APPENDIX SIX – ECOLOGY SURVEYS

Extended Phase 1 Habitat Survey

Hill House, Chigwell Road, Chigwell, Essex

On Behalf of:

Meridian (Hill) Chigwell Ltd.

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www.ses-eco.co.uk

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1.0 Introduction and Aims

1.1 Southern Ecological Solutions Ltd. (SES) was commissioned by Meridian (Hill) Chigwell Ltd. in 2012 to undertake an extended Phase 1 Habitat Survey of Hill House, Chigwell Road, Chigwell, Essex (the Site). An update to these surveys was commissioned by Meridian (Hill) Chigwell Ltd. in April 2017. The development consists of a former landfill site and is characterised by varied slopes that are vegetated by self-sown/plantation wooded blocks and scrub. Tussocky grassland is also prevalent with grassy rides providing a link between grassland habitats and these scrubby/wooded blocks. Mature trees are largely limited to the Site's boundary. Ditches with running water span the length of the western boundary and partially along the eastern boundary. The proposed development is for c.100 residential units and a care home (Appendix 2).

1.2 The objectives of this extended Phase 1 Habitat Survey were to:

- Map the main ecological features within the Site and compile a plant species list for each habitat type;
- Make an initial assessment of the presence or likely absence of species of conservation concern;
- Identify any legal and planning policy constraints relevant to nature conservation which may affect the development;
- Determine any potential further ecological issues;
- Determine the need for further surveys and mitigation; and
- Make recommendations for minimising impacts on biodiversity and providing net gains in biodiversity where possible in accordance with chapter 11: Conserving and Enhancing the Natural Environment, of the National Planning Policy Framework (NPPF) (DfCLG, 2012) and Epping Forest District Council Local Plan and Alterations (1998/2006) core policy CP2 and Nature Conservation NC1-NC5.

1.3 The initial site survey was undertaken by suitably qualified ecologist Andrew Pankhurst BA (Hons) ACIEEM on the 4th October 2012. Since this time and as a result of the initial extended Phase 1 Habitat Survey, several Phase 2 surveys have been completed (SES, 2014a-g).

1.4 A period of time has elapsed since these surveys requiring ecological surveys to be updated. This report revisits aims listed within section 1.2, as well as up to date planning policy. Subsequent changes to protected species legislation and latest survey guidance have also been adhered to. In summary, this report provides the recommended scope of surveys which need to be undertaken in accordance with relevant planning policy, wildlife legislation and in accordance with the latest published survey guidance.

1.5 The update survey was undertaken by Ella Barnett BSc (Hons) ACIEEM on 16th May 2017 in suitable weather conditions.

2.0 Methods

Desk Study

2.1 SES commissioned a data search for records of protected and notable fauna species and designated sites via the Essex Field Club (EFC). The results of this data search were received on the 10th May 2017. The data search encompassed the study area, and up to 3km from the boundary for protected species. Furthermore, records of hazel dormouse *Muscardinus avellanarius* were searched for using National Biodiversity Network (NBN) Atlas which holds data from the People's Trust for Endangered Species (PTES).

2.2 A web based search for designated sites via Magic Map was undertaken for the following designations: international (approx. 7km from the Site boundary); national (approx. 5km from the Site boundary) and non-statutory (approx. 2km from the Site boundary). SES commissioned a non-statutory site search by Essex Wildlife Trust (EWT) for within 2km of the Site boundary. Furthermore, a web based search was undertaken for waterbodies within 500m of the Site boundary utilising Promap and Magic Map.

Extended Phase 1 Habitat Survey

2.3 The field survey comprised of an extended Phase 1 Habitat Survey (JNCC, 2010) of the proposed development site. This is a standard technique for obtaining baseline ecological information for areas of land, including proposed development sites.

2.4 The dominant and readily identifiable higher plant species identified in each of the various habitat parcels were recorded and their abundances assessed on the DAFOR scale:

- D Dominant;
- A Abundant;
- F Frequent;
- O Occasional;
- R Rare.

2.5 These scores represent the abundance within the defined area only and do not reflect national or regional abundances. Plant species nomenclature follows Stace (2010).

3.0 Constraints

3.1 Desktop data searches are a valuable tool in evaluating a site's potential to hold rare and protected species, it is not however an absolute in confirming presence or absence of notable species due to the nature of how the records are collected.

4.0 Results

Desk Study

4.1 A number of protected and notable species were recorded during the desktop data search within 2km from the Site.

4.2 European protected species are animals and plants listed in Annex IV of the European Habitats Directive (1992) as amended which receive protection in the UK under Regulation 41 of The Conservation of Habitats and Species Regulations (CSHR) (2010). European protected species recorded within 2km of the proposed development site are shown in Table 1 below.

Table 1: European legally protected species recorded within 2km of the Site from EFC data search.

European Protected Species	Year/s	Closest Record (km) (Year)
A bat species *Chiroptera sp.*	2005 - 2010	1.5km south-east (2005)
Brown Long-eared Bat *Plecotus auritus*	2006 - 2010	1.4km north-west (2010)
Common Pipistrelle *Pipistrellus pipistrellus*	1994 - 2010	0.3km south-west (2009)
Daubenton's *Myotis daubentonii*	2002 - 2013	0.8km north (2007)
European Otter *Lutra lutra*	2009	1.5km north (2009)
Great crested newt *Triturus cristatus*	1994 - 2013	1.6km north (1998)
Nathusius' Pipistrelle *Pipistrellus nathusii*	2007 - 2013	0.8km north (2007)
Noctule *Nyctalus noctula*	1992 - 2010	0.8km north (2007)
Pipistrelle sp. *Pipistrelle sp.*	1983 - 2009	1.3km north-west (2009)
Serotine *Eptesicus serotinus*	2002 - 2010	0.8km north (2007)
Soprano Pipistrelle *Pipistrellus pygmaeus*	1997 - 2013	0.3km south-west (2009)

4.3 No records of hazel dormouse were found on the NBN Atlas within 3km of the Site.

4.4 UK protected species are animals and plants protected within one or more of the following: Wildlife and Countryside Act (WCA) (1981) as amended and The Protection of Badgers Act 1992. Species listed on the Natural Environment and Rural Communities (NERC) Act (2006) (previously UK Biodiversity Action Plan species) section 40 and 41 found within 2km of the Site are also listed in Table 2 below.

Table 2: UK legally protected species recorded within 2km of the Site from a data search including NERC Act species (2006).

UK Protected Species	Year/s	Closest Record (km) (Year)
Badger *Meles meles*	1996 - 2007	1.3km south-east (2007)
European Hedgehog *Erinaceus europaeus*	1976 - 2009	0.1km north-west (1999)
Grass Snake *Natrix natrix*	1976 - 2016	1.2km south-east (1981)
Harvest Mouse *Micromys minutus*	1996	1.0km south (1996)
Northern Water Vole *Arvicola amphibius*	1982 - 2008	0.3km north (2008)
Slow-worm *Anguis fragilis*	1981 - 2012	1.2km south-east (1981)

4.5 The desk study also highlighted a number of designated sites via EFC, EWT and Magic Map within the following designations: European (approx. 7km from the Site boundary); national (approx. 5km from the Site boundary) and non-statutory (approx. 2km from the Site boundary) see Table 3 below.

Table 3: Designated Protected Sites within the vicinity of the Site, listed in order of distance (from the Site).

Site Name	Distance and Direction from Site	Reason for Designation
Barnaby Way Wood, LWS	1.0km north-east	Partly ancient strip of woodland also of some geomorphological interest. The role of this site as an urban woodland is probably of greater importance than its status as a strip of ancient woodland.
Epping Forest SAC, SSSI	1.1km north-west	Qualifies as an SAC for its Atlantic acidophilous beech forest in the north-eastern part of the habitat's UK range. The site also consists of northern Atlantic wet heaths with *Erica tetralix* and European dry heath. The site is also designated as it supports stag beetles and many Red Data Book and Nationally Scarce invertebrate species. The site is designated as a SSSI as it is one of only a few remaining large-scale examples of ancient wood-pasture in lowland Britain and has retained habitats of high nature conservation value including ancient semi-natural woodland, old grassland plans and scattered wetland.
Roding Valley Meadows SSSI, LNR	1.7km north	Roding Valley Meadows forms one of the largest continuous areas of species-rich grassland in Essex, comprising traditionally managed hay meadows, flood meadows and marsh. The meadow and marshland communities include a diverse assemblage of plant species, many of which are uncommon in Essex, and the site includes the largest known bed of the Brown Sedge *Carex disticha* in Essex.
Linders Field LNR	2.0km north	Mixture of ancient woodland, scrub, grassland and ponds.
Chigwell Row Wood LNR	3.4km east	A remnant of Hainault Forest containing ancient trees including many pollards over 250 years old. Over 800 species of invertebrates recorded.
Hainault Forest SSSI	4.1km east	Hainault Forest is part of the ancient wood-pasture Forest of Havering. The principal woodland type present is pedunculated oak-hornbeam; the birch-hazel variant dominates over nearly three-quarters of the ancient woodland, and the ash-maple variant is also present. The woodland and scrub areas support a diverse flora and fauna, including a diverse breeding bird community. The site is of regional importance for two species of breeding birds. It is also of county significance in Essex for its populations of nightingale, wood warbler and spotted flycatcher and in Greater London for tree pipit, marsh tit and redpoll. Woodcock, turtle dove and three species of woodpecker are also of interest.
Ainslie Wood LNR	4.2 km west	This woodland contains oak, hornbeam, wild service, hazel, crab-apple, field maple, hawthorn, blackthorn and rowan.
Hainault Lodge LNR	4.6km east	This site consists of pasture-woodland and is home to an interesting variety of plants including butcher's broom, foxgloves and red campion. Fauna includes orange tip, speckled wood, long-tailed tits, robin, great spotted and green woodpeckers.
Lee Valley SPA	6.9km west	Internationally important numbers of breeding and wintering wildfowl, especially Gadwall and Shovelor and for wintering Bittern.

Statutory Designated Sites: SAC = Special Area of Conservation; **SSSI =** Site of Special Scientific Interest; **LNR** = Local Nature Reserve; **SPA** = Special Protection Area.
Non-Statutory Designated Sites: LWS = Local Wildlife Site.

Extended Phase 1 Habitat Survey

4.6 The Phase 1 Habitat map of the Site is shown within Appendix 1 and the plant species recorded per habitat type are tabled in Appendix 3. Plates are found in Appendix 4. The Site is largely the same as in the previous report (SES, 2014d). *Any changes to habitat descriptions are given in blue italics.*

4.7 The Site is a former landfill which ceased operations in 1978. The Site is c.14.6ha, located immediately to the south-east of the M11 but accessed from Chigwell Road. Residential development and formal green open space is located beyond the Site's west and south-western extent. West Hatch High School and its formal playing fields are located east and north-east of the Site boundary; further north-east is a pocket of land similar in composition to the grassland/scrub habitat found within the Site runs north-east to Luxborough Lane. Beyond Chigwell Road to the south-east of the Site, residential development dominates the landscape.

4.8 The topography on Site is extremely variable due to its former use as landfill. The Site is characterised by varied slopes that are vegetated by self-sown/plantation wooded blocks and scrub. Tussocky rank grassland is also prevalent with grassy rides providing a link between grassland habitats and these scrubby/wooded blocks. Mature trees are largely limited to the Site's boundaries. A ditch with running water spans the length of the western boundary. A dry ditch is present along the north-eastern boundary. An ephemeral water body containing mature willow *salix sp.* is located towards the centre of the Site. *This pond has been dry throughout surveys in 2017.*

4.9 There were eight habitat types found within the Site:

1. Semi-improved grassland;
2. Tall ruderal;
3. Semi-natural woodland;
4. Scattered trees;
5. Running water;
6. Scattered/dense scrub;
7. Building; and
8. Improved grassland.

Semi-improved grassland

4.10 Tussocky grassland can be found throughout the Site; common rank grass species such as false-oat grass *Arrhenatheurm elatius*, common couch *Elytrigia repens* and cock's foot *Dactylis glomerata* were all frequently encountered. Herbaceous forb species include occasional vetch *Vicia spp.*, cinqfoil *Potentilla sp*. and yarrow *Achillea millefolium*. These grasslands are punctuated by semi-natural woodland blocks and scrub. Rides and glades link grasslands throughout the Site, these rides look to be cut to maintain public walking routes. The grasslands found on Site are under pressure from succession with scrubby species starting to creep and form dense thickets.

Tall ruderal

4.11 Tall ruderals can be found intermittently throughout the Site with prominent patches forming beds of common nettles *Urtica dioica*, Russian comfrey *Symphytum x uplandicum* and vetches.

Semi-natural woodland and Scattered trees

4.12 Small self-sown and planted wooded blocks can be found throughout the Site, these blocks are predominantly found upon the Site's sloped banks. Most of these wooded blocks are linked with dense scrub, which typically grades into grassland. The understorey is characteristically scrubby and/or over-shaded limiting ground flora to blankets of ivy *Hedera helix*. Frequently encountered species include field maple *Acer campestre*, sycamore *Acer pseudoplanatus* and ash *Fraxinus excelsior*. The south-eastern boundary contains a more mature wooded block than those found within areas previously used for landfill. This wooded block is characterised by field maple, hawthorn *Crataegus monogyna*, ash and sycamore. Mature specimens including oak *Quercus robur* horse chestnut *Aesculus hippocastanum* and ash line parts of the Site's north-eastern boundary shared with West Hatch High School and along the north-western boundary adjacent to the formal playing fields.

4.13 Most trees located on Site form pockets of woodland, however, individual species can be found scattered within grassland and lining the Site's boundaries.

Running Water

4.14 A running stream runs briefly from the south-eastern boundary adjacent to Chigwell Road before entering an underground culvert to re-emerge on the south-western boundary, where it flows parallel with this boundary until reaching the M11. This stream is partially concrete-lined and occasionally pipes fed by run off from the neighbouring residential development (beyond southern boundary). The Site's gradient is managed by gradually 'stepping' down the stream by manmade features. These streams are consistently over-shaded by the trees and scrub and as a consequence are largely devoid of aquatic vegetation, although willowherb *Epilobium sp.* was recorded in sections that receive sunlight. Himalayan balsam *Impatiens glandulifera* was also recorded within the western boundary stream, this species is listed as an alien invasive species on Schedule 9 within the WCA (1981) (see section 5.15- 5.18 for discussion and recommendations). The depth of this stream is habitually shallow, but where the stream has been 'stepped' down deeper pools do exist. The bottom of the stream is silted with most rocks found being of pebble size.

Dense and Scattered Scrub

4.15 Thickets of dense and scattered scrub can be found throughout the Site. Scrub is usually associated with the edge of the wooded blocks presenting as transitional habitats. Blocks of dense scrub hug the Site's sloping banks dominated by Bramble *Rubus sp.* with occasional Rose *Rosa sp..* Smaller patches of scrub can be frequently encountered within the Site's grasslands. Large patches of Japanese knotweed *Fallopia japonica*, an alien invasive species listed on Schedule 9 of the WCA (1981) was recorded in 2013 within scrub patches at T1-T3 see Appendix 1 (see section 5.15- 5.18 for discussion and recommendations). *No Japanese knotweed was observed on Site during any of the surveys in 2017. This species is under a management plan on Site. Some of these areas were also subject to an arson attack since the previous survey, likely in early 2017 with some patches of dense scrub in the centre of the Site now burnt to the ground.*

Building

4.16 A building, named as the barn, which is two storeys high and actively used as storage for the horse stables can be located towards the Site's south-eastern extent. This barn is surrounded by single storey stables which line the perimeter of a small courtyard. The barn is a two storey structure of brick construction. It has a pitched slate tile roof and is aligned north-east to south-west.

Improved Grassland

4.17 Improved grassland punctuated by scattered trees forming a horse pasture (under a grazing regime) is present, orientated towards the south-east of the Site, directly north-west of the stables (Appendix 1). Smaller areas of improved grassland can be found south-east of the stable block, partially under the canopy of wooded areas running towards Chigwell Road. Another small area of improved grassland contains scattered fruit trees and is situated towards the southern boundary almost immediately south-west of the aforementioned pasture.

5.0 Findings and Recommendations

Statutory/Non-statutory Sites

European Designated Sites

5.1 Two European designated sites were found within 7km of the Site. Epping Forest is a Special Area of Conservation (SAC) as well as being a Site of Special Scientific Interest (SSSI). The closest part of Epping Forest to Site is 1.1km to the north-west of Site. It is designated for its woodland habitat which supports stag beetles *Lucanus cervus* and other invertebrates which are listed on the Red Data Book and are Nationally Scarce. Lee Valley is a Special Protection Area (SPA) located 6.9km to the west of Site. It has been designated an SPA due to its internationally important numbers of breeding and wintering wildfowl including bittern *Botaurus stellaris*, gadwall *Anas strepera* and shoveler *Anas clypeata*.

Statutory Designated Sites

5.2 Three SSSIs (Epping Forest, Roding Valley Meadows and Hainault Forest) and five Local Nature Reserves (LNRs) (Roding Valley Meadows, Linders Field, Chigwell Row Wood, Ainslie Wood and Hainault Lodge) are located within 5km of the Site. These designations are afforded protection from significant direct and indirect effects upon qualifying features under the WCA (1981).

5.3 Chelmer Valley Riverside LNR is located approximately 3.3km south-west of the Site, designated for its range of habitats including unimproved grassland and the river itself. Due to the amount of open space being incorporated into the proposed layout (Appendix 2) and the distance from Site, it is predicted that there will be no significant direct or indirect effects on the designated sites or their qualifying features. In addition, the Site falls outside of criteria defined within Natural England's 'impact risk zones' used to assess planning applications likely impacts upon statutory sites.

Non-Statutory Designated Sites

5.4 A single Local Wildlife Site (LWS), Barnaby Way Wood, is located within 2km of the Site. This designation is protected by local policy.

5.5 Barnaby Way Wood, LWS, is located approximately 1.1km north-east of the Site, designated for its partly ancient woodland and geomorphological interest. Due to the distance of the Site from Barnaby Way Wood and the amount of green open space incorporated into the proposed scheme it is considered unlikely there will be any significant direct or indirect effects on the status of the LWS.

Protected Habitats

Lowland Meadow

5.6 The grasslands recorded are dominated by rank species choking floral diversity and as such are not considered to provide a notable example of this habitat type. The proposed development will involve the permanent loss of some areas of this habitat. Compensation and enhancement will be delivered through the Site's landscaping plan which will provide additional floral diversity within created meadow grassland habitat woven and interconnected to the Site's green infrastructure to form a biodiverse mosaic of habitats, managed in perpetuity.

5.7 The recommended Phase 2 surveys within this report will provide (if required) mitigation/compensation recommendations to satisfy wildlife legislation and planning policy guidance to provide no net loss to the conservation status of the species that rely on this habitat.

Lowland Mixed Deciduous Woodland

5.8 The majority of woodland on Site is relatively recently established (landfill ceased in 1978) and confined to small blocks/strips. Native species dominate the canopies with ash and field maple frequently encountered. More mature wooded areas can be found within the south of the Site, specimens include ash, sycamore and horse chestnut. Mature oak trees are also present along the eastern and western boundaries of the Site.

5.9 The wooded blocks will also be assessed in relation to their value to protected and notable faunal species that it may directly or indirectly support via the recommended Phase 2 surveys. This will ensure that wildlife legislation and planning policy guidance is satisfied and that there is no net loss to local relevant species populations.

5.10 There is potential for some trees onsite to have Tree Preservation Orders (TPOs) attached to them and it is recommended that the local council is contacted for advice on TPOs within the local area.

Species of Conservation Concern

Plants

5.11 No plant species recorded on Site are listed under Schedule 8 of the WCA (1981), and it is considered that none are rare or threatened.

5.12 There are records of invasive species listed under Schedule 9 of the WCA (1981) on Site including Japanese knotweed and Himalayan balsam.

5.13 Japanese knotweed was recorded in three separate locations during the survey in 2012 (SES, 2014d; target notes T1-T3 on Phase 1 Habitat map in Appendix 1). No evidence of this plant was found during the update walkover in 2017.

5.14 Himalayan balsam is present along the ditch in the north-west of Site and was found to extend for approximately 80m during the update walkover survey (target note T4, Appendix 1).

5.15 It is an offence to plant or otherwise allow either of these species to grow in the wild. A specialist contractor should be consulted if they have not been already, in relation to the management and eradication of both of these species on Site.

Badger

5.16 Badgers are legally protected under The Protection of Badgers Act (1992) and as such, are of material consideration when applying the principles of the NPPF (DfCLG, 2012).

5.17 The desk study revealed two records within 3km of the Site, with the closest being 1.3km south-east of the Site in 2007.

5.18 The habitats on Site provide potential foraging, dispersal and sett-building opportunities for badgers that may be present in the wider landscape. In 2013 the Site was visited three times to search for evidence of badgers (SES, 2014a). No definitive badger field signs were observed during the first two survey visits such as latrines or setts. In October an old latrine and bedding was found to the north-east of Site (T5, Appendix 1) indicating a sett nearby. As it has been a number of years since this survey was undertaken it is recommended that an update badger survey is undertaken.

5.19 Badger surveys can be undertaken anytime but ideally outside of the summer months (when vegetation is dense) but are best undertaken when vegetation is low in February and April; this also coincides with a peak in territorial activity. A second peak in activity occurs in October but vegetation can potentially hinder the location of setts in dense vegetation.

Bats

5.20 All bat species are legally protected under Schedule 9 WCA (1981) and Regulation 40 of CHSR (2010) thus making bats a material consideration of the planning process.

5.21 The desk study results of bat species are shown in Table 4 below.

Table 4: Records of bat species within 2km of the Site boundary via the EFC data search.

European Protected Species	Year/s	Closest Record (km/m) (Year)
A bat species *Chiroptera sp.*	2005 - 2010	1.5km south-east (2005)
Brown Long-eared Bat *Plecotus auritus*	2006 - 2010	1.4km north-west (2010)
Common Pipistrelle *Pipistrellus pipistrellus*	1994 - 2010	0.3km south-west (2009)
Daubenton's *Myotis daubentonii*	2002 - 2013	0.8km north (2007)
Nathusius' Pipistrelle *Pipistrellus nathusii*	2007 - 2013	0.8km north (2007)
Pipistrelle sp. *Pipistrelle sp.*	1983 - 2009	1.3km north-west (2009)
Serotine *Eptesicus serotinus*	2002 - 2010	0.8km north (2007)
Soprano Pipistrelle *Pipistrellus pygmaeus*	1997 - 2013	0.3km south-west (2009)

Roosting

5.22 There are a number of trees on Site with the potential to support roosting bats. A barn in the south-east of Site also has potential to support roosting bats. Previous surveys include aerial inspections and emergence surveys of trees on Site (SES, 2014b). Although no bats were found to be roosting within the trees or building on Site a significant amount of time has passed since these surveys were undertaken and so it is recommended that the trees on Site are scoped again for bat roosting potential, further aerial inspections and emergence/re-entry surveys undertaken if necessary.

