APPENDIX 9.1
ECOLOGY SURVEY REPORT

CB4 – PHASE 2

Ecology Survey Report

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V2
February 2022

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Quality Management

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EXECUTIVE SUMMARY

- RPS Planning and Development Ltd (RPS) was commissioned by Bidwell's to undertake ecology surveys of Cambridge North, Phase 2 to help inform the proposed redevelopment of the site.
- The Site is wholly within the Chesterton Station Interchange (CSI) area. The CSI area was subject to a successful application for the Cambridge North Station which was approved in 2016 (permission S/3102/15/FL issued by South Cambridgeshire District Council and permission 15/2317/FUL issued by Cambridge City Council).
- The study area is located on land adjacent to Cowley Road, Cambridge North Station, Cambridge CB4 1UN, and comprises dense mainly birch scrub, semi-improved grassland, shrubs, ephemeral/short perennial plant communities and bare ground.
- The site is bounded by the station car park along the eastern boundary, existing commercial development along the northern boundary, the Cambridgeshire Guided Busway along the western boundary, and by Phase 1a along the southern boundary.
- The site is 6.89 ha in size. The National Grid coordinates for the centre of the site are TL 4744 6085.
- An Environmental Statement (ES) was produced in 2015 for the Cambridge North Station Development which included this site.
- Since then, update Phase 1 surveys and further Phase 2 surveys have been completed on the site including invasive species, reptile surveys, bat surveys and breeding bird surveys in 2018, a preliminary bat roost assessment in 2019 and further bat emergence surveys 2020. A breeding bird scoping survey was undertaken in June 2019 in the temporary car park area. There were no birds breeding in that area of the site.
- Updated invertebrate and botanical surveys were undertaken in 2020 and 2021, these add to surveys undertaken previously on site by RPS and others.
- A summary of the 2018 and 2019 survey results and the conditions on site lead to the scoping out of update surveys for birds, bats and reptiles in 2021, this is detailed in the sections below.
- The habitats on-site support a number of protected species including plants, birds, bats and invertebrates.
- The site supports a mosaic habitat which in turn supports a variety of protected species. Habitats on site are of varying conditions and the good and moderate condition open mosaic will be retained (where possible) within the final scheme. The mitigation for this will be detailed in the Ecology Design Strategy and within the Biodiversity Net Gain assessment report.
- This survey report will inform the EIA Ecology Chapter to be produced later this year. This will assess impact and define both mitigation and Biodiversity Net Gain requirements.
- A separate Ecological Mitigation and Management Plan (EMMP) will be required for the site in addition to this report to reduce the risk of ecological impacts throughout the project.

Contents

Tables

Figures

Appendices

1 INTRODUCTION

1.1 Background to the Study

1.1.1 RPS Planning and Development Ltd (RPS) was commissioned by Bidwell's to undertake ecology surveys of Cambridge North, Phase 2 to help inform the proposed redevelopment of the site.

1.1.2 The Site is located wholly within the Chesterton Station Interchange (CSI) area. The CSI area was subject to a successful application for the Cambridge North Station which was approved in 2016 (permission S/3102/15/FL issued by South Cambridgeshire District Council and permission 15/2317/FUL issued by Cambridge City Council).

1.1.3 Cambridgeshire County Council (CCC) submitted a planning application for the new Chesterton Station Interchange (CSI) (now known as Cambridge North Station) in 2013 (Refs: S/1497/13/CM & C/05001/13/CC). Planning permission was granted for this application on the 23rd July 2014. Further planning applications were submitted in December 2015 for amendments to the proposed Station Development to provide a revised Station Square. These were accompanied by an Environmental Statement (ES). A range of baseline and species-specific surveys were undertaken on site in 2012 and 2013. These were updated by others in 2015.

1.1.4 The impacts on ecology and nature conservation are described in The Cambridge Science Park Interchange ES (May 2015) and the Chesterton Sidings and the Bramble Field Local Nature Reserve ES (2013).

Previous botanical survey work

1.1.5 A series of Phase 1 habitat surveys which mapped the habitats on the wider CSI study area have been completed. Of particular relevance are the surveys undertaken by Cambridge Ecology in April 2012, September 2013 and April 2015 covering the CSI and these three plans can be found in the Ecological Impact and Enhancement Statement produced by RPS (RPS, 2017).

1.1.6 In 2012, the CSI study area was a mix of dense mainly birch scrub, semi-improved grassland, shrubs, ephemeral / short perennial plant communities and bare ground.

1.1.7 By September 2013, the most notable change was that due to operational activities, vegetation management in the winter of 2012 / 13 meant that the dense birch scrub across large parts of the CSI study area had been cleared.

1.1.8 256 species of plant were recorded during the 2012 and 2013 Chesterton Sidings study area as a whole during the Phase 1 Habitat surveys. Cambridge Ecology considered that this number of plants is low to average for an area of this size. The majority of the plant species recorded were common and widespread species and no legally protected or BAP species were recorded.

1.1.9 The 2015 botany survey recorded 363 species of plants in the whole Chesterton Sidings study area. Of these, 271 were considered native to the UK and the remaining 92 were considered to be non-native plant species. As a consequence of the vegetation clearance works taking place in 2015 in the CSI study area, the botanical assemblage was considered by Cambridge Ecology to have declined in that three-year period.

1.1.10 Within the Cambridge North Station Amendments ES, the overall value of the CSI study area was considered to be of local value for its plant species on the basis that there were some notable species although none of the plants were considered rare.

1.1.11 A Phase 1 Habitat survey and a protected species scoping survey was conducted by RPS on the 13th April 2017 and subsequent botanical surveys were undertaken by Wildlife Splash on behalf of RPS in August 2017 (RPS, 2017).

1.1.12 A good proportion of the bare ground remaining is the original railways sidings substrate, and although disturbed it retains the potential to regenerate quickly back to the early succession plant

community that formed part of the habitats defined by Cambridge Ecology in their May 2015 report as 'open mosaic habitat' (OMH).

1.1.13 These open areas supporting annual, biennial and short-lived perennial species such as this qualify as 'open mosaic habitat on previously developed land', which is a UKBAP habitat and habitat of principal importance under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 and is therefore OMH is subject to specific actions within the Cambridge North Station Landscape and Ecology Management Plan (LEMP) produced by Atkins in March 2018 which covers the Cambridge North Station and to a degree also the wider site (Atkins, 2018). Additionally, there are further actions within the Office and Hotel LEMP (RPS, 2019) and which cover temporary construction activities within the CB4 1b site.

1.1.14 This survey report includes the following survey information

- Desk study information 2020
- Invasive Species Survey 2018
- Reptile Survey 2018
- Reptile Translocation 2019
- Breeding Bird Survey 2018
- Breeding Bird Scoping Survey 2019
- Bat Activity Survey 2018
- Preliminary Bat Roost Assessment 2019
- Bat Emergence Survey 2020
- Invertebrate Survey 2020 and 2021
- Detailed Botanical Survey 2020 and 2021

1.1.15 An updated Phase 1 survey walkover was undertaken in 2021 assessing the potential for protected habitats and species on site, as well as mapping the OMH and the condition of these plant communities in detail. This report details the current potential for protected species and habitat on site and provides detail of the most recent survey work undertaken.

1.2 Site Location

1.2.1 The study area is located on land adjacent to Cowley Road, Cambridge North Station, Cambridge CB4 1UN, and comprises dense mainly birch scrub, semi-improved grassland, shrubs, ephemeral/short perennial plant communities and bare ground.

1.2.2 The site is bounded by the station car park along the eastern boundary, existing commercial development along the northern boundary, the Cambridgeshire Guided Busway along the western boundary, and by Phase 1a along the southern boundary.

1.2.3 The site is 6.89 ha in size. The National Grid coordinates for the centre of the site are TL 4744 6085.

2 METHODS

2.1 Desk Study

2.1.1 Ecological records within a 2 km radius of the site were requested from Cambridgeshire and Peterborough Environmental Records Centre (CPERC) in June 2020. Data requests were limited to records for protected species recorded within the last ten years and sites of nature conservation interest within 2 km of the site. This included a review of existing statutory sites of nature conservation interest, such as Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Area of Conservation (SACs) and National Nature Reserves (NNRs), and non-statutory sites, such as Sites of Importance for Nature Conservation (SINCs) and Local Wildlife Sites (LWSs).

2.1.2 Locations of statutory designated sites were accessed via the government 'MAGIC' website (MagicMap, 2016).

2.1.3 A 1:25,000 OS map was used to identify nearby features such as ponds or green corridors that could provide habitat or connectivity to other areas.

2.2 Invasive Species

2.2.1 A survey of Land adjacent to Cambridge North Station, Cambridge CB4 1UN was conducted on 2nd July 2018 by Peter Watson (RPS Senior Consultant Ecologist) following best practice as described by the Environment Agency (2006, amended in 2013), Royal Institute of Chartered Surveyors (RICS, 2012) and the Property Care Association (PCA, 2013).

2.2.2 Peter Watson is a specialist in invasive species and holds both the Certified Surveyor of Japanese Knotweed (CSJK) and Qualified Technician (PCA QT) PCA approved qualifications. RPS is a full member of the Property Care Association (PCA).

2.2.3 The survey entailed a detailed search within the boundary of the site including searching for signs of dead stems, old crowns or leaves along with a careful search of the immediate surrounding vicinity and what could be seen of neighbouring properties.

2.2.4 The location of any invasive species was recorded along with:

- The level of establishment
- The health of plants; and
- Any other relevant information (e.g. presence of features that might impede control).

2.3 Reptile Surveys

2.3.1 Artificial refugia in the form of sheets of roofing felt, approximately 0.5 m^2 in size, were placed in likely basking spots (for example, un-shaded patches next to cover, in areas of long grass and next to potential hibernation sites such as piles of rubble, logs or disused rabbit burrows).

2.3.2 The site was visited on 16 days in October 2018 during suitable weather conditions. Further surveys (14 days + were undertaken in March 2019). The weather conditions and temperatures for each visit are set out in Table 2.2 below.

2018 survey and translocation

2.3.3 A total of 42 sheets were set out on 15th August 2018. Sheet positions are shown in figure 1 below.

2.3.4 The site was visited on 7 days in September during suitable weather conditions. Reptile activity is greatly influenced by weather conditions, with reptiles most likely to use refugia in temperatures of

between 9ºC and 18ºC (Froglife, 1999), in hazy or intermittent sunshine with light winds (Gent & Gibson, 1998).

2.3.5 The weather conditions and temperatures for each visit are set out in Table 2.1 below.

Table 2.1: Reptile Survey dates and Weather conditions 2018

Visit Number	Date	Temperature	Cloud Cover	Wind
1	07/09/18	15	1/8	Light
2	11/09/18	20	8/8	Light
3	13/09/18	18	2/8	Calm
4	17/09/18	23	3/8	Light
5	21/09/18	18	6/8	Moderate
6	25/09/18	19	2/8	Light
7	28/09/18	18	3/8	Light

2.3.6 Each visit involved walking slowly around the entire site, checking suitable reptile basking and refuge areas and checking all of the reptile sheets on site.

2.3.7 Due to the requirement of Phase 1b to be used for temporary compounds to facilitate the construction of Phase 1a, it was necessary to undertake a localised translocation in the areas where reptiles were observed during the October surveys.

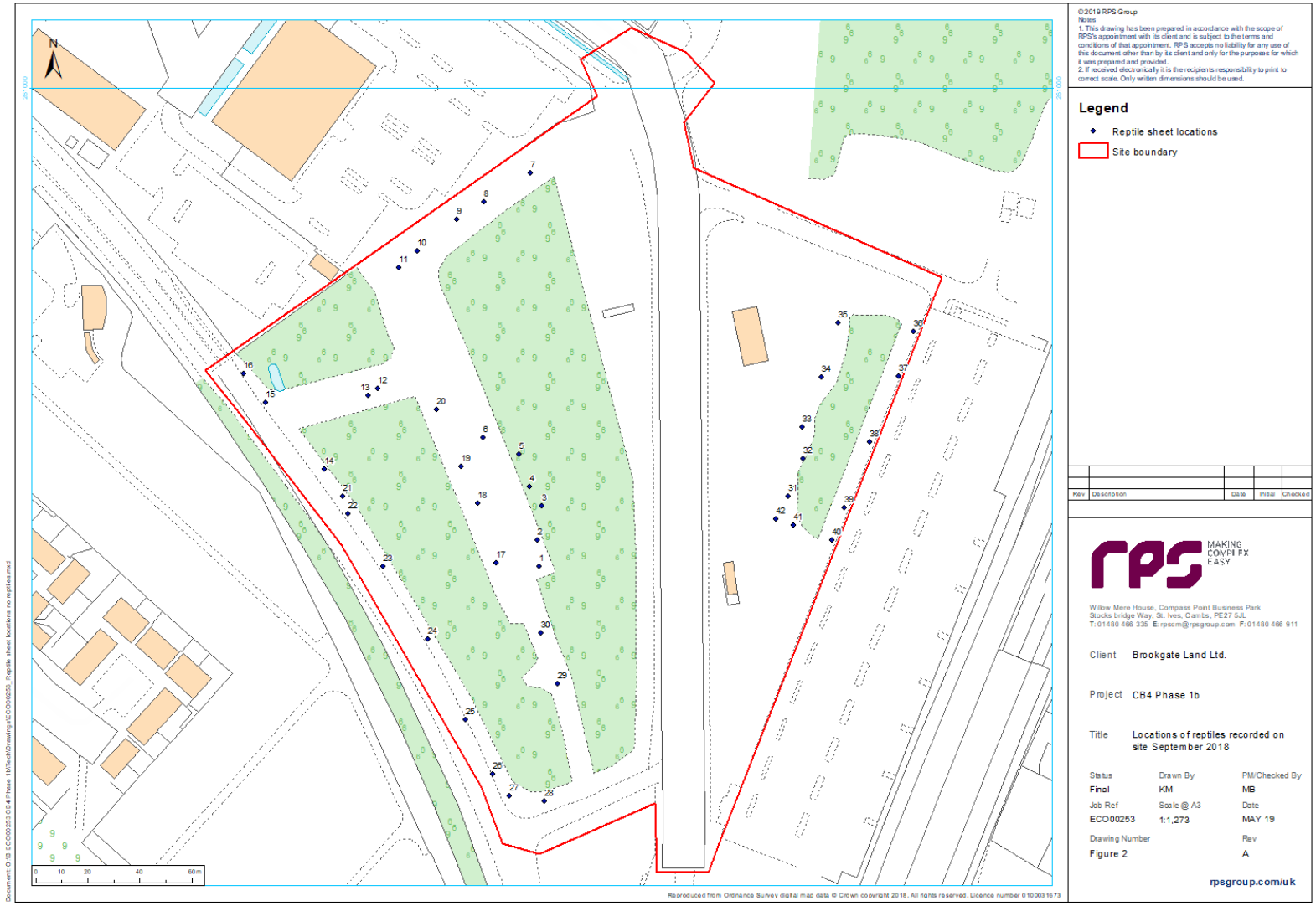
2.3.8 A total of 86 sheets were set out on 5th October 2018.

