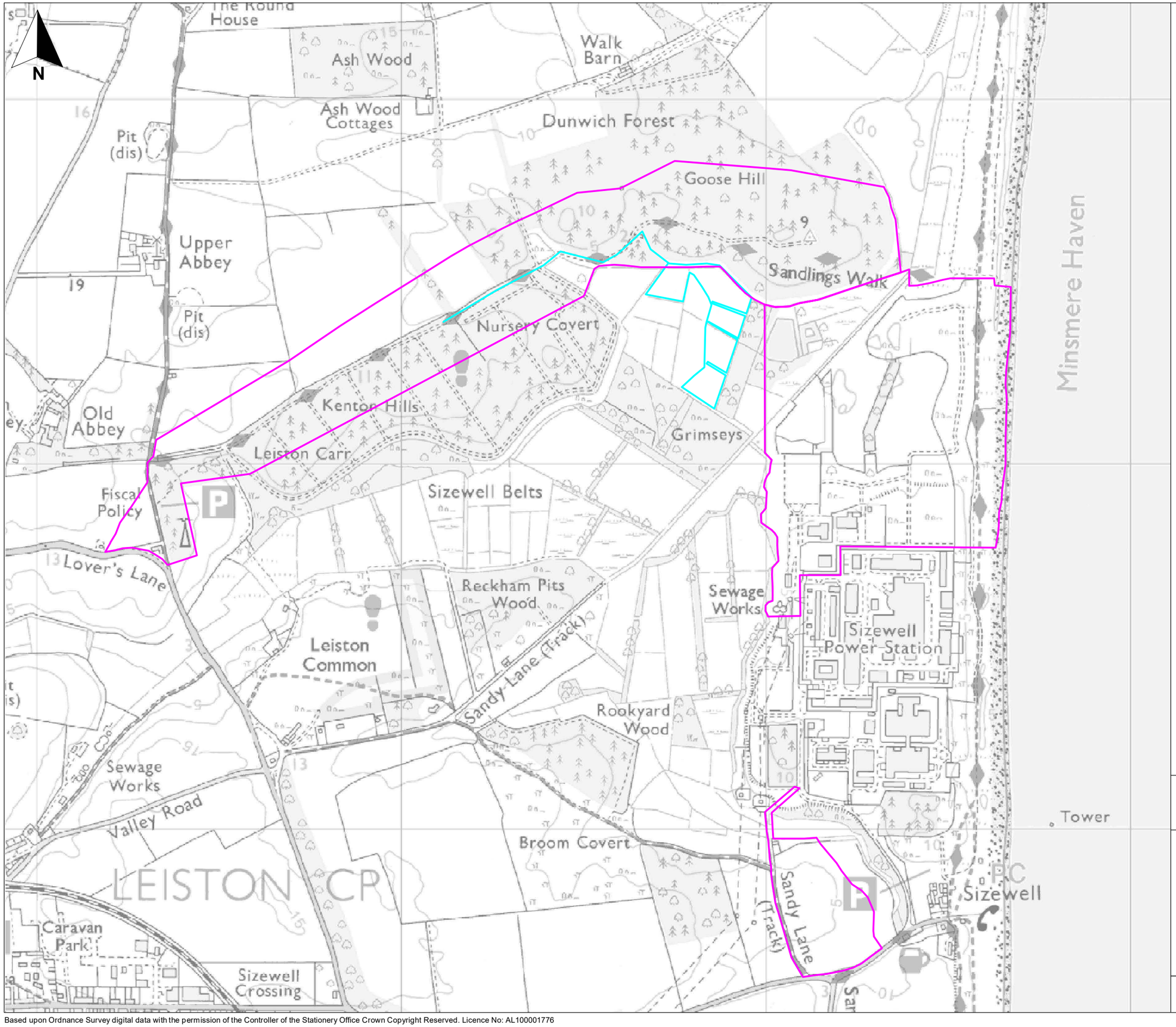


Key

SSA boundary

Transect route - 13th May 2009

0 m 500 m

Scale 1:10,000 @ A3

Sizewell Bat Survey Report 2009

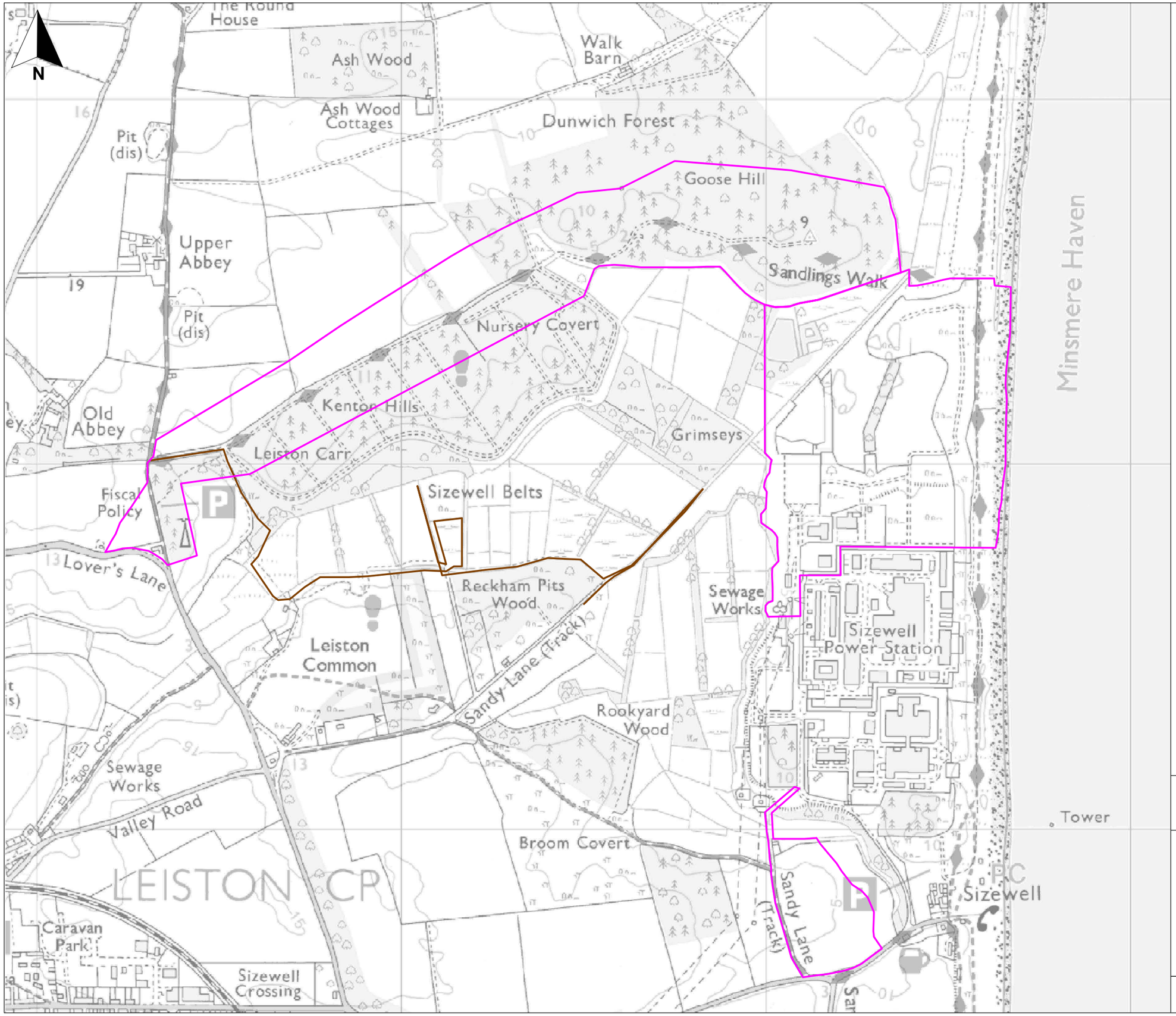
Figure 3.9

Walked transect route for

13th May 2009

March 2010
19801-R692.wor tugwc

Entec



Key

- SSA boundary
- Transect route - 25th May 2009

0 m 500 m

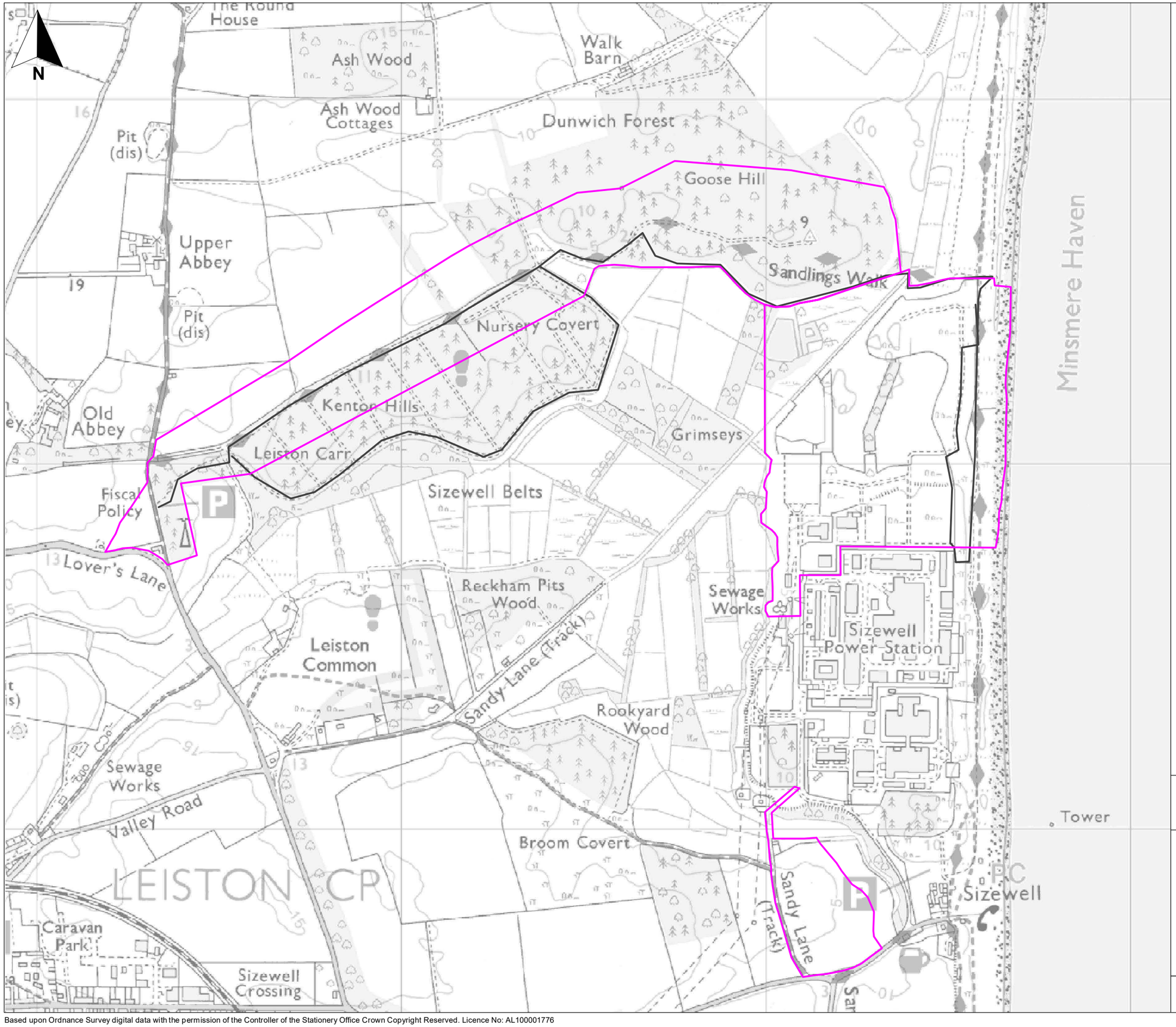
Scale 1:10,000 @ A3

Sizewell Bat Survey Report 2009

Figure 3.10
Walked transect route for
25th May 2009

March 2010
19801-R693.wor tugwc

Entec



Key

SSA boundary

Transect route - 4th June 2009

0 m 500 m

Scale 1:10,000 @ A3

Sizewell Bat Survey Report 2009

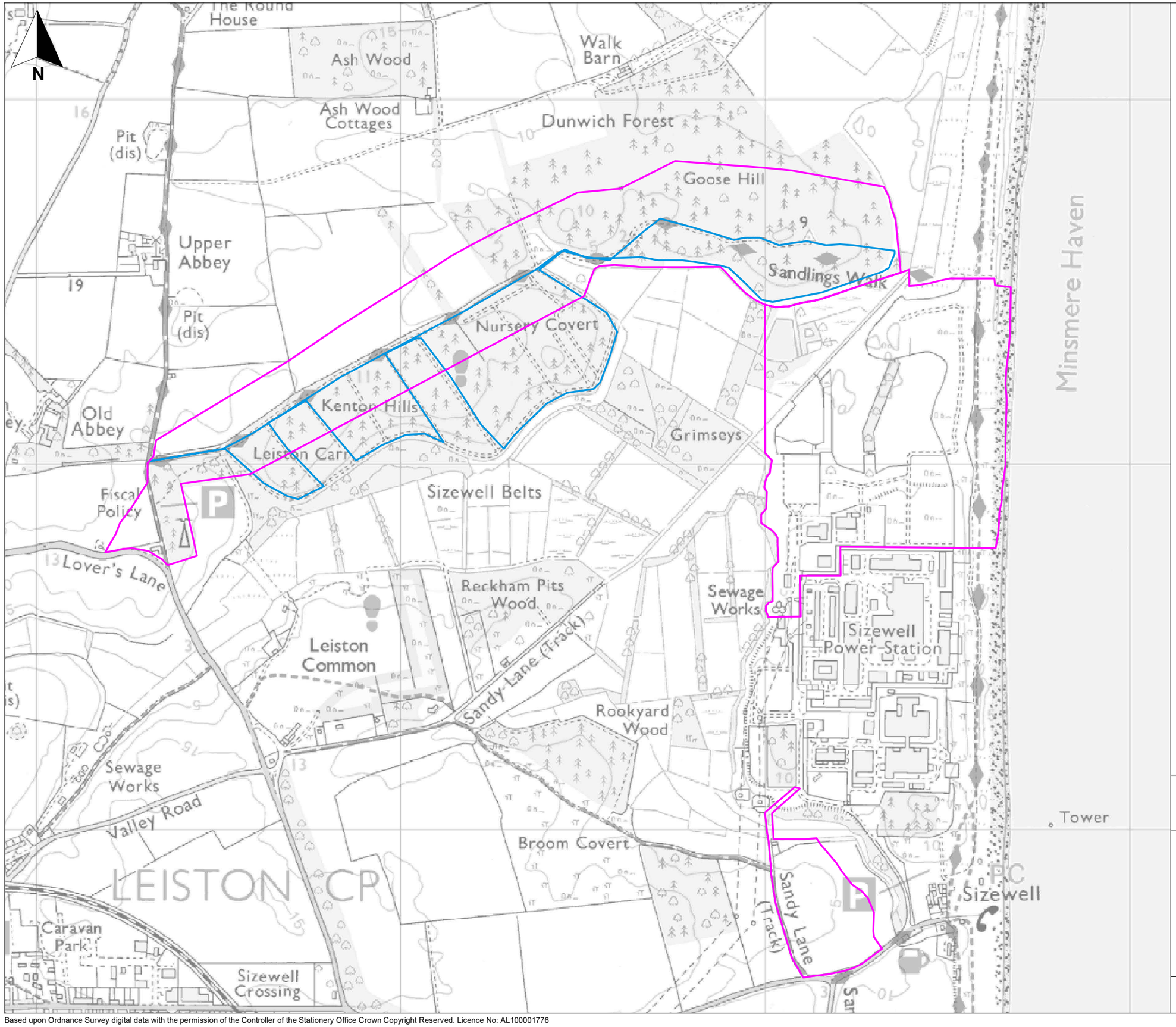
Figure 3.11

Walked transect route for

4th June 2009

April 2010
19801-R694.wor tugwc

Entec



Key

- SSA boundary
- Transect route - 25th June 2009

0 m — 500 m

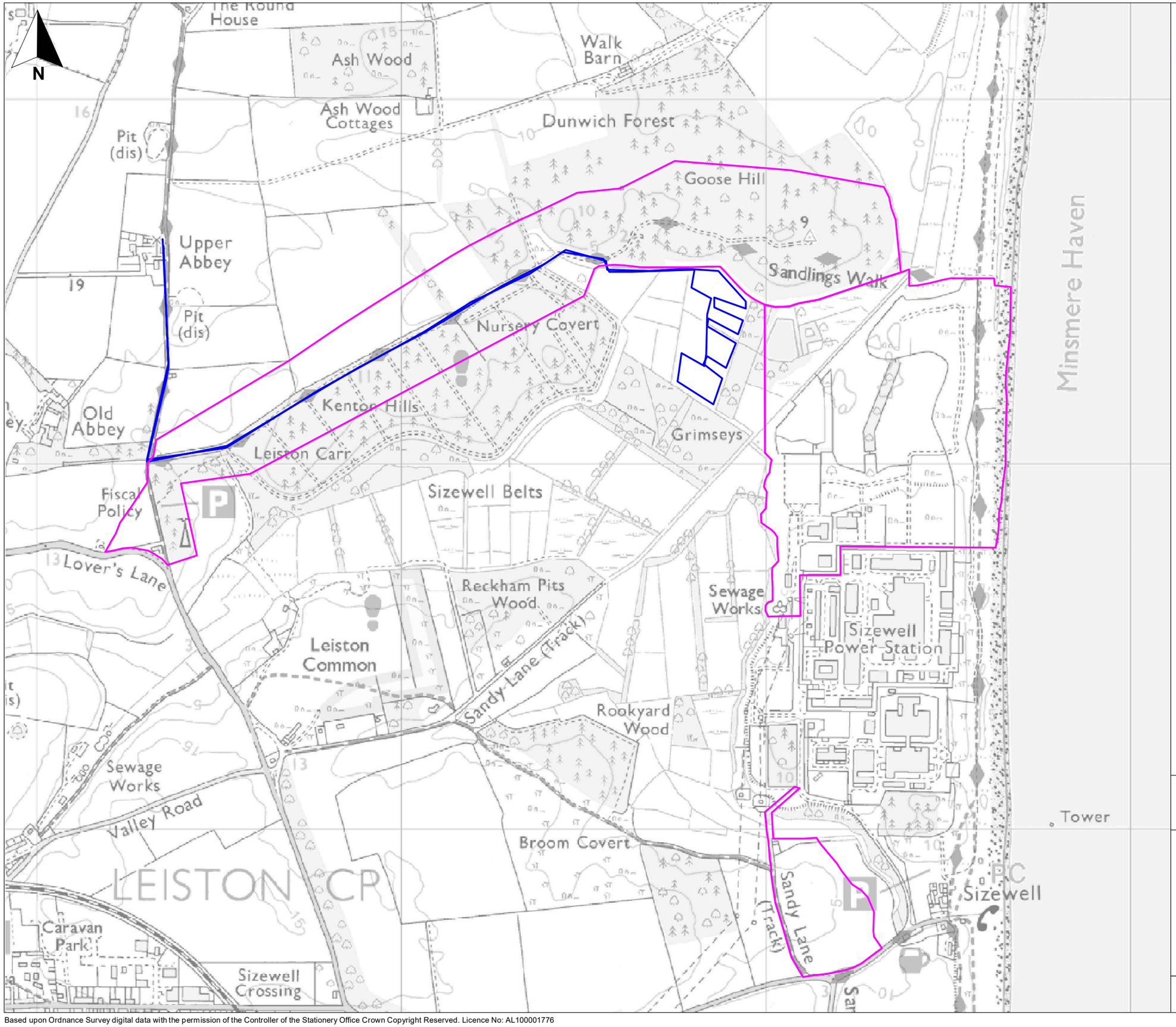
Scale 1:10,000 @ A3

Sizewell Bat Survey Report 2009

Figure 3.12
Walked transect route for
25th June 2009

March 2010
19801-R695.wor tugwc

Entec



Key

- SSA boundary
- Transect route 18th August 2009

0 m — 500 m

Scale 1:10,000 @ A3

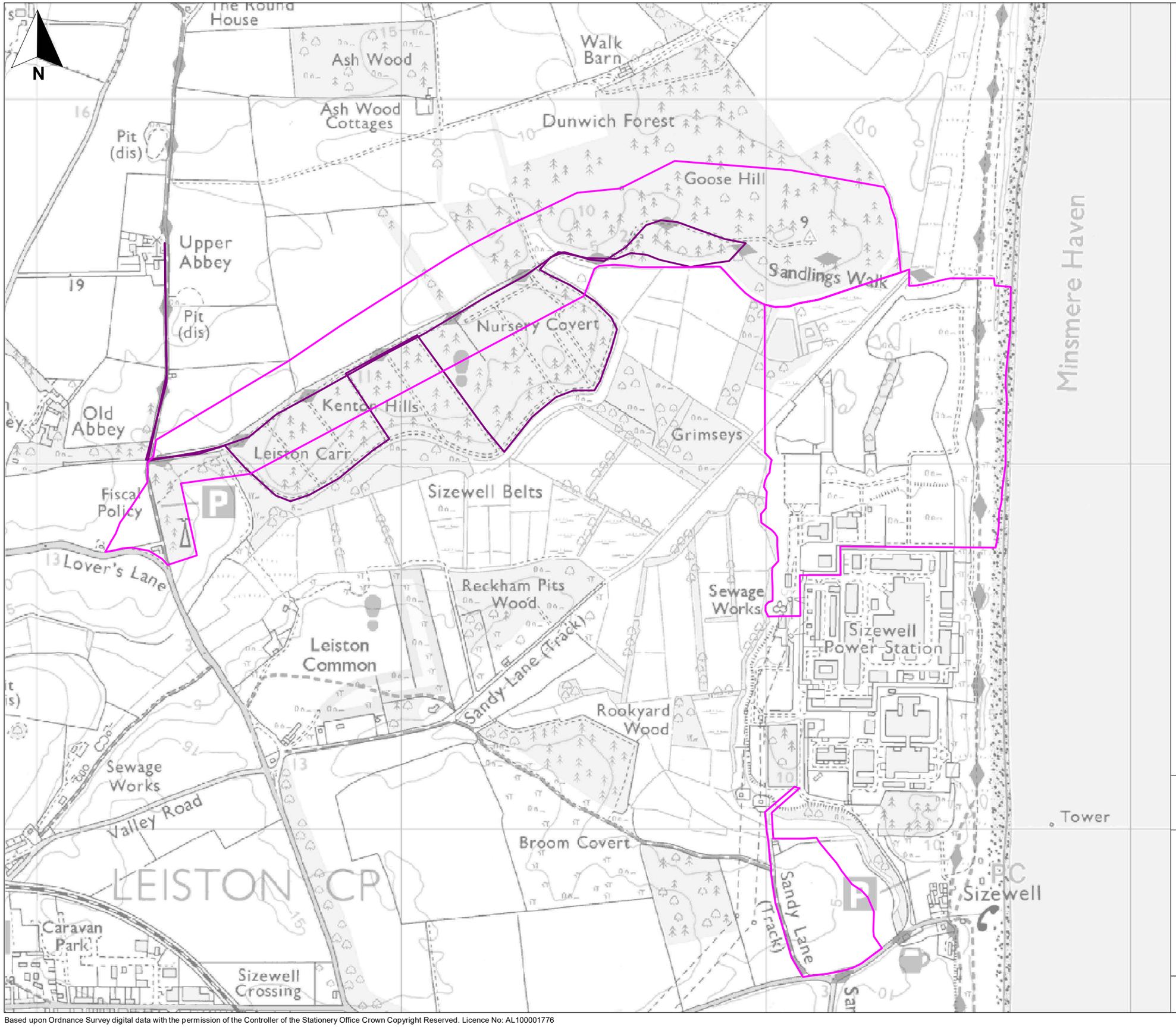
Sizewell Bat Survey Report 2009

Figure 3.13

Walked transect route for 18th August 2009

March 2010
19801-R696.wor tugwc

Entec



Key

- SSA boundary
- Transect route 25th August 2009

0 m — 500 m

Scale 1:10,000 @ A3

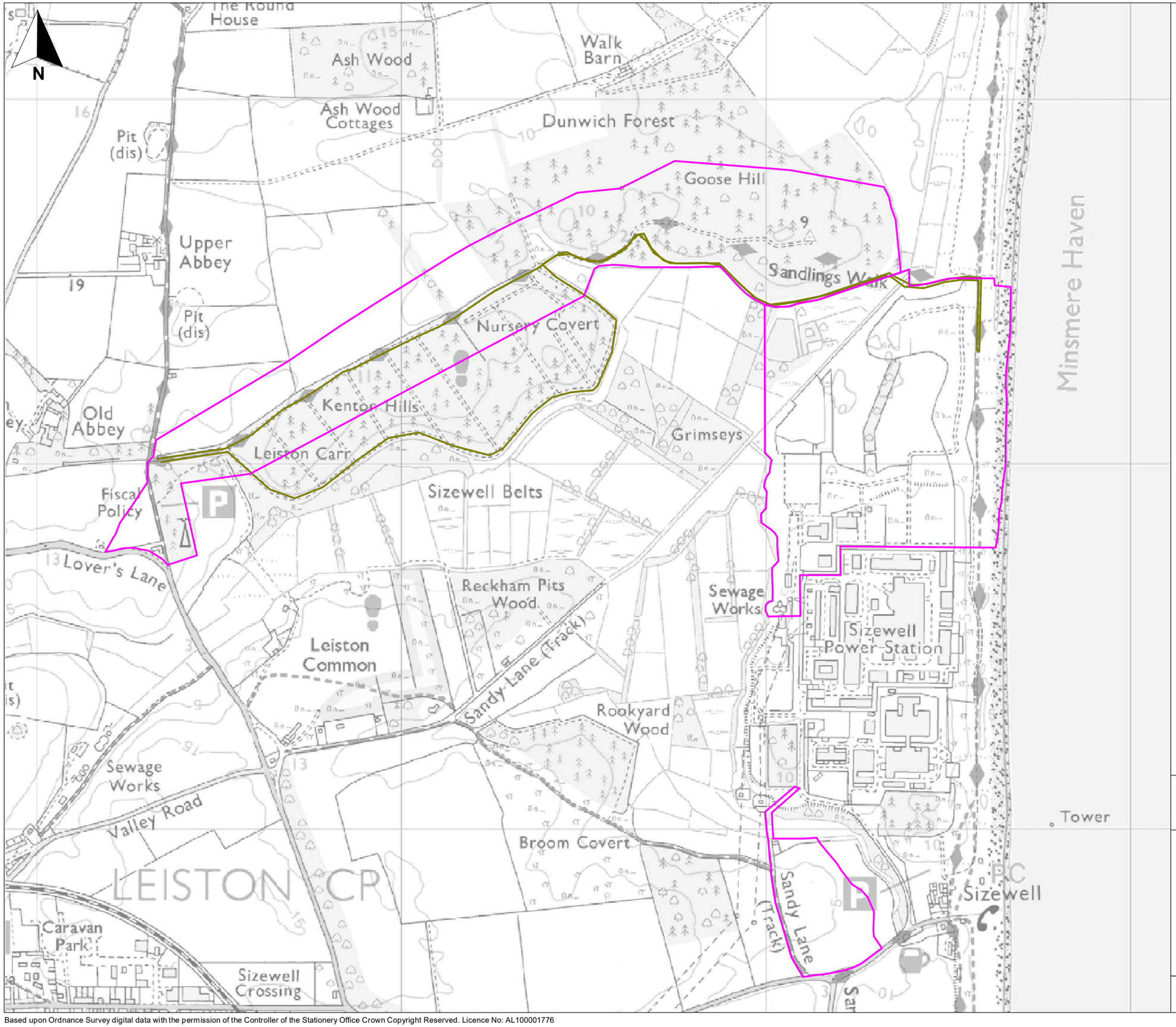
Sizewell Bat Survey Report 2009

Figure 3.14

Walked transect route for 25th August 2009

March 2010
19801-R697.wor tugwc

Entec



Key

- SSA boundary
- Transect route 14th September 2009

0 m — 500 m

Scale 1:10,000 @ A3

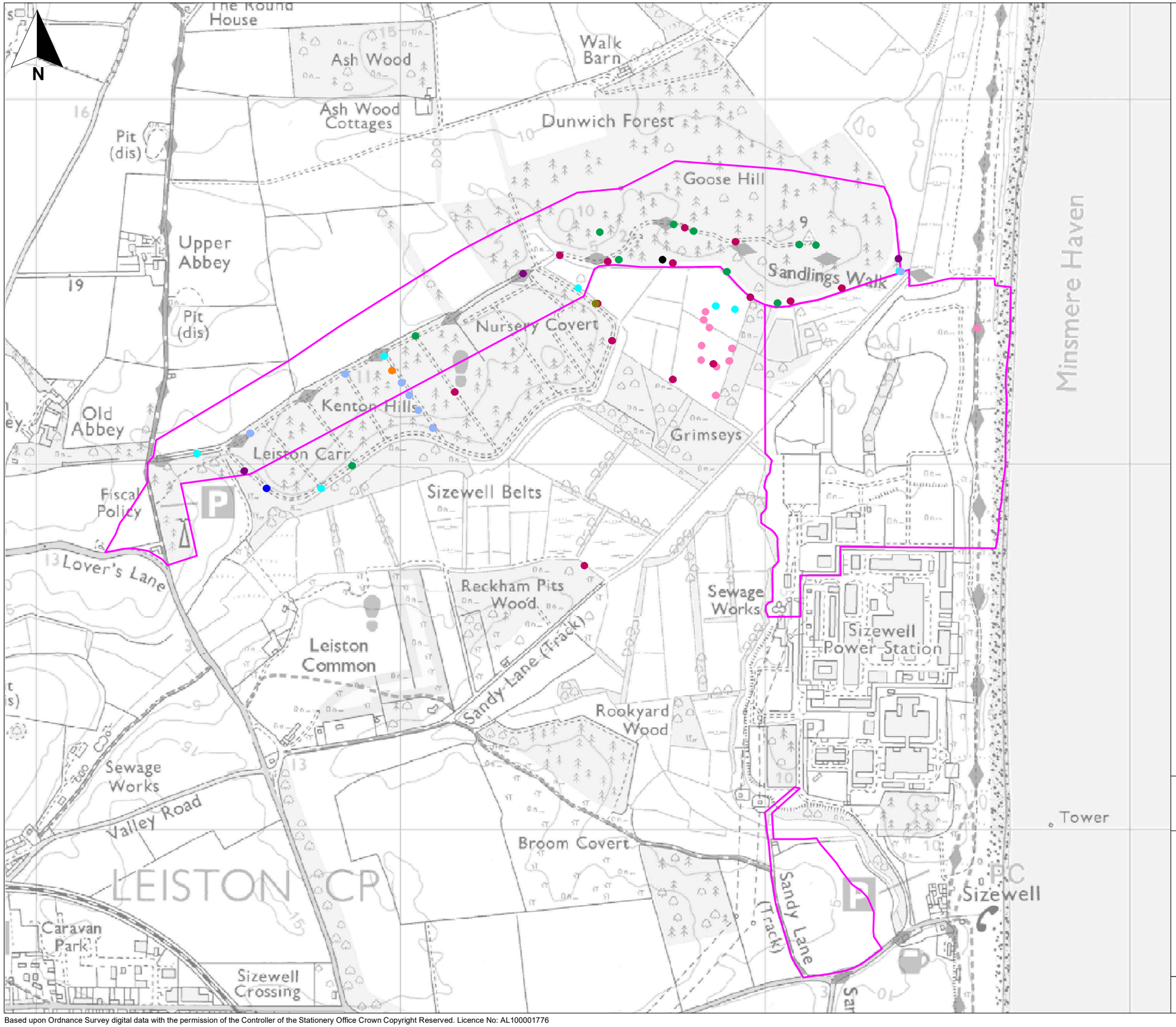
Sizewell Bat Survey Report 2009

Figure 3.15

Walked transect route for 14th September 2009

March 2010
19801-R698.wor tugwc

Entec



Key

- SSA boundary

Location of Bat Foraging and Communiting Passes

- Barbastella barbastellus
- Barbastella barbastellus query
- Eptesicus serotinus
- Myotis sp
- Myotis/Plecotus
- Nyctalus noctula
- Nyctalus sp
- Pipistrellus nathusii
- Plecotus sp
- Plecotus/Eptesicus

0 m — 500 m

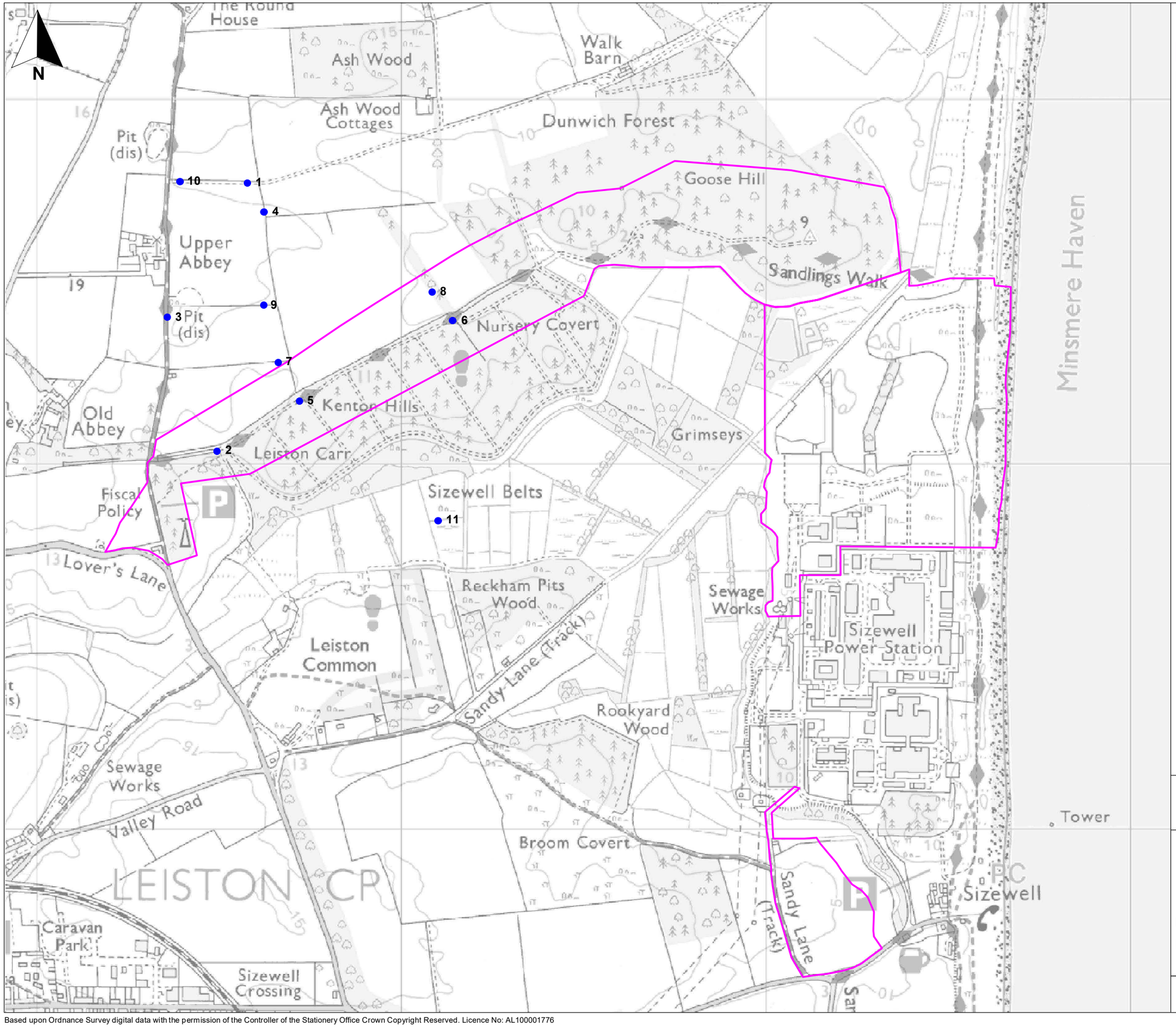
Scale 1:10,000 @ A3

Sizewell Bat Survey Report 2009

Figure 3.16
The distribution of bat records recorded during walked transect surveys in 2009. Records of the two most frequent species, common and soprano pipistrelle have not been mapped

March 2010
19801-R699.wor tugwc

Entec



Key

- SSA boundary
- Static survey locations

0 m 500 m

Scale 1:10,000 @ A3

EDF

Sizewell Bat Survey Report 2009

Figure 3.17

Numbered static survey locations

March 2010
19801-R700.wor tugwc

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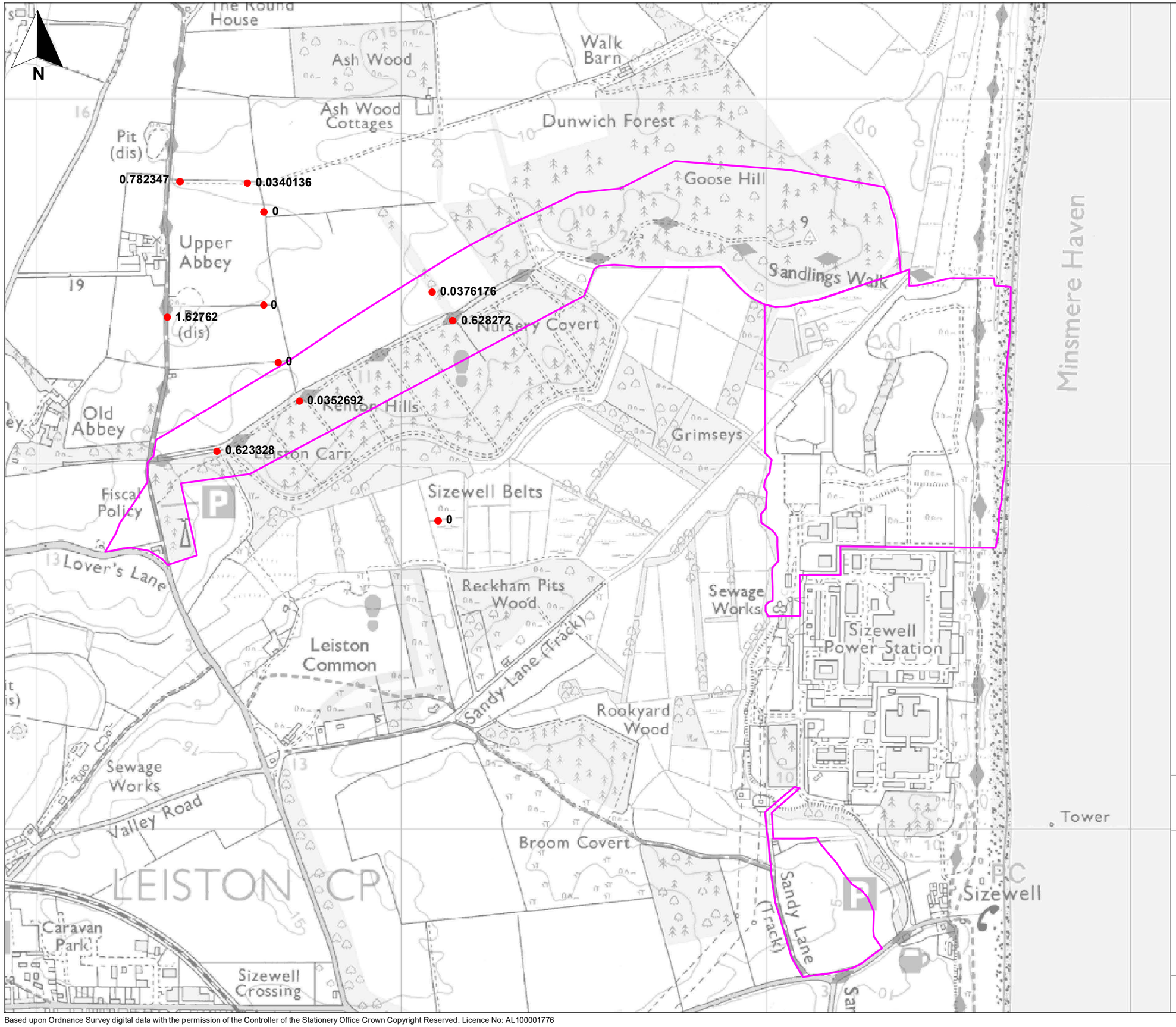

Sizewell Bat Survey Report 2009

Figure 3.18

Relative activity of barbastelles at static dataloggers

March 2010
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Appendix A
Desk Study Results
10 Pages

Table A1 Desk Study Records of Bats Within 15km of the Site

Latin Name	Approximate Location	Grid Reference	Year
Myotis nattereri	Dunwich Shelter	TM475693	2006
Myotis nattereri	Leiston	TM459658	1997
Myotis nattereri	Leiston	TM459657	1996
Myotis nattereri	Leiston	TM454646	2004
Myotis nattereri	Blythburgh	TM453753	1992
Myotis nattereri	Leiston	TM453645	1996
Myotis nattereri	Sudbourne	TM429522	2005
Myotis nattereri	Wenhaston Churchyard	TM425755	2000
Myotis nattereri	Westhall Churchyard	TM424804	2000
Myotis nattereri	Westhall Churchyard	TM423805	2000
Myotis nattereri	Thorington Churchyard	TM423724	2007
Myotis nattereri	Orford	TM421499	2003
Myotis nattereri	Snape Cloisters	TM399581	2000
Myotis nattereri	Thorington	TM418738	1994
Myotis nattereri	Snape Marshes	TM398580	1996
Myotis nattereri	Snape Cloisters	TM397581	1988
Myotis nattereri	Snape	TM390579	1996
Myotis nattereri	Kelsale-cum-Carlton	TM383644	2001
Myotis nattereri	Tunstall	TM371554	2005
Myotis nattereri	Little Glemham	TM353583	1996
Myotis nattereri	Heveningham Ice House	TM347733	2006
Myotis nattereri	Heveningham Ice House	TM3473773269	2000
Myotis nattereri	Campsea Ash Ice House	TM338553	2006
Myotis nattereri	Campsea Ash Ice House	TM338551	2001
Myotis nattereri	Bruisyard	TM317664	2003
Myotis nattereri	Parham Tunnels	TM314594	2006
Myotis nattereri	Parham Churchyard	TM309606	2004
Myotis daubentonii	Campsea Ash Ice House	TM338553	2006
Myotis daubentonii	Heveningham Ice House	TM3473773269	2001
Myotis daubentonii	Heveningham Ice House	TM347733	2006
Myotis daubentonii	Campsea Ash Ice House	TM338551	2001
Myotis daubentonii	Snape Marshes	TM398580	1996

Table A1 (continued) Desk Study Records of Bats Within 15km of the Site

Latin Name	Approximate Location	Grid Reference	Year
Myotis daubentonii	Snape Cloisters	TM399581	2000
Myotis daubentonii	Bramfield	TM404738	1997
Myotis daubentonii	Friston	TM422579	1996
Myotis daubentonii	Reydon Fishing Lakes	TM497769	1991
Myotis daubentonii	Friston	TM421579	1994
Eptesicus serotinus	North Warren	TM455587	2002
Eptesicus serotinus	Captains Wood	TM4214454173	2005
Eptesicus serotinus	Campsea Ash Park	TM339554	1996
Eptesicus serotinus	Stratford St Andrew	TM354604	1993
Eptesicus serotinus	Stratford St Andrew	TM358601	1991
Eptesicus serotinus	Yoxford	TM396692	1997
Eptesicus serotinus	Bramfield	TM399737	2000
Eptesicus serotinus	Captains Wood	TM4155553774	2005
Eptesicus serotinus	Friston	TM421579	1994
Eptesicus serotinus	Captains Wood	TM4224953787	2005
Eptesicus serotinus	Friston	TM422579	1996
Eptesicus serotinus	Thorington Churchyard	TM423724	2007
Eptesicus serotinus	Theberton	TM445652	2000
Eptesicus serotinus	Aldringham Common and Walks	TM460608	1994
Eptesicus serotinus	Aldringham Common and Walks	TM465609	1998
Eptesicus serotinus	Aldringham-cum-Thorpe	TM467608	1994
Eptesicus serotinus	Wangford (East)	TM474786	2001
Eptesicus serotinus	Sudbourne	TM408512	2000
Nyctalus noctula	Buss Creek	TM499766	1991
Nyctalus noctula	Reydon Fishing Lakes	TM497769	1991
Nyctalus noctula	Campsea Ash Park	TM339554	1996
Nyctalus noctula	Leiston	TM460642	2004
Nyctalus noctula	North Warren	TM456592	2004
Nyctalus noctula	North Warren	TM455587	2001
Nyctalus noctula	Captains Wood	TM42245385	2005
Nyctalus noctula	Captains Wood	TM4208354046	2005
Nyctalus noctula	Captains Wood	TM4183353446	2005

Table A1 (continued) Desk Study Records of Bats Within 15km of the Site

Latin Name	Approximate Location	Grid Reference	Year
Pipistrellus pipistrellus	Orford Ness: National Trust	TM440491	2005
Pipistrellus pipistrellus	Westleton	TM443693	1993
Pipistrellus pipistrellus	Westleton	TM442690	1997
Pipistrellus pipistrellus	Leiston	TM442619	1993
Pipistrellus pipistrellus	Westleton	TM441691	2006
Pipistrellus pipistrellus	Bramfield	TM399736	1985
Pipistrellus pipistrellus	Leiston	TM440625	1997
Pipistrellus pipistrellus	Aldeburgh	TM447574	2004
Pipistrellus pipistrellus	Westleton	TM439705	2000
Pipistrellus pipistrellus	Leiston	TM438625	1999
Pipistrellus pipistrellus	Middleton	TM436677	1996
Pipistrellus pipistrellus	Leiston	TM436628	1993
Pipistrellus pipistrellus	Knodishall	TM435606	1996
Pipistrellus pipistrellus	Henham	TM440786	1994
Pipistrellus pipistrellus	Aldringham-cum-Thorpe	TM449598	1993
Pipistrellus pipistrellus	Sizewell	TM455638	1993
Pipistrellus pipistrellus	North Warren	TM455587	2002
Pipistrellus pipistrellus	Leiston	TM454646	2000
Pipistrellus pipistrellus	Aldeburgh	TM454579	1996
Pipistrellus pipistrellus	Leiston	TM444621	1993
Pipistrellus pipistrellus	Eastbridge Meadows	TM448663	1996
Pipistrellus pipistrellus	Leiston	TM448644	1993
Pipistrellus pipistrellus	Aldeburgh	TM448576	1985
Pipistrellus pipistrellus	Aldringham-cum-Thorpe	TM447614	2000
Pipistrellus pipistrellus	Blythburgh	TM451753	2003
Pipistrellus pipistrellus	Halesworth	TM404779	1998
Pipistrellus pipistrellus	Orford Ness: National Trust	TM429494	2005
Pipistrellus pipistrellus	Sudbourne	TM412534	1992
Pipistrellus pipistrellus	Sudbourne	TM412532	1995
Pipistrellus pipistrellus	Sudbourne	TM410511	2004
Pipistrellus pipistrellus	Sudbourne	TM408512	2000
Pipistrellus pipistrellus	Middleton	TM407669	1996

Table A1 (continued) Desk Study Records of Bats Within 15km of the Site

Latin Name	Approximate Location	Grid Reference	Year
Pipistrellus pipistrellus	Friston	TM413604	1997
Pipistrellus pipistrellus	Captains Wood	TM4153353512	2005
Pipistrellus pipistrellus	Holton	TM402789	1991
Pipistrellus pipistrellus	Bramfield	TM402737	1998
Pipistrellus pipistrellus	Bramfield	TM401738	2001
Pipistrellus pipistrellus	Bramfield	TM399737	2000
Pipistrellus pipistrellus	Snape	TM421579	2003
Pipistrellus pipistrellus	Westhall Churchyard	TM424804	2000
Pipistrellus pipistrellus	Orford	TM424497	1994
Pipistrellus pipistrellus	Westhall Churchyard	TM423805	2000
Pipistrellus pipistrellus	Westhall Churchyard	TM423804	2003
Pipistrellus pipistrellus	Iken Churchyard	TM412567	1998
Pipistrellus pipistrellus	Captains Wood	TM4191253926	2005
Pipistrellus pipistrellus	Thorington	TM418738	1994
Pipistrellus pipistrellus	Darsham	TM418694	1992
Pipistrellus pipistrellus	Iken	TM417517	1997
Pipistrellus pipistrellus	Darsham	TM423697	2004
Pipistrellus pipistrellus	Buss Creek	TM499766	1991
Pipistrellus pipistrellus	Reydon Fishing Lakes	TM497769	1991
Pipistrellus pipistrellus	Southwold	TM503784	1997
Pipistrellus pipistrellus	Wangford (East)	TM489785	1996
Pipistrellus pipistrellus	Aldeburgh	TM457576	1997
Pipistrellus pipistrellus	Reydon	TM515782	1993
Pipistrellus pipistrellus	Southwold	TM509765	1991
Pipistrellus pipistrellus	Southwold Churchyard	TM507764	2007
Pipistrellus pipistrellus	Aldeburgh	TM464569	1997
Pipistrellus pipistrellus	Dunwich	TM470700	2006
Pipistrellus pipistrellus	Norman Gwatkin Reserve	TM462767	1990
Pipistrellus pipistrellus	Sizewell	TM471629	1994
Pipistrellus pipistrellus	Henham Estate	TM459779	2000
Pipistrellus pipistrellus	Westleton	TM459682	2003
Pipistrellus pipistrellus	Leiston	TM459658	1994

Table A1 (continued) Desk Study Records of Bats Within 15km of the Site

Latin Name	Approximate Location	Grid Reference	Year
Pipistrellus Pipistrellus	Leiston	TM459657	1996
Pipistrellus pipistrellus	Friston	TM415587	2004
Pipistrellus pipistrellus	Aldeburgh	TM463564	1996
Pipistrellus pipistrellus	Wangford (East)	TM474786	1998
Pipistrellus pipistrellus	Frostenden	TM483806	1994
Pipistrellus pipistrellus	Wangford (East)	TM467794	2003
Pipistrellus pipistrellus	Dunwich	TM475701	1994
Pipistrellus pipistrellus	Sizewell	TM457633	1993
Pipistrellus pipistrellus	Dunwich	TM474701	2000
Pipistrellus pipistrellus	Thorpeness Churchyard	TM474598	1993
Pipistrellus pipistrellus	Minsmere B. R.	TM473672	1994
Pipistrellus pipistrellus	Blythburgh	TM472768	1990
Pipistrellus pipistrellus	Westhall	TM416804	2004
Pipistrellus pipistrellus	Marlesford	TM324584	1993
Pipistrellus pipistrellus	Ubbeston	TM321718	1988
Pipistrellus pipistrellus	Framlingham	TM316641	1997
Pipistrellus pipistrellus	Parham	TM315605	1996
Pipistrellus pipistrellus	Hacheston	TM312585	1993
Pipistrellus pipistrellus	Framlingham	TM307622	1997
Pipistrellus pipistrellus	Walpole	TM365746	1986
Pipistrellus pipistrellus	Butley Churchyard	TM374502	1990
Pipistrellus pipistrellus	Blaxhall	TM370571	1996
Pipistrellus pipistrellus	Butley	TM369508	2003
Pipistrellus pipistrellus	Sibton Churchyard	TM368695	1998
Pipistrellus pipistrellus	Blaxhall	TM380564	1987
Pipistrellus pipistrellus	Bruisyard Churchyard	TM325663	1996
Pipistrellus pipistrellus	Farnham	TM362599	1997
Pipistrellus pipistrellus	Tunstall	TM358552	2004
Pipistrellus pipistrellus	Blaxhall	TM357569	1995
Pipistrellus pipistrellus	Saxmundham	TM386634	1986
Pipistrellus pipistrellus	Snape Churchyard	TM396594	1994
Pipistrellus pipistrellus	Snape Churchyard	TM395593	1994

Table A1 (continued) Desk Study Records of Bats Within 15km of the Site

Latin Name	Approximate Location	Grid Reference	Year
Pipistrellus Pipistrellus	Yoxford	TM393693	1996
Pipistrellus pipistrellus	Saxmundham	TM392629	1993
Pipistrellus pipistrellus	Sternfield	TM391616	1997
Pipistrellus pipistrellus	Snape	TM390579	1996
Pipistrellus pipistrellus	Tunstall Common	TM379558	1992
Pipistrellus pipistrellus	Kelsale-cum-Carlton	TM387652	1996
Pipistrellus pipistrellus	Saxmundham	TM385643	1993
Pipistrellus pipistrellus	Saxmundham	TM385634	1998
Pipistrellus pipistrellus	Halesworth	TM384777	2000
Pipistrellus pipistrellus	Benhall	TM384615	1993
Pipistrellus pipistrellus	Blaxhall Common	TM383559	1992
Pipistrellus pipistrellus	Walpole	TM364747	1985
Pipistrellus pipistrellus	Chillesford	TM389525	2004
Pipistrellus pipistrellus	Swefling	TM337645	1997
Pipistrellus pipistrellus	Swefling	TM344643	1988
Pipistrellus pipistrellus	Huntingfield	TM342738	2004
Pipistrellus pipistrellus	R.A.F. Bentwaters	TM341532	1990
Pipistrellus pipistrellus	Campsea Ash Park	TM339554	1996
Pipistrellus pipistrellus	Stratford St Andrew	TM354613	1996
Pipistrellus pipistrellus	Farnham	TM366599	1993
Pipistrellus pipistrellus	Huntingfield Churchyard	TM336744	2001
Pipistrellus pipistrellus	Heveningham	TM336727	1998
Pipistrellus pipistrellus	Heveningham	TM334727	2004
Pipistrellus pipistrellus	Peasenhall	TM334698	2004
Pipistrellus pipistrellus	Badingham	TM327684	1991
Pipistrellus pipistrellus	Bruisyard	TM327664	1995
Pipistrellus pipistrellus	Cransford	TM326644	1998
Pipistrellus pipistrellus	Swefling Churchyard	TM346638	1999
Pipistrellus pipistrellus	Little Glemham	TM353583	1996
Pipistrellus pipistrellus	Swefling	TM350643	1989
Pipistrellus pygmaeus	Sizewell	TM465643	2001
Pipistrellus pygmaeus	Leiston	TM460642	2004

Table A1 (continued) Desk Study Records of Bats Within 15km of the Site

Latin Name	Approximate Location	Grid Reference	Year
Pipistrellus pygmaeus	Marlesford Churchyard	TM324584	2003
Pipistrellus pygmaeus	Captains Wood	TM4169753246	2005
Pipistrellus pygmaeus	Captains Wood	TM4191253926	2005
Pipistrellus pygmaeus	Captains Wood	TM4214453787	2005
Pipistrellus pygmaeus	Leiston	TM454646	2004
Barbastella barbastellus	Captains Wood	TM4200853420	2005
Barbastella barbastellus	Leiston	TM454646	2004
Barbastella barbastellus	Captains Wood	TM42245385	2005
Barbastella barbastellus	Captains Wood	TM4191253839	2005
Barbastella barbastellus	Captains Wood	TM4143953418	2005
Barbastella barbastellus	Leiston	TM453646	1997
Plecotus auritus	Snape	TM388585	1993
Plecotus auritus	Wissett	TM382786	1994
Plecotus auritus	Halesworth	TM386775	1990
Plecotus auritus	Snape	TM388574	1993
Plecotus auritus	Snape	TM388586	1993
Plecotus auritus	Sternfield	TM388611	1984
Plecotus auritus	Chillesford	TM389525	2004
Plecotus auritus	Snape	TM390579	1996
Plecotus auritus	Halesworth	TM390782	2006
Plecotus auritus	Tunstall	TM392550	1995
Plecotus auritus	Yoxford	TM394690	1997
Plecotus auritus	Sudbourne	TM408512	2000
Plecotus auritus	Snape	TM421579	2003
Plecotus auritus	Thorington	TM418738	1994
Plecotus auritus	Yoxford	TM395689	1990
Plecotus auritus	Bramfield	TM408745	2004
Plecotus auritus	Middleton	TM407669	1996
Plecotus auritus	Sudbourne	TM406511	1993
Plecotus auritus	Bramfield	TM399738	1992
Plecotus auritus	Bramfield	TM399737	2000
Plecotus auritus	Yoxford	TM396692	1997

Table A1 (continued) Desk Study Records of Bats Within 15km of the Site

Latin Name	Approximate Location	Grid Reference	Year
Plecotus auritus	Great Glemham	TM349624	1991
Plecotus auritus	Swefling	TM350643	1989
Plecotus auritus	Little Glemham	TM353583	1996
Plecotus auritus	Holton	TM395781	2006
Plecotus auritus	Tunstall	TM357547	2001
Plecotus auritus	Blaxhall	TM354566	2003
Plecotus auritus	Butley Churchyard	TM374502	2003
Plecotus auritus	Rendham	TM357665	2000
Plecotus auritus	Stratford St Andrew Churchyard	TM358602	2002
Plecotus auritus	Sibton	TM361637	1997
Plecotus auritus	Sibton	TM361673	1997
Plecotus auritus	Farnham	TM366598	1985
Plecotus auritus	Stratford St Andrew	TM354613	1996
Plecotus auritus	Sibton	TM380716	2007
Plecotus auritus	Aldeburgh	TM454589	2004
Plecotus auritus	Leiston	TM459657	1996
Plecotus auritus	Henham Estate	TM449785	2005
Plecotus auritus	Blythburgh	TM451753	2003
Plecotus auritus	Westleton	TM452712	1997
Plecotus auritus	Aldringham-cum-Thorpe	TM453588	1997
Plecotus auritus	Leiston	TM453645	1996
Plecotus auritus	Westleton	TM447697	2002
Plecotus auritus	Westleton	TM453684	2005
Plecotus auritus	Aldeburgh	TM447574	1993
Plecotus auritus	Aldringham-cum-Thorpe	TM454598	2002
Plecotus auritus	Leiston	TM454646	2000
Plecotus auritus	Westleton	TM454710	1993
Plecotus auritus	Westleton	TM455710	2003
Plecotus auritus	Uggeshall Churchyard	TM455804	1987
Plecotus auritus	Friston	TM431589	2005
Plecotus auritus	Westleton	TM453683	2000
Plecotus auritus	Theberton	TM443662	1993

Table A1 (continued) Desk Study Records of Bats Within 15km of the Site

Latin Name	Approximate Location	Grid Reference	Year
Plecotus auritus	Middleton	TM432677	2008
Plecotus auritus	Westhall Churchyard	TM432805	2003
Plecotus auritus	Westleton	TM438689	1998
Plecotus auritus	Darsham	TM439694	2003
Plecotus auritus	Westleton	TM441688	1991
Plecotus auritus	Westleton	TM442690	1997
Plecotus auritus	Henham Estate	TM459779	2000
Plecotus auritus	Theberton	TM445652	2002
Plecotus auritus	Aldringham-cum-Thorpe	TM446604	1994
Plecotus auritus	Aldringham-cum-Thorpe	TM446607	1996
Plecotus auritus	Theberton	TM446652	2006
Plecotus auritus	Theberton	TM442662	1993
Plecotus auritus	Wangford (East)	TM458769	1995
Plecotus auritus	Walberswick	TM488748	2003
Plecotus auritus	Reydon	TM494784	2005
Plecotus auritus	Walberswick	TM499748	2004
Plecotus auritus	Walberswick	TM501748	2005
Plecotus auritus	Framlingham	TM307622	1997
Plecotus auritus	Reydon	TM495771	2000
Plecotus auritus	Aldringham-cum-Thorpe	TM467608	1994
Plecotus auritus	Aldringham Common and Walks	TM460608	1994
Plecotus auritus	Leiston	TM461649	1998
Plecotus auritus	Westleton	TM463717	2002
Plecotus auritus	Sizewell Levels and Associated Areas	TM464636	2001
Plecotus auritus	Westleton	TM464673	1997
Plecotus auritus	Dunwich	TM466704	2007
Plecotus auritus	Thorpeness	TM474599	2002
Plecotus auritus	Wangford (East)	TM474786	2001
Plecotus auritus	Dunwich Shelter	TM475693	2006
Plecotus auritus	Dunwich	TM475701	1994
Plecotus auritus	Heveningham Churchyard	TM334726	1993
Plecotus auritus	Huntingfield	TM336744	1993

Table A1 (continued) **Desk Study Records of Bats Within 15km of the Site**

Latin Name	Approximate Location	Grid Reference	Year
Plecotus auritus	Swefling	TM337645	1997
Plecotus auritus	Campsea Ash Ice House	TM338551	2001
Plecotus auritus	Great Glemham	TM341623	2006
Plecotus auritus	Little Glemham	TM344548	2007
Plecotus auritus	Marlesford Churchyard	TM323583	1996
Plecotus auritus	Parham	TM315605	1996
Plecotus auritus	Framlingham	TM316641	1997
Plecotus auritus	Bruisyard	TM317664	2003
Plecotus auritus	Heveningham	TM333726	1993
Plecotus auritus	Marlesford Churchyard	TM324584	2008
Plecotus auritus	Linstead Parva Churchyard	TM324726	1989
Plecotus auritus	Huntingfield	TM332735	2005
Plecotus auritus	Orford	TM422499	1993
Plecotus auritus	Huntingfield	TM341738	2004
Plecotus auritus	Sudbourne	TM429522	2005
Plecotus auritus	Wenhaston-with-Mells Hamlet	TM427751	1992
Plecotus auritus	Captains Wood	TM425544	2001
Plecotus auritus	Westhall Churchyard	TM424805	2007
Plecotus auritus	Westhall Churchyard	TM423804	2003
Plecotus auritus	Darsham	TM423697	2004
Plecotus auritus	Middleton	TM423664	2005
Plecotus auritus	Friston	TM422579	1996
Plecotus auritus	Middleton	TM421674	2005
Plecotus auritus	Captains Wood	TM42265405	2005

Appendix B
Landscape Appraisal Results

24 Pages

Table B1 Habitat suitability assessment for Fred's Mount/Goose Hill (Woodland 1)

Name of woodland	**Fred's Mount/Goose Hill – wet woodland**
Number code	**1**
Size	53ha
% Broadleaf	High (100%)
No. Broadleaf species	Medium
	4-5 species
Species diversity	Medium
Structural diversity	Medium
	Under-storey rhododendron and young trees
Water association	Yes
	Stream
Other habitat association	Yes
	Within conifer plantation
Age	Young
	Even-aged
Overall assessment for roosting	Medium
	Occasional standing dead wood and ivy cover

Table B2 Habitat suitability assessment for Fred's Mount conifer plantation (Woodland 2)

Name of woodland	**Fred's Mount – conifer plantation near car park**
Number code	**2**
Size	93ha
% Broadleaf	Low (0%)
No. Broadleaf species	Low (0%).
Species diversity	Low
	Pinus spp.
Structural diversity	Low
	No under-storey
Water association	No
Other habitat association	Yes
	Conifer woodland surrounding on all sides
Age	Semi-mature: c50 years old, even-aged
Overall assessment for roosting	Low
	No obvious roosting opportunities

Table B3 Habitat suitability assessment for Minsmere – south of car park (Woodland 3)

Name of woodland	**Minsmere – south of car park**
Number code	**3**
Size	15ha
% Broadleaf	High (100%)
No. Broadleaf species	High
	Sweet chestnut, hazel, oak and birch
Species diversity	High
	Hawthorn, field maple
Structural diversity	High
	Shrub layer
Water association	Yes
	Minsmere wetlands
Other habitat association	Yes
	Scotthall woodlands, other woodland, Minsmere
Age	Mature
	Oak and chestnut
Overall assessment for roosting	High/Medium
	Storm damage is occasional/frequent. High potential for roosting in certain features. Interior scrubby with structure in under-storey.