Foraging/Commuting

5.23 The Site is valued at having moderate value for foraging and commuting bats due to the trees and semi-improved grassland on Site. To fully assess the potential impacts of development upon local bat populations bat activity surveys were undertaken in 2012 (September and October) and 2013 (April-August) in line with the current best practice guidelines at the time (Hundt, 2012). A transect was walked once each month in addition to automated surveys. No bats were found to be roosting within the trees surveyed and a low-moderate level of bat activity from five species of bat was recorded in both years (SES, 2014b).

5.24 As a significant amount of time has passed since these surveys were undertaken it is recommended

that bat activity surveys are repeated on Site in line with current best practice guidelines (Collins, 2016). One transect should be walked each month (April-October) with two static detectors placed out on Site each month.

5.25 The Site may be enhanced for bats by installing a variety of bat boxes on the trees and proposed buildings. Furthermore, appropriate planting of species known to benefit bats (Appendix 5) could be included in the masterplan to provide increased foraging opportunities.

Birds

5.26 All nesting birds are protected under the WCA (1981). Thus, if any nesting bird habitat is to be lost (scrub), this should be cleared outside of the nesting season (which is generally 1st March to 31st August) or after an ecologist has confirmed active nests are not present.

5.27 The Site contains an interwoven mixture of woodland blocks, scrub and grassland within an urban setting. These habitats may be suitable for species such as the Birds of Conservation Concern (BoCC) Red listed skylark *Alauda arvensis*, which may be expected to winter and breed on Site. To adequately assess the ornithological features of interest and subsequently guide mitigation/compensation requirements a wintering and breeding bird survey were undertaken (SES, 2014c, h). Three visits were undertaken between October 2012 and February 2013 to assess the wintering birds on Site and three visits were also undertaken between April 2013 and June 2013 to assess breeding birds on Site.

5.28 A medium to high level of bird activity was recorded across the Site during the wintering bird survey. A total of 41 species were recorded during the survey including 27 of which actively used the Site. This activity was distributed across the Site in all habitats.

5.29 A total of 32 species were recorded during the breeding bird survey including 25 of which actively used the Site. A medium to high level of bird activity and density of breeding territories were recorded across the Site, reflecting the general spread of semi-natural habitat types across the area, with frequent scrub, woodland and rough grassland. However, these habitats held higher breeding bird densities further from the M11 corridor and the general value of the Site is likely impoverished by the proximity of the motorway.

5.30 As a significant amount of time has passed since these surveys were undertaken it is recommended that update breeding and wintering bird surveys take place to subsequently guide mitigation/compensation requirements. A total of three visits should be undertaken for breeding bird surveys (May-July) and a further three wintering bird visits (October-March).

5.31 The Site may be enhanced for birds by installing a variety of bird boxes on the trees and proposed buildings. Furthermore, appropriate planting of native species or plant species known to benefit wildlife for more formal areas (Appendix 6) could be included in the masterplan to provide increased nesting and foraging opportunities.

Great Crested Newt

5.32 GCN is legally protected under Schedule 9 of the WCA (1981) and regulation 40 of the CHSR (2010), thus making the species a material consideration of the planning process.

5.33 The desk study showed records of GCN within 3km of Site between 1994 and 2014 with the closest record at 1.6km north of Site.

5.34 The Site provides terrestrial habitat suitable for GCN, including grassland, scrub and woodland. Aquatic habitat is limited to the flowing stream and the ephemeral water body wet throughout the spring/winter in 2012/2013 (SES, 2014e). The streams are not considered to be viable breeding habitat due to their lack of aquatic vegetation, flow rate and depth. Also, it should be noted that the 'stepped' nature of the north-western stream would also act as a barrier to the use of this habitat. Because of these reasons the streams are also not considered to be valuable as a 'sink' (foraging/dispersal habitat) resource either. The ephemeral water body on Site is situated at the base of a slope and directly adjoining to the southern grazing pasture. This pond is heavily shaded due to mature willows situated within it. During the update survey in 2017 this pond was completely dry.

5.35 Although the Site contains suitable terrestrial habitat, it exists as a relatively isolated parcel of land being ringed by urban development and the M11 to the north of Site. The green infrastructure immediately surrounding the Site is mostly of limited value to GCN due to its amenity nature (intensely cut), but a strip of landscape that is ubiquitous to that found on Site runs north-east towards Luxborough Lane; however, onward ecological connectivity to potential GCN habitat from here seems to be poor.

5.36 Presence/likely absence surveys in 2013 found no evidence of GCN within the pond on Site or in a second pond within 500m to the north-east of Site (SES, 2014e). As a significant amount of time has passed since these surveys were undertaken it is recommended that presence/likely absence surveys are repeated in the pond on Site (if possible) and any other ponds within 500m.

Invertebrates

5.37 Many invertebrates are listed as species of principal importance under Section 41 of the NERC Act (2006), Local Planning Authorities use Section 41 list to identify the species and habitats that should be afforded priority when applying the requirements of the NPPF (DfCLG, 2012).

5.38 The Site contains features of potential importance for invertebrates such as grassland, south-facing banks and successional growth. In 2013 four site visits were undertaken between April and July (SES, 2014f). It was considered that there was potential for stag beetles to be present within dead trees on Site but at a level so low that development of the Site would not affect the Site integrity of Epping Forest SAC. The only species of conversation concern recorded was the cinnabar moth *Tyria jacobaeae* which is a NERC Act (2006) species of principal importance.

5.39 The habitats were assessed as being of generally low quality, in terms of the condition and extent of specialist micro-habitats with many such micro-habitats wholly absent, such as many types of dead wood or exposures of bare sandy substrates. Since the survey in 2013 took place there have been some fires on Site which have cleared areas of vegetation and exposed the ground. Due to this development and that there has been a significant amount of time passed since these surveys were undertaken it is recommended that an update assessment of the importance of the Site for invertebrates is undertaken.

Notable mammals

5.40 The desk study showed records of the Notable Mammal European Hedgehog *Erinaceus europaeus* just 200m west of Site. Records date between 1997 and 2014.

5.41 The Site area is considered to provide some suitable habitats for NERC Act (2006) mammals including European hedgehog and harvest mouse *Micromys minutus*. Brown hare *Lepus europaeus* are not considered to utilise the Site. Both European hedgehog and harvest mouse has been recorded within 2km of the Site's boundary.

5.42 Records of European hedgehog come within 2km of Site and date between 1976 and 2009. Whereas only one record of harvest mouse is present approximately 1km to the south of Site from 1996. It is recommended that care should be taken when clearing vegetation to avoid killing or injuring European hedgehogs and harvest mouse throughout the year in their nests (summer, maternity and hibernation). Vegetation clearance should be undertaken in stages and be excluded during the hibernation period (October to March) when small mammals are more vulnerable or once a fingertip search by an ecologist has been undertaken.

5.43 The majority of the water vole *Arvicola amphibious* records are located to the west of the M11 along the River Roding. There is connectivity via ditches to this river; however a culvert is present under the M11, a feature which is likely to prevent water voles from inhabiting the ditches on Site. Connectivity is also not present to records to the north-east of Site. Water vole is not considered further in this report.

Reptiles

5.44 There are four reptile species considered to be the most common and widespread; common lizard, slow-worm *Anguis fraglilis*, adder *Viper berus* and grass snake *Natrix helvetica*. These four species of reptiles are legally protected from deliberate destruction under the WCA (1981).

5.45 The desk study results of reptile species are shown in Table 7 below.

Table 5: Records of reptile species within 2km of the Site boundary via a data search.

UK Protected Species	Year/s	Closest Record (km) (Year)
Slow-worm *Anguis fragilis*	1981-2012	1.2km south-east (1981)
Grass Snake *Natrix helvetica*	1976-2016	1.2km south-east (1981)

5.46 The Site contains large areas of suitable reptile habitat including grassland and scrub which are ecologically connected to the wider landscape. No reptiles were found utilising the Site in 2013 when a presence/likely absence survey was undertaken (SES, 2014g). As there has been a significant amount of time passed since these surveys were undertaken and there are other suitable habitats connected to Site, it is recommended that an update assessment of the usage of the Site by reptiles is undertaken.

5.47 A seven visit presence and likely absence survey should be undertaken during 'suitable' days for reptile activity (March - September); a 'suitable' survey day is determined by the weather with temperature being the pre-eminent factor. Reptile refugia (0.5m x 0.5m) should be used to observe reptiles basking. Refugia should be laid at a density of 10 per hectare. This survey method is recognised as best practice by Froglife (1999) and the Herpetofauna Worker's Manual (Gent and Gibson, 2003).

5.48 This survey will provide adequate information in order to ensure suitable mitigation and compensation measures are in place to achieve no net loss in the local conservation status, also ensuring wildlife legislation and planning policy guidance are met.

Other species

5.49 The following protected species are deemed to be highly unlikely to be present on Site due to a lack of suitable habitats on or close to the Site:

- Aquatic species including white-clawed crayfish *Austropotamobius pallipes*, otter *Lutra lutra*; and
- Hazel Dormouse.

6.0 Conclusion

6.1 Southern Ecological Solutions Ltd. (SES) was commissioned by Meridian (Hill) Chigwell Ltd. to update an extended Phase 1 habitat survey of Hill House, Chigwell Road, Chigwell, Essex (the Site). The Site (c.14.6 ha) consists of a former landfill site, stable block and pasture (see Appendix 1 for Site plan). The proposed indicative development includes c.100 residential units and a care home (Appendix 2).

6.2 No significant impacts are predicted upon statutory or non-statutory sites as a result of the proposed development. To adhere to planning policy and relevant wildlife legislation further works have been recommended for the following ecological features:

- Badgers (update Site search for evidence of badgers and their setts);
- Bats (update activity surveys, tree and building scoping, tree aerial inspections, possible emergence/re-entry surveys);
- Birds (update breeding and wintering birds);
- Great crested newt (update assessment of ponds and presence/likely absence surveys);
- Invertebrates (update Site assessment);
- Notable mammals (update habitat assessment and search for field signs); and
- Reptiles (update presence/likely absence surveys).

6.3 It is predicted that any potential adverse impacts from the proposed development upon specific protected species/habitats can be mitigated in line with relevant wildlife legislation and planning policy. With appropriate on site mitigation and targeted enhancements, a positive change in the biodiversity could potentially be achieved, in line with chapter 11: *Conserving and Enhancing the Natural Environment*, of the NPPF (DfCLG, 2012) and Epping Forest District Council Local Plan and Alterations (1998/2006) core policy CP2 and Nature Conservation NC1-NC5.

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Appendix 1: Phase 1 Habitat Map

Appendix 2: Indicative Proposed Site Plan

Appendix 3: Plant Species List and Relative Abundance

Common Name	**Latin Name**	Semi-improved grassland	Semi-natural woodland/ scattered trees	Scattered/ dense scrub	Improved grassland	Building	Tall ruderal	Running water	Standing Water
Cock's-foot	*Dactylis glomerata*	F	O		over grazed sward likely to be improved				
Common Nettles	*Urtica dioica*	O	O				O		
Common Ivy	*Hedera helix*	R	F						
Hard Rush	*Juncus inflexus*	R							
Hogweed	*Heracleum sphondylium*	R					O		
False Oat Grass	*Arrhenatherum elatius*	F	O						
Common Couch Grass	*Elytrigia repens*	F							
Dock spp.	*Rumex sp.*	R							
White Clover	*Trifolium repens*	R							
Vetch	*Vicia spp.*	O	R				F		
Wild Teasel	*Dipsacus fullonum*	R							
Red Clover	*Trifolium pratense*	R							
Spear Thistle	*Cirsium Vulgare*	R							
Red Fescue	*Festuca rubra*	O							
Willowherb	*Epilobium spp.*	R						R	
Mugwort	*Artemisia vulgaris*	R							
Bristly Ox Tongue	*Picris echioides*	O							
Common Ragwort	*Senecio jacobaea*	R							
Common Toadflax	*Linaria vulgaris*	R							
Hedge Bindweed	*Calystegia sepium*	R	O				O		
Field Bindweed	*Convolvulus Arvensis*	R							
Cinqfoil	*Potentilla sp.*	O							
Perennial Rye Grass	*Lolium perenne*	O	O						
Timothy	*Phleum*	O							
Yarrow	*Achillea millefolium*	O							
Common Bent Grass	*Agrostis capillaris*	R	R						
Ground Ivy	*Glechoma hederacea*	R							
Hawk Weed	*Hieracium agg.(sp)*	O							
Meadow Buttercup	*Ranunculus acris*	R							
Creeping Buttercup	*Ranunculus repens*	R							
Tufted Hair Grass	*Deschampsia caespitosa*	R							
Ribwort Plantain	*Plantago lanceolata*	R	O						
Greater Plantain	*Plantago major*	R							

Common Name	**Latin Name**	Semi-improved grassland	Semi-natural woodland/ scattered trees	Scattered/ dense scrub	Improved grassland	Building	Tall ruderal	Running water	Standing Water
Russian Comfrey	*Symphytum x uplandicum*						O		
Common Reed	*Phragmites australis*		R						
Ash	*Fraxinus excelsior*		F	O					
Sycamore	*Acer pseudoplatanus*		F	O					
Elder	*Sambucus nigra*		R						
Horse Chestnut	*Aesculus hippocastanum*		O						
Common Hawthorn	*Crataegus monogyna*		F	O					
Laurel	*Laurus sp.*		R						
Bramble (blackberry)	*Rubus fruticosus*		O	A					
Blackthorn	*Prunus spinosa*		O	O					
Wood Avens	*Geum urbanum*		R						
Pendulous Sedge	*Carex pendula*		R						
Cherry	*Prunus spp.*		O						
Field Maple	*Acer campestre*		F	O					
Buckthorn	*Rhamnus cathartica*		R						
Evergreen (holm) Oak	*Quercus ilex*		R						
Grey Poplar	*Populus x canescens*		O						
Aspen Poplar	*Populus tremula*		O						
Elm	*Ulmus spp.*		O	R					
Male Fern	*Dryopteris felix-mas*		R						
Apple	*Malus sp.*		R						
Pedunculate (English) Oak	*Quercus robur*		R	R					
Rose	*Rosa spp.*		O	F					
Willow	*Salix spp.*		O						
Soft (common) Rush	*Juncus effusus*		R						R
Small Leaved Lime	*Tilia cordata*		R						
Dogwood	*Cornus sanguinea*		R						
Japanese Knotweed	*Fallopia japonica*			R					
Himalayan Balsam	*Impatiens glandulifera*							R	
Fleabane	*Erigeron sp.*	R							
Non native			R	R					
Box	*Buxus sempervirens*			R					
Early Marsh Orchid	*Dactylorhiza incaranata*			R					

Appendix 4: Plates

Plate 1. Grassland, scrub and scattered tree habitat on site

Plate 2. Barn within the south-east of site

Plate 3. Ditch at the eastern boundary of the site

Plate 4. Areas of bare ground due to recent fires on site

Plate 5. Large pollarded tree to the south of site

Appendix 5: Species of known benefit to bats

The following table is reproduced from *Gunnell, K., Grant, G. and Williams, C. (2012). Landscape and Urban Design for Bats and Biodiversity, Bat Conservation Trust*. This suggests plant species that can provide benefit for bats by either providing a food source for insects and/or roost potential. The plants listed are predominately native to Britain. The small group of non-native plants included for their documented value for wildlife. This list has been checked against Natural England's list of invasive non-native plants.

Plant species	Common name	Native (N)	Type	Benefit	Soil	Light	Extensive green roofs	Living walls	Rain gardens	Hedge/ trees	Beds/ borders
Acer campestre	Field maple	N	T/S	C	Any	Sun/ shade				Y	
Acer platanoides	Norway maple		T	S	Well drained/ alkaline	Sun/ shade				Y	
Acer saooharum	Sugar maple		T	S	Any	Sun/ shade				Y	
Achillea millefolium	Yarrow	N	HP	C,F	Well drained	Sun				Y	
Ajuga reptans	Bugle	N	HP	C,F	Any	Sun/ shade	Y		Y		
Anthyllis vulneraria	Kidney vetch	N	HP	F	Well drained	Sun	Y				
Aubrieta deltoidea	Aubrieta		H	F	Well drained	Sun/shade		Y			
Betula pendula	Sliver birch	N	T	C	Sandy/ acid	Sun				Y	
Cardamine pratensis	Cuckoo- flower	N	HP	F	Moist	Sun/ shade			Y		Y
Carpinus betulus	Hornbeam	N	T	C	Clay	Sun				Y	
Centaurea nigra	Common knapweed	N	HP	C,F	Dry, not acid	Sun	Y				Y
Centranthus ruber	Red valerian		HP	F	Well drained	Sun	Y				Y
Clematis vitalba	Old man's Beard	N	C	F	well drained/ alkaline	Sun				Y	
Corylus avellana	Hazel	N	S	C	Any dry	Sun/ shade		Y		Y	
Crataegus monogyna	Hawthorn	N	S	S,C	Any	Sun/shade				Y	
Daucus carota	Wild carrot	N	Bi	S,C,F	Any	Sun	Y				Y
Dianthus spp.	Pinks	N	A-Bi	F	Well drained	Sun	Y	Y			Y
Digitalis purpurea	Foxglove	N	Bi	C	Well drained	Shade/ partial shade				Y	Y
Erica cinera	Bell heather	N	S	F	Sandy	Full sun					Y
Ersimum cherira	Wallflower		Bi-P	F	Well drained	Sun		Y			Y
Eupatorium	Hemp agrimony	N	H	F	Moist	Sun/ shade			Y		Y
Fagus sylvatica	Beech	N	T	C, R	Well drained alkaline	Sun/shade				Y	
Foeniculum vulgare	Fennel		H	F	Well drained	Sun					Y
Fraxinus excelsior	Common Ash	N	T	C, R	Any	Sun/ shade				Y	
Hebe spp.	Hebe species		S	F	Well drained	Sun /shade				Y	Y
Hedera Helix	Ivy	N	C	F,C	Any	Sun/ shade		Y	Y	Y	Y

Hesperis matrionalis	Sweet Rocket		H	F	Well drained/ dry	Sun/ shade					Y
Hyacinthoides non -scripta	Bluebell	N	B	F	Loam	Shade/ partial shade		Y		Y	Y
Ilex aquailfolium	Holly	N	T	C	Any	Sun/ shade				Y	
Jasmine officinale	Common jasmine		C	F	Well drained	Sun		Y			Y
Lavandula spp.	Lavender species		S	F	Well drained / sandy	Sun		Y			Y
Linaria vulgaris	Toadflax	N	HP	C	Well drained/ alkaline	Sun	Y				Y
Lonicera periclymenum	Honeysuckle	N	C	F	Well drained	Sun		Y		Y	
Lotus corniculatus	Bird's foot trefoil	N	HP	F	Well drained/ dry	Sun	Y				Y
Lunaria annua	Honesty		Bi	F	Any	Sun/ partial shade	Y				Y
Malus spp.	Apple		T	C	Any	Sun				Y	Y
Matthiola longipetala	Night - scented stock		A	F	Well drained/ moist				Y		Y
Myosotis spp.	Forget me not species	N	A	F	Any	Sun	Y	Y			Y
Nicotiania alata	Ornamental tobacco		A	F	Well drained moist	Sun /partial shade			Y		Y
Oneothera spp.	Evening primrose		Bi	F	Well drained	Sun	Y				Y
Origanum vulgare	Marjoram	N	HP	F	Well drained / dry	Sun				Y	
Populus alba	White poplar	N	T	C	Clay loam	Sun				Y	
Primula veris	Cowslip	N	HP	F	Well drained/ moist	Sun/ partial shade	Y				Y
Primula vulgaris	Primrose	N	HP	F	Moist	Partial shade	Y	Y		Y	Y
Prunus avium	Wild cherry	N	T	C	Any	Sun				Y	Y
Prunus domestica	Plum		T	C	Well drained/ moist	Sun				Y	Y
Prunus spinosa	Blackthorn	N	S	C	Any	Sun/ partial shade				Y	
Querois petraea	Sessile oak	N	T	C,R	Sandy loam	Sun/ shade				Y	
Quercus robur	Common oak	N	T	R	Clay Loam	Sun/ shade				Y	
Rosa canina	Dog rose	N	S	C	Any	Sun			Y	Y	Y
Salix spp.	Willow species	N	S	S,C	Moist	Sun/ shade			Y	Y	
Sambucus nigra	Elder	N	T	C	Clay loam	Sun				Y	
Saponaria officinalis	Soapwort	N	HP	F	Any	Sun					Y
Saxifraga oppositifolia	saxifage	N	HP	C	Well drained	Sun	Y	Y			Y
Scabiosa columbaria	small scabious	N	HP	F	Well drained/ alkaline	Sun	Y				Y
Sedum spectabile	Ice plant		HP	F	Well drained/ dry	Sun	Y				Y
Silene dioecia	Red campion	N	HP	F	Any	Shade/ partial shade		Y	Y	Y	Y
Sorbus aucuparia	Rowan	N	T	C	Well drained	Sun				Y	

Stachys lanata	Lamb's ear		HP	F	Well drained/ dry	Sun					Y
Symphotrichum spp.	Michalemas daisies		HP	F	Any	Sun					Y
Tages patula	French marigold		A	F	Well drained	Sun					Y
Thymus serpyllum	Creeping thyme	N	HP/S	F	Well drained/ dry	Sun	Y	Y			Y
Tilia x europaea	Common lime		T	C	Any	Sun/ shade				Y	
Trifolium spp.	Clover species	N	H	F	Any	Sun	Y				Y
Valerina spp.	Valerian species	N	HP	F	Moist	Sun/ partial shade			Y		Y
Verbascum spp.	Mulliens	N	Bi, HP	C	Well drained	Sun					Y
Verbena bonariensis	Verbena		HP	F	Well drained/moist	Sun					Y
Viburnum lantana	Wayfaring tree	N	S	C	Any	Sun/ shade				Y	Y
Viburnum opulus	Guelder rose	N	S	C	Moist	Sun/ shade			Y	Y	
Viola tricolor	Pansy	N	A	F	Well drained/ moist		Y	Y			Y

Legend

Type		**Benefit**	
HP	Herbaceous perennial	C	Moth caterpillar food plant
Bi	Biennial	S	Sap sucking insects (e.g. whiteflies)
BiP	Biennial perennial	F	Flowers attract adult moths
T	Tree	E	Good roost potential
S	Shrub		
H	Herb		
A	Annual		
B	Bulb		
C	Creeper/ climber		

Appendix 6: Plant Species of known benefit to wildlife

Common Name	Scientific Name	Benefits
Shrubs		
Barberry *	*Berberis spp.*	Nectar, fruit, nesting cover
Blackthorn	*Prunus spinosa*	Nectar, fruit, larval foodplant, nesting cover
Broom	*Cystisus scoparius*	Nectar, larval foodplant
Buckthorn #	*Rhamnus cathartica*	Nectar, berries, larval foodplant, nesting cover
Californian lilac*	*Ceonothus spp.*	Nectar, nesting cover
Dog Rose	*Rosa canina agg.*	Nectar, fruit, larval foodplant, nesting cover
Dogwood	*Cornus sanguinea*	Nectar, fruit, larval foodplant
Elder	*Sambucus nigra*	Nectar , fruit, larval foodplant, nesting cover
Field rose	*Rosa arvensis*	Nectar, larval foodplant, fruit
Firethorn*	*Pyracantha spp.*	Nectar, fruit, nesting cover
Flowering currant *	*Ribes sanguineum*	Nectar, larval foodplant
Garden lavender*	*Lavandula x intermedia*	Nectar
Gorse	*Ulex europaeus*	Nectar, larval foodplant, nesting cover
Guelder rose	*Viburnum opulus*	Nectar, fruit, larval foodplant
Hawthorn	*Crataegus monogyna*	Nectar, fruit, larval foodplant, nesting cover
Hazel	*Corylus avellana*	Nuts, larval foodplant
Hebe *	*Hebe spp.*	Nectar
Holly	*Ilex aquifolium*	Nectar, fruit, larval foodplant, nesting cover
Laurustinus*	*Viburnum tinus*	Nectar, nesting cover
Mexican orange *	*Choisya ternata*	Nectar
Rosemary *	*Rosmarinus officinalis*	Nectar
Spindle #	*Euonymous europaeus*	Nectar, fruits
Tutsan	*Hypericum androsaemum*	Nectar, fruit, larval foodplant
Wayfaring tree	*Viburnum lantana*	Nectar, fruit, larval foodplant
Yew#	*Taxus baccata*	Berries, nesting cover
Climbers		
Clematis*	*Clematis tangutica*	Nectar, seeds
Honeysuckle	*Lonicera periclymenum*	Nectar, fruit, larval foodplant, nesting cover
Ivy	*Herdera helix*	Nectar, fruit, larval foodplant, nesting cover
Traveller's joy	*Clematis vitalba*	Nectar, seeds, larval foodplant

Note:

* Non-native species

poisonous

** Native Woody species

Appendix 7: Ponds within 500m of the Site boundary

Phase 2 Ecological Surveys & Assessment

Hill House, Chigwell Road, Chigwell, Essex

On Behalf of:

Meridian (Hill) Chigwell Ltd.