Table 2.2**: Reptile translocation survey dates and weather conditions 2018**

Visit Number	Date	Temperature	Cloud Cover	Wind
1	08/10/18	17-16	5-7/8	Light
2	09/10/18	15-17	1/8	Moderate
3	10/10/18	16-19	1/8	Calm
4	11/10/18	18	2/8	Moderate
5	12/10/18	16	2/8	Light
6	16/10/18	18	4/8	Light
7	17/10/18	14	6/8	Calm
8	18/10/18	14-16	4-5/8	Calm
9	19/10/18	12-15	5-1/8	Calm
10	20/10/18	12	4/8	Light
11	21/10/18	13	2/8	Light
12	22/10/18	10	4/8	Light
13	23/10/18	15	2-3/8	Light – Moderate
14	24/10/18	14	8/8	Light
15	25/10/18	10	3/8	Light
16	26/10/18	10	4/8	Moderate

2.3.9 The location of the initial reptile sheets is shown in Figure 1.

Figure 1: Reptile sheet locations 2018



2019 survey and translocation

2.3.10 A total of 84 sheets were set out in February 2019. Sheet positions are shown in Figure 2 below.

2.3.11 The site was visited on 14 days in March during suitable weather conditions.

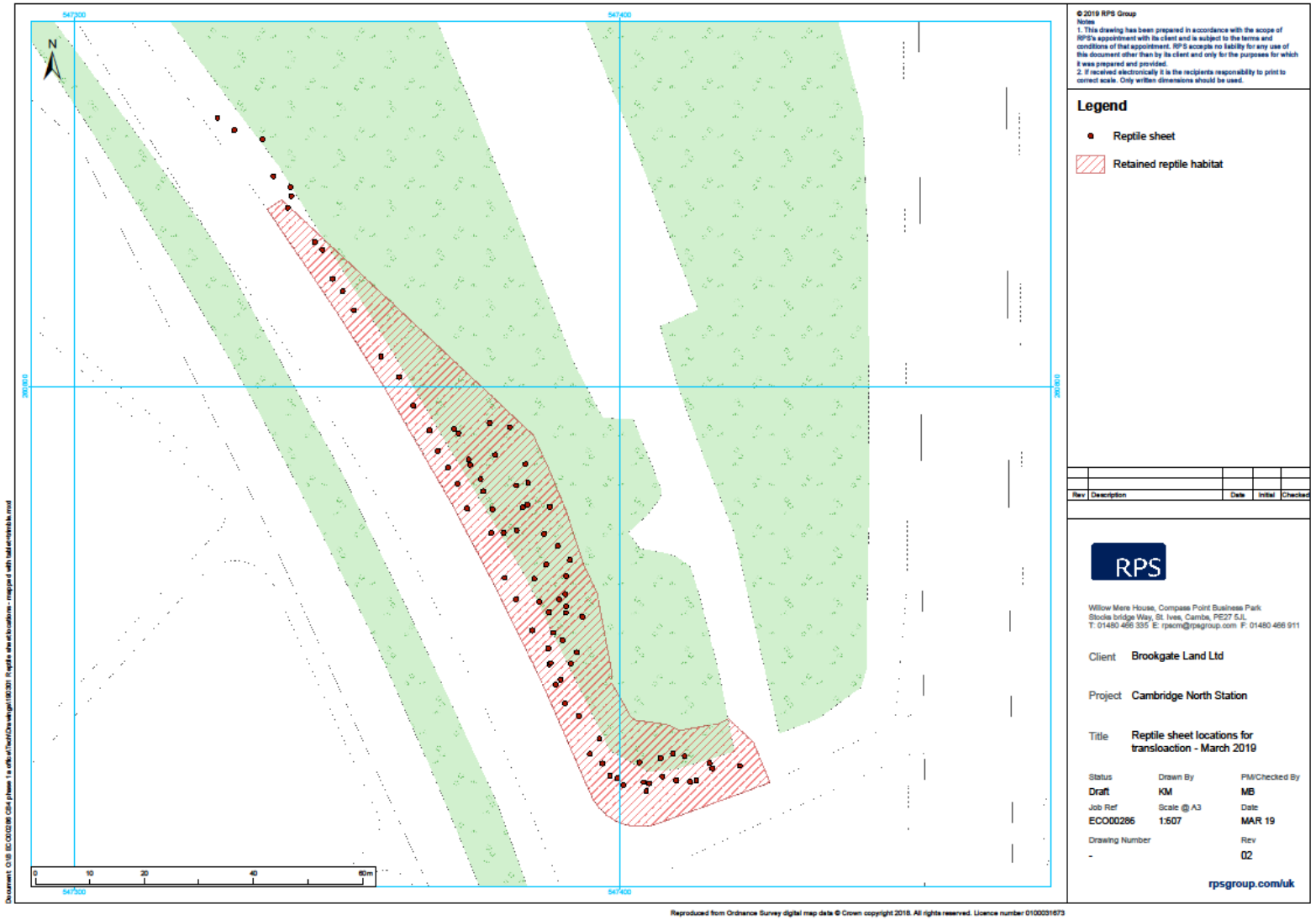
Limitations

2.3.12 The reptile survey did not cover the dense scrub on site due to the lack of suitable basking areas, but reptiles could utilise these areas while foraging, hibernating and when dispersing to other areas on site. The translocation efforts did though cover the dense scrub areas (and areas of recently cleared scrub) and reptiles were subsequently found to be absent. The scrub contains a number of wooden sleepers, stumps and debris piles that are potential hibernacula and these were hand searched as part of thew site clearance works for the Phase 1 office development.

Scoping out requirement for further surveys

2.3.13 Based on the surveys previously undertaken on site and the results of the 2018 surveys combined with the translocation in 2019, the site is considered to be effectively cleared of reptiles. It is unlikely that reptiles have re-colonised the site from the surrounds, including the guided busway, due to the location the office contractors compound and the retained reptile fencing around the site. Therefore, the need for further surveys have been scoped out.

Figure 2: Reptile sheet locations 2019



2.4 Breeding Bird Surveys

2.4.1 The breeding bird survey undertaken was based on a standard territory mapping methodology as outlined in Gilbert et al. (1998) and Bibby et al. (2000).

2.4.2 This method is based on the principle that many species during the breeding season are territorial. This is found particularly amongst passerines, where territories are often marked by conspicuous song, display and periodic disputes with neighbouring individuals.

2.4.3 All bird species were recorded and mapped across the whole site.

2.4.4 The survey area was walked at a slow pace in order to locate and identify all individual birds. Visits were undertaken early in the morning, finishing before midday. The whole survey area was covered in each visit, using suitable optical equipment to observe bird behaviour and all areas of the site were approached to within 50-100m, where possible. Survey routes were mapped, and the direction walked alternated on each visit, to ensure that all areas were covered at various times of day across the duration of the survey. All species encountered within the survey area were recorded and mapped.

2.4.5 Surveys for breeding birds were undertaken in June 2018 with a total of three survey visits taking place. The survey visits and ornithologist undertaking the survey were as follows:

- Visit 1: 24th May 2018; Matthew White
- Visit 2: 4th June 2018; Andrew Seth
- Visit 3: 22nd June 2018; Andrew Seth

2.4.6 On each visit, registrations were recorded directly into ESRI Arcpad GIS software loaded onto handheld PDA devices, with a 1:10,000 scale Ordnance Survey base map of the study area (and adjacent land). A fresh map was used for each survey. Registrations of birds were recorded using standard British Trust for Ornithology (BTO) two letter species codes (BTO 2009). Specific codes were also used to denote singing, calling, movement between areas, flight, carrying food, nest building, aggressive encounters and other behaviour.

2.4.7 The expected outcome is that mapped registrations fall into clusters, approximately coinciding with territories. A cluster is generally a spatially distinct group of registrations that represent the activity of not more than one pair. Ideally, clusters include registrations of territorial behaviour across all visits and are clearly demarcated from adjacent clusters by simultaneous recording of neighbouring birds. Where a species exhibits high territory density, the mapping of simultaneously singing birds becomes essential. Territory boundaries are assumed to be between such birds.

2.4.8 Territory mapping methods produce analysis maps of non-overlapping ellipses encircling clusters of records thought to relate to separate pairs of breeding birds. These ellipses may not show the entire extent of the pairs' actual breeding territory which may be significantly larger; however, they are likely to show those areas in which the pair is most active.

2.4.9 On completion of the surveys, analysis maps were produced for each species, consisting of all registrations recorded during the survey. From these species' maps, the number of territories was calculated by identifying the number of territories or clusters present.

2.4.10 Standard registration mapping techniques were also used to record non-breeding species.

2.4.11 The following definitions have been used to identify the breeding status of the species recorded:

2.4.12 Confirmed Breeding: includes species for which territories were positively identified as a result of the number of registrations, the location of an active nest, and the presence of recently fledged young or downy young.

2.4.13 Probable Breeding: includes a pair observed in suitable nesting habitat in breeding season, or agitated behaviour / anxiety calls from adults suggesting probable presence of nest or young nearby. Behaviour was observed on insufficient occasions to confirm the presence of a territory.

2.4.14 Possible Breeding: includes species observed in breeding season in suitable nesting habitats, or singing male present (or breeding calls heard) in breeding season in suitable breeding habitat.

2.4.15 Non-Breeding: fly-over species observed but suspected to be on migration, or species observed but suspected to be summering non-breeder.

2.4.16 A breeding bird scoping survey was undertaken on the 10th and 24th June 2019 in the area of the temporary carpark.

Limitations

2.4.17 Two bird surveys were conducted in June 2018, it is possible that some species breeding earlier in the season could have been missed.

Scoping out requirement for further surveys

2.4.18 Based on the surveys previously undertaken on site and the 2019 scoping survey and changes to the site since that period it is considered that the bird assemblage is of local importance only and the diversity and abundance of bird species recorded on site remains unchanged since the 2018 and 2019 surveys. Therefore, the need for further surveys have been scoped out.

2.5 Bat surveys

Preliminary Bat Roost Assessment

2.5.1 A preliminary bat roost assessment was carried out on the trees on site by a Crystal Acquaviva a bat licenced ecologist (NE 2015-14566_CLS-CLS) on the 7th of January 2020 following best practice as described by the Bat Conservation Trust (Collins, 2016), English Nature's Bat Mitigation Guidelines (Mitchell-Jones, 2004) and the Joint Nature Conservation Committee's Bat Worker's Manual (Mitchell-Jones & McLeish, 2004).

2.5.2 Trees were assessed for their potential to support bats roosts by identifying features such as holes, cavities or splits. Signs of evidence of bats such as staining (caused by the natural oils in the bats' fur), scratch marks or droppings, were also searched for.

2.5.3 Each trees' suitability for roosting bats was also assessed by examining the surrounding habitat. Important habitat features surrounding the structure which may influence roost potential include whether the structure is in a semi-rural or parkland location, its proximity to a significant linear habitat features such as a watercourse, mature hedgerow, wooded lane or an area of woodland.

2.5.4 Table 2.3 shows which trees were considered to have roost potential and need further surveys.

Table 2.3: Preliminary Roost Assessment

Tree Reference	Species	Features	Roost potential	Tree Notes	Further Action
T1	Willow	Cavity or Woodpecker hole, Deadwood, Ivy	High	Old pollarded willow, 2 large woodpecker holes on south, ivy clad. Previously had C&I and emergence survey. Rot at base further climbing not possible	Emergence survey
T2	Willow *Salix sp*.	Cracked or lifted bark, Cavity or Woodpecker hole	High	Old pollarded tree, some holes in stem bark leading beneath, large cavity on south of stem	Emergence survey
T3	Willow? *Salix sp*.	Cracked or lifted bark	Low	Young, decaying	Supervised soft felling
T4	Willow *Salix sp*.	Cracked or lifted bark	Low	Two stems, crack on east stem at 2-3m	Supervised soft felling
Stump 1	Willow *Salix sp*.	None	Negligible	No bat roost potential	n/a
Stump 2	Unknown	Cracked or lifted bark	Low	Small crack on southeast side	Supervised soft felling
T5	Ash *Fraxinus excelsior*	Cracked or lifted bark, Deadwood	Low	Few small wounds upper branches and tears in cracked limb near ground	Supervised soft felling
G1	Hawthorn *Crataegus monogyna*	Ivy	Low	Approx. 10 heavily ivy clad tall hawthorn	Supervised soft felling

Limitations

2.5.2 Bats can have seasonal use of roosts and being so mobile may arrive and start using a site after it has been surveyed, or roost somewhere else during the period it was surveyed. Additionally, features in trees can change rapidly potentially becoming more suitable as time passes.