Table B4 Habitat suitability assessment for Scottshall Coverts (Woodland 4).

Name of woodland	**Scottshall Coverts**
Number code	**4**
Size	44ha
% Broadleaf	High
	100% oak woodland
No. Broadleaf species	High
	Oak, birch, s. chestnut, beech
Species diversity	Medium
Structural diversity	Medium
	Very open woodland, sparse understory – parkland feel
Water association	No
Other habitat association	Yes Scottshall House
Age	Mature: veteran oaks, standing deadwood
	Semi-mature: mixed age stands
Overall assessment for roosting	High

Notes: Scottshall House. Large house with converted barns, little potential as roost site. Tiled roofs and weatherboarding.

Table B5 Habitat suitability assessment for New Hangman's woods (Woodland 5)

Name of woodland	**New Hangman's woods**
Number code	**5**
Size	20ha
% Broadleaf	High (90-100%)
No. Broadleaf species	Medium
	Avenue of limes, birch, hazel, beech
Species diversity	Medium
	Secondary sycamore growth
Structural diversity	Low
	No under-storey, shrub layer
Water association	Yes
	Minsmere wetlands
Other habitat association	Yes
	Scotthall woodlands, other woodland, Minsmere
Age	Mature: oak and chestnut
	Semi-mature: avenue of limes
	Young: mostly young sycamore trees
Overall assessment for roosting	Medium
	Lack of mature trees and dead wood. Structure very poor – young and even-aged

Table B6 Habitat suitability assessment for Eastbridge Wood (Woodland 6)

Name of woodland	**Eastbridge Wood**
Number code	**6**
Size	94ha
% Broadleaf	High
	100% oak woodland
No. Broadleaf species	Low
	Willow, alder, ash, some oak
Species diversity	Low
	Willow carr
Structural diversity	Medium
	Dense willow carr
Water association	Yes
	Upper Minsmere wetlands/valley
Other habitat association	No
Age	Young: mostly multi-stem willow in young stands
Overall assessment for roosting	Low
	Young willow carr, some roosting potential in crack willow/cracked limbs

Table B7 Habitat suitability assessment for Osier Bed (Woodland 7)

Name of woodland	**Osier bed**
Number code	**7**
Size	3ha
% Broadleaf	High (100%)
No. Broadleaf species	High
	Oak, willow, horse chestnut, ash, elder, elm, hazel
Species diversity	High
Structural diversity	Medium
	Dense under-storey, hawthorn, willow, bramble
Water association	Yes
	Wet woodland, wet ditch
Other habitat association	Yes
	Theberton House/estate
Age	Mature: mixed woodland with mature oaks
Overall assessment for roosting	Medium
	Good species diversity and wetland association. Some standing dead wood, dense under-storey. High potential for foraging.

Table B8 Habitat suitability assessment for Shelterbelt (Woodland 8)

Name of woodland	**Shelterbelt – assessed from moving car**
Number code	**8**
Size	10ha
% Broadleaf	High (70%)
	Some conifers in interior
No. Broadleaf species	High
Species diversity	Medium
Structural diversity	Medium
	Some mature trees, mostly even-aged
Water association	No
Other habitat association	Yes Theberton House
Age	Mature: some mature oaks associated with road
	are integrated into shelterbelt
Overall assessment for roosting	High/Medium
	Good connectivity along east side of road with links to Theberton estate.

Table B9 Habitat suitability assessment for Theberton Woods (Woodland 9)

Name of woodland	**Theberton Woods**
Number code	**9**
Size	34ha
% Broadleaf	High (90-100%)
No. Broadleaf species	Medium
	Hornbeam, ash, beech, hazel, willow
Species diversity	Medium
	Some shrub layer and under-storey
Structural diversity	Medium
	Field maple, elm, blackthorn
Water association	Yes several ponds in wood
Other habitat association	No
Age	Mature: scattered mature oak
	Young: even-aged
Overall assessment for roosting	Low
	Ash with hazel coppice, standards are semi-mature, Occaisonal dead wood. Good for foraging.

Table B10 Habitat suitability assessment for The Wilderness (Woodland 10)

Name of woodland	**The Wilderness – no direct access, assessed from a distance**
Number code	**10**
Size	14ha
% Broadleaf	High
	100% oak woodland with coppice
No. Broadleaf species	Medium
	Oak/ash coppice with hazel
Species diversity	Medium
Structural diversity	Medium
	Dense under-storey
Water association	Yes
	Ponds within wood – not observed directly
Other habitat association	Yes
	Darsham House Park. Good foraging habitat in parkland
Age	Mature: some mature oaks eviden
	Semi-mature: standards with coppice
Overall assessment for roosting	Medium
	Some mature oaks evident. Good structure and diverse under-storey. Good foraging potential and potential roosts in mature oaks.

Table B11 Habitat suitability assessment for Greyfriars Wood (Woodland 11)

Name of woodland	**Greyfriars Wood**
Number code	**11**
Size	81ha
% Broadleaf	Low
	Conifer plantation
No. Broadleaf species	Low
	Sycamore dominant in non-conifer areas
Species diversity	Low
	Young trees only
Structural diversity	Low
	Bracken only
Water association	No
Other habitat association	Yes
	Dunwich Heath. Part of a network of sites forming part of Minsmere-Walberswick Heaths and Marshes SSSI and SAC. Extensive areas of coniferous woodland and dry heath
Age	Mature: very occasional mature oak on lane
	Semi-mature: even-aged plantation
Overall assessment for roosting	Low
	Coniferous plantation with some broadleaved woodland on periphery. Mature oaks along lane.

Table B12 Habitat suitability assessment for Mill Road Wood (Woodland 12)

Name of woodland	**Mill Road Wood**
Number code	**12**
Size	133ha
% Broadleaf	High (100%)
No. Broadleaf species	Low
	Birch dominant
Species diversity	Low
	Occasional oak
Structural diversity	Low
	Bracken and honeysuckle
Water association	Yes
Other habitat association	Yes
Age	Young: oak, birch
Overall assessment for roosting	Low
	Heathland with secondary regeneration of birch. Bracken ground flora.

Table B13 Habitat suitability assessment for Margaret Wood, Thorpeness (Woodland 13)

Name of woodland	**Margaret Wood, Thorpeness**
Number code	**13**
Size	14ha
% Broadleaf	Medium
	50% conifer
No. Broadleaf species	Low
	Birch and oak with conifer
Species diversity	Low
Structural diversity	Medium
	Bramble and gorse scrub
Water association	No
Other habitat association	Yes
	Aldringham Heath
Age	All young trees
Overall assessment for roosting	High
	Former conifer plantation with secondary re-growth of birch and oak

Table B14 Habitat suitability assessment for Hundred River Wood (Woodland 14)

Name of woodland	**Hundred River Wood**
Number code	**14**
Size	18ha
% Broadleaf	High (100%)
No. Broadleaf species	Low
	Oak, birch, sycamore
Species diversity	Low
Structural diversity	Medium
	Blackthorn, gorse, bracken, hawthorn
Water association	Yes
	Hundred River
Other habitat association	No
Age	All young trees
Overall assessment for roosting	Low
	Heathland with secondary regeneration of birch. Bracken ground flora. Good foraging and connectivity.

Table B15 Habitat suitability assessment for Black Heath Wood (Woodland 15)

Name of woodland	**Black Heath Wood**
Number code	**15**
Size	82ha
% Broadleaf	Medium
	Conifer and birch
No. Broadleaf species	Low
	Birch and oak with conifer
Species diversity	Low
	Bracken and bramble
Structural diversity	Low
Water association	Yes
	Alde Estuary
Other habitat association	No
Age	All semi-mature and young trees
Overall assessment for roosting	High
	Medium potential as a foraging habitat.

Table B16 Habitat suitability assessment for Foxburrow Covert and Portobello Covert (Woodland 16)

Name of woodland	**Foxburrow Covert and Portobello Covert**
Number code	**16**
Size	11ha
% Broadleaf	High
	100% oak, beech, hazel, holly, ash sycamore
No. Broadleaf species	Medium
Species diversity	Medium
Structural diversity	Medium
	Some mature oak/beech standards old coppice
Water association	No
Other habitat association	Yes
	Green lanes connecting woodlands
Age	Mostly young or semi-mature trees
Overall assessment for roosting	Low
	Very small and narrow. Occasional mature oak and beech. Mostly young secondary re-growth with mature trees along green lanes.

Table B17 Habitat suitability assessment for Great Wood (Woodland 17)

Name of woodland	**Great Wood – very similar to 16**
Number code	**17**
Size	6ha
% Broadleaf	High
	100% oak, beech, hazel, holly, ash sycamore
No. Broadleaf species	Medium
Species diversity	Medium
Structural diversity	Medium
	Some mature oak/beech standards old coppice
Water association	No
Other habitat association	Yes
	Green lanes connecting woodlands
Age	Mostly young or semi-mature trees
Overall assessment for roosting	Medium
	No direct access. Larger area of coppice woodland.
	Likely to be good for foraging and also to have potential roost sites.

Table B18 Habitat suitability assessment for St. Peter's Church, Theberton

Job Number 3040.02	Date: 18/11/09
Job Name Sizewell	Start time:
	Stop time:
Surveyor(s) AK	Other Personnel: none
Survey Location Theberton, St Peter's Church	Grid Reference: TM 43728 65917
Weather strong wind, dry	Temperature: 15°C
Survey equipment used:	Survey method: scoping survey
Binoculars	
Photos taken	
Building Type Church	No. of Storeys: 1
Near Theberton House Estate and Minsmere	
Building Age built 1300s	Building Size (length/width): 32m x 11m
Wall Construction:	Roof construction:
Stone	Pitched
Solid wall	Thatch – looks recently re-thatched
	Inaccessible roof void at roof apex between wooden roof frame & thatch and the ceiling.
External features:	Potential/actual roost/access points
Missing mortar/cracks	Other – through porch, gap in door and through wall gaps and along roof beam
Bat evidence:	Overall assessment:
Droppings (state species/condition) Occasional pipistrelles droppings in porch. Medium sized droppings (BLE) on font and windows sills	Bats present Some potential for roosting barbastelle

Table B19 Habitat suitability assessment for Lady Chapel, Leiston Abbey

Job Number 3040.02	Date: 18/11/09
Job Name Sizewell	Start time:
	Stop time:
Surveyor(s) AK	Other Personnel: none
Survey Location Lady Chapel, Leiston Abbey	Grid Reference: TM443643
Weather strong wind, dry	Temperature: 15°C
Survey equipment used:	Survey method: scoping survey and internal inspection
Binoculars	
Photos taken	
Building Type Chapel	No. of Storeys: 1
Building Age 12th Century with 17th Century additions	Building Size (length/width): not recorded
Wall Construction:	Roof construction:
Brick/stone	Pitched
Solid wall	Open mortice joints present
Cladding – weatherboard on exterior gable	Thatch
Thatch and wood frame – cracks and gaps in wood and at roof/wall join	No underfelt or ceiling – underside of thatch visible inside
External features:	Potential/actual roost/access points
Barge boarding/weather boarding	Gable apex
Missing mortar/cracks	Roof
	Under weather boarding
	Other (specify) – gaps in stonework
Bat evidence:	Overall assessment:
Droppings (state species/condition)	Bats present
Scattered droppings all over interior – pipistrelles and medium-sized droppings.	Some potential for roosting barbastelle

Table B20 Habitat suitability assessment for barn in Thorpeness

Job Number 3040.02	Date: 18/11/09
Job Name Sizewell	Start time:
	Stop time:
Surveyor(s) AK	Other Personnel: none
Survey Location Thorpeness Barn	Grid Reference: TM 47329 59973
Weather strong wind, dry	Temperature: 15°C
Survey equipment used:	Survey method: scoping survey and external inspection
Binoculars	
Photos taken	
Building Type Thatched Barn with pantile stables and sheds in L-shaped configuration	No. of Storeys: 1
Building Age 200 years or older?	Building Size (length/width): 37m x 8m
Wall Construction:	Roof construction:
Brick/wood	Thatched roof to main barn. Derelict condition and open hatches into main body of thatch.
Solid	Pitched and clay tiled roof to stables and out buildings.
Building is derelict.	
External features:	Potential/actual roost/access points
Barge boarding/weather boarding on gable ends	Many gaps – weatherboarding, open hatches, gaps in brickwork, many gaps under roof tiles of stables – open sides to sheds and stables.
Open windows and hatches direct to interior	
Missing mortar/cracks	
Bat evidence:	Overall assessment:
None	High potential
	Potential roosting site for several species, including barbastelle.

Images B1 and B2: Fred's Mount / Goose Hill (left- Woodland 1) and Fred's Mount / Goose Hill Conifer plantation (right – Woodland 2)

Images B3 and B4: Minsmere car park (left - Woodland 3) and Hangman's Wood (right - Woodland 5)

Images B5 and B6: Scottshall Coverts (Woodland 4)

Images B7 and B8: Eastbridge Wood (left – Woodland 6) and Minsmere levels and Colney Hill (photo taken from Coastguard cottages (right)

Images B9 and B10: Remnant parkland around Theberton House

Image B11: Barn at Thorpeness (left) and Tracks/ potential flight lines from Thorpeness barn towards Margaret Woods and Sizewell

Images B12 and B13: Tracks/ potential flight lines from Thorpeness barn towards Margaret Woods and Sizewell (1 of 2)

Images B12 and B13: Margaret Woods (left – Woodland 13) and Black Heath Wood (right – Woodland 15) (2 of 2)

Images B14 and B15: Foxburrow Coverts (left – Woodland 16) and Home Farm thatched cottage (right)

Appendix C
Detailed Transect Survey Results

1 Pages

Table C1 Details of numbers of bat passes and relative activity for walked transects in 2009

	Number of passes recorded									Totals		
Date	**27/04/2009**	**29/04/2009**	**13/05/2009**	**25/05/2009**	**04/06/2009**	**25/06/2009**	**18/08/2009**	**25/08/2009**	**14/09/2009**	**Total**	**B/h**	**% of total**
P. pipistrellus	46	87	14	57	71	19	42	36	16	388	18.0	30.0
P. pygmaeus	30	72	31	28	31	39	95	97	75	498	23.1	44.3
P. nathusii			13		1					14	0.6	1.2
P. pipistrellus / P. nathusii					4					4	0.2	0.4
P. pipistrellus / P. pygmaeus	3	47	7	1	9	31	54	8	7	167	7.7	14.8
Plecotus species						1				1	0.0	0.1
Plecotus/Eptesicus						2	1			3	0.1	0.3
Myotis/Plecotus						1			1	2	0.1	0.2
Myotis species			1	2	1	3	4	1	4	16	0.7	1.4
N. noctula		2	2		2	1	1			8	0.4	0.7
Nyctalus species						1				1	0.0	0.1
E. serotinus						9		3		12	0.6	1.1
B. barbastellus		1	1		1	4	1		3	11	0.5	1.0
Grand Total	79	209	69	88	120	111	198	145	106	1125		
Survey duration (min)	143	171	90	137	175	128	150	154	145	1293		
Total B/h	**33.1**	**73.3**	**46.0**	**38.5**	**41.1**	**52.0**	**79.2**	**56.5**	**43.9**	**52.2**		

A	28 Jan 2011	Matt Hobbs (BSG)	Lynn Whitfield	Draft	Draft Issue for EDF comment	Emma Toovey
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NNB Generation Company
Sizewell Bat Survey Report 2010

1. Executive Summary

Baker Shepherd Gillespie (BSG) was commissioned to carry out bat surveys at the Sizewell Estate in 2010 as part of the baseline survey programme for bats that began in 2007. The main focus of the survey programme in 2010 was a trapping and radio-tracking survey of barbastelle *Barbastella barbastellus* bats during 1-12 June with the aim of discovering whether breeding female bats use the Estate for roosting, foraging or commuting. The survey programme also included a continuation and intensification of activity surveys (both walked transects and static detector surveys), roost surveys (bat box checks and emergence surveys of known roosts) for all bat species present on site, and an inspection of trees for potential to support bat roosts, covering all areas likely to be affected by development proposals at that time.

During the trapping survey a total of 177 bats from eight species were caught, including nine barbastelles. Of these, two were too heavily pregnant to be tagged but a further six pregnant females and one male were radio-tagged and tracked. A total of 13 roosts, including 12 tree roosts used by pregnant females, were found during this study, and 11 of the tree roosts were located within the Sizewell Estate. Clusters of tree roosts were found in Ash Wood (3), The Grove (3) and along the north edge of Kenton Hills and Nursery Covert (3) with additional roosts in the Grimseys area (which was not accessible), Hangman's Wood, Greenhouse Plantation and a barn to the west of the site (single male bat).

The females were recorded switching between trees regularly, although the distances between the roosts were greater than those found in other published studies of pre-lactational barbastelles. This is likely to be due to the relative scarcity of trees suitable as barbastelle roosts. The woodland areas used for roosting and the relative position of most of the roosts found – i.e. on woodland edges - were not typical of the published parameters thought suitable for maternity colonies of barbastelle. This may reflect the fragmented nature of suitable roosting habitat, the low availability of suitable trees within the plantation blocks that make up most of the woodland on the Estate and also the low number of published studies from the UK which have all been undertaken in extensive areas of high-quality broad-leaved woodland habitat, unlike Sizewell. During night-time tracking, barbastelles were recorded using a variety of habitats, with sustained foraging recorded in several areas including Sizewell Belts (particularly the northern section), both broad-leaved and plantation woodland, parkland and farmland (both pasture and arable).

Barbastelles were also recorded regularly from walked transect surveys (12 passes) and from static detector surveys, with barbastelles recorded from 53 of the 56 static detector deployments. The detectors covered most areas of the site at least twice during the season enabling a comparison between activity levels in discrete areas of the site in the 'spring' (mid-April to early July) and 'summer' (July-September). A dramatic increase in barbastelle activity occurred after early July, which suggested the presence of newly flying young of the year and/or an influx of adult bats due to increased temperatures and insect abundance. Although barbastelles used almost all areas of the site, the highest activity levels were recorded along commuting and

foraging features close to Ash Wood (on woodland and arable edge, particularly at Black Walks), Upper Abbey track, Goose Hill, the perimeter track around Kenton Hills and Nursery Covert, Fiscal Policy and Leiston Old Abbey. Activity levels detected on the Belts, in the open arable areas away from commuting routes, and around the main reactor development site were generally fairly low.

Following the discovery of a number of roosts during the radio-tracking survey, simultaneous emergence surveys were carried out on all accessible known tree roosts in both July and August. No barbastelles were recorded during the first survey, and 11 bats were recorded emerging from three trees during the second. It is possible that only a sub-set of the population and their roosts were recorded during emergence surveys, as barbastelles move roosts frequently. However, it is also possible that the population at Sizewell is relatively small, a conjecture that is borne out by the small number of bats trapped and the high number of recaptures from roosts.

Detector survey results for other bat species were in accord with those from previous years' surveys in terms of the species and activity levels detected throughout the season. However, in contrast with the results from 2007-2009 when very little Nathusius' pipistrelle activity was recorded, many calls of this species were detected, including during the summer months. This could indicate a resident population, as well as a transient migratory population, with the possibility of this species breeding on the site.

Over 450 trees considered to have medium or higher potential to support roosting bats were identified during the tree inspection. The results of this survey show that there are a number of blocks of broad-leaved woodland within or near to the site that are suitable for supporting maternity colonies of barbastelle as well as other species of bats. Large clusters of suitable trees were found in Ash Wood, The Grove and Fiscal Policy, and around Leiston Old Abbey, Grimseys and the eastern edge of the Sizewell Belts SSSI.

2. Introduction

An area of land directly north of the Sizewell 'B' Power Station has been identified as having the potential to accommodate new nuclear plant. This area has an approximate central grid reference of TM473640 and is referred to in this document as the 'Strategic Site Area (SSA)'. In addition to the station build area there is a requirement for a new access road that will run in an easterly direction before linking into the wider road network at Lover's Lane, although its exact route has not yet been determined. In addition to these permanent development proposals there will also be a number of temporary construction activities and other associated developments but details of these areas are yet to be ascertained.

Entec UK Ltd has been undertaking ecological survey work within the potential zone of influence of the proposed new build area since 2007 in order to provide sufficient information to support the scheme design requirements and subsequent ecological impact assessment, mitigation proposals and general planning requirements. The bat survey work outlined within this report is part of this suite of works. This report outlines the findings of the 2010 bat survey work and complements surveys undertaken in 2007, 2008 and 2009.

2.1 Legislation and Policy Guidance

2.1.1 Biodiversity Action Plan

Seventeen[1] species of bat are known to be resident in the UK, seven of which are on the new list of priority species[2] 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 *Pipistrellus pipistrellus*. Tranche 2, published in 2000, was withdrawn and a new list was published in June 2010, with new SAPs due for completion in autumn 2010, although these had not been issued at the time of writing. The latest list includes the following bat species: barbastelle, brown long-eared bat, noctule, soprano pipistrelle and lesser horseshoe bat.

2.1.2 Protective Legislation Relating to Bats

All bat species and their roosts were 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) before 2010. This legislation has been replaced and updated by The Conservation of Habitats and Species Regulations 2010. In addition, the lesser horseshoe bat *Rhinolophus hipposideros*, greater horseshoe bat *Rhinolophus 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.

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:

[1] 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.

[2] Priority bat species in the UK BAP: barbastelle, Bechstein's bat *Myotis bechsteinii*, noctule *Nyctalus noctula*, soprano pipistrelle *Pipistrellus pygmaeus,* brown long-eared bat *Plecotus auritus,* greater horseshoe bat *Rhinolophus ferrumequinum* and lesser horseshoe bat *Rhinolophus hipposideros.*

- 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. Case law 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. 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. As noted above this legislation has now been replaced by The Conservation of Habitats and Species Regulations 2010 which do not make any substantive changes to the previous legislation with respect to 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';
- 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.

2.2 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)
Nathusius' pipistrelle	*Pipistrellus nathusii*	Unknown	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	Russ (2010)
Brown long-eared bat	*Plecotus auritus*	Common and widespread	Second only to pipistrelles in terms of number of 10km squares in the county in which it is recorded	Suffolk Bat Group

Table 1 (continued) **Status of Bat Species in Suffolk**

English name	Scientific name	Status in Suffolk	Notes	Source of information
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/Brandt's/Alcathoe* whiskered bat	*Myotis mystacinus/brandtii/alcathoe*	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
Daubenton's bat	*Myotis 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
Leisler's bat	*Nyctalus leisleri*	Uncommon	Only three nursery colonies are known in the county. Appears to be confined to the north-west of Suffolk	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	*Rhinolophus hipposideros*	Very rare (very few records)	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 Bat Group and Alan Miller of the Suffolk Wildlife Trust

* Whiskered and Brandt's 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, 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.

2.3 Barbastelle Status in the UK and Europe

The barbastelle is rare in Britain (Battersby, 2005), and only sparsely distributed through its range in Europe (Altringham, 2003), with populations categorised as vulnerable (IUCN, 2006;

EU Red List). The most recent official population estimate is of 5,000 animals in the UK (Battersby, 2005). However, the population count is based on very limited data and more recent studies indicate that the true figure may be anywhere between 5,000 and 10,000 (Harris & Yalden, 2008). The National Bat Monitoring Programme (NBMP) does not yet hold sufficient data to calculate population trends for barbastelle. The NBMP Woodland Survey does include surveys for barbastelle at a total of 22 sites, of which nine hold barbastelle (Bat Conservation Trust (BCT), 2010). NBMP surveys focus on Special Areas of Conservation (SACs) for which barbastelle is one of the criteria for designation. Data collated by the Barbastelle & Bechstein's Technical Advisory Group from the NBMP gives a number of occupied 10km squares (86) as the most meaningful statistic until an updated population estimate can be provided[3].

There are apparently no published figures for the number of maternity colonies since a quoted figure of five in the UK in 2001 (Greenaway, 2001). However, at least 15 sites which support maternity colonies are known in the UK at the time of writing. Seven of these are within six SACs for which the barbastelle is a primary reason for site selection, and one is within a SAC for which it is listed as a qualifying feature. In addition there are another six sites for which there is an online reference and another which is confidential. More details of these sites can be found in **Table 2**. There are apparently no published data for any other maternity colonies, although it is known anecdotally that more colonies than are listed in **Table 2** have been located in recent years as study efforts have increased.

The lack of population data is due largely to the rarity of the species, the difficulty in finding roosts of this species and the difficulty of detecting them using aural bat detectors. Although barbastelle are likely to be an under-recorded species there is no doubt it is a rare species under threat throughout Europe (Dietz *et al.,* 2009).

Their characteristic short and directional echolocation call (Denzinger *et al.,* 2001), and fast and far-travelling flight (Dietz *et al.,* 2009) make barbastelles difficult to hear and identify using bat detectors during transect surveys. In addition, barbastelles are now known often to emit calls which are extremely quiet, 10-100 times lower in amplitude than those of other aerial-hawking species of bats. They are thought to employ this strategy in order to remain undetected by eared moth species which form their principal prey resource (Goerlitz *et al.*, 2010). Nevertheless, their calls are reasonably detectable in the field at short distances using recordable detectors.

Table 2 Barbastelle Maternity Colonies in the UK

Site name	County	Year of discovery	Designated?
Ebernoe	West Sussex	1996	SSSI, NNR, SAC
The Mens	West Sussex	2000?	SSSI, SAC
Eversden and Wimpole	Cambridgeshire	2002	SSSI, SAC
Horner Wood	Somerset	1999	NNR, SAC (Exmoor and Quantock)

[3] http://www.ukbap-reporting.org.uk/status/species_habitat_nat_status.asp?X=%7BE92537EC-5F7F-4536-B8FA-A074508DFDCF%7D&C=1&txtLogout=&flipLang

Table 2 (continued) **Barbastelle Maternity Colonies in the UK**

Site name	County	Year of discovery	Designated?
Hawns and Dendles	Devon	2002	SSSI (Dendles Wood) NNR, SAC (Exmoor and Quantock)
Mottisfont	Hampshire	prior to 2003	SSSI, SAC
Pengelli Forest	Pembrokeshire	2000	SSSI, NNR, SAC (North Pembrokeshire Woodland)
Paston Great Barn	Norfolk	1996	SSSI, SAC
New Forest	Hampshire	2006	Within New Forest NNR, SAC (not a qualifying feature)
Chambers Farm Wood	Lincolnshire	2010	Part of Bardney Limewoods SSSI/NNR
Whichford Wood	Warwickshire	2008	SSSI
Briddlesford Woods	Isle of Wight	2004	SSSI, SAC (not a qualifying feature)
Parkhurst Forest	Isle of Wight	2009	SSSI
Location not available	Cornwall*		
Location not available	Norfolk†	2009	

* Information from from Cornwall Bat Group website.

, † BSG ,unpublished data

2.4 Summary of Baseline Survey Work, 2007-2009

The bat surveys carried out in 2010 are part of the baseline survey programme for bats that began in 2007 and are being conducted to inform the ecological impact assessment (EcIA) section of an Environmental Statement (ES) for the proposed development. Survey work was carried out in 2007 (report ref: 19801cb114), 2008 (report ref: 19801cb205) and 2009 (report ref: 19801ca405). Details of the results of the survey work and supplementary desk study can be found in the relevant reports and have been summarised below.

From the desk study undertaken in 2007 and 2009 and conversations with the Wildlife Trust and local householders, there are known to be a number of bat roosts within the Sizewell estate which include small roosts of Natterer's bat (Upper Abbey Barn), brown long-eared bat (Upper Abbey Barn and Ash Cottages), common and soprano pipistrelle (Upper Abbey Barn and bat boxes in Kenton Hills), noctule (bat boxes in Kenton Hills – which can include hibernating bats) and barbastelle (some anecdotal records from Upper Abbey Barn and Lower Abbey).

Ten[4] species of bats have been recorded during bat activity and trapping surveys: common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, brown long-eared bat, Natterer's bat, Daubenton's bat, noctule, Leisler's bat, serotine and barbastelle.

Barbastelle bats have been recorded on most areas of the site that have been surveyed, with greatest frequency in the areas of plantation woodland (Kenton Hills, Goose Hill) and lesser

[4] Note that earlier reports included a few detector calls which were erroneously reported as being from whiskered bat; however, these should have been included simply as '*Myotis*', as it is not possible to distinguish with certainty between the whiskered group and other *Myotis* species on this basis.

frequency in the area of Sizewell Belts and the arable land to the north of the plantation areas. The highest level of activity was recorded (in 2009) along the track between Fiscal Policy and Upper Abbey and the timing of records suggests that this feature may be a commuting corridor for the species. During a trapping survey over three half-nights in May 2009 five barbastelles, of which four were females, as well as another 42 bats of six species, were caught. Although it was not possible to say whether the females were pregnant, at least three had bred in previous years. This information suggested that the site may be of importance to breeding female bats.

A landscape and woodland appraisal of potential roosting areas within 15km of the site suggested that there are limited opportunities for maternity colonies of barbastelle close to the site (based on current knowledge of the species' roosting requirements) and that the highest quality habitat is probably located 2-3 km to the north in the woodlands around Minsmere RSPB reserve.

2.5 Aims of the 2010 Survey Work

The 2010 survey work was commissioned by EDF Energy to address recommendations made in the 2009 Sizewell bat survey report (report ref: 19801ca405). The 2010 surveys were designed to supplement and improve upon the existing baseline information with regard to all bat species, although the main focus of the surveys was to investigate the status of barbastelle within the site through radio-tracking of (predominantly) female bats. In addition further survey work was commissioned following the results of radio-tracking surveys in June 2010 once these surveys had confirmed the presence of one or more breeding colonies of barbastelle within the Sizewell Estate and surrounding area.

The general aims of the surveys for all bat species were to continue the baseline survey carried out in 2007-2009 and to intensify survey effort in some areas given the increased anticipated land-take for the scheme, which is likely to be based on developing two reactors rather than one. The following survey methods were used: walked transect survey (twice a month), static detector survey and surveys of the bat boxes within the plantation woodland. The static detector survey was designed to cover all areas of the wider site at least twice a year to look for seasonal differences in bat activity and also to both complement and fill any gaps in the radio-tracking data for barbastelle.

The radio-tracking surveys were necessary to identify:

- Whether the site is a core foraging area for a maternity colony of barbastelles;
- The location of areas of the site that are of greatest importance for commuting and foraging female barbastelles and that may be negatively affected by proposed works;
- The location of maternity colonies;
- The location of other key commuting routes.

Following the discovery of maternity roosts of barbastelle within the Sizewell Estate and the surrounding area during the radio-tracking survey, additional survey work was commissioned by EDF Energy as follows:

- Simultaneous emergence surveys on known barbastelle roost trees to provide a minimum population count;

- An inspection of trees for potential to support bat roosts, covering all areas likely to be affected by current development proposals, with recording of a number of parameters considered relevant to roost selection by bats, and particularly barbastelle.

3. Methods

3.1 Trapping and Radio-Tracking Surveys

Harp-trapping and mist-netting with additional hand-netting from tree roosts was undertaken between 1 June and 8 June 2010 with radio-tracking continuing until 12 June. The surveys were carried out by Corylus Ecology with assistance provided by ecologists from BSG and Entec.

No barbastelle maternity roosting sites were known prior to the survey work so trapping effort initially focussed on catching barbastelles on flight-lines, rather than from roosts. Prior to commencing the trapping survey, the locations of suitable trapping points were determined from previous activity surveys by BSG and from a site walkover to pinpoint exact habitat features where nets could be placed to maximum effect . The principal aim was to capture and radio-track barbastelles, with priority given to female bats. An acoustic lure (Sussex Autobat), playing a synthesised barbastelle social call, was used near to harp traps on a number of evenings specifically to attract barbastelle bats. The lure was used on the following occasions:

- 3 June: between harp trap 1 and 2 on Upper Abbey track;
- 4 June: between harp trap 1 and 2 in The Grove;
- 5 June: between harp trap 1 and 2 in Fiscal Policy;
- 6 June: at HT2 in Broom Covert.

Unfortunately the lure was damaged on 7 June and could not be used again during the trapping surveys.

Bats were tracked throughout the night until they were lost by surveyors and then tracked by surveyors during the day who attempted to find their roosting locations. At emergence times surveyors also attempted to catch bats from roost trees using static hand-nets and a cone trap where placement was possible.

A licence for the trapping and radio-tracking project was granted to Helen Lucking of Corylus Ecology by Natural England (licence number 20102328). Two key accredited agents were used: Alastair Wrigley of Corylus Ecology and Geoff Billington of Greena Ecology. A number of other surveyors employed by Corylus Ecology were used as accredited agents during the trapping and for radio-tracking. All radio-trackers were experienced in such work.

As well as focussing on female bats, priority was also given to tracking those bats recorded within the site area. If no tagged bats were in the site area then surveyors would search for bats in the wider area. As a result some bats were followed less closely than others and the number of successful triangulation points or 'fixes' (which are determined from intersecting bearings taken simultaneously) varied significantly between bats. It is recognised that for data from

radio-tracking to be used to work out home ranges[5] fixes would typically be required at consecutive 10 minute intervals throughout consecutive nights for each animal being tracked.

Biometric data were recorded from all bats caught, including the gender, forearm length and weight. Every bat was also examined to ascertain its breeding status, where possible. Only bats which were in healthy condition and of suitable weight were considered for tracking. All females were checked and if found to be at an advanced stage of pregnancy they were released immediately and not used for tracking. Bats were tagged with radio-transmitters provided by Biotrack. Tags weighed 0.47g and the licence granted from Natural England allowed tags to be used on bats up to a maximum of 7% body weight. In most cases the tags weighed less than 5% of the bat's weight; on all occasions they were less than 6% of body weight with the average being 5.1% of body weight. The bats being tracked were fur-clipped and the transmitters glued between the shoulder blades using SkinBond[6] adhesive. The transmitters used were designed with a battery life of at least eight days. Time was allowed for the bats and transmitters to settle and for receivers to be set to the optimum frequency of each transmitter before releasing the bats close to where they had been caught. Each tracked bat was assigned a consecutive number to allow them to be distinguished easily during tracking.

Bats were radio-tracked using Australis and Sika radio-tracking scanning receivers with Yagi rigid directional aerials to track bats on foot. Whip omni-directional antennas were employed when searching for bats by vehicle. Hand-held sighting compasses were used to take bearings and both detailed maps and handheld GPS units were used to provide locations for both surveyors and bats. Between two and five surveyors were used to radio-track the bats with both close-tracking and synchronised triangulation techniques used to produce joint bearings. Surveyors used radio-sets and mobile phones to allow contact to be maintained while synchronised joint bearings were taken.

The key night-time radio-tracking surveyors used were experienced in multi-bat tracking projects for development and road schemes, each having a minimum of six years' experience of similar, sustained trapping and tracking survey. Experienced day-time surveyors were used to track bats back to day roosts. Seven surveyors worked on the project with a small number of additional assistants from BSG and Entec also present to help with the trapping efforts.

A series of safe observation points for the radio-tracking surveyors were pre-planned to allow for safe working and to provide the best receiver locations for joint bearings to be taken. As the principal aim was to determine whether the bats were using areas likely to be affected by the proposals, the surveyors concentrated the tracking effort within the Sizewell Estate. If a bat was recorded then attempts were made to take synchronised, also referred to as "joint", bearings, with another surveyor. This meant that surveyors frequently had to change locations in order to get joint bearings. It is a recognised problem that gathering regular accurate triangulated fixes for foraging bats is difficult. This is because bats forage in flight and at speed, continually twisting and turning, causing fluctuations in transmitter pulse amplitude which can impede interpretation of distance and direction (Mackie & Racey, 2007). In addition, the barbastelle is a wide-ranging, fast-flying species which switches roosts frequently. Care also had to be taken

[5] The area in which an animal normally roosts and forages.

[6] Current guidance from the Bat Conservation Trust suggests that the new formulation of SkinBond adhesive may not be safe for use with bats. The SkinBond adhesive used during surveys at Sizewell was an old formulation sourced from Canada and is thought to be safe.

to ensure that the surveyors were positioned away from overhead cables and from cars to avoid disturbance to the compasses and radio-signals.

Collecting tracking data on breeding female bats was prioritised over data collection from male bats. If no tagged bats were in the area of the proposals surveyors would search for bats in the wider area, although priority would always be given to those in closer proximity to the scheme. As a result, varying numbers of triangulation points were taken per bat and not all bats were followed as closely as others. It is recognised that for data from radio-tracking to be used to work out home ranges, joint bearings would typically be required at consecutive 10-minute intervals throughout consecutive nights for each animal being tracked. The focus of this survey was finding roosts as well as key foraging areas and commuting routes for breeding females, and determining whether the development scheme is likely to affect any of these.

Care was taken to ensure that tag frequencies would not overlap. In addition, as a requirement under the Natural England licence for both periods of radio-tracking, the local bat group representatives were contacted, in this case Suffolk Bat Group, to inform them of the work and to check whether any other radio-tracking was being undertaken by other surveyors who should also have contacted the same bat group representatives. No such concurrent studies were reported.

3.1.1 Analysis

Detailed statistical analysis relating to variation in home ranges or core areas has not been undertaken as the same level of survey effort was not carried out for each bat. However, the fixes obtained have allowed a description of the areas used by each tagged bat to be made with reference primarily to proximity to the site, and wherever sufficient information has been gathered, analysis of home ranges has been undertaken.

The data presented in this report are based on all available triangulation points. In addition, where a bat was known to be present in a given location at a given time a data point was also generated. Where a bat was closely radio-tracked, for example a bat foraging for a sustained period within a specific area, a triangulation point was generated for the approximate centre of the foraging area with a separate triangulation point generated for every ten minute interval. Bat fixes were transferred to digital geo-referenced maps using AutoCAD and coordinates for triangulation points were determined; the extent of bat activity for each bat was plotted independently and the data were carefully scrutinised and any obviously false bearings were discarded. The coordinates of the plotted triangulation points were then transferred into Ranges 7 software (Anatrack) and analysed to produce minimum convex polygons[7] (MCPs), neighbour linkage[8] (or clusters) and kernel contours[9]. These are all methods of showing home ranges. For all bats where roosts were found, the roost sites were included within the home ranges. The analysis was carried out using 95% of the locations closest to the home range centre (for

[7] The MCP enables the creation of a boundary around all fixes using the smallest possible convex polygon. This is commonly used but may overestimate the size of home ranges.

[8] A type of multivariate analysis which aims to group a set of variables or individuals into classes, so that the objects in each class are as like each other as possible and as unlike the other classes as possible, as defined by a designated list of characteristics and indicators.

[9] 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.

polygons produced by MCP analysis) or the 95% nearest to each other for the contour analysis (the cluster and kernel contours). Additional coordinates for areas where no joint bearings had been obtained, but where close tracking had been undertaken, were also calculated. Such additional data were combined with the triangulation data to create a separate data set for re-analysis within Ranges 7.

Within each data set, the trapping locations were specified as the focal sites and all coordinates from the night time tracking and roost locations were input as location qualifying variables (LQVs) within Ranges. Typically a focal site might consist of a den, nest or roost of a tracked animal. In the case of the bats tracked during this study, since animals regularly switched day roost, that location could not be used as focal site within Ranges; hence the location where the animal was caught was used for this purpose.

3.2 Walked Transects

A total of 11 walked transect surveys were undertaken between April and September 2010. These were carried out twice a month except in April when one survey was undertaken. During each visit two surveyors together (for health and safety reasons) walked a pre-determined transect route within the survey area. Each survey visit started around sunset and typically took 2-3 hours to complete. 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 frequency division detector for recording calls for subsequent identification (see Section 3.5). Wherever possible, surveyors recorded the observed behaviour and numbers of bats onto field proforma. Notes were taken of all bat sightings (to assist with their identification) in conjunction with the Anabat recordings. Field notes included a record of the time of each bat encounter, allowing results to be cross-referenced with the recorded data.

Transect routes in 2010 were designed to cover those areas which are anticipated to be most affected by the current scheme namely:

- Goose Hill woodland;
- Northern areas of Sizewell Belts SSSI;
- Fiscal Policy, Kenton Hills, and Nursery Covert woodland;
- The proposed power station site area (when accessible during the summer); and
- Arable areas to the north of the plantation woodland.

3.3 Static Bat Detector Survey

3.3.1 Survey Effort

The key purpose of the static bat detector survey was to examine in detail spatial and temporal patterns of bat, and in particular barbastelle, activity, and to identify areas of high importance for bats through quantitative analysis of relative activity levels between areas and between seasons.

Anabat bat detectors were used to assess bat activity at various fixed points throughout the site. The detectors were left *in situ* for a number of days or weeks at each survey point, which allowed continuous monitoring to take place during the period when bats are active. They were

programmed to begin recording half an hour before sunset and finish half and hour after sunrise. Survey hours varied throughout the survey season according to day length.

Six detectors were deployed for 2-3 weeks before being moved to another six survey locations. This was continued throughout the survey period with a total of 10 deployments (of six detectors) completed. The detectors were located fairly systematically over the entire proposed works area and most areas were covered on 2-3 occasions.

3.3.2 Survey Periods and Areas

The survey period was split into two periods, 14 April – 6 July (period 1, "spring") and 7 July to 14 September (period 2, "summer") and each detector was numbered according to period, deployment number and Anabat number, e.g. P1_1a.

The survey area was also split into six areas which enabled comparison between the relative activity of bats in different parts of the site. These areas are shown on **Figure C1** and cover the following areas of the site:

- Area 1 – Farmland. This includes a wide area of arable farmland to the north of the plantation woodland and also a single pasture field adjacent to the woodland at Leiston Old Abbey. It also includes a number of potential commuting and foraging features, such as hedgerows, tree lines, the Upper Abbey track, Stonewall Belts and Ash Wood;
- Area 2 – Goose Hill and The Grove;
- Area 3 – Kenton Hills/ Nursery Covert/ Fiscal Policy;
- Area 4 – Sizewell Belts north;
- Area 5 – Preliminary works area; and
- Area 6 – Sizewell Belts south.

One detector was located outside of the areas shown on **Figure C1**. Static detector number P2_2f was located at the south-western edge of the existing power station site next to an arable field which may need to be developed as a car park within the proposed development scheme.

3.3.3 Deployment of Anabat Detectors

Anabat 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. With the microphone pointing downwards at 45 degrees the 90 degree bend in the pipe allows reception of calls from the upward-pointing, open end of the pipe. The pipe was then attached to a hedgerow, tree or other suitable habitat feature with the Anabat housing hidden on the ground. 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. Wherever possible, the microphone was pointing along a potential commuting or foraging feature to record clear identifiable calls from bats echolocating along features and towards the microphone. The detector and microphone housing used at Sizewell has been tested in an acoustic laboratory at Bristol University using playbacks of calls from UK bat species. Although results are preliminary, the housing has been shown to record bat calls

with only small apparent reductions in detection distances of less than 10% in comparison to a microphone with no housing (BSG, unpublished data).

3.3.4 Data Analysis

Selecting Data for Analysis

Because of the very large amount of data likely to be recorded during such an intensive field season of static bat detector recording, the decision was made prior to the commencement of the work that not all of the data would be checked and labelled for all species of bats. All recordings were checked for barbastelle calls by rapid scanning of sound files for this species. Due to the distinctiveness of barbastelle calls it is possible to scan the data for this species without needing to undertake the time-consuming task of identifying and labelling every other bat call.

For all other species of bats, a sub-set of three nights of data from each deployment was chosen. These nights were those with the highest number of bat calls recorded. 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 relative activity rates for those three nights will be higher than if all the data within the particular recording period from which they were selected was analysed. As relative activity is not a measure of abundance this upward bias is unlikely to make any difference to the evaluation of the importance of bat populations at Sizewell.

3.4 Recording Bat Activity

The Anabat SD1 frequency division bat detector was used to record bat calls during 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 data produced by Anabats is then analysed used zero-crossing analysis (ZCA) through an in-built interface module to prepare the data for use on a PC. ZCA enables rapid analysis of the frequency-time characteristics of bat calls and uses small amounts of data for storage.

The Anabat has internal storage and computing power that allows the unit to be used as a remote fixed-point detector. Although not as much information on the bat's echolocation is preserved as with some other bat detectors, such as time-expansion systems, frequency division detectors provide clear depictions of important call details that allow identification of a number of species to a similar level of accuracy as other methods. Recording is triggered by high frequency ultrasound, such as bat calls, in the vicinity of the detector, and any recordings are stored as discrete 15-second sound files on an internal compact flash card, along with date and time. If bat activity continues for more than 15 seconds successive sound files are created until ultrasound is no longer detected.

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. The velocity of sound at any point is affected by the spherical spreading loss of sound energy in air. The rate of energy and velocity loss is also affected by environmental conditions, principally temperature and humidity. Although no published research exists to date, bat detectors are likely to detect calls from particular species of bats at greater distances than others. The key characteristics of bat calls in relation to their detectability are amplitude and frequency. The

amplitude, or intensity, is the measure of the amount of energy in a sound wave. Sound absorption is frequency dependent with greater attenuation at higher frequencies. In summary bats which produce high amplitude and low frequency calls will be detectable at greater distances. Detectability is also affected by the design of the bat detector used. Microphones are of particular importance as they do not generally have a flat frequency response and the size and shape of the microphone affects their directionality; i.e. smaller microphones are more omni-directional and larger microphones have greater on-axis sensitivity.

The Anabat has a large microphone which is fairly directional and a peak frequency response at 40-50 kHz. Detection is thought to be most efficient between 7.5º either side of directly ahead (0º = on axis) of the Anabat microphone with detection distances decreasing with increasing angles from the axis (Larson & Hayes, 2000).

It is possible to categorise bat species according to how detectable their calls are; however, the ability of bat detectors to detect bats is affected by many different variables, for example, the environmental conditions, the angle of the sound source from the microphone, the distance between bat and microphone, the echolocation behaviour of the bat (commuting, foraging) etc. In general, bats with calls that can be detected over greater distances are large bats which use low frequency CF calls such as noctule and the most difficult to detect are those which use weak FM calls such as the brown long-eared bat or high frequencies, such as horseshoe bats. In addition, as stated above, recent research by Bristol University has shown that barbastelles use particularly quiet calls and this may be due to their foraging strategy (Goerlitz *et al.* 2010). **Table 3** indicates the likely detectability of UK bat species or species groups based on preliminary research undertaken by BSG in collaboration with Bristol University.

Table 3 Estimated Detection Distances for Suffolk Bat Species

English Name	Latin Name	Maximum detection distance (m)
Pipistrelle species	*Pipistrellus* sp.	30
Brown long-eared bat	*Plecotus auritus*	5 (up to 10 for louder commuting call)
Myotis species	*Myotis* sp.	15
Noctule	*Nyctalus noctula*	>100 (CF call)
Leisler's bat	*Nyctalus leisleri*	50 (CF call)
Serotine	*Eptesicus serotinus*	30?
Barbastelle	*Barbastella barbastellus*	5
Lesser horseshoe bat	*Rhinolophus hipposideros*	5

3.5 Bat Call Analysis

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 having 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.
- *Nyctalus* sp. (either Leisler's bat or noctule).
- *E. serotinus/N. leisleri* (either serotine or Leisler's bat)
- *Nyctalus/Eptesicus* sp.
- *Plecotus/Eptesicus* sp.

Bat calls which could not be ascribed to any of these categories were not used in the analysis.

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 an effort-related comparison between the time periods and TC7 was corrected to allow for variation in night length throughout the survey season.

3.6 Emergence Surveys of Barbastelle Roost Trees

During the radio-tracking surveys a total of 13 barbastelle roosts were located. Of these, one was a barn used by a single male bat and another refers to an area of inaccessible woodland at Grimseys where two female barbastelles roosted. It was impossible to tell if more than one roost location was used in Grimseys. The other 11 roosts were all in trees which could be accessed (see Section 4.1.1). Following the completion of the radio-tracking surveys, simultaneous emergence surveys of all 11 trees were carried out to allow a minimum population count to be achieved for the site. All tree roosts must be surveyed simultaneously due to the highly mobile nature of barbastelle maternity roosts, which often move every 1-2 days (Greenaway, 2008; Greenaway & Hill, 2004).

The surveys involved a total of eight surveyors (one per tree) with an additional three trees surveyed by use of infra-red video cameras (with illumination) and bat detectors. These three trees were selected due to their suitability for this remote survey technique, in particular the visibility and extent of the known roosting features. Emergence surveys were carried out on 6 July and 3 August to provide an indication of the variability in numbers of roosting bats using known roost trees.

3.7 Bat Box Surveys

A number of bat boxes have been attached to Corsican pine *Pinus nigra* ssp. *laricio* trees in plantation woodland within Kenton Hills. These boxes are usually checked annually by the Suffolk Wildlife Trust in September (Alan Miller, pers. comm.) when there is limited risk of disturbance to any breeding colonies of bats. During 2010 surveys of all the bat boxes were carried out on 3 June and 4 August to establish the species and breeding status of any bats found using the boxes. When bats were found, the following data were collected: date and time; box number; species; number of bats; sex; and breeding condition. Biometric data such as forearm length and weight were not collected as this was not necessary to fulfil the aims of the survey and would have led to further disturbance to bats.

3.8 Tree Assessment

Following the discovery of a number of pre-maternity roost trees during the radio-tracking survey (see Section 4.1) surveyors from BSG and Corylus Ecology undertook a survey of all mature trees within the Sizewell Estate, during August and September 2010. The aim of the tree survey was to identify all trees with medium or higher potential to support roosting bats of any species.

For broad-leaved woodland areas with a large number of suitable trees, surveyors inspected all accessible trees individually. In areas of pine plantation where most trees are not damaged, are in uniform rows and are easily visible, surveyors walked strip transects through the blocks of woodland and carefully scanned areas of trees on either side of the transect route for any signs of damage.

The following parameters were collected for trees:

- GPS location (national grid reference);
- Species of tree;
- Decay Index (1-8) following Vonhof & Barclay (1996);
- Height of tree (m);
- Diameter at breast height (DBH) (cm);
- Type of roost feature, e.g. lifted bark, woodpecker hole;
- Aspect of roost feature (e.g. NW);
- Extent of 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 (%);
- Digital image no.;
- Necessity for winter re-check (Y/N); and
- Assessment of potential for roosting bats (medium, high, very high).

To aid analysis of the data the area was split into blocks, which are detailed in Section 4.6.

3.9 Personnel

The bat survey work in 2010 was co-ordinated and led by Matthew Hobbs of Baker Shepherd Gillespie. The trapping and radio-tracking study was led by Helen Lucking of Corylus Ecology (NE licence number 20102328). A further six surveyors were used for this element of the survey work[10].

Walked transect and static detector survey work during 2010 was carried out by a total of six ecologists. These surveys were all led by either Matthew Hobbs or Vilas Anthwal (licence number 20093830) with another four surveyors assisting[11]. For emergence surveys, the same two surveyors led the surveys with an additional eight surveyors used[12]. Bat box surveys were led by Vilas Anthwal and Paul Spencer (licence number 20101899) with Matthew Hobbs, Stephanie Boocock and Heather White assisting. The tree survey was carried out by Matthew Hobbs, Vilas Anthwal, Stephanie Boocock, Anna Gundrey, Alastair Wrigley, Paul Spencer and Heather White.

3.10 Evaluation Methodology

In order to evaluate the importance of ecological features identified from 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).

[10] Alastair Wrigley (licence number 20101843), Paul Spencer, Heather White (all Corylus Ecology), Geoff Billington (Greena Ecology; licence number 20101072), Alison Johnson (freelance; licence number 20094211), Marie Steggel (freelance; licence number 20102057).

[11] Anna Gundrey, Stephanie Boocock (Licence number 20102881), Owain Gabb (all BSG) and Heather White (Corylus Ecology).

[12] Laura Jennings, Natalie White, Helen Evriviades (licence no. 20103809) (all BSG), Alastair Wrigley, Paul Spencer, Heather White (all Corylus Ecology), Katheryn Leggat (20103804), Lynn Whitfield (licence no. 20100108) (both Entec).

Where possible, formal criteria are used to assess the conservation importance of each feature of interest within a 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* (IEEM, 2006). 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, 2010).

3.11 Survey Limitations

3.11.1 Trapping and Radio-Tracking

During the radio-tracking session, the weather was generally good. A Tinytag temperature datalogger was installed in Nursery Covert from 4 June until the end of the survey and surveyors also noted changes in temperature when it became particularly cold or there were significant weather events such as rain. On two nights, 8 and 9 June, a thick sea mist came in from the sea and temperatures were much lower on those nights. The 6 June survey was affected by thunder and heavy rain immediately prior to trapping which meant that only harp traps were used, although it was not possible to attach capture bags until approximately 30 minutes after sunset. On 5 June the temperature inside the woodland dropped to 8.3°C. The temperature outside the woodland was recorded by the surveyors as being as low as 4°C. This affected the success of the trapping and it was noted that the activity of tagged bats decreased during periods of lower temperatures.

The landscape of the area made joint bearings difficult to take. Much of the area is flat and there were few good vantage points from which to take bearings over the wider landscape. Although there is slightly higher ground in Nursery Covert and Goose Hill, these areas are not particularly elevated and have undulating ground. As a result the signal from tagged bats would rapidly appear and disappear as they moved under and over ridges in the woodland and surveyors frequently had to move location to be able to take bearings. A total of 31 observation points were used from which at least one bat was detected, and many more observation points were used from which no bats were detected. Care was taken not to cause a nuisance to local residents late at night and in some instances this restricted vantage points for taking bearings.