January 2018

www.ses-eco.co.uk

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Contents

Appendices

1.0 Introduction and Aims

1.1 Southern Ecological Solutions Ltd. (SES) was commissioned by Meridian (Hill) Chigwell Ltd. in 2012 to undertake Phase 2 ecological surveys (SES, 2014a-h) at the proposed development Site (c.14.6ha) at Hill House, Chigwell Road, Chigwell, Essex (the Site). An update to these surveys was commissioned by Meridian (Hill) Chigwell Ltd. in April 2017. The development consists of a former landfill site and is characterised by varied slopes that are vegetated by self-sown/plantation wooded blocks and scrub. Tussocky grassland is also prevalent with grassy rides providing a link between grassland habitats and these scrubby/wooded blocks. Mature trees are largely limited to the Site's boundary. Ditches with running water span the length of the western boundary and partially along the eastern boundary (Appendix 1). The proposed indicative development is for c.100 residential units and a care home (Appendix 2).

1.2 Following an initial Phase 1 Habitat Assessment (SES, 2017) the following surveys were recommended:

- Badger presence/likely absence survey;
- Bat activity surveys;
- A scoping survey of the trees on Site which are due to be removed or close to proposed development for potential roosting bats;
- A scoping survey of the buildings on Site for potential roosting bats;
- Potential bat emergence/re-entry surveys on trees and buildings;
- Records of small and medium-sized mammals during surveys;
- Invertebrate surveys;
- Reptiles presence/likely absence survey;
- Great crested newt presence/likely absence survey;
- Wintering and breeding bird surveys.

1.3 The aims of these surveys were to:

- Determine the usage of the Site by protected and notable species;
- Assess the value of the Site and its potential direct and indirect impacts the proposed development may have on these species.

1.4 This report sets out the results of the Extended Phase 1 Survey Report (SES, 2017), previous and current Phase 2 surveys and assessments. All features, including statutory and non-statutory sites, habitats and protected and notable features are then evaluated using the evidence from the desk study, field surveys and relevant literature. The development details (Appendix 2) are then set out and the impacts on receptors without mitigation assessed. Mitigation options are then outlined and residual impacts assessed.

1.5 The proposed outline mitigation also seeks to minimise impacts on biodiversity and provide net gains for biodiversity where possible, in accordance with relevant wildlife legislation and planning policy such as Chapter 11: Conserving and Enhancing the Natural Environment, of the National Planning Policy Framework (NPPF) (DfCLG, 2012) and Epping Forest District Council Local Plan and Alterations (1998/2006) core policy CP2 and Nature Conservation NC1-NC5.

1.6 All surveys were undertaken or supervised by suitably qualified ecologists. Other than those listed

below, all surveys were undertaken or supervised by Ella Barnett BSc (Hons) Associate Member of the Chartered Institute of Ecology and Environmental Management (CIEEM).

1.7 Bat activity, breeding bird and wintering bird surveys were undertaken by Steve Parr, Full Member of CIEEM (MCIEEM). Invertebrate surveys were undertaken by Dr. Graham Hopkins, MCIEEM. All survey work was supervised or reviewed by Andrew Pankhurst BA (Hons) ACIEEM.

1.8 The Site is located immediately to the south-east of the M11 but accessed from Chigwell Road. Residential development and formal green open space is located beyond the Site's west and south western extent. West Hatch High School and its formal playing fields are located east and north-east of the Site boundary; further north a pocket of land similar in composition to the grassland/scrub habitat found within the Site runs north-east to Luxborough Lane. Beyond Chigwell Road south-east of the Site, residential development dominates the landscape.

2.0 Methods

Desk Study

2.1 SES commissioned a data search for records of protected and notable fauna species and designated sites via the Essex Field Club (EFC). The results of this data search were received on the 10th May 2017. The data search encompassed the study area, and up to 3km from the boundary for protected species. Furthermore, records of hazel dormouse *Muscardinus avellanarius* were searched for using NBN Atlas which holds data from the People's Trust for Endangered Species (PTES).

2.2 A web based search for designated sites via Magic Map was undertaken for the following designations: international (approx. 7km from the Site boundary) and national (approx. 5km from the Site boundary). SES commissioned a non-statutory site search by Essex Wildlife Trust (EWT) for within 2km of the Site boundary. Furthermore, a web based search was undertaken for waterbodies within 500m of the Site boundary utilising Promap and Magic Map.

Field surveys

2.3 The following is a summary of the methods employed during field surveys; full details of each survey method are provided in Appendix 3.

Habitats

2.4 An update Phase 1 Habitat Survey using JNCC (2010) guidelines was undertaken on 16th May 2017 (SES, 2017). The Phase 1 habitat map is provided in Appendix 1.

Badgers

2.5 A badger *Meles meles* survey was initially undertaken in April, August and October 2013 (SES, 2014a) across the Site using standard guidelines for classifying badger setts (Harris *et al.*, 1989). An update badger survey was undertaken on 16th May 2017. The surveys covered the whole Site although some patches of dense scrub were unable to be accessed.

Bats

2.6 Initial surveys including scoping surveys of buildings and trees, aerial inspections of trees, emergence/re-entry surveys on trees and activity surveys were undertaken in 2012 and 2013 (SES, 2014b) in accordance with Bat Conservation Trust (BCT) Guidelines (Hundt, 2012).

Activity Surveys

2.7 Bat activity surveys were undertaken over a transect monthly during September-October 2012, April-August 2013 (SES, 2014b) and monthly May-October 2017. See Appendix 4 for a plan showing the transect locations.

Automated Surveys

2.8 Static bat detectors, both SM2+ (Wildlife Acoustics Ltd.) and Anabats, were used to record bat activity over five consecutive nights once per month during all months visited for activity surveys at various locations within the Site (SES, 2014b). See Appendix 5 for a plan showing the Automated Detector locations.

Scoping and Emergence Surveys

2.9 A tree and building inspection survey was undertaken in 2013 (SES, 2014b) following best practice guidance (Hundt, 2012) with the update survey on 18th May 2017 (trees) and 29th June 2017 (buildings) following updated guidance (Collins, 2016). The trees inspected were those identified as likely to be removed as a result of or at the edge of the proposed development. All buildings on Site are to be demolished. Features with potential to support roosting bats were subject to emergence surveys between June and August 2017 following best practice guidance (Collins, 2016) to determine the presence of bat roosts.

Birds

Breeding Birds

2.10 The breeding bird survey (BBS) in 2013 (SES, 2014c) followed the standard Common Bird Census (CBC) methodology (Gilbert *et al*., 1998) but was modified from ten to three survey visits through the spring and early summer to ensure that both resident breeding birds and migrant breeding birds (which tend to start breeding later in the season) were recorded.

2.11 The breeding bird survey was updated in 2017 also using a cut-down version of the standard Common Bird Census (CBC) methods, devised by the British Trust for Ornithology (BTO) (Marchant 1983; Bibby *et al.,*1992). Three visits were carried out in suitable weather conditions in May and June 2017.

2.12 The results from the previous breeding survey in 2013 (SES, 2014c) were also reviewed and compared with the 2017 data.

Wintering Birds

2.13 A wintering bird survey (WBS) was undertaken following generic wintering bird monitoring methods given in Gilbert *et al.* (1998). In 2012/2013 the Site was visited three times through the wintering period, in late October 2012, December 2012 and February 2013 (SES, 2014h). Three visits are believed sufficient to determine the usage by wintering birds at this Site.

2.14 Update surveys will be undertaken in the winter 2017/2018 and will be submitted as an addendum to this report.

Great Crested Newt

2.15 All ponds within 500m of the Site were identified from available mapping. Ponds were excluded if there were significant barriers for great crested newt (GCN) *Triturus cristatus* dispersal between these ponds and the Site. Access to ponds was requested for surveys by letter and direct contact with landowners. Where access was granted ponds were surveyed following published guidance (English Nature, 2001). This involved four surveys to detect the presence or likely absence of GCN. Habitat Suitability Indexes (HSIs) (Oldham *et al.*, 2000) for GCN were also calculated for all ponds surveyed. A plan showing the location of ponds is provided in Appendix 6.

2.16 The initial surveys were carried out on two ponds between mid-March and mid-June 2013 (SES, 2014e) with at least two visits being undertaken between mid-April and mid-May. Each survey consisted of an evening and morning site visit using a variety of methods such as torch light surveys, bottle trapping, egg searching, refuge search and netting. Egg searches were careful to not affect significant amounts of egg laying habitat and once it was established that a pond was a breeding pond, further egg search was not undertaken.

2.17 In 2017 the ponds were found to be dry and so presence/likely absence surveys were unable to be undertaken at the Site.

Invertebrates

2013 Visual Appraisal & Field Sampling

2.18 The first site visit was undertaken on the afternoon of 24 April 2013 by Dr Graham Hopkins MIEEM FRES, to undertake a visual appraisal and field survey; additional survey visits were undertaken on: 25 May, 26 June and 25 July 2013 (SES, 2014f). The first coincided with the peak of blooming by blackthorn *Prunus spinosa* and the second with the start of hawthorn *Crataegus monogyna* blooming.

2.19 At a generic level the criteria for classifying the habitat units are presented below (Table 1).

Table 1: Criteria used to appraise the likely quality of semi-natural habitats for important invertebrate

Category	Definition
Excellent	Semi-natural habitat with extensive areas of key micro-habitats with a range of variation within these micro-habitats
High	Semi-natural habitats with most of the key micro-habitats associated with important invertebrates in that habitat present

Medium	Semi-natural habitats present with at least some of the micro-habitats associated with important invertebrates in that habitat present
Low	Semi-natural habitats present but the micro-habitats specifically associated with important invertebrates missing or limited in extent
Negligible	Semi-natural habitat missing or very small in extent and key micro-habitats absent

2.20 Based on a visual appraisal of the Site, sampling concentrated on four principal sampling stations of greatest potential value but with incidental surveys of other areas (Appendix 1: Figure 1). Station 1 was within the woodland, and Stations 2, 3 and 4 on the boundary of the grassland and scrub. At each station the sampling comprised a 50-minute sampling period using a combination of sweep-netting and hand searching, divided as approximately 20 minutes sweeping and 30 minutes hand search. Additional sampling was also undertaken of the pond 3 (26 June and 27 July 2013 only), based on 30 minutes sampling using a standard pond net.

ISIS Analysis

2.21 The inventory data are analysed using the ISIS package (Drake et al., 2007) to identify the broad assemblage types present and then the specific assemblage types present, i.e. which habitat/microhabitats support specialist species.

2017 Survey Visits

2.22 Survey visits were undertaken by an experienced field entomologist, Dr Graham Hopkins FRES, who undertook the identification work in conjunction with Dr JI Thacker.

2.23 Three site visits were undertaken: 24th May. 29th June and 20th July 2017. Sampling was undertaken at five sampling stations (Appendix 11) with incidental recording elsewhere, with each station sampled for 50-minutes per visit using a range of hand and netting methods. The protocol is compatible with natural England's Invertebrate Species-habitat Information System methods (Drake et al., 2007).

2.24 Analysis was undertaken using the ISIS package as described above.

Reptiles

2.25 A seven visit presence and likely absence survey was undertaken during 'suitable' days for reptile activity during April and May 2013 (SES, 2014g), then repeated between May and August 2017. This survey methodology followed best practice (Froglife, 1999; Gent & Gibson, 2003). See Appendix 7 for a plan showing the location of reptile refugia.

Small and Medium-sized Mammals

2.26 Records of small and medium-sized mammal species, especially those species listed as priority species under Section 41 of the Natural Environment Rural Communities Act (NERC Act) (2006), including hedgehog *Erinaceus europaeus*, harvest mouse *Micromys minutus* and brown hare *Lepus europaeus*, were collected during survey visits for other protected species.

Constraints

2.27 Desktop data searches are a valuable tool in evaluating a site's potential to hold rare and protected species, it is not however an absolute in confirming presence or absence of notable species due to the nature of how the records are collected.

2.28 Due to horses being present on site bat activity surveys would sometimes have to be amended on the night. This affected the transect around sampling points 10 and 11 (Appendix 4) where the route would sometime have to avoid the horse pasture and stables. This is not considered a significant constraint on the survey results as bat activity was picked up by static detectors in these areas (Appendix 5).

3.0 Results

Statutory and Non-Statutory Designated Sites

European Designated Sites

3.1 Two European designated sites were found within 7km of the Site. Epping Forest is a Special Area of Conservation (SAC) as well as being a Site of Special Scientific Interest (SSSI). The closest part of Epping Forest to Site is 1.1km to the north-west of Site. It is designated for its woodland habitat which supports stag beetles *Lucanus cervus* and other invertebrates which are listed on the Red Data Book and are Nationally Scarce. Lee Valley is a Special Protection Area (SPA) located 6.9km to the west of Site. It has been designated an SPA due to its internationally important numbers of breeding and wintering wildfowl including bittern *Botaurus stellaris*, gadwall *Anas strepera* and shoveler *Anas clypeata*.

Statutory Designated Sites

3.2 Three SSSIs (Epping Forest, Roding Valley Meadows and Hainault Forest) and five Local Nature Reserves (LNRs) (Roding Valley Meadows, Linders Field, Chigwell Row Wood, Ainslie Wood and Hainault Lodge) are located within 5km of the Site. These designations are afforded protection from significant direct and indirect effects upon qualifying features under the Wildlife and Countryside Act (WCA) (1981) as amended.

3.3 Chelmer Valley Riverside LNR is located approximately 3.3km south-west of the Site, designated for its range of habitats including unimproved grassland and the river itself. Due to the amount of open space being incorporated into the proposed layout (Appendix 2) and the distance from site, it is predicted that there will be no significant direct or indirect effects on the designated sites or their qualifying features. In addition, the Site falls outside of criteria defined within Natural England's 'impact risk zones' used to assess planning applications likely impacts upon statutory sites.

Table 2: The distance and direction of statutory sites within 8 km of the site boundary.

Site Name	Distance and Direction from Site	Reason for Designation
Epping Forest SAC, SSSI	1.1km north-west	Qualifies as an SAC for its Atlantic acidophilous beech forest in the north-eastern part of the habitat's UK range. The site also consists of northern Atlantic wet heaths with *Erica tetralix* and European dry heath. The site is also designated as it supports stag beetles and many Red Data Book and Nationally Scarce invertebrate species. The site is designated as a SSSI as it is one of only a few remaining large-scale examples of ancient wood-pasture in lowland Britain and has retained habitats of high nature conservation value including ancient semi-natural woodland, old grassland plans and scattered wetland.
Roding Valley Meadows SSSI, LNR	1.7km north	Roding Valley Meadows forms one of the largest continuous areas of species-rich grassland in Essex, comprising traditionally managed hay meadows, flood meadows and marsh. The meadow and marshland communities include a diverse assemblage of plant species, many of which are uncommon in Essex, and the site includes the largest known bed of the Brown Sedge *Carex disticha* in Essex.
Linders Field LNR	2.0km north	Mixture of ancient woodland, scrub, grassland and ponds.
Chigwell Row Wood LNR	3.4km east	A remnant of Hainault Forest containing ancient trees including many pollards over 250 years old. Over 800 species of invertebrates recorded.
Hainault Forest SSSI	4.1km east	Hainault Forest is part of the ancient wood-pasture Forest of Havering. The principal woodland type present is pedunculated oak-hornbeam; the birch-hazel variant dominates over nearly three-quarters of the ancient woodland, and the ash-maple variant is also present. The woodland and scrub areas support a diverse flora and fauna, including a diverse breeding bird community. The site is of regional importance for two species of breeding birds. It is also of county significance in Essex for its populations of nightingale, wood warbler and spotted flycatcher and in Greater London for tree pipit, marsh tit and redpoll. Woodcock, turtle dove and three species of woodpecker are also of interest.
Ainslie Wood LNR	4.2 km west	This woodland contains oak, hornbeam, wild service, hazel, crab-apple, field maple, hawthorn, blackthorn and rowan.
Hainault Lodge LNR	4.6km east	This site consists of pasture-woodland and is home to an interesting variety of plants including butcher's broom, foxgloves and red campion. Fauna includes orange tip, speckled wood, long-tailed tits, robin, great spotted and green woodpeckers.
Lee Valley SPA	6.9km west	Internationally important numbers of breeding and wintering wildfowl, especially Gadwall and Shovelor and for wintering Bittern.

Statutory Designated Sites: SSSI = Site of Special Scientific Interest; **LNR** = Local Nature Reserve.

Non-statutory Designated Sites

3.4 A single Local Wildlife Site (LWS), Barnaby Way Wood, is located within 2km of the Site. This designation is protected by local policy.

3.5 Barnaby Way Wood, LWS, is located approximately 1.1km north-east of the Site, designated for its partly ancient woodland and geomorphological interest.

Habitats

Phase I Habitats

3.6 The Phase 1 Habitat map of the Site is shown within Appendix 1. The Site is largely the same as in the previous report (SES, 2014d). *Any changes to habitat descriptions are given in blue italics.*

3.7 There were eight habitat types found within the Site:

1. Semi-improved grassland;
2. Tall ruderal;
3. Semi-natural woodland;

4. Scattered trees;
5. Running water;
6. Scattered/dense scrub;
7. Building; and
8. Improved grassland.

Semi-improved grassland

3.8 Tussocky grassland can be found throughout the Site; common rank grass species such as false-oat grass *Arrhenatheurm elatius*, common couch *Elytrigia repens* and cock's foot *Dactylis glomerata* were all frequently encountered. Herbaceous forb species include occasional vetch *Vicia spp.*, cinqfoil *Potentilla sp*. and yarrow *Achillea millefolium*. These grasslands are punctuated by semi-natural woodland blocks and scrub. Rides and glades link grasslands throughout the Site, these rides look to be cut to maintain public walking routes. The grasslands found on Site are under pressure from succession with scrubby species starting to creep and form dense thickets.

Tall ruderal

3.9 Tall ruderals can be found intermittently throughout the Site with prominent patches forming beds of common nettles *Urtica dioica*, Russian comfrey *Symphytum x uplandicum* and vetches.

Semi-natural woodland and Scattered trees

3.10 Small self-sown and planted wooded blocks can be found throughout the Site, these blocks are predominantly found upon the Site's sloped banks. Most of these wooded blocks are linked with dense scrub, which typically grades into grassland. The understorey is characteristically scrubby and/or over-shaded limiting ground flora to blankets of ivy *Hedera helix*. Frequently encountered species include field maple *Acer campestre*, sycamore *Acer pseudoplanatus* and ash *Fraxinus excelsior*. The south-eastern boundary contains a more mature wooded block than those found within areas previously used for landfill. This wooded block is characterised by field maple, hawthorn *Crataegus monogyna*, ash and sycamore. Mature specimens including oak *Quercus robur* horse chestnut *Aesculus hippocastanum* and ash line parts of the Site's north-eastern boundary shared with West Hatch High School and along the north-western boundary adjacent to the formal playing fields.

3.11 Most trees located on Site form pockets of woodland, however, individual species can be found scattered within grassland and lining the Site's boundaries.

Running Water

3.12 A running stream runs briefly from the south-eastern boundary adjacent to Chigwell Road before entering an underground culvert to re-emerge on the south-western boundary, where it flows parallel with this boundary until reaching the M11. This stream is partially concrete-lined and occasionally pipes fed by run off from the neighbouring residential development (beyond southern boundary). The Site's gradient is managed by gradually 'stepping' down the stream by manmade features. These streams are consistently over-shaded by the trees and scrub and as a consequence are largely devoid of aquatic vegetation, although willowherb *Epilobium sp.* was recorded in sections that receive sunlight. Himalayan Balsam *Impatiens glandulifera* was also recorded within the western boundary stream, this species is listed as an alien invasive species on Schedule 9 within the WCA (1981) (see section 5.15- 5.18 for discussion and recommendations). The depth of this stream is

habitually shallow, but where the stream has been 'stepped' down deeper pools do exist. The bottom of the stream is silted with most rocks found being of pebble size.