2.5.3 These factors and limitations have been considered when assessing the and trees for roost potential and recommending further survey and mitigation.

Bat Emergence/re-entry Surveys - Trees

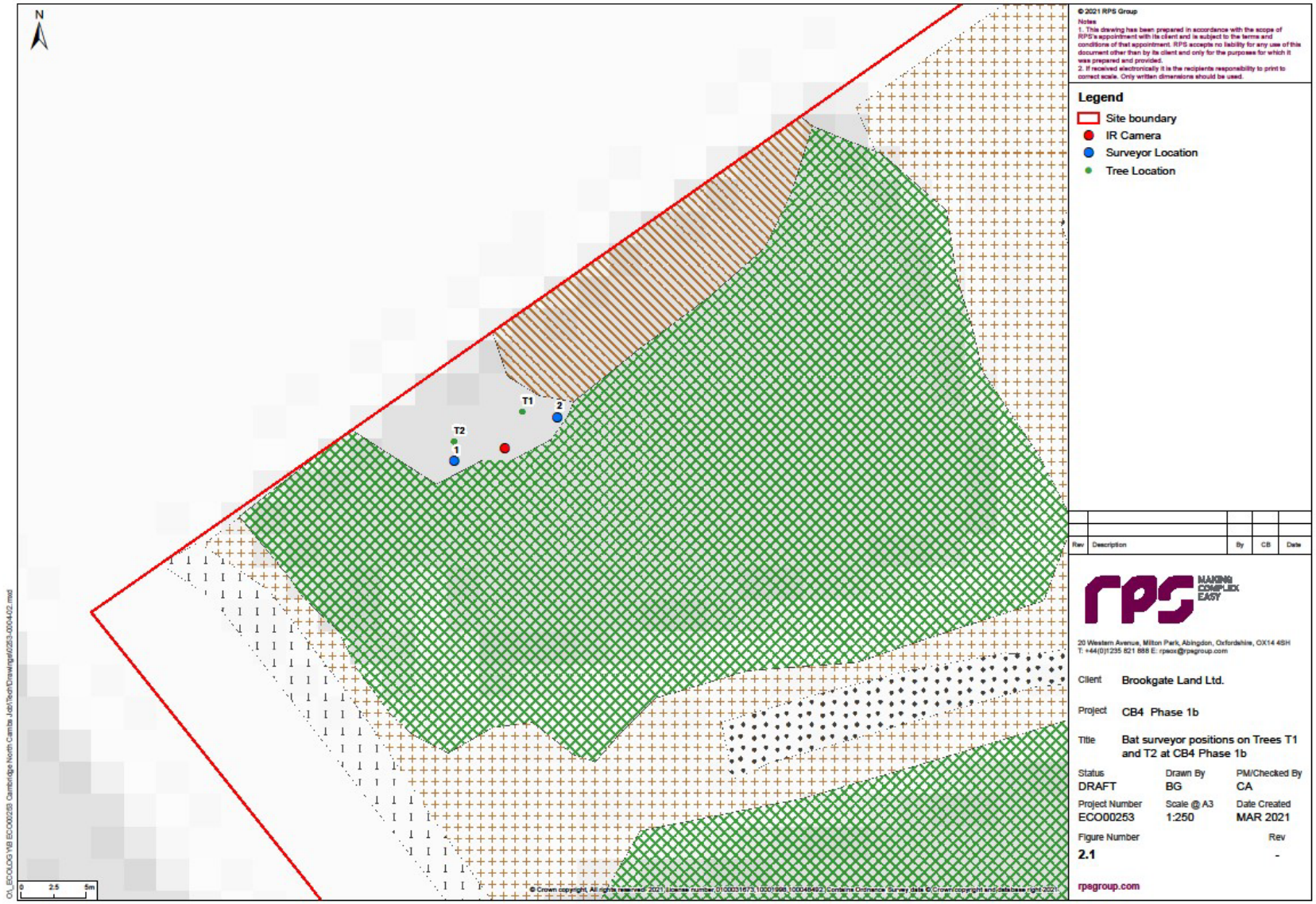
2.5.1 Further to a Preliminary Ecological Appraisal (PEA) in May 2019 and a Preliminary Roost Assessment (PRA) in January 2020, RPS conducted several emergence/re-entry surveys on trees assessed as having potential to support roosting bats. Table 2.4 below describes survey requirements in further detail.

Table 2.4: Phase 2 bat survey requirements at CB4, Phase 2

Tree number and species	Bat roost potential	Number of emergence/re-entry surveys
Tree 1 (T1) Willow sp., *Salix sp*.	High	Three emergence/ re-entry surveys
Tree 2 (T2) Willow sp., *Salix sp*.	High	Three emergence/ re-entry surveys

2.5.2 Two experienced bat surveyors, led by Matt Fasham, an ecologist experienced in undertaking bat emergence surveys and two infra-red cameras paired with static detectors were positioned in multiple locations to ensure features suitable for supporting bats were covered in all locations. Figure 3 below displays the locations of all surveyors and Table 2.5 below provides further survey details.

Figure 3: Bat surveyor positions on Trees T1 and T2 at CB4 Phase 2



2.5.3 Surveys were completed between August 2020 and September 2020 and included 3 dusk emergence surveys. Table 2.5 below provides a summary of survey conditions.

2.5.4 Bat activity was recoded using Batlogger M detectors and notes taken to determine flight paths and any emergence/re-entry points.

2.5.5 Echolocation calls were subsequently analysed using computer software (BatExplorer) for confirmation of species.

Table 2.5: Emergence bat survey details 2020 CB4 Phase 2

Tree number	Survey date (2020) and survey type (emergence/re-entry)	Survey time	Duration (hours)	Weather conditions	Sunset/sunrise time
Trees T1 and T2	Thursday 6th August emergence survey	20.34 – 22.34	2.00	Dry; clear; 21°C; 70% humidity; 80% cloud; wind 1.	20.49
	Thursday 20th August emergence survey	19.59 – 21.59	2.00	Dry; clear; 21°C; 87% humidity; clear; wind 1	20.14
	Tuesday 1st September emergence	19.31 – 21.31	2.00	Dry; clear; 13°C; humidity 80%; cloud 80%; wind 2	20.01

Bat Activity Surveys

2.5.6 Bat activity surveys consist of a walked route or transect around the site to record bat activity. During the transect, the ecologist walks a planned route at constant speed (so the sampling area is the same per unit time) with the aid of a bat detector and appropriate recording equipment for ultrasonic sound. The ecologist will record observations such as numbers of bats, flight directions, behaviour (e.g. commuting or foraging) and relative speed and flight height.

2.5.7 Three dusk activity surveys were undertaken on site in June, July and August 2018.

2.5.8 The transect route included all of the habitat types encountered within the site boundary to ensure an accurate representation of the bat species present on site. Refer to Figure 5 to Figure 7 for the routes walked on each survey visit.

2.5.9 Routes were slowly walked by an experienced surveyor, with regular stop points of 5 minutes to record the presence of bats. The surveyor was equipped with time expansion bat detectors (Pettersson Ultrasonic Detector D 240X Bat detector) and recording devices for later analysis (Anabat).

2.5.10 The number of bat contacts along the transect routes were recorded, together with the species and time of detection. Direction and start and end points of the transect routes were also marked on the maps and are shown on the figures.

2.5.11 All bat passes were recorded, and all bats were identified to species level on site, where possible. Bat calls were subsequently analysed using computer software (Analook W 4.1.26z Sound Analysis and Batsound) for confirmation of species. Where possible, additional notes on size, flight height, type of flight (such as commuting or foraging) and direction of flight were also recorded.

2.5.12 The dusk surveys commenced at sunset and lasted for 2 hours after sunset.

2.5.13 The surveys were carried out following current guidelines (Collins, 2016). The dates and weather conditions during the surveys are shown in Table 2.6.

Table 2.6: Weather conditions for bat activity surveys

Transect	Date	Temperature	Weather	Sunset Time
1	07/06/2018	15.5-13 °C	Dry, wind F2, cloud 4-8/8	21:17
2	11/07/2018	17 °C	Dry, wind F2 N, cloud 1/8	21:19
3	30/08/2018	17-14 °C	Dry, wind F4-1 SW, cloud 8-4/8	19:51

Static Monitoring

2.5.14 Three statics were deployed on site on three occasions between June and August 2018. Positions are shown Figure 4 below.

2.5.15 Combined, the Anabat detectors deployed across the site sampled a total of 22 Anabat-nights between June and September.

2.5.1 The Anabats were programmed to switch on 30 minutes before sunset time and switch off 30 minutes after sunrise time. These devices are triggered to automatically record sounds within an appropriate frequency range to record bat calls.

2.5.2 Data was analysed using Analook software, to identify bat species recorded in each survey location.

2.5.3 A total of 572 confirmed bat contacts were recorded over the 22 detector-nights. The overall mean activity for the pair of detectors was 26 bat contacts per Anabat-night.

2.5.4 A total of seven species were recorded during the surveys: Common Pipistrelle, Soprano Pipistrelle, Nathusius' Pipistrelle, Noctule, Serotine, Brown Long-eared and an unknown Myotis.

Limitations

2.5.5 There were no weather or access limitations during the emergence surveys. All emergence surveys were undertaken at a suitable time of year and under suitable weather conditions.

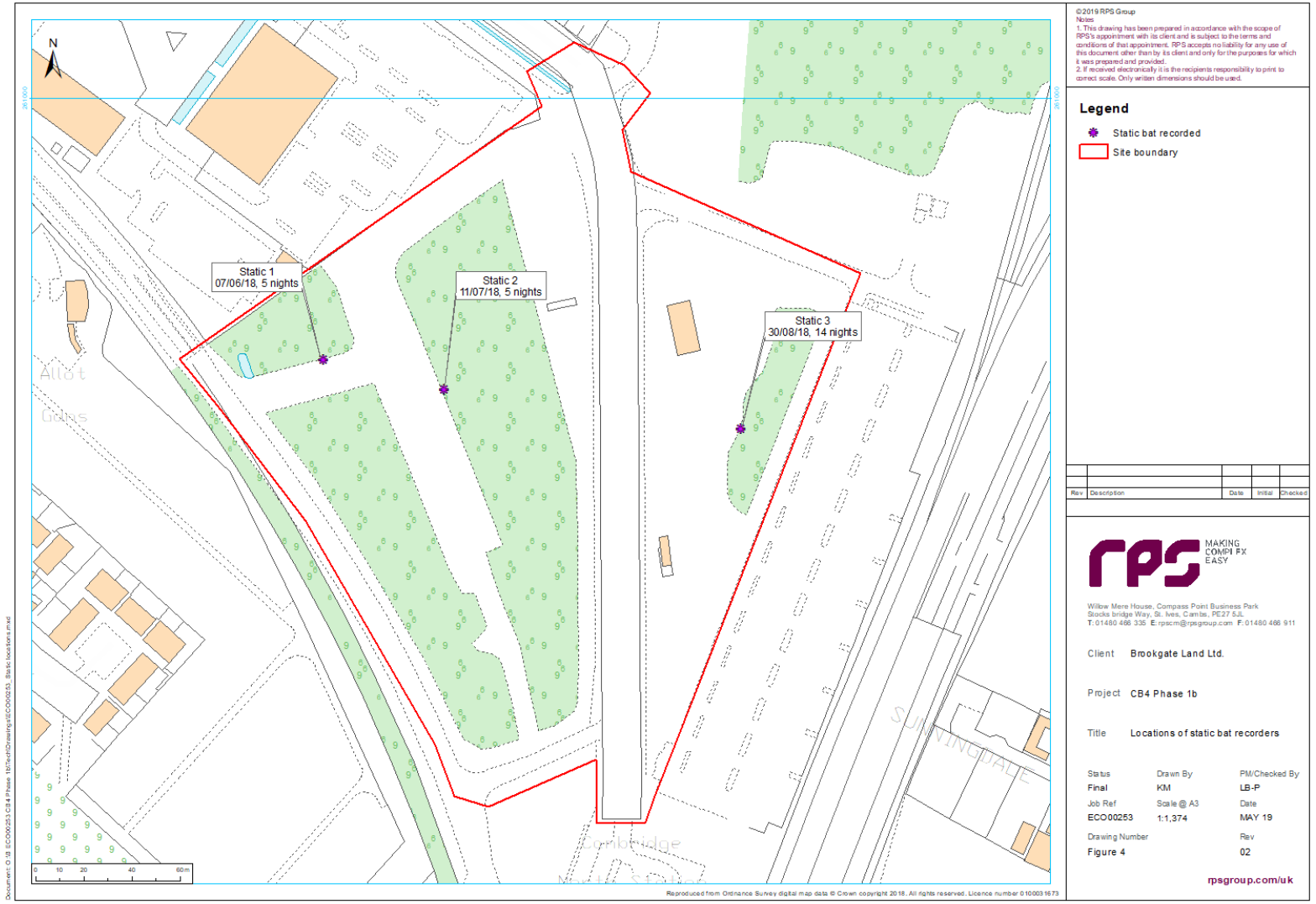
2.5.6 It should be noted that bats are a group of species with a range of dynamic behaviours and as such, bats can roost in different locations, forage in different areas and preferentially commute along different routes in response to a number of changing physical and environmental factors.