Another more unusual problem was the early loss of tags. On two occasions tagged bats were re-caught without tags and with reddened areas on their backs suggesting that bats had removed the tags by chewing/grooming. These recaptured bats were not re-tagged. Some tags remained on bats for eight nights; others were lost after two nights.

The aim of obtaining as many triangulation points as possible means that some of the tracking data may include auto-correlated fixes. If a bat was located by two surveyors able to take suitable joint bearings then the opportunity to take a series of joint bearings would be taken, including in consecutive minutes. As described in Radio-tracking and Animal Populations (Millspaugh & Marzluff, 2001), autocorrelation can result (1) when the animal has too little time to move away from the first observation point, (2) when the animal simply does not move between observations, or (3) when the animal periodically returns to a previously used portion of its range (Hansteen *et al.*, 1997). Because it was important to acquire information within the survey area when the opportunity presented itself, the method followed did not include any pre-determined time interval between successive observations, which is sometimes used to reduce the possibility of autocorrelated data. The analysis in this report uses all available triangulation points which were determined from intersecting bearings taken simultaneously. In addition, where a bat was known to be present in a given location at a given time a data point was also generated. Where a bat was closely radio-tracked, for example a bat foraging for a sustained period within a specific area, a triangulation point was generated for the approximate centre of the foraging area with a separate triangulation point generated for every ten minute interval. The trapping location of an animal, when caught in flight rather than from a roost, was also included as the focal site within the Ranges program.

3.11.2 Walked Transects

The spring of 2010 was notably cold and dry and some of the walked transect surveys were carried out in sub-optimal temperatures, although they were within the range acceptable to standard survey guidelines (BCT, 2007).

3.11.3 Static Bat Detector Survey

Some of the Anabat datalogger systems that were deployed with the intention of monitoring foraging habitats and flightlines failed to record successfully but this happened during only four out of 60 deployments. Where this problem occurred Anabats were re-deployed and parts replaced where necessary to address any problems. It is therefore considered that sufficient data were collected to inform the assessment below.

3.11.4 Emergence Surveys of Barbastelle Roosts

No significant limitations to the surveys were encountered.

3.11.5 Bat Box Surveys

During the first survey on 8 June, a box was found that contained a large number of soprano pipistrelle bats. It was impossible to lift the lid of the box without causing potentially serious disturbance to a number of bats and the decision was made to leave the box and not risk undue disturbance to what was assumed to be a maternity colony. Although a count of the colony could not be made at this time surveyors returned in July to carry out an emergence count of the colony.

3.11.6 Tree Assessment

The tree survey was undertaken during the summer, which is a sub-optimal period for survey due to the presence of leaves which can mask roost features. However, very few trees were considered to need a re-survey in the winter. In most cases sufficient detail could be seen to enable a judgement to be made as to the potential for bat roosts. Also, access to Grimseys and the adjacent wetland area in the north-eastern Belts was difficult and visibility poor due to dense under-storey in many places although most trees in these areas were accessed and assessed

successfully, with the exception of an area of inaccessible boggy ground which contained a number of large willow *Salix* sp. trees.

4. Results

4.1 Trapping and Radio-Tracking Survey

A total of 177 bats from eight species were caught during the trapping sessions. Full details of all bats caught are provided in **Table A1**[13] with a summary of the nine species caught provided in **Table 4**. Vantage points for taking bearings are shown in **Figure A1. T**he trapping and roost locations are shown in **Figure A2**.

Table 4 Summary of all bats trapped

Species	Male	Female		Not sexed[14]	Total	Percentage
		Not pregnant	Pregnant			
Soprano pipistrelle	31	1	36	1	69	39.0
Common pipistrelle	31	4	22	1	58	32.8
Natterer's bat	6	1	12	-	19	10.7
Brown long-eared bat	6	-	7	-	13	7.3
Barbastelle 1		-	8	-	9	5.1
Pipistrelle sp.	-	-	-	5	5	2.8
Serotine -		-	1	-	1	0.6
Noctule 2		-	-	-	2	1.1
Daubenton's bat	1	-	-	-	1	0.6
Totals 78		6	86	7	**177**	

Trapping commenced on 1 June at Fiscal Policy (T1), where four female barbastelle bats were caught. Two were considered so heavily pregnant that attaching a radio-transmitter may have had an adverse affect on their welfare but fur trimming was carried out to enable them to be identified if recaptured during the trapping period. On 2 June trapping continued in Nursery Covert near Turf Pits (T2) and at tree roost R1. A single female barbastelle was caught in the traps and a single female barbastelle bat was caught from R1 where bat 1 was recaptured and a further three bats escaped. On 3 June trapping took place along Upper Abbey Track (T3) and at tree roost R2. No barbastelles were caught at either location. On 4 June trapping was undertaken at The Grove (T4) and at tree roost R5. No barbastelles were caught at these

[13] Table and figure numbers preceded with a letter can be found in the relevant appendices (A, B etc.).

[14] Bats were caught while still setting up traps and were released without recording all biometric information.

locations. On 5 June trapping was carried out at Fiscal Policy for a second time (T1) but with the traps set in different locations and another female barbastelle was caught. Mist nets were also employed at gaps in hedgerows where they join to the north-west and south-west corners of Ash Wood (T5) but no barbastelles were caught. On 6 June 2010 the evening was wet with a heavy thunderstorm before sunset which meant that trapping was limited to harp traps. Traps were also set along a strong linear pathway at Broom Covert (T6) to the south of the site, and at roost R7 in The Grove but no bats were caught. During trapping on Sandy Lane (T7) and at tree roost R8 on 7 June, two previously tagged bats and a single untagged female bat were caught from the tree roost. On 8 June 2010, the final night of trapping was undertaken at Nursery Covert with the traps set at different locations from those on 2 June. A single male barbastelle was caught. In total 7 barbastelle bats were tagged and tracked. These were numbered 1 to 7 and are discussed below in detail. A summary of the bats tagged and radio-tracked is presented in **Table 5**.

Table 5 Summary information relating to tagged barbastelle bats

Bat number	Sex	Breeding condition	Forearm length (mm)	Weight (g)	Comments
1	F	Pregnant	37.8	9.5	Good ear discs*
2	F	Pregnant	39.5	9	Good ear discs
3	F	Pregnant	38.8	10	
4	F	Pregnant	41	9.5	Good ear discs
5	F	Pregnant	38.4	8.5	Good ear discs
6 F		Pregnant	39.7	9.4	
7 M		-	38	8.1	
	Averages		**39.03**	**9.1**	

* Some barbastelles have circles of skin on the outside of their ears which can be used to distinguish between individuals.

The tree and building roosts to which the barbastelles were tracked, and which of the tracked bats was using them, are shown in **Table A2**. The trapping location at which each bat was caught and which roost each bat used during each day are shown in **Table A3**. **Figure A1** illustrates the locations of the roosts described and **Figure A3** shows photographs of the roosts.

Plans for each bat tracked with triangulation points, extent of ranges and the MCP, neighbourhood linkage (clusters) and kernels are shown on **Figures A4** to **A10**.

A description of the activity of each tagged barbastelle bat and a summary of key information gathered regarding roosting and foraging locations during the radio-tracking sessions, relating specifically to the outline works area, is given below.

4.1.1 Summary of the Radio-Tracking Survey Results

Although full habitat descriptions can be found in the extended Phase 1 habitat survey report for the site (report ref: 19801cb36), a brief description of the main habitats in which barbastelle

have been detected is included below. The movements of individual bats, roosting areas and key foraging/commuting routes identified as a result of the radio-tracking are then discussed.

Habitat Description

The woodland habitats within the site are dominated by blocks of mature coniferous plantation dominated by Corsican pine which extend across Kenton Hills, Nursery Covert, Hilltop Covert and Goose Hill. Grimseys extends to the south-east of Nursery Covert and consists of an area of low lying, wet, mixed woodland dominated by ash *Fraxinus excelsior* and occasional pedunculate oak *Quercus robur* with alder *Alnus glutinosa*. Fiscal Policy, which lies to the west of Kenton Hills, supports both coniferous plantation and regenerating broad-leaved trees, the latter dominated by sycamore *Acer pseudoplatanus*. These woodland blocks are all contiguous and form a large wooded area extending in an east-west orientation.

To the south lies Sizewell Belts, a large area of species-rich lowland grazing pasture which is served by numerous water-filled ditches. The Belts extend beyond Sandy Lane to the south where there are several further blocks of woodland, including Reckham Pitt Wood which is mostly regenerating silver birch, and Rookyard Wood which is coniferous plantation. To the north of the main area of woodland is a series of large arable fields with some hedgerows, both defunct and intact, which connect with Ash Wood. Ash Wood consists of a well established block of broad-leaved woodland of mixed ash and pedunculate oak standards. Occasional Scots pine *Pinus sylvestris* and other non-native trees, including sweet chestnut *Castanea sativa*, are present especially towards the eastern end. A large number of mature pedunculate oak standards, especially those towards the western end, were found to have highly suitable roosting features for barbastelle bats, including large plates of lifted bark and deep fissures in trunks and boughs. The canopy is high and closed throughout and the under-storey is dense at the margins but otherwise quite patchy with hawthorn *Crataegus monogyna*, hazel *Corylus avellana* and holly *Ilex aquifolium*. The Grove is a thin curved belt of woodland which extends north from Goose Hill. This belt has a large number of mature pedunculate oak standards along its centre line, many of which have suffered storm damage. As a result there is a high concentration of trees with suitable roosting features. Younger, regenerating and planted oak trees and invading sycamore extend to the margins of the wood. The belt is wider at the southern end and becomes progressively narrower to the north. In the wider southern end which supports the greatest concentration of older oak standards with the greatest number of roosting features, the canopy is closed and the scrub under-storey quite patchy.

Movements of Tagged Bats

Bat 1

This pregnant female barbastelle bat was caught in a harp trap in Fiscal Policy (T1) that was erected along the small path between the car park and Leiston Carr at 21:45 on 1 June 2010. During the following day it was tracked back to a tree on the edge of Kenton Hills (R1). Attempts were made to trap bats from this tree roost on 2 June 2010 with a further pregnant female caught (bat 4). Bat 1 was recaptured and a further three bats were seen emerging from the tree. The following day bat 1 was found roosting in R3 on the northern side of Ash Wood and it used this roost area for the following two days. On 6 June it was found in roost R7 in The Grove, however, the tag was recovered having been dislodged from the bat in the roost tree. Attempts were made to catch from this tree but no bats were caught.

On the night of 4 June bat 1 was recorded in the Upper Abbey Track/Fiscal Policy area at 22:15 after roosting in Ash Wood during the day. It was recorded in this area moving up and down along the track until 22:32 when it was recorded as stationary on the southern corner of the barn at Leiston Abbey Farm, after which it flew rapidly south down a track. It was then recorded flying over the fields either side of the track. Between 01:50 and 02:11 it was recorded in the Fiscal Policy Area, although it was not possible to get a joint bearing of the bat in this area. It was then recorded to the west of the Upper Abbey Track at points 1.6 and 1.7.

On the night of 5 June it was recorded again in the Fiscal Policy area at 22:20 after roosting in Ash Wood during the day. It appeared to be using Upper Abbey Track and Fiscal Policy areas as it did on the previous evening. From 22:55 the bat was recorded foraging along field boundaries south of Lover's Lane. It was recorded flying either side of Lover's Lane and towards Leiston Abbey until 00:20. Between 01:10 and 02:20 surveyors kept track of this bat and it remained in the same general area.

On 6 June the bat was tracked back to tree roost R7 in The Grove but the tag was found to have come off the bat in the roost.

Bat 2

This pregnant female was caught in a mist net along the main track along the north of Fiscal Policy at 3:15 on 2 June 2010. During the following day it was tracked back to a tree on the edge of Leiston Carr/Kenton Hills (R1) along with bat 1.

On the night of 2 June bat 2 was tracked from 0:50 to 02:50 along the western side of Hilltop Covert and was recorded in the same area between 03:16 and 03:44.

The following day it separated from bat 1 and went to R2 further east along the same tree line as R1; bat 2 was re-caught from this roost. Only one other bat escaped being caught and no untagged bats were caught. Scratching was heard from inside the roost but no more bats came out. Bat 2 was released at 22:15 and recorded in the vicinity of The Grove at 22:43. At 23:24 it was recorded close to R2 again. It was then recorded flying around the field boundaries north of Kenton Hills and east of the Upper Abbey track.

On 4 June bat 2 joined bat 1 in roost R3 in Ash Wood. At 22:21 it was recorded in the same field area foraging north of Kenton Hills and east of the Upper Abbey track. It was recorded briefly to the west of there before returning to the field complex east of the track where it was monitored until 00:32. It was then recorded to the north-east in the vicinity of The Grove at 01:10 before moving back to the Upper Abbey track area. At 02:20 it was recorded near to Fiscal Policy on the western side of the track.

On 5 June bat 2 was again in roost R3 in Ash Wood but unfortunately the tag came off in the roost.

Bat 3

This female was caught in a mist net along the track on the north-eastern side of Nursery Covert at 21:50 on 2 June. After being released the bat was tracked between 02:50 and 03:26 along the edge of Hilltop Covert and the field boundaries and small belts of woodland extending north from Nursery Covert.

The bat was tracked the following day to the area of Grimseys Wood. The area supporting the roost tree is shown as R4, but the exact tree was not found as it was not possible to get access

into this section of wood due to the deep ditches surrounding it. The bat was then recorded in the Upper Abbey track area at around 22:30; although no joint bearings were obtained. It was not recorded for the rest of the night although surveyors covered the Lover's Lane, Sandy Lane, Ash Wood and Upper Abbey track areas.

On 4 June the bat was recorded in tree roost R5 in The Grove and unfortunately the tag had come off the bat.

Bat 4

This bat was caught from tree roost R1 on 2 June 2010. It roosted in tree roost R3 in The Grove for the following three days until the tag came off the bat on 5 June. The bat was re-caught from the tree but it was not re-tagged as there was some redness on its back which suggested that the tag had been removed by chewing/grooming.

After its release at R1 the bat was recorded heading north on the eastern side of Ash Wood. It was not recorded again that evening.

On the evening of 3 June the bat was recorded shortly after emergence time between 22:30 and 22:40, foraging to the north of Leiston Hills and towards Hilltop Covert. It was recorded as moving rapidly but joint bearings were not obtained. The surveyor near to R2 closely tracked it flying from west to east just north of the woodland. It was recorded in the same area from 01:30 until 01:50. From 03:30 no bats were recorded flying and at 03:45 Bat 4 was confirmed as static within Ash Wood. The bat moved at some point after that as it was recorded back in The Grove in R3 the following day.

On the evening of 4 June the bat was not recorded by the surveyors in the Lover's Lane area of Fiscal Policy or from the survey positions between Ash Wood and Leiston Carr, along Upper Abbey track or along the track south of Ash Cottage. It was finally recorded to the north-east of Lover's Lane at 02:30 and then north of Ash Wood at 02:40. It was recorded briefly to the west of the Eastbridge Road north of Potter's Farm and then back in the Ash Wood area at 03:00 before moving to The Grove/Goose Hill area by c.03:15.

Bat 5

This pregnant female was caught from tree roost R3 on 5 June. After its release the bat was recorded in the Fiscal Policy/Sizewell Belts area at 23:32 and again at 0:58. The bat was recorded widely around the site and was found roosting in five further tree roosts including in Hangmans New Wood in the RSPB's Minsmere reserve (R12), a tree on the edge of Abbey Road near Greenhouse Plantation (R6) in The Grove (R8) and in Ash Wood (R9 and R13).

On the occasions when the bat roosted in Ash Wood or The Grove it flew to the Sizewell Belts after emerging. When the bat was found in R6 it foraged initially in the areas of pasture and trees immediately south and west of Theberton House. The bat also roosted for a single day in Hangmans New Wood in tree roost R12. No bats were seen emerging from the tree, although Bat 5 was radio-tracked flying away from the tree.

Bats 5 and 6 were both found in tree roost R9 in Ash Wood on 9 June and an emergence count was undertaken. Bat 5 was not seen emerging but was confirmed moving within Ash Wood and then static back in the tree roost. At least eight bats were seen emerging from the tree, not including bat 5 which again managed to emerge unseen. The first bat emerged at 21.36, and the last at 21.43. At 21.55 a surveyor in Nursery Covert recorded bat 5 to the east of Nursery

Covert and then in the north-eastern part of Sizewell Belts. Similarly on 11 June, when bat 5 had roosted in Ash Wood, it was first recorded moving at 34 minutes after sunset and was recorded in a similar area of the Belts some 41 minutes after sunset. The bat remained foraging in the Sizewell Belts area until 90 minutes after sunset with the foraging area almost exclusively restricted to a sheltered area of wet woodland within Sizewell Belts to the north-east of Grimseys. After foraging in Sizewell Belts, this bat moved swiftly to the west where it was recorded foraging in the Leiston Abbey Woodland area. Occasional forays to Ash Wood and The Grove were recorded but no further time was spent foraging in the Sizewell Belts area after early evening.

Bat 5 was also recorded to the west of Abbey Road where it foraged over field systems between Hill Farm and the ruins of Leiston Abbey. Sustained periods of foraging were also recorded in the area around Greenhouse Plantation and in particular in the field systems flanking Abbey Lane.

Bat 6

This bat was caught from roost R8 in The Grove. It was also recorded roosting in woodland at Grimseys, although the exact tree roost was not found as the area of woodland could not be accessed. The bat also used roosts R9 and R13 in Ash Wood and roost R11, a dead elm *Ulmus* sp pole, in Turf Pits. Over the consecutive nights bat 6 was tracked a pattern of activity was recorded with the bat flying from its roost between 30 and 40 minutes after sunset before arriving in Sizewell Belts some ten minutes later. The bat remained foraging in the Sizewell Belts area until around 90 minutes after sunset with the foraging area almost exclusively restricted to the sheltered part of Sizewell Belts to the north-east of Grimseys. When bat 6 roosted in Grimseys, it proceeded to forage for a similar duration in this same area. It is possible that the movement of bats 5 and 6 away from the Belts area was caused by a drop in both temperature and insect abundance.

After the initial foraging period in Sizewell Belts, this bat proceeded swiftly to the west where it was recorded foraging in the Leiston Abbey Woodland area and Upper Abbey track. Occasional visits to Ash Wood and The Grove were recorded but no further time was spent foraging in the Sizewell Belts area after early evening.

Sustained periods of foraging were also recorded later in the night in field systems to the north, west and south of Old Abbey Farm and Leiston Old Abbey. The hedgerows and field systems to the south-west of Ash Wood and along Upper Abbey track were also a favoured foraging area. It was also recorded briefly further west towards Hill Farm and north of Ash Wood towards Black Walks.

Bat 7

This bat was the only male bat caught throughout the trapping period. It was caught on the last night of trapping in Turf Pits at approximately 00:30 on 9 June 2010. The bat was not found during the day of 9 June but was found during the evening foraging c2km south-west of Fiscal Policy near Buckle's Wood to the west of Leiston. It was recorded foraging along the tree belts and woodland strips alongside the arable fields in the area around Buckle's Wood and was then recorded in an apparent night roost in Wood Farm Barn. The bat was checked on through the night and found to be foraging in the same location each time a surveyor checked. The following day the bat was recorded roosting in Wood Farm Barn and that evening it did not appear to move. The owners of the barn allowed access but no bats could be seen. It was

decided that the bat had managed to dislodge the tag inside one of the barns, although it could not be found. Roost 10 was 3.1km from where the bat was trapped.

Roost Characteristics

A total of 13 barbastelle day roosts were found during the radio-tracking survey. Of these, 12 were tree roosts used by pregnant female bats, and one (roost 10) was a barn used by a single male. Three tree roosts were found in the line of oak trees orientated east-west along the northern edge of Nursery Covert and Kenton Hills, with three more in both Ash Wood and The Grove. Two female barbastelles were recorded roosting in Grimseys ("roost 4"), although the exact location/s could not be found due to lack of access into this area at the time of the survey. Another tree roost was found on the edge of Abbey Road near Greenhouse Plantation and another to the north in land belonging to the RSPB at Hangmans New Wood. Of the individual tree roosts identified, 10 were pedunculate oaks including one dead tree (Roost 6 in Greenhouse Plantation) and one was a small dead elm. In addition, one bat was recorded hanging on the outside of the large barn at Upper Abbey on one night for a brief period and it was thought on several occasions that other bats were stationary briefly in woodland near Leiston Old Abbey and within Ash Wood. These bats may have been using night roosts.

Of the 11 roosts that could be identified to a single tree, eight were behind loose/lifted or flaking bark (Roosts 1, 2, 3, 5, 6, 8, 9 and 11), one consisted of a deep fissure in a north facing, torn off limb (Roost 7), another a vertical split in the main trunk (Roost 13), and another a deep horizontal fissure in a massive, dead, east facing bough (Roost 12). Three of the 11 tree roosts were on the northern edge of woodland blocks and seven were within 30m of the edge of woodland (see **Table 6**). Roost 11 was within 20m of a large ride and Roost 6 was within 30m of Abbey Road.

Table 6 Distance of known roost trees from the nearest woodland edge

Tree roost no.	Distance from nearest edge (m)
1	0
2	0
3	0
5	c.30
6	30
7	c. 30
8	c. 23
9	13
11	c. 95 (20 to path)
12	25
13	20

With regard to the height of the roosting positions, seven were at 3-6m and four were at 6-10m from the ground. The roosts in Ash Wood and The Grove were all in high canopy woodland. The canopies in these locations were generally closed with patchy to open under-storey. At Roost 8, which is close to the ground, the shrub layer was sparse.

Barbastelles are known to move roosts regularly even during the period when their young cannot fly. Within the current study area Ash Wood is in an isolated position, while The Grove is a thin strip of woodland connected to coniferous plantation on its southern side. There are significant clusters of trees with potential for supporting barbastelles in these woodland blocks. The distances between tree roosts used by breeding female bats are given in **Table 7**. The bats at Sizewell were tracked in the pre-lactation period, and the smallest distance between roost switches was 488m (between Roosts 1 and 2) and the largest distance recorded was 2006m, between Roost 6 near Greenhouse Plantation and Roost 8 in The Grove. The average distance between roost switches was 1203m. This suggests that the population in Sizewell switch roosts on a regular basis and travel significant distances between roosts.

Table 7 Distances between roost switches

Roosts	Distance (m)
R1 - R3	1068
R1 - R2	488
R2 - R3	882
R4 - R5	1047
R3 - R6	1118
R3 - R7	983
R4 - R9	1358
R6 - R8	2006
R6 - R9	1353
R9 - R12	1893
R9 - R11	734
R12 - R13	1834
R11 - R13	876

Foraging areas and home ranges

Bats were recorded using a wide variety of habitats during the radio-tracking surveys. The areas used are summarised in **Figures A4** to **A10** which illustrate triangulation points, extent of ranges and the MCP, neighbourhood linkage (clusters) and kernels for each bat.

It is difficult to generalise about the commuting and foraging behaviour of barbastelles from this study, as they were tracked for only a short period of time during June with most bats only successfully tracked for a few hours during that period. As a result, the data collected should not

be seen to provide a definitive guide to barbastelle movement patterns on site. In summary, the following areas were used most often by bats for foraging or commuting (roost sites are not considered here):

- Fiscal Policy (bats 1, 2);
- Upper Abbey track (bats 1, 2, 6);
- Near Lover's Lane (bat 1);
- Arable fields north of Kenton Hills (bat 2, 3, 4, 6);
- Sizewell Belts (north-eastern area) (bat 5, 6);
- Greenhouse plantation/pasture west of Abbey Lane (bat 5);
- Theberton House parkland (bat 5);
- Leiston Old Abbey area (bat 6); and
- Buckle Wood west of Leiston (bat 7).

A 95% MCP analysis was carried out. **Figure A11** shows the MCPs for the breeding females, and a summary of the MCP sizes is provided in **Table A4**. The most data were recorded for Bats 1, 2, 5 and 6, while the tags came off bats 3 and 4 after only two nights. As a result the MCP areas for the latter, measuring 41.6ha and 34ha respectively, may not represent the full home ranges of these bats. The MCP of bat 1 was 160ha, of bat 5 was 388.5ha and of bat 6 was 259.3ha. The MCP of bat 2 was smaller at 75.73ha. The average MCP area for these four breeding females was 221 ha.

In comparison, the 95% kernel analysis (see **Figure A12**) recorded home range sizes of the same four bats of between 101ha and 410ha with a median of 256ha. The core area size (based on a 95% cluster analysis) ranged from 0.25ha to 172ha with the number of core areas ranging between 1 and 4 (see **Figure A13**). Whilst a number of these cluster core areas do overlap, there may be some partitioning of foraging habitat which can be seen on **Figures A8** and **A9** for bats 5 and 6 respectively. There may be an east/west partitioning of the belts area north of Grimseys where foraging occurred after sunset, and then further partitioning of habitat with bat 6 using the Leiston Old Abbey areas for sustained foraging and bat 5 found further north and west around the Eastbridge Road, Theberton House and the fields north of Leiston Abbey. In comparison, bat 1 was recorded in a more southerly location around Lover's Lane. Areas of overlap occurred around Ash Wood and the field system north of Kenton Hills and around Upper Abbey track. No non-breeding female bats were caught or tracked and therefore it is not possible to determine whether non-breeding females use different foraging areas from breeding bats.

Only one male bat was radio-tracked (bat 7) and this bat flew out of the main survey area after being released and was not recorded back in the main survey area during the period the tag stayed on the bat. Once the bat had been found, the general area was checked by single surveyors to verify that the bat was still present in that area. Unfortunately the tag was lost from the bat too soon to allow enough joint bearings to be taken for a home range analysis to be run.

The furthest distances recorded from a roost tree to a triangulation point were 2.4km for bat 1 (R7 to point 1.31 in field systems south of Lover's Lane on 5-6 June), 1.3km for bat 2 (R3 to

point 2.20 at Fiscal Policy on 4 to 5 June), 2.8km for bat 5 (R8 to point 5.47 in field system near Hill Farm on 7 to 8 June) and 2.6km for bat 6 (R4 to point 6.23 in field system near Hill Farm on 8 June 2010.

4.2 Walked Transects

4.2.1 Survey Effort

Details of transect surveys are included in **Table 8** and a map of all walked transect survey routes is presented in **Figure B1.** A map of each transect route is included in **Figures B2-12**.

Table 8 Details of walked transect surveys in 2010. Wind strength is given in the Beaufort scale and wind direction is abbreviated to an eight point compass (e.g. NE = north-east).

Date	Sunset	Start	Finish	Surveyors*	Weather conditions
14/04	19:50	20:20	22:20	MH+VA	11-8°C, NE 1, 10% cloud, dry
04/05	20:24	20:16	22:37	MH+VA	8-4°C, NE 3, 0% cloud, dry and cold
18/05	20:47	20:45	23:20	MH+VA	12-8°C, 0 wind, 10% cloud, dry
02/06	21:06	21:13	23:41	MH+VA	10-9°C, 0 wind, 0% cloud, dry
15/06	21:17	22:35*	00:40	MH+VA	12°C, NE 4-5, 20% cloud, dry
07/07	21:15	21:25	23:40	MH+VA	20°C, 0 wind, 70% cloud, dry
20/07	21:02	21:10	00:14	VA+OG	21-18°C, 0 wind, 80% cloud, dry
02/08	20:43	20:44	23:05	MH+SB	14-13°C, SW 1, 10% cloud, dry after thunderstorm
18/08	20:12	20:12	22:40	MH+VA	18-16°C, W 1-2, 70-10% cloud, some light rain
02/09	19:39	20:00	22:12	VA+AG	14°C, W 1, 30% cloud, dry
16/09	19:07	19:07	21:42	MH+HW	11-10°C, NW 3-4, 50% cloud, dry

* An emergence watch on Roosts 3, 9 and 13 was undertaken for the first hour after sunset.

4.2.2 Relative Activity of Bats

In total 1,147 bat passes of at least nine species of bats were recorded during walked transect surveys in 2010, although it is very likely that ten were recorded with Daubenton's bats seen foraging over the Sizewell Belts in addition to probable Natterer's bats recorded in most areas of woodland. Both of these species were caught during trapping surveys. Across the survey season, soprano pipistrelle was the most frequently encountered species on walked transects with 17.4 B/h and 40% of all passes recorded as this species (n = 459). The common pipistrelle was the second most numerous with 15.3 B/h and common/soprano pipistrelle the third with 4.4 B/h. Relative activity of less than 1 B/h was recorded for all other species or grouped species categories with the exception of *Myotis* sp. for which 3.6 B/h was recorded. **Table 9** summarises the relative activity level recorded during walked transects for all species or grouped species categories. Full details of the number of passes and species recorded during each transect survey are included in **Table B1**.

Table 9 Relative bat activity recorded during walked transects.

Species	Total passes	B/h	% of total
Soprano pipistrelle	459	17.4	40
Common pipistrelle	403	15.3	35.1
Common/soprano pipistrelle	117	4.4	10.2
Myotis species	96	3.6	8.4
Noctule	16	0.6	1.4
Serotine	14	0.5	1.2
Barbastelle	12	0.5	1
Leisler's bat	9	0.3	0.8
Common/ Nathusius' pipistrelle	6	0.2	0.5
Leisler's bat / serotine	3	0.1	0.3
Nathusius' pipistrelle	1	<0.1	0.1
Nyctalus species	1	<0.1	0.1

General bat activity levels varied between months, with a minimum of 5.2 B/h (4 May) and a maximum of 104.6 B/h (2 June). The overall relative activity level for transect surveys was 43.5 B/h. Fluctuations between surveys are normal, being influenced by short-term variations in weather conditions and prey availability and seasonal variations such as the increase in general abundance due to the presence of juvenile bats in the late summer. The spring of 2010 (particularly April/May) on the Suffolk coast was very dry with a prevailing cold easterly airflow and corresponding low temperatures during mid-April to mid-June. As a result, activity levels were noticeably low for the first three surveys.

4.2.3 Spatial Distribution of Bats

The spatial distribution of all bat records, with the exception of common and soprano pipistrelle bats, is illustrated in **Figure B13**. Records of these two species are particularly numerous and they are found in most areas of the site. For a detailed analysis of the spatial distribution of these two species from static detector recordings please see Section 4.3.

Barbastelle

Barbastelle were recorded on five of the 11 walked transects in 2010. They were recorded on the dates and at the locations which follow:

14 April – a single pass at Turf Pits.

7 July – two separate passes along the track at the north edge of Kenton Hills.

2 August – two separate passes at the north end of Fiscal Policy and on Upper Abbey track.

18 August – two passes one minute apart on the track east of the crossroads in Goose Hill.

16 September – three consecutive passes in a pasture field north of Leiston Old Abbey, one pass from Upper Abbey track and one from a hedge to the south-west of Ash Wood.

All but one of these passes was recorded within an hour of sunset with the earliest 34 minutes after sunset.

Other Species

Most noctule passes were recorded during the final transect of the season (16th September) when a single bat flew from the arable area north of Fiscal Policy south over the woodland and a further two bats (at least) were seen foraging over the standard trees within the pasture field adjacent to the woodland at Leiston Old Abbey. All of these records were within 15-25 minutes of sunset and are likely to have involved bats roosting within or close to the Sizewell Estate. Another four passes were recorded during transects in the eastern half of the site, at Turf Pits, in Goose Hill, Stonewall Belt and the northern edge of the wooded area of the Belts.

Leisler's bat was recorded on three dates; 18 May (Kenton Hills), 7 July (Goose Hill) and 2 August (just north of Goose Hill) as was serotine with records on 7 July (Nursery Covert and Goose Hill), 2 August (east side of Ash Wood) and 18 August (several passes around the perimeter of Kenton Hills). Both species were recorded foraging together along the main east-west ride in Goose Hill on 7 July when several large bats were present.

There was a scatter of five records of brown long-eared bat with a single pass along Upper Abbey track, two in Goose Hill and two in the northern arable areas. This species is often difficult to detect and is likely to be more abundant than the lack of records suggest given the presence of known roosts at Upper Abbey Barn and Ash Cottage.

Common and soprano pipistrelle bats were recorded on every survey and occurred in most of the survey area. Nathusius' pipistrelle was recorded once, with a single pass recorded on the northern edge of Sizewell Belts on 18th August.

A total of 96 passes of *Myotis* bats were recorded with a wide scatter of records. Of particular interest was the observation of 20-25 *Myotis* bats flying east along the northern edge of Fiscal Policy between 22:05 and 22:20 (50-65 minutes after sunset) on 7th July. It is thought likely that these bats had all recently emerged from woodland nearby, possibly in Fiscal Policy, although the exact area could not be found due to the poor light and difficulty in attempting to track the flight-path of the bats back to their roost. Another large *Myotis* roost was suspected in The Grove from both walked transect survey records as well as emergence watches in The Grove and static detector deployments. Large numbers of passes have been recorded on several occasions at around 40-60 minutes after sunset, which is the typical emergence time for *Myotis* bats.

It is also worth noting that several visual observations were made of Daubenton's bats feeding low over the wide ditches in the northern Sizewell Belts on 15 June. These bats could be identified by their distinctive horizontal and low-level foraging flights over water.

4.3 Static Bat Detector Survey

4.3.1 Survey Effort

Six Anabat detectors were used continuously on site from 14 April to 14 September, with a total of 10 deployments (of six detectors) completed over ten discrete time periods of 2-3 weeks. Anabats did not record during four of these deployments, leaving 56 successful deployments.

Static bat detectors were operating for a total of 839 detector nights, equating to 7,281 hours (sunset-sunrise each night) throughout the survey season. After three nights were selected for analysis for all bat species, this total was reduced to 1,462 hours of survey time. **Figure C2** shows the locations of all static bat detectors. **Table C1** gives details of static bat detector deployment dates and locations with relative activity rates (B/h) for all bats and the minimum number of species recorded at each location shown in **Table C2**. **Table 10** shows the number of successful detector deployments in each area and in each season.

Table 10 Number of successful detector deployments by survey area (1-6) and period

		Number of detectors	
Area name	**Area no.**	**Period 1 'spring' 14 April - 6 July**	**Period 2 'summer' 7 July – 14 September**
Farmland	1	6	9
Goose Hill and The Grove	2	7	7
Kenton Hills/ Nursery Covert/Fiscal Policy	3	4	4
Sizewell Belts north	4	4	3
Preliminary works area	5	3	2
Sizewell Belts south	6	2	4

4.3.2 Relative Activity and Spatial Distribution of all Bats (not including Barbastelle)

In total 65,310 bat passes (not including barbastelle) of nine species were recorded at an average rate of 44.7 B/h. The same species recorded during walked transects were recorded during static surveys. The relative activity of all bats (not including barbastelle) at each static detector survey location is illustrated in **Figure C3** with **Figures C4 and C5** showing the relative activity at survey locations in spring and summer respectively.

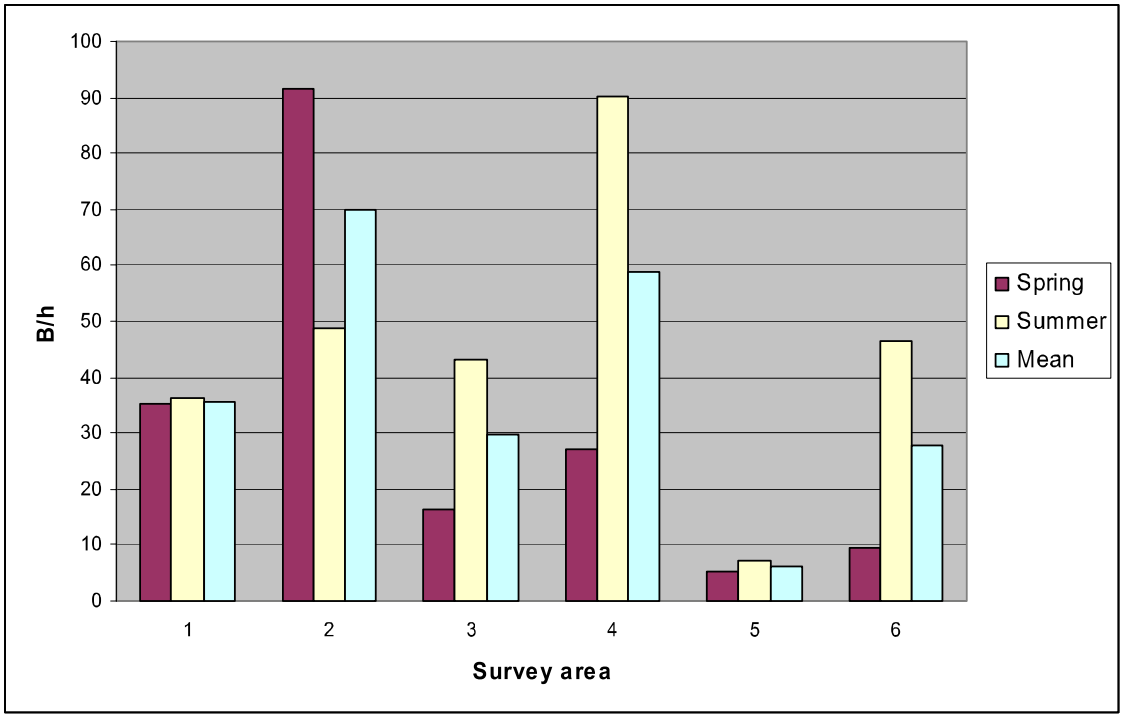
Table 11 summarises the relative activity level recorded during static detector surveys for all species or grouped species categories. The relative activity level and spatial distribution of each species or species group are described in turn below.

Table 11 Relative activity level recorded during static bat detector survey (not including barbastelle)

Species	Total passes	B/h	% of total
Soprano pipistrelle	35,606	24.4	54.5
Common pipistrelle	20,099	13.8	30.8
Common/soprano pipistrelle	3591	2.5	5.5
Nathusius' pipistrelle	2538	1.7	3.9
Myotis species	1230	0.8	1.9
Leisler's bat	979	0.7	1.5
Noctule	477	0.3	0.7
Serotine	447	0.3	0.7
Brown long-eared bat	147	0.1	0.2
Nyctalus species	111	<0.1	0.2
Common/ Nathusius' pipistrelle	32	<0.1	<0.1
Plecotus/Eptesicus	29	<0.1	<0.1
Nyctalus/Eptesicus	22	<0.1	<0.1
Myotis/Plecotus	2	<0.1	<0.1
Total	**65,310**	**44.7**	**100**

All detectors that were deployed recorded bats. There was variation in bat activity recorded between different areas and in different seasons as is shown in **Figure 1**. There was no increase in bat activity from the spring (43.6 B/h) to the summer (46.5 B/h), although if two detectors from the spring with far higher activity levels than any others (P1_1f and P1_3f, see below) were removed from the analysis the spring total would fall significantly. These two detectors are responsible for the apparent anomalies in the spring total, activity level being higher than that in summer for Areas 1 and 2. Across areas, the highest activity level was recorded from Area 2 (Goose Hill and The Grove) with 73.2 B/h, although this would decrease significantly if detector P1_1f was removed from the analysis. Activity levels from Area 4 (Sizewell Belts north) were also high (57.5 B/h) with a very high summer peak of 93.2 B/h. Activity from this part of the Belts was noticeably higher than from the southern area (Area 6) where an average relative activity of 38.6 B/h was recorded, with a similar increase from spring (10.5 B/h) to summer (38.6 B/h) as the northern Area 4. By far the lowest activity levels were recorded from the preliminary works area (Area 5) with just 7.4 B/h over both periods.

Figure 1 Relative activity of all bats (not including barbastelle) by survey area (1-6) and period.



The highest activity levels came from six detectors that each recorded more than 80 B/h as follows:

1. P1_1f (543.7 B/h) - located on the northern edge of The Grove facing the grazing marshes of Minsmere in April. Very high activity levels were recorded from all three species of pipistrelle bats, and there was also significant noctule activity.
2. P2_5b (153.37 B/h) - located in the northern part of Sizewell Belts in September. The large majority of passes were from pipistrelle bats, principally soprano pipistrelles.
3. P1_3f (111.6 B/h) – located on a small lane at the northern end of Upper Abbey track in May/June. The large majority of passes were from pipistrelle bats, principally common pipistrelles.
4. P2_3a (120.7 B/h) – located on Upper Abbey track in August. High levels of activity were recorded from pipistrelle bats, principally soprano pipistrelle. Comparatively high activity levels were also recorded from serotine and *Myotis* bats and, to a lesser extent, barbastelle.
5. P2_5e (86.9 B/h) – located in the north-eastern corner of the Belts in September. High levels of activity were recorded from all three pipistrelle species, principally soprano pipistrelles.
6. P2_5a (88.6 B/h) – located in the south-western part of the Belts in September. The majority of all records came from soprano pipistrelles.

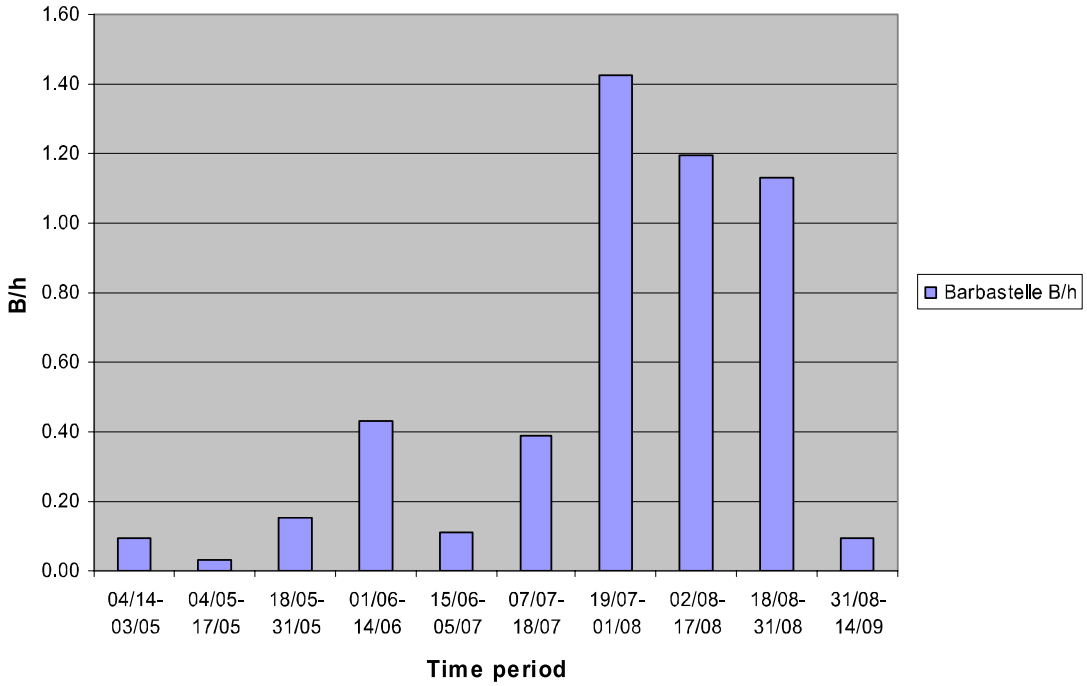
4.3.3 Relative Activity and Spatial Distribution of Barbastelle.

The relative activity of barbastelle at each static detector survey location is illustrated in **Figure C6** with **Figures C7-8** showing the relative activity at survey locations in spring and summer respectively.

In total 3,667 barbastelle passes were recorded at an average rate of 0.5 B/h. Barbastelle bats were recorded from 53 of the 56 static detector locations with detectors 1c, 2c and 3e (all in spring) recording no barbastelles. All detectors recorded barbastelles during the summer period. In general much higher activity rates were recorded during the summer (0.84 B/h than the spring (0.16 B/h) and there was clearly an increase in activity on the site after early July. This coincides with the time when the young are likely to be born and also coincided with a dramatic increase in insect abundance, noticed by surveyors following a sustained period of warm weather from around 20 June into early July. An increase in night-time temperatures was also noted at this time, which will have favoured the survival of young bats. One element which may also have contributed to the increase in bat activity could have been the arrival of new adult bats due to the increase in insect abundance. **Figure 2** shows how barbastelle activity seems to have increased during the latter half of the survey period. The figure shows an upward trend although it should be taken into account that detectors were moved between different areas in different time periods and that any trend is indicative rather than statistically significant.

An analysis of barbastelle activity within the different survey areas identified in Section 3.2.2 (see **Figure C1**) shows that there are differences between the six areas in terms of activity recorded (although as noted above, the recorders were in different places so these may to some extent have reflected differences between nearby locations). **Figure 3** shows that the highest activity levels were recorded in Areas 1-3, namely the Farmland (mean 0.8 B/h), Goose Hill and The Grove (mean 0.5 B/h) and Kenton Hills/Nursery Covert/ Fiscal Policy (0.7 B/h) with the lowest activity levels recorded in the Sizewell Belts north (0.14 B/h), south (0.07 B/h) and the preliminary works area (0.06 B/h). Higher summer activity levels were recorded in all areas, although there was very little difference between spring and summer in Area 3. This may suggest that during the cold spring, the sheltered woodland in this area provided an important foraging resource. Goose Hill on the other hand is more open, at higher elevation and quite exposed to the prevailing (and cold) north-easterly winds that were prevalent in spring 2010.

Figure 2 Barbastelle relative activity in relation to deployment period.



The nocturnal activity of barbastelle also showed quite strong patterns with bats typically being recorded first by detectors at around 40 minutes after sunset, although this fell to around 30 minutes later in the season as the evening twilight period shortened. An overall peak in activity was recorded between 30 and 60 minutes after sunset with a decline towards the middle of the night and then a second peak between 100 and 60 minutes before sunrise with very few records after 30 minutes before sunrise (see **Figure 4**). This is a typical activity pattern for most bat species with many bats using night roosts during the middle period of the night and having two clear activity (foraging) peaks at the beginning and end of the nocturnal cycle. During spring, this difference was exaggerated with very little foraging in the middle of night due to cold night temperatures. **Figure C9** shows both the static bat detector locations where barbastelle feeding calls were recorded and also the locations where peaks in activity close to sunset or sunrise were recorded. The former may indicate foraging areas and the latter may suggest that barbastelles were commuting past these detectors on their way to or from a roost. Although relatively few feeding calls were recorded overall, barbastelle feeding calls are particularly quiet and difficult to detect and this should not be taken as indicating a lack of foraging activity on the site.

Figure 3 **Relative activity of barbastelle by survey area (1-6) and period**

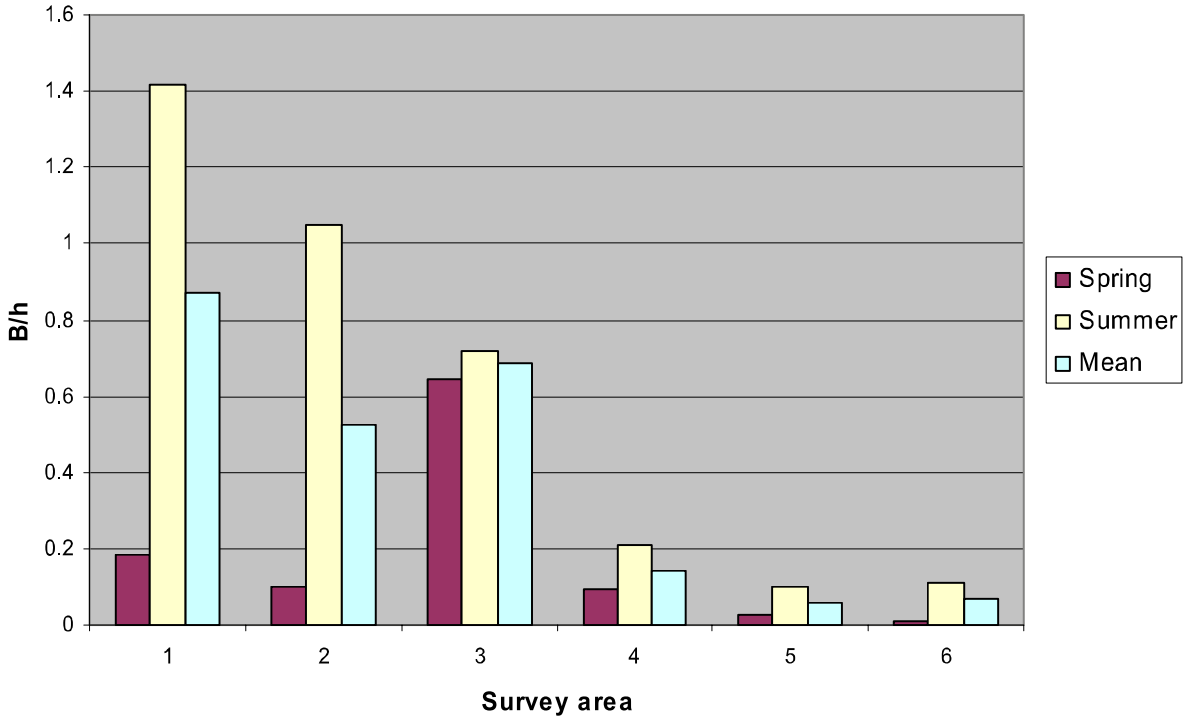
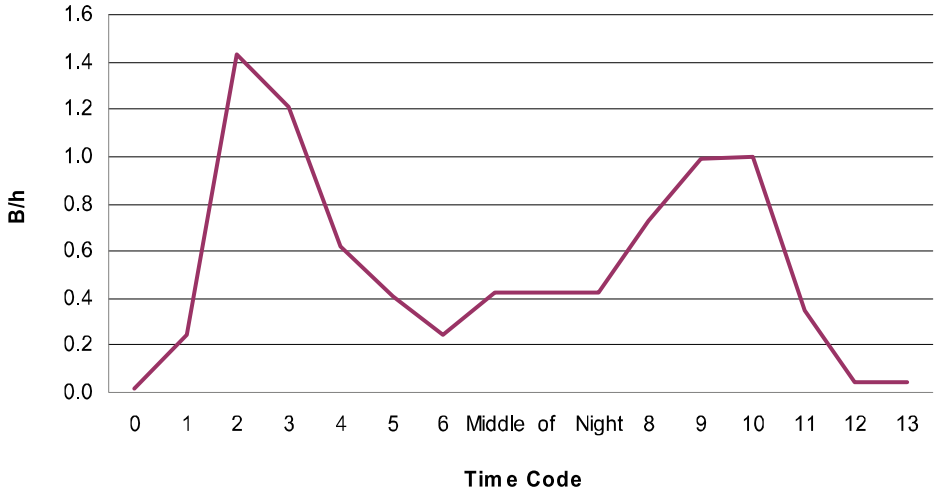


Figure 4 **Barbastelle relative activity patterns in relation to sunset and sunrise. For an explanation of time codes please see Section 3.3.1. The 'Middle of Night' label on the X-axis = Time Code 7**



Area 1 - Farmland

Although the highest levels of barbastelle activity were recorded in Area 1 (farmland) this does not mean that arable land is necessarily a key habitat for barbastelles within the site. Area 1 contains Ash Wood, which is probably one of the most important maternity roost areas. Several of the features at which the highest levels of barbastelle activity were recorded are connected to the wood and are likely to provide commuting routes and foraging areas for bats dispersing from and returning to the wood. For example, by far the highest level of activity (4.7 B/h) of any feature in the survey area was recorded along the defunct hawthorn hedge at Black Walks in the last two weeks of August. This is likely to be a movement corridor for dispersal to the north from Ash Wood, although feeding buzzes from foraging bats were recorded here and the peak of activity was in the middle of the night rather than at commuting times close to sunset and sunrise with 81% of all calls (n = 537) during the middle of the night (TC 7). Similarly, at the hedgerows leading west and east from the north end of Ash Wood, most activity was during the middle of the night and they were not apparently used as major commuting routes. However, high levels of activity were also recorded from along Stonewall Belt (July, 2.6 B/h), much of which was at commuting times. Bats are likely to commute along this feature to reach Goose Hill from Ash Wood. Another strong commuting feature which is used by barbastelle is Upper Abbey track (August, 1.19 B/h) although from the detector positioned along here in August most activity was from bats returning to roosts, possibly in Ash Wood (TC 10-11 = 6.3 B/h). In addition, the detector in the pasture field adjacent to Leiston Old Abbey recorded high levels of activity and this field seems to be of general importance to barbastelle (2.7 B/h). High levels of activity were recorded here close to both sunset and sunrise and this area may be of importance to commuting and/or foraging barbastelle (TC 2-3 = 8.7B/h; TC 9-10 = 10.5 B/h).

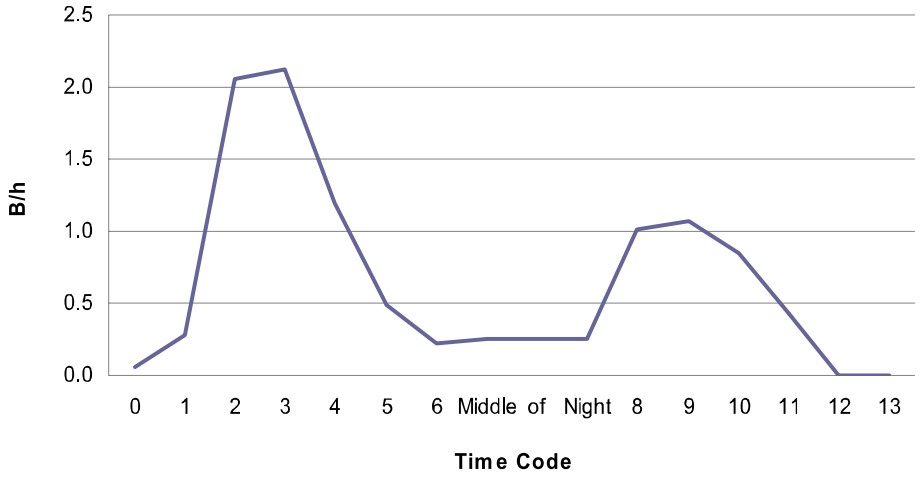
In contrast, the large block of arable land to the south of Ash Wood, east of Upper Abbey track and west of Stonewall Belt where several radio-tracked females were recorded, seems to be of lesser importance with few passes recorded from the four detectors located in this area. However, it is possible that barbastelles are not moving along linear features in these open areas and that detectors placed on pinch points in hedges did not record them very often. However, it is also possible that bats foraging in these open areas were more easily located by radio-tracking surveyors, leading to an upward bias in joint bearings from arable areas.

Area 2 – Goose Hill and The Grove

Barbastelle relative activity was fairly high in Area 2 with a mean of 0.5 B/h over the survey season. It was, however, significantly higher in the summer (1.1 B/h) than the spring (0.1 B/h) and this may be related to a number of factors including: prey availability, the cold spring with prevailing north-east winds, or that the detectors were located in sub-optimal habitat in the spring. The latter explanation seems unlikely, however, as the habitat is reasonably uniform within Goose Hill and barbastelles clearly use most areas. The areas of highest activity in the summer were scattered over most of Goose Hill with the four highest (all in July) at the main junction in the centre (3 B/h), the re-planted triangle in the east (1.5 B/h), the clearing to the north of Turf Pits (1.4 B/h) and the north-east edge (1.3 B/h). It is clear, from the variability in counts of barbastelle passes between nights on most detectors, that bats use all of the rides between the woodland blocks for commuting or foraging and that bats were not using the same routes every night. Most of these detectors recorded clear commuting behaviour with lower levels of activity recorded during the middle of the night. The highest level of potential commuting activity was recorded at the main junction (TC 2-3 = 7 B/h; TC 9-11 = 7.4 B/h) and Turf Pits (TC 2-3 = 10.2 B/h). See **Figure 5** and **Figure C9** for more details of nocturnal behaviour patterns.

Of the two static detectors located in The Grove, both were positioned to try to find commuting routes to the north. The first at a hedgerow pinch-point (like Black Walks), which seemed well suited to recording barbastelles moving between Minsmere and Sizewell, only recorded two barbastelles and the second, in a narrow part of the woodland, recorded none. This indicates that potentially bats from the roosts in The Grove are not moving directly north from roosting areas or that they are using an undiscovered route.

Figure 5 Barbastelle relative activity patterns in relation to sunset and sunrise in Area 2.



Area 3 – Kenton Hills/ Nursery Covert/ Fiscal Policy

Most of Area 3 was regularly used by barbastelles in the deployment periods and all detectors recorded this species. Activity levels in the spring were not significantly higher than in the summer as they were in most other areas of the site. The highest activity levels were recorded along the ride which runs east-west along the northern edge, where three roost trees have been located, at Fiscal Policy (August, 1.42 B/h), Nursery Covert (June, 1.1 B/h) and also on the perimeter ride near Grimseys (August, 1.54 B/h) where just two weeks later only 0.19 B/h were recorded. The ride around the perimeter and the broad-leaved woodland at Fiscal Policy seem to be the most frequently used part of the woodland here. However, reasonably high levels of barbastelle activity were also recorded from the rides which bisect the plantations. A similar nocturnal pattern of activity was seen in Area 3 and Area 2, with a strong peak in the first two hours after sunset and a smaller peak in the last two hours before sunrise.

The highest activity levels for commuting bats were recorded in the evening commuting period along the footpath through Fiscal Policy (TC 2-3; 7.1 B/h) and on the track just to the north (TC 2-3; 11.8 B/h).

Area 4 – Sizewell Belts North

Despite evidence from the radio-tracking study of bats 4 and 5 bats regularly using the northern Belts as a primary foraging location in June, the static detectors recorded low (but consistent) numbers of passes through the season, with the exception of a single detector, in damp birch

woodland in the north-eastern part (July, 0.62 B/h). It is possible that the detectors may not have picked up a large number of passes when bats were foraging in open areas as the detectors were always located on edge habitats. Unlike in the woodland habitats, foraging activity over the marshes of the Belts may not be concentrated along edge habitats like rides, where it is easy to detect passing bats flying close to detectors.

When the data were examined for nocturnal activity patterns, a similar early peak of activity was evident as was found during the radio-tracking study, with 61% of passes (n = 83; 2 B/h) between 40 and 80 minutes after sunset. The relative activity rate rose during this time period in summer to 3.6 B/h. The northern Belts appears to be an important primary foraging area for small numbers of barbastelle, presumably while insects are still active in the early part of the evening.

Area 5 – Preliminary Works Area

Although bats, including barbastelles, have been recorded in this area in previous years, it is clearly of much lower value to bats than most other areas of the site. The results from five static detector deployments, three in May, one in July and one in August, confirmed these impressions. A total of 33 barbastelle passes were recorded with the majority of these from one detector located on the southern edge of the works site in late August (0.14 B/h). Most passes were from the middle part of the night.

Area 6 – Sizewell Belts South

Activity levels in Area 6 were also low with a mean of 0.07 B/h which is very similar to Area 5 and notably lower than the northern Belts, which are more sheltered and closer to known roost areas than the southern Belts. The highest activity level was recorded along the northern edge in September (0.24 B/h).