Dense and Scattered Scrub

3.13 Thickets of dense and scattered scrub can be found throughout the Site. Scrub is usually associated with the edge of the wooded blocks presenting as transitional habitats. Blocks of dense scrub hug the Site's sloping banks dominated by Bramble *Rubus sp.* with occasional Rose *Rosa sp..* Smaller patches of scrub can be frequently encountered within the Site's grasslands. Large patches of Japanese knotweed *Fallopia japonica*, an alien invasive species listed on Schedule 9 of the WCA (1981) was recorded in 2013 within scrub patches at T2 and T3 see Appendix 1 (see section 5.15- 5.18 for discussion and recommendations). *No Japanese knotweed was observed on Site during any of the surveys in 2017. This species is under a management plan on Site. Some of these areas were also subject to an arson attack since the previous survey, likely in early 2017 with some patches of dense scrub in the centre of the Site now burnt to the ground.*

Building

3.14 A building, named as the barn, which is two storeys high and actively used as storage for the horse stables can be located towards the Site's south-eastern extent. This barn is surrounded by single storey stables which line the perimeter of a small courtyard. The barn is a two storey structure of brick construction. It has a pitched slate tile roof and is aligned north-east to south-west.

Improved Grassland

3.15 Improved grassland punctuated by scattered trees forming a horse pasture (under a grazing regime) is present, orientated towards the south-east of the Site, directly north-west of the stables (Appendix 1). Smaller areas of improved grassland can be found south-east of the stable block, partially under the canopy of wooded areas running towards Chigwell Road. Another small area of improved grassland contains scattered fruit trees and is situated towards the southern boundary almost immediately south-west of the aforementioned pasture.

Protected Habitats

Lowland Meadow

3.16 The grasslands recorded are dominated by rank species choking floral diversity and as such are not considered to provide a notable example of this habitat type. The proposed development will involve the permanent loss of areas of this habitat.

Lowland Mixed Deciduous Woodland

3.17 The majority of woodland on Site is relatively recently established (landfill ceased in 1978) and confined to small blocks/strips. Native species dominate the canopies with ash and field maple frequently encountered. More mature wooded areas can be found within the south of the Site, specimens include ash, sycamore and horse chestnut. Mature oak trees are also present along the eastern and western boundaries of the Site.

3.18 There is potential for some trees onsite to have Tree Preservation Orders (TPOs) attached to them and it is recommended that the local council is contacted for advice on TPOs within the local area.

Badgers

Desk Study

3.19 The desk study revealed two records within 3km of the Site, with the closest being 1.3km south-east of the Site in 2007.

Field Survey

3.20 In 2013 a latrine and bedding were found to the north-east of Site. No definitive evidence of badgers was found on Site in 2013 or 2017 surveys and in the update survey no evidence of badgers was found where it had been in 2013.

Bats

Desk Study

3.21 The desk study results of bat species are shown in Table 3 below.

Table 3: Synthesis of bat records held by data suppliers, with most recent date recorded and type of record (roost, capture or unspecified)

European Protected Species	Year/s	Closest Record (km/m) (Year)
A bat species *Chiroptera sp.*	2005 - 2010	1.5km south-east (2005)
Brown Long-eared Bat *Plecotus auritus*	2006 - 2010	1.4km north-west (2010)
Common Pipistrelle *Pipistrellus pipistrellus*	1994 - 2010	0.3km south-west (2009)
Daubenton's *Myotis daubentonii*	2002 - 2013	0.8km north (2007)
Nathusius' Pipistrelle *Pipistrellus nathusii*	2007 - 2013	0.8km north (2007)
Pipistrelle sp. *Pipistrelle sp.*	1983 - 2009	1.3km north-west (2009)
Serotine *Eptesicus serotinus*	2002 - 2010	0.8km north (2007)
Soprano Pipistrelle *Pipistrellus pygmaeus*	1997 - 2013	0.3km south-west (2009)

Activity and Static Surveys

3.22 A total of five species were recorded during the static surveys in 2012/2013 (SES, 2014b), the majority of which were common pipistrelles *Pipistrellus pipistrellus*. Other species included soprano pipistrelle *Pipistrellus pygmaeus*, Nathusius' pipistrelle *Pipistrellus nathusii*, Leisler's bat *Nyctalus leislerii* and noctule *Nyctalus noctula*.

3.23 Additional species recorded by automated detectors in 2017 included serotine *Eptesicus serotinus* and brown long-eared bats *Plecotus auritus* (Table 4). The majority of the calls were made by common pipistrelles (93.5%).

3.24 Activity surveys in 2012/2013 found common pipistrelle, soprano pipistrelle, noctule (2012 only) and Nathusius' pipistrelle (2013 only) to be using the Site (SES, 2014b). Common and soprano pipistrelles were seen to be using the hedgerows and woodland edges on Site with a single noctule recorded in the south-west area of the Site comprising rough grassland and scrub.

3.25 In 2017 only common and soprano pipistrelle species were seen (Appendix 8). These species were generally distributed around the Site with highest levels of activity seen in the north-east and around woodland in the centre/south of Site.

Table 4: Automated Bat Detector Results 2017

	Early May		Late May		June		July		August		Sept		Oct		Total
Automated Detector ID	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**2**	
45 pip	-	2	-	-	-	-	45	-	N/R	N/R	24	-	388	-	**459**
55pip	-	-	-	-	-	-	-	-	N/R	N/R	13	-	-	-	**13**
Nat Pip	-	-	-	-	-	-	-	-	N/R	N/R	2	-	-	-	**2**
Poss Nathusius'	-	-	-	-	-	-	1	-	N/R	N/R	-	-	1	-	**2**
pip sp	-	-	-	-	-	-	-	-	N/R	N/R	1	-	-	-	**1**
noctule	-	-	-	-	-	-	1	-	N/R	N/R	-	-	-	-	**1**
nyctalus	1	1	3	-	3	-	-	-	N/R	N/R	1	-	1	-	**10**
serotine	-	-	-	-	-	-	1	-	N/R	N/R	-	-	-	-	**1**
BLE	-	-	-	-	-	-	-	-	N/R	N/R	2	-	-	-	**2**
Total	**1**	**3**	**3**	**0**	**3**	**0**	**48**	**0**	**0**	**0**	**43**	**0**	**390**	**0**	**491**
Monthly Total	**4**		**3**		**3**		**48**		**0**		**43**		**390**		

Tree Scoping Survey

3.26 All trees due to be removed as a result of or on the edge of the proposed development were inspected from ground level; In 2013 ten trees were identified as having the potential to support roosting bats and hence subject to further survey work following best practice guidance (Hundt, 2012). An aerial inspection in May and July 2013 reduced this number to six trees which had emergence/re-entry surveys carried out on them in 2013.

3.27 During an update survey in 2017 a total of 34 trees were believed to have potential to support roosting bats. This number was refined to trees which were likely to be affected by the proposed development and those with moderate to high potential were aerially inspected on 20th June 2017. A total of ten trees were climbed with an eleventh tree recently blown down in a storm. Of these, four were found to have moderate to high potential to support roosting bats and so emergence/re-entry surveys were undertaken, in line with best practice guidance (Collins, 2016).

Table 5: Summary of Tree Survey Results in 2017

Tree	Description	Potential bat roost features	Bat roosting potential
3	Mature Horse Chestnut	Large cavity on main stem, very open. Branch heading out to west has large cavity but it is open to the elements. Ripped branch heading south is open with no potential crevices for bats	None
14	Mature Hornbeam	Wound on limb which is south-facing on the south-east aspect 5m AGL. Feature exposed to weather.	None
16	Mature Oak	Woodpecker hole on north side of main trunk, 6m AGL. Two large woodpecker holes on south side of main stem, 7m AGL.	High
17	Mature Oak	Hole on west side of main trunk, 2.5m AGL. Bird nest present, only downward cavity.	Low
22	Mature Ash, Multi-stemmed	Large woodpecker holes on eastern and western aspects, 3m AGL. Exposed or only downward cavity.	Low
23	Mature Ash	Large woodpecker hole on north aspect of main stem, 8m AGL.	Moderate

Tree	Description	Potential bat roost features	Bat roosting potential
28	Mature Ash	Large vertical rot hole on south-west side, 5m AGL. Vertical hole 5.5m AGL 6 inches up and narrows to a point. Woodpecker hole on south-east aspect, 5.5m AGL. Open and exposed wound at the top.	Moderate
29	Mature Ash (tree blown over in storm)	Small woodpecker hole on south side of main stem, 4m AGL.	None
30	Mature Ash	Rot hole on north aspect of main stem, 8m AGL. Cracks around edges are exposed. Two holes on main stem 10m AGL. Lower hole is blunt, higher hole goes up 6 inches and splits into two channels. Smooth inside and around opening.	High
32	Mature Willow	Woodpecker hole on east aspect of main stem, blunt, 9-10m AGL.	None
34	Mature Willow	Woodpecker hole on west side of main stem, 10m AGL. Exposed to the elements	None

Tree Emergence/Re-entry Survey

3.28 Emergence/re-entry surveys were carried out on the trees identified in the tree scoping and aerial inspections as having potential to support roosting bats (see Appendix 9). Between two and three surveys were undertaken on each tree depending on the roosting potential the tree held as per BCT Guidance (Hundt, 2012) and as per the updated guidance (Collins, 2016) see Table 5 for details.

3.29 No bats were seen to emerge or re-enter any of the features on these trees.

Building Scoping Survey

3.30 An internal inspection of the building found that the stables had not potential to support roosting bats. The first floor of the barn was not accessible for health and safety reasons although holes are present in the ground floor ceiling. There were many cobwebs present within the ground floor of the barn with no evidence of bat droppings. Pigeons were seen to be roosting within the first floor and loft of the barn which in some circumstances can deter roosting bats. Access points including missing tiles, slipped wooden boards and gaps around doors were present. The building was found to have moderate potential to support roosting bats.

Building Emergence/Re-entry Survey

3.31 Two emergence/re-entry surveys were undertaken on the barn in the south-east of Site. No bats were seen to emerge or re-enter the building.

Birds

Breeding Birds

3.32 107 bird species were recorded from the data search provided by EFC (June 2017). This included a range of specially protected species and those of high conservation concern, red and amber-listed by

Eaton et al., (2015). A proportion are likely to occur in the farmland and woodland habitats within the site such as barn owl *Tyto alba*, hobby *Falco subbuteo*, kestrel *Falco tinnunculus*, spotted flycatcher *Muscicapa striata*, linnet *Caruelis cannabina* and yellowhammer *Emberiza citrinella*.

Table 6: Summary of survey visits

Species	No. Records	Sch1	Red	Amber	Green	Intro
Barn Owl	2	1			1	
Barn Swallow	15				1	
Blackbird	22				1	
Blue Tit	22				1	
Brambling	1	1			1	
Bullfinch	18		1			
Buzzard	29				1	
Carrion Crow	19				1	
Coal Tit	9				1	
Collared Dove	11				1	
Common Woodpigeon	21				1	
Coot	11				1	
Cuckoo	10		1			
Dunnock	18			1		
Goldcrest	9				1	
Great Spotted Woodpecker	19				1	
Great Tit	22				1	
Green Woodpecker	22				1	
Grey Partridge	1	1	1			
Grey Wagtail	1		1			
Hobby	1	1			1	
House Martin	7			1		
House Sparrow	6		1			
Jay	16				1	
Kestrel	32			1		
Linnet	6		1			
Little Owl	5				1	
Magpie	19				1	
Mallard	19			1		
Marsh Tit	2		1			
Meadow Pipit	5				1	
Merlin	3	1	1			
Mistle Thrush	14		1			
Moorhen	14				1	
Nightingale	2		1			
Pheasant	20					1
Reed Bunting	11		1			
Robin	21				1	
Skylark	21		1			
Song Thrush	21		1			
Sparrowhawk	14				1	
Spotted Flycatcher	2		1			
Starling	12		1			
Stock Dove	21			1		
Swift	8			1		
Total	897	15	33	23	49	3
Tree Pipit	1		1			
Treecreeper	5				1	
Turtle Dove	4		1			

Species	No. Records	Sch1	Red	Amber	Green	Intro
Willow Warbler	10			1		
Woodcock	3		1			
Yellow Wagtail	1		1			
Yellowhammer	20		1			

3.33 The 2017 breeding bird surveys recorded a total of 32 species recorded of which 22 were breeding species and the remaining 10 were foraging on the site (Appendix 10). The 2013 survey would have added reed bunting *Emberiza schoeniclus* and stock dove *Columba oenas* to the list of red and amber-listed species (SES, 2014c) however, the results are not considered to significantly affect the results.

3.34 There were three red-listed species (Eaton *et al.*, 2015) of which one species, song thrush *Turdus philomelos*, was breeding and house sparrow *Passer domesticus* and starling *Sturnus vulgaris* were breeding nearby and foraging on site. There were three species listed as amber of which one, dunnock *Prunella modularis*, was breeding and two, house martin *Delichon urbica* and stock dove, were foraging on site. There were no records of other notable species and there were no Schedule 1 WCA (1981) species recorded breeding or foraging on the site.

Wintering Birds

3.35 A medium to high level of bird activity was recorded across the Site during the WBS in 2012/13. A total of 41 species were recorded during the survey including 27 of which actively used the Site. This activity was distributed across the Site in all habitats. Linnets, song thrush, bullfinch *Pyrrhula pyrrhula*, dunnock, green woodpecker *Picus viridis*, mistle thrush *Turdus viscivorus*, reed bunting and waxwing *Bombycilla garrulus* were all recorded during these surveys.

Great Crested Newt

Desk Study

3.36 The desk study showed records of GCN within 3km of Site between 1994 and 2014 with the closest record at 1.6km north of Site.

3.37 The Site provides terrestrial habitat suitable for GCN, including grassland, scrub and woodland. Aquatic habitat is limited to the flowing stream and the ephemeral water body wet throughout the spring/winter. The streams are not considered to be viable breeding habitat due to their lack of aquatic vegetation, flow rate and depth. Also, it should be noted that the 'stepped' nature of the northern stream would also act as a barrier to the use of this habitat. Because of these reasons the streams are also not considered to be valuable as a 'sink' (foraging/dispersal habitat) resource either. The ephemeral water body on Site is situated at the base of a slope and directly adjoining to the southern grazing pasture. This pond is heavily shaded due to mature willows situated within it.

3.38 Although the Site contains suitable terrestrial habitat, it exists as a relatively isolated parcel of land being ringed by urban development and the M11 to the north of Site. The green infrastructure immediately surrounding the Site is mostly of limited value to GCN due to its amenity nature (intensely cut), but a strip of landscape that is ubiquitous to that found on Site runs north-east towards Luxborough Lane; however, onward ecological connectivity to potential GCN habitat from here seems to be poor.

Habitat Suitability Index (HSI)

3.39 An HSI assessment of the ponds within 500m of the Site could only be undertaken in 2013 as they were both dry in 2017. Pond 1 was found to be dry for part of 2013 also but when it was wet it was heavily over-shaded and assessed as being 'below average'. Pond 2 was also largely dry and over-shaded in 2013 and was assessed as being 'poor' (SES, 2014e).

Presence/Likely Absence Survey

3.40 The full survey results for 2013 are provided in the previous GCN survey (SES, 2014e). No GCN were found in any of the ponds surveyed.

3.41 The data presents that GCN are reasonably unlikely not to be utilising the sites habitats. Hence GCN is not considered further in this assessment.

Invertebrates

Desk Study

3.42 The data search returned records for 826 species considered to be of conservation concern against national or county-level criteria. Many of the records are from sites >1km distant, but of note are a number of post-2010 records from within 100m for stag beetles (Coleoptera: Lucanidae). The profile of the local assemblages of invertebrates is presented in Table 7. A wide range of assemblage types are represented, including woodland, grassland and wetland types, including saltmarsh (presumably attributable to vagrants). Of the more specific species (those with Specific Assemblage Type (SAT) associations) a wide and diverse range are represented, with those potentially relevant to the site including dead wood ('bark and sapwood decay', heartwood decay', and fungal fruiting bodies'), and open grassland ('bare sand and chalk' and 'open short sward'); the 'flower rich resource' reflects the high numbers of flower visiting species

Table 7: Assemblages Represented within the Desk Study Data

Assemblage code	Assemblage name	Number of species
Broad Assemblage Types		
A2	Wood decay	107
F2	Grassland & scrub matrix	76
W3	Permanent wet mire	55
A1	Arboreal canopy	48
F1	Unshaded early successional mosaic	38
W1	Flowing water	31
F3	Shaded field & ground layer	26
W2	Mineral marsh & open water	21
M3	Saltmarsh, estuary & mud flat	3
M2	Sandy shore	1
Specific Assemblage Type		
A211	Heartwood decay	28
W314	Reedfen and pools	12
A215	Epiphyte fauna	2
A212	Bark & sapwood decay	41
A213	Fungal fruiting bodies	5
W211	Open water on disturbed mineral sediments	2
W313	Moss and tussock fen	2
W125	Slow-flowing rivers	1
W126	Seepage	2
F112	Open short sward	6
F002	Rich flower resource	7

Assemblage code	Assemblage name	Number of species
F111	Bare sand & chalk	12
F001	Scrub edge	4
M311	Saltmarsh	2
F003	Scrub-heath & moorland	3

Field Surveys

3.43 In previous surveys (SES, 2014f) the only species of conservation concern recorded during the field surveys was the cinnabar moth *Tyria Jacobaea*. A limited number of specialist species were recorded, associated with: bare sand and chalk (two species) and open short sward grassland (one species); and bark and sapwood decay (seven species).

3.44 The five sampling stations in 2017 were divided as four within grassland scrub-matrix or grassland-scrub transition habitat (station 1 is located on a parcel of grassland on the upper part of a landfill dome, and 2-4 located on the slopes of the domes, see Appendix 11 for a plan); station 5 was located within semi-natural woodland.

3.45 The woodland appears to be self-sown and dominated by sycamore with ash and field maple as occasional or frequent components. Scattered seedlings of scrub are present, mainly hawthorn. The woodland is relatively young, with the trees uniform in size and less than 20-30cm in diameter; the only exception are two large horse chestnuts near the east boundary, which appear to have been pollarded historically. The ground flora is species poor but dominated by cow parsley *Anthriscus sylvestris* with few other woodland species. Dead wood is mostly restricted to narrow diameter timbers but there is a large fallen trunk present, possibly horse chestnut.

3.46 The grassland-scrub areas comprises principally blackthorn, dog-rose *Rosa canina*, ash and oak. The main expanses of grassland were on the tops of the domes and form open areas with only occasional scrub, grading into denser scrub at the edges. The sward is dominated by rank grassland, principally false oat-grass; herbs are restricted to occasional tall species such as teasel *Dipsacus fullonum* and creeping thistle *Cirsium arvense*. The ground flora is dominated by rank grasses but in places the grassland includes abundant nectar plants such as ragwort *Senecio jacobaea*, creeping thistles and teasels. The slopes of the two domes offer more open grassland conditions, largely without bare substrates exposed but with sparser grass swards and with some sunlight penetrating to ground surface level.

3.47 Additional habitats present include:

- A single pond lay at the base of the north-east slope, fringed by tall scrub and trees and apparently without any aquatic vegetation; visually this pond appeared to be of low potential value;
- A small, shallow stream. The bed was dominated by coarse sand and silt, without gravel or cobbles. It sides were fairly steep but lacking marginal vegetation due to woodland shade. The stream was near-dry in summer and is thought unlikely to support species of conservation significance.

3.48 The field surveys recorded a total of 195 species (Appendix 12), predominantly associated with grassland and woodland assemblage types with some vagrants from wetlands (Table 8). Within the SAT associations, the high numbers of flower visitors is represented within the 'rich flower resource' assemblage, a single open grassland species ('bare sand and chalk), two dead wood species

('heartwood decay' and 'bark and sapwood decay'), and 'scrub edge'. The relatively low numbers of open grassland species (either within 'the SATs of bare sand and chalk' or 'open short sward') is a reflection of the relatively tall and rank character of the grassland and also probably the relatively heavy soil in more open locations on the sides of the domes.

Table 8: Assemblages Reported within the Field Survey Data

Assemblage code	Assemblage name	Number of species
Broad Assemblage Types		
F2	Grassland & scrub matrix	86
F1	Unshaded early successional mosaic	24
A2	Wood decay	15
W3	Permanent wet mire	11
A1	Arboreal canopy	10
F3	Shaded field & ground layer	9
W2	Mineral marsh & open water	8
W1	Flowing water	2
Specific Assemblage Type		
F002	Rich flower resource	19
F001	Scrub edge	6
A212	Bark & sapwood decay	12
A211	Heartwood decay	1
F111	Bare sand & chalk	1

3.49 The specialist species are associated with the SATs for a variety of ecological requirements:

- Bare sand and chalk, is represented by a single species only, the wasp *Crossocerus quadrimaculatus* (Hymenoptera: Crabronidae) that requires bare substrate for nesting while otherwise hunting flies and other insects in grassland and scrub;
- Scrub edge is represented by species that require the habitat for: hunting (such as the robberfly *Dioctria baumhaueri* Diptera: Asilidae); as foodplants (such as the speckled bush cricket *Leptophyes punctatissima* Orthoptera: Phaneropteridae); or for shelter and cover (such as the speckled wood *Pararge aegeria* Lepidoptera: Satyridae);
- Heartwood decay, the hoverfly *Myathropa florea* (Diptera; Syrphidae) that feeds in wet decaying timber and rot hole habitat as larvae, but found more widely on flowers as adults;
- Bark and sapwood decay is represented as the largest SAT (other than the rich-flower resource), comprising bees associated with dead wood for nesting (such as the leaf cutter *Megachile ligniseca* Hymenoptera: Megachilidae) or with dead wood feeding larvae associated with relatively small timbers (as with several beetles and the hoverfly *Xylota sylvarum* (Diptera: Syrphidae). Also represented as a dead wood feeder is the jewel beetle *Agrilus angustulus* (Coleptera: Buprestidae) that is Nationally Scarce.