2.5.7 The bat data presented in the tables detailing results of the bat surveys show number of contacts for different bat species. It is important to understand that the number of contacts does not equate to number of individual bats, as several contacts can be generated by one bat flying past the surveyors several times. Instead, number of contacts provides an index of bat activity, which can be used to identify areas of habitat of greater or lesser importance for bats.

Scoping out requirement for further surveys

2.5.8 Based on the surveys previously undertaken and on the 2018 surveys and changes to the site since that period it is considered that the value of the site for foraging and commuting bats has not changed and the bat population is of local interest only. The suitability of habitat for bats on site has likely decreased due to the loss of vegetation and therefore the diversity and abundance of bat species should be considered as previously recorded. Therefore, the need for further surveys have been scoped out.

Figure 4: Static Bat detector locations



2.6 Invertebrate Surveys

2.6.1 The surveys were carried out over eight dates in August 2020, and May and June 2021.

2.6.2 The survey area was sampled using a sweep net and by general searching. During the sweep netting, the net was swept from side to side as the surveyor paced slowly through the survey area. A limited ground search was also undertaken in the open, sparsely vegetated areas.

2.6.3 Full details of the methods used are provided in Appendix B.

2.7 Botanical Surveys

2.7.1 Using the data collected for the Phase 1 survey (RPS. 2019), habitat condition assessments were undertaken for the habitats present within the project boundary.

2.7.2 A number of Phase 1 Habitat surveys have been undertaken on the application site since April 2012. This includes update surveys undertaken in September 2013, April 2015, April 2017, October 2019, December 2020 and July 2021. Detailed botanical surveys were undertaken in August 2017, June 2018, October 2019 June 2020.

2.7.3 The appropriate 'Condition sheet' was first selected via the Table TS1-1 in the technical supplement provided by Crosher *et a*l. (2019).

2.7.4 The condition sheet was then used to assess the individual habitats by comparing how they scored against pre-set condition assessment criteria. The criteria describe what components are needed for the habitat to be of good, moderate or poor value.

2.7.5 Each Habitat was scored the following:

1 – Poor

2 – Moderate

3 – Good

2.7.6 The calculator allows these to be further divided and provides categories for fairly good and fairly poor. The ecologist undertaking the assessment used their professional judgement, considering the habitat condition assessment criteria, to decide when it was suitable to use these categories.

2.7.7 It should be noted that some habitats are given a fixed score and do not need assessing.

2.8 Accurate Lifespan of Ecological Data

2.8.1 Most ecological data remain valid for only short periods due to the inherently transient nature of the subject. The survey results contained in this report are considered accurate for two years, assuming no significant changes to the site conditions.

2.8.2 The early ecological surveys have been used to inform the scope of further update surveys, and the scope of the Ecological Assessment. A number of species groups have been scoped out of further surveys because the lack of significant (in some instance any) findings. These are discussed in the evaluation section below for each species group.

3 RESULTS

3.1 Desk Study

Designated Sites

3.1.1 There are thirteen statutory designated sites for nature conservation value within 2 km of the site. The closest of these is Bramblefields Local Nature Reserve, approximately 0.45 km from the site.

3.1.2 Eleven non-statutory sites are located within the 2 km search radius of the site. The closest of these is the Grassland near Chalford Oaks LWS, located 1.44 km from the site.

3.1.3 A summary of these sites is provided in Table 3.1 below and the location of each site is detailed in Figure 5.

Table 3.1: Statutory Designated sites within 5 km and Non-Statutory Designated sites within 2 km of the study area

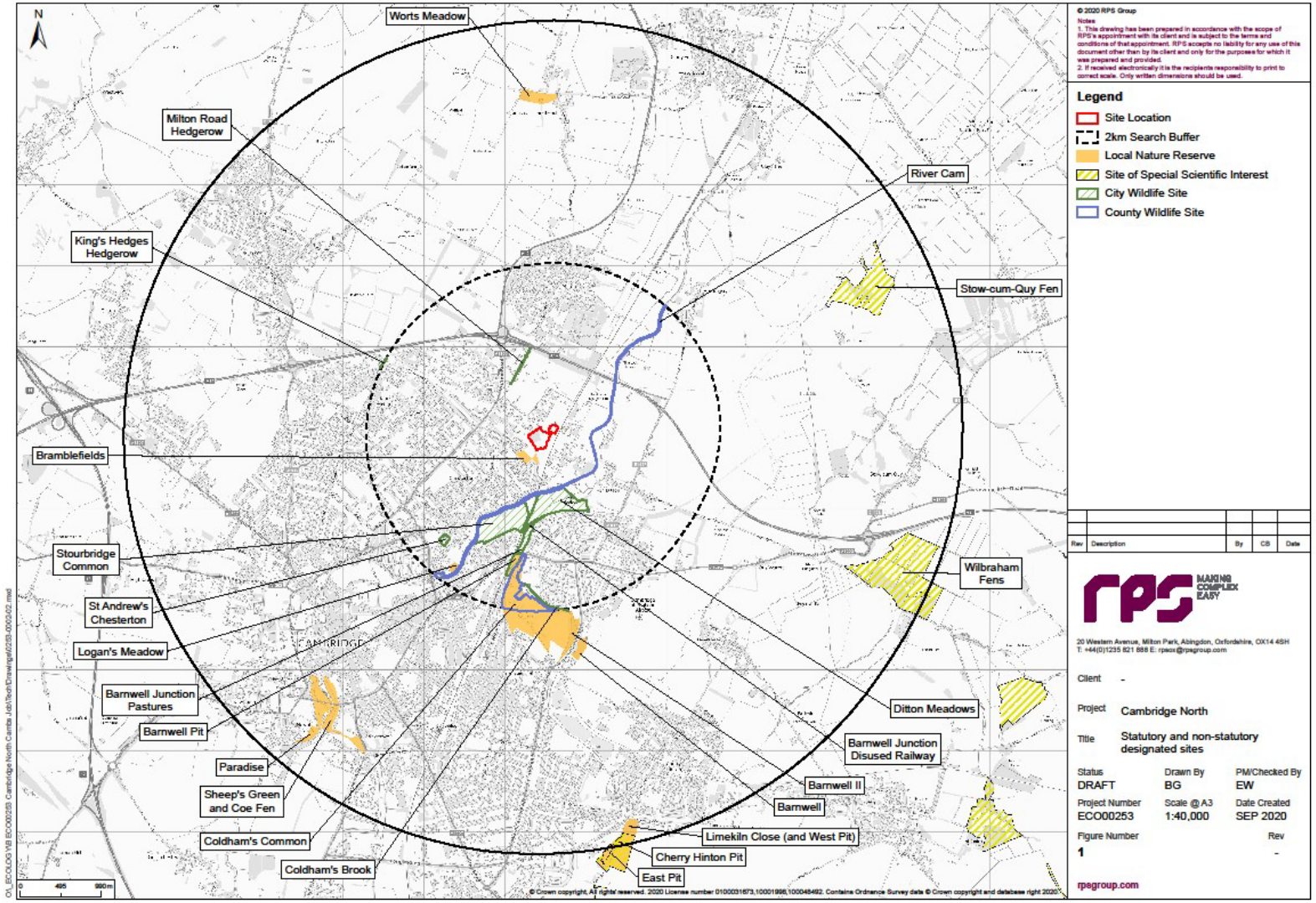
Site name	Type	Approx. area (ha)	Interest Features	Distance from site (km)
Statutory Sites				
Bramblefields	LNR	2.08	The site is mixture of grassland and scrub and also contains a pond in which with newts and frogs. The site is noted for its bird population, Song Thrush *Turdus philomelos* in particular.	0.45
Coldhams Common	LNR	49.28	Areas of unimproved grassland. These areas contain the ant hills of Yellow Meadow Ants *Lasius flavus* and are an indication that the site has never been ploughed. Management encouraging species such as the Pyramidal Orchid *Anacamptis pyramidalis* may appear which is found on other parts of the common.	1.31
Logan's meadow	LNR	1.11	Small site next to the River Cam. Wildlife includes warblers *Sylviidae*, starling roost in autumn, small tortoiseshell *Aglais urticae* and comma butterflies *Polygonia c-album*, freshwater mussels in the river and bats.	1.71
Barnwell II West	LNR	3.75	The wildlife corridor formed along the Coldham Brook has valuable habitats used by a variety of birds. The Brook is managed to encourage water voles *Arvicola amphibius*. Species include blackthorn *Prunus spinosa*, hawthorn *Crataegus monogyna* and wild rose *Rosa sp.* scrub. Birds include kingfishers *Alcedo atthis*, nightingales *Luscinia megarhynchos*, redwings *Turdus iliacus* and fieldfares *Turdus pilaris*. Invertebrates include speckled wood *Pararge aegeria,* and orange tip butterflies *Anthocharis cardamines*, dragonflies *Anisoptera sp.* and damselflies *Zygoptera sp.*	1.04
Barnwell	LNR	2.61	Habitats include grassland, scrub and pond. Species include blackthorn, hawthorn and wild rose scrub. Bee orchids *Ophrys apifera* in early summer. Birds include blackcap *Sylvia atricapilla*, willow warblers *Phylloscopus trochilus*, redwings and fieldfares. Frogs and toads breed on site and grass snakes *Natrix natrix* occur. Butterflies include common blue *Polyommatus icarus* and meadow brown *Maniola jurtina*.	2.39
Stow-cum-Quy Fen	SSSI	29.86	Stow cum Quy Fen possesses areas of floristically rich calcareous loam pasture. In addition, a number of pools formed on Chalk Marl are present and these support a range of aquatic plants including some uncommon species. Both the grassland and open water habitats described above are rare in the British Isles	3.63

Site name	Type	Approx. area (ha)	Interest Features	Distance from site (km)
Sheeps Green and Coe Fen	LNR	16.87	The main habitat of Sheep's Green and Coe Fen is improved or semi-improved grassland. There are some clumps of bramble and other shrubs and hedges adding structural variation, shelter and a food source for birds, small mammals and insects.	3.83
Wilbraham Fens	SSSI	61.99	The site is a large area of fen and neutral grassland with associated scrub and open water communities. Similar fens are now rare in Britain and now occur only in a few scattered inland localities, mainly in East Anglia.	3.93
Worts Meadow	LNR	5.65	The main wildlife interest is to be seen during the summer months when the hedges provide habitat for yellowhammers *Emberiza citrinella*, and whitethroats *Sylvia communis* and turtle dove *Streptopelia turtur*.	3.96
Paradise	LNR	2.19	This woodland contains a central marsh area, wet woodland and a number of riverside mature willows. Notable species include Butterbur *Petasites hybridus* and the Musk beetle *Aromia moschata.*	4.36
Limekiln Close (and West Pit)	LNR	2.86	Undulating terrain as these sites were quarries in the past and are now important grassland habitats. There is some scrub. Chalk grassland flowers include meadow cranesbill. The rare moon carrot is found at West Pit LNR. Birds include warblers and breeding sparrow hawks *Accipiter nisus.*	4.69
East Pit	LNR	12.94	The quarry supports a variety of habitats that harbour some rare plants and insects. The steep cliffs surrounding the exposed chalk and scrub providing nesting and feeding sites for more than 60 species of bird.	4.84
Cherry Hinton Pit	SSSI	12.78	This area is primarily notified for the populations of four nationally uncommon plant species which occur on the site. These are great pignut *Bunium bulbocastanum*, moon carrot *Seseli libanotis*, perennial flax *Linum perenne ssp. anglicumand* and grape hyacinth *Muscari neglectum*. In addition, areas of herb-rich chalk grassland are present, and these represent a habitat type which has almost disappeared from the eastern counties of England.	4.85
Non-statutory Sites				
River Cam	CoWS	N/A	Is a major river (together with adjacent semi-natural habitat) that has not been grossly modified by canalisation and/or poor water quality. Additionally, it has areas with concentrations of mature pollard willows.	0.41
Ditton Meadows	CiWS	15.96	Lies within the flood plain of the River Cam. Central drain qualifies as species rich linear water body and also for NVC S6 Greater Pond-sedge swamp. Coldham's Brook qualifies as unmodified chalk stream.	0.54
Milton Road Hedgerows	CiWS	0.25	Site qualifies for its potential value as it just misses criteria for hedgerows and is likely to meet them in the future.	0.65
Stourbridge Common	CiWS	17.76	Area of undeveloped floodplain directly associated with the River Cam County Wildlife Site.	0.66
Barnwell Junction Disused Railway	CiWS	0.58	Hedgerow at least 100m in length and 2m in width at widest point with 4 or more woody species. Also satisfies criteria for calcareous and neutral grassland.	0.83
Barnwell Junction Pastures	CiWS	2.32	Neutral grassland with two or more strong neutral grassland indicator species in frequent numbers.	0.91
Barnwell Pit	CiWS	2.45	Calcareous grassland with six or more calcareous grassland indicator species in frequent numbers.	1.3
Coldham's Brook	CiWS	0.95	Chalk stream together with adjacent semi-natural habitat that has not been grossly modified through canalisation and/or poor water quality.	1.31

Site name	Type	Approx. area (ha)	Interest Features	Distance from site (km)
Coldham's Common	CoWS	41.53	Locally frequent numbers of at least 8 neutral grassland indicator species, 3 strong; habitat mosaic >10ha supporting three habitats (semi-improved grassland, woodland, scrub) in close association, at least one of which is of or approaching CWS standard.	1.31
King's Hedges Hedgerow	CiWS	0.08	Supports hedgerow at least 100m in length and 2m in width at its widest point with four or more woody species, and with at least part of the hedge allowed to flower and fruit.	1.99
St Andrew's, Chesterton	CiWS	1.02	Qualifies for its potential value as it supports grassland with five or more neutral grassland indicator species but not in sufficient numbers to qualify.	1.53

Abbreviations used in Table 3.1: LNR: Local Nature Reserve; SSSI: Site of Special Scientific Interest; CoWS: County Wildlife Site; CiWS: City Wildlife Site; ha: hectare.