4.3.4 Relative Activity and Spatial Distribution of *Myotis* Bats

The relative activity of *Myotis* bats at each static detector survey location is illustrated in **Figure C10** with **Figures C11-12** showing the relative activity at survey locations in spring and summer respectively.

In total 1,228 *Myotis* passes were recorded at an average rate of 0.8 B/h. *Myotis* bats were recorded from 52 of the 56 static locations with all detectors recording them during the summer period. In contrast to most other species, higher activity rates were recorded in the spring (1.1 B/h) than the summer (0.6 B/h) and this was largely due to a very high number of passes recorded by a detector along a wide ditch in the northern Belts (P1_2a).

An analysis of *Myotis* activity within the different survey areas shows that there are some differences between the six areas in terms of activity recorded. Similar activity levels were recorded in Areas 1-3 and 6, with 0.4-0.6 B/h recorded in all. The activity level in Area 4 (northern Belts) was much higher (3.0 B/h) although this is likely to be due to over 400 passes of (presumably) Daubenton's bats foraging over a wide ditch on 16-17 May. The lowest activity rate (0.2 B/h) was recorded in the preliminary works area. Two other detectors recorded higher activity levels for *Myotis* bats with, notably, P1_3e in The Grove in June (3.4 B/h) and P2_3a along Upper Abbey track in August (4.2 B/h). Both of these locations are thought to be close to roosts of Natterer's bats, with a confirmed maternity colony in Upper Abbey Barn and a roost suspected in The Grove, where a number of this species were caught

during trapping surveys. *Myotis* bats are clearly widely distributed over the survey area and are present throughout the active period.

The nocturnal activity of *Myotis* bats shows a similar pattern to that of barbastelle, with bats typically being recorded first by detectors at around 40 minutes after sunset, with a peak around 60 minutes after sunset and a smaller secondary peak around 60 minutes before sunrise.

4.3.5 Relative Activity and Spatial Distribution of *Nyctalus* Species (Noctule and Leisler's Bats)

This section will cover both species of *Nyctalus* bat present on site and also any bat calls which belonged to either species but could not be identified to species level. The relative activity of noctule and Leisler's bat at each static detector survey location are illustrated in **Figures C13** and **C16** respectively with **Figures C14-15** and **C17-18** showing the relative activity at survey locations in spring and summer respectively.

In total 477 noctule passes were recorded at an average rate of 0.33 B/h, with 979 Leisler's passes (0.67 B/h) and a further 111 *Nyctalus* sp. passes recorded (0.08 B/h). Noctules were recorded from 38 static detector deployments: 19 in spring and 19 in summer. Leisler's bats were only recorded from 19 deployments; 6 in spring and 13 in summer. Unidentified *Nyctalus* bats were recorded from 20 deployments, and four of those did not record either noctule or Leisler's bat. In total, *Nyctalus* species were recorded from 49 detector deployments. Higher activity rates were recorded for noctule in the spring (0.41 B/h) than the summer (0.26 B/h) in contrast to Leisler's bat with higher activity rates in the summer (1.1 B/h) than in the spring (0.09 B/h). However much of this trend can be attributed to a single detector in the north-east corner of Goose Hill where 59% of all calls were recorded (n = 576).

An analysis of *Nyctalus* activity within the different survey areas shows that there are distinct differences in the spatial distribution of records for both species (see **Figures 6** and **7**). For noctule, the highest activity levels were recorded in the Belts and particularly in the southern Belts (Area 6 = 1.3 B/h), with similar levels of activity in the northern Belts (0.45 B/h) and Goose Hill and The Grove (0.33 B/h). Levels in other areas of the site were similar except for Area 3 where very low levels of activity was recorded (0.03 B/h), presumably because of the lack of open habitats where noctules prefer to feed. Three detectors recorded higher levels of activity than others: P1_1d in the southern Belts in April recorded 2.8 B/h, principally during the period 1-2 hours after sunset; P1_1f at the grazing marsh edge of The Grove in April recorded 2.5 B/h with most activity between 0 and 60 minutes after sunset; and P2_5c in the eastern part of the southern Belts recorded 2.7 B/h with activity spread through the night and a peak 0-20 minutes after sunset. All three detectors were located adjacent to SSSI grazing marsh habitats. The early arrival of noctules in The Grove and southern Belts may suggest the possibility of a roost nearby. The two noctules caught in The Grove during trapping were both males, as was a single bat found in a bat box in Kenton Hills (see Section 3.5). The activity rates for noctule are low, especially given the detectability of this species due to their far-carrying calls, and there is currently no evidence that the Sizewell Estate supports any large roosts of this species.

Leisler's bat showed different habitat preferences from noctule with highest activity levels recorded in Areas 1 (Farmland) and 2 (Goose Hill and The Grove). Only five detectors recorded more than 1 B/h for this species. Of these three were in Goose Hill between June and August, one was on the edge of Goose Hill at Stonewall Belts in July and the other was near Leiston Old Abbey in August. Most activity at all detectors was in the early and middle part of

the night with very few bats recorded in the two hours before sunrise. Most early bats were recorded 20-40 minutes after sunset. The relatively low activity rates and lack of very early records suggests that the Sizewell Estate does not support any large roosts of this species.

Figure 6 Relative activity of noctule by survey area (1-6) and period

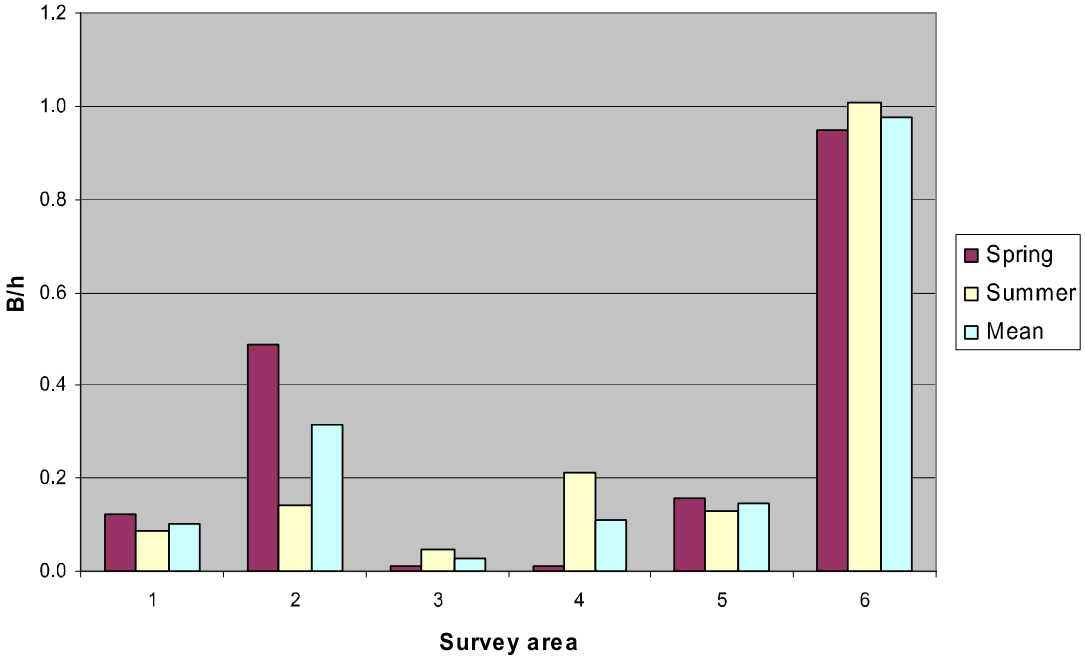
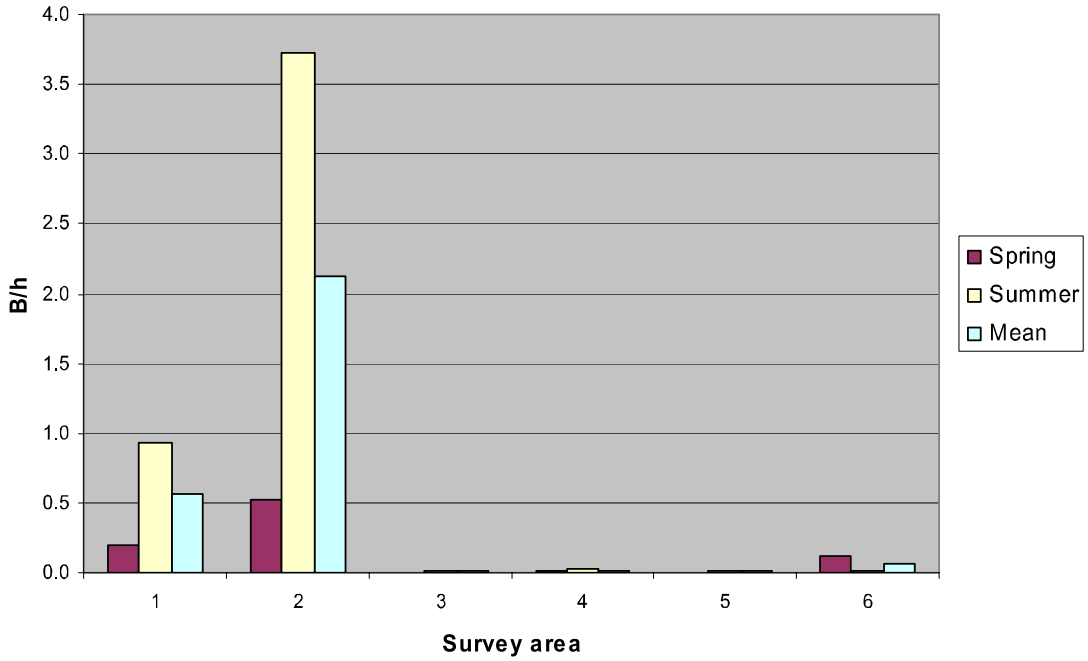


Figure 7 Relative activity of Leisler's bat by survey area (1-6) and period



4.3.6 Relative Activity and Spatial Distribution of Pipistrelle Bats

This section will cover all three species of pipistrelle (common, soprano, Nathusius') bat present on site and also any bat calls which belonged to one or other species but could not be identified for certain (see Section 3.5 for identification parameters used). The relative activity of common, soprano and Nathusius' pipistrelle at each static detector survey location are illustrated in **Figures C19**, **C22** and **C25** respectively with **Figures C20-21**, **C23-24**, and **C26-27** showing the relative activity at survey locations in spring and summer respectively.

In total 20,099 common pipistrelle passes were recorded (13.8 B/h), with 35,606 soprano pipistrelle (24.4 B/h), 2,538 Nathusius' pipistrelle passes (1.7B/h) and a total of 3,623 unidentified passes (2.6 B/h) with 99% of these recorded as either common or soprano pipistrelle. Common and soprano pipistrelle bats were recorded from all detectors in all seasons. Nathusius' pipistrelle was recorded from 18 detectors in the spring and 14 in the summer. Higher activity rates were recorded for common pipistrelle in the spring (17.4 B/h) than the summer (11.1 B/h) in contrast to soprano pipistrelle bat with higher activity rates in the summer (27.7 B/h) than in the spring (10.5 B/h). Much of this trend for common pipistrelle can be attributed to two detectors at the north end of The Grove and the north end of Upper Abbey track which recorded far higher activity rates than any others in the summer.

Nathusius' pipistrelle shows a different seasonal activity pattern from those of the more common pipistrelle species. During April and May, records of this species were quite widespread with a total of 15 of 18 detector deployments recording them. During June and July 6 of 20 deployments recorded them and during August and September, 11 of 17 deployments with all six in September recording this species. This species was recorded from all but one detector deployed in the Sizewell Belts and 92% of passes recorded in June and July came from this area. The seasonal pattern suggests that Nathusius' pipistrelle is common and widespread

during April and May and in August and September (particularly the latter month), with highest levels of activity coming from grazing marsh areas (see below). However, activity in June to July is reduced and largely confined to the Belts, particularly the northern Belts.

An analysis of pipistrelle activity within the different survey areas shows that there are distinct differences in the spatial distribution of records for all species although there are overlaps between them (see **Figures 8-10**). For common pipistrelle the highest activity levels were recorded in the spring in Areas 1 and 2 but overall activity levels in Areas 1-4 were reasonably high throughout spring and summer with reduced levels of activity in Areas 5 and 6. For soprano pipistrelle, the highest levels of activity were recorded in grazing marsh areas, in Areas 4 and 6 and also along the northern edge of The Grove during the summer (P1_1f). In general, excepting P1_1f where exceptionally high levels of activity were recorded for all pipistrelle species, soprano pipistrelle activity rose significantly during the summer and this is likely to be due to the presence of juvenile bats. There is at least one maternity colony of soprano pipistrelle, numbering around 70 adult bats in the bat boxes in Kenton Hills and it is likely there are more in other building and tree roosts within the site. The Sizewell Belts areas are therefore presumably important foraging grounds for large numbers of young bats. Nathusius' pipistrelle was also recorded most frequently in grazing marsh areas in Areas 2 and 4, although there were scattered records in most areas except for Area 3 where very low levels were recorded. Almost all records of this species came from open areas rather than woodland rides, which included a number of records in spring from Area 5.

From the seasonal distribution of records it is likely that this species is migrating through Sizewell in the spring and autumn and presumably crossing the North Sea to do so (Russ *et al.*, 2001). Of particular interest was a marked increase in Nathusius' pipistrelle activity on the morning of 7 September. Although a few passes were recorded in the preceding nights, 4 of the six detectors, all but one of which were in the Belts, recorded bats after 03:30 in the morning and then feeding until sunrise. The other two detectors recorded their first Nathusius' pipistrelles of the recording period on the evening of the 7th. This could indicate that a number of bats may have arrived over the North Sea almost simultaneously on the morning of the 7th. It is also notable that overnight there was a large arrival of migrant birds over the North Sea on the east coast with hundreds of migrant passerines (warblers, chats etc.) recorded nearby at Minsmere as well as many other locations on the North Sea coast of England. It seems possible that bats may have been using similar weather conditions to nocturnally migrating birds (light following winds and fair weather) to cross the North Sea from Scandinavia to be grounded on the coast by inclement weather.

In addition, it is also likely that there are one or more summer roosts of this species in the Sizewell area, based on the consistent activity over the Belts during the summer. There are numerous roosting opportunities available for this species on the Estate and a total of 17 passes recorded before sunset or 0-20 minutes after sunset which may suggest that this species is likely to be roosting on or close to the site. However, there is not a clear pattern to the distribution of these records with passes recorded from near Ash Wood, the edge of The Grove, the northern Belts, the main site (2 deployments) and Goose Hill (3 deployments). Although male Nathusius' pipistrelles are known to hold territory through song-flighting and attract harems of females in the late summer (August/September), there were no records of their distinctive social/song calls, which would have provided evidence of mating activity.

Figure 8 Relative activity of common pipistrelle by survey area (1-6) and period

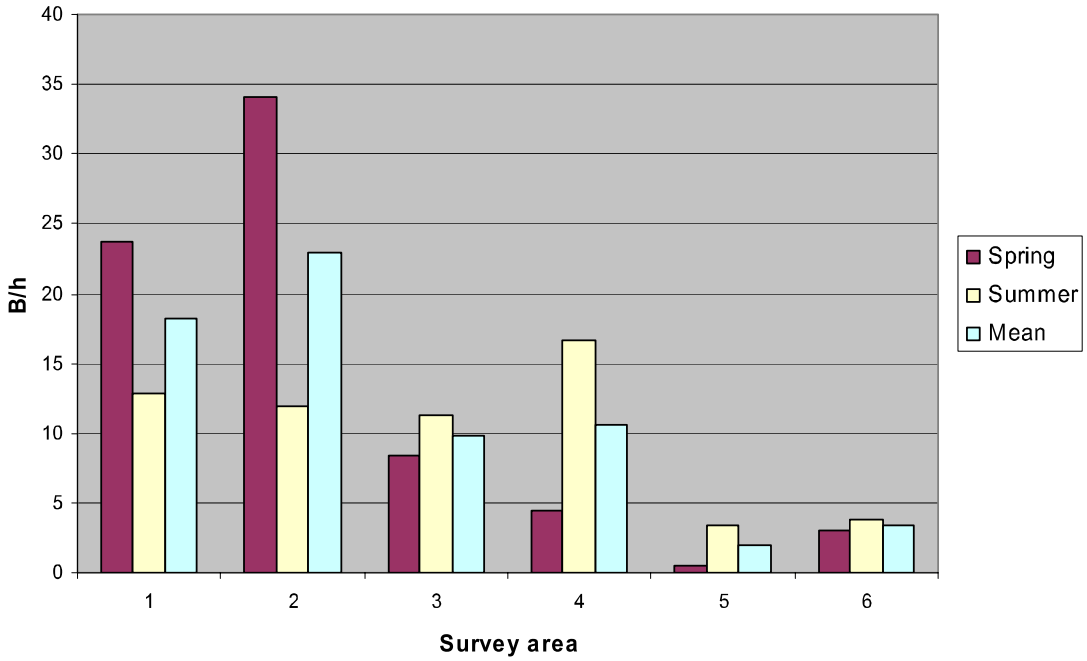


Figure 9 Relative activity of soprano pipistrelle by survey area (1-6) and period

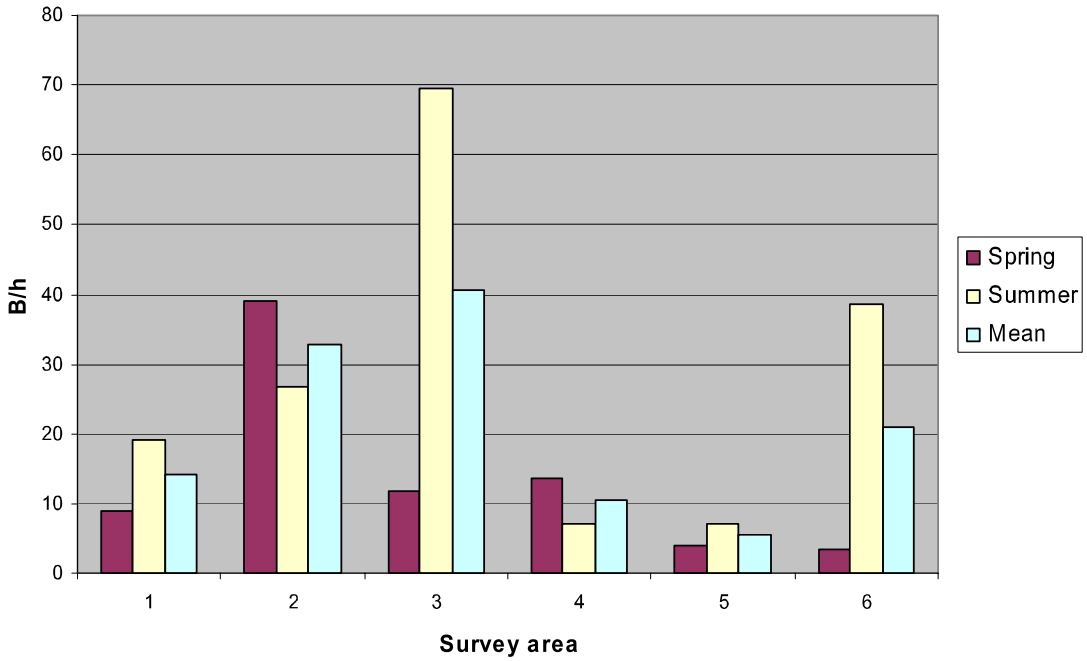
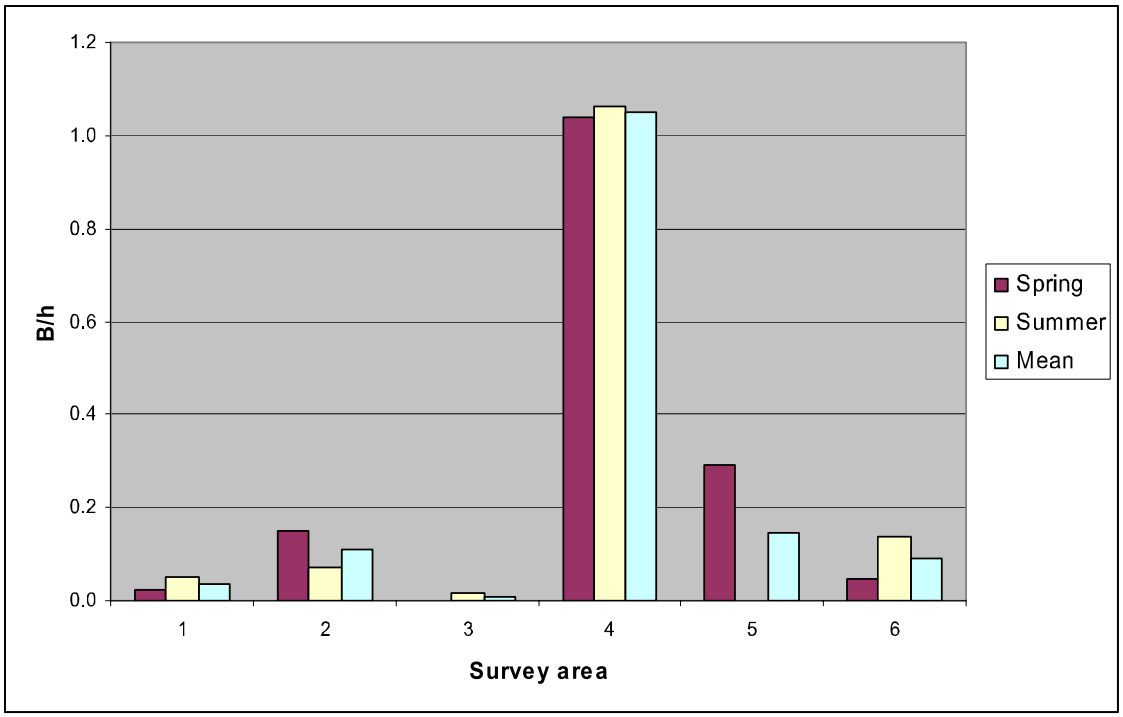


Figure 10 **Relative activity of Nathusius' pipistrelle by survey area (1-6) and period. For this graph the data for static detector P1_1f has been removed due to the very high B/h recorded, which obscures the other results.**



4.3.7 Relative Activity and Spatial Distribution of Serotine

The relative activity of serotine at each static detector survey location is illustrated in **Figure C28** with **Figure C29-30** showing the relative activity at survey locations in spring and summer respectively.

In total 447 serotine passes were recorded at an average rate of 0.31 B/h. Serotine bats were recorded from 10 of the 56 static locations with four in spring and six in summer. Serotines were recorded regularly from very few detectors and seem to be quite local in their distribution. Reasonably high activity levels were recorded from both detectors on Upper Abbey track in both April (6.1 B/h) and August (5.5 B/h), where the only serotine was caught during trapping. In addition, they were recorded in the Black Walks area north of Ash Wood in April (4.1 B/h) but not in August. The only other locations they were recorded from with any regularity were the central ride through Goose Hill in July (0.95 B/h) at a time when noctule and Leisler's bat were also frequently recorded in Goose Hill, and also from a ride in Kenton Hills in August (0.63 B/h).

The nocturnal activity of serotine bats suggests that the site is not close to any significant roosts as the majority of records are during the middle of the night (TC 7 = 63.3%) and only 4.3% of records were recorded within one hour of sunset.

4.3.8 Relative Activity and Spatial Distribution of Brown Long Eared Bat

The relative activity of brown long-eared bat at each static detector survey location is illustrated in **Figure C31**.

In total 147 brown long-eared bat passes were recorded at an average rate of 0.1 B/h. Brown long-eared bats were recorded from 29 of the 56 static locations with eight in spring and 21 in summer. Brown long-eared bat were recorded occasionally from a number of detectors and seem to be quite widespread in their distribution. All detectors recorded low activity levels with only two detectors recording more than ten passes from this species, at the southern end of Stonewall Belt (13 passes) and Black Walks (20 passes). Although four bats were caught in a single night along Upper Abbey track in June only nine passes were recorded in two weeks along the same track in August with none in April. The lack of Anabat data from this species in contrast to a total of 13 bats caught (7% of total) reflects the fact that this species is very difficult to detect using bat detectors, having a quiet call and even foraging using passive listening as opposed to echolocation.

It is not possible to conduct a meaningful analysis of nocturnal activity patterns of brown long-eared bat owing to the low levels of activity recorded.

4.4 Emergence Surveys of Barbastelle Roost Trees

The results of the simultaneous emergence surveys of the 11 barbastelle roost trees (6 July and 3 August 2010) and of emergence watches on some trees during the radio-tracking study are presented in **Table 12**.

No bats were recorded emerging on 6 July and 11 barbastelles emerged from three trees on 3 August. This result may reflect that a large number of roost trees may be used by female bats, that the radio-tracking survey may only have identified a sample of the trees used, and that bats were roosting in other trees at the time of the emergence survey. Owing to the frequent roost changes and the existence of sub-groups within a colony, maternity colony numbers are difficult to estimate (as discussed in Greenaway, 2008). It may also indicate that the population at Sizewell is not large, although it is not possible to make a reliable population estimate from the limited data that have been collected.

Table 12 Numbers of barbastelles counted during emergence surveys. N/A = no survey carried out.

Roost No.	2 June	3 June	6 June	8 June	9 June	10 June	15 June	6 July	3 August
R1	4	N/A	N/A 0		N/A N/A		N/A	0	0
R2	N/A	N/A N/A		N/A N/A		N/A	N/A	0	0
R3	N/A	4	N/A N/A		N/A N/A		0	0	0
R4*	N/A	N/A N/A		N/A N/A		N/A	N/A	N/A	N/A
R5	N/A	N/A N/A		N/A N/A		N/A	N/A	0	9
R6	N/A	N/A N/A		N/A N/A		N/A	N/A	0	0
R7	N/A	N/A N/A		N/A N/A		N/A	N/A	0	0
R8 N/A		N/A	3 N/A		N/A	N/A	N/A	0	0
R9	N/A	N/A N/A		N/A 9		N/A	0	0	1

Table 12 (continued) Numbers of barbastelles counted during emergence surveys. N/A = no survey carried out.

Roost No.	2 June	3 June	6 June	8 June	9 June	10 June	15 June	6 July	3 August
R10†	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
R11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	0
R12	N/A	N/A	N/A	N/A	N/A	0	N/A	0	1
R13	N/A	N/A	N/A	N/A	N/A	N/A	5+	0	0

*R4 was not located due to the position of the roost/s in inaccessible woodland in Grimseys

†R10 was used by a single male bat and no emergence survey was performed.

4.5 Bat box surveys

The results of the two bat box surveys are summarised below and full details are provide in **Table D1**, with the locations of the boxes shown in **Figure D1**.

On 3 June a single male noctule was recorded in box 37 and two single male common pipistrelles were found in boxes 6 and 8. Single soprano pipistrelles were recorded from boxes 16 and 25 and a maternity colony was found in box 20. The surveyors decided not to disturb the colony by counting the bats as the box was extremely full, but the number of bats present was estimated to be at least 50.

On 7 July, the maternity colony had moved to Box 22 and an emergence count was made prior to the commencement of a walked transect from 15 minutes before sunset, which was at 21:15, until 10 minutes after sunset when the transect was started. A video camera with image intensifier was left recording to gain an accurate and complete count for the full emergence period. A total of 55 soprano pipistrelles were recorded emerging from the box by 21:40.

On 4 August a single post-lactating female common pipistrelle was found in Box 18. Soprano pipistrelles were found in eleven boxes with 28 bats found in ten of the boxes and an estimate of around 50 bats in Box 28. A number of juveniles and post-lactating female bats provided confirmation of the status of the roost as a maternity colony.

4.6 Tree Assessment

A total of approximately 500 trees within the survey area were identified as having medium or higher potential for roosting bats. **Figure D2** shows the zones into which the woodland was divided for the survey. The areas surveyed and the numbers of trees found with medium, high or very high potential are listed in **Table 13**. **Figure D3** shows the survey area, locations of trees and the assessment of their potential. The full results of the tree survey are provided in **Table D2**.

Several woodland blocks contain clusters of suitable trees including Ash Wood, The Grove, Leiston Old Abbey, Fiscal Policy, Grimseys and the damp woodland on the east side of the northern Belts. In addition, the line of oaks along the east-west access track includes a number of trees with very suitable features for roosting bats.

Table 13 Numbers of trees with medium or higher potential by survey zone.

		Potential			
Zone	**Name of zone**	**Medium**	**High**	**Very high**	**Total**
A	Ash Wood	39	22	13	**74**
B	The Grove	8	22	7	**37**
C	Stonewall Belt	6	0	1	**7**
D	Leiston Old Abbey	16	9	1	**26**
E	Fiscal Policy	99	20	7	**126**
F+FA	East-west access track	34	15	8	**57**
G	Leiston Carr	2	6	5	**13**
H	Grimseys	5	26	1	**32**
I	East side of Belts	4	2	6	**12***
J	Kenton Hills/ Nursery Covert	8	12	0	**20**
K	Goose Hill	38	13	0	**51**
L	Upper Abbey track and arable	14	2	0	**16**
Totals		**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.

4.7 Discussion of 2010 Results for Barbastelle

Roost Selection

All barbastelle roost trees located were pedunculate oak save for a single dead elm (Roost 11) and an unidentified dead tree (Roost 6). Of the 11 tree roosts found to support breeding female barbastelles, eight were behind loose/lifted or flaking bark (R1, R2, R3, R5, R6, R8, R9 and R11). One consisted of a deep fissure in a north-facing, torn off limb (R7), another a vertical split in the main trunk (R13) and another a deep horizontal fissure in a massive, failed, east-facing bough (R12). The apparent preference shown towards roosting behind raised bark, is similar to that found in other radio-tracking research of this species in Italy (Russo *et al.* 2004), Germany (Kerth & Melber, 2009), and England (Billington, 2002; Greenaway 2008; Greenaway & Hill, 2004) where barbastelle nursery roosts tended to be within splits in trees or under loose bark. Published research from the UK indicates that breeding roosts tend to be found in quiet locations well away from the woodland edges and surrounded by dense cover (Russo *et al.*, 2004; Greenaway, 2008) but this was not found to be the case in this study. Of the 11 tree roosts found, three were on the northern edge of woodland blocks and seven were within 30m of woodland edge. Roost R11, in a dead elm, was within 20m of a large ride and Roost R6 was within 30m of Abbey Road (see **Table 6**; Section 4.1.1). Also, in recent anecdotal reports from other UK barbastelle colonies (e.g. Eversden and Wimpole in Cambridgeshire), roosts have been found in very small woodland blocks and therefore not deep within woodland.

The weather conditions during the radio-tracking were mild initially but there were nights where a sea mist came in and the temperatures in the open habitats became cooler, with nighttime temperatures dropping to 5°C on some evenings. It was noted that the bats appeared to return to roosts earlier during these colder temperatures and ventured further inland and foraged within the woodland blocks, as opposed to during warmer conditions when they foraged in the more open habitats, including the more easterly/seaward reaches of Sizewell Belts. Breeding female bats need to remain homeothermic, i.e. to maintain a high body temperature rather than going into torpor and allowing it to fall, as non-breeding bats do to save energy. This is in order to allow foetal development and later lactation, and it has been suggested that barbastelle bats select warmer areas for roosting to limit the costs of homeothermy (Russo *et al.*, 2004). At Sizewell, although some roosts with breeding females were on the southern side of tree roosts, several were on the northern and eastern sides of the trees. Although all tree roost sites benefited from woodland cover at least on one aspect, all were close to a woodland edge and some, for example, roosts R1 and R2 were on the extreme northern edge. The orientations and locations of tree roosts in this instance do not appear to show any clear correlation with those in Russo's study.

Movements between Roosts

Barbastelle bats are known to move roosts regularly even during the period when their young cannot fly (Russo *et al.*, 2004). The mean distance moved between trees by female bats in central Italy ranged between 31m and 626m, with distances contracting during the main lactating period (Russo *et al.*, 2004). This suggests that female barbastelles, in order to continue to move roosts regularly, need a large number of suitable roost trees relatively close to each other during the whole breeding season, but particularly during the main lactating period. Russo *et al.* also found that barbastelle roosts were most frequently found within unmanaged woodland where the dead trees occurred most frequently, in comparison with managed woodland and pasture woodland and where clusters of larger trees occurred. Greenaway and Hill (2004) found that the roosts tended to be located within a distinct area which they refer to as a "loyalty area". Loyalty areas will gradually change over time as woodlands develop, and Greenaway and Hill (2004) suggest that management plans for nursery roosting sites should include areas of five to ten times the area that bats are presently using.

The bats at Sizewell were tracked in the pre-lactation period and the smallest distance between roost switches was 488m between roost R1 and R2 (see **Table 7**), this being the only roost switch within the range recorded pre-lactating by Russo *et al.* (284-626m). The largest distance recorded was 2006m between R6 near Greenhouse Plantation and R8 in The Grove. The average distance between roost switches was 1203m. This suggests that the population in Sizewell continues to switch roosts on a regular basis but over a larger distance. However, a study in Germany found that female barbastelles could cover large distances of up to 9.0km between consecutive day roost locations (Kerth & Melber, 2009) and it seems likely that there is a great deal of variation between colonies, probably reflecting the relative availability of roost sites.

One notable feature of the behaviour of the tracked breeding female barbastelles was the frequency of visits to the two main clusters of roost trees in Ash Wood and The Grove. Bats 5 and 6 were both recorded visiting both Ash Wood and The Grove during the same night often on several occasions. Such visits appeared to follow sustained foraging, for example over the eastern reaches of Sizewell Belts in the earlier foraging phase or after foraging in the vicinity of Leiston Abbey Woods or Greenhouse Plantation in later foraging phases.

Colony Structure and Size

Owing to the numerous roost changes and the existence of sub-groups within a colony, maternity colony sizes are difficult to estimate (as discussed in Greenaway, 2008). Russo *et al.* (2004) found that the number of bats in a maternity colony over seven different counts throughout July and August was 16.7 bats ± 4.2 (range 12-23 bats). Billington (pers. comm.) counted 26 bats within a single tree roost in Somerset. Greenaway (2008) studied two maternity colonies in Sussex, and estimated counts of at least 64 breeding females in one maternity colony and at least 80 breeding females in the other. These colonies were further divided into sub-groups of 16-25 breeding females (Greenaway, 2008). Non-breeding females may roost within maternity colonies (Greenaway, 2008), but have also been recorded roosting with small groups of males (Parsons *et al.*, 2003).

Although the bats within a colony will frequently switch trees and therefore roost with different bats, they may be defined into several sub-groups (Greenaway, 2008; Greenaway & Hill, 2004). Records exist of bats changing sub-groups between different years, but never changing nursery colonies (Greenaway, 2004; Greenaway, 2008; Greenaway & Hill, 2004).

Given the limited data collected from trapping and radio-tracking studies, it is not possible to come to any firm conclusions about maternity colony size at Sizewell. The low emergence counts and the relatively high rate of recaptures during the 2010 study would suggest that the colony at Sizewell is relatively small: a maximum total of 11 barbastelles were recorded emerging from three trees in August, and this is likely to have included some juvenile bats. However, this may have been only a subgroup of the population at Sizewell. Barbastelles are notoriously adept at evading traps/nets and therefore difficult to catch (Billington, pers comm.). There are a limited number of ideal trapping locations on the Sizewell Estate on flightlines that are used regularly and where bats find it difficult to evade capture, i.e. on rides where there is dense vegetation both above and to the sides. None of the extensive coniferous plantation woodland is suitable for trapping due to the open structure of the woodland. Barbastelles were caught only at Fiscal Policy and Turf Pits during trapping sessions in both 2009 and 2010 (as well as from tree roosts in 2010) although several other locations were used in 2010 (Upper Abbey track, The Grove, Ash Wood, Broom Covert, Sandy Lane). Moreover, there are a large number of flightlines that are used regularly by barbastelles on the Sizewell Estate which are unsuitable for trapping (e.g. all of Goose Hill, Kenton Hills/Nursery Covert, Sizewell Belts and all of the arable and pasture habitat). It is likely that the available trapping locations are not used by all of the barbastelles and therefore only a proportion of the total barbastelle population has been sampled by trapping.

Foraging Areas and Home Ranges

During the radio-tracking survey bats 5 and 6 were recorded regularly flying from roosts in Ash Wood/The Grove to Sizewell Belts. Emerging some 30 to 40 minutes after sunset, they then remained in Ash Wood for a brief period before moving swiftly south towards Nursery Covert/Goose Hill and were then recorded in the eastern reaches of Sizewell Belts (to the north-east and east of Grimseys) from 45 – 50 minutes after sunset until 70 – 95 minutes after sunset. On the occasions when bat 6 roosted in Grimseys it was recorded foraging in the eastern reaches of the Belts immediately after emerging until 75 minutes after sunset. Radiotracked bats were not recorded foraging in this area of the Belts later in the night. Earlier during the survey bats 1 and 2 were not recorded for a short period between emergence time and around 22.20 when they were recorded in the Abbey Farm track area. It is possible that these bats were also using the Sizewell Belts area for early evening foraging.

These results also reflect those from the static detector surveys where barbastelle activity in the northern Belts was concentrated almost exclusively in the first part of the night. However, activity levels in that area were generally low in comparison to many areas of the site and it is possible that there are several key foraging areas for barbastelle, and that the site area is partitioned between foraging females to some extent, as has been found in other studies (e.g. Hillen *et al.*, 2009).

For the 95% MCP analysis, there were limited data except for four females (bats 1, 2, 5 and 6). The mean MCP area for these four was 221ha (range: 75.7-388.4ha). This is at the lower end of the ranges recorded for adult female barbastelles in the Mens (MCP% not given; range: 260-2,928 ha; mean: 1,236ha) and Ebernoe Common (MCP% not given; range: 45-2,521ha; mean: 779.5ha) (Greenaway, 2008), was similar to that measured in Germany (100% MCP; mean: 222ha) (Kerth & Melber, 2009) but was much higher than that recorded in Switzerland (MCP% not given; mean: 8.8ha) (Sierro & Arlettaz, 1997).

For the 95% kernel analysis the median home range size of the same four bats was 256ha (range: 101-410ha). This figure is lower than that recorded for 12 female barbastelle bats in Germany although a wide range of values was recorded (kernel 95%; range: 125-2551ha; median: 403ha) (Hillen *et al.*, 2009), but higher than that from another site in Germany (90% kernel; mean: 108.6ha) (Kerth & Melber, 2009) Home range and core area measurements of barbastelles studied foraging in pine forests in Switzerland were much lower; Sierro and Arlettaz (1997) used the MCP method to measure a maximum home range of 56 ha with a mean core area of 8.8 ha.

At Sizewell the core area size (based on a 95% cluster analysis) ranged from 0.25ha to 172ha with the number of core areas ranging between 1 and 4 (see **Figure A13**). Although there is overlap there does appear to be some east-west partitioning of foraging habitat in the belts area north of Grimseys which can be seen on **Figures A8** and **A9** for bats 5 and 6 respectively. Further to the west, bat 6 used the Leiston Old Abbey areas for sustained foraging whilst bat 5 was further north and west around the Eastbridge Road, Theberton House and the fields north of Leiston Abbey. In comparison bat 1 was recorded in a more southerly location around Lover's Lane. Areas of overlap occurred around Ash Wood and the field system north of Kenton Hills and around Abbey Farm Track.

No non-breeding female bats were caught or tracked and therefore it is not possible to determine whether foraging areas for these bats differ from those of breeding females. Greenaway (2008) found that there was greater variability in MCP size for non-breeding barbastelles (both male and female). The lower metabolic demands of non-breeding bats mean that they do not require such large foraging areas, but their tendency to wander in the late summer to find mating opportunities means they can also have quite large MCP areas. For example, it was determined that non-lactating female noctules used more marginal and less preferred habitats significantly more than lactating bats (Mackie & Racey, 2007), although there was little difference in timing of foraging activity or distances travelled between lactating and non-breeding female bats.

Barbastelle bats radio-tracked from The Mens Woodland SAC ranged widely (range: 2.64-11.98km; mean: 7.1km), as did those from Ebernoe Common SAC (range: 1.17-10.46; mean: 5.1) (Greenaway, 2008). The average flight distances for pregnant or lactating females at the same locations were 7.67km and 5.09km respectively (Greenaway, 2008). From Paston Barn near Cromer (Norfolk) female barbastelles flew a maximum of 2.75km to their foraging site, while males were tracked 4.75km (Parsons *et al.*, undated). At Sizewell the maximum distance

recorded from a roost tree was 2.4km for bat 1, 1.3km for bat 2, 2.8km for bat 5 and 2.6km for bat 6.

Habitat Use

At Sizewell, barbastelles have been recorded using a wide variety of habitats for foraging and commuting. The Sizewell Estate provides a rich habitat for this species due to the varied foraging opportunities and habitats available, including sheltered grazing marsh, water bodies, reed bed, pine plantation, wet and dry broad-leaved woodland, well structured hedgerows, pasture and arable farmland, parkland (to the west) and coastal dunes, in addition to numerous roosting opportunities. The data collected between 2007 and 2010 shows that barbastelles use almost all the habitat available within the Sizewell Estate for commuting and/or foraging. However, some areas appear to be more important than others. The highest activity levels were recorded in several key locations:

- Around Ash Wood several hedgerows are used for foraging and to some extent for commuting. The highest activity levels were recorded in the area to the north around Black Walks. Stonewall Belt to the south appears to be a significant commuting route for bats from Ash Wood;
- Upper Abbey track and the pasture field near Leiston Old Abbey were consistently used by barbastelles for both foraging and commuting.

Most areas of the central woodland blocks were important for foraging and commuting barbastelles, with most activity recorded in the numerous rides through the woodland and particularly in Fiscal Policy, the east-west access track on the north edge of Kenton Hills etc., Turf Pits, the central rides in Goose Hill and the north-eastern part of Goose Hill, where bats from The Grove may potentially commute through. Where the woodland habitat is fragmented, barbastelles were often recorded flying over open habitats including foraging over arable and pasture fields as well as parkland to the west at Theberton. The overall impression of barbastelle activity at Sizewell is that bats use all of the available habitat and do not apparently travel very far from roosts to foraging areas.

5. Evaluation

This section of the report aims to evaluate the bat resource identified within and around the footprint of the proposed development, setting the ecological context for the identification of the significance of potential impacts within the EIA. This section updates the preliminary evaluation and revised evaluation of the importance of the bat assemblage following surveys in 2007-2009 and in the report for each year respectively. The evaluation of resources has been conducted in accordance with IEEM EcIA guidance (see Section 2.4). The updated evaluation in this report should not be taken as definitive, but rather a preliminary discussion of the likely value of the bat resource.

5.1 Evaluation from 2007-2009

5.1.1 Background

The revised evaluation for 2010 takes into account the evaluations from the preceding three years of baseline work. However, the size of the survey area that is under consideration grew considerably in 2010. This is for two principal reasons: firstly the potential land-take for the

scheme has increased due to the consideration for building two reactors instead of the original one; secondly, the discovery of maternity colonies of barbastelle has led to more intensive survey in areas of the site that have not been considered in great detail previously, such as the arable land surrounding Ash Wood and several areas considered within the tree survey. In addition, other areas that have been surveyed previously have been subject to more intensive survey in 2010, e.g. Sizewell Belts. The evaluation therefore does not follow the same arrangement for dividing the survey area into sectors for evaluation that is presented in the preceding years' survey reports. As background, both the 2007 bat survey report (Entec doc ref 19801cb114) and the 2008 bat survey report (Entec doc ref 19801cb205) considered areas which were thought likely to be directly impacted by the scheme. These are:

- The southern side of 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 and as far south as Leiston Carr and Sizewell Belts;
- The north-south tree-line north of Nursery Covert.
- The preliminary works area.

In addition, 2009 surveys provided preliminary evaluations of two additional areas/features following the results of 2009 surveys. These were:

- The area of arable land, including hedgerows, which may be affected by plans for heathland creation. This includes the area north from Fiscal Policy, Kenton Hills and Nursery Covert to the northern limit of the survey area at the hedgerow boundary where static detectors 1 and 10 were located and east to the edge of Hilltop Covert.
- The track running from Fiscal Policy to Upper Abbey, where static detector 3 was located. This area is clearly of importance to bats and there is some potential for this feature to be affected by heathland creation and/or works associated with the proposed new access track.

Other new areas were also surveyed during 2009 including those around Sizewell Belts and Leiston Common to the south. However, these were not considered in the evaluation section in the 2009 report for two reasons:

1. It was thought unlikely that the bat population in these areas would be directly affected by the proposed works
2. Insufficient survey work was carried out during 2009 to provide a robust conclusion for the purposes of evaluation.

5.2 2010 Evaluation

Overall, the number and diversity of bats caught during radio-tracking and recorded during activity surveys in 2010 was high and the area as a whole appears to be important for bats. These results therefore reinforce the evaluation from the previous years' baseline survey.

The evaluation provided below is presented for barbastelle and then for all other species of bats separately. This draws together the results from both the activity survey (walked transects and static bat detector surveys) and the radio-tracking surveys with further information, where relevant, from any roost/tree surveys. In this section, barbastelle bats remain the focus for discussion due to their high conservation status and the presence of a breeding colony on the site. The evaluation places a value on the identified ecological resource in geographic terms, as described in the Institute of Ecology and Environmental Management's guidelines relating to ecological impact assessment (IEEM, 2006). This section does not attempt to give a value to particular areas of the site, although it would be possible to do so, and concentrates on assessing the value of the populations of each species of bat at Sizewell.

5.2.1 Barbastelle

In addition to the breeding roosts located within the Sizewell Estate, much of the area is apparently used by pregnant female barbastelles for both commuting and foraging and the value of the site should be considered as a whole to the relevant population. The precise evaluation of this resource is difficult for some key reasons:

- The reference population size (i.e. Suffolk or UK) is unclear as there is no published estimate for the Suffolk population, and UK population estimates (see Section 2.6) are based on very limited data;
- The size of the population at Sizewell is not known, although the minimum size of the maternity colony recorded from emergence counts is probably 11 (albeit this figure may have included some juvenile bats) ;
- It is not known for certain whether there are any hibernation roosts for barbastelle within the Sizewell Estate, although given that this species frequently roosts in trees during the hibernation period, where suitable roost trees are available it is likely that at least a proportion of the summer population also hibernate on the site.

Nevertheless, barbastelle is thought to be rare in the UK, with a low number of maternity colonies discovered to date (see Section 2.6). The UK conservation status of barbastelle is therefore such that any breeding colony of this species would be regarded as of at least **national** (if not **international**) importance.

5.2.2 Natterer's Bat

There is at least one Natterer's roost close to the Sizewell Estate (in Upper Abbey Barn) and there may be at least two more *Myotis* roosts which are likely be of this species (based on their frequency of capture during trapping surveys) in Fiscal Policy and The Grove. These may also be maternity roosts, based on the number of pregnant females (12) caught during trapping surveys, although it is possible that different roosts may be used by bats from the same colony and only one colony may be present within the Sizewell Estate. This species is reasonably widespread in Suffolk and is listed as "fairly common" in the UK by Battersby (2005) with an estimated English population of 70,000 individuals. Recent monitoring data from hibernation counts has indicated that the UK population may be increasing but there is insufficient data at

present to be sure of this trend (BCT, 2010). The presence of breeding colonies means that the site resource is likely to be valued as of at least **district** importance.

5.2.3 Daubenton's Bat

It is difficult to assess precisely the value of the Daubenton's bat population at Sizewell, given the lack of data on the species. However, single bats have been trapped in both 2009 and 2010 and they have been observed feeding over ditches in the northern area of the Sizewell Belts. They are likely to be reasonably common across the site and largely associated with wetland habitats. Daubenton's bats are widespread and locally common in Suffolk and are thought to be common throughout much of the UK (Battersby, 2005) with probably largely stable populations (BCT, 2010). The value of the Daubenton's population is thus likely to be of **local** importance, although this may be raised if evidence of a maternity colony is found.

5.2.4 Noctule

Noctule bats are recorded regularly at Sizewell and appear to prefer open areas, particularly grazing marsh, for foraging. Individual noctules use bat boxes in Kenton Hills for summer and winter roosting, but they are not likely to be roosting on the site in large numbers or for breeding, given the low activity levels recorded for this species and the fact that all three noctules recorded in the hand (two in The Grove during trapping, and one in a bat box) were male. The species is thought to be widespread in Suffolk, albeit present in low numbers and generally uncommon in the UK (Battersby, 2005). The noctule population using the site is therefore likely to be of **local** importance.

5.2.5 Leisler's Bat

The population of Leisler's bat does not appear to be large, with relatively low activity levels recorded from most detectors. This combined with the lack of any records soon after sunset or before sunrise, and the fact that in the UK maternity colonies tend to occur in buildings rather than trees, suggests that the Sizewell Estate does not support any major roosts of this species. However, there are very few known Leisler's roosts in Suffolk (three to date, all in the NW of the county) and they have not been recorded in this general area before (see 2009 report). The English population is thought to be around 9,750 individuals and the species is thought to be scarce in the UK (Battersby, 2005). Despite the apparently low numbers of bats present, therefore, the Leisler's bat population is likely to be of at least **district** importance.

5.2.6 Common Pipistrelle

Common pipistrelle is widespread and common in Suffolk and is the most abundant species of bat in the UK (Battersby, 2005), although they were not recorded as frequently as soprano pipistrelle within the Sizewell Estate in 2010. Although no large roosts have been found of this species, they have been seen emerging from Upper Abbey Barn in small numbers and may roost in other buildings in the area as well as in trees and the bat boxes, were single bats were found during surveys in 2010. A large number of pregnant females were caught in 2010 and there are likely to be a number of maternity colonies within the Sizewell Estate. The population at Sizewell is likely to be of **local** importance.

5.2.7 Soprano Pipistrelle

This is the most frequently recorded species of bat at Sizewell. There are known roosts of soprano pipistrelle in Upper Abbey Barn and the bat boxes in Kenton Hills (maternity colony of around 70 individuals). A large number of pregnant female bats of this species were caught and there are likely to be further undiscovered roosts within the Estate. The resource of soprano

piistrelle is likely to be of **local** or possibly **district** importance, due to the large numbers of this species present on site and the importance of the site for breeding females.

5.2.8 Nathusius' Pipistrelle

Maps of UK records in Russ *et al.* (2001) show that this species has been recorded prior to 1998 in Suffolk and that three records have been collected since 1998 on a reliable online national database[15], collated by Jon Russ from Aberdeen University. These records include one from close to the site at Sizewell Wents (TM468628) in July 2007. The status of the species in the UK is unclear although it has been afforded the status of a migrant winter visitor (Speakman *et al.*, 1991) and it is listed as rare with the mainland British population estimated to be 4,000 individuals (Battersby, 2005). There are only three known maternity colonies in Great Britain, all in eastern England[16]. In addition the NBMP has recently begun a Nathusius' pipistrelle survey which was piloted in 2009 and continued in 2010. Results should be published in February 2011 and may add a significant number of records to the UK (and Suffolk) database.

The relatively high activity levels of this species recorded at migration times suggests that Nathusius' pipistrelle is fairly common and widespread at Sizewell during April/May and August/September (and potentially October although surveys have not been carried out at this time) and that the migratory population may be of importance, given the apparently low numbers of records from Suffolk and elsewhere in the UK, although it is possible that this species is significantly under-recorded and/or expanding its range into the UK. The presence of this species over the Sizewell Belts during the summer implies that there may be a breeding colony nearby. The recording of calls close to sunset may indicate areas where bats may be roosting, but those recorded at Sizewell tell us little about the potential location of any roosts due to the scattered distribution of these records (see Section 4.3.6).

The Nathusius' pipistrelle population should be split into two for the purposes of evaluation: a migratory population (which passes through the area, and possibly hibernates) and a potential breeding population, due to the difference in value that these two populations may have. There appears to be a large migratory population present in the spring and autumn which currently appears to be of **district** or **county** importance due to the apparent scarcity of records within Suffolk. If there is a breeding population within the Sizewell Estate the population would be of at least **regional** importance, given the scarcity of colonies of this species in the UK.

5.2.9 Serotine

The population of serotine using the site does not appear to be large, with relatively low activity levels recorded from a few static detectors. This combined with the lack of records close to sunset or sunrise suggests that the Sizewell Estate does not support any large roosts of this species. Moreover, serotine bats prefer to roost in buildings rather than trees and there is no evidence at present of any roosts in buildings that have been surveyed, although there are a number of unsurveyed buildings in the surrounding area which may have the potential to support this species. There are at least 35 known roosts of this species in the county and they are clearly a widespread and reasonably common species in the county. The population at Sizewell is therefore likely to be of **local** importance.

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[15] http://www.nathusius.org.uk/Distribution.htm

[16] The roosts were found in Norfolk, Lincolnshire and Rutland. Of these the former has not been re-checked and the latter two were present for one year only.

5.2.10 Brown Long-Eared Bat

At least two maternity colonies of brown long-eared bats are located within the Sizewell Estate, at Upper Abbey Barn and Ash Cottage (from anecdotal evidence) and the species is likely to be relatively common and found in most areas of the site, based on the trapping results (13 bats caught) and the widespread distribution of static detectors that recorded them. The population at Sizewell is likely to be of **local** importance given the species' status in Suffolk as common and widespread.

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 (2010). The state of the UK's bats: National Bat Monitoring Programme Population Trends 2008. The Bat Conservation Trust.

Bat Conservation Trust (2010). The National Bat Monitoring Programme – Annual Report 2009.

Battersby, J. (Ed) & Tracking Mammals Partnership (2005). UK Mammals: Species Status and Population Trends. First Report by the Tracking Mammals Partnership. JNCC/Tracking Mammals Partnership, Peterborough.

Billington, G. (2002). Report on further research of Barbastelle bats associated with Pengelli Forest Special Area of Conservation. Greena Ecological Consultancy for CCW.

Boye, P. & Dietz, M. (2005). Research Report No 661: Development of good practice guidelines for woodland management for bats. English Nature, Peterborough.

Denzinger, A., Siemers, B.M., Schaub, A. & Schnitzler, HU. (2001). Echolocation by the Barbastelle bat *Barbastella barbastellus*. *J Comp Physiol* **A 187**: 521-528.

Dietz, C., von Helversen, O. and Nill, D. (2009) Bats of Britain, Europe and Northwest Africa. A&C Black Publishers Ltd, London.

Goerlitz, H. R, Hofstede, H. M., Zeale, M. R. K., Jones, G. and Holderied, M. W. (2010). An aerial-hawking bat uses stealth echolocation to counter moth hearing. Current Biology **20**: 1568–1572.

Greenaway, F. (2008). Barbastelle bats in the Sussex West Weald 1997-2008. Sussex Wildlife Trust Report.

Greenaway, F. & D. Hill. (2004). Woodland management advice for Bechstein's bat and barbastelle bat. English Nature Research Reports: Number 658. English Nature, Peterborough.

Greenaway F. (2004). Advice for the management of flightlines and foraging habitats of the barbastelle bat *Barbastellus barbastellus*. English Nature Research Report 657. English Nature, Peterborough.

Greenaway F. (2001). *The barbastelle in Britain.* British Wildlife. June 2001. pp 327-334.

Hansteen, T.L., Andreassen, H.P. & Ims, R.A. (1997) Effects of spatio-temporal scale on auto-correlation and home range estimators. *Journal of Wildlife Management*, **61**, 280–290.

Harris S. & Yalden D. W (Eds.) (2008). Mammals of the British Isles: Handbook, 4th Edition. Published by the Mammal Society.

Hillen J., Kiefer, A., and Veith, M. (2009). Foraging site fidelity shapes the special organisation of a population of female western barbastelle bats. *Biological Conservation*, **142**: 187 -823.

Institute of Ecology and Environmental Management. (2006). Guidelines for Ecological Impact Assessment in the United Kingdom. Institute of Ecology and Environmental Management, 2006.

Kerth, G. & Melber, M. (2009) Species-specific barrier effects of a motorway on the habitat use of two threatened forest-living bat species. *Biological Conservation* **142**: 270-279.

Larson, D. J. & Hayes, J. P. (2000). Variability in sensitivity of Anabat II detectors and a method of calibration. *Acta Chiropterologica*, **2**(2): 209-213.

Mackie, I. and Racey, P. (2007). Habitat use varies with reproductive state in noctules *Nyctalus noctula*: implications for conservation. *Biological Conservation*, **140**: 70 – 77.

Millspaugh, J. and Marzluff, J. (eds) (2001). *Radio-tracking and Animal Populations*. Academic Press, San Diego, California.

Parsons, S.M., George, B.P., & E.L. George. undated. Barbastelle bats at Paston Great Barn. Norfolk Bat Group.

Parsons, S.M., George, B.P., & E.L. George (2001) Barbastelle bats at Paston Great Barn. Transactions of the Norfolk and Norwich Naturalists Society, **34 (2)**:307-317.

Richardson, P. (2000). Distribution atlas of bats in Britain and Ireland 1980-1999. Bat Conservation Trust.

Russ, J. M., Hutson, A. M., Montgomery, W. I., Racey, P. A., & Speakman, J. R. (2001). The status of Nathusius' pipistrelle (*Pipistrellus nathusii*, Keyserling & Blasius, 1839) in the British Isles. *J. Zool. Lond.*, **254**, 91-100.

Russ, J.M. (2010). http://www.nathusius.org.uk/Distribution.htm

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

Sierro, A. & Arlettaz, R. (1997). Barbastelle bats (*Barbastella* spp.) specialize in the predation of moth: implications for foraging tactics and conservation. *Acta Oecol.*, **18**: 91-106.

Speakman, J. R., Racey, P.A., Hutson, A. M., Webb, P. I., Burnett (1991). Status of Nathusius' pipistrelle (*Pipistrellus nathusii*) in Britain. Journal of Zoology, **225 (4)**: 685-690.

Vonhof, M. J. & Barclay, R. M. R. (1996). Roost-site selection and roosting ecology of forest-dwelling bats in southern British Columbia. *Canadian Journal of Zoology*, **74,** 1797–1805.

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Appendix A
Trapping and Radio-Tracking Results

10 Pages

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Table A1 Details of all bats trapped. M= male, F = female, NB = non-breeding, P = pregnant, L = lactating, TS = testes swollen (i.e. male in breeding condition), HT = harp trap, MN = mist net, R = tree roost, HT(L)=acoustic lure used at trap playing barbastelle 1 social call on Sussex Autobat.