Assemblages

3.50 Two species of conservation concern were recorded, a single Section 41 NERC Act (2006) species and a Nationally Scarce species (Table 9). The cinnabar moth is a widespread but declining species that is a Specific of Principal Importance

Table 9: Summary of species of conservation concern from field surveys

Species	Status	Ecology	Recording unit
Cinnabar moth *Tyria jacobaeae* (Lepidoptera: Arctiidae)	Species of Principal Importance	Associated with ragwort as a caterpillar foodplant and found widely where this is found, in different types of grassland and ruderal vegetation	Found on the slopes of the domes at sampling stations 2, 3 and 4 and noted elsewhere incidentally where ragwort present

Species	Status	Ecology	Recording unit
Jewel beetle *Agrilus angustulus* (Coleoptera: Buprestidae)	Nationally Scarce	A species with larvae that tunnel beneath the thin bark of various deciduous scrub and tree species	Only recorded from sampling station 4, swept from long grassland near scrub

Reptiles

Desk Study

3.51 There are four reptile species considered to be the most common and widespread; common lizard *Zootoca vivipara*, slow-worm *Anguis fraglilis*, adder *Viper berus* and grass snake *Natrix helvetica*. These four species of reptiles are legally protected from deliberate destruction under the WCA (1981).

3.52 The desk study results of reptile species are shown in Table 10 below.

Table 10: Records of reptile species within 2km of the Site boundary via a data search.

UK Protected Species	Year/s	Closest Record (km) (Year)
Slow-worm *Anguis fragilis*	1981-2012	1.2km south-east (1981)
Grass Snake *Natrix helvetica*	1976-2016	1.2km south-east (1981)

3.53 The Site contains large areas of suitable reptile habitat including grassland and scrub which are ecologically connected to the wider landscape.

Field Survey

3.54 A seven visit presence/likely absence survey for reptiles took place across the Site in April and May 2013. An update survey was undertaken between May and August 2017. No reptiles were found during any of the Site visits. Table 11 below highlights weather conditions for each survey visit in 2017 as well as reptiles recorded; indicative locations of reptile refugia can be found in Appendix 7.

Table 11: Weather Conditions and Reptile Species Recorded.

Survey visit	Date	Prevailing weather	Temperature °C	Species
1	24.05.17	80% Cloud Cover, Beaufort 1	17°C	-
2	30.05.17	50% Cloud Cover, Beaufort 2	17°C	-
3	26.06.17	60% Cloud Cover, Beaufort 1	15°C	-
4	29.06.17	40% Cloud Cover, Beaufort 2	16°C	-
5	03.07.17	50% Cloud Cover, Beaufort 1	16°C	-
6	14.08.17	60% Cloud Cover, Beaufort 1	17°C	-
7	22.08.17	70% Cloud Cover, Beaufort 2	16°C	-

Small and Medium-sized Mammals

Desk Study

3.55 Records of UK BAP/NERC Act (2006) species of principal importance identified within 2km of the study area included European hedgehog and harvest mouse:

- Multiple records of hedgehog within the wider landscape between 1976 and 2009, one of which was approximately 200m to the west of Site;

- A single record of harvest mouse was present approximately 1km to the south of Site in 1996;

Habitat Assessment

European Hedgehog

3.56 The scrubby areas on Site are considered to provide suitable foraging habitat for the European hedgehog based on the guidance provided by Harris & Yalden (2008). No evidence of this species was found on Site during any of the surveys.

Harvest Mouse

3.57 The long grassland on Site provides suitable nesting and foraging habitat on Site for harvest mouse. No evidence of this species was found on Site during any of the surveys.

4.0 Evaluation

Valuing ecological features and resources

4.1 The CIEEM Guidelines (2016) recognise that ecological evaluation is a 'complex and subjective process' but provides key considerations to apply when 'applying professional judgment to assign values to ecological features and resources'.

4.2 In this chapter, all ecological resources or features are assigned to a value relating to their geographic frame of reference, using the following scale:

- International
- UK
- National (England)
- Regional (South-east)
- County (Essex)
- District (Epping Forest)
- Local or parish including the immediate zone of influence of the Site.

4.3 Focusing on assessments of biodiversity value, there are various characteristics that can be used to identify ecological resources or features that are likely to be important in terms of biodiversity. The following factors have been considered when assessing the conservation value of each ecological resource:

- Species richness and abundance (species diversity)
- The presence of species or populations of nature conservation importance
- The presence of locally, regionally or nationally rare species.

Statutory and Non-Statutory Designated Sites

European Protected Sites

4.4 There are no features within the Site.

4.5 There is one SAC within 7km of the Site:

- Epping Forest is location approximately 1.1km north-west of the Site.

4.6 There is one Special Protection Area (SPA) within 7km of the Site:

- Lee Valley is approximately 6.9km to the west of Site.

4.7 All sites are evaluated as being of **International** value for their habitat and species features

SSSIs

4.8 There are no features within the Site. Roding Valley Meadows (1.7km north of Site) and Hainault Forest (4.1km east of Site) are assessed as being important at the **National** scale for habitats on Site; species-rich grassland and ancient wood-pasture, respectively.

LWS

4.9 There are no features within the Site. Barnaby Way Wood (1.1km north-east of Site) is assessed of being of important at a **County** scale.

Habitats

Vegetation

Lowland Meadow

4.10 The grasslands recorded on Site are dominated by rank species choking floral diversity and as such are not considered to provide a notable example of this habitat type. The grassland meadows are valued at a **Site** level.

Lowland Mixed Deciduous Woodland

4.11 The majority of woodland on Site is relatively recently established (landfill ceased in 1978) and confined to small blocks/strips. Native species dominate the canopies with ash and field maple frequently encountered. More mature wooded areas can be found within the south of the Site, specimens include ash, sycamore and horse chestnut. Mature oak trees are also present along the eastern and western boundaries of the Site.

4.12 Due to their location (Epping Forest District), size and composition the Site's wooded blocks are valued to a **Site** level within a geographic scale.

Badgers

4.13 Although no evidence of badgers were found on Site it is possible they are present within the wider landscape and occasionally utilise the Site for commuting/foraging purposes. The Site is therefore considered important at a **Site** level.

Bats

4.14 The Site had an assemblage of at least five species, it is possible that other *Myotis* species also occur. Nathusius' pipistrelle was recorded in low numbers but regularly on Site, and this is a species which is rare in the areas according to existing records. No roosts were found on Site. Given these results, the Site is assessed to be of **Local** value for commuting and foraging bats.

Birds

Breeding birds

4.15 The bird community size is a function of the size of the site and also the diversity of habitats. There were over 30 species recorded and just over 20 species considered to be breeding. The bird community was not especially rich and reflected the young woodland, rough grassland and scrub habitats. The woodland community did not support many notable species. For example, the survey did not record spotted flycatcher or nightingale *Luscinia megarhynchos* in the woodland or scrub habitats. However, the scrub habitats supported a diverse array of warblers and finches. The breeding bird community is hence regarded as being of **Local** importance based on the criteria of Fuller (1980) and modified considering recent species declines by IEEM (2006). This accords with the evaluation of the 2013 survey data (SES, 2014c).

Table 12: Site value based on breeding bird community size (Fuller 1980)

Number of breeding bird species	Site Value
<25	Local
25-49	District
50-69	County
70-84	Regional
>85	National

Wintering Birds

4.16 Although the Site was valued at being of local importance for each of the notable species independently, the Site was valued as **District** importance for the wintering bird assemblage in 2012/2013 (SES, 2014h). This was due to the total number of species using the Site and the relative scarcity of similar relatively undisturbed habitats in the surrounding area. It is predicted that this evaluation will not change significantly once the update surveys have been undertaken.

Great Crested Newts

4.17 As both ponds accessible within 500m of the Site were dry during the spring and summer of 2017 and the results of no GCN found during surveys in 2013 it is reasonably likely that GCN are absent

from Site and so are no longer considered in this report.

Invertebrate Survey

4.18 No species with legal protection was recorded and none are likely to be present.

4.19 Two species of conservation concern were recorded, of which one is recognised specifically within the planning system as a species of principal importance under the NERC Act (2006). The cinnabar moth is one of a number of species that is of conservation concern based on national declines while nevertheless remaining widespread (Butterfly Conservation, 2006); it is found widely on ragwort a herb of grassland and ruderal vegetation. The other species of conservation concern is a dead wood jewel beetle *Agrilus angustulus* considered to be Nationally Scarce and of value as part of wider biodiversity.

4.20 Within the context of ISIS and the numbers of species within different assemblage types, none are considered to be in 'favourable' condition and other than dead wood and scrub edge the numbers of specialists are relatively low and only the jewel beetle is part of a wider assemblage of specialist species. Against the criteria of Colin Plant Associates (2006) an assemblage of two species of conservation concern would be evaluated as **District** importance. Additional sampling effort would identify additional species and almost certainly species of conservation concern within the group of widespread declining moths with the status of species of principal importance (NERC Act, 2006), and also possibly the stag beetle (a Nationally Scarce species of principal importance (NERC Act, 2006)). However, it is thought unlikely that sufficient numbers of species of conservation concern or species of sufficient rarity or importance would be recorded to alter the evaluation, as judged from the condition of habitats, the species assemblages recorded, and the species that are likely to be present. It is therefore concluded that the evaluation as District importance is robust.

Reptiles

4.21 The seven visit presence and likely absence survey during suitable weather conditions in 2013 and 2017 uncovered no reptile species on Site. It is therefore considered that reptile species are absent from Site and are no longer considered in this report.

Small and Medium-sized Mammals

4.22 There were no records of small or medium-sized mammals on the Site and no field signs observed. The habitats were assessed as having potential to support European hedgehog and harvest mouse only. European hedgehog and harvest mouse as features within the Site are assessed as being of **Site** value.

Summary of Evaluation Features

Table 13: Summary Evaluation of Site Features

No.	Feature	Summary Description	Value
1	SAC/SPA	Epping Forest 1.1km north-west of Site Lee Valley 6.9km west of Site	International
2	SSSI/LNR	Roding Valley Meadows 1.7km north of Site; Hainault Forest 4.1km east of Site (and constituent SSSI of the SAC); Linders Field 2.0km to the north of Site; Chigwell Row Wood 3.4km to the east of Site; Ainslie Wood 4.2km to the west of Site; Hainault Lodge 4.6km to the east of Site	National
3	LWS	Barnabay Way Wood 1.1km north-east of Site	County
3	NERC Act Priority Habitats	Lowland Meadow Lowland Mixed Deciduous Woodland	Site
4	Other habitats	Scattered trees and ditches	Site
5	Badger	No setts on Site but potential for it to be used for commuting and foraging	Site
6	Bats	Bat Foraging and Commuting Assemblage	Local
7	Birds	Breeding Assemblage Wintering Assemblage	Local District
8	Invertebrates	Specialist species from a number of assemblages but only 'bark and sapwood decay' and 'scrub edge' with more than singletons recorded. Two species of conservation concern, one widespread declining Species of Principal Importance and a Nationally Scarce species	District
9	Small and Medium-sized Mammals	Suitable habitats for European hedgehog and harvest mouse	Site

5.0 Impacts without Mitigation

Characterising and quantifying effects and assessing their significance

5.1 The CIEEM Guidelines (CIEEM, 2016) state that ecological effects should be characterised in terms of ecosystem structure and function and reference should be made to: positive or negative effects; extent; magnitude; duration; reversibility; timing and frequency; and cumulative effects. The guidelines provide a list of 'key aspects of ecosystems to consider when predicting effects'. Whilst this proposal does not require a formal Ecological Impact Assessment (EcIA), this report quantifies the effects in a comparable way.

5.2 Following the characterisation of effects, an assessment of the ecological significance of an effect is made. The Guidelines promote an approach in which a beneficial or adverse effect is determined to be significant or not, in ecological terms, in relation to the integrity of the defined Site or ecosystem(s) and/or the conservation status of habitats or species within a given geographical area, which relates to the level at which it has been valued. The decision about whether an effect is significant or not, is independent of the value of the ecological feature; the value of any feature that would be significantly affected is then used to determine the implications, in terms of legislation, policy and/or development control (CIEEM, 2016).

5.3 The Guidelines also state that: 'Significant effects on features of ecological importance should be mitigated (or compensated for) in accordance with guidance derived from policies applied at the scale relevant to the value of the feature or resource' and that: 'Any significant effects remaining after mitigation (the residual effects), together with an assessment of the likelihood of success in the mitigation, are the factors to be considered against legislation, policy and development control in determining the application' (CIEEM, 2016).

Development Footprint

5.4 The Proposed Development would comprise c.100 residential units and a care home with associated landscaping, highways and open space. The developable area within the Site covers approximately 3.3ha of the Site, with a residual 11.3ha for use as informal greenspace provision.

Statutory Designated Sites

5.5 The proposed indicative development will not have direct impacts upon the surrounding statutory designated sites. Indirect impacts are likely to include increased visitors to locally designated sites, especially those with car parks and visitors' centres. It is considered the open space on Site is likely to prevent a significant adverse effect on the surrounding designated sites.

Non-statutory Designated Sites

5.6 Due to the distance of the Site from Barnaby Way Wood and the amount of green open space incorporated into the proposed scheme it is considered unlikely there will be any significant direct or indirect effects on the status of the LWS.

Protected Habitats

Lowland Meadow Mixed Deciduous Woodland

5.7 Construction will lead to the permanent loss of small amounts of these habitats. Much of the woodland to be lost is young and/or plantation woodland. The mature woodland habitats on Site are being retained. Impacts are assessed as **minor adverse** at a Site level.

Badgers

5.8 Some minor disruption to badger dispersal and foraging would occur. It is unlikely that a badger sett would be affected by the proposed works. It is possible that without precautionary construction techniques badgers could get trapped within any trenches or consume poisonous chemicals insecurely stored overnight and die as a result of it. Impacts are therefore assessed as being **minor adverse** at a Site level. Confidence in this assessment is high.

Bats

5.9 The more important habitats for bats including areas of woodland and boundary habitats are being retained and so it is unlikely that a significant impact on commuting and foraging bats will occur as a result of the proposed development. However, if a suitable lighting strategy is not put in place then it could prevent bats from utilising these retained habitats and so there is potential to have a **minor adverse** effect on the bat assemblage on Site at a Local level.

Birds

Breeding Birds

5.10 The proposed development will encompass about 3.3ha (22.6%) of the 14.6ha site. The retention of 77.4% of the habitats will include much of the grassland and scrub and the consequent impacts without mitigation is assessed as **minor adverse** at the Local level.

Wintering Birds

5.11 There are likely to be **minor adverse** impacts on the wintering populations of bullfinch, linnet, green woodpecker, mistle thrush, reed bunting and a range of other species currently using the Site, due to the loss of habitat and increased human disturbance. However, this impact will be lower due to populations already being suppressed by the motorway road traffic noise and the less mature habitats of the former landfill areas.

5.12 For all species, there are likely to be **minor adverse** impacts during the construction stage as habitats are cleared and development works commence, and during the early operational stages, before the maturation of urban semi-natural habitats.

Invertebrates

5.13 The proposals are for residential housing located within grassland and scrub habitat, a small area of improved grassland and part of the woodland along the eastern edge of the site. These broad

locations are associated with both species of conservation concern: the cinnabar moth and the jewel beetle. However, although the distributions as recorded within the surveys are restricted to within or near the development footprints it is very likely that both species occur more widely within the grassland and scrub habitat locally. The woodland habitat with larger trees will remain largely outside of the development footprints, although a breach to provide access would be created and potentially affect dead wood habitat, possibly including areas used by stag beetles. The overall magnitude of impact of direct habitat loss to development is likely to be **minor adverse**, at the District scale.

5.14 As well as development footprints the scheme may result in incorrect impacts particularly via artificial lighting. Although the wider locality is lit at night the proposed development areas is unlit. Although lighting is thought likely to be capable of impacting species at the population level the extent of lighting in the context of the locally available grassland and scrub habitat is likely to be minor with extensive areas of habitat remaining unlit locally. The magnitude of lighting impact is therefore considered to be **minor adverse**, at the District scale. Other indirect impacts from new residential housing, such as increased vandalism and disturbance are unlikely to impact invertebrates.

Small and Medium-sized Mammals

5.15 The loss of habitats suitable for European hedgehog and harvest mouse from construction impacts are assessed as **minor adverse** effects at a Site level of importance. Operational impacts are also **minor adverse** at a Site level of importance through increased predation by dogs and recreational disturbance although gardens will provide ideal foraging habitats for European hedgehog.

Summary

Table 14: Summary of Impacts without Mitigation Arising from the Development of the Site (those in bold are assessed as Significant Effects).

No.	Receptor	Predicted Impact	Level/Predicted Adverse Effect	Confidence in Prediction
1	SAC/SPA	None Predicted	International/Neutral	High
2	SSSI/LNR	None Predicted	National/Neutral	High
3	LWS	None Predicted	County/Neutral	High
4	NERC Act Priority Habitats	Loss of some grassland and woodland	Site/Minor adverse	High
5	Other habitats	Loss of some scattered trees	Site/Minor adverse	High
6	Badger	Loss of some commuting and sub-optimal foraging habitat. Injury/death during construction	Site/Minor adverse	High
7	Bats	Retention of boundary habitats although risk of lighting to affect bat usage	Local/Minor adverse	High
8	Birds	Loss of grassland and scrub	Local/Minor adverse	High

No.	Receptor	Predicted Impact	Level/Predicted Adverse Effect	Confidence in Prediction
9	Invertebrates	Loss of grassland and scrub habitat supporting two species of conservation concern, albeit probably on only part of locally occupied habitat Lighting impacts	District/Minor adverse	High
10	Small and Medium-Sized Mammals	Construction and operational impacts on European hedgehogs and harvest mouse	Site/Minor adverse	Moderate

6.0 Mitigation, Enhancement and Residual Impacts

Habitats

6.1 The development will lead to the loss of c.3.3ha of habitat including grassland, woodland and scattered trees.

6.2 The development has a significant opportunity to improve the remaining woodland and grassland through enhanced management in perpetuity. These measures would be best achieved through the establishment of an ecological site management plan that would include a principal objective to maintain and enhance the grassland and woodland habitats. The Site's landscaping plan will provide additional floral diversity within created meadow grassland habitat woven and interconnected to the Site's green infrastructure to for a biodiverse mosaic of habitats, managed in perpetuity. The loss of woodland is being offset through the planting of new woodland.

6.3 Given the recommended management plan there would be an overall increase in habitat quality with associated enhancements to associated species such as bats, birds and invertebrates. The residual effect will therefore be **minor positive** for grassland and woodland habitats.

Badgers

6.4 It is recommended that precautionary measures take place to ensure that in the event of a badger coming on to Site during construction the risk of injuring and killing is minimised. It is therefore recommended that the following measures, applicable to most sites, take place, these include covering any trenches at night or leaving a plank of wood leant against the side to ensure they can escape if they were to accidentally fall in. Chemicals should also be appropriately sealed and stored.

6.5 Thus residual impacts upon the local badger social group from the proposed development of the Site are considered to be neutral.

Bats

6.6 In general, it is recommended that site lighting is kept to a minimum during both construction and operational phases, especially in areas of potential foraging/commuting corridors such as woodland edges. If lighting is necessary, then there are a number of ways to minimise the effect of lighting on bats. The following mitigation strategies have been taken from Bat Consevration Trust Landscape and Urban design for Bats and Biodiversity (Gunnell *et al.*, 2012) and other referenced sources:

- In general, light sources should emit minimal ultra-violet light (Langevelde *et al.*, 2011) and avoid the white and blue wavelengths of the light spectrum, so as to avoid attracting insects and thus potentially reducing numbers in adjacent areas, which bats may use for foraging;
- Limiting the height of lighting columns to eight metres and increasing the spacing of lighting columns (Fure, 2006) can reduce spill of light into unwanted areas such as the aforementioned habitats. The spread of light should be kept near to or below the horizontal plane, by using as steep a downward angle as possible and eliminating bare bulbs and upward pointing light fixtures. Other ways to reduce light spill include the use of directional luminaires, shields, baffles and/or louvres. Flat, cut-off lanterns are best. Additionally lights should be located away from reflective surfaces where the reflection of light will spill onto potential foraging/commuting corridors;
- Lighting that is required for security or access should use a lamp of no greater than 2000 lumens (150 Watts) and be PIR sensor activated, to ensure that the lights are only on when required and turned off when not in use (Jones, 2000; Hundt, 2012).

6.7 With these lighting implementations, it is considered that any adverse effects from lighting upon potential bat populations would be minimised.

6.8 There is an opportunity to enhance the Site for bats through the inclusion of such measures as bat boxes being installed on the proposed buildings or mature trees around Site, away from artificial light. There are numerous bat box designs but the Schwegler universal bat box 1FF provides excellent summer roosting conditions for crevice inhabiting species including common pipistrelle which have been recorded on Site. In addition, species of known benefit to bats can also be included within the landscaping scheme which will also enhance biodiversity in general, in line with the NPPF (DfCLG, 2012) and Epping Forest District Council Local Plan and Alterations (1998/2006) core policy CP2 and Nature Conservation NC1-NC5. The resulting residual effect upon bats is considered **neutral to minor positive**.

Birds

Breeding Birds

6.9 Mitigation is not proposed but the site would be enhanced by the provision of house sparrow and house martin/ swift nest boxes within the built development. The resulting residual effect upon breeding birds is considered to be **neutral**.

Wintering Birds

6.10 With careful design and mitigation and creation of compensatory habitats on-site, the long-term impacts of the proposed development will be fully ameliorated. For example, the proposals include significant areas of open space, most importantly the retention and enhancement of the perimeter stream and associated scrub and woodland habitats, and the creation of a large area of parkland across the western third of the site where specifically designed ecological features, such as wildflower meadows with patches of scrub, will be created. This area will form a large bund to help screen the motorway traffic noise resulting in a significant beneficial impact on the bird populations across the rest of the site. The proposed enhancements of the site through the creation of new habitats will likely result in a **minor positive** residual impact on wintering bird populations in the long term.

Invertebrates

6.11 As considered, neither of the species of conservation concern recorded are likely to be locally restricted to the scheme footprint and are likely to be present more widely. The broad enhancement and mitigation outlined below are likely to be appropriate for these two species and other species of value. Within the scheme the suggested mitigation and enhancements for invertebrates are recommended in relation to the soft landscaping of the final scheme and management options for habitat within open space areas:

- Within the developed area landscaping should aim to provide an abundance of nectar plants over an extended period for flower visiting species. Early season flowering trees are potentially of particular value and also late season blossom that may be provided by ornamental planting;
- Within areas of greenspace where there is sufficient space for large trees then these should be encouraged to grow as large, open growth form specimens. Such trees provide a continuity of dead wood types in the medium and long term including particularly valuable heartwood decay and also subterranean dead wood as required by stag beetles;
- Grassland areas should include a range of sward heights and aim to develop areas including a matrix of swards, from open short sward and bare areas through longer swards and sward interspersed with scrub. Pedestrian traffic can be used to promote periodic disturbance and open short sward conditions. With the availability of sloping banks these could potentially create high quality habitat areas for many bees and wasps, with grassland in these areas encouraged to develop as short sward via disturbance and cutting regimes as appropriate and rank scrub growth minimised, although some scrub would offer additional habitat variation of value;
- Dead wood created during vegetation clearance should be retained on-site as dead wood piles for invertebrates, located in both sunny situations and also shaded areas. Within shaded areas the partial burial of vertically stacked timbers would increase the likelihood of their use by stag beetles;
- The lighting plan should avoid spill onto semi-natural vegetation and, where possible, emit wavelengths with a UV component.