Figure 5: Designated sites within a 2 km search radius of the site



Species

3.1.4 Records of protected species were obtained from the Cambridgeshire and Peterborough Environmental Records Centre (CPERC). A number of species of conservation importance or otherwise notable were recorded within the 2 km search radius of the site. None were provided for the actual development site itself. Common lizard *Zootoca vivipara* was recorded on site in 2015 and grass snake *Natrix helvetica* in 2018. Common pipistrelle *Pipistrellus pipistrellus* bat was recorded on site in 2017 and soprano pipistrelle *Pipistrellus pygmaeus* in 2018. A summary of these records is provided in Table 3.2.

3.1.5 In order to simplify the results, only records of species from the last 10 years are shown. In addition, only data with a 6-figure grid reference resolution or higher are provided, since locations given at a lower resolution do not allow accurate calculation of distance to the site boundary*.

Table 3.2: Species records from the last 10 years within 2 km of the site

Common name	Scientific name	Nearest distance from site (m)	Year of most recent record	Conservation Status
Flora				
Clustered Stonewort	*Tolypella glomerata*	1551	2010	CPASI, NS
Opposite-leaved Pondweed	*Groenlandia densa*	1645	2011	VU(ENG, GB), CPASI
Orchard Tooth	*Sarcodontia crocea*	1769	2017	Sect.41, UKBAP
Sea-buckthorn	*Hippophae rhamnoides*	1381	2013	NS
Whorl-grass	*Catabrosa aquatica*	1541	2014	VU(ENG)
Invertebrates				
Beaded Chestnut	*Agrochola lychnidis*	1291	2013	Sect.41, UKBAP
Blood-vein	*Timandra comae*	1291	2013	Sect.41, UKBAP
Buff Ermine	*Spilosoma lutea*	1291	2013	Sect.41, UKBAP
Centre-barred Sallow	*Atethmia centrago*	1291	2013	Sect.41, UKBAP
Dark Spinach	*Pelurga comitata*	1291	2013	Sect.41, UKBAP
Dot Moth	*Melanchra persicariae*	1291	2013	Sect.41, UKBAP
Dusky Brocade	*Apamea remissa*	1291	2013	Sect.41, UKBAP
Feathered Gothic	*Tholera decimalis*	1291	2013	Sect.41, UKBAP
Green-brindled Crescent	*Allophyes oxyacanthae*	1291	2013	Sect.41, UKBAP
Grey Dagger	*Acronicta psi*	1291	2013	Sect.41, UKBAP
Lackey	*Malacosoma neustria*	1291	2013	Sect.41, UKBAP
Longitarsus ballotae	*Longitarsus ballotae*	1964	2013	Nb
Mottled Rustic	*Caradrina morpheus*	1291	2013	Sect.41, UKBAP
Mouse Moth	*Amphipyra tragopoginis*	1291	2013	Sect.41, UKBAP
Musk Beetle	*Aromia moschata*	1301	2010	Nb
Ptinus sexpunctatus	*Ptinus sexpunctatus*	630	2012	Nb
Rustic	*Hoplodrina blanda*	1291	2013	Sect.41, UKBAP
Scarce Chaser	*Libellula fulva*	1182	2011	NT(GB)
Shoulder-striped Wainscot	*Leucania comma*	1291	2013	Sect.41, UKBAP
Variable Damselfly	*Coenagrion pulchellum*	534	2018	NT(GB)
Amphibians				
Common Frog	*Rana temporaria*	95	2018	EPS

Common name	Scientific name	Nearest distance from site (m)	Year of most recent record	Conservation Status
Common Toad	*Bufo bufo*	856	2018	Sect.41, UKBAP
Great Crested Newt	*Triturus cristatus*	1003	2016	EPS, Sect.41, UKBAP, WCA5
Reptiles				
Common Lizard	*Zootoca vivipara*	0	2015	Sect.41, UKBAP, WCA5
Grass Snake	*Natrix helvetica*	0	2018	Sect.41, UKBAP, WCA5
Slow-worm	*Anguis fragilis*	1534	2011	Sect.41, UKBAP, WCA5
Birds				
Arctic Tern	*Sterna paradisaea*	X	2012	BD1, BAmb
Barn Owl	*Tyto alba*	X	2010	CPASI, WCA1i
Bittern	*Botaurus stellaris*	1379	2013	BD1, Sect.41, UKBAP, WCA1i, BAmb
Black-headed Gull	*Chroicocephalus ridibundus*	X	2013	BAmb
Brambling	*Fringilla montifringilla*	X	2013	WCA1i
Brent Goose	*Branta bernicla*	X	2013	Sect.41, UKBAP, BAmb
Bullfinch	*Pyrrhula pyrrhula*	X	2013	Sect.41, UKBAP, BAmb
Caspian Gull	*Larus cachinnans*	1806	2013	BAmb
Cetti's Warbler	*Cettia cetti*	1202	2011	WCA1i
Common Crossbill	*Loxia curvirostra*	652	2013	WCA1i
Common Gull	*Larus canus*	X	2013	BAmb
Common Sandpiper	*Actitis hypoleucos*	1301	2013	BAmb
Common Tern	*Sterna hirundo*	556	2013	BD1, BAmb
Crane	*Grus grus*	X	2013	BD1, CPASI, BAmb
Cuckoo	*Cuculus canorus*	918	2012	Sect.41, UKBAP, BRed
Curlew	*Numenius arquata*	1075	2012	Sect.41, UKBAP, BRed
Dunnock	*Prunella modularis*	548	2010	Sect.41, UKBAP, BAmb
Fieldfare	*Turdus pilaris*	689	2012	WCA1i, BRed
Gadwall	*Anas strepera*	1466	2013	BAmb
Glaucous Gull	*Larus hyperboreus*	1806	2012	BAmb
Golden Plover	*Pluvialis apricaria*	X	2011	BD1
Goldeneye	*Bucephala clangula*	X	2010	WCA1ii, BAmb
Great Black-backed Gull	*Larus marinus*	X	2013	BAmb
Green Sandpiper	*Tringa ochropus*	1020	2013	WCA1i, BAmb
Greenshank	*Tringa nebularia*	X	2010	WCA1i, BAmb
Grey Partridge	*Perdix perdix*	838	2013	Sect.41, UKBAP, BRed
Grey Wagtail	*Motacilla cinerea*	1075	2013	BRed
Greylag Goose	*Anser anser*	1466	2013	WCA1ii, BAmb
Herring Gull	*Larus argentatus*	X	2013	BRed
Hobby	*Falco subbuteo*	913	2013	WCA1i
Honey-buzzard	*Pernis apivorus*	X	2013	BD1, WCA1i, BAmb
House Martin	*Delichon urbicum*	913	2013	BAmb
House Sparrow	*Passer domesticus*	548	2013	Sect.41, UKBAP, BRed
Iceland Gull	*Larus glaucoides subsp. glaucoides*	X	2012	BAmb

Common name	Scientific name	Nearest distance from site (m)	Year of most recent record	Conservation Status
Kestrel	*Falco tinnunculus*	X	2013	BAmb
Kingfisher	*Alcedo atthis*	638	2013	BD1, WCA1i, BAmb
Lapwing	*Vanellus vanellus*	X	2012	Sect.41, UKBAP, BRed
Lesser Black-backed Gull	*Larus fuscus*	X	2013	BAmb
Lesser Redpoll	*Acanthis cabaret*	1075	2013	Sect.41, UKBAP, BRed
Linnet	*Linaria cannabina*	X	2013	Sect.41, UKBAP, BRed
Little Egret	*Egretta garzetta*	1105	2013	BD1
Mallard	*Anas platyrhynchos*	438	2013	BAmb
Marsh Harrier	*Circus aeruginosus*	1315	2013	BD1, WCA1i
Meadow Pipit	*Anthus pratensis*	1075	2013	BAmb
Mediterranean Gull	*Larus melanocephalus*	X	2013	BD1, WCA1i, BAmb
Merlin	*Falco columbarius*	X	2013	BD1, WCA1i, BRed
Mistle Thrush	*Turdus viscivorus*	X	2011	BRed
Mute Swan	*Cygnus olor*	1466	2013	BAmb
Osprey	*Pandion haliaetus*	1075	2013	BD1, WCA1i, BAmb
Oystercatcher	*Haematopus ostralegus*	X	2010	BAmb
Peregrine	*Falco peregrinus*	808	2013	BD1, WCA1i
Pink-footed Goose	*Anser brachyrhynchus*	X	2010	BAmb
Pochard	*Aythya ferina*	1466	2013	BRed
Red Kite	*Milvus milvus*	X	2013	BD1, WCA1i
Redstart	*Phoenicurus phoenicurus*	X	2013	BAmb
Redwing	*Turdus iliacus*	689	2014	WCA1i, BRed
Reed Bunting	*Emberiza schoeniclus*	1780	2013	Sect.41, UKBAP, BAmb
Ring Ouzel	*Turdus torquatus*	X	2012	Sect.41, UKBAP, BRed
Scaup	*Aythya marila*	X	2011	Sect.41, UKBAP, WCA1i, BRed
Shoveler	*Anas clypeata*	1466	2013	BAmb
Skylark	*Alauda arvensis*	X	2013	Sect.41, UKBAP, BRed
Snipe	*Gallinago gallinago*	681	2013	BAmb
Song Thrush	*Turdus philomelos*	548	2010	Sect.41, UKBAP, BRed
Spotted Flycatcher	*Muscicapa striata*	X	2013	Sect.41, UKBAP, BRed
Starling	*Sturnus vulgaris*	548	2013	Sect.41, UKBAP, BRed
Stock Dove	*Columba oenas*	X	2012	BAmb
Swift	*Apus apus*	689	2013	CPASI, BAmb
Tawny Owl	*Strix aluco*	X	2012	BAmb
Teal	*Anas crecca*	1466	2013	BAmb
Turtle Dove	*Streptopelia turtur*	1202	2013	Sect.41, UKBAP, BRed
Wigeon	*Anas penelope*	1466	2013	BAmb
Willow Warbler	*Phylloscopus trochilus*	X	2010	BAmb
Wood Sandpiper	*Tringa glareola*	X	2012	BD1, WCA1i, BAmb
Wood Warbler	*Phylloscopus sibilatrix*	X	2013	Sect.41, UKBAP, BRed
Woodcock	*Scolopax rusticola*	83	2013	BRed
Yellow Wagtail	*Motacilla flava*	763	2013	Sect.41, UKBAP, BRed
Yellow-legged Gull	*Larus michahellis*	1806	2014	Sect.41, UKBAP, BRed

Common name	Scientific name	Nearest distance from site (m)	Year of most recent record	Conservation Status
Mammals (Bats)				
Brown Long-eared Bat	*Plecotus auritus*	X	2017	EPS, Sect.41, UKBAP, WCA5
Common Pipistrelle	*Pipistrellus pipistrellus*	0	2017	EPS, WCA5
Daubenton's Bat	*Myotis daubentonii*	856	2018	EPS, WCA5
Long-eared Bat species	*Plecotus*	837	2014	EPS, WCA5
Nathusius's Pipistrelle	*Pipistrellus nathusii*	X	2017	EPS, NT(GB), WCA5
Noctule Bat	*Nyctalus noctula*	0	2017	EPS, Sect.41, UKBAP, WCA5
Pipistrelle Bat species	*Pipistrellus*	796	2016	EPS, WCA5
Serotine	*Eptesicus serotinus*	837	2014	EPS, VU(GB), WCA5
Soprano Pipistrelle	*Pipistrellus pygmaeus*	0	2016	EPS, Sect.41, UKBAP, WCA5
Unidentified Bat	*Myotis sp.*	1629	2010	EPS, WCA5
Mammals				
Eurasian Badger	*Meles meles*	1520	2013	PBA
European Otter	*Lutra lutra*	556	2017	EPS, Sect.41, UKBAP, WCA5
European Water Vole	*Arvicola amphibius*	381	2018	EN(GB), Sect.41, UKBAP, WCA5
Polecat	*Mustela putorius*	1169	2015	EPS, Sect.41, UKBAP
West European Hedgehog	*Erinaceus europaeus*	253	2018	VU(GB), Sect.41, UKBAP

Abbreviations used in Table 3.2: WCA1i: Wildlife & Countryside Act Schedule 1, part 1; WCA5: Wildlife & Countryside Act Schedule 5; N: Nationally Notable; Na: Notable A; Nb: Notable B; NR: Nationally Rare; NS: Nationally Scarce; Sect.41: Natural Environment & Rural Communities Act Species of Principal Importance; UKBAP: UK Biodiversity Action Plan priority species; BD1: Birds Directive Annex 1; BRed: Bird Population Status: red; BAmb: Bird Population Status: amber; VU(GB)/(ENG): IUCN (2001) – Vulnerable Great Britain/England; NT(GB)/(ENG): IUCN (2001) - near threatened Great Britain/England; EN(GB)/(ENG): IUCN (2001) – Endangered Great Britain/England; EPS: European Protected Species; CPASI: Cambridgeshire and Peterborough Additional Species of Interest; X: No species records with 6 figure grid reference or greater provided.