01/06/2010
T1 - Fiscal Policy HL/ADW

	Time	Species	Sex	Breeding Status	Forearm (mm)	Weight (g)	Trap	Tag number
1	21.00	Soprano pipistrelle	M	NB	29.4		HT3	
2	21.30	Soprano pipistrelle	F	P	30.8		MN1	
3	21.35	Soprano pipistrelle	F	Heavily pregnant - released			HT3	
4	21.35	Common pipistrelle	F	P	32.1		HT3	
5	21.35	Common pipistrelle	F	NB			HT3	
6	21.45	Barbastelle	F	P	37.8	11	HT1	1
7	21.50	Common pipistrelle	M	NB	31.4		HT3	
8	22.20	Natterer's bat	F	P	40	8	HT2	
9	22.20	Natterer's bat	F	P	38.1	8	HT3	
10	22.55	Soprano pipistrelle	F	P			HT3	
11	23.30	Common pipistrelle	M	NB	31.2	6	HT2	
12	23.40	Common pipistrelle	M	NB	32.1	4.5	MN3	
13	23.40	Common pipistrelle	M	NB	31.8	4.5	HT3	
14	23.40	Common pipistrelle	F	P	31.7	5	MN3	
15	0.30	Soprano pipistrelle	F	P	32.5		HT3	
16	0.30	Soprano pipistrelle	F	P	33.6	6.5	HT3	
17	0.30	Common pipistrelle	M	NB	31.3	4.5	HT3	
18	0.30	Common pipistrelle	M	NB	31.7	4	HT3	
19	1.00	Common pipistrelle	M	NB	31.7	4.5	HT3	
20	1.00	Common pipistrelle	M	NB	31.5	4.6	HT3	
21	1.30	Common pipistrelle	F	NB	32.1	5.5	HT3	
22	1.50	Common pipistrelle	M	NB	31.3	5	HT3	
23	2.45	Barbastelle	F	P	39.6	11	MN1	
24	2.45	Common pipistrelle	M	NB	32.1	5	HT3	
25	2.45	Common pipistrelle	M	NB	32.4	5.5	HT3	
26	3.15	Barbastelle	F	P	39.5	9	MN3	2
27	3.15	Brown long-eared bat	M	NB	37.9	6.9	HT1	
28	3.46	Barbastelle	F	P	40.9	11.5	MN1	

02/06/2010
T2 Turf Pits

	Time	Species	Sex	Breeding Status	Forearm (mm)	Weight (g)	Trap	Tag number
29	21.30	Soprano pipistrelle	M	NB	29.9	5	HT1	
30	21.30	Soprano pipistrelle	F	P	31.8	5.5	HT1	
31	21.50	Barbastelle	F	P	38.8	10	MN2	3
32	22.30	Natterer's bat	F	NB	40		MN1	
33	22.30	Barbastelle	F	P	41	9.5	R1	4
34	22.50	Common pipistrelle	F	P	34.4	6.5	MN2	
35	22.50	Common pipistrelle	M	NB	30	5	MN1	
36	23.05	Common pipistrelle	F	NB	32	6	HT3	
37	23.15	Common pipistrelle	F	P	32	5	HT2	
38	23.15	Common pipistrelle	F	P	31.2	5	HT1	
39	23.30	Common pipistrelle	M	NB	30.5	5	HT1	
40	0.10	Soprano pipistrelle	M	NB	31.9	5	MN2	
41	0.10	Soprano pipistrelle	M	NB	30.1	4.5	HT1	
42	0.45	Soprano pipistrelle	F	P	31.4		HT1	

03/06/2010
T3 Abbey Farm Track and Footpath and R2 but no success

	Time	Species	Sex	Breeding Status	Forearm (mm)	Weight (g)	Trap	Tag no.
43	21.45	Brown long-eared bat	M	NB	39.6	7	HT2(L)	
44	21.45	Soprano pipistrelle	M	NB	31.3	4	HT1(L)	
45	21.45	Common pipistrelle	M	NB	31.3	7.5	HT2(L)	
46	22.05	Brown long-eared bat	F	P	38.2	7	HT1(L)	
47	22.05	Common pipistrelle	M	NB	31	5	HT3	
48	22.05	Soprano pipistrelle	M	NB	31.3	5	HT3	
49	22.20	Natterer's bat	F	P	39	9	HT2(L)	
50	22.20	Brown long-eared bat	F	P	37.2	7	HT1(L)	
51	22.20	Natterer's bat	F	P	37.9	9	HT1(L)	
52	22.20	Soprano pipistrelle	M	NB	30.3	3.5	HT1(L)	
53	22.20	Common pipistrelle	F	P	31	4.5	HT3	
54	22.50	Natterer's bat	F	P	36.2	7.5	HT1(L)	

	Time	Species	Sex	Breeding Status	Forearm (mm)	Weight (g)	Trap	Tag no.
55	22.50	Common pipistrelle	F	P	31.9	4.5	HT2(L)	
56	0.00	Soprano pipistrelle	F	P	30	4.5		
57	0.30	Common pipistrelle	M	NB	30.8	4	HT2(L)	
58	0.54	Common pipistrelle	M	NB	31	4	HT1(L)	
59	1.30	Common pipistrelle	M	NB	32.2	5	HT1(L)	
60	2.20	Serotine	F	P	53.9		HT2(L)	
61	3.55	Brown long-eared bat	F	P	-		HT2(L)	

04/06/2010
T4 The Grove and R5 but no success

	Time	Species	Sex	Breeding Status	Forearm (mm)	Weight (g)	Trap	Tag no.
62	22.00	Common pipistrelle	M	TS	30.5	4.2	MN1	
63	23.3	Soprano pipistrelle	M	NB	30.6		MN4	
64	23.3	Noctule	M	NB	50.3	19.6	HT4	
65	23.3	Natterer's bat	F	P	39.2	8.5	HT2(L)	
66	23.3	Natterer's bat	F	P	38.8	27	HT2(L)	
67	23.3	Natterer's bat	M	NB	38	6	MN3	
68	0.05	Common pipistrelle	F	P	32.5	4.8	HT2(L)	
69	1.15	Noctule	M	NB	51.5		HT2(L)	
70	3.00	Natterer's bat	F	P	38.6	9.5	MN4	
71	3.00	Natterer's bat	M	NB	38	8	HT2(L)	
72	3.00	Natterer's bat	M	B	37.5	6.5	MN3	
73	3.45	Soprano pipistrelle	M	NB			HT2(L)	
74	3.55	Brown long-eared bat	M	NB			MN1	

05/06/2010
T1 Fiscal Policy and T5 Ash Wood and R3

	Time	Species	Sex	Breeding Status	Forearm (mm)	Weight (g)	Trap	Tag no.
		Barbastelle	F	P	39.2	9	R3	
75	21.1	Soprano pipistrelle	F	NB	31.9	5.5		
76		Common pipistrelle	F	NB	31.5	4	MN1	
77		Soprano pipistrelle	F	P	31.9	5.5	HT1(L)	
78		Common pipistrelle	M	NB	30.6	4	MN2	
79		Soprano pipistrelle	M	NB	30.3	4	HT2(L)	
80	22.00	Natterer's bat	M	NB	38.5	8	MN2	
81	22.20	Natterer's bat	F	P	39	8	MN1	
82	22.20	Natterer's bat	F	P	37.8	9	HT2(L)	
83	22.20	Natterer's bat	F	P	39.3	9	HT2(L)	
84	22.20	Natterer's bat	F	P	38.9	7		
85	22.20	Brown long-eared bat	M	NB	38.1	6.5		
86	22.20	Barbastelle	F	B	38.4	8.5	R3	5
87	23.00	Brown long-eared bat	M	NB	37.9	7	HT1/2(L)	
88	23.00	Brown long-eared bat	F	L	36.8	7.1	MN2	
89	23.00	Brown long-eared bat	F	P	38.9	8.5	HT1/2(L)	
90	23.38	Brown long-eared bat	F	P	39.5	8	MN2	
91	0.20	Common pipistrelle	F	P	30.5	5		
92	0.20	Soprano pipistrelle	F	P			HT4	
93	0.46	Brown long-eared bat	F	L	38.2	7	MN1	
94	1.40	Common pipistrelle	F	P	31.8	6	MN1	
95	1.40	Pipistrelle sp.					HT1(L)	
96	1.40	Soprano pipistrelle	M	NB			MN1	
97	1.40	Soprano pipistrelle					MN1	
98	2.10	Brown long-eared bat	M		38.5	7.5	MN1	

06/06/2010
T6 Broom Covert and R7

	Time	Species	Sex	Breeding Status	Forearm (mm)	Weight (g)	Trap	Tag no.
99	23.3	Soprano pipistrelle	M	NB	30	4.5	HT2(L)	
100	23.3	Common pipistrelle	F	P	33.4	6	HT2 (L)	
101	0.55	Soprano pipistrelle	M	NB	31.3	4.5	HT2(L)	
102	1.10	Common pipistrelle	F	P	33.2	4.5	HT1	
103	1.25	Common pipistrelle	M	B	30	4.5	HT2(L)	
104	1.55	Soprano pipistrelle	M	B	29.3	4.5	HT1	
105	2.40	Common pipistrelle	F	P	31.7	6.5	HT2(L)	

07/06/2010
T7 Sandy Lane and R8

	Time	Species	Sex	Breeding Status	Forearm (mm)	Weight (g)	Trap	Tag no.
106	22.10	Common pipistrelle	F	P	27.5	5.5	MN3	
107	22.15	Common pipistrelle	M		30	4	HT1	
108	22.15	Soprano pipistrelle	M		30	4	HT1	
109	22.15	Soprano pipistrelle	F		31.2	5.5		
110	22.15	Soprano pipistrelle	M		31.1	4.5		
111	22.15	Soprano pipistrelle	F	P	31		HT2	
112	22.15	Soprano pipistrelle	F	P	30.5	5.5	HT2	
113	22.15	Common pipistrelle	F	P	33	5.5		
114	22.15	Soprano pipistrelle	F	NB	29	3.8		
115	22.15	Common pipistrelle	M	MB	29.5	4.5		
116	22.15	Soprano pipistrelle	M		30	4		
117	22.15	Pipistrelle sp.						
118	22.15	Common pipistrelle	M		30.5	3		
119	22.15	Soprano pipistrelle	F	P	29.8	4		
120	23.00	Common pipistrelle	F					
121	23.00	Soprano pipistrelle	F					
122	23.00	Soprano pipistrelle	M					
123	23.00	Soprano pipistrelle	M					

	Time	Species	Sex	Breeding Status	Forearm (mm)	Weight (g)	Trap	Tag no.
124	23.00	Soprano pipistrelle	M					
125	23.00	Soprano pipistrelle	M					
126	23.00	Soprano pipistrelle	F					
127	23.15	Soprano pipistrelle	F	P				
128	23.15	Soprano pipistrelle	F	P				
129	23.15	Soprano pipistrelle	F	P	32.5	6.5		
130	23.15	Soprano pipistrelle	F	P			MN2	
131	23.15	Soprano pipistrelle	F	P	32	6.2	HT2	
132	23.15	Soprano pipistrelle	F	P		6	MN4	
133	23.15	Daubenton's bat	M	NB	34	8.5	MN4	
134	23.30	Soprano pipistrelle	F	heavily P			MN3	
135	23.30	Soprano pipistrelle	F	NB	30.5	5.5	HT2	
136	23.30	Common pipistrelle	M		29.6	6	HT1	
137	23.20	Soprano pipistrelle	M		30.5	4	HT2	
138	23.30	Soprano pipistrelle	F	heavily P	29.5		HT4	
139	23.30	Soprano pipistrelle	F	P	31.5	5.7	HT2	
140	23.30	Soprano pipistrelle	F	heavily P			MN2	
141	23.30	Soprano pipistrelle	M	NB	31	5	HT2	
142	23.30	Pipistrelle sp.						
143	23.30	Pipistrelle sp.						
144	23.30	Soprano pipistrelle	F	P	30.5	6.3		
145	0.00	Common pipistrelle	F	heavily P			N4	
146	0.00	Common pipistrelle						
147	0.00	Soprano pipistrelle	F	heavily P			N4	
148	0.00	Common pipistrelle	M	TS	31.6	4.8	N3	
149	0.00	Common pipistrelle	F	heavily P			HT4	
150	0.00	Natterer's bat	M		41	7.5	HT4	
151	1.00	Common pipistrelle	F	heavily P			HT1	
152	1.00	Common pipistrelle	M		31	4.5		
153	1.51	Pipistrelle sp.					MN2	
154	1.55	Soprano pipistrelle	F	heavily P			MN1	
155	1.55	Soprano pipistrelle	F	heavily P			HT4	
156	1.55	Common pipistrelle	M		29.9	5.4	HT3	

	Time	Species	Sex	Breeding Status	Forearm (mm)	Weight (g)	Trap	Tag no.
157	1.55	Common pipistrelle	M		30.2	4.6	HT1	
158	1.55	Soprano pipistrelle	M	TS	29.3	4.9	HT2	
159	2.45	Common pipistrelle	F	L	31.1	4.4	MN4	
160	2.45	Soprano pipistrelle	M	TS	32.3	4.5	HT3	
161	2.45	Soprano pipistrelle	M		30.6	4.4	HT2	
162	2.45	Soprano pipistrelle	M		31	4.6	HT2	
163	2.45	Soprano pipistrelle	F	L	32	5.9	HT.2	
164	3.10	Soprano pipistrelle	M	TS			MN4	
165	4.00	Common pipistrelle	M				HT4	
166	4.00	Soprano pipistrelle	F	P			HT2	
167	4.00	Soprano pipistrelle	F	P				
168	4.00	Soprano pipistrelle	M					
	TR 8							
	21.25	Barbastelle	F	P				
	21.25	Barbastelle	F	P				
169	21.25	Barbastelle	F	?	39.7	9.4		6

08/06/2010
T2 Turf Pits

	Time	Species	Sex	Breeding Status	Forearm (mm)	Weight (g)	Trap	Tag no.
170	23.10	Common pipistrelle	F	P	32.1	6.2		
171	23.50	Common pipistrelle	M		29	4.8		
172	23.50	Natterer's bat	M		38.3	7.1		
173	0.00	Soprano pipistrelle	M		30	4.4		
174	0.30	Barbastelle	M		38	8.1		7
175	1.30	Common pipistrelle	F	P	30.4	5.8		
176	1.30	Soprano pipistrelle	F	P	30	5.7		
177	1.30	Soprano pipistrelle	F	P	-			

Table A2 Description of roosts used by tracked bats. agl = above ground level; DBH = diameter at breast height.

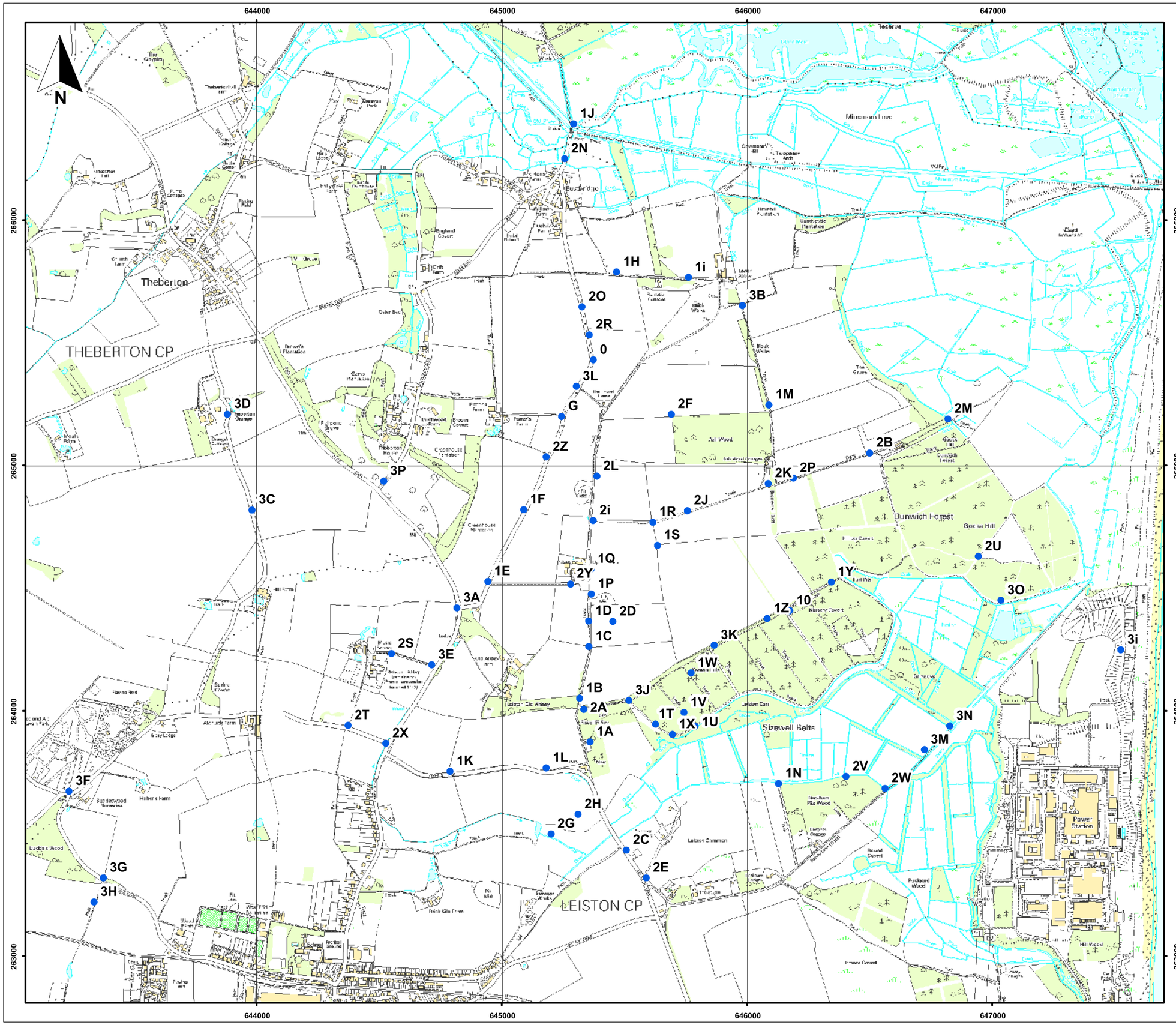
Roost no.	Bat no.	Area	Tree/Building	Species	DBH (cm)	Height (m agl)	Description of roost feature
R1	1 + 2	east-west track	Tree	Oak	c.90	5m	Rotten branch with flaking bark on branch and trunk c 5m agl SSE facing
R2	2	east-west track	Tree	Oak	80	c.4m	Split bark on forked limb SSE facing. Both forks have potential.
R3	3,4	Ash Wood	Tree	oak	100	4-8m	Peeling bark on northern forked limb (4m-8M). Signal loudest on NW side @ 4.5m AGL.
R4	3	Grimseys	NA	NA	NA	NA	Area around Grimseys - roost location not known
R5	3	The Grove	Tree	Oak	38	3-6m	Flaking bark on vertical stem
R6	5	Greenhouse Plantation	Tree	Dead tree	40	7 - 8m	Dead flaking bark on trunk , bat on north-west side at c7m agl
R7	1	The Grove	Tree	Oak	90	10m	Tree is full of potential features from 3m agl to top c 16m agl. Main feature where bats roosting torn off limb on north side with deep fissure, 10m agl
R8	5 + 6	The Grove	Tree	Oak	60	3m	Loose bark below split limb on Eastern side. Several access holes noted
R9	5 + 6	Ash Wood	Tree	Oak	c.80	6-8m	Key features are splitting limbs and loose bark towards the top of the tree (radio signal was stongest higher up). Cracks in bark also noted lower down plus woodpecker hole on S face @ c.6-8m.
R10	7	Wood Farm Barn	Barn				Barn with timber weatherboarding and corrugated metal roof
R11	6	Nursery Covert	Tree	Dead elm	c.30	3-5m	Loose bark towards the top of the tree and woodpecker hole on S face @ c.4m
R12	5	Hangman's Wood	Tree	Oak	c.100	3-4m	Features throughout including splits and fissures. NB large cavity and split on e face of main stem.
R13	5 +6	Ash Wood	Tree	Oak	c.80	4-6m	Main feature is split horizontal limb that extends north from main stem @ c.5m and then upwards.

Table A3 Trapping locations of tagged bats and details of their roost use.

Bat no.	Sex	01/06/10	02/06/10	03/06/10	04/06/10	05/06/10	06/06/10	07/06/10	08/06/10	09/06/10	10/06/10	11/06/10	12/06/10
1	F	Caught Fiscal Policy	R1	R3	R3	R3	R7	Tag off					
2	F	Caught Fiscal Policy	R1	R2	R3	R3	Tag off						
3	F		Caught Turf Pits	R4	R5	Tag off							
4	F		Caught R1	R3	R3	R3	Tag off						
5	F					Caught R3	R6	R8	R6	R9	R12	R13	R13
6	F							Caught R8	R4	R9	R11	R13	R13
7	M								Caught Turf Pits	Not found	R10	R10	Tag off

Table A4 Summary of home range sizes for tagged barbastelles.

Bat no	MCP	Kernel	Cluster
1	160.1	182.3	76.3
2	75.7	101.1	15.4
3	41.7	64.9	41.7
4	34.0	39.2	4.4
5	388.4	410.1	175.2
6	259.3	329.7	98.8
7	111.7	653.3	111.6



Key:

- Vantage point 2V

0.4 0.2 0 0.4 Kilometres

Scale: 1:15000 @ A3

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EDF

Sizewell Bat Report 2010

Figure A1
Vantage points

January 2011
28130-A51.mxd tugwc

Entec

643000 644000 645000 646000 647000

267000 266000 265000 264000 263000

N

R12 R3 R9 R8 R7 R5 R13 R6 R11 R2 R4 R1 R10

T3 T4 T5 T5 T2 T3 T1 T7 T6

Theberton

THEBERTON CP

Dunwich Forest

Sizewell Belts

LEISTON CP

Key:

R1 Roost 1

T1 Mist net/harp trap trapping location 1

0.4 0.2 0 0.4 Kilometres

Scale: 1:16000 @ A3

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EDF

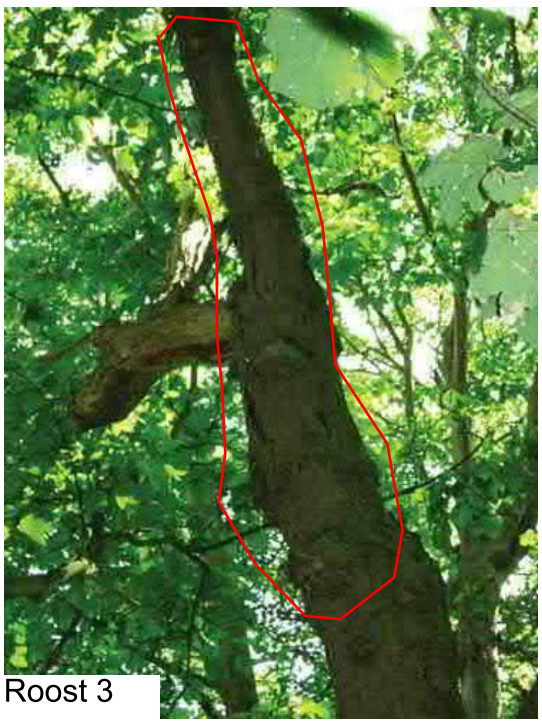
Sizewell Bat Report 2010

Figure A2
Roosts and trapping locations

January 2011
28130-A52.mxd tugwc

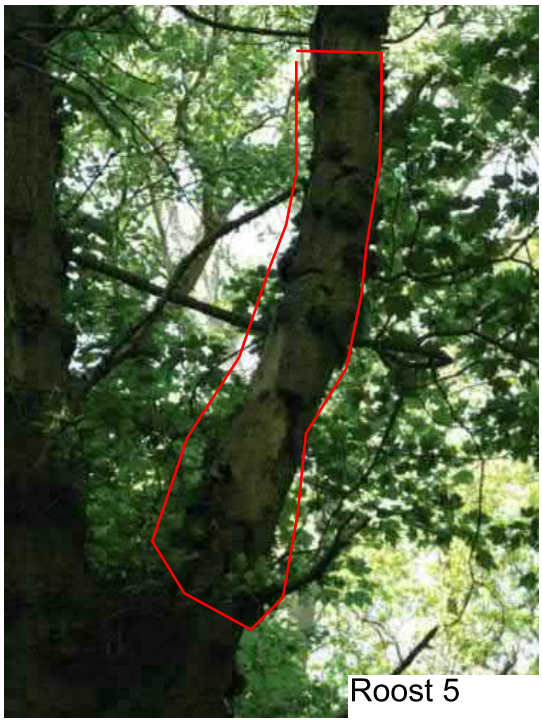
Entec

Figure 3 Sizewell Tree Roosts



Roost 5

Roost 5



Roost 5

Roost 6

Roost 6

Roost 6

Roost 7

Roost 7

Roost 7

Roost 8

Roost 9

Roosting/
Emergence area

Roost 9

Roost 11

Roost 11

Roost 12

Roost 12

Roost 13

643000 644000 645000 646000 647000

267000 266000 265000 264000 263000

N

R12 R3 R9 R13 R8 R7 R5 R6 R11 R2 R1 R4 R10

1.3 1.28 1.4 1.29 1.10 1.19 1.9 1.17 1.14 1.8 T1 1.16 1.13 1.20 1.15 1.12 1.7 1.6 1.11 1.5 1:31 1:32 1.3 1.21 1.5 1.22

Theberton

THEBERTON CP

Dunwich Forest

Sizewell Belts

LEISTON CP

Key:

- Roosts used by other barbastelles
- Roosts used by bat 1
- T1 — Mist net/harp trap trapping location 1 - bat 1 caught here
- ▲1.21 — Bat 1 joint bearing triangulation point 21
- Close tracking area
- 95% kernel analysis
- 95% cluster analysis
- 95% MCP analysis

0.4 0.2 0 0.4 Kilometres

Scale: 1:16000 @ A3

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Sizewell Bat Report 2010

Figure A4
Bat 1 - triangulation points

January 2011
28130-A53.mxd tugwc

Entec

643000 644000 645000 646000 647000

267000 266000 265000 264000 263000

N

R12 R3 R9 R13 R6 R10 R1 R2 R4 R5 R7 R8 R11

2.33 2.32 2.30 2.25 2.4 2.2 2.3 2.24 2.5 2.21 2.6 2.1 2.22 2.23 2.26 2.13 2.9 2.11 2.31 2.17 2.15 2.16 2.18 2.8 2.14 2.10 2.19 2.7 2.12 T1 2.20

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THEBERTON CP

Dunwich Forest

Sizewell Belts

LEISTON CP

Power Station

Key:

- Roosts used by other barbastelles
- Roosts used by bat 2
- T1 — Mist net/harp trap trapping location 1 - bat 2 caught here
- ▲ 2.13 — Bat 2 joint bearing triangulation point 13
- ● 2.31 — Bat 2 additional point 31
- 95% kernel analysis
- 95% cluster analysis
- 95% MCP analysis

0.4 0.2 0 0.4 Kilometres

Scale: 1:16000 @ A3

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Sizewell Bat Report 2010

Figure A5
Bat 2 - triangulation points

January 2011
28130-A54.mxd tugwc

Entec

643000 644000 645000 646000 647000

267000 266000 265000 264000 263000

N

R12 R3 R9 R13 R8 R7 R5 R6 R11 T2 R2 R1 R4 R10

3.1 3.2 3.3 3.4 3.5 3.6

Theberton

THEBERTON CP

Dunwich Forest

Sizewell Belts

LEISTON CP

Key:

- Roosts used by other barbastelles
- Roosts used by bat 3
- T2 — Mist net/harp trap trapping location 1 - bat 3 caught here
- ▲ 3.1 — Bat 3 joint bearing triangulation point 1
- 95% kernel analysis
- 95% cluster analysis
- 95% MCP analysis

0.4 0.2 0 0.4 Kilometres

Scale: 1:16000 @ A3

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EDF

Sizewell Bat Report 2010

Figure A6
Bat 3 - triangulation points

January 2011
28130-A55.mxd tugwc

Entec

643000 644000 645000 646000 647000

267000 266000 265000 264000 263000

N

R12

R13 R3 R9 R8 R7 R5

4.9 4.1

R6 R11 4.6

4.8 4.7 R2

4.2

R1 R4

R10

Theberton

THEBERTON CP

LEISTON CP

Dunwich Forest

Sizewell Belts

Key:

- Roosts used by other barbastelles
- Roosts used by bat 4
- ▲4.2 Bat 4 joint bearing triangulation point 2
- ●4.8 Bat 4 additional point 8
- 95% kernel analysis
- 95% cluster analysis
- 95% MCP analysis

0.4 0.2 0 0.4 Kilometres

Scale: 1:16000 @ A3

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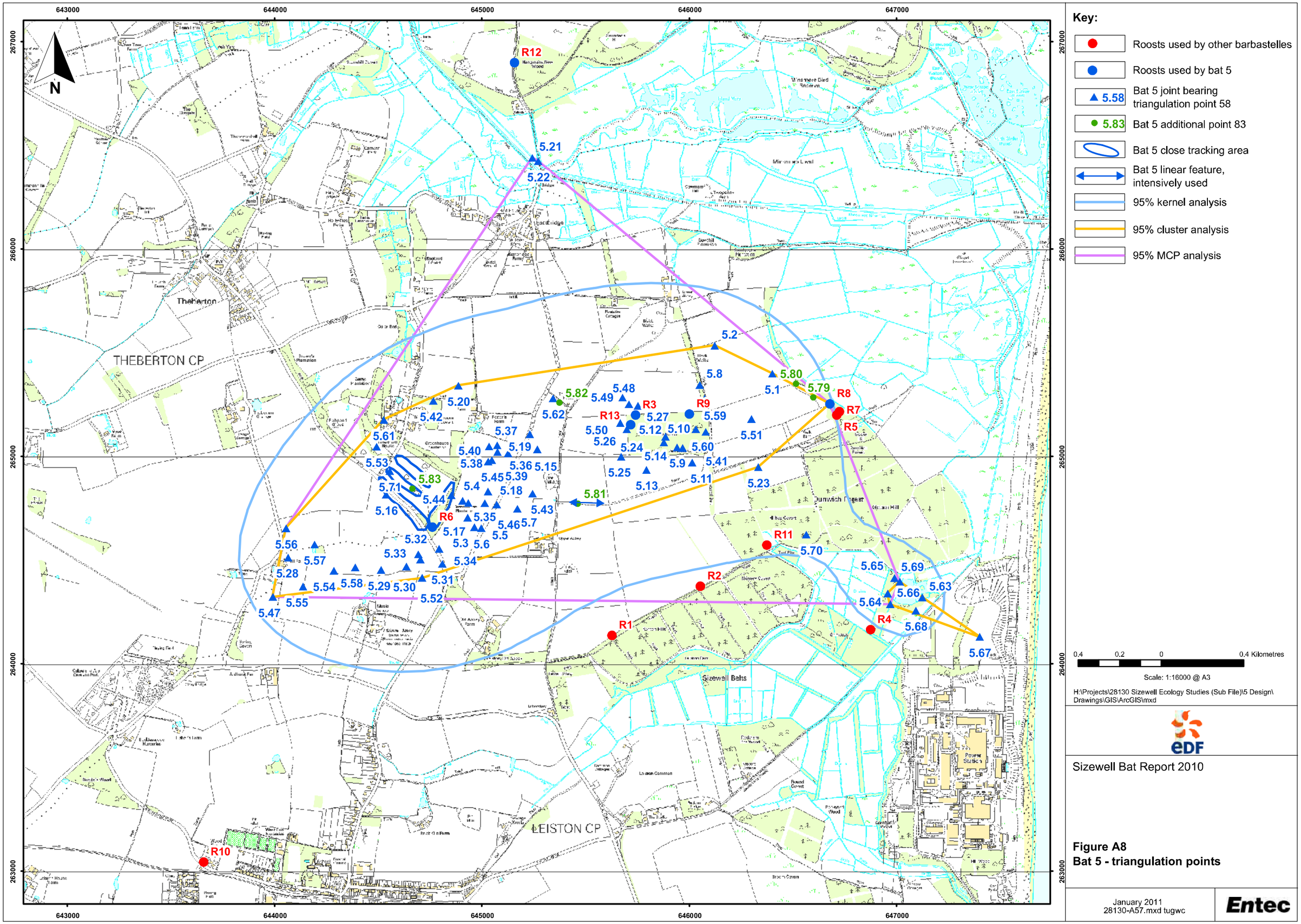
eDF

Sizewell Bat Report 2010

Figure A7
Bat 4 - triangulation points

January 2011
28130-A56.mxd tugwc

Entec



Key:

- Roosts used by other barbastelles
- Roosts used by bat 5
- 5.58 — Bat 5 joint bearing triangulation point 58
- 5.83 — Bat 5 additional point 83
- Bat 5 close tracking area
- Bat 5 linear feature, intensively used
- 95% kernel analysis
- 95% cluster analysis
- 95% MCP analysis

0.4 0.2 0 0.4 Kilometres

Scale: 1:16000 @ A3

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EDF

Sizewell Bat Report 2010

Figure A8
Bat 5 - triangulation points

January 2011
28130-A57.mxd tugwc

Entec

643000 644000 645000 646000 647000

267000 266000 265000 264000 263000

N

R12 R3 R13 R9 R8 R7 R5 R6 R11 R2 R1 R4 R10

6.7 6.4 6.6 6.5 6.29 6.2 6.13 6.65 6.57 6.41 6.1 6.33 6.28 6.3 6.49 6.17 6.22 6.32 6.25 6.24 6.20 6.18 6.52 6.40 6.23 6.47 6.30 6.42 6.27 6.21 6.19 6.43 6.38 6.37 6.48 6.54 6.46 6.10 6.53 6.55 6.14 6.51 6.36 6.26 6.31 6.9 6.24 6.16 6.56 6.45 6.11 6.50 6.15 6.39 6.35 6.27 6.12 6.34 6.8 6.63 6.64

Theberton

THEBERTON CP

Sizewell Belts

LEISTON CP

Power Station

0.4 0.2 0 0.4 Kilometres

Scale: 1:16000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

Key:

- Roosts used by other barbastelles
- Roosts used by bat 6
- ▲ 6.42 Bat 6 joint bearing triangulation point 42
- 6.65 Bat 6 additional point 65
- 95% kernel analysis
- 95% cluster analysis
- 95% MCP analysis

Sizewell Bat Report 2010

Figure A9
Bat 6 - triangulation points

January 2011
28130-A58.mxd tugwc

Entec

643000 644000 645000 646000 647000

267000 266000 265000 264000 263000

N

R12 R6 R11 T2 R2 R1 R4 R10 R3 R13 R9 R8 R7 R5

Theberton

THEBERTON CP

LEISTON CP

Sizewell Belts

Dunwich Forest

Power Station

Key:

- Roosts used by other barbastelles
- Roosts used by bat 7
- T2 — Mist net/harp trap trapping location 2 - bat 7 caught here
- ▲7.2 — Bat 7 joint bearing triangulation point 2
- 95% kernel analysis
- 95% cluster analysis
- 95% MCP analysis

0.4 0.2 0 0.4 Kilometres

Scale: 1:16000 @ A3

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Sizewell Bat Report 2010

Figure A10
Bat 7 - triangulation points

January 2011
28130-A59.mxd tugwc

Entec

643000 644000 645000 646000 647000

267000 266000 265000 264000 263000

N

Theberton

THEBERTON CP

Leiston Abbey

Sizewell Belts

Power Station

LEISTON CP

Key:

- Bat 1 95% MCP analysis
- Bat 2 95% MCP analysis
- Bat 3 95% MCP analysis
- Bat 4 95% MCP analysis
- Bat 5 95% MCP analysis
- Bat 6 95% MCP analysis

0.4 0.2 0 0.4 Kilometres

Scale: 1:16000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

Sizewell Bat Report 2010

Figure A11
MCPs breeding female barbastelles

January 2011
28130-A60.mxd tugwc

Entec

643000 644000 645000 646000 647000

267000 266000 265000 264000 263000

N

Theberton

THEBERTON CP

Eastbridge

Minsmere Level

Minsmere Bird Reserve

Dunwich Forest

Sizewell Belts

LEISTON CP

Power Station

Key:

- Bat 1 95% kernel analysis
- Bat 2 95% kernel analysis
- Bat 3 95% kernel analysis
- Bat 4 95% kernel analysis
- Bat 5 95% kernel analysis
- Bat 6 95% kernel analysis

0.4 0.2 0 0.4 Kilometres

Scale: 1:16000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

Sizewell Bat Report 2010

Figure A12
Kernels breeding female barbastelles

January 2011
28130-A61.mxd tugwc

Entec

643000 644000 645000 646000 647000

267000 266000 265000 264000 263000

N

Theberton

THEBERTON CP

Leiston

Sizewell Belts

LEISTON CP

Dunwich Forest

Minsmere Level

Minsmere Bird Reserve

Key:

- Bat 1 95% cluster analysis
- Bat 2 95% cluster analysis
- Bat 3 95% cluster analysis
- Bat 4 95% cluster analysis
- Bat 5 95% cluster analysis
- Bat 6 95% cluster analysis

0.4 0.2 0 0.4 Kilometres

Scale: 1:16000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

EDF

Sizewell Bat Report 2010

Figure A13
Clusters breeding female barbastelles

January 2011
28130-A62.mxd tugwc

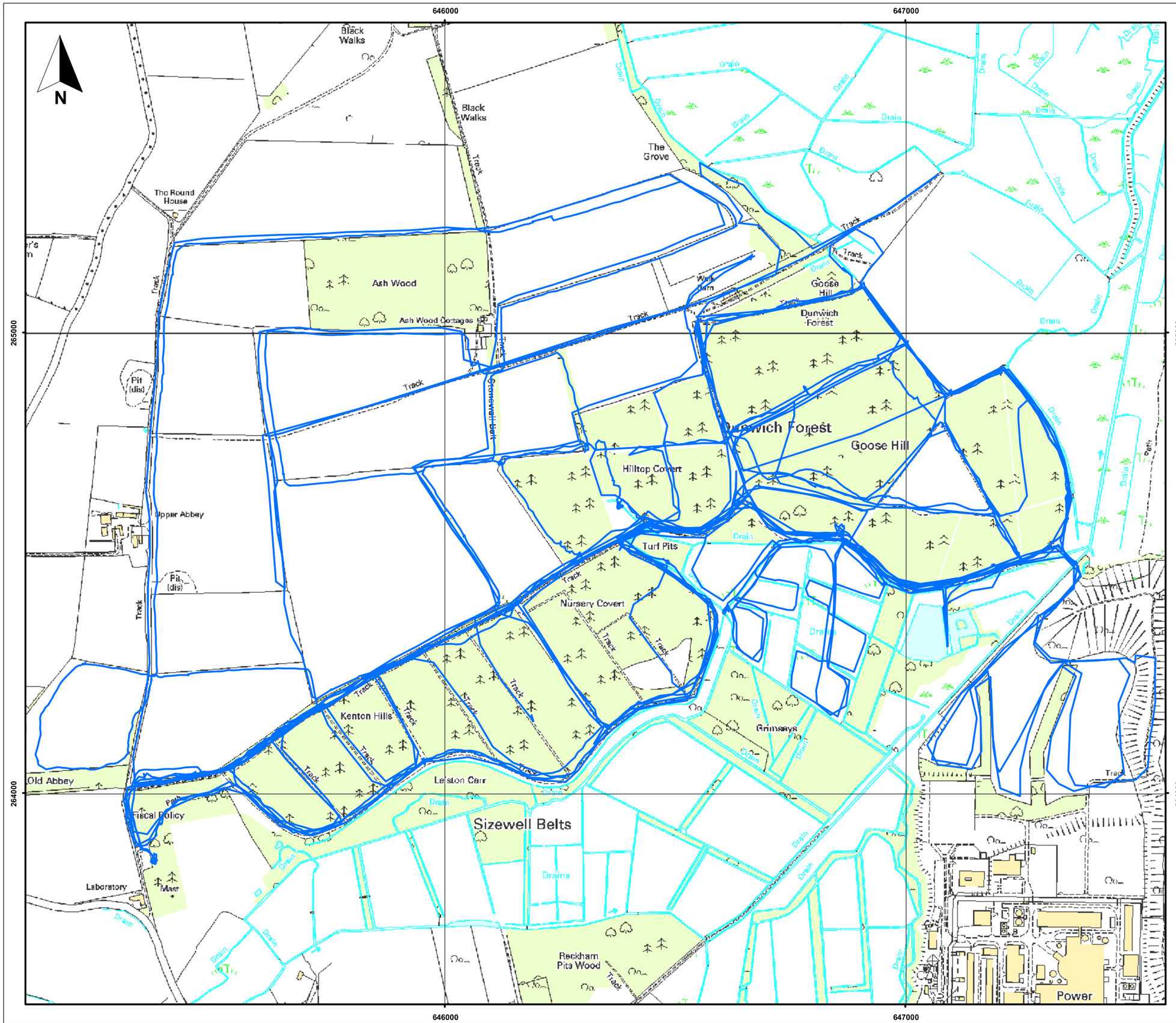
Entec

Appendix B
Walked Transect Results

2 Pages

Table B1 Number of passes, relative activity (B/h) and species recorded during each walked transect

Date	14/04/10	04/05/10	18/05/10	02/06/10	15/06/10	07/07/10	20/07/10	02/08/10	18/08/10	02/09/10	16/09/10	Total	B/h	% of total
Myotis sp.	3	1	1	27	17	21	10	2	3	10	1	**96**	**3.6**	**8.4**
Noctule			1		1			1	1		12	**16**	**0.6**	**1.4**
Nyctalus sp.							1					**1**	**0.0**	**0.1**
Leisler's bat			1			6		2				**9**	**0.3**	**0.8**
Leisler's bat/ serotine						3						**3**	**0.1**	**0.3**
Serotine						5		3	6			**14**	**0.5**	**1.2**
Common pipistrelle	4	5	25	110	12	20	15	36	87	25	64	**403**	**15.3**	**35.1**
Common/soprano pipistrelle		2	2	55	4	3	5	17	9	18	2	**117**	**4.4**	**10.2**
Soprano pipistrelle	5	4	27	59	49	36	56	28	54	83	58	**459**	**17.4**	**40.0**
Common/Nathusius' pipistrelle				6								**6**	**0.2**	**0.5**
Nathusius' pipistrelle									1			**1**	**0.0**	**0.1**
Brown long-eared bat	1						1	1	1		2	**6**	**0.2**	**0.5**
Barbastelle	1					2		2	2		5	**12**	**0.5**	**1.0**
Grand Total	**14**	**12**	**57**	**258**	**83**	**96**	**88**	**94**	**164**	**136**	**144**	**1147**		
Survey duration (min)	**120**	**139**	**155**	**148**	**125**	**135**	**185**	**139**	**148**	**132**	**155**	**1581**		
Total *B/Hr*	**7.0**	**5.2**	**22.1**	**104.6**	**39.8**	**42.7**	**28.5**	**40.6**	**66.5**	**61.8**	**55.7**	**43.5**		



Key:

Transect route

0.2 0.1 0 0.2 Kilometres

Scale: 1:8000 @ A3

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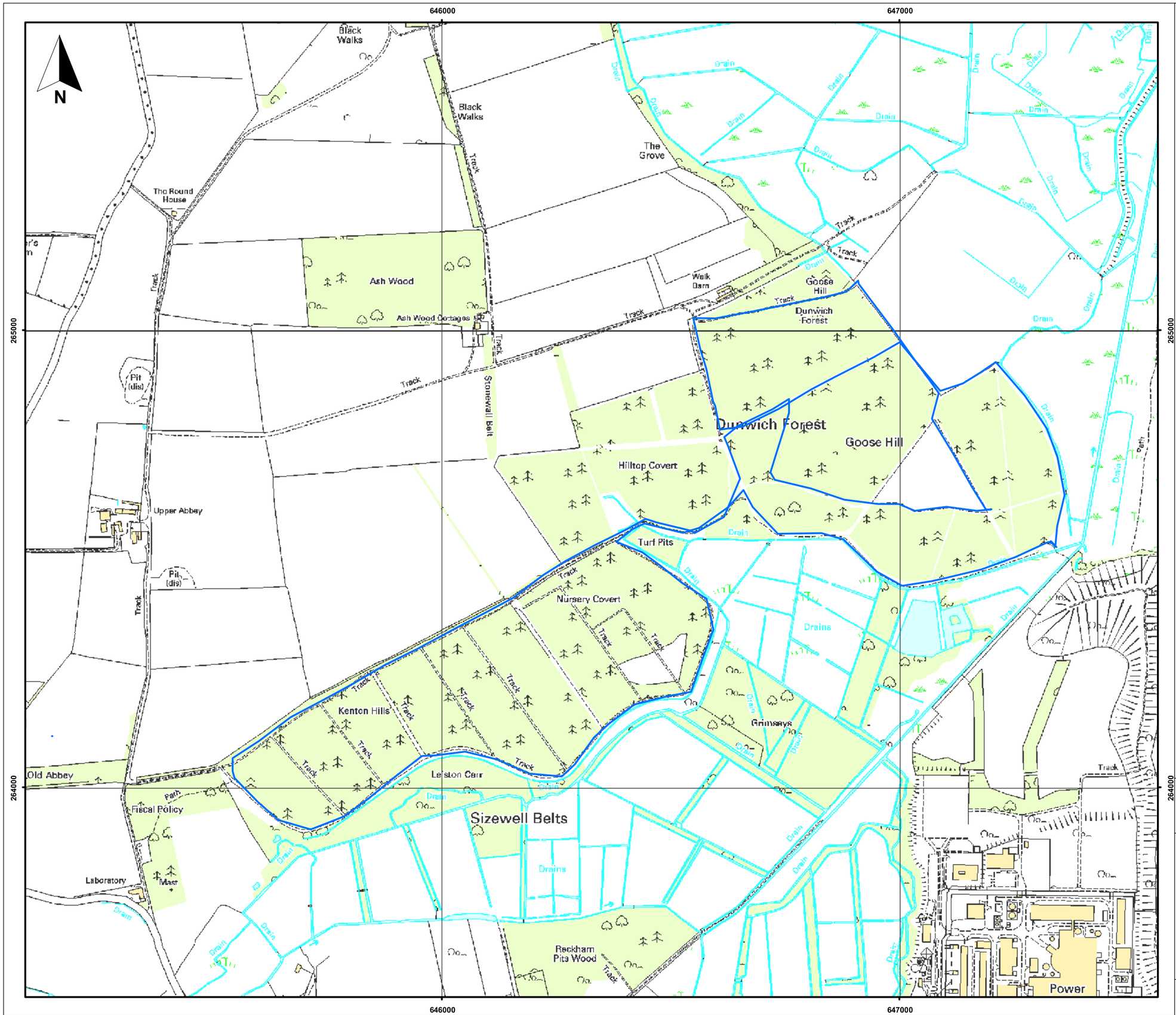
Sizewell Bat Report 2010

Figure B1
Combined 2010 walked transect bat survey routes

January 2011
28130-A63.mxd tugwc

Entec



Key:

Transect route

0.2 0.1 0 0.2 Kilometres

Scale: 1:8000 @ A3

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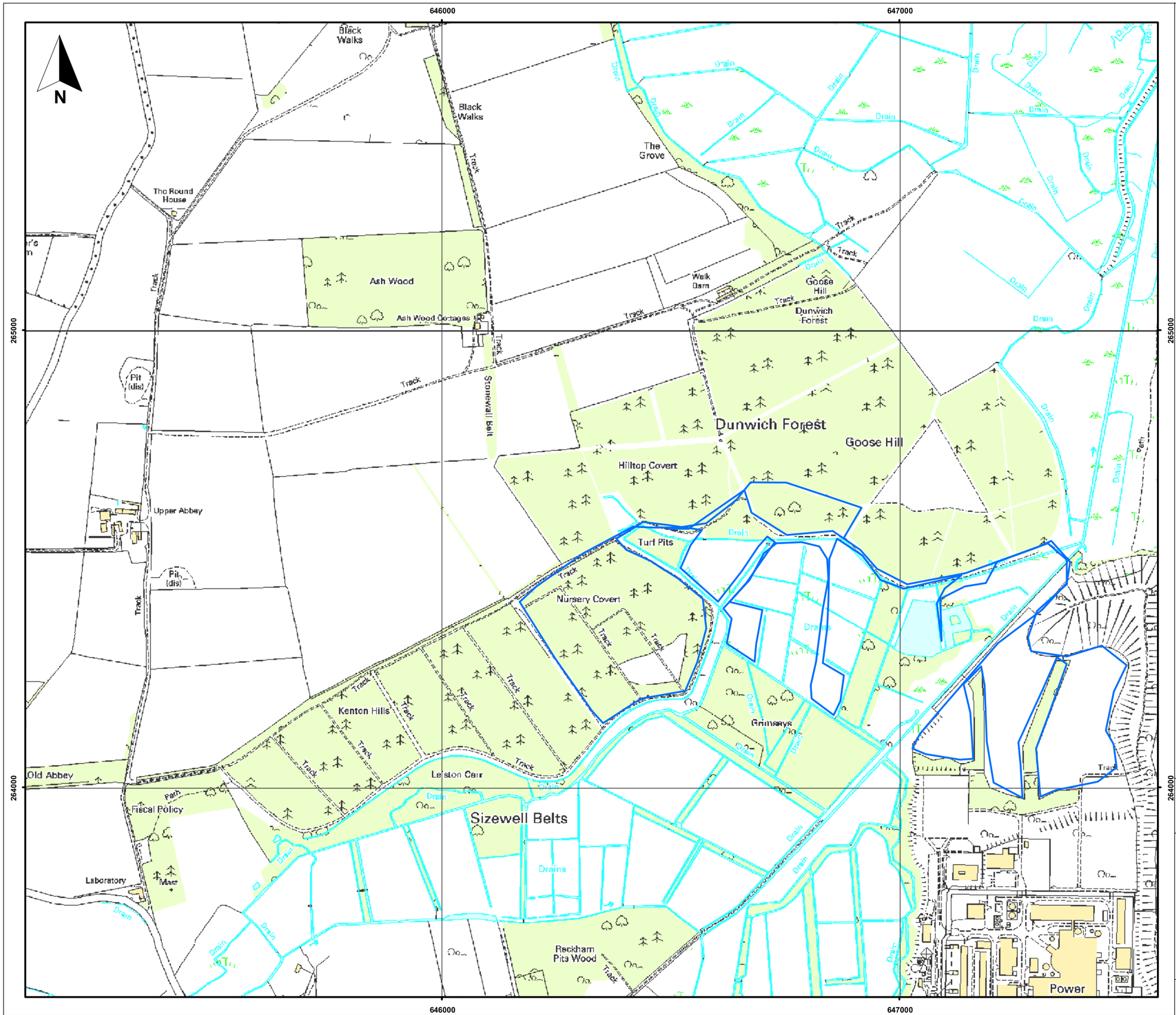
Sizewell Bat Report 2010

Figure B2
Walked transect T1

January 2011
28130-A64.mxd tugwc

Entec



Key:

Transect route

0.2 0.1 0 0.2 Kilometres

Scale: 1:8000 @ A3

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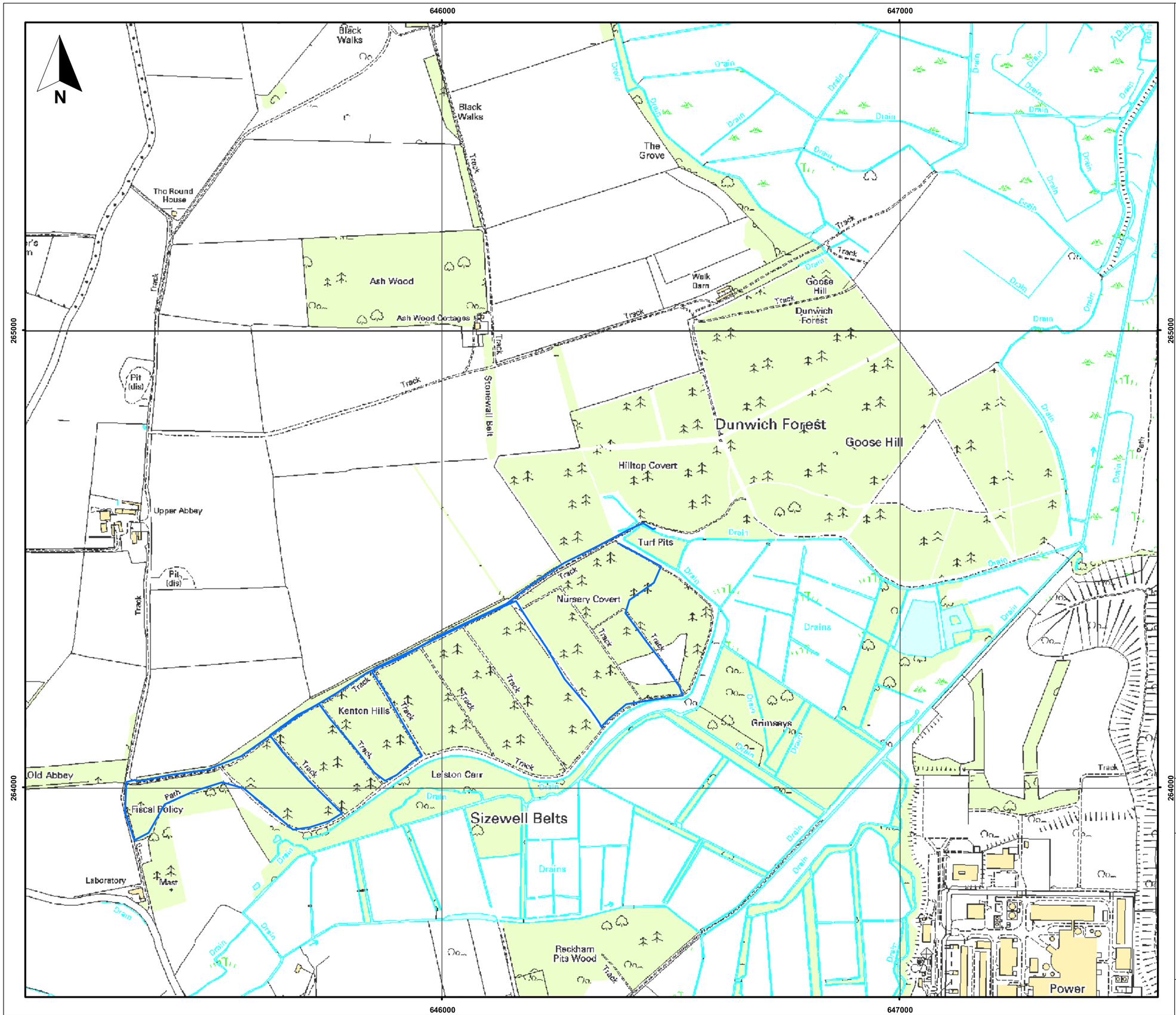
Sizewell Bat Report 2010

Figure B3
Walked transect T2

January 2011
28130-A65.mxd tugwc

Entec



Key:

Transect route

0.2 0.1 0 0.2 Kilometres

Scale: 1:8000 @ A3

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Sizewell Bat Report 2010

Figure B4
Walked transect T3

January 2011
28130-A66.mxd tugwc

646000
647000
265000
264000
N
Black Walks
The Round House
Ash Wood
Ash Wood Cottages
Track
Stonewall Belt
Pit (dis)
Upper Abbey
Old Abbey
Fiscal Policy
Path
Laboratory
Mast
Kenton Hills
Leiston Carr
Sizewell Belts
Drains
Drain
Reckham Pits Wood
Nursery Covert
Turf Pits
Hilltop Covert
Dunwich Forest
Goose Hill
The Grove
Walk Barn
Grimseys
Power
Path

Key:

Transect route

0.2 0.1 0 0.2 Kilometres

Scale: 1:8000 @ A3

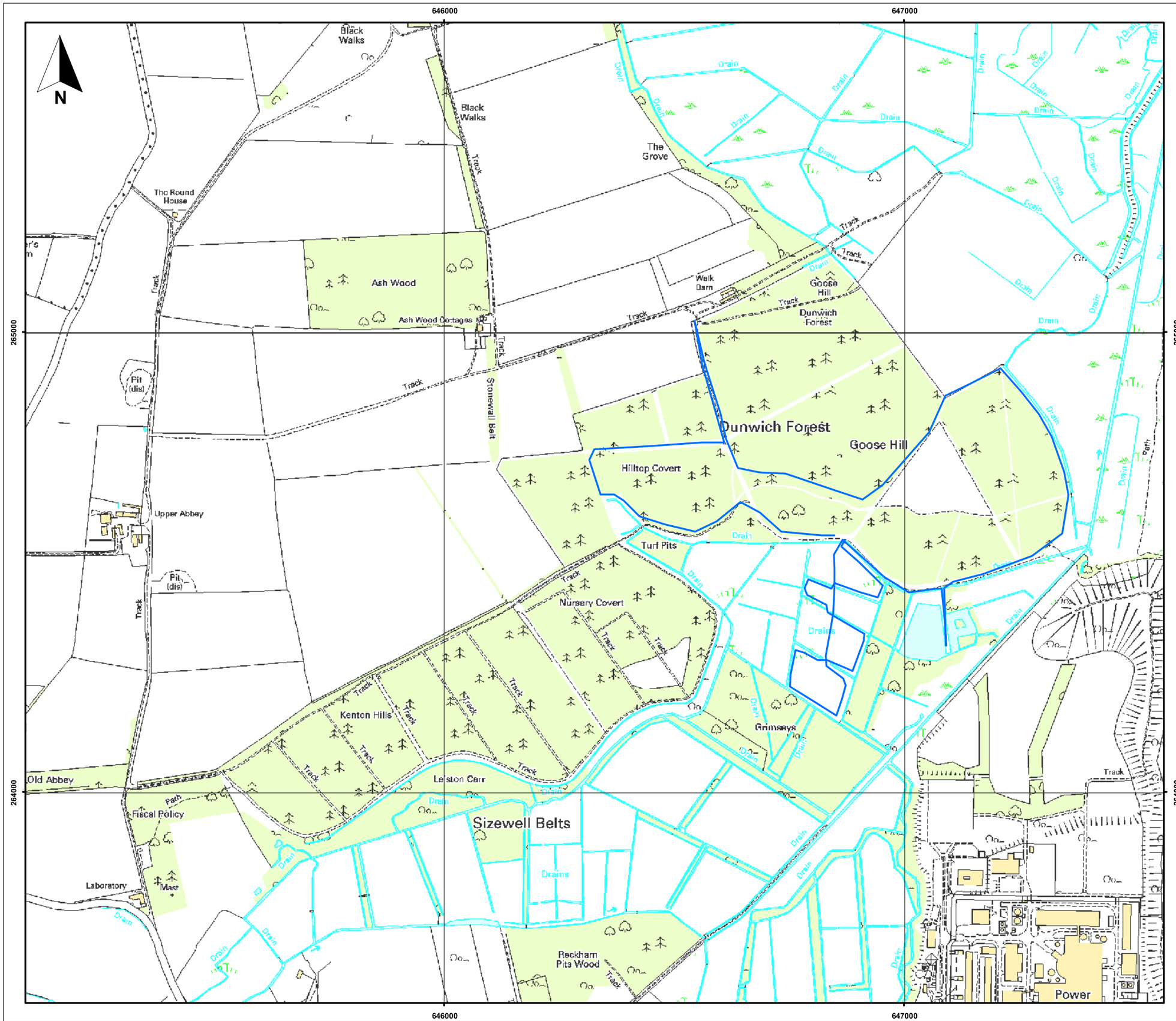
H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