6.12 The improved management of greenspace areas is seen as the principal mitigation and enhancement resulting from the scheme. With the above recommendations, the overall residual impacts are assessed as **neutral**.

Small and Medium-sized Mammals

6.13 To enhance the Site for hedgehogs, connectivity between the proposed gardens can be created by leaving small holes in fences or raising a panel in each garden fence. Hedgehog homes could be distributed throughout the woodland or scrubby areas to provide suitable sheltering spaces for hedgehogs. The resulting residual effect is assessed as **minor positive**.

6.14 To enhance the Site for harvest mouse the management plan of the woodland should take this species into account to ensure that long grassland margins are created. By increasing the floral diversity on Site there will be an increase of variety of prey for both harvest mouse and hedgehog. The resulting residual effect is assessed as **minor positive**.

Summary

Table 15: Summary of Residual Impacts Arising from the Development of the Site on Features that are Significantly Impacted by the Proposed Development (Significant Effects are shown in bold).

No.	Receptor	Summary Mitigation Measures for Significant Impacts	Residual Impact
4	NERC Act Priority Habitats	Management Plan	**Minor Positive**
5	Other Habitats	Management Plan	**Minor Positive**
6	Badger	Precautionary construction techniques	**Neutral**
7	Bats	Bat-sensitive lighting strategy	**Neutral to Minor Positive**
8	Breeding Birds Wintering Birds	Provision of house sparrow and house martin nest boxes Creation of parkland, wildflower meadows and scrub habitat	**Neutral** **Minor positive**
9	Rare and Nationally Notable Invertebrates	Improved management of grassland and scrub areas. Lighting scheme design	**Neutral**
10	Small and Medium-sized Mammals	Facilitating connectivity between proposed gardens, installation of hedgehog homes, management of grassland and creation of greater biodiversity of grassland/flora	**Site/minor positive**

7.0 Conclusion

7.1 The proposed residential development at Hill House, Chigwell, Essex been assessed for its biodiversity value in general as well as its potential to support a number of ecological receptors as set out in a previous Extended Phase 1 Habitat survey undertaken by SES (2017), and through various Phase 2 ecological surveys and assessments (badgers, bats, small and medium-sized mammals, reptiles, GCN, dormice, wintering birds, breeding birds and invertebrates) as discussed within this report.

7.2 Through implementing the above mitigation recommendations, it is considered that all significant adverse impacts from the proposed development upon specific habitats, designated sites and protected species would be mitigated in line with relevant wildlife legislation and planning policy (chapter 11 of the NPPF (DfCLG, 2012) policies D1 and D5 (WBC, 2002) and Epping Forest District Council Local Plan and Alterations (1998/2006) core policy CP2 and Nature Conservation NC1-NC5.

7.3 It is recommended that an Ecological Mitigation and Management Plan is produced to guide the proposed development and to maximise the biodiversity potential of this Site. The production of this document is usually facilitated through an appropriately worded planning condition, which is considered suitable in this instance.

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Appendix 1: Phase 1 Habitat Map (SES, 2014e)

Appendix 2: Proposed Site Plan

Appendix 3: Survey Methods

A review of historic ecology surveys was undertaken. These included previous surveys of badger (SES, 2014a), bats (SES, 2014b), breeding birds (SES, 2014c), extended Phase 1 Habitat survey (SES, 2014d), great crested newt (SES, 2014e), invertebrates (SES, 2014f), reptiles (SES, 2014g) and wintering bird surveys (SES, 2014h).

Badger Presence/Likely Absence Survey

Badger surveys can be undertaken anytime, but ideally outside of the summer months when vegetation is dense. They are best undertaken when vegetation is low in February and April; which also coincides with a peak in territorial activity. A second peak in activity occurs in October but vegetation can potentially hinder the location of setts in dense vegetation.

The survey consisted of a review of aerial photographs and a detailed systematic walkover survey, with particular attention being paid to areas where vegetation and/or topography offered suitable sett sites. The badger signs looked for were:

- Setts,
- Prints,
- Badger runs,
- Hairs,
- Latrines,
- Scratching posts, and
- Snuffle marks.

A walkover survey was undertaken on 16th May 2017 when the weather conditions were dry and with good visibility.

All accessible holes were examined to determine if they were or ever had been badger setts. The number of entrances and levels of use were recorded and the sett was classified according to the criteria used in the National Badger surveys (Harris *et al*. 1989). The classification criteria are given below:

- **Main setts** – a large well established, often extensive and in continuous use. There is only one main sett per social group of badgers. This is where the cubs are most likely to be born.
- **Annexe setts** – occur in close association with the main sett and are linked to the main sett by clear well-used paths. If a second litter of cubs are born, they will be reared here.
- **Subsidiary setts** – these often have 3-5 holes and are normally over 50m from a main sett and are not linked by clear paths. These setts are not continually active.
- **Outlying setts** – these usually have 1-3 holes, have small spoil heaps and are sporadically used. Foxes and rabbits may move in.

An assessment of the activity of each sett was undertaken; the following categories were assigned to the entrance holes to make this assessment:

- **Well-used**: Entrances clear of debris and vegetation and are obviously well used.
- **Partially-used**: Entrances are not in regular use and have debris such as leaves or twigs across the entrances. These holes could come into regular use with minimal clearance.
- **Disused**: Entrances have not been used for some time, are partially or completely blocked. There

may be a depression in the ground where the hole used to be.

Natural England (2009) define a badger sett as the system of tunnels and chambers, in which badgers live, and their entrances and immediate surrounds or to other structures used by badgers for shelter and refuge. More specifically the 1992 Act says that these structures and places must show signs indicating current use by a badger. 'Signs indicating current use' are those such as fresh spoil heaps and clear entrances.

Assessment of Territory Size and Population Density

Badger territories are likely shaped by the dispersion of food resources (Kruuk & Parish, 1982) as it is known that badgers often feed in patches, where food resources are more easily obtained. We know that badgers may live within a territory that contains a significant earthworm biomass, but there is no correlation between earth worm biomass (most important badger food resource in England) and badger group size as the earth worms may not be accessible. For instance they may be present in high numbers within arable fields, where it is difficult to extract them. Certain habitats constitute high quality foraging habitat, especially deciduous woodland, the base of hedgerows and close grazed pasture as earth worm biomass is high and extracting them is relatively easy (Hoffer, 1988). Thus if a small proportion of earth worm rich habitat is present in a territory, large quantities of other habitat types are also included.

Bats

Bat Activity Survey

A suite of transect and static detector surveys were undertaken in 2017 to conform to methods stated in the *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (Collins, 2016). In relation to these guidelines the site was assessed as moderate quality for bat activity. Therefore, the following programme of survey work was undertaken:

- Bat activity surveys along one walked transect once each month (May-October), stopping at 12 designated sampling points for four minutes (see Appendix 4 for transect routes). The transect was routed to cover the site as evenly as possible, walked by paired surveyors. Transect start points and route direction (clockwise/anti-clockwise) were varied systematically between survey visits to ensure coverage of different areas of the site at different times in relation to sunset, to ensure there was no systematic spatio-temporal bias in the results. In September a dusk and dawn activity survey was undertaken. BatBox Duets with Edirol recorders were used to record bat calls for all surveys.

- Automated survey locations were sampled (using constant-monitoring data-logging detectors – Anabats and SM2s) using two detectors for at least five nights each month (see Appendix 5).

Bat call analysis

All bat calls recorded on Anabats or SM2 detectors were downloaded. The Zero Crossing (ZC) files were converted to .zca files using Kaleidoscope (Wildlife Acoustics, 2015). All calls were viewed and analysed in AnalookW (Chris Corben, 2011) using Zero Crossings Analysis. Assigning species identification within AnalookW was done using differing combinations of the following call characteristics and parameters: peak frequency; maximum and minimum frequency; call duration; call slope; overall visual pattern assessed by eye. Calls were compared to an in-house bat call library and the book *British Bat Calls* (Russ, 2012) was used extensively to guide identification.

WAV files from SM2s were analysed using the automated identification programme SonoChiro (Biotope, 2015). This analyses each individual call event and can record up to 15 seconds in a single sound file. Thus some files contain calls lasting a fraction of a second, whilst others may record for multiple seconds (for example, where a foraging bat flies repeatedly in a tight space close to the detector). The length of the sound file has not been discriminated in this analysis. Each sound file may record multiple individuals of each species, but this is difficult to distinguish, thus only species and not number of individuals have been assigned to each sound file. SonoChiro assigns a confidence value to each putative identification to facilitate creation of a subset of data for manual checks of call identification.

Manual checks were performed on all bat species other than pipistrelle using BatSound (Pettersson). Calls were compared to an in-house bat call library and the book *British Bat Calls* (Russ, 2012) was used extensively to guide identification. As with AnalookW, assigning species identification within BatSound was done using differing combinations of the following call characteristics and parameters: peak frequency energy; maximum and minimum frequency; call duration; call slope; overall visual pattern assessed by eye. Calls were compared to an in-house bat call library and the book *British Bat Calls* (Russ, 2012) was used extensively to guide identification.

Some pipistrelle calls are difficult to assign to common or soprano, and have been assigned to *Pipistrellus* genus only. Some *Nyctalus* sp. calls are also difficult to assign to noctule or Leisler's bat and have been assigned the *Nyctalus sp.* genus only.

Bat Roost Scoping Survey

A tree scoping survey was undertaken on the 18th May 2017 by suitably qualified ecologist Ella Barnett BSc (Hons) ACIEEM. The trees due to be removed as part of the proposed development or at the boundary of the proposed development were inspected from the ground. The survey involved using binoculars to look for potential roosting features such as woodpecker holes, splits and cracks in branches and loose bark.

All accessible potential roosting features were surveyed in this way, with detailed observations being made on the presence of bats (live and/or dead) or evidence of occupation by bats; including bat droppings, scratch marks at potential access points, urine staining as well as characteristic staining and/or smoothing of the tree bark made by the fur of bats. Notes were made on the nature of the features and the potential for the features and tree to support roosting bats in line with best practise guidance from the *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (Collins, 2016).

Trees that were believed to have potential to support roosting bats were put into three categories; low, medium or high. An aerial inspection was undertaken on the 20th June 2017 to inspect the potential bat roosting features more closely. The survey involved the climbing trees by NPTC level 2 certification with rope and harness to undertake an inspection of the potential roosting features. The features of each tree were inspected at close range by using a powerful torch, an angled mirror and an endoscope to look into deep cracks and crevices. The classification of trees was changed to reflect the new information and the trees were subject to emergence/re-entry surveys where necessary. See below for further details.

Bat Emergence/Re-entry Surveys

After the scoping survey the trees and buildings were categorised into one of three potential risk sections: Low, Medium and High these categories are defined as follows:

- **Low:** A tree of sufficient size and age to contain potential roosting features (PRFs) but with none seen from the ground or features seen with only limited roosting potential e.g. shallow cracks/splits/holes and young ivy;
- **Medium:** A structure/tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status e.g. large open holes, hollow trunks, old ivy growth;
- **High**: A structure/tree with one or more potential roost sites that are obviously suitable for use by large numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat e.g. old woodpecker holes/knot holes, deep cracks, splits and loose bark.

Emergence/re-entry surveys were carried out on the trees and the barn following standard guidelines recommended in *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (Collins, 2016).

Recordings were made of bat calls to assist in the identification of any bats seen emerging and/or entering the trees/building. Any bats emerging from or re-entering the trees/building were identified from calls, counted, with roost access points and flight direction noted where possible. In addition to this, general bat activity at the point of surveys was also recorded.

The surveys were conducted between June 2017 and August 2017. All surveys were carried out in optimal weather conditions. The emergence surveys started approximately 15 minutes before sunset and continued for 1.5 hours after sunset. The re-entry survey started one and a half hours before sunrise and finished at sunrise. Equipment used included Batbox Duet frequency division detectors with Edirol digital.

Table A1: Survey dates, timings, weather conditions and schedule

Survey Type	Date	Time	Sunrise/Sunset	Temperature (°C)	Weather Conditions	Features Surveyed
Dusk	29.06.17	21:06-22:51	21:21	18-17	100% Cloud Cover, Beaufort Scale 0	T16, T28, T30
Dawn	06.07.17	03:20-05:05	04:50	22-19	90-100% Cloud Cover, Beaufort Scale 1	Barn
Dusk	20.07.17	20:50-22:35	21:05	19-17	20% Cloud Cover, Beaufort Scale 2	T16, T23, Barn
Dawn	21.07.17	03:37-05:07	05:07	12	0% Cloud Cover, Beaufort Scale 0-1	T28, T30
Dusk	03.08.17	20:29-22.14	20:44	18	95% Cloud Cover, Beaufort Scale 3	T30, Barn
Dawn	04.08.17	03:57-05:27	05:27	17	20-100% Cloud Cover, Beaufort Scale 1-2	T16, T23

Breeding Birds

Breeding bird surveys were undertaken by Stephen Parr BSc MCIEEM. The survey area included the whole of the area within the application site boundary and adjacent areas that could be surveyed from within the site, generally covering a buffer perimeter of 10-20m. Thus adjacent field boundaries and other potential bird nesting habitats where birds using the site during the breeding season may nest, and vice versa were generally also included. A transect was walked slowly pausing to record birds heard and observed, covering all areas of the Site within 25m, and route directions were varied between survey visits. Birds flying over and not using the site or surrounding area were recorded separately. All bird locations and behaviour was mapped onto photocopied OS maps (1:5000 scale) using the standard CBC notation.

All survey visits were undertaken during the morning after the dawn period when bird singing intensity tends to be high but stable (Bibby et al. 2000). Survey times and weather conditions can be found in the table

below.

Table A2: Summary of survey visits

Visit Number	Date	Time	Survey Conditions
1	25/05/2017	07:30 - 10:00	Very good: 17°C, no precipitation, 0 wind, cloud 0/8, good visibility.
2	14/06/2017	09:00 - 11:30	Good: 22°C, no precipitation, 3-4 wind blustery, cloud 3/8, good visibility.
3	06/07/2017	07:00 – 09:30	Good: 22°C, no precipitation, 0 wind, cloud 8/8, good visibility

Analysis of mapped bird registrations

Field maps were analysed to determine probable breeding bird registrations relating to different territories and to judge which birds are using the area for breeding or for other activities such as foraging. A probable or definite territory is defined as a cluster of registrations of singing or displaying individuals from more than one visit, or one or more registrations of the following breeding behaviour: disturbance displaying, interspecific aggressive interaction, repetitively alarming, carrying food, nest material or faecal sacs, or if active nests or young were found.

If a singing bird is recorded on just one visit or sight observations of birds are recorded in the same area on more than one visit and are not likely to be associated with any other recorded territories, these are assigned as possible territories. Presence of such species in suitable breeding habitat on a single visit is assigned to possible territories unless the possibility of nesting is considered negligible by the observer.

This process is open to subjectivity in interpretation except where active nests are located. Therefore, these territories are classed as putative and their mapped locations indicate the 'centre' of a territory and not necessarily the nesting location. The maps were analysed to determine the number of probable and possible territories or pairs of each species present.

Assessment Methodology for Breeding Birds

The assessment methodology for this report follows the "Guidelines for Ecological Impact Assessment" developed by the Institute of Ecology and Environmental Management (IEEM, 2006).

Valuing ecological features and resources

The IEEM Guidelines recognise that ecological evaluation is a 'complex and subjective process' but provides key considerations to apply when 'applying professional judgement to assign values to ecological features and resources'.

In this chapter, all ecological resources or features are assigned to a value relating to their geographic frame of reference, using the following scale:

- International;
- UK;
- National (England);
- Regional (South-east);
- County (Essex);
- District (Epping Forest);

- Local (Chigwell); and
- Site (the Site).

Focusing on assessments of biodiversity value, there are various characteristics that can be used to identify ecological resources or features that are likely to be important in terms of biodiversity. The following factors have been considered when assessing the conservation value of the breeding bird resource:

- Species richness and abundance (species diversity);
- The presence of species or populations of nature conservation importance;
- The presence of locally, regionally or nationally rare species.

The methods by which these factors have been assessed are detailed below.

Species diversity

The number of species present is a simple and effective measure of diversity that can be used to describe conservation value separately for breeding, passage and wintering bird assemblages. Fuller (1980) provided the following criteria for breeding birds where the number of species found breeding in an area can be given a value as shown below:

Table A3: Criteria used to define importance of breeding bird assemblages

National	Regional	County	Local
85+	84-70	69-50	49-25

The application of this approach to assemblages of County importance or lower requires some care as there is no provision for assessment at the District or Parish scale. It is assumed that an assemblage comprising between 49-25 equates to District importance, and fewer than 25 species is only of importance at the Parish/Local level.

Since the publication of this method, further declines have occurred in many bird populations, and for this reason it is probably legitimate to recalibrate the categories slightly downwards.

Species of conservation importance

Criteria for the assessment of species of conservation importance are draw from the following:

- Birds of Conservation Concern (BoCC) listings (Eaton *et al.*, 2009). The red list currently contains species in need of urgent conservation action. Breeding and non-breeding species are included. Criteria for inclusion in the red list are species whose UK populations declined by more than 50% during 1984-09 or during 1969-2009, or whose UK population has experienced a historical (1800-1995) decline, or globally threatened species regularly occurring in the UK. The amber list contains 126 species. The criteria for inclusion for species in the amber list are those whose UK populations declined by 25-49% during 1984-09 or during 1969-2009, or whose UK population is restricted or small, or are present in internationally important numbers in the UK, or Species of European Conservation Concern.
- WCA (1981) and the Birds Directive (1979). Species listed under Section 1 of the 1981 Act are specially protected by law and species listed on Annex 1 to the 1979 Directive on the Conservation of Wild Birds (79/409/EEC) are recognised for their international conservation

importance.

- Biodiversity Action Plan Species. The Convention on Biological Diversity, one of several major initiatives stemming from the 'Earth Summit' in Rio de Janeiro, Brazil in 1992, led to the UK Government setting out a broad strategy for the conservation and enhancement of wildlife species and habitats through the UK Biodiversity Action Plan (BAP) (The Biodiversity Partnership 2006 & 2007). Twenty six bird species were identified as species of principal importance for the purpose of conserving biodiversity and requiring urgent conservation action within the UK BAP. A review of the UK BAP in August 2007 has identified a further 32 bird species or subspecies of principal conservation importance giving a total of 58. The statutory basis for the habitats and species listed in BAPs is provided by Section 41 of the NERC Act (2006) which places a duty on the Secretary of State to take steps and promote the taking of steps by others, to further the conservation of the habitats and species on the list.
- NERC Act (2006). The BAP lists form the basis of the list of species and habitats considered to be of principal importance for the purpose of conserving biodiversity that has been drawn up as directed by Section 41 of the NERC Act (2006). This places a duty on the Secretary of State to take steps, and to promote the taking of steps by others, to further the conservation of the habitats and species on the list.
- Both the National Planning Policy Framework (2012) (NPPF) and the Circular 06/05 Biodiversity and Geological Conservation - Statutory Obligations and Their Impact Within the Planning System (2005) present guiding principles that those species identified as being of principal importance for the purpose of conserving English biodiversity should be protected from the adverse effects of development through the planning system. The conservation of these species should be promoted through the incorporation of beneficial biodiversity designs within developments.
- Populations of conservation importance. The generally accepted criterion is that the presence on a site of a bird species' population of over 1% of the total geographical resource is significant at the international or national scale. A similar approach has been taken in this report to assess the importance of populations at the Regional, County, District or Local scale. At the National and Regional scale evaluations have been judged using population estimates published in Baker *et al.* (2006) and information in Gibbons *et al.* (1993).

Rare species

The generally accepted criterion is that species with fewer than 1000 pairs breeding in the UK are described as Nationally Rare. There is no formal definition for a rare non-breeding bird species or breeding birds in a regional or local context. However, if such species are present they are likely to fall within the criterion for populations of conservation importance as outlined above.

Characterising and quantifying effects and assessing their significance

The CIEEM Guidelines state that ecological effects should be characterised in terms of ecosystem structure and function and reference should be made to: positive or negative effects; extent; magnitude; duration; reversibility; timing and frequency; and cumulative effects. The guidelines provide a list of 'key aspects of ecosystems to consider when predicting effects'. Whilst this proposal does not require a formal Ecological Impact Assessment (EcIA), this report quantifies the effects in a comparable way.

Following the characterisation of effects, an assessment of the ecological significance of an effect is made. Prior to the publication of the current Guidelines in 2006, ecological significance was defined using a matrix

in which ecological value and magnitude of effect were combined to determine different grades of significance; usually high, medium or low. The guidance now advises that assigning levels of significance in this way obstructs a clear understanding of the EcIA process and can result in an assessment that lacks rigour (IEEM, 2005). The Guidelines promote a more transparent approach in which a beneficial or adverse effect is determined to be significant or not, in ecological terms, in relation to the integrity of the defined site or ecosystem(s) and/or the conservation status of habitats or species within a given geographical area, which relates to the level at which it has been valued. The decision about whether an effect is significant or not, is independent of the value of the ecological feature; the value of any feature that will be significantly affected is then used to determine the implications, in terms of legislation, policy and/or development control (IEEM, 2005).

The Guidelines also state that: 'Significant effects on features of ecological importance should be mitigated (or compensated for) in accordance with guidance derived from policies applied at the scale relevant to the value of the feature or resource' and that: 'Any significant effects remaining after mitigation (the residual effects), together with an assessment of the likelihood of success in the mitigation, are the factors to be considered against legislation, policy and development control in determining the application' (IEEM, February 2006).

Invertebrate Survey

Species Statuses

For most taxa the species of conservation concern are defined according to what is termed the 'older UK scheme' or pre-IUCN criteria, as follows:

- Nationally Notable - species known or likely to be present within 16 to 100 10-km squares of the Ordnance Survey National Grid in the UK; for a number of species this is further refined as -A or -B according to range: -A is assigned to species thought to occur in 30 or fewer 10-km squares of the National Grid; and -B for species thought to occur in 31 to 100 10-km squares of the National Grid.
- Nationally Scarce – a term now largely superseding Nationally Notable and defined as species in 16-100 10-km squares of the National Grid.
- Red Data Book species – species occurring in fewer than 16 10-km squares of the National Grid, divided as: Endangered (Red Data Book 1),for species known from a single population or in continuous recent decline and now known from five or fewer 10-km squares; Vulnerable (Red Data Book 2), likely to become Endangered (Red Data Book 1) if causal factors continue; Rare (Red Data Book 3), species at risk but not qualifying as Vulnerable; and Red Data Book K, species Insufficiently Known but likely to qualify at least as Rare.
- Species of Principal Importance as listed in Section 41 of the National Environment and Rural Communities Act, 2006; these are abbreviated as NERC-S41. These species are not formally categorised but based on a range of criteria including species status and declines while nevertheless remaining moderately widespread.