3.2 Invasive Species Survey

3.2.1 No Schedule 9 invasive species were found to be present within the boundary of the CB4 Phase 1b site. Non-Native Invasive Species (NNIS) of particular concern are listed under Schedule 9 Part 2 of the Wildlife and Countryside Act 1981 (as amended in 2008) (WCA). Essentially, it is an offence to cause Schedule 9 plants to grow in the wild and, if transported offsite, there is a duty of care for any part of the plant that can facilitate growth, including, for example, whole plants, seeds, rhizomes, bulbs, corms and cuttings.

3.2.2 *Cotoneaster Cotoneaster sp*, a Schedule 9 NNIS was recorded external but adjacent to the site. The species is located to the east of the site planted in landscaped areas of the car park adjacent to Cowley Road (see Appendix D, Photograph 1). As the area is currently well managed, spread of this species is contained and no further action is necessary. Management of these areas should be maintained.

3.2.3 Tree of Heaven *Ailanthus altissima* was recorded within the site boundary (see Appendix D, Photograph 2). This species is located in the north-east corner of the site at UK national grid reference TL 47425 60990, growing in the boundary hedge. Tree of Heaven is not currently listed as a Schedule 9 NNIS but can be highly invasive in an unmanaged setting and should be controlled (see below).

3.2.4 Buddleia *Buddleja davidii* is present throughout the site (see Appendix D, Photograph 3). Whilst this species is not a Schedule 9 NNIS, it is considered invasive due to its quick spreading nature. Control is therefore recommended.

3.3 Reptile Survey

3.3.1 A peak count of one Common Lizard *Zootoca vivipara* was recorded on the third survey visit and a peak count of one Grass Snake *Natrix natrix* was recorded on the first survey visit during the 2018 survey and translocation.

3.3.2 Results are presented below in Table 3.3.

Table 3.3: Reptile Survey Results

Date	Common Lizard		Grass Snake	
	a	j	a	j
07/09/18	0	0	0	1
11/09/18	0	0	0	0
13/09/18	1	0	0	0
17/09/18	0	0	0	0
21/09/18	0	0	0	0
25/09/18	0	0	0	0
28/09/18	0	0	0	0

Abbreviations used in Table 3: a: adult; j: juvenile

3.3.3 The 2019 localised translocation did not observe or capture any reptiles on site.

3.4 Breeding Bird surveys

3.4.1 A total of 29 species were recorded during the survey of breeding birds within the site area in May/June. Of these species 13 were confirmed to be breeding.

3.4.2 A summary of the breeding and conservation status of the 29 species recorded during the course of the survey, with the numbers of territories identified (or estimated in the case of probable and possible records) is provided in Table 3.4. The location of the breeding birds when they were within the proposed development area has also been recorded.

Table 3.4: Breeding Bird survey results

Species	Breeding status	Minimum number of territories	Breeding within proposed development area	UK BAP priority species	Birds of conservation concern
Blackbird	Confirmed	2	Yes		
Blackcap	NB				
Blue Tit	Confirmed	2	Yes		
Carrion Crow	NB				
Chiffchaff	Confirmed	2	Yes		
Collared Dove	NB				
Dunnock	Confirmed	2	Yes	✓	Amber
Green Woodpecker	Possibly Breeding				
Grey Wagtail	NB				Red
Goldfinch	Confirmed	1	Yes		
Greenfinch	NB				
Great Spotted Woodpecker	Confirmed	1	Yes		
Great Tit	NB				

House Sparrow	NB				
Jay	NB				
Long-tailed Tit	Confirmed	2	Yes		
Mallard	NB				Amber
Magpie	Confirmed	1	Yes		
Robin	Confirmed	4	Yes		
Red-legged Partridge	NB				
Reed Warbler	NB				
Stock Dove	NB				Amber
Starling	NB			✓	Red
Swift	NB				Amber
Song Thrush	Confirmed	1	Yes	✓	Red
Sedge Warbler	NB				
Woodpigeon	Confirmed	7	Yes		
Wren	Confirmed	4	yes		
Willow Warbler	NB				Amber

3.4.3 Sixteen species were considered to be non-breeding. Of the 13 species considered to be breeding on site Two were listed as a UK BAP priority species, one included in the BoCC Amber list and one in the red list.

3.4.4 The breeding bird scoping survey undertaken on the 10th and 24th June 2019 in the area of the temporary carpark. No rare birds were found to be breeding. The potential for breeding birds on the site prior to clearance is considered to be similar to other parts of the CB4 study area.

Species Accounts

3.4.5 The following species accounts relate to those species confirmed as breeding within the survey area in 2018 that are listed on Schedule 1 of the Wildlife & Countryside Act 1981, as a NERC Species of Principal Importance, the Birds of Conservation Concern Red List or as a UK BAP

Priority Species. Therefore, these species are regarded as being of high conservation importance. Where the data is available, the number of territories recorded during survey is compared to the species regional and national status. National and regional status is derived from the reports of the Rare Breeding Birds Panel (RBBP), where appropriate (Holling *et al*., 2012).

3.4.6 Any breeding population identified within the survey area is considered to be of national importance if it exceeded 1% of the national population. No breeding population of any species within the survey area approaches the 1% level of the national population.

Other Species of Conservation Concern

3.4.7 Two of the species recorded as breeding within the survey area in 2018 (Dunnock and Song Thrush) are listed as priority species on the UKBAP.

3.4.8 Two of the species recorded as breeding within the survey area in 2018 (Dunnock and Song Thrush) are listed in Section 41 of the NERC Act 2006 as being of principal importance for the conservation of biodiversity in England.

3.4.9 One of the species recorded as breeding within the survey area (Song Thrush) is included on the BoCC Red List.

3.4.10 One of the species recorded as breeding (Dunnock) is included on the BoCC Amber List.

3.5 Bat surveys

Emergence/re-entry surveys - Trees

3.5.1 Results from bat emergence/re-entry surveys in 2020 are summarised below in Table 3.5 and shown in Appendix C. This includes details of species found and roost types (if identified).

Table 3.5: Bat emergence/re-entry survey results for CB4, Phase 2.

Tree number	Survey date (2020) and survey type (emergence/re-entry)	Species confirmed roosting and numbers	Species confirmed foraging/commuting
Trees 1 and 2 (T1 & T2)	Wednesday 6th August emergence survey	None	Common Pipistrelle
	Thursday 20th August emergence	None	Common Pipistrelle Soprano Pipistrelle Noctule
	Friday 1st September emergence survey	None	Common Pipistrelle Soprano Pipistrelle Noctule

3.5.2 No bat roosts have been identified within trees T1 and T2 during the 2020 emergence surveys. Three species of bat were identified foraging/commuting within and through the site including common and soprano pipistrelle and noctule.

Bat Activity Surveys

3.5.3 Bat activity surveys consist of a walked route or transect around the site to record bat activity. During the transect, the ecologist walks a planned route at constant speed (so the sampling area

is the same per unit time) with the aid of a bat detector and appropriate recording equipment for ultrasonic sound. The ecologist will record observations such as numbers of bats, flight directions, behaviour (e.g., commuting or foraging) and relative speed and flight height.

3.5.4 The results are summarised in Table 3.6 with time of first contact shown in Table 3.7.

Table 3.6: Numbers of bat contacts recorded during transect surveys

Survey date	Bat Species									
	CPIP	SPIP	NPIP	PIP	NOC	EPT	BLE	MYO	UkSp	TOTAL
07/06/2018	3	1	0	0	0	0	0	0	1	5
11/07/2018	10	4	0	0	1	0	0	0	1	16
30/08/2018	6	3	0	4	0	0	0	0	5	18

CPIP = Common Pipistrelle, SPIP = Soprano Pipistrelle, NPIP = Nathusius' Pipistrelle, PIP = Pipistrelle sp., NOC = Noctule, SER = Serotine, BLE = Brown Long-eared, MYO = Myotis sp., UkSp = Unknown bat species

3.5.5 On the first transect which lasted 150 minutes, bat activity on site was limited. Only three Common Pipistrelle contacts and a single Soprano Pipistrelle contact were recorded, although an unknown bat was also recorded during the survey. The first three bats were recorded on the north-western side of the site alongside the Cambridgeshire Guided Busway and a fourth bat was recorded on the northern boundary of the site.

3.5.6 On the second transect which lasted 150 minutes, a higher number of Common Pipistrelle contacts were recorded, 10 in total. In addition, four Soprano Pipistrelle contacts, one Noctule and 1 unknown bat were also recorded. The majority of bat contacts were recorded along the western boundary of the site adjacent to the Cambridgeshire Guided Busway, and on the northern edge of the scrub and woodland on site although both a Common Pipistrelle and Soprano Pipistrelle were recorded east of this. Low numbers of pipistrelle bats were recorded foraging above the scrub on site.

3.5.7 On the third transect which lasted 150 minutes, six Common Pipistrelle and three Soprano Pipistrelle contacts were recorded. In addition, four unknown Pipistrelle bats and five unknown bats were also recorded. The majority of bats were recorded within and around the scrub and trees on site although Pipistrelle bats were recorded on the eastern side of the site and an unknown bat was recorded north of the site boundary.