Sizewell Bat Report 2010

Figure B5
Walked transect T4

January 2011
28130-A67.mxd tugwc

Entec



Key:

Transect route

0.2 0.1 0 0.2 Kilometres

Scale: 1:8000 @ A3

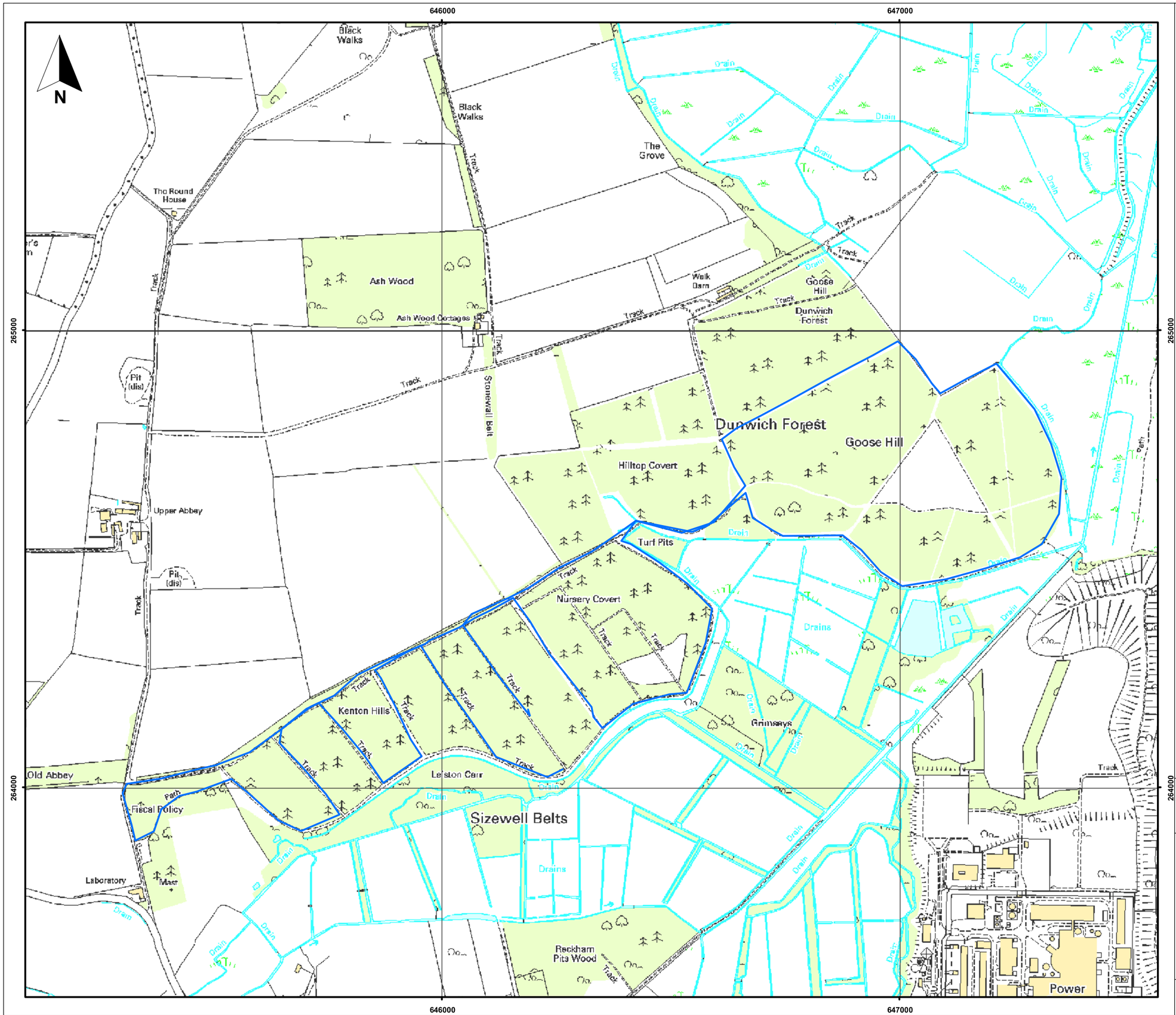
H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

Sizewell Bat Report 2010

Figure B6
Walked transect T5

January 2011
28130-A68.mxd tugwc

Entec



Key:

Transect route

0.2 0.1 0 0.2 Kilometres

Scale: 1:8000 @ A3

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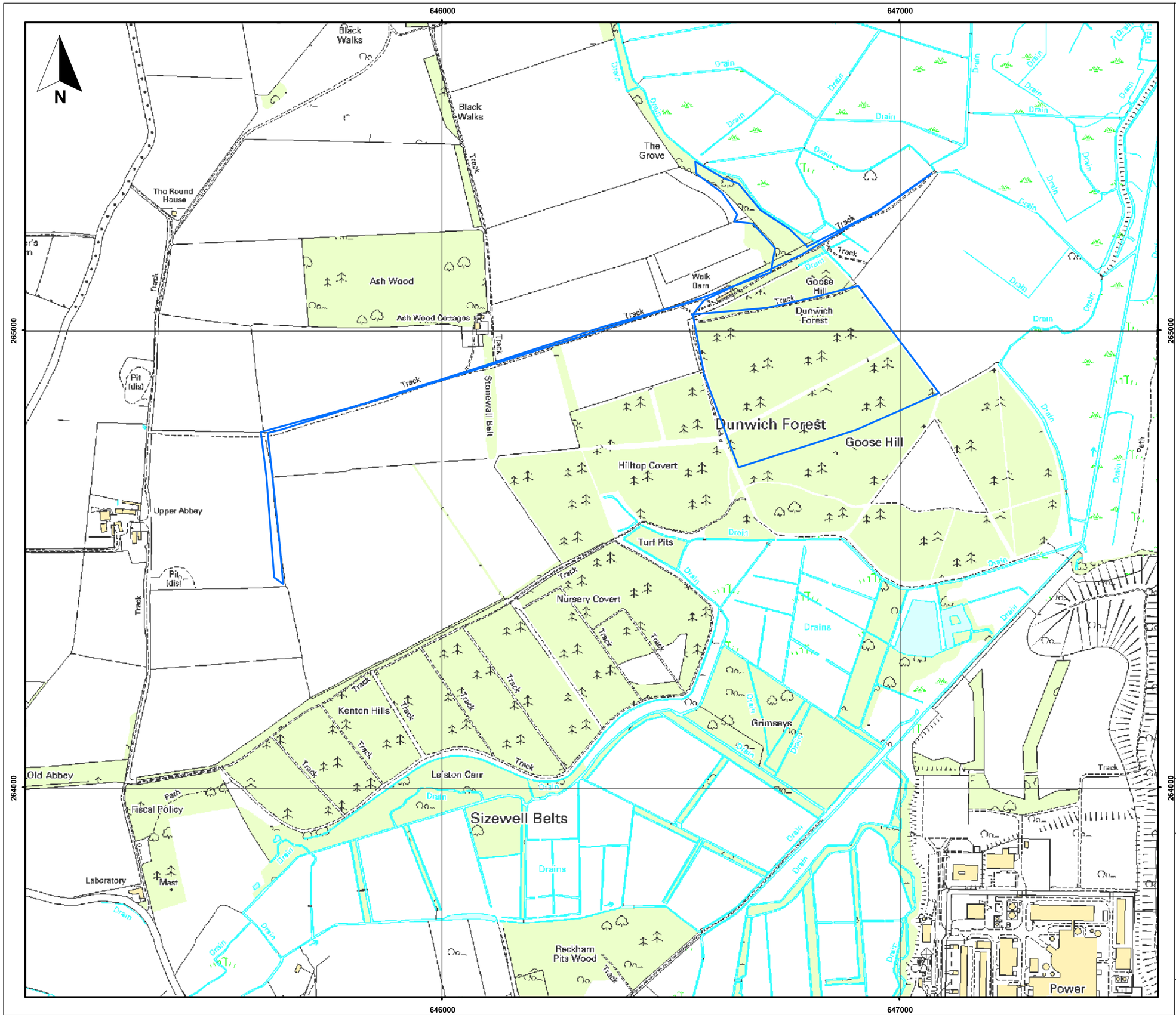
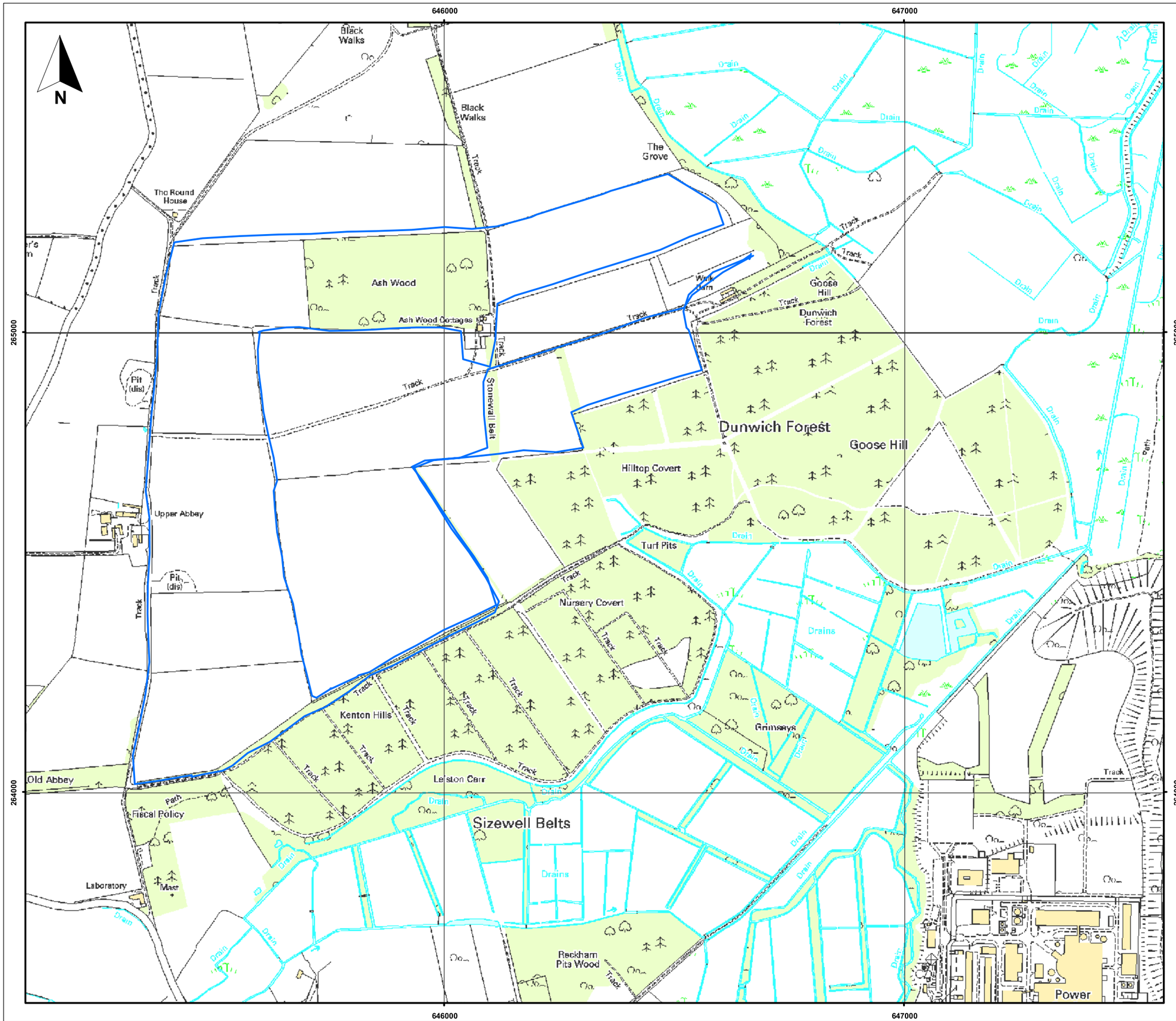
Sizewell Bat Report 2010

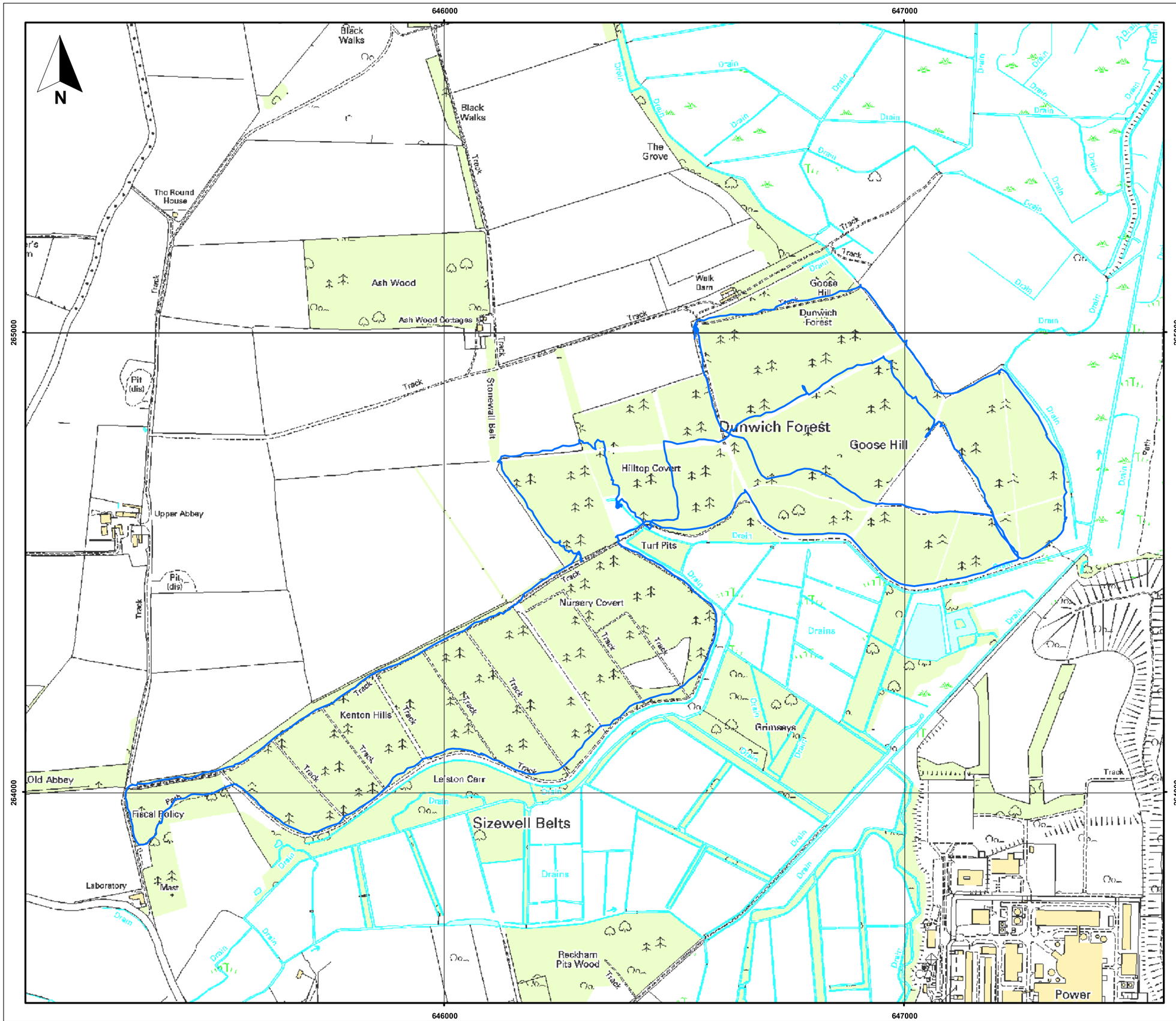
Figure B7
Walked transect T6

January 2011
28130-A69.mxd tugwc

Entec







Key:

Transect route

0.2 0.1 0 0.2 Kilometres

Scale: 1:8000 @ A3

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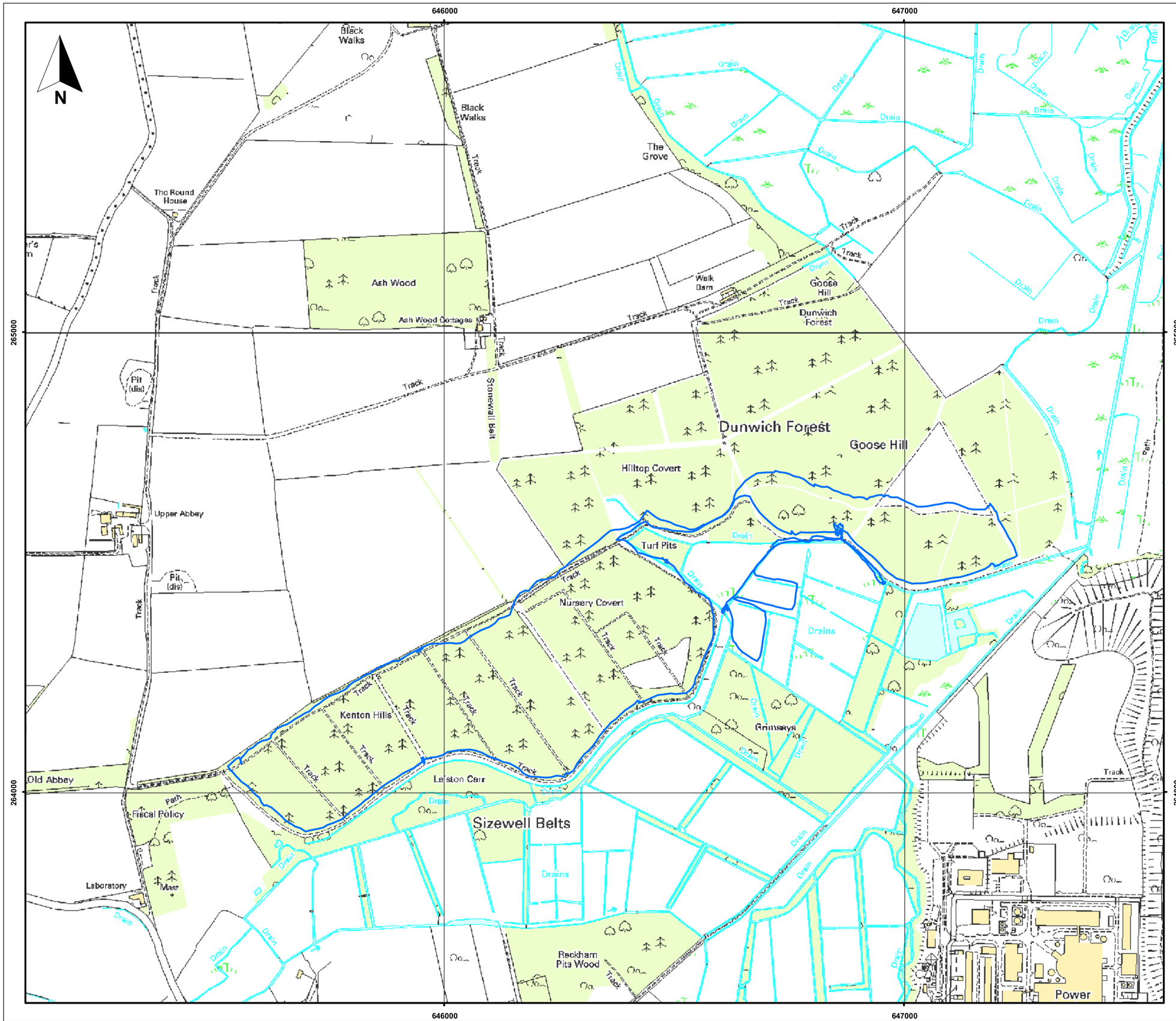
Sizewell Bat Report 2010

Figure B10
Walked transect T9

January 2011
28130-A72.mxd tugwc

Entec



Key:

Transect route

0.2 0.1 0 0.2 Kilometres

Scale: 1:8000 @ A3

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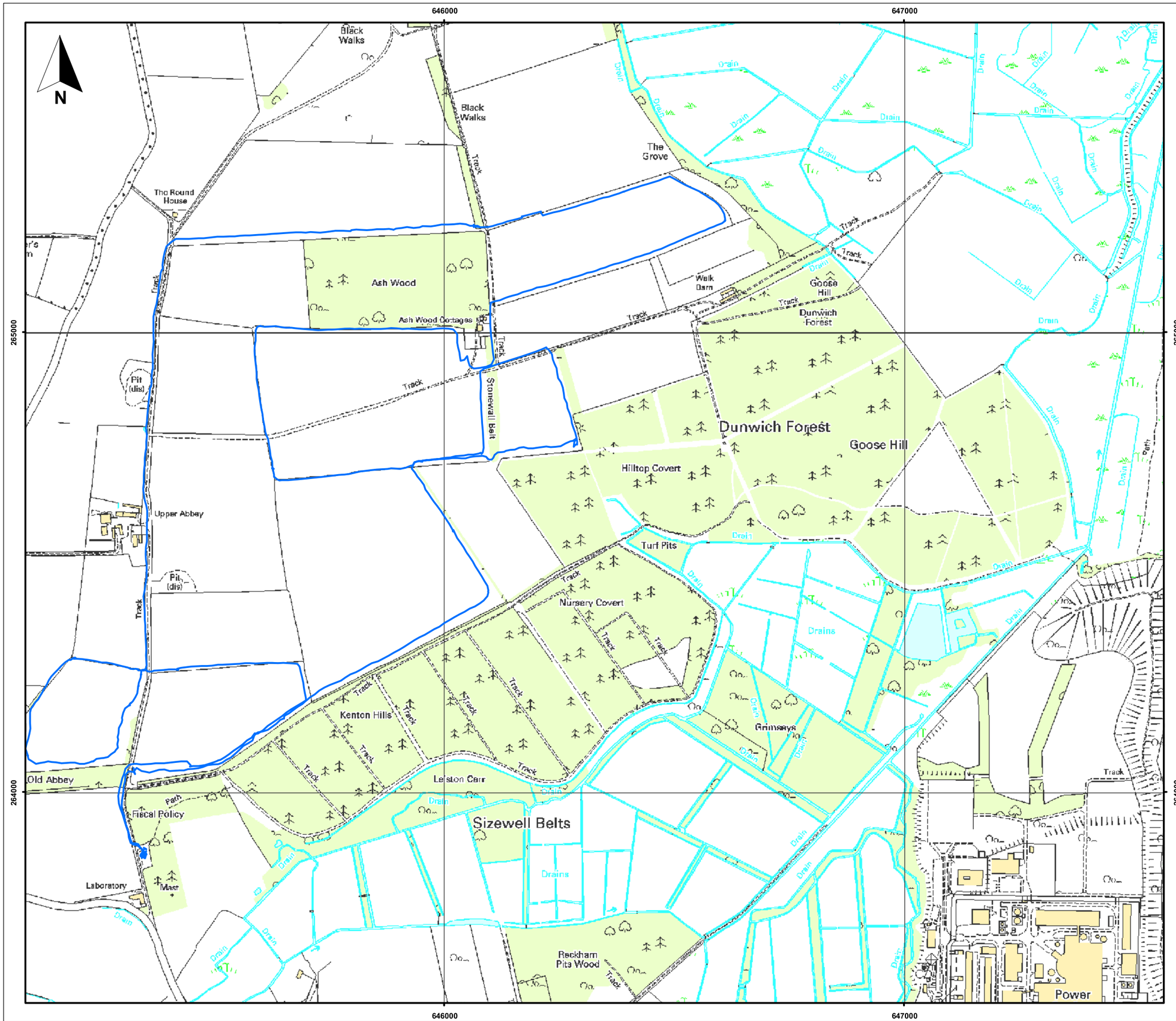
Sizewell Bat Report 2010

Figure B11
Walked transect T10

January 2011
28130-A73.mxd tugwc

Entec



Key:

Transect route

0.2 0.1 0 0.2 Kilometres

Scale: 1:8000 @ A3

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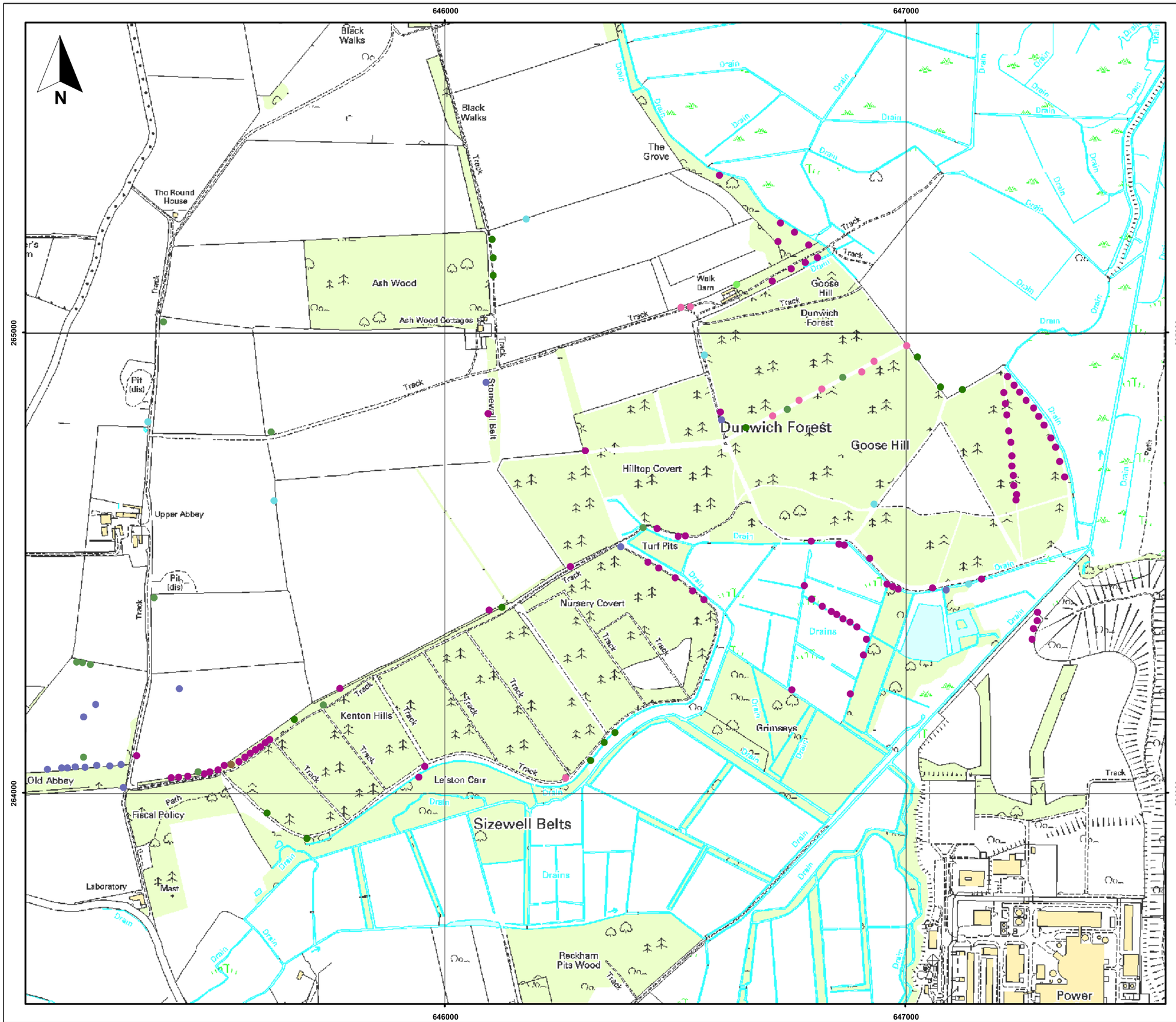
Sizewell Bat Report 2010

Figure B12
Walked transect T11

January 2011
28130-A74.mxd tugwc

Entec



Key:

- Barbastelle
- Barbastelle query
- Brown long-eared
- Leisler's
- Noctule
- *Nyctalus*
- *Myotis*
- Serotine

0.2 0.1 0 0.2 Kilometres

Scale: 1:8000 @ A3

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Sizewell Bat Report 2010

Figure B13
Locations of bat passes recorded during 2010 walked transect surveys

January 2011
28130-A75.mxd tugwc

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Appendix C
Static Bat Detector Survey Results

6 Pages

Table C1 Static bat detector deployment dates and locations. The table also lists the three dates analysed for all bat calls from each deployment.

Period	Static	Location	Area	Deployed	Collected	Nights	Dates analysed for all bats
1	1a	Upper Abbey Track	1	14/04/2010	04/05/2010	20	25, 29 and 30 April
1	1b	Leiston Old Abbey	1	14/04/2010	05/05/2010	20	25, 28 and 30 April
1	1c	Belts south west	6	15/04/2010	06/05/2010	19	25, 28 and 29 April
1	1d	Belts south-east	6	15/04/2010	07/05/2010	19	18, 24 and 25 April
1	1e	Black Walks	1	14/04/2010	08/05/2010	20	25, 28 and 29 April
1	1f	The Grove - north	2	14/04/2010	09/05/2010	20	25, 29 and 30 April
1	2a	Sizewell Belts north	4	05/05/2010	18/05/2010	13	5, 15, and 16 May
1	2b	SSSI lake	4	05/05/2010	18/05/2010	14	5, 14, and 16 May
1	2c	Edge of Works	5	04/05/2010	18/05/2010	14	5, 9, and 16 May
1	2d	Works north-east	5	04/05/2010	18/05/2010	14	14, 15, and 16 May
1	2e	Works west	5	04/05/2010	18/05/2010	14	9, 14, and 16 May
1	2f	Car Park south	NA	04/05/2010	18/05/2010	14	5, 8 and 9 May
1	3a	off Upper Abbey track	1	19/05/2010	01/06/2010	14	28,29 and 30 May
1	3b	Goose Hill - east	2	18/05/2010	01/06/2010	14	19, 24 and 28 May
1	3c	Goose Hill - south	2	18/05/2010	01/06/2010	14	19, 20 and 29 May
1	3d	Goose Hill - central	2	18/05/2010	01/06/2010	14	19, 23 and 28 May
1	3e	The Grove	2	18/05/2010	01/06/2010	14	20, 24 and 26 May
1	3f	The Round House	1	19/05/2010	01/06/2010	14	23, 24 and 25 May
1	4a	Kenton Hills	3	01/06/2010	15/01/2010	15	1, 4 and 13 June
1	4b	Nursery Covert	3	01/06/2010	15/01/2010	14	11, 13 and 14 June
1	4e	Kenton Hills	3	01/06/2010	15/01/2010	14	3, 7 and 11 June
1	4f	Fiscal Policy	3	01/06/2010	15/01/2010	14	4, 11 and 14 June
1	5a	Belts north	4	15/06/2010	06/07/2010	21	25 and 28 June, 4 July
1	5b	Belts north	4	15/06/2010	06/07/2010	21	20, 21 and 25 June
1	5c	Goose Hill - NW	2	15/06/2010	06/07/2010	21	17 and 21June, 5 July
1	5d	Hilltop Covert	2	15/06/2010	06/07/2010	21	28 June, 4 and 5 July
1	5e	SW of Ash Wood	1	16/06/2010	06/07/2010	21	18 and 20 June, 4 July
2	1a	Goose Hill - SE	2	08/07/2010	19/07/2010	11	13, 14 and 16 July
2	1b	Goose Hill - east	2	08/07/2010	19/07/2010	11	07, 14 and 16 July
2	1c	SSSI ponds	4	08/07/2010	19/07/2010	12	12, 14 and 17 July
2	1d	Works - NW	5	08/07/2010	19/07/2010	12	07, 10 and 16 July

Table C1 (continued) Static bat detector deployment dates and locations. The table also lists the three dates analysed for all bat calls from each deployment.

Period	Static	Location	Area	Deployed	Collected	Nights	Dates analysed for all bats
2	1e	Belts south east	6	08/07/2010	19/07/2010	12	12, 13 and 14 July
2	1f	Belts south west	6	08/07/2010	19/07/2010	12	14, 16 and 18 July
2	2a	Goose Hill - NE	2	19/07/2010	02/08/2010	14	21, 24 and 28 July
2	2b	Stonewall Belt	1	19/07/2010	02/08/2010	13	20, 21 and 24 July
2	2c	Turf Pits - north edge	2	19/07/2010	02/08/2010	14	20, 26 and 30 July
2	2d	Hilltop Covert	2	19/07/2010	02/08/2010	14	29 and 30 July, 1 August
2	2e	Goose Hill - south	2	19/07/2010	02/08/2010	14	22, 29 and 31 July
2	3a	Upper Abbey track	1	02/08/2010	18/08/2010	16	04, 12, and 16 August
2	3b	Fiscal Policy	3	02/08/2010	18/08/2010	8	12, 13 and 16 August
2	3c	Kenton hills	3	02/08/2010	18/08/2010	16	3, 8 and 17 August
2	3d	edge of Grimseys	3	02/08/2010	18/08/2010	16	2, 3 and 14 August
2	3e	Arable tree line	1	02/08/2010	18/08/2010	16	8, 10 and 14 August
2	3f	Leiston Old Abbey	1	04/08/2010	18/08/2010	13	6, 9 and 17 August
2	4a	Works area - south	5	19/08/2010	02/09/2010	14	22, 30 August, 1 September
2	4b	Black Walks	1	19/08/2010	02/09/2010	14	24, 27 and 28 August
2	4c	east of Ash Wood	1	19/08/2010	02/09/2010	14	27 and 31 August, 1 September
2	4d	west of Ash Wood	1	19/08/2010	02/09/2010	14	19, 21 and 22 August
2	4e	south of Ash Wood	1	19/08/2010	02/09/2010	14	27, 30 and 231 August
2	4f	north of Kenton Hills	1	19/08/2010	02/09/2010	14	22 and 24 August, 1 September
2	5a	Southern Belts west	6	02/09/2010	16/09/2010	14	10, 11 and 13 September
2	5b	Northern Belts west	4	02/09/2010	16/09/2010	14	9, 10 and 11 September
2	5c	Southern Belts east	6	02/09/2010	16/09/2010	14	11, 12 and 15 September
2	5d	Goose Hill - east	2	02/09/2010	16/09/2010	14	4, 10 and 11 September
2	5e	Belts - NE	4	02/09/2010	16/09/2010	14	2, 4 and 7 September
2	5f	edge of Grimseys	3	02/09/2010	16/09/2010	14	4, 7 and 10 September

Table C2 Static bat detector deployment codes, minimum number of species recorded at each and relative activity rate for bats (B/h) recorded at each location. Abbreviations have been used for different bat species/categories s follows: *Nyctalus* = noctule or Leisler's bat, BLE = brown long-eared bat, Pip45 = common pipistrelle, Pip55 = soprano pipistrelle, Pip50 = common/ soprano pipistrelle, Pip-nat = Nathusius' pipistrelle. For barbastelle all data were used to calculate relative activity.

Period	Static	Minimum no. species	All bats	*Myotis*	Noctule	Leislers	*Nyctalus*	BLE	Pip45	Pip50	Pip55	Pip-nat	Serotine	Barbastelle
1	1a	7	18.2	0.14			0.04		8.78	0.11	2.99	0.04	6.12	0.06
1	1b	9	16.51	0.5	0.22	0.75	0.11	0.07	10.87	0.43	3.44	0.04	0.07	0.21
1	1c	3	6.91		0.04				1.11	2.58	3.19			
1	1d	8	11.78	0.21	2.81	0.35	1.56	0.17	0.9		5.65	0.14		0.02
1	1e	9	34.32	0.25	0.21	0.43	0.07	0.25	20.42	0.14	9.06	0.04	3.44	0.26
1	1f	7	426.37	0.07	2.48	0.07	0.22		150.32	25.18	167.3	80.72		0.01
1	2a	7	54	18.34	0.83		0.04	0.2	8.01	4.02	22.37	0.2		0.08
1	2b	8	3.59	0.95	0.32	0.04		0.08	0.59	0.12	1.03	0.47		0.01
1	2c	5	12.58	0.04	0.27		0.04		0.82	0.04	11.25	0.12		
1	2d	5	1.05	0.16					0.12	0.04	0.2	0.52		0.01
1	2e	6	1.59	0.16	0.2				0.63		0.36	0.24		0.08
1	2f	5	9.11	0.84				0.04	7.16		1.07			0.02
1	3a	4	2.91	0.35					0.35		2.21			0.03
1	3b	6	70.56	0.59	0.42				38.2	2.2	28.9	0.25		0.26
1	3c	6	19.52	0.17	0.04				4.45	3.15	11.67	0.04		0.23
1	3d	6	20.89	0.17	0.08		0.13		3	1.81	15.44	0.25		0.12

Table C2 (continued) Static bat detector deployment codes, minimum number of species recorded at each and relative activity rate for bats (B/h) recorded at each location.

Period	Static	Minimum no. species	All bats	*Myotis*	Noctule	Leislers	*Nyctalus*	BLE	Pip45	Pip50	Pip55	Pip-nat	Serotine	Barbastelle
1	3e	5	78.23	3.38	0.17				34.01	1.22	39.2	0.25		
1	3f	5	119.92		0.21				94.19	0.38	25.08	0.04		0.26
1	4a	4	5.11				0.04		3.5	0.13	1.39		0.04	0.55
1	4b	5	17.35	0.05	0.05				1.74	0.41	15.1			1.1
1	4e	3	9.72						3.47	0	6.26			0.04
1	4f	4	65.03	0.54					24.92	14.91	24.65			0.91
1	5a	7	26.73	0.5	0.69		0.32	0.27	7.13	3.11	11.61	3.11		0.14
1	5b	6	24.72	1.25	0.97				2.03	0.55	19.55	0.37		0.12
1	5c	6	16.54	0.32	0.05				6.91	0.05	9.12	0.09		0.01
1	5d	7	7.51	0.05	0.18	3.64	0.09	0.14	2.09	0.05	1.27			0.16
1	5e	6	19.11	0.05	0.09		0.23	0.05	7.88	0.23	10.59			0.24
2	1a	5	62.69	0.26			0.35	0.09	15.31	2.34	44.34			0.01
2	1b	8	40.74	0.48	0.04	0.31	0.04	0.31	1.61	4.18	33.55		0.22	1.54
2	1c	4	39.05	0.13					2.26	0.13	36.53			0.62
2	1d	4	17.51	0.18					5.37	0.04	11.92			0.04
2	1e	5	23.8	0.13	0.61				1.05	0.04	22.71			0.02
2	1f	7	60.82	1.51	0.22			0.22	5.42	7.75	47.39	0.04		0.1

Table C2 (continued) Static bat detector deployment codes, minimum number of species recorded at each and relative activity rate for bats (B/h) recorded at each location.

Period	Static	Minimum no. species	All bats	*Myotis*	Noctule	Leislers	*Nyctalus*	BLE	Pip45	Pip50	Pip55	Pip-nat	Serotine	Barbastelle
2	2a	7	82.17	1.27	0.7	23.69		0.08	18.92	17.19	20.32			1.34
2	2b	7	33.74	0.54		4.68	0.04	0.54	9.94	0.25	17.58	0.17		2.6
2	2c	6	78.67	0.16		0.49		0.33	30.92	8.54	38.23			1.35
2	2d	8	12.14	0.87		0.04		0.16	7.74	0.24	2.18	0.04	0.87	2.99
2	2e	7	27.13	0.44	0.12	1.57		0.04	4.93	4.2	15.83			0.29
2	3a	6	108.14	4.2			0.04	0.33	13.04	0.7	84.94		4.9	1.19
2	3b	5	26.62	1.59	0.04				13.69	3.76	7.55			1.42
2	3c	8	51.01	0.3	0.07	0.07		0.07	9.81	0.07	40.01		0.59	0.21
2	3d	6	17.55	0.53	0.08			0.04	1.14	0.04	15.73			1.54
2	3e	8	27.07	0.41	0	0.04		0.07	5.9	0.15	20.43	0.04	0.04	0.15
2	3f	8	44.57	0.63	0.48	3.57	0.22	0.22	33.15	0.37	5.82	0.11		2.65
2	4a	6	4.38	0.33	0.26	0.03			1.41	0.03	2.32			0.14
2	4b	7	44.56	0.69	0.1			0.66	28.43	0.3	14.31	0.07		4.73
2	4c	7	6.2	0.26	0.1			0.19	1.39	0.45	3.78	0.03		0.72
2	4d	7	8.71	0.38		0.07	0.07	0.24	3.91	0.07	3.95		0.03	1
2	4e	7	6.23	0.26	0.1			0.19	1.4	0.45	3.8	0.03		0.13
2	4f	4	47.54	0.4					18.22	10.9	18.02			0.08

Table C2 (continued) Static bat detector deployment codes, minimum number of species recorded at each and relative activity rate for bats (B/h) recorded at each location.

Period	Static	Minimum no. species	All bats	*Myotis*	Noctule	Leislers	*Nyctalus*	BLE	Pip45	Pip50	Pip55	Pip-nat	Serotine	Barbastelle
2	5a	7	88.59	1.02	0.51		0.06	0.12	3.26	6.8	78.35	0.06		0.24
2	5b	6	140.78	0.06	0.51				29.7	2.01	107.99	0.51		0.03
2	5c	8	12.55	0.21	2.69	0.03	0.15	0.12	5.74	0.03	6.22	0.45		0.05
2	5d	6	37.3	0.03	0.12		0.21		3.8	0.71	31.96	0.46		0.01
2	5e	8	90.96	0.94	0.13	0.06		0.19	18.1	4.75	64.12	2.67		0.15
2	5f	5	77.13	0.31			0.03		20.28	0.03	56.41	0.06		0.09

Key:

- Survey area boundary
- AREA 1 — Farmland
- AREA 2 — Goose Hill and The Grove
- AREA 3 — Kenton Hills / Nursery Covert / Fiscal Policy
- AREA 4 — Sizewell Belts north
- AREA 5 — Main site areas
- AREA 6 — Sizewell Belts south

0.25 0.125 0 0.25 Kilometres

Scale: 1:10000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

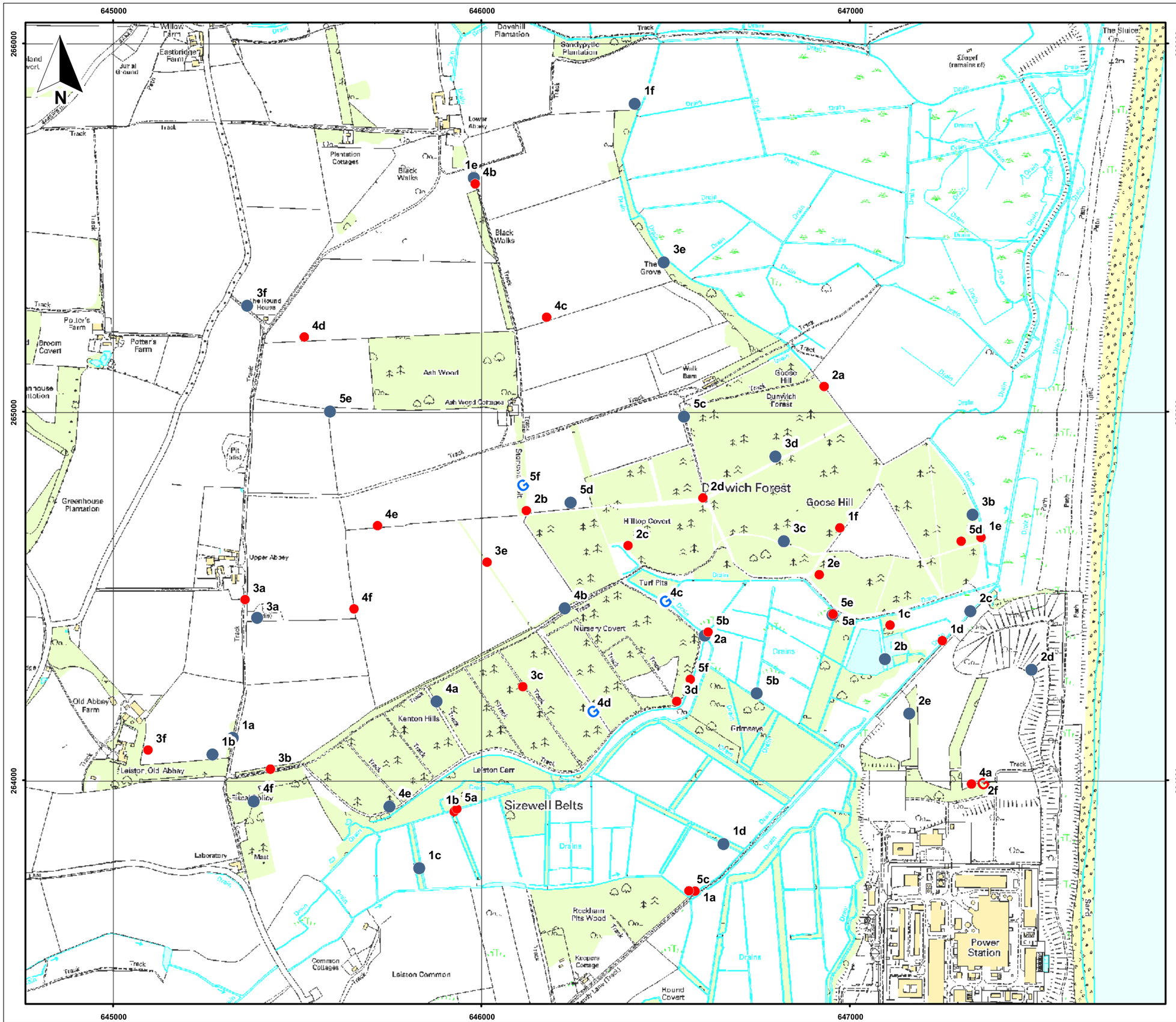
EDF

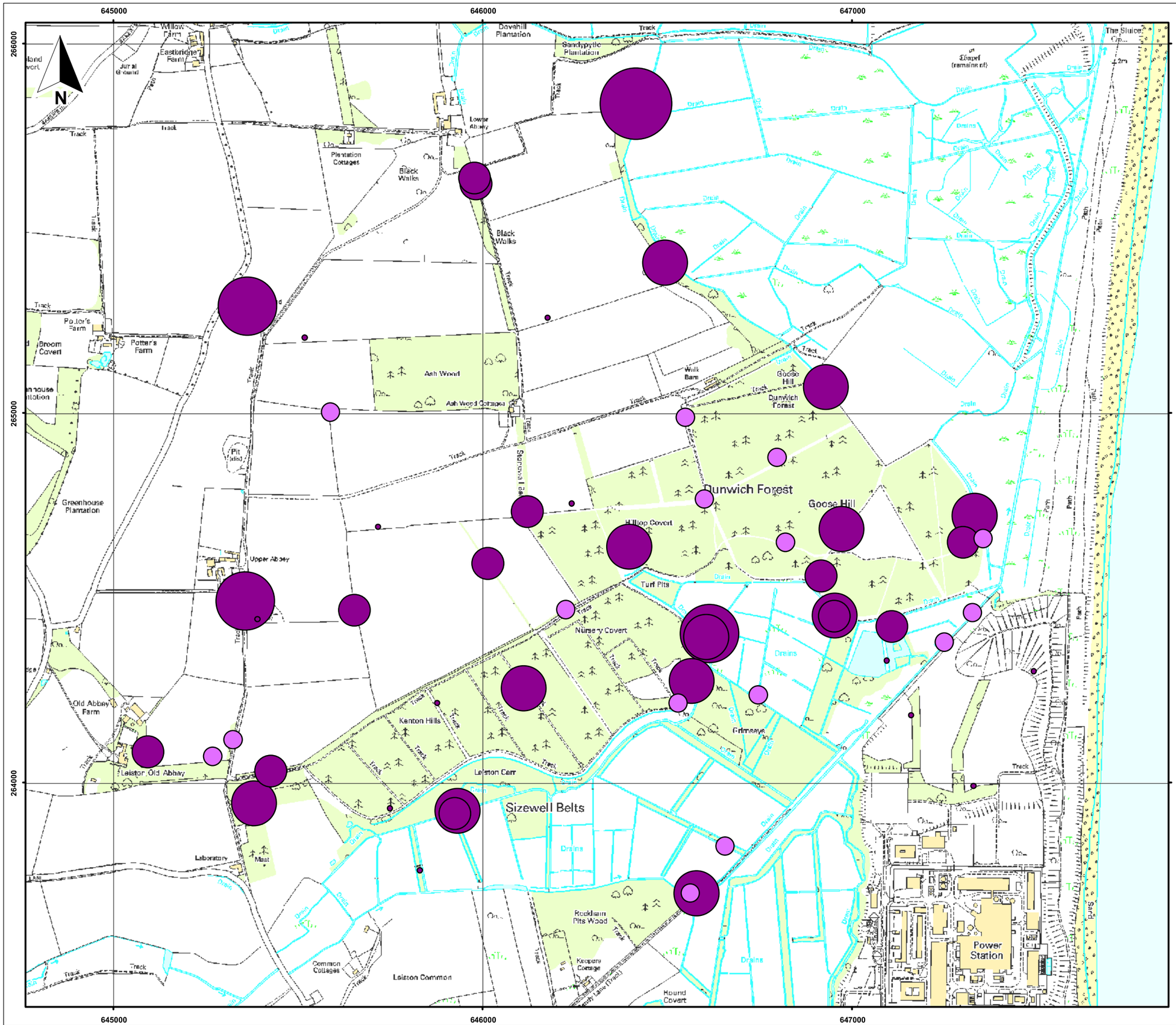
Sizewell Bat Report 2010

Figure C1
Survey areas used to compare relative activity of barbastelles across the site

January 2011
28130-A76.mxd tugwc

Entec





Key:

- 0 - 10
- 11 - 25
- 26- 50
- 51 - 100
- 100 - 150
- 151 - 430

0.25 0.125 0 0.25 Kilometres

Scale: 1:10000 @ A3

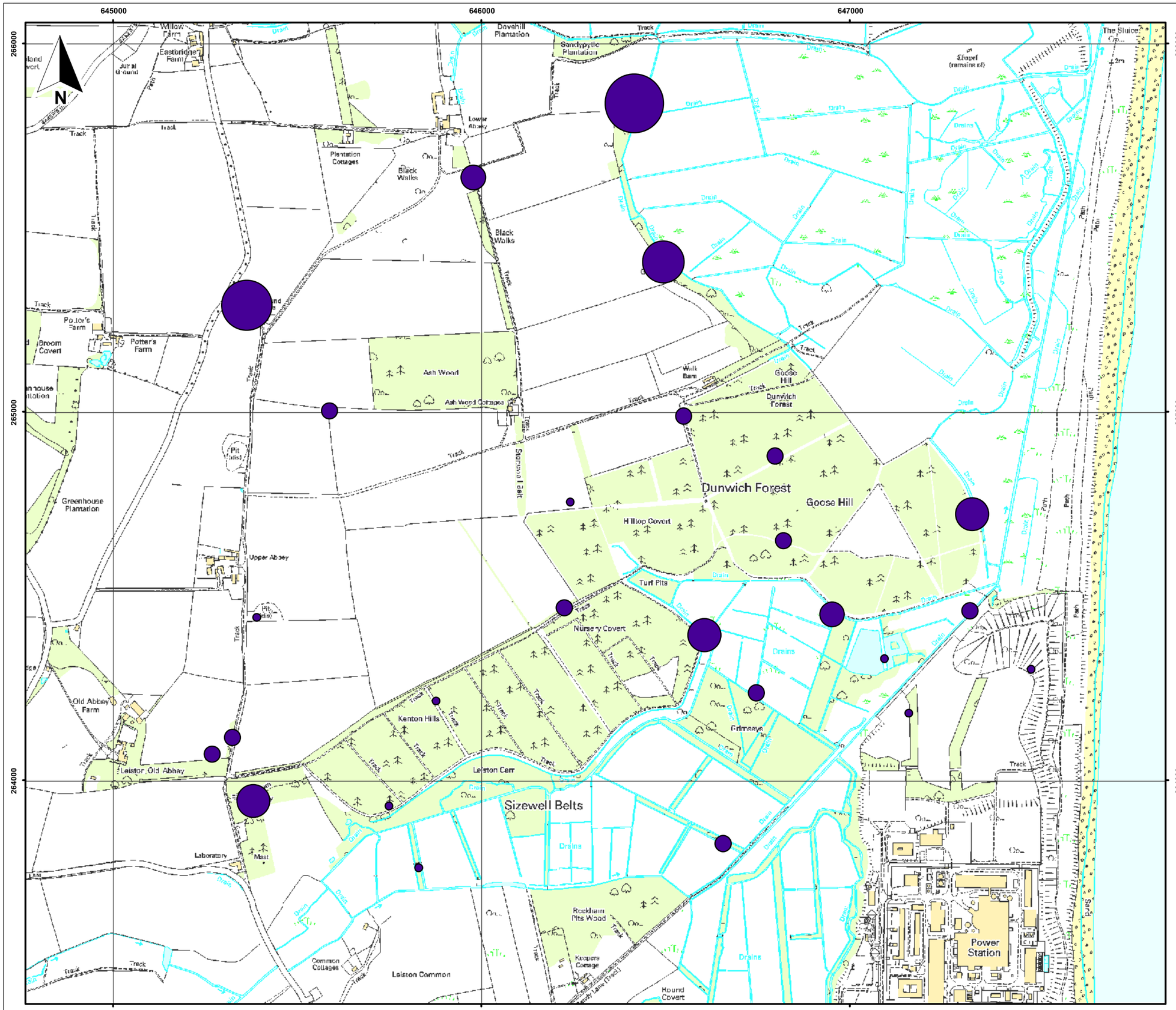
H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\ Drawings\GIS\ArcGIS\mxd

Sizewell Bat Report 2010

Figure C3
Relative activity (B/h) of all species at static survey locations 2010

January 2011
28130-A78.mxd tugwc

Entec



Sizewell Bat Report 2010

Figure C4
Relative activity (B/h) of all species at static survey locations April - June 2010

January 2011
28130-A79.mxd tugwc

Entec

645000 646000 647000

266000 265000 264000

N

Key:

- 0 - 10
- 11 - 25
- 26 - 50
- 51 - 75
- 76 - 110
- 111 - 150

0.25 0.125 0 0.25 Kilometres

Scale: 1:10000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\ Drawings\GIS\ArcGIS\mxd

Sizewell Bat Report 2010

Figure C5
Relative activity (B/h) of all species at static survey locations July - September 2010

January 2011
28130-A80.mxd tugwc

Entec

645000 646000 647000

266000 265000 264000

N

Key:

- 0
- 0.01 - 0.25
- 0.26 - 0.50
- 0.51 - 1.00
- 1.01 - 1.50
- 1.51 - 2.00
- 2.01 - 3.00
- 3.01 - 4.00
- 4.01 - 5.00

0.25 0.125 0 0.25 Kilometres

Scale: 1:10000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

Sizewell Bat Report 2010

Figure C6
Relative activity (B/h) of barbastelle at static survey locations in 2010

January 2011
28130-A81.mxd tugwc

645000
646000
647000
266000
265000
264000

N

Key:

- 0
- 0.01 - 0.25
- 0.26 - 0.50
- 0.51 - 1.00
- 1.01 - 1.50
- 1.51 - 2.00
- 2.01 - 3.00
- 3.01 - 4.00
- 4.01 - 5.00

0.25 0.125 0 0.25 Kilometres

Scale: 1:10000 @ A3

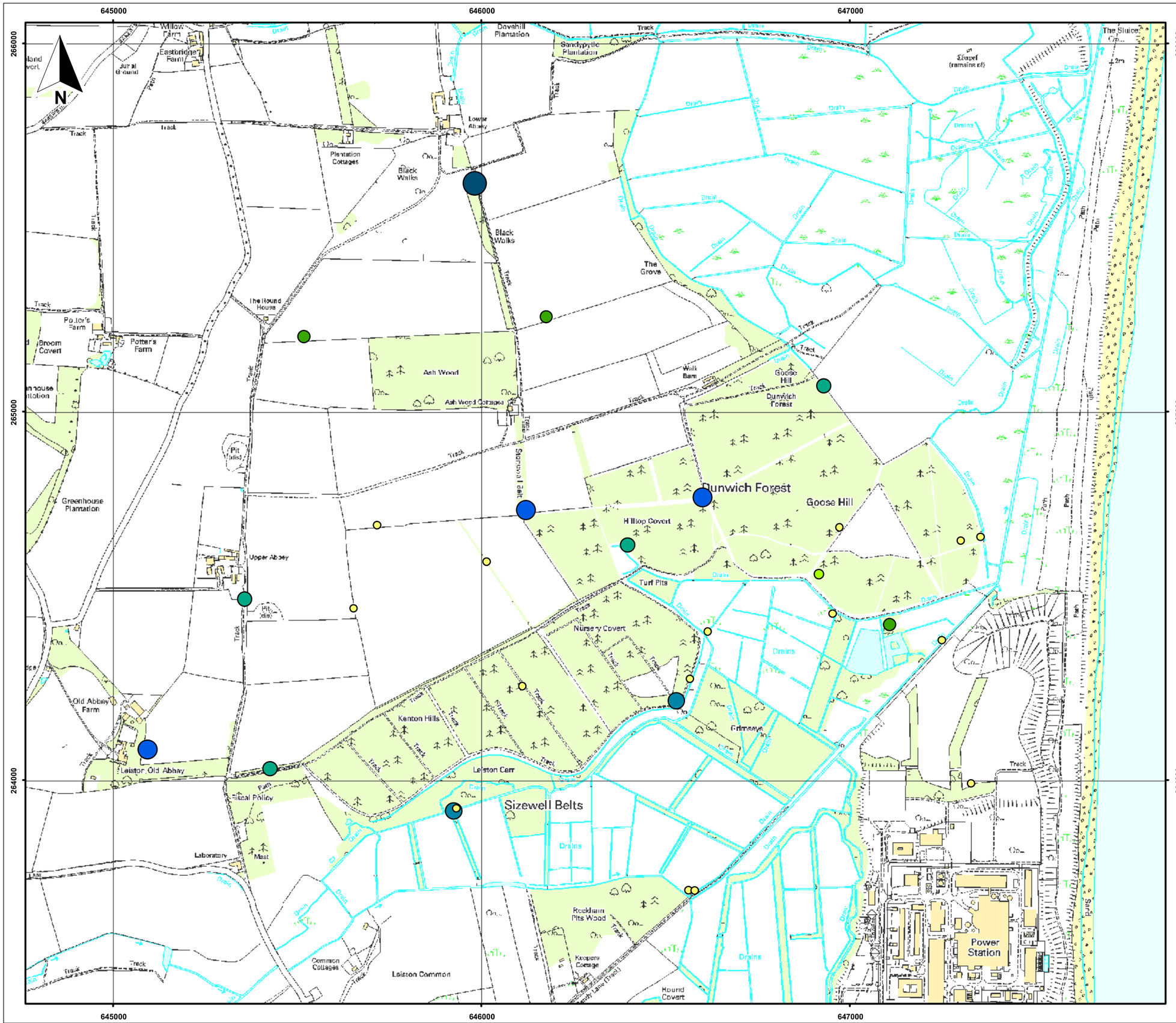
H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