A number of taxa, of particular relevance here the butterflies, have been assessed according to standardised IUCN criteria based on criteria such as population reduction and area of occupancy:

- Critically Endangered. A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see Appendix #).

- Endangered. A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see Appendix #).
- Vulnerable. A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Appendix #).
- Near Threatened. A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
- Least Concern. A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

Within the text rare or scarce species refers to those assessed as being of conservation concern against IUCN criteria or the older UK scheme, while those listed under NERC-S41 are referred to specifically under this category.

Reptiles

To detect presence or likely absence, a seven visit survey is recommended (Froglife, 1999). Seven survey visits were undertaken during 'suitable' days for reptile activity; a 'suitable' survey day is determined by the weather, with temperature being the pre-eminent factor.

Refugia were laid in suitable habitat using the surveyor's professional judgement. This assessment allowed an assessment of the carrying capacity of these habitats. As density dependence often plays a role in population size (Massot *et al.*, 1992), this information will guide the mitigation and compensation measures. Refugia were laid at a density of 10 per hectare in suitable habitat, as per best practice guidance (Froglife, 1999). Reptile refugia (0.5m x 0.5m felt squares) were used to observe reptiles basking or taking refuge, these were laid in transects and left for seven days to settle before the survey commenced. Appendix 7 shows the indicative refugia positions.

Ambient air temperature is an essential factor for reptile surveys after suitable habitat has been located. Reptile surveys conducted between 10 and 17 degrees centigrade have the most chance of success. The key months for reptile surveys are April, May and September with April and May being advantageous because it is reptile mating season, which means they will be more obvious and less wary of observers. Also the temperatures are generally lower during these months and as such it will take longer for the reptiles to warm up so they must spend more time basking. During the warmer summer months animals will have to spend less time basking due to the increase in ambient temperature, thus reptile survey visits will be conducted earlier in the day during the hotter summer months. However the temperature on the day of the visit will ultimately determine what time the survey takes place.

Small and Medium-sized Mammals

The Phase 1 survey identified habitats on site which may have the potential to support small mammals listed as UK BAP priority species and as species of principal importance under Section 41 of the NERC Act (2006). As such a survey for BAP mammals was undertaken on the subsequent Phase 2 surveys by or supervised by suitably qualified ecologist Ella Barnett BSc (Hons) ACIEEM.

The presence/likely absence of these species (European hedgehog, brown hare and harvest mice) has been determined using incidental surveying during numerous site visits following Cresswell *et al*. (2012) survey

method, including early morning and evening ecological surveys such as bats, reptiles and breeding birds.

European Hedgehog

Records of hedgehogs within the vicinity of the study area were analysed in addition to spotlight surveys at night using a powerful lamp and scanning the ground either side as the observer walks along habitats used by hedgehogs (e.g. woodland edges and short grass). Occasional pauses to listen for rustling are useful. Cold and/or wet nights are less productive than warm nights. In addition survey for potential nesting sites (i.e. brushwood piles, sprawling brambles as well as underground in burrows, tree stumps or natural cavities) and materials (medium sized deciduous leaves i.e. oak leaves) are vital features, with an absence of sheltering supportive structures suggesting an absence of hedgehogs.

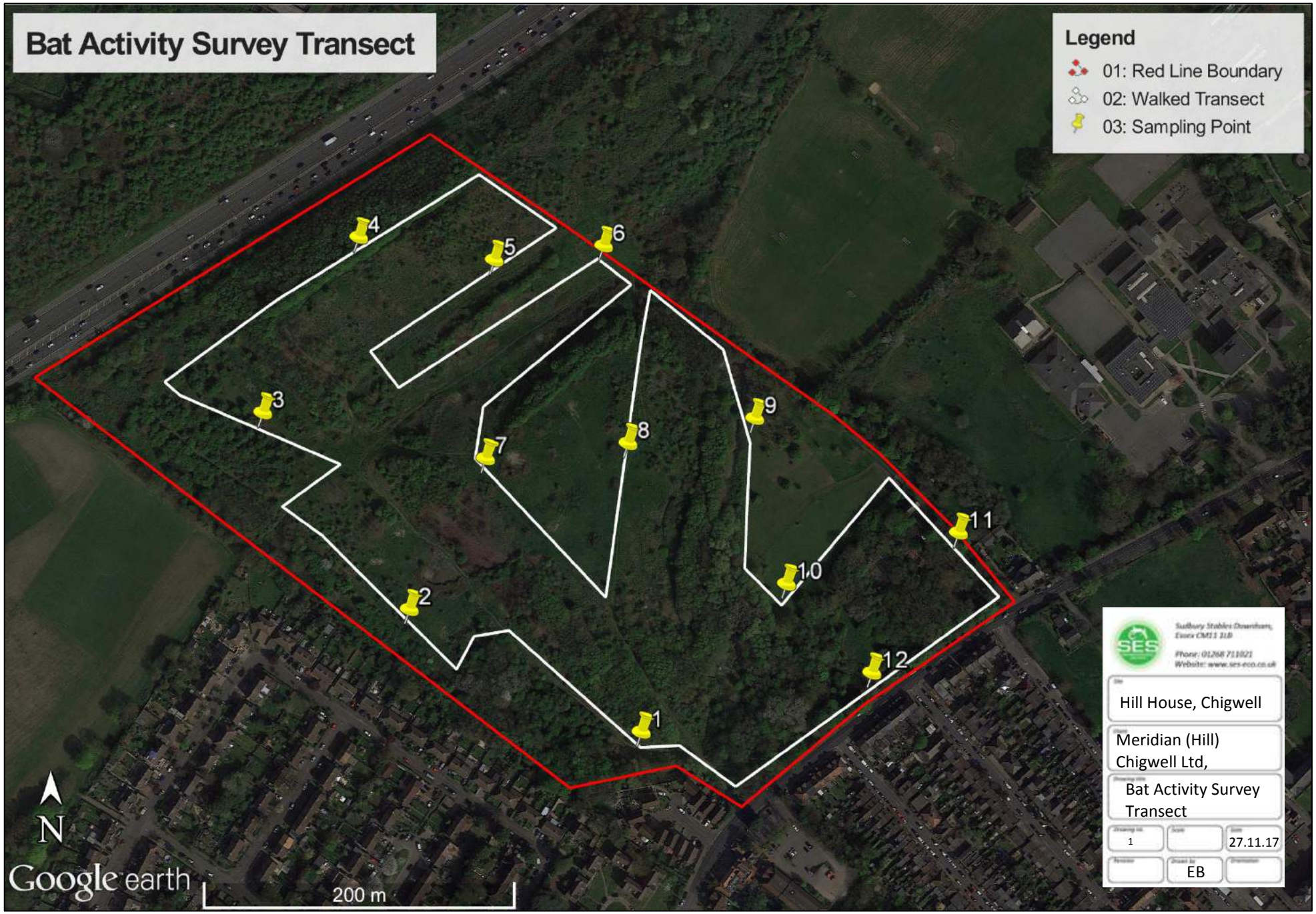
Brown Hare

Brown hares prefer open landscapes where they can evade predators more easily. Hares do not shelter in burrows. Instead they make small depressions in the ground (known as forms), usually alongside hedgerows or within long grass. Their diet consists of grasses, herbaceous plants and cereal crops. A desk top data search for brown hare was undertaken alongside spotlight searches just before dusk and just after dawn. Searches for droppings (hard, round or slightly flattened pellets, about 1cm across) are also useful. Hare surveys are best undertaken in late winter/early spring when vegetation cover is at its lowest and thus hares are at their most visible.

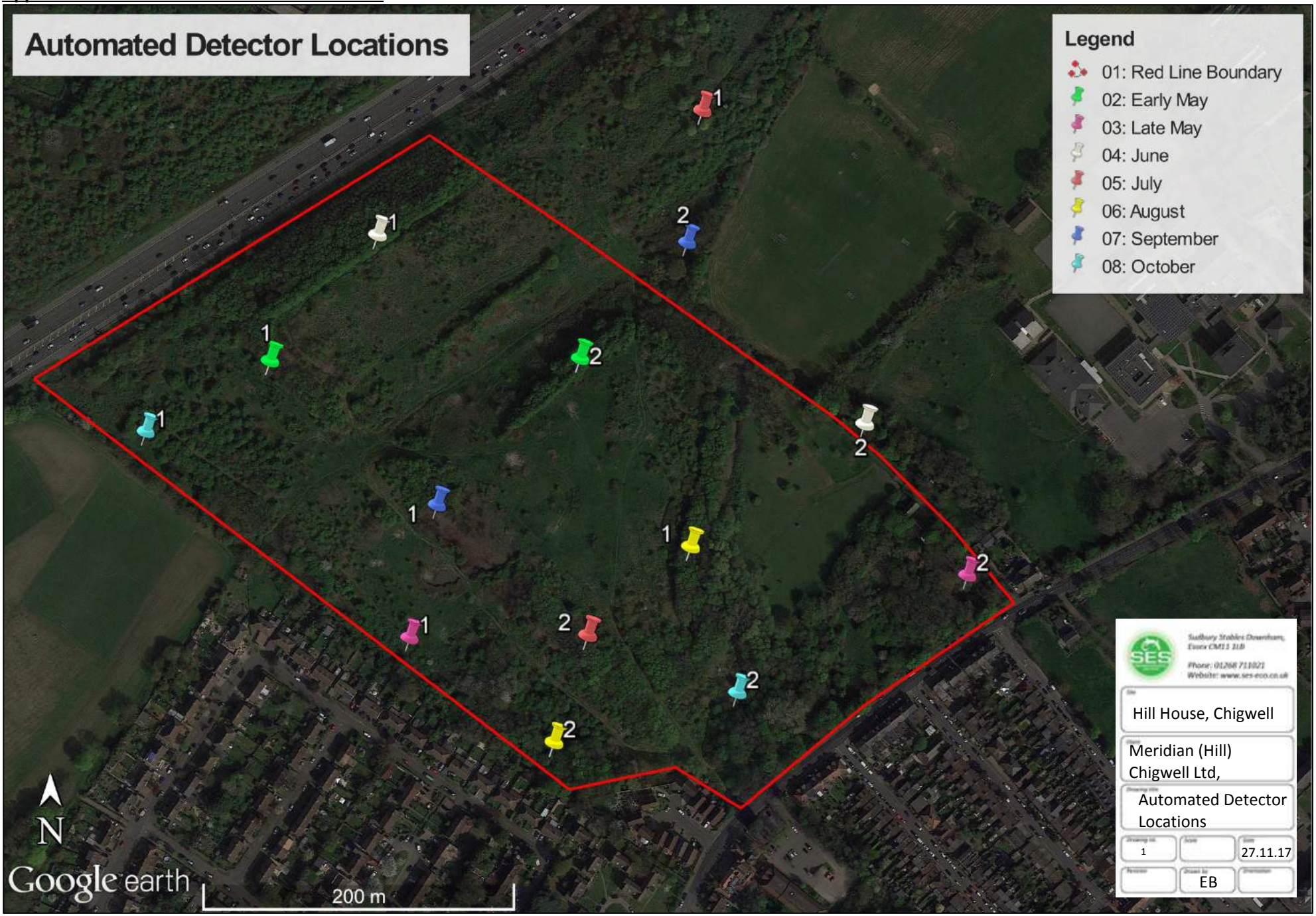
Harvest Mice

Breeding nests are the most obvious sign indicating the presence of harvest mice and they are the only British mammal to build nests of woven grass well above ground. Nests tend to be found in dense vegetation such as grasses, rushes, cereals, grassy hedgerows and brambles.

Appendix 4: Bat Activity Transect Map



Appendix 5: Automated Bat Detector Locations



Appendix 6: Pond Locations within 500m of the Site

Appendix 7: Reptile Mat Locations

Appendix 8: Bat Activity Transect Data

24th May 2017. Dusk activity survey.

Weather: Beaufort 0-1, Cloud cover <5% **Temperature:** 22°C **Detectors:** BatBox Duet and Edirol Recorder.

Sunset: 20:59 / Start time: 20:59 / Finish time: 22:54

Time	Sampling Point	Comment
	W2	No Activity
21:02	**S2**	
	W3	
21:09	**S3**	
	W4	
21:19	**S4**	
	W5	
21:28	**S5**	
	W6	
21:38	**S6**	3x Common Pipistrelle
	W7	2x Common Pipistrelle
21:47	**S7**	No Activity
	W8	1x Common Pipistrelle
21:59	**S8**	No Activity
	W9	
22:12	**S9**	
	W10	1x Soprano Pipistrelle
22:22	**S10**	1x Common Pipistrelle
	W1	No Activity
22:32	**S1**	1x Common Pipistrelle
	W1	No Activity
22:41	**S12**	
	W12	
22:49	**S11**	2x Common Pipistrelle

26th June 2017. Dusk activity survey.
Weather: Beaufort 1, Cloud cover 65% **Temperature:** 20°C **Detectors:** BatBox Duet and Edirol Recorder.
Sunset: 21:22 / Start time: 21:22 / Finish time: 23:18

Time	Sampling Point	Comment
	W10	No Activity
21:34	**S9**	
	W9	1x Common Pipistrelle; 4 passes
21:46	**S8**	1x Common Pipistrelle; 2 passes
	W8	1x Common Pipistrelle; 3 passes
21:57	**S7**	1x Common Pipistrelle
	W7	1x Common Pipistrelle; 2 passes
22:11	**S6**	1x Common Pipistrelle
	W6	2x Common Pipsitrelle
22:24	**S5**	1x Common Pipistrelle
	W5	No Activity
22:33	**S4**	
	W4	
22:43	**S3**	1x Common Pipistrelle
	W3	No Activity
22:53	**S2**	1x Common Pipistrelle
	W2	No Activity
23:03	**S1**	2x Common Pipsitrelle
	W1	2x Common Pipsitrelle
23:13	**S12**	1x Common Pipistrelle; 3 passes
	W12	No Activity

24th July 2017. Dusk activity survey.
Weather: Beaufort 1, Cloud cover 100% **Temperature:** 16°C **Detectors:** BatBox Duet and Edirol Recorder.
Sunset: 21:00 / Start time: 21:00 / Finish time: 23:02

Time	Sampling Point	Comment
	W4	No Activity
21:16	**S4**	
	W5	
21:25	**S5**	
	W6	1x Common Pipistrelle
21:36	**S6**	1x Common Pipistrelle
	W7	2x Common Pipistrelle
21:46	**S7**	1x Pipistrelle sp.
	W8	No Activity
21:54	**S8**	
	W9	1x Common Pipistrelle
22:04	**S9**	2x Common Pipistrelle
	W10	1x Common Pipistrelle
22:15	**S10**	No Activity
	W11	
22:23	**S11**	
	W12	
22:31	**S12**	1x Common Pipistrelle
	W1	1x Common Pipistrelle
22:41	**S1**	1x Common Pipistrelle
	W2	No Activity
22:50	**S2**	
	W3	
22:58	**S3**	

24th August 2017. Dusk activity survey.
Weather: Beaufort 0-1, Cloud cover 10% **Temperature:** 21°C **Detectors:** BatBox Duet and Edirol Recorder.
Sunset: 20:04 / Start time: 20:04 / Finish time: 22:04

Time	Sampling Point	Comment
	W3	No Activity
20:08	**S2**	
	W2	
20:15	**S1**	
	W1	
20:22	**S12**	
	W12	1x Common Pipistrelle; 3 passes
20:34	**S9**	No Activity
	W9	1x Soprano Pipistrelle
20:45	**S8**	1x Common Pipistrelle
	W8	No Activity
20:54	**S7**	
	W7	
21:06	**S6**	3x Common Pipsitrelle; 2 passes, 2 passes, 1 pass
	W6	1x Common Pipsitrelle
21:21	**S5**	1x Soprano Pipistrelle; 2 passes
	W5	No Activity
21:37	**S4**	1x Common Pipistrelle
	W4	1x Common Pipistrelle
21:52	**S3**	1x Common Pipistrelle

26th September 2017. Dusk activity survey.
Weather: Beaufort 0, Cloud cover 30% **Temperature:** 18°C **Detectors:** BatBox Duet and Edirol Recorder.
Sunset: 18:49 / Start time: 18:49 / Finish time: 20:49

Time	Sampling Point	Comment
	W6	No Activity
18:55	**S5**	
	W5	
19:05	**S4**	
	W4	
19:15	**S3**	
	W3	
19:25	**S2**	
	W2	1x Common Pipistrelle
19:35	**S1**	1x Common Pipistrelle
	W1	No Activity
19:30	**S12**	1x Common Pipistrelle
	W12	2x Common Pipistrelle
19:55	**S11**	1x Common Pipistrelle; 2 passes
	W11	No Activity
20:05	**S10**	1x Common Pipistrelle
	W10	1x Common Pipistrelle
20:15	**S9**	1x Common Pipistrelle
	W9	1x Common Pipistrelle
20:25	**S8**	1x Common Pipistrelle
	W8	1x Common Pipistrelle
20:35	**S7**	No Activity
	W7	1x Common Pipistrelle
20:45	**S6**	No Activity

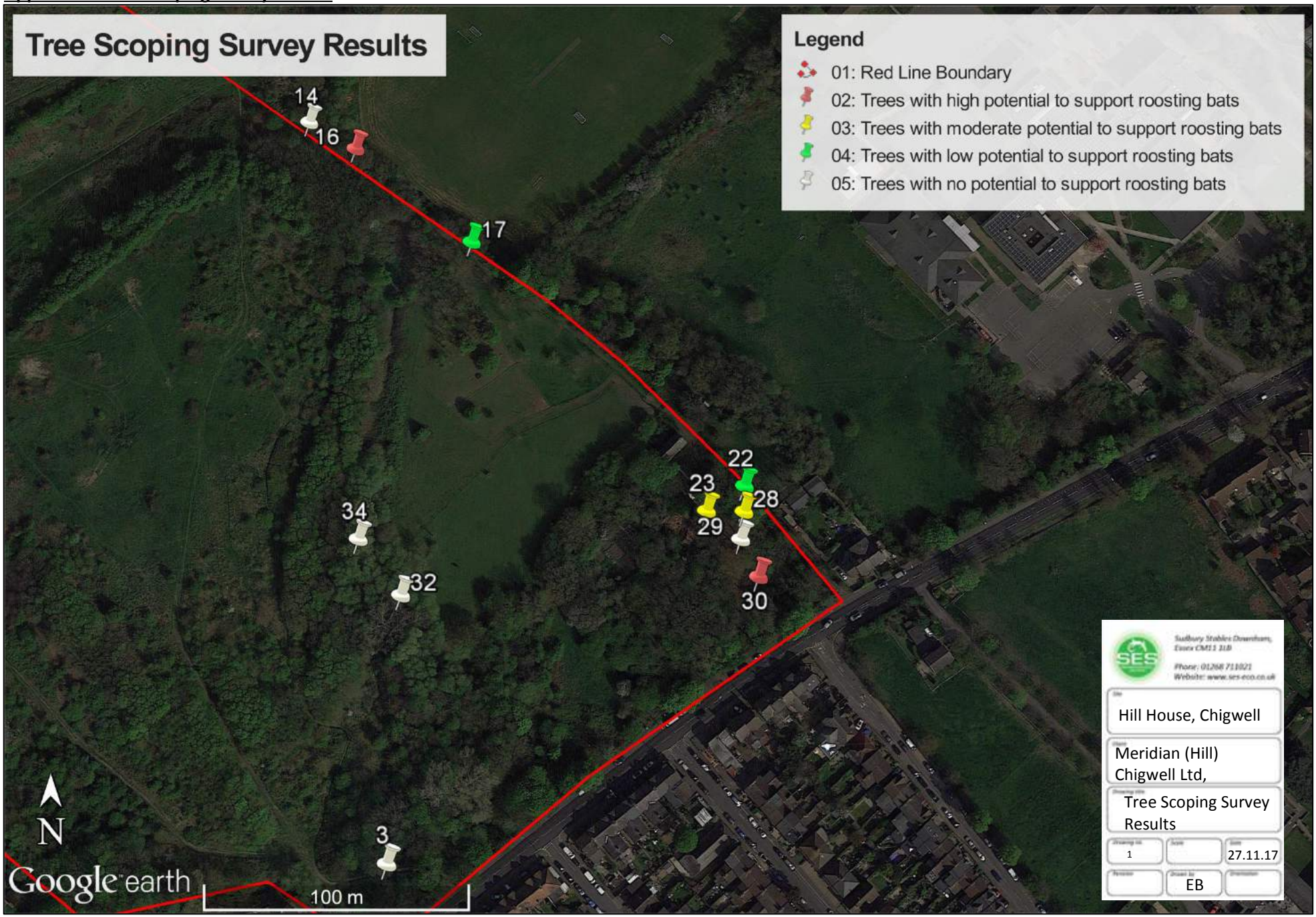
27th September 2017. Dawn activity survey.
Weather: Beaufort 0, Cloud cover 100% **Temperature:** 14°C **Detectors:** BatBox Duet and Edirol Recorder.
Start time: 04:50 / Finish time: 06:54 / Sunrise: 06:52

Time	Sampling Point	Comment
	W11	No Activity
04:54	**S11**	
	W12	
05:04	**S12**	
	W1	
05:14	**S1**	
	W2	
05:24	**S2**	
	W3	
05:34	**S3**	
	W4	
05:44	**S4**	
	W5	
05:54	**S5**	
	W6	
06:04	**S6**	
	W7	
06:14	**S7**	
	W8	
06:24	**S8**	
	W9	
06:34	**S9**	
	W10	
06:44	**S10**	

23rd October 2017. Dusk activity survey.
Weather: Beaufort 1, Cloud cover 100% **Temperature:** 17°C **Detectors:** BatBox Duet and Edirol Recorder.
Sunset: 17:49 / Start time: 17:49 / Finish time: 19:51