3.5.8 Transect routes for each survey shown in Figure 6 (07/06/18), Figure 7 (11/07/18) and Figure 8 (30/08/18).

Figure 6: Bat transect route 07/06/2018

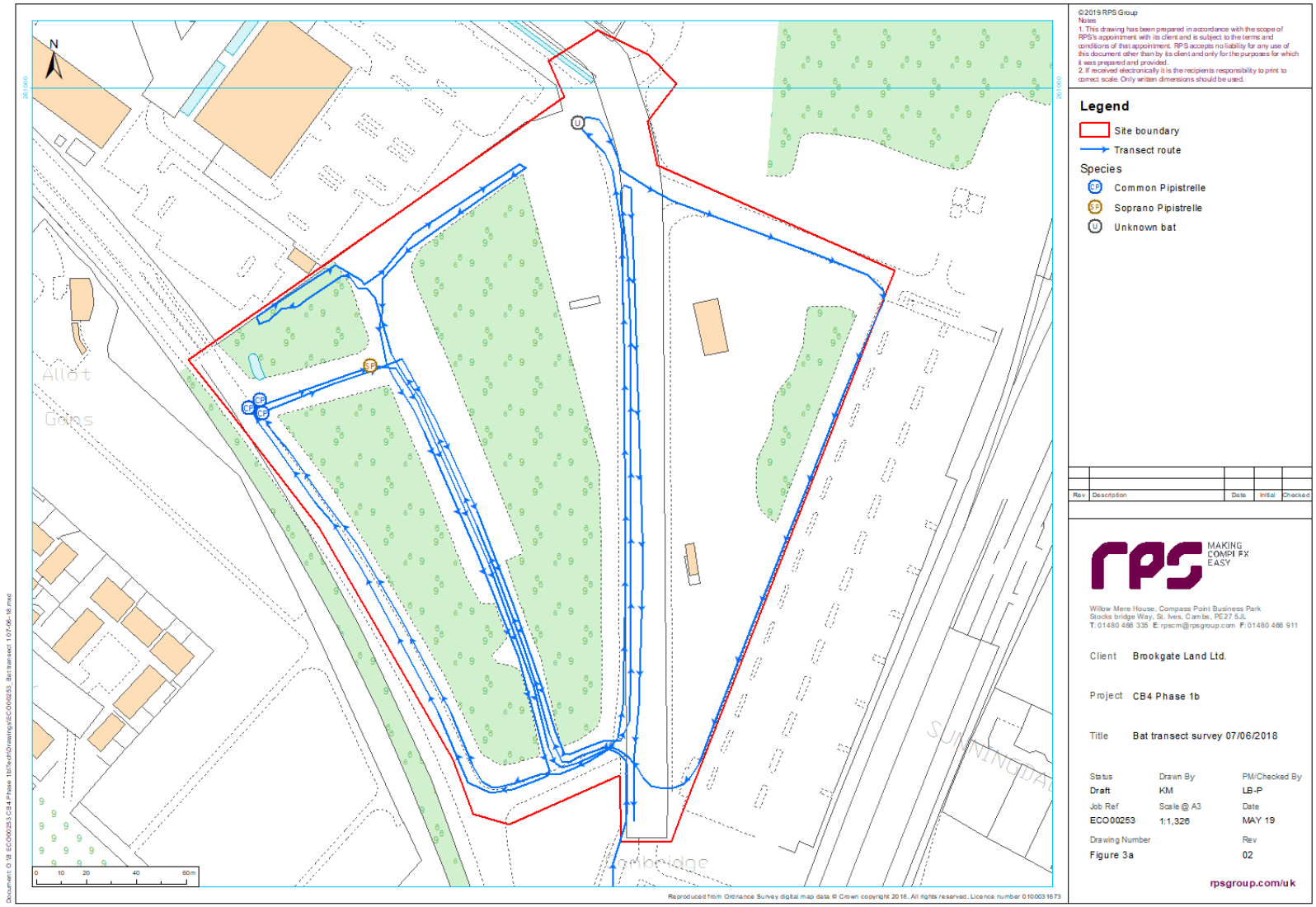


Figure 7: Bat transect route 11/07/2018

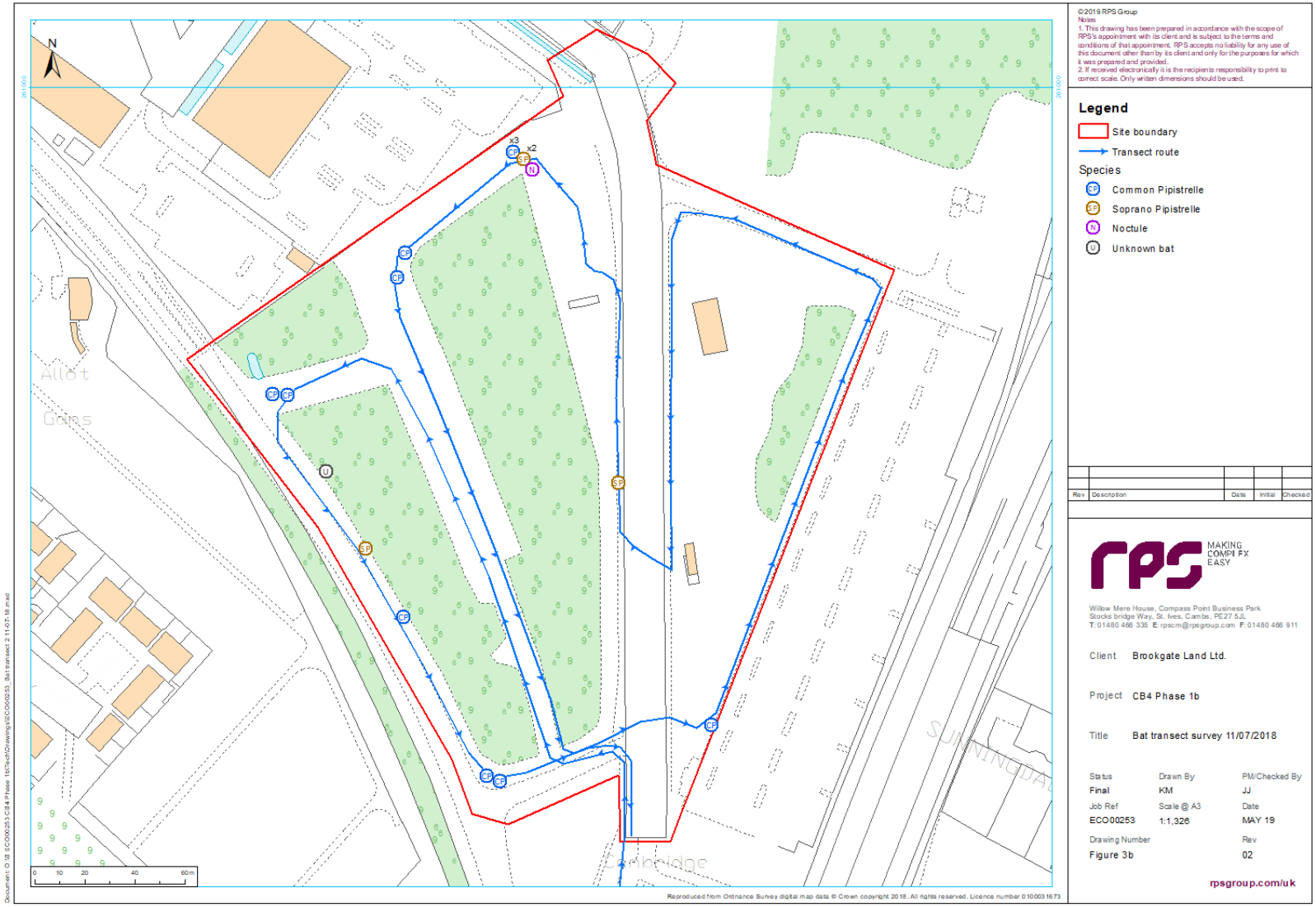


Figure 8: Bat transect route 30/08/2018

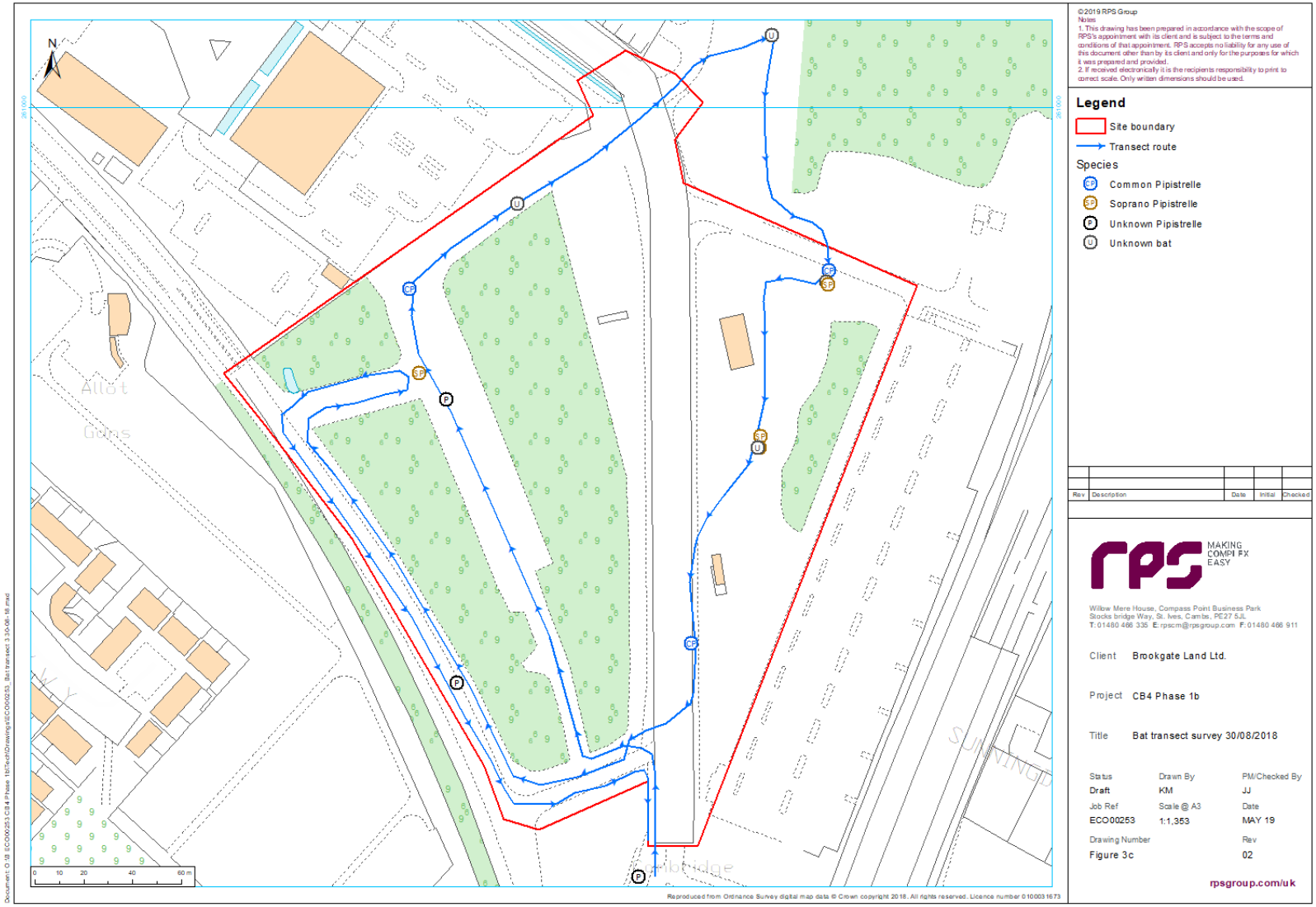


Table 3.7: Times of first contact

Species	Transect	Time of first contact	Time since sunset of first contact
Common Pipistrelle	**1**	22:01	44 minutes
	2	22:08	49 minutes
	3	20:20	29 minutes
Soprano Pipistrelle	**1**	22:16	56 minutes
	2	23:01	102 minutes
	3	20:49	58 minutes
Noctule	**2**	23:13	114 minutes

3.5.9 Common Pipistrelle was the species recorded most often, with 10 contacts on the second survey, three contacts were recorded on the first survey, rising to six on the third survey visit. Soprano Pipistrelle was sparsely recorded, with four contacts recorded in July but only one and three contacts recorded on the first and third survey visits. A single Noctule Bat was recorded during the second transect survey. Four contacts of an unknown Pipistrelle bat were recorded on the third transect survey and an unidentifiable bat species was recorded once during the first and second transect and five times during the third transect visit.

Static monitoring

3.5.10 A total of seven species were recorded on the static detectors. Common Pipistrelle bats were most commonly encountered, followed by Soprano Pipistrelle and Noctule bats.

3.5.11 The data from the static detectors support the activity surveys in the analysis that the most commonly encountered bats on site are Common Pipistrelles, Soprano Pipistrelles and Noctules. However, whilst a large number of bat calls were recording during the duration of the monitoring period, it cannot be determined whether the calls are multiple bats or the same bat passing by the monitor multiple times.

3.5.12 Nathusius' Pipistrelle bats were recorded in June and September and both Brown Long-eared and Serotine bats were recorded in July. Three contacts from an unknown *Myotis* bat were recorded in September. However, these four species were not recorded during the transect surveys.

3.5.13 As shown in Table 3.8 and Table 3.9, Common and Soprano Pipistrelle contacts comprised nearly all the total contacts recorded. Therefore, it is considered that the other species are only sporadically using the site.

Table 3.8: Number of bat contacts recorded during static monitoring surveys

Survey date	Anabat Number	Number of nights recording	Location	Bat Species								
				CPIP	SPIP	NPIP	PIP	NOC	EPT	BLE	MYO	TOTAL
07/06/2018	A2	4	On northern edge of road cutting through scrub and woodland, at a height of 3m facing south.	46	6	5	0	3	0	0	0	60
11/07/2018	A2	5	On eastern edge of road cutting through scrub and woodland, at a height of 3m facing west.	105	2	0	0	4	11	2	0	135
30/08/2018	A5	13	On western edge of scrub and trees on the eastern side of the site, at a height of 3m facing west.	236	88	7	0	43	0	0	3	377

CPIP = Common Pipistrelle, SPIP = Soprano Pipistrelle, NPIP = Nathusius' Pipistrelle, PIP = Pipistrelle sp., NOC = Noctule, SER = Serotine, BLE = Brown Long-eared, MYO = Myotis sp.

Table 3.9: Average bat contacts recorded per night of recording static monitoring surveys

Survey date	Anabat Number	Number of nights recording	Location	Bat Species								
				CPIP	SPIP	NPIP	PIP	NOC	EPT	BLE	MYO	TOTAL
06-09/06/18	A2	4	On northern edge of road cutting through scrub and woodland, at a height of 3m facing south.	11.5	1.5	1.2	0	0.8	0	0	0	15
11-16/07/18	A2	5	On eastern edge of road cutting through scrub and woodland, at a height of 3m facing west.	21	0.4	0	0	0.8	2.2	0.4	0	24.8
30/08/18-12/09/18	A5	13	On western edge of scrub and trees on the eastern side of the site, at a height of 3m facing west.	18.2	6.8	0.5	0	3.3	0	0	0.2	29

CPIP = Common Pipistrelle, SPIP = Soprano Pipistrelle, NPIP = Nathusius' Pipistrelle, PIP = Pipistrelle sp., NOC = Noctule, SER = Serotine, BLE = Brown Long-eared, MYO = Myotis sp.

3.6 Invertebrate Surveys

3.6.1 A broad range of invertebrate groups were covered including representatives of the following groups

- Woodlice
- Spiders
- Snakeflies
- Lacewings
- Dragonflies and damselflies
- Grasshoppers and crickets
- Earwigs
- True bugs
- Froghoppers
- Aphids
- Maths
- Butterflies
- Beetles
- True flies
- Sawflies
- Wasps
- Bees
- Ants
- Snails

3.6.2 The survey identified 482 invertebrate species with 68 (14.1%) considered here as Species of conservation concern. This is a high proportion of scarce and rare species and confirms that the site continues to support a valuable assemblage of invertebrate species.

3.6.3 During the analysis it was revealed that several of the important species are not any longer of great conservation concern.

3.6.4 A copy of the report can be found in Appendix B (Gibbs, 2021).

3.7 Botanical Survey

3.7.1 The habitats outlined below follow that of UK habitat classifications (UK Hab).

U1a – Urban, Open mosaic habitats on previously developed land (OMH)

3.7.2 Large areas of open mosaic habitat (OMH) were identified across the site. These are located to the north east of the site and west of the site within disturbed areas of ground (Figure 9). The species composition was consistent across all areas of OMH with dominant species such as wild carrot *Daucus carrota*, teasel *Dipsacus fullonum*, hairy Willowherb *Epilobium hirsuta*, perforate St

johns-wort *Hypericum perforatum*, Cat's ear *Hypericum perforatum* and Purple toadflax *Linaria purperea*.

3.7.3 A full species list is shown in Table 3.10 below.

3.7.4 Two notable species were identified within the OMH lesser calamint *Clinopodium calamintha* designated as 'Vulnerable' and 'Nationally Scarce', and Burmuda grass *Cynodon dactylon* designated as 'Nationally Rare'.

3.7.5 **OMH** west of the informal car parking area – moderate condition, previously disturbed 2017/2018 and now recovering. No mulleins, evening primrose or other OMH perennial plant community species (e.g. legumes) present. Yet has established and is frequent. **Poor condition OMH**, recovering.