Sizewell Bat Report 2010

Figure C7
Relative activity (B/h) of barbastelle at static survey locations, April - June 2010

January 2011
28130-A82.mxd tugwc

Entec



Sizewell Bat Report 2010

Figure C8
Relative activity (B/h) of barbastelle at static survey locations, July - September 2010

January 2011
28130-A83.mxd tugwc

Entec

645000 646000 647000

266000 265000 264000

N

F

Sizewell Belts

Key:

Commuting back

small

Large

Commuting out

small

medium

large

<all other values>

Commuting out & back

Small

Medium

Large

F Foraging activity

0.25 0.125 0 0.25 Kilometres

Scale: 1:10000 @ A3

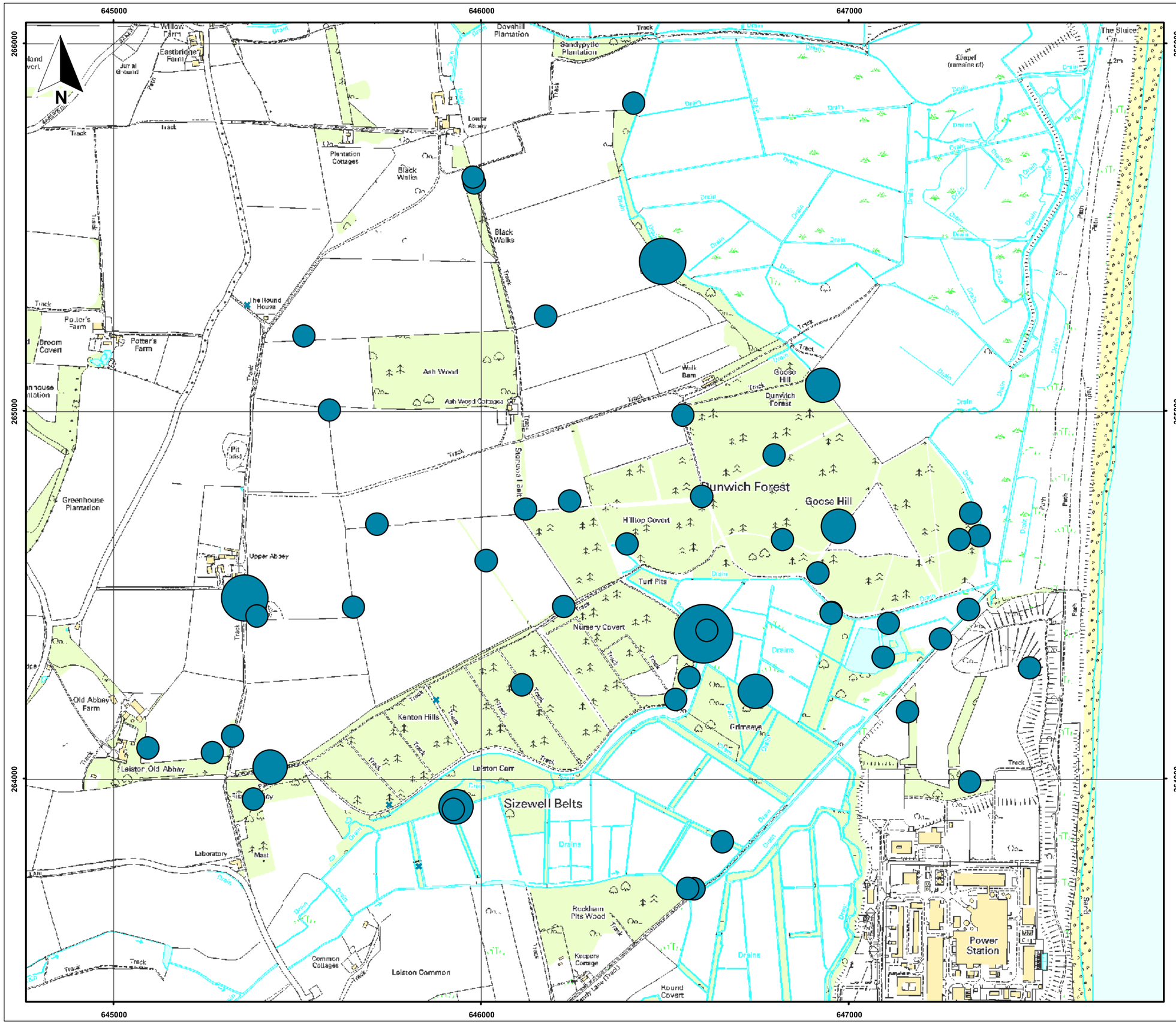
H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

Sizewell Bat Report 2010

Figure C9
Barbastelle commuting and foraging activity at static survey locations 2010

January 2011
28130-A84.mxd tugwc

Entec



Key:

- 0
- 0.01 - 1.00
- 1.01 - 2.00
- 2.01 - 5.00
- 5.01 - 20.00

0.25 0.125 0 0.25 Kilometres

Scale: 1:10000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\ Drawings\GIS\ArcGIS\mxd

Sizewell Bat Report 2010

Figure C10
Relative activity (B/h) of *Myotis* at static survey locations 2010

January 2011
28130-A85.mxd tugwc

Entec

645000 646000 647000

266000 265000 264000

N

Key:

- 0
- 0.1 - 0.50
- 0.51 - 1.0
- 1.1 - 2.0
- 2.1+

0.25 0.125 0 0.25 Kilometres

Scale: 1:10000 @ A3

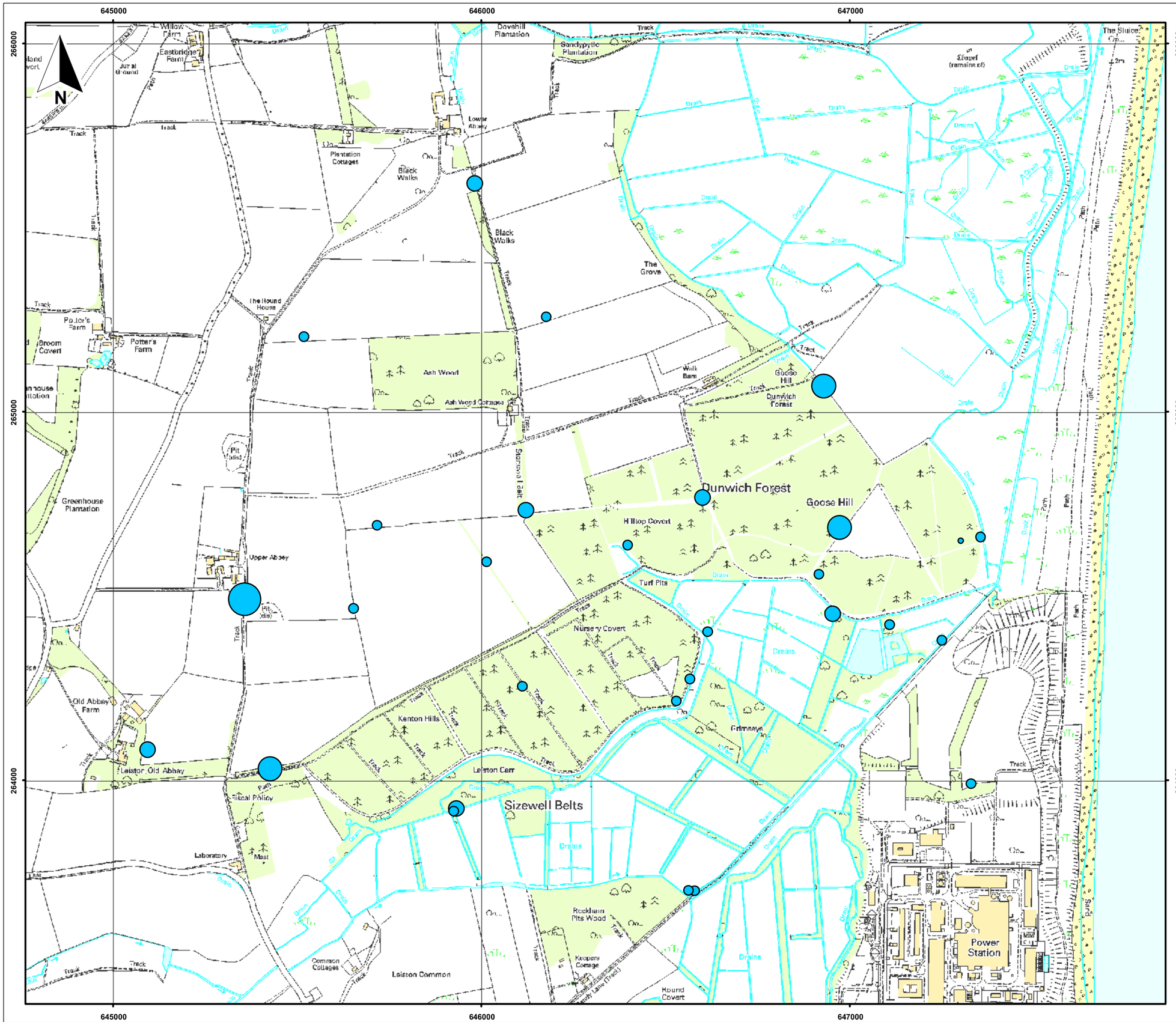
H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

Sizewell Bat Report 2010

Figure C11
Relative activity (B/h) of *Myotis* at static survey locations April - June 2010

January 2011
28130-A86.mxd tugwc

Entec



Key:

- 0 - 0.03
- 0.031 - 0.5
- 0.51 - 1.0
- 1.01 - 1.5
- 1.51 +

0.25 0.125 0 0.25 Kilometres

Scale: 1:10000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

Sizewell Bat Report 2010

Figure C12
Relative activity (B/h) of *Myotis* at static survey locations July - September 2010

January 2011
28130-A87.mxd tugwc

Entec

645000 646000 647000

266000 265000 264000

N

Key:

- 0
- 0.01 - 0.15
- 0.151 - 0.40
- 0.41 - 1.00
- 1.01 - 3.00

0.25 0.125 0 0.25 Kilometres

Scale: 1:10000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

eDF

Sizewell Bat Report 2010

Figure C13
Relative activity (B/h) of noctule at static survey locations 2010

January 2011
28130-A88.mxd tugwc

Entec

645000 646000 647000

266000 265000 264000

N

Key:

- 0 - 0.10
- 0.11 - 0.25
- 0.26 - 0.50
- 0.51 - 1.0
- 1.1+

0.25 0.125 0 0.25 Kilometres

Scale: 1:10000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

eDF

Sizewell Bat Report 2010

Figure C14
Relative activity (B/h) of noctule at static survey locations April - June 2010

January 2011
28130-A89.mxd tugwc

Entec

645000
646000
647000
266000
265000
264000

N

Key:

- 0
- 0.1 - 0.50
- 0.51 - 1.0
- 1.01 - 1.50
- 1.51 +

0.25 0.125 0 0.25 Kilometres

Scale: 1:10000 @ A3

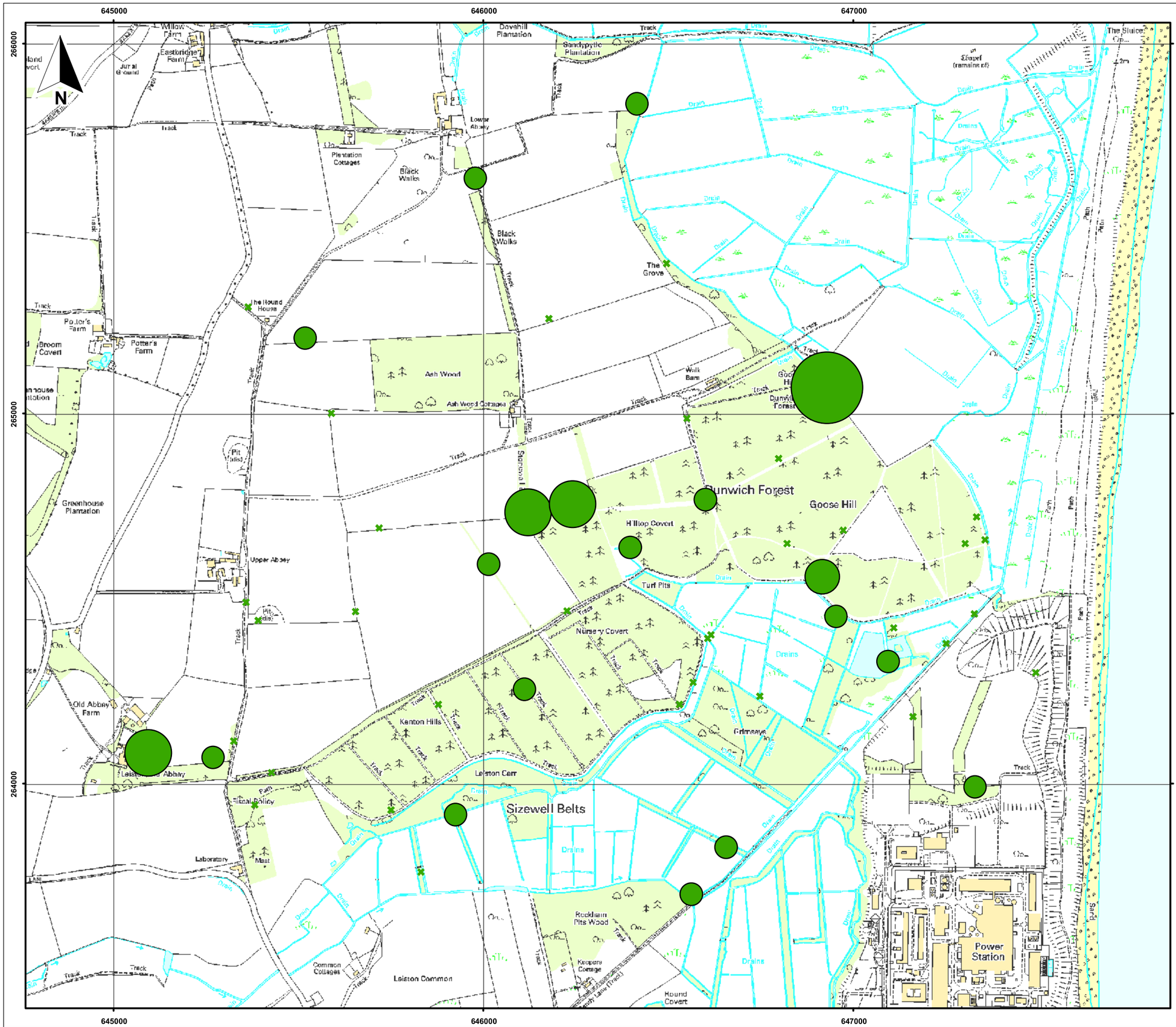
H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

Sizewell Bat Report 2010

Figure C15
Relative activity (B/h) of noctule at static survey locations July - September 2010

January 2011
28130-A90.mxd tugwc

Entec



645000
646000
647000
266000
265000
264000

N

Key:

- 0
- 0 .1 - 0.15
- 0.16 - 0.5
- 0.51 - 0.75
- 0.76 +

0.25 0.125 0 0.25 Kilometres

Scale: 1:10000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\ Drawings\GIS\ArcGIS\mxd

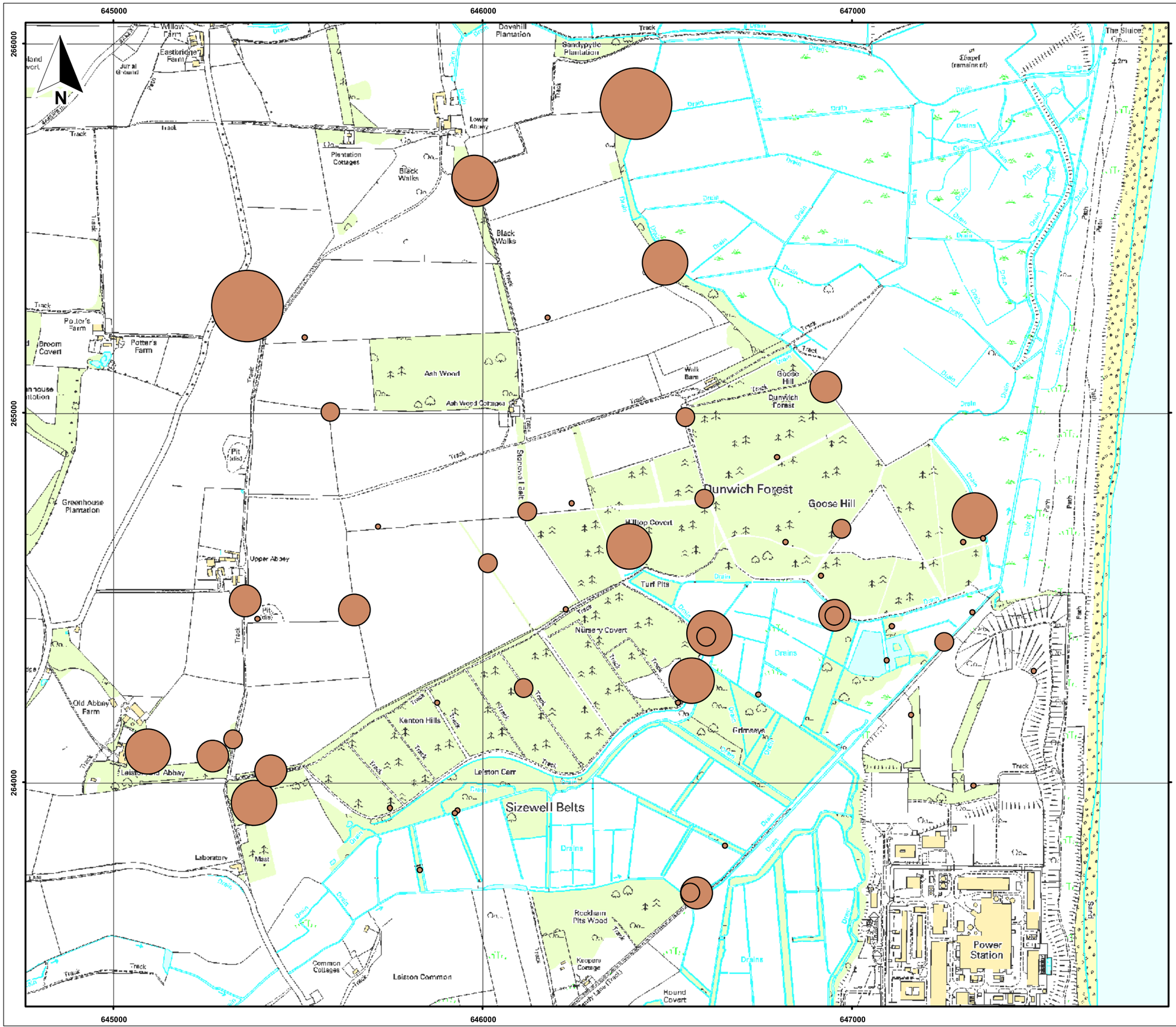
Sizewell Bat Report 2010

Figure C17
Relative activity (B/h) of Leisler's at static survey locations April - June 2010

January 2011
28130-A92.mxd tugwc

Entec

645000
646000
647000
266000
265000
264000
N
Key:
0
0.1 - 0.50
0.51 - 1.50
1.51 - 5.0
5.01+
0.25 0.125 0 0.25 Kilometres
Scale: 1:10000 @ A3
H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\ Drawings\GIS\ArcGIS\mxd
Sizewell Bat Report 2010
Figure C18
Relative activity (B/h) of Leisler's at static survey locations July - September 2010
January 2011
28130-A93.mxd tugwc
Entec



Key:

- 0 - 5.00
- 5.01 - 10.00
- 10.01 - 20.00
- 20.01 - 50.00
- 50.01 - 151.00

0.25 0.125 0 0.25 Kilometres

Scale: 1:10000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\ Drawings\GIS\ArcGIS\mxd

Sizewell Bat Report 2010

Figure C19
Relative activity (B/h) of common pipistrelle at static survey locations 2010

January 2011
28130-A94.mxd tugwc

Entec

Key:

- 0 - 10
- 11 - 25
- 26 - 50
- 51 - 100
- 101 - 150

0.25 0.125 0 0.25 Kilometres

Scale: 1:10000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

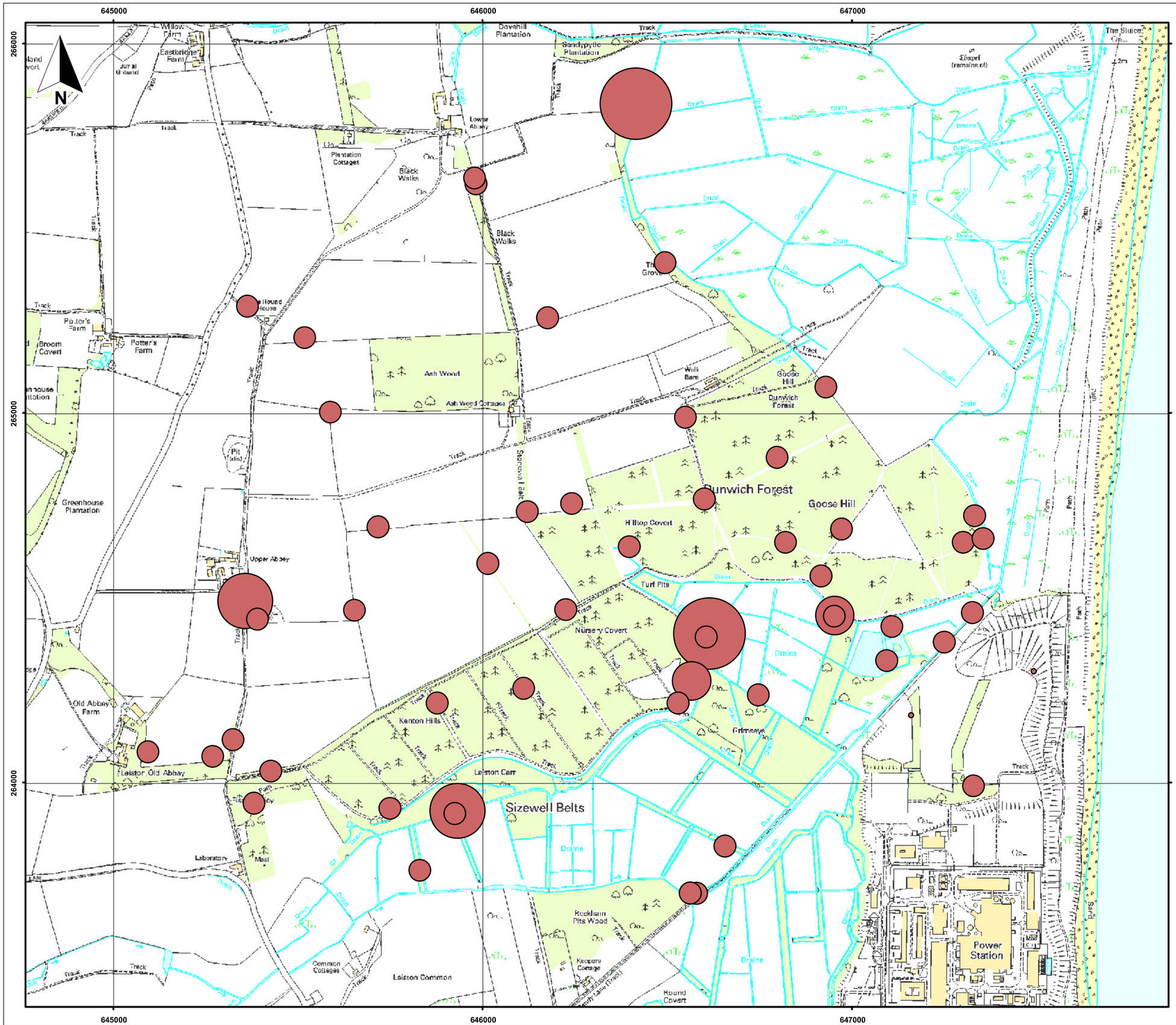
Sizewell Bat Report 2010

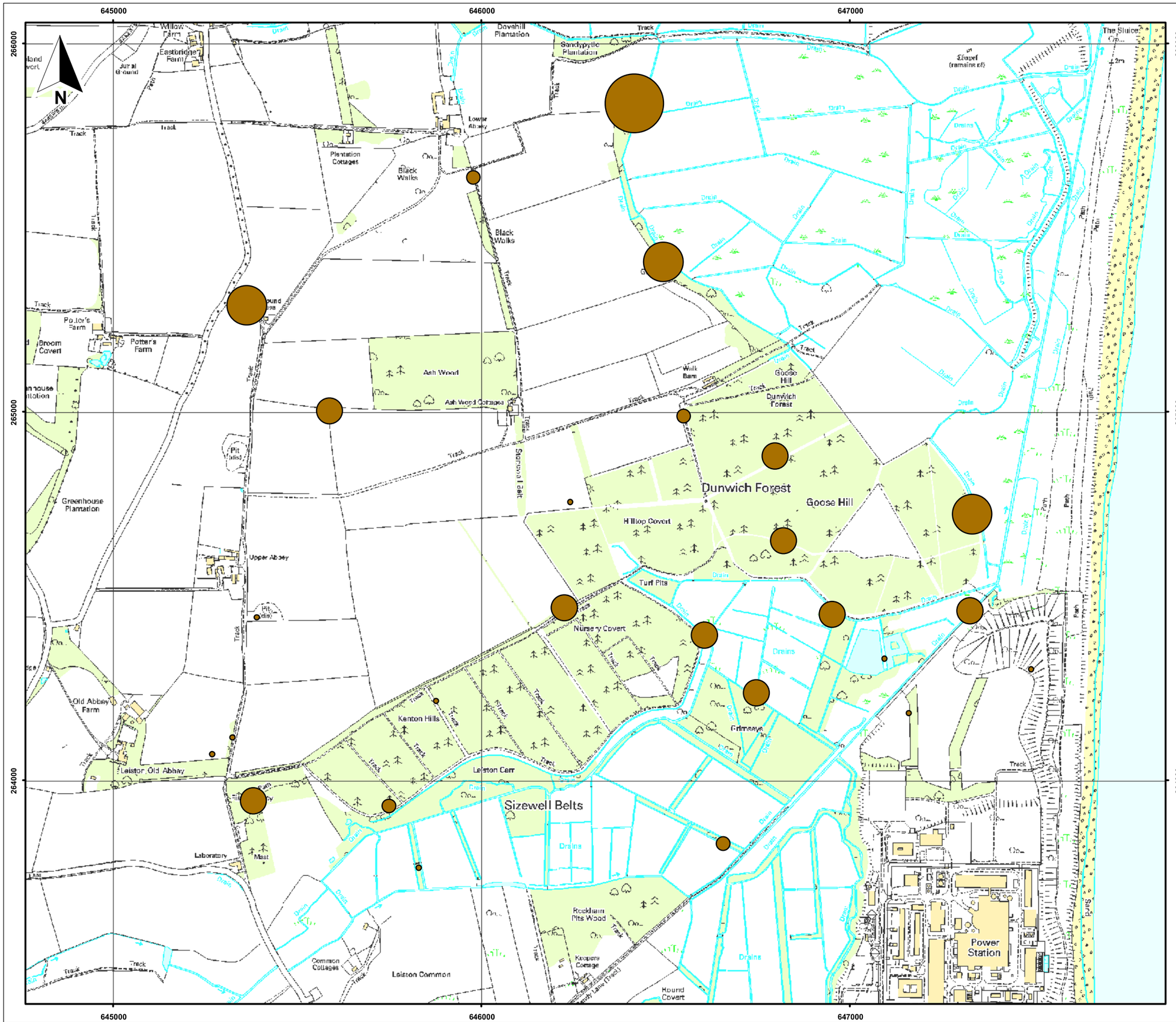
Figure C20
Relative activity (B/h) of common pipistrelle at static survey locations April - June 2010

January 2011
28130-A95.mxd tugwc

Entec

645000
646000
647000
266000
265000
264000
N
Key:
-
0 - 5
6 - 10
11 - 20
21 - 30
31 - 40
0.25 0.125 0 0.25 Kilometres
Scale: 1:10000 @ A3
H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\ Drawings\GIS\ArcGIS\mxd
EDF
Sizewell Bat Report 2010
Figure C21
Relative activity (B/h) of common pipistrelle at static survey locations July - September 2010
January 2011
28130-A96.mxd tugwc
Entec





645000
646000
647000
266000
265000
264000

N

Key:

- 0 - 10
- 11 - 25
- 26 - 50
- 51 - 75
- 76 +

0.25 0.125 0 0.25 Kilometres

Scale: 1:10000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\ Drawings\GIS\ArcGIS\mxd

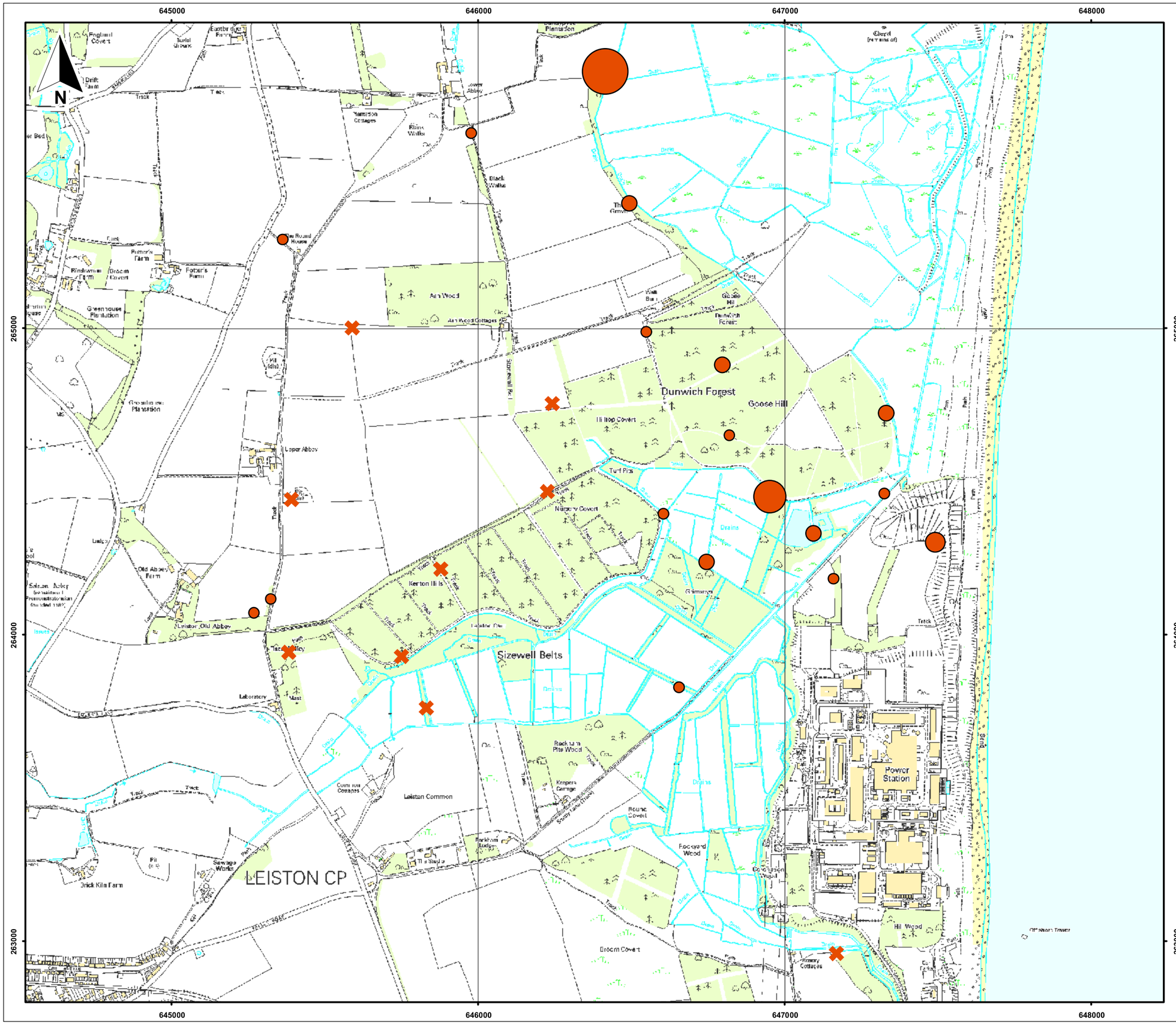
Sizewell Bat Report 2010

Figure C24
Relative activity (B/h) of soprano pipistrelle at static survey locations July - September 2010

January 2011
28130-A99.mxd tugwc

Entec

645000
646000
647000
266000
265000
264000
N
Key:
0 - 0.10
0.11 - 0.50
0.51 - 1.00
1.01 - 5.00
5.01 - 81.00
0.25 0.125 0 0.25 Kilometres
Scale: 1:10000 @ A3
H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\ Drawings\GIS\ArcGIS\mxd
eDF
Sizewell Bat Report 2010
Figure C25
Relative activity (B/h) of Nathusius' pipistrelle at static survey locations 2010
January 2011
28130-A100.mxd tugwc
Entec



Key:

- 0
- 0.01 - 0.25
- 0.26 - 0.50
- 0.51 - 1.00
- 1.01 - 5.00
- 5.01 - 80.0

0.3 0.15 0 0.3 Kilometres

Scale: 1:12000 @ A3

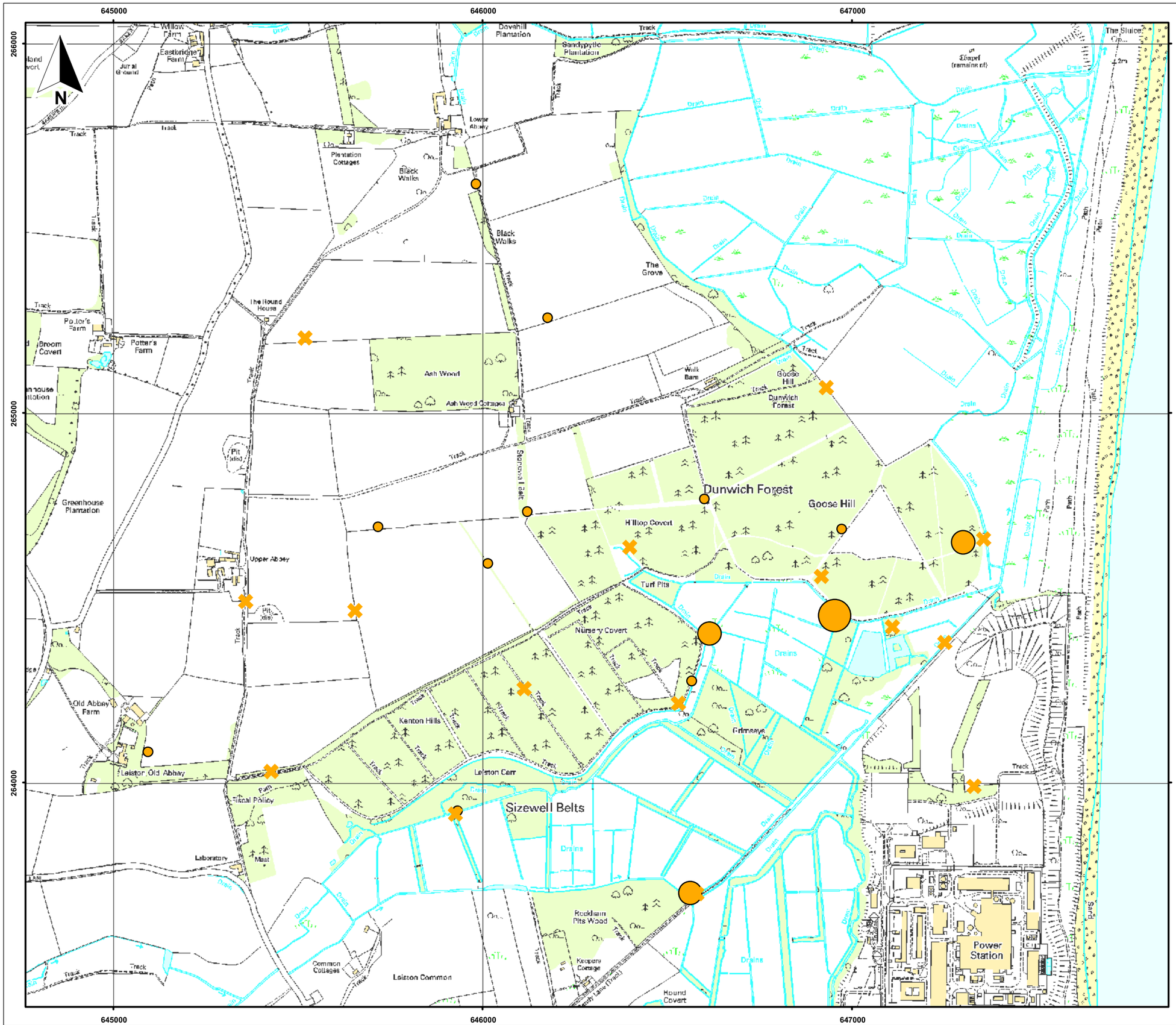
H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\ Drawings\GIS\ArcGIS\mxd

Sizewell Bat Report 2010

Figure C26
Relative activity (B/h) of Nathusius' pipistrelle at static survey locations April - June 2010

January 2011
28130-A101.mxd tugwc

Entec



Sizewell Bat Report 2010

Figure C27
Relative activity (B/h) of Nathusius' pipistrelle at static survey locations July - September 2010

January 2011
28130-A102.mxd tugwc

Entec

645000 646000 647000 648000

265000 264000 263000

N

Key:

- 0
- 0.01 - 0.10
- 0.11 - 0.20
- 0.21 - 1.00
- 1.01 - 6.20

0.3 0.15 0 0.3 Kilometres

Scale: 1:12000 @ A3

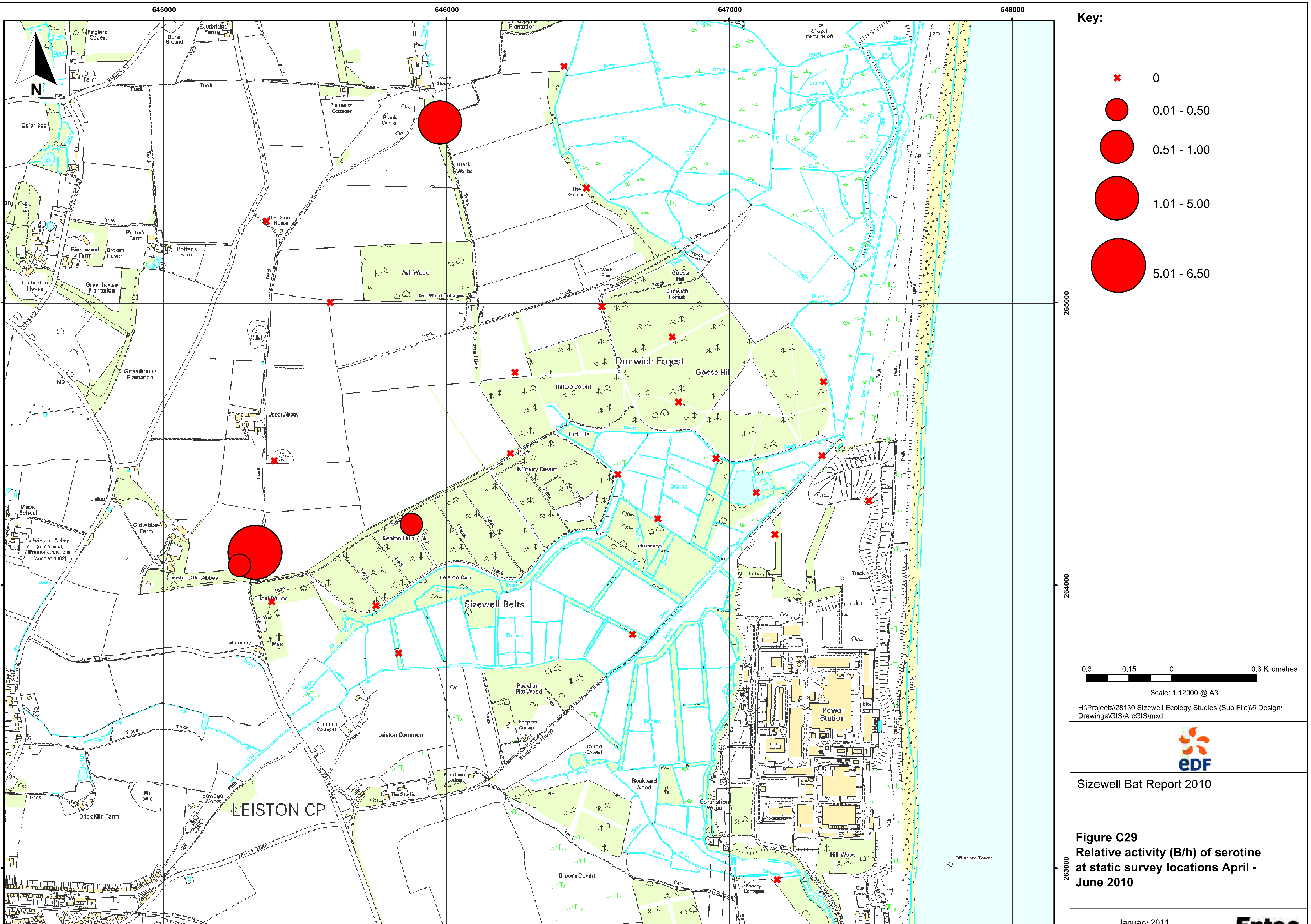
H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

Sizewell Bat Report 2010

Figure C28
Relative activity (B/h) of serotine at static survey locations 2010

January 2011
28130-A103.mxd tugwc

Entec



H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

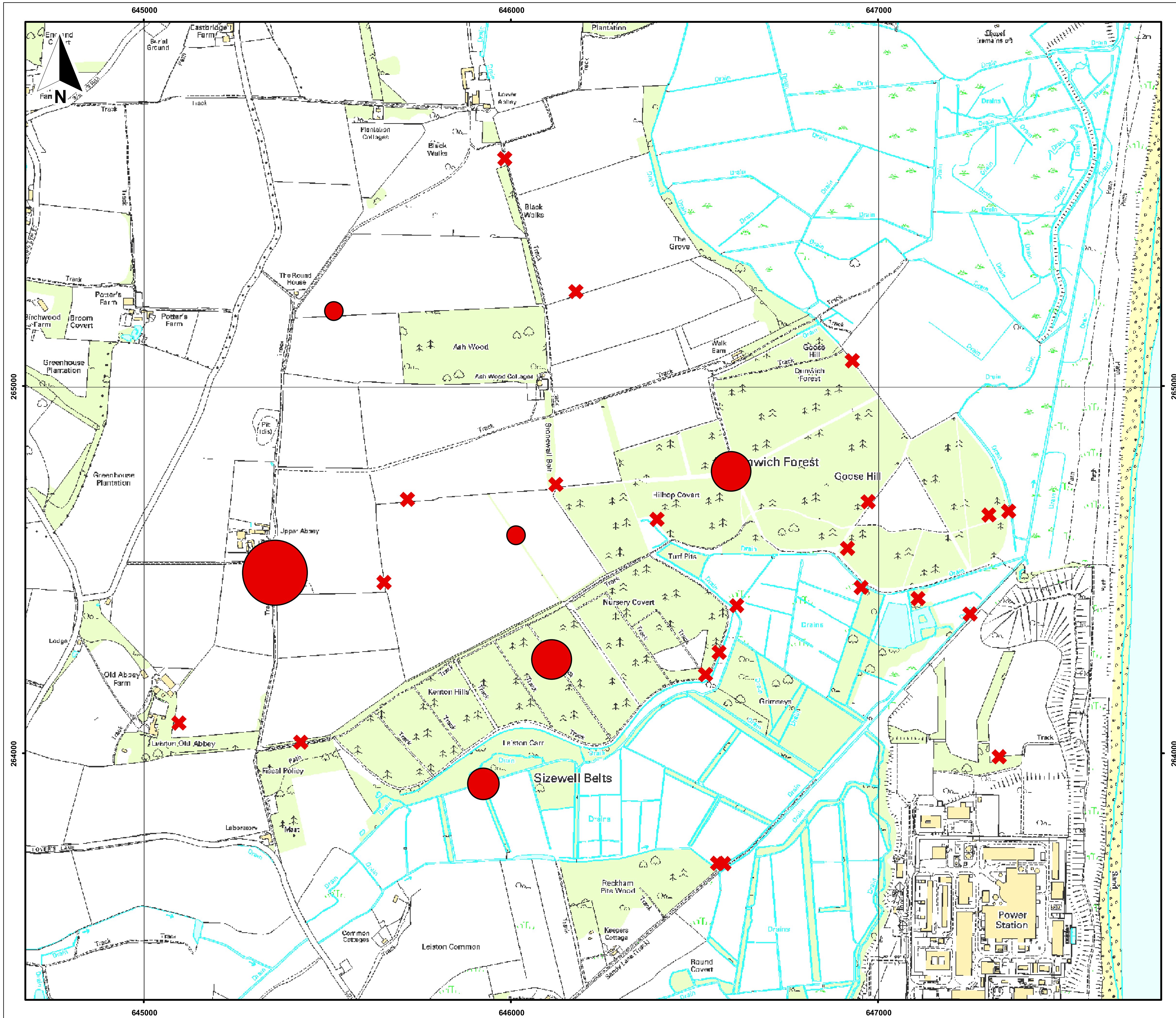
EDF

Sizewell Bat Report 2010

Figure C29
Relative activity (B/h) of serotine at static survey locations April - June 2010

January 2011
28130-A104.mxd tugwc

Entec



Key:

- ✖ 0
- 0.01 - 0.05
- 0.051 - 0.25
- 0.251 - 1.00
- 1.00 - 5.00

0.25 0.125 0 0.25 Kilometres

Scale: 1:10000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

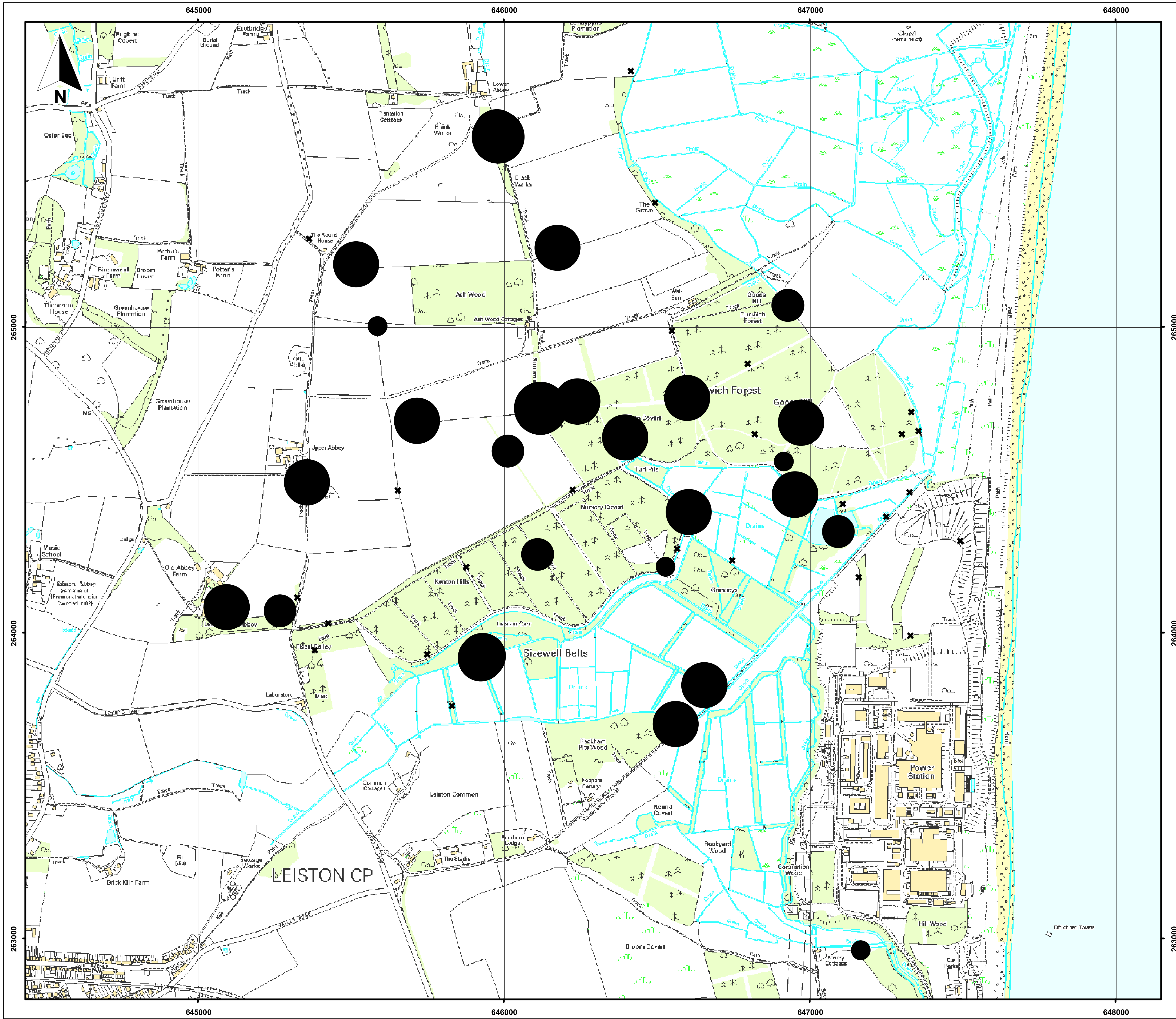
EDF

Sizewell Bat Report 2010

Figure C30
Relative activity (B/h) of serotine at static survey locations July - September 2010

January 2011
28130-A105.mxd tugwc

Entec



Key:

- ✖ 0
- ● 0.01 - 0.05
- ● 0.051 - 0.10
- ● 0.11 - 0.50
- ● 0.51 - 0.70

0.3 0.15 0 0.3 Kilometres

Scale: 1:12000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

EDF

Sizewell Bat Report 2010

Figure C31
Relative activity (B/h) of brown long-eared bat at static survey locations 2010

January 2011
28130-A106.mxd tugwc

Entec

Appendix D
Bat Box and Tree Survey Results

20 Pages

Table D1 Bat box survey results

Date	Box no.	Species	Number	Sex	Breeding?	Notes
03/06/2010	1	0				
03/06/2010	2	0				
03/06/2010	3	0				
03/06/2010	4	0				
03/06/2010	5	0				
03/06/2010	6	Common pipistrelle	1	male	No	Dead wasp nest in box
03/06/2010	7	0				Lid missing
03/06/2010	8	Common pipistrelle	1			Not examined
03/06/2010	9	0				
03/06/2010	11	0				
03/06/2010	12	0				
03/06/2010	14	0				
03/06/2010	15	0				
03/06/2010	16	Soprano pipistrelle	1			
03/06/2010	17	0				
03/06/2010	18	0				
03/06/2010	19	0				
03/06/2010	20	0				
03/06/2010	21	0				
03/06/2010	22	0				
03/06/2010	23	0				
03/06/2010	24	0				Thick fresh pile of droppings
03/06/2010	25	Soprano pipistrelle	1	male	No	No droppings
03/06/2010	27	0				No droppings
03/06/2010	28	Pipistrelle sp.	50+			Not examined due to the risk of harming bats. Clearly a maternity colony
03/06/2010	29	0				No droppings
03/06/2010	30	0				No droppings
03/06/2010	31	0				No droppings
03/06/2010	32	0				No droppings
03/06/2010	33	0				No droppings
03/06/2010	34	0				No droppings
03/06/2010	35	0				No droppings

Table D1 (continued) **Bat box survey results**

Date	Box no.	Species	Number	Sex	Breeding?	Notes
03/06/2010	36	0				No droppings
03/06/2010	37	Noctule	1	male	No	
04/08/2010	3	0				Pipistrelle droppings
04/08/2010	4	0				Pipistrelle droppings
04/08/2010	5	0				Empty
04/08/2010	8	0				No droppings
04/08/2010	9	Soprano pipistrelle	6			Pipistrelle droppings
04/08/2010	10	0				No droppings
04/08/2010	11	0				No droppings
04/08/2010	12	0				No droppings
04/08/2010	14	0				10 old droppings - possibly Myotis
04/08/2010	15	0				50 pipistrelle droppings
04/08/2010	16	Soprano pipistrelle	1	female	Juvenile	Pipistrelle droppings
04/08/2010	17	0				No droppings
04/08/2010	18	Common pipistrelle	1	female	post-lactating	Pipistrelle droppings
04/08/2010	19	0				No droppings
04/08/2010	20	Soprano pipistrelle	50+			Not examined. Clearly a maternity colony
04/08/2010	21	0				100's pipistrelle droppings
04/08/2010	21	0				Individual pipistrelle droppings
04/08/2010	22	0				100's pipistrelle droppings
04/08/2010	23	0				No droppings
04/08/2010	25	Soprano pipistrelle	1	M	Juvenile	Pipistrelle droppings
04/08/2010	26	0				No droppings
04/08/2010	27	0				Pipistrelle droppings
04/08/2010	28	Soprano pipistrelle	11			Pipistrelle droppings
04/08/2010	29	0				Pipistrelle droppings
04/08/2010	30	Soprano pipistrelle	1	female	post-lactating	Pipistrelle droppings
04/08/2010	31	Soprano pipistrelle	4	female	Juvenile	Pipistrelle droppings
04/08/2010	31	Soprano pipistrelle	1	female	post-lactating	No droppings

Table D1 (continued) **Bat box survey results**

Date	Box no.	Species	Number	Sex	Breeding?	Notes
04/08/2010	31	Soprano pipistrelle	1	female	Juvenile	No droppings
04/08/2010	31	Soprano pipistrelle	1	female	Juvenile	No droppings
04/08/2010	32	0				Pipistrelle droppings
04/08/2010	33	0				100's pipistrelle droppings
04/08/2010	35	Soprano pipistrelle	1	M	Juvenile	Pipistrelle droppings
04/08/2010	36	0				Pipistrelle droppings and dead pup
04/08/2010	37	0				Pipistrelle droppings

Table 2 Tree survey results.

Key to ID: Letters correspond to tree survey zones (refer to Figure D2). Trees that are known to be barbastelle roost trees are highlighted in red with the corresponding roost number included following the tree ID, e.g. KB005_R11.

Key to Assessment: VH = very high, H = high, M = moderate

Key to Species: A.g =alder, A.c = horse chestnut, A.p = sycamore, B. sp = birch species, C.a = hazel, C.s = sweet chestnut, Con = conifer species,F.e = ash, F.s = beech, P.s = Scot's pine, P. sp = pine species, Pr. sp = Prunus sp., P.t = aspen, Q.r = pedunculate oak, Q.sp = oak species, S.sp = willow species, T. sp = lime species, U = unknown, U. g = English elm, U..sp – elm species.

Key to decay: 1=live, healthy, no decay; no obvious defects, 2=live, usually healthy; obvious defects such as broken top, cracks or hollows present, 3=recently dead, dead leaves still present, little decay; heartwood hard, 4=dead; no leaves and few twigs present; top often broken; <50% of branches lost; bark loose; heartwood hard; sapwood spongy, 5=dead; no branches or bark; broken off along mid-trunk; sapwood sloughing from upper bole; heartwood soft, 6=dead; stubs >3m in height; heartwood soft; extensive internal decay; outer shell may be hard, 7=dead; stubs<3m in height; heartwood soft; extensive internal decay; outer shell soft, 8=debris; downed stubs or stumps; extensive decay.

Key to DBH: MS = multi-stem, U = unknown

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.

NA = grid reference to be confirmed.