Time	Sampling Point	Comment
	W9	No Activity
17:54	**S9**	
	W11	1x Pipistrelle sp.
18:11	**S11**	1x Common Pipistrelle
	W12	1x Common Pipistrelle
18:20	**S12**	No Activity
	W1	1x Pipistrelle sp.; 2 passes
18:29	**S1**	No Activity
	W2	
18:40	**S2**	1x Common Pipistrelle; 2 passes
	W3	No Activity
18:51	**S3**	2x Common Pipistrelle
	W4	No Activity
19:02	**S4**	
	W5	
19:13	**S5**	1x Common Pipistrelle
	W6	No Activity
19:25	**S6**	1x Pipistrelle sp.
	W7	No Activity
19:35	**S7**	
	W8	
19:45	**S8**	

Appendix 9: Tree Scoping Survey Results



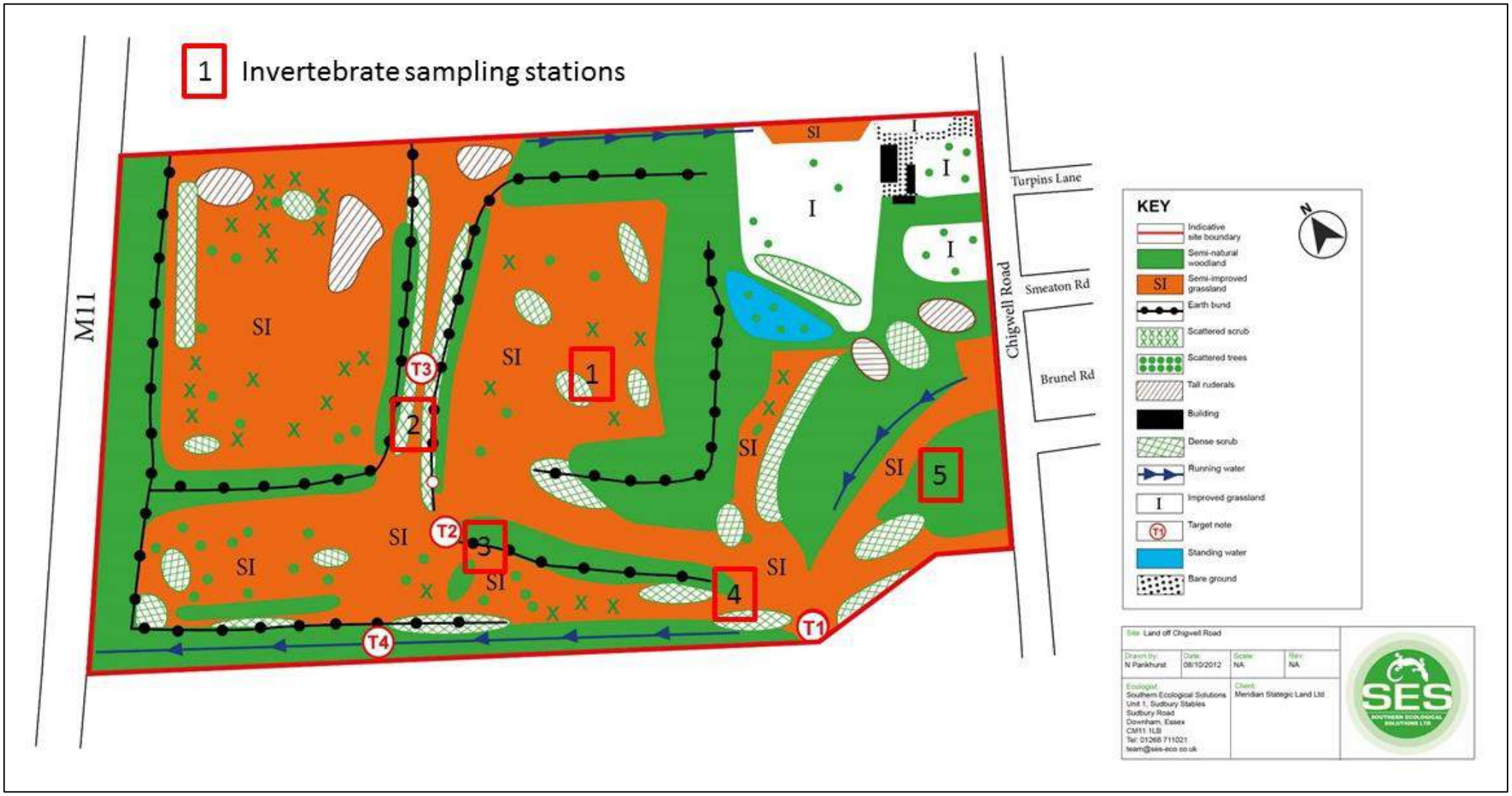
Appendix 10: Breeding Bird Survey Results

Table A4: Summary of breeding status on the site

Species	BoCC 2015	S41	2017 Survey	2013 Survey (Presence/ Absence)
Herring Gull *Larus argentatus*	Red		Max 4 flying over	P
Starling *Sturnus vulgaris*	Red	Y	Foraging flock max 22	P
Song Thrush *Turdus philomelos*	Red	Y	Probable breeding - 3 territories	
Mistle Thrush *Turdus viscivorus*	Red		Possible breeding - 1 territory	
Linnet *Carduelis cannabina*	Red	Y	Possible breeding - 1 territory, foraging flock 4	P
Mallard *Anas platyrhynchos*	Amber		2 flying over	P
Black-headed Gull *Chroicocephalus ridibundus*	Amber		Max 8 flying over	
Common Gull *Larus canus*	Amber		Max 2 flying over	
Stock dove *Columba palumbus*	Amber		-	P
Swift *Apus apus*	Amber	Y	Max 5 flying over	
Willow Warbler *Phylloscopus trochilus*	Amber	Y	Probable breeding - 1 territory	
Dunnock *Prunella modularis*	Amber	Y	Probable breeding - 3 territories	P
Bullfinch *Pyrrhula pyrrhula*	Amber	Y	Probable breeding - 2 territories	
Reed bunting *Emberiza schoeniclus*	Amber	Y	-	P
Canada Goose *Branta canadensis*	Green		Max 2 flying overhead	
Sparrowhawk *Accipiter nisus*	Green		-	P
Pheasant *Phasianus colchicus*	Green		Possible breeding - 1 territory	
Tawny owl *Strix aluco*	Green		-	P
Woodpigeon *Columba oenas*	Green		Confirmed breeding	P
Collared Dove *Streptopelia decaocto*	Green		-	P
Green Woodpecker *Picus viridis*	Green		Possible breeding - 1 territory	P
Great Spotted Woodpecker *Dendrocopos major*	Green		Possible breeding - 1 territory	
Magpie *Pica pica*	Green		Possible breeding - 1 territory	P
Jay *Garrulus glandarius*	Green		Possible breeding - 1 territory	P
Jackdaw *Corvus monedula*	Green		2 flying overhead	P
Carrion Crow *Corvus corone*	Green		Probable breeding - 2 territories	P
Blue Tit *Cyanistes caeruleus*	Green		Probable breeding - 2 territories	P
Great Tit *Parus major*	Green		Possible breeding - 1 territory	P
Long-tailed Tit *Aegithalos caudatus*	Green		Possible breeding - 1 territory	P
Chiffchaff *Phylloscopus collybita*	Green		Probable breeding - 4 territories	P
Blackcap *Sylvia atricapilla*	Green		Probable breeding - 3 territories	
Lesser Whitethroat *Sylvia curruca*	Green		Probable breeding - 2 territories	P
Whitethroat *Sylvia communis*	Green		Probable breeding - 2 territories	P
Wren *Troglodytes troglodytes*	Green		Probable breeding - 3 territories	P
Blackbird *Turdus merula*	Green		Probable breeding - 5 territories	P
Robin *Erithacus rubecula*	Green		Probable breeding - 3 territories	P
Chaffinch *Fringilla coelebs*	Green		Possible breeding - 1 territory	P
Greenfinch *Chloris chloris*	Green		Possible breeding - 1 territory, foraging flock 15	P
Goldfinch *Carduelis carduelis*	Green		Probable breeding - 2 territories	P

BoCC=Bird of Conservation Concern

Appendix 11: Invertebrate Sampling Stations



Appendix 12: Invertebrate Survey Results

Table A5: Supplementary Data

Order	Family	Species	Status	Sampling station				
				1	2	3	4	5
Araneae	Araneidae	*Araneus diadematus*		X				
Araneae	Araneidae	*Larinioides cornutus*				X		
Araneae	Clubionidae	*Clubiona terrestris*						X
Araneae	Dictynidae	*Dictyna arundinacea*			X		X	
Araneae	Dictynidae	*Dictyna uncinata*		X				X
Araneae	Dictynidae	*Lathys humilis*		X				
Araneae	Linyphiidae	*Bathyphantes gracilis*						X
Araneae	Linyphiidae	*Linyphia hortensis*		X			X	
Araneae	Lycosidae	*Alopecosa pulverulenta*					X	X
Araneae	Lycosidae	*Pardosa amentata*				X		X
Araneae	Lycosidae	*Pardosa pullata*		X				
Araneae	Theridiidae	*Enoplognatha ovata*		X			X	X
Araneae	Theridiidae	*Theridion varians*					X	
Araneae	Thomisidae	*Xysticus cristatus*				X		
Coleoptera	Apionidae	*Perapion violaceum*		X	X			
Coleoptera	Buprestidae	*Agrilus angustulus*	NS				X	
Coleoptera	Cantharidae	*Cantharis cryptica*				X		
Coleoptera	Cantharidae	*Cantharis decipiens*					X	
Coleoptera	Cantharidae	*Cantharis figurata*				X		
Coleoptera	Cantharidae	*Cantharis pellucida*				X	X	
Coleoptera	Cantharidae	*Cantharis rustica*			X			
Coleoptera	Cantharidae	*Rhagonycha limbata*		X			X	
Coleoptera	Cantharidae	*Rhagonycha testacea*			X	X		
Coleoptera	Carabidae	*Acupalpus meridianus*					X	
Coleoptera	Carabidae	*Agonum fuliginosum*				X	X	
Coleoptera	Carabidae	*Agonum viduum*			X			
Coleoptera	Carabidae	*Amara aenea*				X		
Coleoptera	Carabidae	*Amara communis*			X			
Coleoptera	Carabidae	*Amara ovata*				X	X	
Coleoptera	Carabidae	*Calathus fuscipes*					X	
Coleoptera	Carabidae	*Harpalus latus*				X		
Coleoptera	Carabidae	*Harpalus rufipes*			X	X		
Coleoptera	Carabidae	*Nebria brevicollis*			X			
Coleoptera	Carabidae	*Notiophilus biguttatus*				X	X	
Coleoptera	Carabidae	*Paradromius linearis*					X	
Coleoptera	Carabidae	*Pterostichus madidus*					X	X
Coleoptera	Carabidae	*Pterostichus nigrita*				X		
Coleoptera	Carabidae	*Pterostichus strenuus*					X	
Coleoptera	Cerambycidae	*Clytus arietis*					X	
Coleoptera	Cerambycidae	*Grammoptera ruficornis*				X	X	
Coleoptera	Cerambycidae	*Rhagium mordax*						X
Coleoptera	Chrysomelidae	*Bruchus loti*				X	X	
Coleoptera	Chrysomelidae	*Cassida rubiginosa*				X		

Order	Family	Species	Status	Sampling station				
				1	2	3	4	5
Coleoptera	Chrysomelidae	*Chrysolina polita*				X		
Coleoptera	Chrysomelidae	*Epitrix pubescens*		X			X	
Coleoptera	Chrysomelidae	*Plateumaris sericea*			X			
Coleoptera	Coccinellidae	*Coccinella septempunctata*		X			X	
Coleoptera	Coccinellidae	*Harmonia axyridis*		X		X	X	X
Coleoptera	Coccinellidae	*Propylea quattuordecimpunctata*			X	X		
Coleoptera	Coccinellidae	*Rhyzobius litura*						X
Coleoptera	Curculionidae	*Ceutorhynchus obstrictus*		X				
Coleoptera	Curculionidae	*Cionus alauda*			X			
Coleoptera	Curculionidae	*Mecinus pyraster*				X		
Coleoptera	Curculionidae	*Nedyus quadrimaculatus*					X	
Coleoptera	Curculionidae	*Phyllobius pomaceus*		X		X		
Coleoptera	Curculionidae	*Sitona sulcifrons*				X		
Coleoptera	Elateridae	*Adrastus pallens*				X		
Coleoptera	Elateridae	*Athous haemorrhoidalis*		X	X	X		
Coleoptera	Elateridae	*Denticollis linearis*					X	
Coleoptera	Malachiidae	*Malachius bipustulatus*					X	
Coleoptera	Oedemeridae	*Oedemera lurida*			X	X		
Coleoptera	Oedemeridae	*Oedemera nobilis*		X	X	X	X	
Coleoptera	Scraptiidae	*Anaspis maculata*						X
Coleoptera	Staphylinidae	*Anotylus rugosus*			X			
Coleoptera	Staphylinidae	*Lathrobium brunnipes*						X
Coleoptera	Staphylinidae	*Quedius picipes*						X
Coleoptera	Staphylinidae	*Stenus bimaculatus*				X		X
Coleoptera	Staphylinidae	*Stenus clavicornis*		X				X
Coleoptera	Staphylinidae	*Stenus flavipes*				X		X
Coleoptera	Staphylinidae	*Stenus fulvicornis*						X
Coleoptera	Staphylinidae	*Tachyporus chrysomelinus*						X
Coleoptera	Staphylinidae	*Tachyporus hypnorum*					X	
Coleptera	Cerambycidae	*Agapanthia villosoviridescens*		X				
Diptera	Asilidae	Dicotria baumhaueri				X	X	
Diptera	Asilidae	*Dioctria rufipes*				X		
Diptera	Asilidae	Leptogaster cylindrica		X	X	X	X	
Diptera	Asilidae	Neoitamus cyanurus						X
Diptera	Bibionidae	*Bibio johannis*					X	
Diptera	Bombylidae	Bombylius major				X		
Diptera	Chrysopilidae	Chrysopilus asiliformis				X		
Diptera	Conopidae	Conops quadrifasciatus		X				
Diptera	Conopidae	Myopa testacea		X	X			
Diptera	Conopidae	**Sicus ferrugineus**		X				
Diptera	Dolichopodidae	*Dolichopus plumipes*		X				
Diptera	Dolichopodidae	*Hercostomus cupreus*				X		
Diptera	Empididae	*Empis femorata*			X			
Diptera	Empididae	*Empis nigripes*					X	
Diptera	Empididae	*Empis stercorea*			X	X		

Order	Family	Species	Status	Sampling station				
				1	2	3	4	5
Diptera	Ptychopteridae	*Ptychoptera albimana*						X
Diptera	Rhagionidae	*Rhagio scolopaceus*						X
Diptera	Stratiomyidae	*Beris morrisii*		X		X	X	
Diptera	Stratiomyidae	*Beris vallata*		X			X	
Diptera	Stratiomyidae	Pachygaster atra			X			
Diptera	Syrphidae	*Baccha elongata*						X
Diptera	Syrphidae	Cheilosia albitarsis				X	X	
Diptera	Syrphidae	*Cheilosia bergenstammi*				X		
Diptera	Syrphidae	Cheilosia illustrata					X	
Diptera	Syrphidae	*Cheilosia pagana*				X		
Diptera	Syrphidae	*Chrysogaster cemiteriorum*			X			
Diptera	Syrphidae	*Chrysotoxum bicinctum*			X			
Diptera	Syrphidae	Chrysotoxum verralli					X	
Diptera	Syrphidae	*Didea fasciata*		X		X		
Diptera	Syrphidae	*Episyrphus balteatus*		X	X	X	X	
Diptera	Syrphidae	*Eristalis interruptus*			X			
Diptera	Syrphidae	*Eristalis intricarius*		X	X			
Diptera	Syrphidae	*Eristalis nemorum*		X	X			
Diptera	Syrphidae	*Eristalis pertinax*			X	X	X	
Diptera	Syrphidae	*Eristalis tenax*		X				
Diptera	Syrphidae	*Eumerus tuberculatus*					X	
Diptera	Syrphidae	*Helophilus pendulus*		X	X	X		
Diptera	Syrphidae	Helophilus trivittatus		X				
Diptera	Syrphidae	*Meliscaeva auricollis*				X		
Diptera	Syrphidae	**Myathropa florea**					X	
Diptera	Syrphidae	*Neoascia podagrica*		X				X
Diptera	Syrphidae	*Neoascia tenur*						X
Diptera	Syrphidae	*Platycheirus clypeatus*		X	X		X	
Diptera	Syrphidae	*Platycheirus peltatus*		X	X	X		
Diptera	Syrphidae	*Scaeva pyrastri*		X			X	
Diptera	Syrphidae	Sphaerophorioa scripta		X	X	X		
Diptera	Syrphidae	Sphegina clunipes					X	X
Diptera	Syrphidae	Volucella bombylans		X				
Diptera	Syrphidae	Volucella inflata		X		X		
Diptera	Syrphidae	Volucella zonaria		X				
Diptera	Syrphidae	Xylota sylvarum						X
Diptera	Tephritidae	*Urophora cardui*		X	X			
Diptera	Therevidae	Thereva nobilitata				X		
Diptera	Tipulidae	*Nephrotoma appendiculata*					X	
Diptera	Tipulidae	*Tipula lunata*						X
Hemiptera - Heteroptera	Coreidae	*Coreus marginatus*			X	X		
Hemiptera - Heteroptera	Miridae	*Pithanus maerkelii*			X			
Hemiptera - Heteroptera	Pentatomidae	*Aelia acuminata*		X		X		
Hemiptera - Heteroptera	Pentatomidae	*Pentatoma rufipes*		X		X		
Hemiptera – Heteroptera	Lygaeidae	*Heterogaster urticae*		X	X	X		
Hemiptera – Heteroptera	Miridae	*Deraeocoris lutescens*		X			X	

Order	Family	Species	Status	Sampling station				
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Hemiptera – Heteroptera	Miridae	*Harpocera thoracica*		X			X	
Hemiptera – Heteroptera	Miridae	*Liocoris tripustulatus*		X		X		
Hemiptera – Heteroptera	Miridae	*Stenodema laevigata*		X	X	X		
Hemiptera – Heteroptera	Tingidae	*Tingis ampliata*		X				
Hymenoptera – Aculeata	Andrenidae	*Andrena cineraria*			X	X	X	
Hymenoptera – Aculeata	Andrenidae	*Andrena denticulata*		X	X			
Hymenoptera – Aculeata	Andrenidae	*Andrena dorsata*		X		X		
Hymenoptera – Aculeata	Andrenidae	*Andrena fulva*		X	X			
Hymenoptera – Aculeata	Andrenidae	*Andrena synadelpha*		X		X		
Hymenoptera – Aculeata	Apidae	*Bombus hypnorum*				X	X	
Hymenoptera – Aculeata	Apidae	*Bombus lapidarius*				X		
Hymenoptera – Aculeata	Apidae	*Bombus lucorum*			X			
Hymenoptera – Aculeata	Apidae	*Bombus pascuorum*		X	X	X		
Hymenoptera – Aculeata	Apidae	*Bombus sylvestris*		X		X		
Hymenoptera – Aculeata	Apidae	*Bombus terrestris*		X		X		
Hymenoptera – Aculeata	Apidae	*Bombus vestalis*		X				
Hymenoptera – Aculeata	Colletidae	*Colletes daviesanus*					X	
Hymenoptera – Aculeata	Colletidae	*Hylaeus hyalinatus*		X		X		
Hymenoptera – Aculeata	Diastatidae	*Astata boops*		X			X	
Hymenoptera – Aculeata	Formicidae	*Myrmica rubra*				X		
Hymenoptera – Aculeata	Halictidae	*Halictus tumulorum*		X		X		
Hymenoptera – Aculeata	Halictidae	*Lasioglossum calceatum*				X		
Hymenoptera – Aculeata	Megachilidae	*Megachile centuncularis*		X	X			
Hymenoptera – Aculeata	Megachilidae	*Megachile ligniseca*			X			
Hymenoptera – Aculeata	Megachilidae	*Osmia leaiana*					X	
Hymenoptera – Aculeata	Sphecidae	*Cerceris arenaria*				X		
Hymenoptera – Aculeata	Sphecidae	*Crossocerus quadrimaculatus*		X			X	
Hymenoptera – Aculeata	Vespidae	*Vespula vulgaris*		X		X		X
Lepidoptera	Arctiidae	*Tyria jacobaeae*	NERC-S41		X	X	X	
Lepidoptera	Hesperiidae	Ochlodes venata				X		
Lepidoptera	Hesperiidae	*Thymelicus lineola*				X		
Lepidoptera	Hesperiidae	*Thymelicus sylvestris*			X	X	X	
Lepidoptera	Lycaenidae	*Callophrys rubi*			X		X	
Lepidoptera	Lycaenidae	*Celastrina argiolus*			X		X	
Lepidoptera	Lycaenidae	*Polyommatus icarus*		X		X	X	
Lepidoptera	Nymphalidae	*Aglais urticae*		X			X	
Lepidoptera	Pieridae	*Anthocharis cardamines*		X			X	
Lepidoptera	Pieridae	*Gonepteryx rhamni*		X				
Lepidoptera	Pieridae	*Pieris brassicae*		X		X	X	
Lepidoptera	Pieridae	*Pieris napi*		X				
Lepidoptera	Pieridae	*Pieris rapae*		X	X	X		
Lepidoptera	Pieridae	*Polygonia c-album*					X	
Lepidoptera	Satyridae	*Maniola jurtina*		X	X	X	X	
Lepidoptera	Satyridae	*Melanargia galathea*				X	X	
Lepidoptera	Satyridae	*Pararge aegeria*			X	X	X	
Lepidoptera	Zygaenidae	*Zygaena filipendulae*				X		

Order	Family	Species	Status	Sampling station				
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Mollusca	Clausiliidae	*Clausilia bidentata*						
Mollusca	Clausiliidae	*Cochlodina laminata*						X
Mollusca	Discidae	*Discus rotundatus*						
Mollusca	Ellobiidae	*Carychium minimum*						
Mollusca	Enidae	Ena obscura						X
Mollusca	Helicidae	Cepaea nemoralis				X	X	
Mollusca	Helicidae	*Helix aspersa*						X
Mollusca	Oxychiliidae	*Aegopinella nitidula*						
Mollusca	Zonitidae	*Oxychilus cellarius*						X
Neuroptera	Chrysopidae	*Chrysopa perla*						X
Opiliones	Phalangiidae	*Rilaena triangularis*						X
Orthoptera	Acrididae	Chorthippus parallelus		X				
Orthoptera	Acrididae	Omocestus viridulus		X				
Orthoptera	Phaneropteridae	Leptophyes punctatissima			X	X	X	
Orthoptera	Tettigoniidae	Metrioptera roeselii		X	X			