Location				Tree data				Feature data																
								Type												Height		% cover		
ID	Assessment	Eastings	Northings	Species	Decay	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?
A001	H	645699	265201	Q. sp	2	10	1		Y								N	S	6		75	50	100-0023	N
A002	H	645701	265179	Q. sp.	2	17	1	Y	Y	Y	Y	Y					NW	S	7	13	80	70	100-0024	Y
A003	H	645708	265166	Q. sp.	2	16	1		Y		Y	Y					Multiple	S	7	13	75	70	100-025	Y
A004	M	645708	265149	Q. sp.	1	18	1.1		Y								N	S	12		50	75	100-0026	Y
A005	M	645713	265163	Q. sp.	2	9	1							Y			S	S	8		75	80	100-0029	N
A006	M	645714	265135	Q. sp.	1	15	0.9	Y									W	S	6		75	50	100-0030	N
A007	M	645840	265090	Q. sp.	1	18	1.2				Y						W	S	13		75	50	100-0031	N
A008	M	645699	265130	F.e	2	9	0.75	Y			Y						N	S	6		50	40	100-0032	N
A009	H	645699	265120	F.e	1	17	1				Y						W	S	7		75	20	100-0033	N
A010	H	645703	265101	Q. sp.	2	12	1		Y					Y			S	M	4	10	70	50	100-0037	Y
A011	M	645718	265098	F.e	2	14	0.7							Y			S	S	6		90	50	100-0035	N
A012	M	NA	NA	Q. sp.	1	16	1.2		Y		Y	Y					Multiple	S	5	14	50	30	100-0038	Y
A013	M	645706	265053	F.e	2	13	1.1	Y									N	S	4		40	30	100-0039	Y
A014	H	645706	265047	F.e	2	14	1		Y					Y			S	M	5	12	50	40	100-0040	Y
A015	M	645715	265035	F.e	2	13	0.8				Y	Y					E	S	4		60	30	100-0041	N

								Feature data															
Location				Tree data				Type												Height		% cover			
ID	Assessment	Eastings	Northings	Species	Decay	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?
A016	H	645720	265039	Q. sp.	1	15	1.1		Y								W	S	8		70	40	100-0042	N
A017	M	645719	265050	Q. sp.	1	14	0.9	Y									E	S	10		70	40	100-0043	N
A018	M	645711	265025	Q. sp.	5	6	0.6							Y			W	M	4		60	10	100-0045	N
A019	VH	645737	265037	Q. sp.	5	7	0.75		Y								Multiple	L	0	6	90	20	100-0044	N
A020	VH	NA	NA	Q. sp.	5	7	0.75		Y								Multiple	L	0	6	80	20	100-0046	N
A021	M	645756	265102	Q. sp.	1	16	1.1									Y	Multiple	L	0	16	80	70	100-0047	Y
A022	H	645756	265160	Q. sp.	1	18	1.2				Y	Y					E	S	14		90	20	100-0048	N
A023	VH	645749	265190	Q. sp.	4	14	1		Y								Multiple	L	5	12	95	50	100-0049	N
A024	M	645730	265193	Q. sp.	1	16	0.9	Y									W	S	6		95	50	100-0054	N
A025	M	645739	265204	Q. sp.	1	16	1	Y	Y								N	S	12		95	30	100-0053	N
A026	M	645733	265199	Q. sp.	1	14	0.8	Y									N	S	7		75	40	100-0056	N
A027	VH	645727	265173	Q. sp.	2	12	1.1		Y								Multiple	L	2	10	60	70	100-0057	N
A028	H	644950	264070	Q. sp.	4	14	1		Y								N	M	3	11	95	60	100-0059	N
A029	H	645150	264060	Q. sp.	1	15	1.1		Y								Multiple	S	10	14	90	40	100-0060	Y
A030	M	645783	265111	Q. sp.	1	20	1.2		Y								S	S	12		85	60	100-0061	Y
A031	VH	645789	265031	Q. sp.	5	10	0.5		Y								Multiple	L	1	9	90	40	100-0062	N
A032	M	645771	265044	F.e	1	15	0.8	Y									S	S	10		85	40	100-0063	N
A033	M	645782	265043	F.e	1	15	1	Y									S	S	10		85	40	100-0064	N
A034	M	645786	265054	F.e	1	15	0.8	Y									S	S	10		90	50	100-0065	N
A035	M	645812	265047	Q. sp.	1	14	1					Y					E	S	8	12	85	60	100-0066	N
A036	M	645806	265030	Q. sp.	1	13	0.9								Y		Multiple	L	0	12	80	40	100-0067	?
A037	H	645808	265021	Q. sp.	2	13	1		Y								N	M	5	8	50	30	100-0068	?
A038	H	645878	265052	P. sp	5	9	0.5	Y									S	S	4	8	85	60	100-0069	?
A039	H	645962	265039	F.e	2	14	1		Y								Multiple	M	2	12	90	40	100-0070	N
A040	VH	645961	265013	Q. sp.	4	7	0.4		Y								Multiple	L	1	7	45	20	100-0072	N
A041	M	645964	265030	Q. sp.	1	16	1		Y		Y	Y					S	S	4	12	9	40	100-0073	N
A042	H	645982	265040	Q. sp.	3	14	0.9		Y			Y					Multiple	M	5	11	85	60	100-0075	N
A043	M	645965	265047	Q. sp.	1	14	0.8	Y									Multiple	S	10		90	40	100-0076	N
A044	M	645963	265046	F.e	1	16	0.8	Y									Multiple	S	10		90	40	100-0077	N
A045	M	645961	265085	Q. sp.	1	18	1.2								Y		Multiple	L	1.5	17	95	40	100-0079	N

								Feature data															
Location				Tree data				Type												Height		% cover			
ID	Assessment	Eastings	Northings	Species	Decay	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?
A046	H	645957	265117	F.e	1	20	0.9	Y									S	S	10		85	70	100-0080	N
A047	VH	646002	265054	Q. sp.	1	16	0.7		Y								S	S	7	10	95	20	100-0081	N
A048	H	645992	265038	Q. sp.	2	15	1		Y								S	S	7	10	70	60	100-0082	N
A049	M	646027	265016	Q. sp.	1	14	0.7								Y		Multiple	L	2	12	30	75	100-0083	N
A050	M	646035	265028	Q. sp.	2	14	0.7	Y									NE	S	9		30	60	100-0085	N
A051	VH	646034	265044	Q. sp.	2	13	0.7		Y								Multiple	M	2	10	70	40	100-0086	N
A052	VH	646070	265063	Q. sp.	4	12	1		Y		Y	Y					SE	M	1	9	60	10	100-0087	N
A053	H	645580	265210	Q. sp.	1	14	1.1		Y						Y		Multiple	L	2	10	60	5	100-0088	N
A054	M	646034	265105	Q. sp.	1	14	0.8								Y		Multiple	L	1	11	95	20	100-0089	N
A055	M	645990	265076	Q. sp.	1	13	0.8								Y		Multiple	L	1	11	95	10	100-0090	N
A056	M	645994	265105	Q. sp.	1	14	0.9								Y		Multiple	L	1	2	85	20	100-0091	N
A057	M	646023	265115	F.e	1	17	0.9	Y									S	S	11		90	30	100-0092	N
A058	M	646041	265148	Q. sp.	1	19	1.3								Y		Multiple	L	4	11	95	15	100-0094	Y
A059	M	NA	NA	Q. sp.	1	18	1		Y								E	S	11		90	5	100-0095	N
A060	M	646011	265144	F.e	1	16	0.7	Y						Y			E	S	11		90	15	100-0096	N
A061	H	646043	265192	Q. sp.	1	15	1.1		Y			Y					Multiple	S	7	13	85	30	100-0097	Y
A062	M	646050	265203	Q. sp.	1	13	0.6		Y								N	S	5		85	35	100-0098	N
A063	M	646009	265207	Q. sp.	1	17	1								Y		Multiple	L	2	14	60	60	100-0100	N
A064	M	646007	265201	Q. sp.	1	17	0.9								Y		Multiple	L	4	12	60	60	100-0101	N
A065	VH	645987	265218	Q. sp.	2	12	0.9		Y		Y						S	L	0	10	40	50	100-0102	N
A066	H	645969	265209	Q. sp.	2	15	0.9	Y	Y								W	S	10		60	60	100-0103	N
A067	M	645961	265213	Q. sp.	1	17	1								Y		Multiple	L	2	15	70	40	100-0104	N
A068	H	645974	265182	F.e	1	18	0.7	Y									S	S	5	8	70	40	100-0105	N
A069	M	645938	265157	Q. sp.	1	17	1					Y					N	S	8		85	30	100-0106	N
A070	H	645793	265167	Q. sp.	1	19	1		Y								N	S	6	15	90	25	100-0107	N
A071	H	645770	265176	A.p	2	17	0.7				Y						N	S	7		85	30	100-0108	N
A072_R3	VH	645740	265188	Q. sp.	1	161	1		Y								N	S	4	6	90	70	100-0050-52	N
A073_R9	VH	645890	265250	Q. sp.	2	12	0.7		Y								N	M	7	10	60	60	100-0099	N
A074_R13	VH	645741	265174	Q. sp.	2	17	1.1				Y						Multiple	L	0	7	95	70	100-0058	Y

								Feature data																	
Location				Tree data				Type													Height		% cover		
ID	Assessment	Eastings	Northings	Species	Decay	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?	
B001	H	646728	265148	P.t	2	15	0.35	Y									Multiple	S	6	6.5	70	0	123	N	
B002	H	646724	265145	P.t	2	15	0.4	Y									E	S	3.5		60	80	124	N	
B003	H	667340	265151	P.t	2	14	0.4	Y									S	S	3		30	75	125	N	
B004	H	646790	265195	A.p	2	12	0.5				Y	Y	Y				SW	M	6	7	85	0	126	N	
B005	M	646795	265203	A.p	2	13	0.7						Y				E	U	4		90	0	127	N	
B006	M	646763	265194	P.t	2	15	0.5	Y									N	S	6		50	30	128	N	
B007	H	646757	265191	P.t	2	15	0.3	Y									E	S	8	8.5	30	40	130	N	
B008	H	646748	265183	P.t	2	15	0.4	Y									Multiple	S	5	6	40	50	131	N	
B009	H	646737	265169	P.t	3	15	0.3	Y									Multiple	M	4	10	80	0	132	N	
B010	H	646733	265168	U	5	10	0.75						Y				N	M	3		70	80	133	N	
B011	H	646720	265184	Q.r	2	18	0.9						Y				SW	M	4		75	80	134	N	
B012	H	646716	265189	Q.r	2	16	0.9				Y	Y					S	S	3.5		70	60	135	N	
B013	H	646724	265145	P.t	2	16	0.3	Y									S	S	6.5		50	100	136	N	
B014	H	646748	265211	P.t	3	14	0.3	Y									SE	S	5		60	10	137	N	
B015	H	646738	265207	P.t	2	16	0.3	Y									SE	S	7		70	60	138	N	
B016	M	646742	265216	U	5	15	0.3	Y									E	M			70	0	139	N	
B017_R7	VH	646719	265201	Q.r	2	16	0.8				Y	Y					W	M	8		80	70	140	N	
B018	H	646716	265202	A.p	1	16	1	Y									SE	S	3		90	0	141	N	
B019	VH	646723	265226	U	6	5	0.4	Y					Y				Multiple	L	0	5	80	0	142-143	N	
B020	H	646732	265243	P.t	3	14	0.4	Y									N	S	5		10	40	144	N	
B021	M	646697	265229	U	7	3	0.2	Y		Y			Y				Multiple	L	0	3	0	10	145	N	
B022	H	646692	265239	Q.r	1	20	1	Y			Y	Y					Multiple	S	9	10	80	10	146	N	
B023	VH	646706	265253	Q.r	3	15	0.8		Y						Y		Multiple	M	2	4	60	10	147	N	
B024	M	646680	265248	Q.r	2	15	0.6						Y				N	S	5		70	80	148	N	
B025	H	646674	265246	Q.r	2	15	1	Y					Y				NW	M	5		75	0	149	N	
B026_R8	VH	646675	265247	Q. sp.	4	6	0.75	Y	Y								Multiple	L	0	6	10	0	150-151	N	
B027	VH	646685	265269	Q. sp.	6	4	0.3	Y					Y				Multiple	L	0	4	20	100	152	N	
B028	H	646671	265266	P.t	2	14	0.3	Y									SE	S	6		30	100	153	N	
B029	H	646648	265272	Q.r	2	10	1				Y	Y					W	S	4		90	20	154	N	
B030	M	646643	265277	Q.r	2	12	0.8	Y					Y				S	S	5	7	80	30	155	N	

								Feature data																
Location				Tree data				Type												Height		% cover			
ID	Assessment	Eastings	Northings	Species	Decay	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?
B031	H	646653	265272	A.p	4	12	0.9	Y					Y			Y	Multiple	M	1.5	4	30	100	156	N
B032	M	646636	265314	Q.r	2	14	0.75						Y	Y			S	S	6		80	100	157	N
B033	H	646632	265334	A.p	2	12	MS	Y					Y				W	M	1	3	80	0	158	N
B034	VH	646540	265359	Q.r	2	12	0.8	Y		Y			Y				W	U	6	8	20	40	159	N
B035_R5	VH	646732	265174	Q.r	2	12	50		Y								S	S	4		75	80	160	N
B036	H	646734	265174	A.p	2	15	70							Y			N	S	2.5		90	0	161	N
B037	M	646784	265187	P.t	1	18	1							Y			S	S	16		60	50	162-163	
C001	M	646095	264927	Q.r	U	8	1								Y		Multiple	L	U	U	U	U	171	Y
C002	M	646085	264952	U	6	12	0.8							Y	Y		W		4		0	0	172	N
C003	M	646085	264947	Q.r	U	8	1								Y		Multiple	L	U	U	U	U	U	Y
C004	M	646091	264903	P. sp	3	9	1					Y		Y			N	M	3		60	50	173	N
C005	M	646094	264859	F.s	2	14	MS						Y				N	M	3	4	90	20	174	N
C006	VH	646098	264766	F.s	2	14	1						Y				NW	L	2		90	30	175-176	N
C007	M	646112	264734	F.s	2	151	1						Y	Y			N	L	0	4	50	0	177	N
D001	M	645297	264029	Q.r	2	20	1.5		Y						Y		SW	M	5		40	5	1	N
D002	H	645283	264027	A.h	2	20	1.5		Y		Y				Y		SW	M	3	5	40	5	2	N
D003	H	645274	264026	P.s	4	20	0.8		Y								Multiple	L	2	8	40	5	3	N
D004	VH	645261	264028	P.s	1	30	1.8		Y								Multiple	L	0	30	50	5	4	N
D005	M	645257	264024	Q.r	2	20	1.3		Y					Y			S	S	4		40	5	5	N
D006	H	645242	264029	P.s	5	4	0.8		Y						Y		Multiple	M	1	4	50	5	6	N
D007	H	645054	264055	U	5	4	2		Y								E	L	0	4	50	5	7	N
D008	M	645068	264115	Q.r	2	20	1.5		Y								SW	S	7		60	70	8	N
D009	H	645071	264136	A.p	1	15	0.5	Y									W	M	4	7	60	40	9	N
D010	M	645085	264161	U	5	6	0.8		Y								Multiple	M	1	6	60	30	10	N
D011	M	645088	264155	Q.r	2	20	1.5		Y						Y		N	S	2		40	5	11	N
D012	M	645080	264147	P.s	4	20	1.2		Y								Multiple	M	3		90	5	12	N
D013	M	645085	264120	Q.r	2	25	1.5		Y								N	S	4		40	10	13	N
D014	M	645080	264090	A.p	2	20	0.9		Y								Multiple	L	0	10	40	5	14	N
D015	H	645010	264008	Q.r	4	20	5		Y				Y	Y			Multiple	L	2	20	90	5	15	N
D016	M	644957	263993	Q.r	2	30	2.5		Y								N	S	7		30	5	16	N

								Feature data																
Location				Tree data				Type												Height		% cover			
ID	Assessment	Eastings	Northings	Species	Decay	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?
D017	H	644984	263983	Q.r	2	20	3		Y		Y	Y		Y			Multiple	M	2	20	40	5	17	N
D018	M	645019	263993	Q.r	2	20	1.5		Y								SW	S	4	6	40	5	18	N
D019	H	645110	264013	U	5	10	3		Y								Multiple	L	0	4	30	30	19	N
D020	M	645106	264010	U	5	15	3		Y								Multiple	L	0	4	40	30	20	N
D021	M	645170	264022	Q.r	2	20	1.2		Y								S	S	5		30	5	21	N
D022	H	645190	264019	Q.r	4	10	1		Y								Multiple	M	1	4	30	5	22	N
D023	M	645190	264023	Q.r	2	15	1		Y								N	S	2		30	5	23	N
D024	M	645307	264049	C.s	2	12	0.9	Y			Y	Y					E	M	5	10	40	5	24	N
D025	M	645289	264077	Q.r	2	8	1		Y								NW	S	6		40	7	25	N
D026	M	645077	264035	U.g	3	13	0.4		Y								Multiple	M	2	6	75	60	26	N
E001	M	645385	263776	Pr. sp	2	5	0.2		Y								NW	S	1.5	2.5	90	0	682-684	N
E002	M	645365	263760	Con	2	16	1.25		Y			Y					Multiple	L	0	16	50	30	685-689	N
E003	M	645360	263768	Con	2	16	1				Y	Y					W	S	8		50	25	691	N
E004	VH	645363	263788	Con	2	16	1.25		Y		Y	Y	Y				Multiple	L	0	16	50	50	697-700	Y
E005	M	645360	263792	Con	3	10	1			Y	Y	Y					Multiple	L	0	10	50	50	692-696	Y
E006	VH	645378	263796	Con	3	16	1	Y	Y		Y		Y				N	L	8		30	50	705-706	N
E007	H	645426	263809	Q. sp.	5	7	0.25		Y								Multiple	S	2	3	50	30	707-708	N
E008	M	645397	263819	P. sp	3	12	0.3	Y					Y				SW	S	3	4	80	25	709	N
E009	H	645356	263811	U. sp.	4	7	0.2		Y								Multiple	M	1	4	20	10	710-713	N
E010	H	645362	263815	U. sp.	4	7	0.25		Y								Multiple	M	0	4	30	20	N/A	N
E011	M	645394	263859	Con	7	2	0.25		Y		Y						Multiple	S	1.5		40	70	35	N
E012	M	645384	263830	Con	7	2.25	0.2		Y								SE	S	1.5	2	10	90	36	N
E013	M	645399	263821	Con	7	1.5	0.2		Y			Y					S	S	1	1.5	20	70	37-39	N
E014	H	645375	263828	Con	2	16	1.25	Y				Y					Multiple	S	4	7	20	60	40-41	N
E015	M	645351	263820	U. sp.	4	7	0.15		Y								Multiple	M	1	7	5	20	42	N
E016	M	645354	263823	U. sp.	4	7	20		Y								Multiple	M	1	7	5	80	43	N
E017	M	645376	263859	Q.r	2	16	0.2					Y					Multiple	S	4		80	20	44	N
E018	M	645399	263878	Con	7	10	0.2	Y			Y						Multiple	S	0	3	80	60	45-47	N
E019	M	645382	263866	Q. sp.	4	10	0.25		Y								Multiple	M	1	10	30	20	48	N
E020	M	645378	263880	C.a	3	12	MS				Y						E	S	1.5	2	50	30	49-50	N

								Feature data																
Location				Tree data				Type													Height		% cover		
ID	Assessment	Eastings	Northings	Species	Decay	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?
E021	H	645383	263883	Q. sp.	4	12	0.2		Y								Multiple	M	2	12	50	25	51	N
E022	M	645380	263911	P. sp	2	16	0.3								Y		Multiple	L	2	6	60	30	52	N
E023	M	645377	263926	C.s	2	16	0.35					Y					E	S	12		80	60	53-54	N
E024	M	645380	263938	C.s	6	10	0.2	Y	Y								Multiple	S	3	4	90	10	55- 58	N
E025	M	645383	263933	A.p	1	16	0.35								Y		Multiple	L	4	12	80	25	59	N
E026	M	645379	263930	A.p	1	16	MS								Y		Multiple	L	3	14	80	10	60	N
E027	M	645387	263944	Q.r	2	16	0.5				Y						Multiple	S	10		70	30	61-62	N
E028	M	645382	263954	Q.r	1	14	0.25								Y		Multiple	L	2	10	70	30	?	N
E029	M	645388	263947	Q.r	2	16	0.5					Y					SE	S	10		90	30	65	N
E030	M	645386	263951	Q.r	2	16	0.35				Y			Y			SE	S	4	10	90	30	66-67	N
E031	H	645404	263950	Q.r	2	16	0.75				Y	Y					S	S	8		90	30	68	N
E032	M	645407	263954	Q.r	2	16	0.3								Y		Multiple	L	0	16	90	30	NA	N
E033	M	645408	263941	A.p	1	14	0.25								Y		Multiple	L	0	14	60	20	NA	N
E034	M	645410	263962	Con	1	14	0.5								Y		Multiple	L	0	14	80	40	NA	N
E035	M	645427	263966	Q.r	2	16	0.4					Y					S	S	7	8	80	40	69-70	N
E036	M	645415	263969	Q.r	2	16	0.5								Y		Multiple	L	0	16	60	20	NA	N
E037	M	645406	263974	Q.r	2	16	0.5								Y		Multiple	L	0	16	50	20	NA	N
E039	M	645423	263975	Q.r	2	16	0.7								Y		Multiple	L	0	16	60	50	NA	N
E040	M	645420	263963	Q.r	2	16	0.4								Y		Multiple	L	1	16	70	10	NA	N
E041	M	645427	263972	Q.r	2	16	0.4								Y		Multiple	L	1	16	70	10	NA	N
E042	M	645430	263959	Con	2	16	0.4								Y		Multiple	L	1	16	80	10	NA	N
E043	H	645430	263959	Q.r	2	16	0.6				Y				Y		S	M	0	16	80	10	71-72	N
E044	VH	645435	263983	Con	6	6	0.5	Y	Y								Multiple	L	2	6	90	20	73-75	N
E045	VH	645498	263977	Q.r	2	8	0.3			Y	Y						Multiple	M	8		80	20	76-78	N
E046	M	645499	263972	Q.r	2	16	0.3				Y	Y					S	M	7	8	80	20	79-80	N
E047	M	645498	263966	Q.r	2	14	0.4				Y	Y					S	S	5		50	5	81-82	N
E048	H	645509	263973	Q.r	6	7	0.4				Y						Multiple	L	5		60	10	83-84	N
E049	M	645522	263988	Q.r	2	16	0.5				Y						Multiple	S	14		80	10	NA	N
E050	M	645530	263988	Q.r	2	16	0.5				Y	Y					N	M	12		70	30	85-86	N
E051	M	645523	263974	Q.r	2	16	0.6				Y	Y					Multiple	M	8	9	60	20	87-88	N

								Feature data															
Location				Tree data				Type												Height		% cover			
ID	Assessment	Eastings	Northings	Species	Decay	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?
E052	M	645522	2 6396	Q.r	2	16	0.5				Y	Y					S	M		5		50	5	89	N
E053	M	645533	263992	F.e	2	6	0.2				Y						N	S		2		60	30	90-92	N
E054	M	645535	263989	Q.r	2	18	0.6	Y			Y						NE	M		14		60	20	93	N
E055	M	645540	263980	Q.r	2	16	0.6				Y	Y					Multiple	S		10	11	70	5	94	N
E056	H	645523	263994	F.e	2	14	0.4						Y				N	S		4		50	5	95	N
E057	H	645525	264003	Con	2	18	0.5	Y									Multiple	S		4	7	5	5	96	N
E058	M	645536	264006	Q.r	2	16	0.9				Y						NE	S		2		40	10	97-99	N
E059	M	645509	264047	U. sp.	6	20	0.7		Y								Multiple	L		0	20	20	5	NA	N
E060	M	645505	264042	U. sp.	6	8	0.2		Y								E	S		3		0	5	101	N
E061	M	645505	264033	U. sp.	6	8	0.2		Y								E	S		3		0	5	102-103	N
E062	H	645511	264037	U. sp.	6	8	0.2		Y								Multiple	L		0	8	0	5	104	N
E063	M	645508	264031	U. sp.	6	8	0.25		Y								Multiple	L		0	8	20	5	105	N
E064	H	645???	264031	U. sp.	6	8	0.2		Y								Multiple	L		0	8	20	5	106	N
E065	H	645511	264022	U. sp.	6	10	0.3		Y								Multiple	L		0	10	10	0	107	N
E066	M	645518	264025	U. sp.	6	8	0.2		Y								Multiple	L		0	8	10	0	108	N
E067	VH	65519	24032	Q. sp.	6	9	1.25	Y	Y			Y					Multiple	L		0	9	0	20	109-110	N
E068	VH	645453	264038	A.h	2	16	1.1		Y	Y	Y	Y					Multiple	M		3	16	30	5	11-112	N
E069	VH	645453	264038	A.h	6	15	0.75		Y								Multiple	M		2	15	40	10	113 -114	N
E070	M	645462	264024	U. sp.	6	10	0.25		Y								Multiple	L		0	10	30	30	115	N
E071	M	645463	264022	U. sp.	6	10	0.2		Y								Multiple	L		0	10	30	40	116	N
E072	M	645466	264019	U. sp.	6	10	0.2		Y								Multiple	L		0	10	30	40	117	N
E073	M	645466	264019	U. sp.	6	10	0.2		Y								Multiple	L		0	10	30	40	118	N
E074	M	645473	264026	U. sp.	6	8	0.3		Y								Multiple	L		0	8	20	90	119	N
E075	M	645486	264019	U. sp.	6	10	0.3		Y								Multiple	L		0	4	30	80	120	N
E076	M	645485	264020	U. sp.	6	8	0.25		Y								Multiple	M		0	4	20	80	121	N
E077	M	645432	264030	U. sp.	6	10	15		Y								N	S		1		80	5	122	N
E078	H	645421	2 6403	A.h	2	20	1.25		Y						Y		Multiple	M		4	16	70	5	123	N
E079	M	645428	264016	U. sp.	6	10	0.25		Y								Multiple	L		0	10	75	15	124	N
E080	M	645418	264009	A.p	2	20	0.5								Y		Multiple	L		3	20	80	10	125	N
E081	M	645414	264002	A.p	2	18	0.3								Y		Multiple	L		1.5	16	80	10	126	N

								Feature data																
Location				Tree data				Type													Height		% cover			
ID	Assessment	Eastings	Northings	Species	Decay	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?
E082	M	645419	264002	A.p	2	16	0.2								Y		Multiple	L	2	14	80	10	127	N
E083	M	645407	263985	Q.r	2	20	0.6								Y		Multiple	L	1	16	80	5	128	N
E084	M	645413	264015	A.p	2	18	0.4								Y		Multiple	L	2	16	70	10	129	N
E085	M	645403	263994	A.p	2	18	30								Y		Multiple	L	2	16	60	30	130	N
E086	M	645405	263992	Q.r	2	20	0.7								Y		Multiple	L	2	18	60	50	131	N
E087	H	645401	264001	A.p	3	16	0.25	Y		Y			Y				Multiple	M	2.5	3.5	70	5	132	N
E088	M	645399	263995	A.p	2	20	0.4								Y		Multiple	L	2	18	70	5	NA	N
E089	M	645401	264008	A.p	2	20	0.4								Y		Multiple	L	2	18	80	5	NA	N
E090	M	645398	264013	A.p	2	20	0.4								Y		Multiple	L	2	18	70	10	NA	N
E091	M	645389	264016	A.p	2	16	0.3								Y		Multiple	L	2	6	80	10	134-136	N
E092	M	645398	264007	Con	7	1.5	0.4		Y						Y		Multiple	L	0	1.5	80	10	137-138	N
E093	M	645390	264018	Con	7	3	0.4		Y		Y						Multiple	M	0	3	80	30	139-141	N
E094	M	645374	264004	A.p	2	18	0.3								Y		Multiple	L	4	16	60	10	NA	N
E095	M	645382	264000	A.p	2	18	0.4								Y		Multiple	L	2	16	70	20	NA	N
E096	M	645386	263999	A.p	2	18	0.4								Y		Multiple	L	2	16	70	10	NA	N
E097	M	645397	263996	A.p	7	4	0.2	Y		Y			Y				Multiple	M	3	4	70	5	142	N
E098	M	645394	263985	A.p	2	16	0.4								Y		Multiple	L	1	14	60	50	143-145	N
E099	M	645385	263982	U. sp.	5	12	0.3		Y								Multiple	L	0	10	20	10	NA	N
E100	M	645383	264000	A.p	2	18	0.35								Y		Multiple	L	3	16	30	5	NA	N
E101	M	645386	263966	Q.r	2	20	0.6								Y		Multiple	L	2	18	50	40	NA	N
E102	M	645383	263969	Q.r	2	20	0.8								Y		Multiple	L	2	18	50	40	NA	N
E103	M	645359	263992	Con	2	20	0.6		Y						Y		Multiple	L	2	18	60	25	NA	N
E104	M	645358	263998	A.p	2	18	0.4								Y		Multiple	L	2	16	70	5	NA	N
E105	M	645371	264010	A.p	2	18	0.6								Y		Multiple	L	2	16	50	20	NA	N
E106	H	645342	264017	A.h	2	18	1.25	Y				Y	Y				S	M	7	8	50	10	148-149	N
E107	H	645322	264008	A.h	2	18	1								Y		Multiple	L	0	16	30	5	150	N
E108	H	645317	264011	U. sp.	5	8	0.2		Y								Multiple	L	0	8	20	5	151	N
E109	M	645314	264018	Q.r	2	18	0.9								Y		Multiple	L	0	10	25	15	152	N
E110	M	645322	263985	A.p	2	20	0.3								Y		Multiple	L	2	18	60	5	NA	N
E111	M	645320	263982	U. sp.	5	14	0.4								Y		Multiple	L	0	14	30	10	NA	N

Location				Tree data				Feature data: Type									Aspect	Extent	Height		% cover				
ID	Assessment	Eastings	Northings	Species	Decay	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?
E112	M	645325	263984	A.p	2	18	0.4								Y		Multiple	L	0	16	40	20	NA	N
E113	M	645324	263971	Con	5	14	0.4			Y					Y		Multiple	L	0	12	10	50	NA	N
E114	M	645319	263959	Q.r	2	20	0.5								Y		Multiple	L	2	18	70	40	NA	N
E115	M	645317	263957	Q.r	2	20	0.6								Y		Multiple	L	2	18	60	60	NA	N
E116	M	645316	263948	Q.r	2	20	0.5								Y		Multiple	L	2	18	70	50	NA	N
E117	M	645315	263941	Q.r	2	20	40								Y		Multiple	L	2	18	70	50	NA	N
E118	M	645323	263945	Q.r	2	20	0.4								Y		Multiple	L	2	18	80	40	NA	N
E119	M	645321	263941	Q.r	2	20	0.5								Y		Multiple	L	2	18	70	40	NA	N
E120	M	645352	263970	A.p	2	18	1								Y		Multiple	L	0	18	40	30	NA	N
E121	M	645372	263950	U. sp.	5	12	0.3		Y								Multiple	L	1.5	6	10	40	153	N
E122	M	645366	263931	U. sp.	5	14	MS		Y								Multiple	L	2	6	30	10	154-155	N
E123	M	645353	263922	U. sp.	5	14	MS		Y								Multiple	L	1	6	40	5	156	N
E124	M	645349	263903	U. sp.	5	14	0.25		Y								Multiple	M	0	8	0	60	157	N
E125	H	645352	263909	U. sp.	5	14	0.25		Y								Multiple	L	0	8	0	60	158	N
E126	H	645336	263891	Con	2	20	1.5		Y		Y						Multiple	L	0	20	20	60	159-161	N
E127	M	645331	263894	U. sp.	6	2.5	0.15				Y						E	M	0.5	2	20	80	162	N
F001	H	645347	264036	U. sp.	2	7	MS				Y						SE	L	0	3	90	20	163	N
F002	M	645356	264035	Q.r	2	18	1.5		Y		Y						S	S	6		80	60	164	N
F003	H	645365	264027	T. sp.	2	20	2									Y	Multiple	L	0	8	60	10	165	Y
F004	M	645387	264035	Q.r	2	20	1.75				Y			Y			E	S	1	9	80	5	166-167	N
F005	M	645400	264035	T. sp.	2	20	2									Y	Multiple	L	0	6	60	5	168	Y
F006	M	645511	264060	Q.r	2	20	1.25		Y		Y						Multiple	S	1.5	10	50	10	169-170	N
F007	H	645525	264064	Q.r	2	18	1.1		Y			Y					Multiple	M	1.5	2.5	80	10	171-174	N
F008	VH	645551	264094	F.e	3	16	1.1						Y	Y			Multiple	L	2	4	50	60	175-179	N
F009	M	645573	264100	U. sp.	5	10	0.15		Y								Multiple	L	0	3	20	40	180	N
F010	M	645570	264105	U. sp.	5	12	0.2		Y		Y						Multiple	M	0	4	20	60	NA	N
F011	VH	645582	264103	Q.r	7	4	1		Y		Y						Multiple	L	0	4	25	60	182	N
F012	H	645623	264128	Q.r	2	18	1.1		Y		Y	Y					S	S	0	18	70	30	183	N
F013	VH	645623	264136	Q.r	2	18	1.1	Y	Y		Y	Y	Y	Y			Multiple	M	1.5	6	70	5	184-191	N
F014_R1	VH	645631	264149	Q.r	2	14	1		Y		Y	Y					S	M	U	U	70	50	192-194	N

								Feature data																
Location				Tree data				Type												Height		% cover			
ID	Assessment	Eastings	Northings	Species	Decay	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?
F015	VH	645642	264144	Q.r	2	16	1		Y		Y	Y					Multiple	M	2	10	70	5	195-198	N
F016	H	645646	264150	Q.r	2	16	0.7		Y		Y						Multiple	M	6	7	50	5	199-201	N
F017	M	645652	264157	Q.r	2	16	0.6				Y						SE	S	6		50	5	202	N
F019	M	645660	264169	Q.r	2	16	0.8					Y					S	S	3		50	0	203	N
F020	H	645668	264176	Q.r	2	18	1		Y		Y	Y					SE	S	3		50	0	204-205	N
F021	M	645679	264171	P.t	3	10	0.6	Y			Y	Y					Multiple	M	3	6	10	10	206-207	N
F022	M	645698	264189	Q.r	2	18	1					Y					S	S	2	3	70	5	208	N
F023	M	645712	264204	Q.r	2	18	1				Y			Y			Multiple	S	3	10	70	10	209	N
F024	H	645727	264213	Q.r	2	18	1				Y						Multiple	S	1.5	3	80	0	210-211	N
F025	M	645745	264221	P.t	2	18	0.5				Y						E	S	2.5		40	0	212	N
F026	M	645797	264243	Q.r	2	16	1				Y						SW	S	4		70	0	213	N
F027	H	645800	264249	Q.r	2	18	1.2				Y						SW	S	2		70	0	214	N
F028	M	645809	264256	Q.r	2	16	0.6					Y					NE	S	6		60	0	215	N
F029	VH	645818	264260	P.t	2	18	0.5	Y			Y	Y	Y				Multiple	M	5		40	0	216-218	N
F030	M	645838	264272	Q.r	2	18	0.7						Y				E	M	8		80	0	219	N
F031	H	645848	264277	Q.r	2	18	1.1					Y			Y		Multiple	L	1	16	70	0	220	N
F032	M	645859	264281	Q.r	2	18	0.8				Y						W	S	8		50	0	221	N
F033	VH	645867	264227	Q.r	3	16	0.7						Y				Multiple	M	6		40	0	222-223	N
F034	M	645875	264286	P.t	2	3	0.4	Y						Y			W	S	2.5	3	0	0	224	N
F035	VH	645896	264298	Q.r	2	18	1.1		Y				Y				Multiple	M	2	8	70	5	225-227	N
F036	M	645906	264292	Q.r	2	18	1		Y			Y	Y				S	M	6	7	70	10	228	N
F037	M	645914	264301	Q.r	2	16	0.8		Y		Y	Y					S	M	3		60	10	189	N
F038	H	645920	264312	Q.r	2	16	0.8		Y		Y						Multiple	S	4	5	50	5	190	N
F039	H	646026	264364	Q.r	6	2	0.4		Y								Multiple	L	0	2	70	5	191	N
F040	M	646041	264371	Q.r	2	18	70		Y								S	S	4		60	0	192	N
F042	M	646060	264386	Q.r	2	16	0.6		Y								S	M	3		60	0	193	N
F043_R2	M	646066	264390	Q.r	2	16	0.8		Y		Y	Y					W	S	5		60	5	194	N
F044	M	646070	264388	Q.r	2	16	0.8		Y								NE	S	3	4	60	0	195	N
F045	M	646082	264394	Q.r	2	16	70		Y								S	S	3		60	0	196	N
F046	M	646088	264399	Q.r	2	18	1.1				Y			Y			S	S	4		50	0	197	N

Location				Tree data				Feature data: Type									Aspect	Extent	Height		% cover			
ID	Assessment	Eastings	Northings	Species	Decay	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?
FA001	M	645932	264707	Q.r	2	15	0.8					Y	Y				U	U	5		10	0	176	N
FA002	M	645942	264705	Q.r	2	15	0.8		Y								NE	S	4		10	0	177	N
FA003	M	645944	264693	Q.r	2	15	1		Y								E	S	5		10	0	178	N
FA004	H	645951	264693	Q.r	5	5	0.3		Y								Multiple	M	1	3	10	0	179	N
FA005	H	645976	264647	Q.r	5	10	0.8		Y								Multiple	L	2	8	10	0	180	N
FA006	M	646005	264603	P. sp	5	12	0.5				Y						W	M	2	4	10	0	181	N
FA007	M	646030	264567	Q.r	2	15	0.8						Y				W	U	1		10	0	182	N
FA008	M	646087	264487	Q.r	2	13	0.8		Y								SW	S	5		10	0	183	N
FA009	H	646101	264471	P. sp	5	9	0.7					Y	Y				NE	M	4	6	10	0	184	N
FA010	M	646112	264454	Q.r	3	15	0.7		Y								E	S	7		10	0	185	N
FA011	H	646124	264435	P. sp	4	10	0.8		Y			Y					Multiple	S	3		30	0	186	N
FA012	M	646130	264430	Q.r	2	15	1.3		Y		Y						E	S	8		30	0	187	N
FA013	M	646131	264424	Q.r	2	15	1.3		Y			Y					Multiple	S	3		30	0	188	N
G001	H	645641	263945	U	6	15	0.3		Y								E	L	0	4	30	20	178	N
G002	H	645635	263918	B. sp.	2	15	1							Y			S	S	3		60	20	179	N
G003	H	645651	263933	U	6	10	30		Y								Multiple	L	0	10	0	100	180	N
G004	M	645709	263913	Q.r	2	12	0.9							Y			Multiple	L	0	12	70	10	181	Y
G005	H	645785	263936	Q.r	2	15	1				Y						S	S	4		70	100	182-183	N
G006	M	645869	264014	B. sp.	2	12	0.4						Y				NW	M	4		75	100	184	N
G007	H	646112	264086	U	3	4	0.2		Y				Y				NW	M	1	2.5	60	0	185	N
G008	VH	646254	264012	S. sp.	2	18	1	Y			Y	Y					N	M	6	7	70	30	186	N
G009	VH	646273	264022	S. sp.	2	18	1				Y	Y					N	M	6	7	75	0	187	N
G010	H	646446	264194	Q.r	2	12	0.4				Y	Y					SE	S	3.5		60	30	188	N
G011	VH	646465	264197	S. sp.	2	10	0.45	Y					Y				Multiple	L	3	9	75	20	189	N
G012	VH	646528	264194	Q.r	2	12	0.5				Y	Y					W	M	5		80	10	190	N
G013	VH	646570	264306	F.e	2	15	1						Y	Y			W	S	4		60	20	191	N
H001	H	646624	264310	S. sp.	2	15	1.2		Y				Y				Multiple	S	2	10	30	100	119	N
H002	H	646629	264304	A.g	2	10	0.6	Y									E	M	4	8	30	100	120	N
H003	H	646689	264274	F.e	2	14	0.6				Y						SW	M	0	2	50	50	121	N
H004	H	646677	264258	F.e	6	6	0.65	Y					Y				SE	U	3	5	90	50	122	N

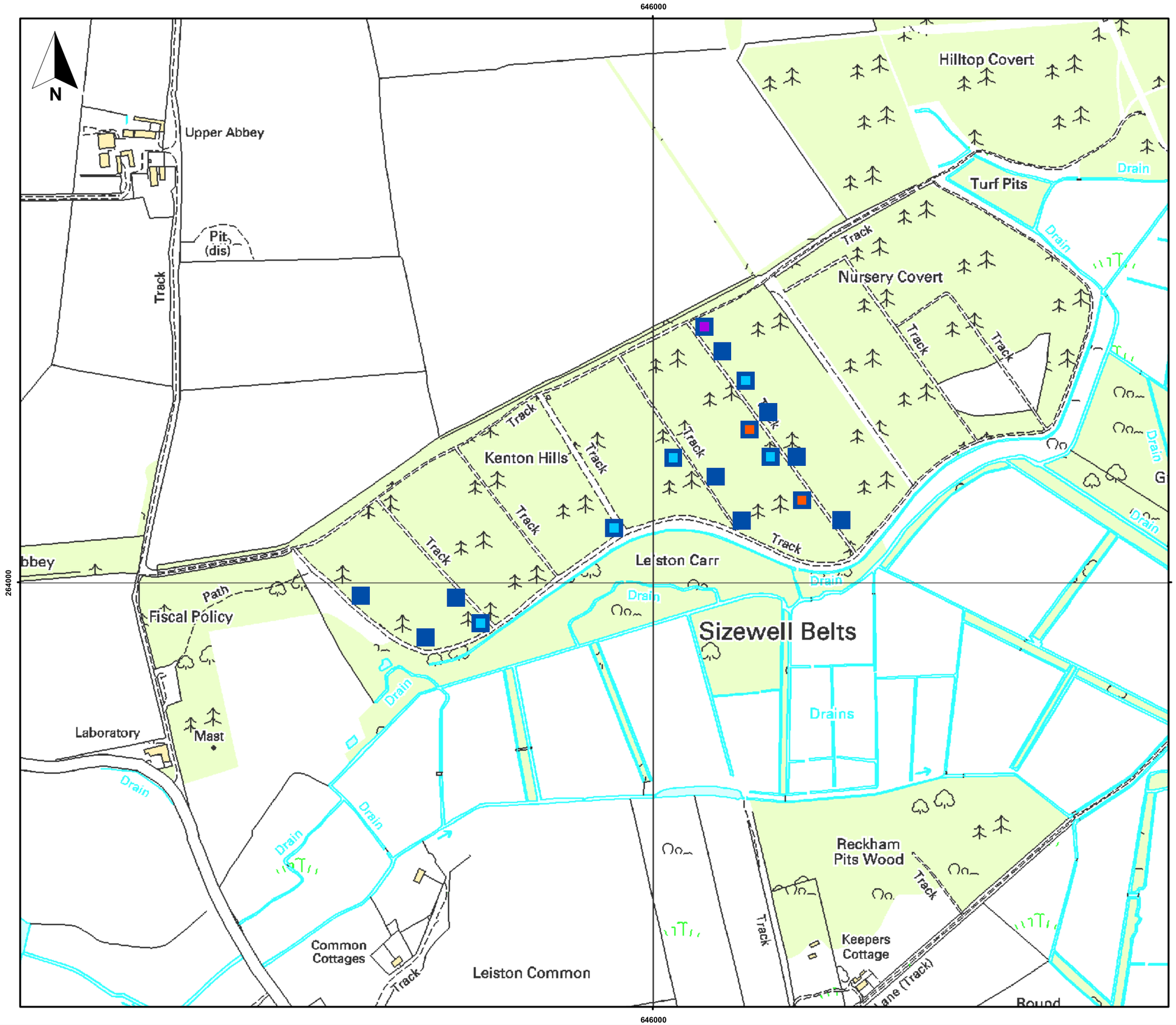
								Feature data															
Location				Tree data				Type												Height		% cover			
ID	Assessment	Eastings	Northings	Species	Decay	Height	DBH(m)	WPH	HB	SOT	VS	HS	Hollow	Rot hole	Dense Ivy	Epicormic growth	Aspect	Extent	lower extent	upper extent	Canopy	Understorey	Image no.	Winter re-check?
H005	H	646680	264253	F.e	3	16	0.5				Y		Y		Y		SW	U	U	U	60	50	123	N
H006	VH	646673	264277	F.e	2	14	0.65			Y			Y				N	M	8		50	100	124	N
H007	H	646690	264268	F.e	6	14	0.6	Y									W	M	8		100	50	125	N
H008	H	646682	264259	F.e	6	6	0.5						Y				N	M	4		80	100	126	N
H009	H	646687	264254	F.e	2	18	0.6	Y									E	S	10		50	50	127	N
H010	H	646687	264254	F.e	4	16	0.5	Y		Y							S	S	10		50	50	NA	N
H011	H	646693	264253	F.e	2	18	U	Y						Y			NE	S	6		60	80	128	N
H012	H	646707	264246	P. sp	7	2	0.8		Y		Y	Y	Y				U	U	U		80	100	129	N
H013	H	646714	264236	F.e	6	10	0.35		Y								U	U	2	4	80	100	130	N
H014	M	646723	264234	F.e	2	18	0.4			Y			Y				S	U	10		80	80	131	N
H015	H	646733	264223	Q. sp.	2	16	0.5		Y								Multiple	M	8	10	60	80	132	N
H016	H	646751	264215	P. sp	2	20	0.8						Y				S	M	U		100	80	133	N
H017	M	646761	264213	Q. sp.	2	16	0.5		Y	Y							E	S	8		50	80	134	N
H018	M	646771	264180	F.e	6	8	0.4						Y				N	U	5		0	60	135	N
H019	VH	646762	264179	P. sp	6	8	0.4		Y								Multiple	L	4		100	80	136	N
H020	H	646758	264167	P. sp	6	8	0.6		Y								Multiple	L	4		100	80	137	N
H021	VH	646754	264183	P. sp	6	U	U		Y								U	U	U		0	100	138	N
H022	VH	646725	264175	P. sp	4	20	1		Y								U	U	U		25	80	139	N
H023	H	646719	264185	P. sp	2	24	0.85						Y	Y			E	S	U		60	80	140	N
H024	H	646699	264200	P. sp	4	16	1		Y								W	S	2	5	80	80	141	N
H025	M	646642	264220	B. sp.	2	1	0.5							Y			W	S	4		80	50	142	N
H026	M	646581	264184	A.g	U	U	U	Y			Y	Y					N	S	4		80	50	143	N
H027	H	646679	264162	B. sp.	6	12	0.45	Y	Y	Y							U	U	10		20	50	144	N
H028	H	646702	264170	A.g	2	14	0.2	Y									U	U	5		60	100	145	N
H029	VH	646732	264160	Q. sp.	4	18	0.5				Y	Y					U	M	12	14	0	100	146	N
H030	H	646764	264119	Q. sp.	2	20	U						Y				U	S	8		50	100	147	N
H031	H	646807	264083	F.e	2	14	40	Y						Y			U	U	10		20	100	U	N
H032	VH	646851	264038	A.g	1	U	MS	Y					Y				Multiple	M	U	U	U	U	148	N
I001	M	646450	264394	Q.r	2	20	0.7		Y								W	S	16	18	0	60	149	N
I002	M	646445	264320	F.e	5	8	0.15						Y				W	M	4	6	20	50	150	N

Location				Tree data				Feature data: Type									Aspect	Extent	Height		% cover			
ID	Assessment	Eastings	Northings	Species	Decay	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?
I003	M	646862	264095	F.e	3	5	0.15						Y				SW	U	5		20	60	152	N
I004	M	646948	264103	S. sp.	2	23	1.5		Y					Y			Multiple	U	10	14	20	60	153	N
I005	H	646934	264108	S. sp.	2	25	1		Y		Y	Y					Multiple	M	10	15	20	60	154	N
I006	VH	646933	264117	S. sp.	3	20	MS		Y								U	U	12		20	60	155	N
I007	VH	646928	264117	S. sp.	4	25	MS		Y								U	U	12		20	80	155	N
I008	VH	646927	264139	S. sp.	5	18	1.2		Y		Y	Y	Y				U	U	4	11	20	30	156	N
I009	VH	647031	264197	S. sp.	3	15	2.5		Y				Y				Multiple	L	2	10	0	U	157	N
I010	VH	647017	264203	S. sp.	4	15	2		Y				Y				Multiple	L	6	10	0	U	158	N
I011	H	647017	264203	S. sp.	4	15	MS		Y			Y	Y				Multiple	L	2	10	5	U	159-160	N
I012	VJH	646951	264211	S. sp.	3	20	1.5	Y	Y				Y				U	U	U		5	20	161-164	N
JA001	H	645565	263986	P. sp	6	8	0.3	Y									NW	M	6	7	20	40	0138-0141,0142	N
JA002	H	645566	263980	P. sp	6	6	0.2	Y									Multiple	M	4	5	50	80	0140-0139	N
JA003	H	645690	263990	P. sp	6	4	0.4	Y									S	S	4.5	4.5	50	80	0143-0144	N
JA004	H	645680	264009	P. sp	6	6	0.35	Y									Multiple	M	4	5	55	80	0145-0146	N
JA005	M	645697	264036	P. sp	2	14	0.45						Y				N	S	12	12	55	65	0149-0150	N
JC001	M	645888	264181	P. sp	4	15	0.5						Y				NE	M	12	12	45	70	151	Y
JC002	H	645858	264181	P. sp	6	8	0.35	Y					Y				Multiple	M	6	8	40	70	0153-0154	N
JC003	H	645863	264168	P. sp	6	11	0.45		Y					Y			Multiple	M	7	7	40	70	0156-0157	N
JC004	H	665841	264198	P. sp	6	12	0.45						Y				Multiple	M	8	12	40	75	0158-0160	N
JC005	H	645832	264238	P. sp	6	10	0.3	Y									S	M	10	10	40	80	0161-0162	N
JC006	H	645854	264237	P. sp	6	7.5	0.4	Y									NE	M	7	7	30	80	163	N
JD001	M	645898	264209	P. sp	6	9.5	0.35	Y									E	M	7	7	35	75	164	N
JD002	M	645991	264141	P. sp	2	14	0.4					Y					W	M	10	12	45	80	0165-0166	N
JF001	M	646157	264404	P. sp	3	11	0.15		Y								W	M	1	4	20	45	170	N
JH001	M	646295	264213	P. sp	2	20	1					Y					NW	S	2.5	3	50	40	171	N
JI001	M	646343	264421	U	6	10	0.2		Y								N	S	3		0	100	192	N
JI002	H	646317	264479	P. sp	6	5	0.25	Y									N	S	5		0	0	193	N
JI003	H	646335	264496	P. sp	6	12	0.4	Y									N	M	4	8	10	40	194	N
JI004	M	646403	264414	P. sp	2	15	0.5					Y	Y				W	M	10	10	55	75	0173-0174	N

								Feature data																
Location				Tree data				Type												Height		% cover			
ID	Assessment	Eastings	Northings	Species	Decay	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?
JI005	M	646377	264339	P. sp	220	1	1				Y	Y					S	M	15	15	40	50	0175-0176	N
KB001	M	646582	264755	P. sp	2	20	1.5	U	U	U	U	U	U	U	U	U	Multiple	M	10		30	0	166	N
KB002	H	646560	264769	P. sp	5	7	0.6			Y			Y				Multiple	L	4	7	30	0	167	N
KB003	M	646482	264745	P. sp	2	16	1		Y		Y	Y					E	M	13		30	0	168	N
KB004	M	646489	264659	P. sp	5	7	0.6	Y		Y							N	U	5		30	0	169	N
KB005_R11	H	646369	264564	U. sp.	5	15	0.15		Y								S	L	1	6	40	50	170	N
KB006	H	646385	264562	U. sp.	5	12	0.15		Y								Multiple	L	1.5	5	40	50	171	N
KB007	M	646400	264574	U. sp.	2	15	0.3			Y							SE	M	8		40	100	172	N
KB008	M	646360	264740	P. sp	5	35	0.6	Y		Y			Y				SE	Unknown	3		0	U	173	N
KB009	M	646335	264766	P. sp	3	20	1.2				Y	Y	Y				S	Unknown	5		10	20	174	N
KB010	M	646336	264772	P. sp	2	20	1.2				Y	Y					E	S	40		40	20	175	N
KC001	M	646372	264773	P. sp	2	14	1						Y	Y			SE	S	10		60	10	1064-1065	N
KC002	M	646372	264829	P. sp	2	16	1	Y		Y			Y				N	L	10		40	10	1068	N
KC003	M	646392	264809	P. sp	6	3.5	0.2	Y	Y								Multiple	L			0	0	1070	N
KE001	H	646978	264474	P. sp	4	16	0.5	Y		Y							Multiple	M	5	16	20	100	93	N
KE002	M	646561	264498	P. sp	5	10	0.6			Y							Multiple	U	10		40	100	44	N
KE003	M	646710	265104	P. sp	2	25	0.7			Y							Multiple	U	12		40	100	95	N
KE004	M	646744	265119	P. sp	4	4	0.4		Y	Y			Y				W	S	3		40	100	96	N
KE005	M	646857	265139	P. sp	4	6	0.6	Y		Y							NW	S	4	6	40	100	97	N
KE006	M	646890	265090	P. sp	2	20	0.7					Y					SW	M	10		20	5	98	N
KE007	M	646899	265074	P. sp	4	18	0.8			Y							E	U	8		30	5	99	N
KE008	M	646902	265052	P. sp	4	5	0.6			Y							U	U	5		30	5	100	N
KE009	M	646893	265057	P. sp	3	3	0.8			Y			Y				U	U	3		30	5	101	N
KE010	M	646918	265034	P. sp	2	20	80				Y		Y	Y			N	M	12		50	0	102	N
KE011	M	646947	265008	P. sp	2	20	0.8			Y	Y						E	U	14		30	0	103	N
KE012	M	646944	265002	P. sp	2	20	0.8							Y			E	S	18		30	0	104	N
KE013	M	646969	265011	P. sp	2	18	0.8					Y					E	S	10		10	20	105	N
KE014	M	646958	264981	P. sp	2	20	1				Y						SE	M	7		50	0	106	N

								Feature data																
Location				Tree data				Type												Height		% cover			
ID	Assessment	Eastings	Northings	Species	Decay	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?
KE015	M	646961	264974	P. sp	5	3.5	0.2			Y				Y			S	U	3		50	0	107	N
KE016	M	646960	264467	P. sp	5	5	0.4							Y			W	S	3		60	0	108	N
KE017	M	646753	264981	P. sp	4	8	0.5			Y			Y				U	U	8		50	100	109	N
KE018	M	646755	264975	P. sp	4	8	0.5			Y			Y				U	U	8		50	100	110	N
KE019	M	646684	264963	P. sp	4	7	0.5	Y	Y	Y			Y				E	U	6		50	100	111	N
KE020	M	646742	265088	P. sp	4	10	0.5			Y			Y				U	U	10		40	100	112	N
KF001	M	647015	264940	P. sp	2	24	0.75				Y	Y					NE		3.5	10	50	0	196-9650	N
KF002	M	647075	264867	P. sp	2	30	U				Y	Y					E	M	25		40	0	9656	N
KF003	M	646654	264782	P. sp	6	8	0.4	Y									SE	S	7		0	0	9657	N
KF004	H	646999	264943	P. sp	2	25	0.7				Y	Y					E	M	12		100	0	9658-9659	N
KF005	H	646997	264935	P. sp	2	25	0.6				Y						NW	M	8		85	0	9660	N
KF006	H	647039	264916	P. sp	6	12	0.5	Y									S	S	11		80	0	9661	N
KF007	M	647032	264911	P. sp	2	20	0.8	U	U	U	U	U	U	U	U	U	E	U	12	14	50	0	9662	N
KF008	M	647054	264869	P. sp	2	U	U	Y			Y	Y					E	S	12		80	0	9663-9664	N
KF009	H	646782	264717	P. sp	7	3	0.2		Y								Multiple	S	1.5		80	0	9666-9667	N
KF010	M	646707	264815	P. sp	6	4	0.25		Y								Multiple	S			40	0	9668	N
KF011	H	646721	264772	P. sp	6	9	0.25						Y				Multiple	U	6		60	0	9669	N
KG001	M	646890	264609	P. sp	2	24	0.5				Y		Y				S	M	4	6	50	0	9670	N
KH001	M	647060	264461	Q.r	2	6	MS		Y		Y	Y					Multiple	M	6		U	U	9673	N
KH002	H	646929	264595	Q.r	5	6	MS		Y								Multiple	U	3		0	0	9674-9675	N
KI001	M	647195	264675	P. sp	6	12	0.2		Y								W	S	1.8	6	80	0	9676	N
KI003	H	647177	264871	P. sp	2	25	0.6				Y	Y					SE	M	14	16	50	0	9680-9681	N
KI004	H	647148	264847	P. sp	6	7	0.2	Y	Y								Multiple	S	4	6	60	0	9682	N
KI005	H	647135	264848	P. sp	6	12	0.25	Y		Y							S	M	9	10	50	0	9683	N
L001	M	645299	264109	P. sp	2	15	0.8	Y			Y	Y	Y				Multiple	M	5	10	10	0	716	N
L002	M	645310	264089	C.s	1	20	1.5		Y								Multiple	M	7	12	10	0	717	Y
L003	M	645311	264100	Q. sp.	1	15	0.9		Y								NW	S	5	5	10	0	718	N
L004	H	645322	264131	P. sp	3	12	0.8	Y									N	M	9	9	10	0	719	N
L005	M	645320	264150	P. sp	4	4	0.4						Y	Y			NE	S	3,5	3,5	0	0	720	N
L006	M	645203	264168	Q. sp.	1	15	2				Y	Y					NW	S	1.5	1.5	0	0	721	N

								Feature data																	
Location				Tree data				Type														Height		% cover			
ID	Assessment	Eastings	Northings	Species	Decay	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?	
L007	M	645308	264281	Q. sp.	1	18	1		Y								S	S	4	4	0	0	722	N	
L008	M	645322	264282	F.e	1	15	2		Y					Y			N	S	10	10	0	0	723	N	
L009	M	645358	264311	Q. sp.	1	17	1.3		Y								Multiple	S	12	12	0	0	724	N	
L010	M	645355	264400	Q. sp.	1	15	1.5								Y		W	S	2	3	0	0	725	N	
L011	M	645352	264453	Q. sp.	1	18	2.2		Y								E	S	10	10	0	0	729	N	
L012	M	645360	264461	Q. sp.	1	20	2.2								Y		Multiple	M	4	8	0	0	730	N	
L013	M	645365	264493	Q. sp.	1	18	1.4		Y								S	S	10	10	0	0	731	N	
L014	M	645356	264643	Q. sp.	1	14	2.3								Y		Multiple	M	0	14	0	0	733	N	
L015	H	645353	264786	Q. sp.	1	20	2				Y						E	M	5	8	0	0	734	N	
L016	M	645624	264715	Q. sp.	1	18	1.2		Y								W	S	6	6	0	0	738	N	



Key:

- Batbox locations
- Maternity
- Noctule
- Pipistrelles

0.1 0.05 0 0.1 Kilometres

Scale: 1:8500 @ A3

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EDF

Sizewell Bat Report 2010

Figure D1
Batbox locations

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645000 646000 647000

265000 264000

N

A B C D E F G H I JA JB JC JD JE JF JG JH JI KA KB KC KD KE KF KG KH KI L FA

Plantation Cottages
Black Walks
Track
The Grove
The Round House
Potter's Farm
Ash Wood
Ash Wood Cottages
Walk Barn
Goose Hill
Dunwich Forest
Pit (dis)
Stonewall Belt
Greenhouse Plantation
Hilltop Cover
Turf Pits
Drains
Nursery Covert
Kenton Hills
Grimseys
Old Abbey Farm
Leiston Old Abbey
Fiscal Policy
Path
Leiston Carr
Sizewell Belts
Laboratory
Mast
Rookham Pits Wood
Keepers Cottage
Common
Power Station
Upper Abbey
Drain

0.2 0.1 0 0.2 Kilometres

Scale: 1:8500 @ A3

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Key:

Zone boundaries

Sizewell Bat Report 2010

Figure D2
Sizewell trees survey zones 2010

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