3.7.6 Compacted track barely vegetated, mainly moss. **Poor condition OMH**, recovering.

3.7.7 Recently bare ground disturbed in 2018/2019 so poor condition OMH and still mostly bare ground. Few taller herb spp. present, mainly docks and not even St John's-wort yet, no OMH perennial plant community species present (mulleins/evening primrose/legumes) yet established. poor condition OMH.

3.7.8 **Recovering OMH** disturbed 2017/2018 but now with St John's-wort and other early successional plants coming back. Few/no OMH perennial plant community species present (mulleins/evening primrose/legumes) yet established but better range of annual species. **Moderate Condition**.

3.7.9 **Good condition OMH** not recently disturbed with scattered young buddleia (a good marker for disturbance) as well as a range of OMH perennial plant community species present (occasional mulleins/legumes) including also tares, and evening primrose. **Good condition**.

3.7.10 **Good condition OMH** with full range of OMH perennials including mulleins, evening primrose, St John's-wort and tares/vetches. Also present are occasional young buddleia, birch and willows. Area was less disturbed in station construction during 2015-2018. **Good condition**.

3.7.11 **Moderate condition OMH** recovering from station construction disturbance during 2015-18. More bare ground 30%+ than the less disturbed areas to the east (TN 12 above) and typical range of OMH perennial plant community species and scrub species absent. **Moderate condition**.

3.7.12 Recently disturbed (2018), **recovering OMH** with little or no buddleia, willow and birch. The typical range of OMH perennial plant community species and scrub species absent. **Moderate condition**.

3.7.13 Recently **disturbed OMH** (2015-2018) with sea buckthorn establishing. There are scattered young buddleia as well but the range of OMH perennial plant community species present is poor including tares, St John's-wort but few others. **Poor condition**.

U – Urban, amenity grassland

3.7.14 Verges along the road consisted of amenity grassland. Species here included yarrow *Achillia milliofolium*, scarlet pimpernel *Anagalis arvensis*, Yorkshire fog *Holcus lanatus* and cats ear *hypocharies radicata*.

3.7.15 Amenity grassland re-seeded by Network Rail (NR) but not maintained and recently (2019) disturbed by passing HGV's so soil is churned up and muddy. Little remaining grass cover, but still present. There are few flowering perennials associated with the OMH plant communities (or grassland indicator spp), rather a mix of vigorous weed species such as abundant dock spp., with thistle spp. re-establishing bramble from the adjacent scrub patch (undesirable species – in condition table). As the grasses decrease in abundance it merges into the tall herb ruderal habitat to the south. **Poor condition**.

U1b – Urban, Developed land, sealed surface (hard standing)

3.7.16 Areas of hard standing consisted of road and pedestrian walkways running through the centre of the site.

U1c – Urban, Artificial unvegetated, unsealed surface (Bare ground)

3.7.17 Multiple areas of bare ground were identified. These were used as material storage and parking for construction works.

3.7.18 The Volker Fitzpatrick site compound/car parking area with compacted gravel bare ground, now being re-used as a contractor's car park. Bare ground with little or no vegetation cover, given the compaction and the current use by vehicles. **Poor condition**.

3.7.19 New bare ground pile of aggregate rubble/materials - unvegetated. **Poor condition**.

3.7.20 New aggregate track so mostly bare ground 80%, some buddleia and bramble growing through the gravel and is starting to re-establish some characteristics of OMH**. Poor condition**.

3.7.21 Bare ground. Pile of aggregate – unvegetated. **Poor condition**.

3.7.22 Compacted access track – 80% bare ground, with moss regenerating as disturbance pressure has been removed in 2019. **Poor condition**.

3.7.23 Dense scrub was cleared February 2019 and has regenerated into scattered birch and willow scrub. These are young shoots from remaining stumps of birch and some willow and sea buckthorn. Abundant bramble and a rather sparse ground flora with occasional reed sweetgrass and leaf litter. **Poor condition**.

H2h – Heath, Mixed scrub

3.7.24 Multiple areas of mixed scrub were identified across the entirety of the site. The more significant areas were to the north east and south of the site.

3.7.25 The species here varied between the two areas with dormant species to the north east including silver birch *Betula pendula*, downy birch *Betula pubescence*, dog rose *Rosa canina* and buddleia *Buddlija davidii*.

3.7.26 The area of scrub to the south also consisted of these species however with the addition of sea buckthorn *Hippophae rhamnoides* a notable species designated as 'Nationally Scarce'.

3.7.27 Dense scrub patch with young birch establishing. Dominated by bramble, with frequent buddleia and occasional sea buckthorn. Little to no ground flora under the dense growth. **Poor condition**.

3.7.28 Dense scrub with young birch establishing. Dominated by even aged bramble, with frequent buddleia and occasional willow and sea buckthorn. Little ground flora under the dense growth. **Poor condition**.

3.7.29 Birch dominated dense scrub 80%+ with bramble/buddleia understorey and occasional willow. **Poor condition**.

W1g – Woodland, Other woodland, Broadleaved

3.7.30 Three blocks of woodland were identified to the west of the site. These areas were of planted origin with the vast majority of trees being of a similar size and age. The dominant species were downy birch with other species such as sycamore *Acer pseudoplatanus*, dogwood *Cornus sanguinius*, and *salix caprea*. A few large trees were also identified, these were ash *Fraxinous excelsior* and weeping willow *Salix babalonica*.

3.7.31 Tree line of more mature birch (15-20 years approx.) in a tree belt 4-5m wide. So young open woodland with a dense bramble understorey, mixed with frequent buddleia and a very limited ground flora due to shading from the bramble. **Moderate condition**.

3.7.32 Young birch/alder woodland with willow, bramble and buddleia understorey and species-poor ground flora. **Moderate condition**.

3.7.33 Young birch dominated woodland grading to south into dense birch scrub. Less willow and alder in these patches, up to 80% + birch cover (both sides of track). Bramble dominated understory and species-poor ground flora. **Poor condition**.

Table 3.10: Plant species recorded during the surveys 2018 and 2019

Common name	Scientific name	Conservation Status
Field Maple	*Acer campestre*	-
Sycamore	*Acer pseudoplatanus*	-
Yarrow	*Achillia milliofolium*	-
Fool's Parsley	*Aethusa cynapium*	-
Garlic Mustard	*Alliaria petiolata*	-
Italian Alder	*Alnus cordata*	-
Italian Alder (sapling)	*Alnus cordata*	-
Alder	*Alnus glutinosa*	-
Common Bent	*Agrostis capillaris*	-
Creeping Bent	*Agrostis stolonifera*	-
Scarlet pimpernel	*Anagallis arvensis*	-
Barren Brome	*Anisantha sterilis*	-
Snapdragon	*Antirrhinum majus*	-
Fool's Water-cress	*Apium nodiflorum*	-
Lesser burdock	*Arctium minus*	-
Thyme-leaved Sandwort	*Arenaria serpyllifolia*	-
False Oat-grass	*Arrhenatherum elatius*	-
Mugwort	*Artemisia vulgaris*	-
Spear-leaved Orache	*Atriplex prostrata*	-
Winter-cress	*Barbarea vulgaris*	-
Silver birch	*Betula pendula*	-
Downy birch	*Betula pubescence*	-
Yellow-wort	*Blackstonia perfoliata*	-
Rough-stalked Feather-moss	*Brachythecium rutabulum*	-
Black Mustard	*Brassica nigra*	-
Soft-brome	*Bromus hordeaceus*	-
Buddleia	*Buddlija davidii*	-
White Bryony	*Bryonia dioica*	-
Wood Small-reed	*Calamagrostis epigejos*	-
Large Bindweed	*Calystegia silvatica*	-
Shepherd's-purse	*Capsella bursa-pastoris*	-
Wavy Bitter-cress	*Cardamine flexuosa*	-
Musk Thistle	*Carduus nutans*	-
Slender Thistle	*Carduus tenuiflorus*	-
Hairy Sedge	*Carex hirta*	-
False Fox-sedge	*Carex otrubae*	-
Pendulous Sedge	*Carex pendula*	-
Cyperus Sedge	*Carex psuedocyperus*	-

Common name	Scientific name	Conservation Status
Carline Thistle	*Carlina vulgaris*	-
Common Knapweed	*Centaurea nigra*	-
Common Centaury	*Centaurium erythraea*	-
Common Mouse-ear	*Cerastium fontanum*	-
Sticky Mouse-ear	*Cerasteum glomeratum*	-
Small Toadflax	*Chaenorhinum minus*	-
Rosebay Willowherb	*Chamerion angustifolium*	-
Fat-hen	*Chenopodium album*	-
Fig-leaved Goosefoot	*Chenopodium ficifolium*	-
Many-seeded Goosefoot	*Chenopodium polyspermum*	-
Dwarf Thistle	*Cirsium acaule*	-
Creeping thistle	*Circium arvense*	-
Spear Thistle	*Cirsium vulgare*	-
Traveller's-joy	*Clematis vitalba*	-
Lesser calamint	*Clinopodium calamintha*	VU, NS
Hemlock	*Conium maculatum*	-
Field Bindweed	*Convolvulus arvensis*	-
Canadian Fleabane	*Conyza canadensis*	-
Dogwood	*Cornus sanguineous*	-
Cotoneaster	*Cotoneaster sp.*	-
Hawthorn	*Crategus monogyna*	-
Montbretia	*Crocosmia x crocosmiiflora*	-
Ivy-leaved Toadflax	*Cymbalaria muralis*	-
Bermuda grass	*Cynodon dactylon*	NR
Cock's-foot	*Dactylis glomerata*	-
Wild carrot	*Daucus carota*	-
Foxglove	*Digitalis purpurea*	-
Teasle	*Dipsacus fullonum*	-
Scaly Male-fern	*Dryopteris affinis*	-
Vipers-bugloss	*Echium vulgare*	-
Cockspur	*Echinochloa crus-galli*	-
Common Couch	*Elytrigia repens*	-
American Willowherb	*Epilobium ciliatum*	-
Hairy willowherb	*Epilobium hirsuta*	-
Square-stalked Willowherb	*Epilobium tetragonum*	-
Field Horsetail	*Equisetum arvense*	-
Common Stork's-bill	*Erodium cicutarium*	-
Hemp-agrimony	*Eupatorium cannabinum*	-
Caper Spurge	*Euphorbia lathyris*	-
Petty Spurge	*Euphorbia peplus*	-
Sun spurge	*Euphorbia hellioscopa*	-
Black-bindweed	*Fallopia convolvulus*	-
Sheep's-fescue	*Festuca ovina*	-
Red Fescue	*Festuca rubra*	-

Common name	Scientific name	Conservation Status
Common Cudweed	*Filago vulgaris*	-
Garden Strawberry	*Fragaria ananassa*	-
Cleavers	*Galium aparine*	-
Cut-leaved Crane's-bill	*Geranium dissectum*	-
Dove's-foot Crane's-bill	*Geranium molle*	-
Small-flowered Crane's-bill	*Geranium pusillum*	-
Herb-Robert	*Geranium robertianum*	-
Wood Avens	*Geum urbanum*	-
Ground-ivy	*Glechoma hederacea*	-
Marsh Cudweed	*Gnaphalium uliginosum*	-
Ivy	*Hedera helix*	-
Bristly Oxtongue	*Helminthotheca echioides*	-
Sea-buckthorn	*Hippophae rhamnoides*	NS
Hoary Mustard	*Hirschfeldia incana*	-
Yorkshire fog	*Holcus lanatus*	-
Perforate St Johns-wort	*Hypericum perforatum*	-
Cat's ear	*Hypochaeris radicata*	-
Sharp-leaved Fluellen	*Kickxia elatine*	-
Field Scabious	*Knautia arvensis*	-
Great Lettuce	*Lactuca virosa*	-
White Dead-nettle	*Lamium album*	-
Red Dead-nettle	*Lamium purpureum*	-
Nipplewort	*Lapsana communis*	-
Broad-leaved Everlasting Pea	*Lathyrus latifolius*	-
Meadow Vetchling	*Lathyrus pratensis*	-
Lesser Swine-cress	*Lepidium didymum*	-
Oxeye Daisy	*Leucanthemum vulgare*	-
Common Toadflax	*Linaria vulgaris*	-
Purple toadflax	*Linaria purpurea*	-
Perennial Rye-grass	*Lolium perenne*	-
Common Bird's-foot-trefoil	*Lotus corniculatus*	-
Common mallow	*Malva arvense*	-
Scented Mayweed	*Matricaria camomilla*	-
Pineappleweed	*Matricaria discoidea*	-
Black Medick	*Medicago lupulina*	-
Lucerne	*Medicago sativa sativa*	-
White sweet clover	*Melilotus alba*	-
Yellow sweet clover	*Melilotus officinalis*	-
Three-nerved Sandwort	*Moehringia trinervia*	-
Wall Lettuce	*Mycelis muralis*	-
Early Forget-me-not	*Myosotis ramosisssima*	-
Small-flowered Evening-primrose	*Oenothera cambrica*	-
Large-flowered Evening-primrose	*Oenothera glazioviana*	-
Cotton Thistle	*Onopordum acanthium*	-

Common name	Scientific name	Conservation Status
Wild Marjoram	*Origanum vulgare*	-
Long-headed Poppy	*Papaver dubium*	-
Common Poppy	*Papaver rhoeas*	-
Opium Poppy	*Papaver somniferum*	-
Wild Parsnip	*Pastinaca sativa*	-
Green Alkanet	*Pentaglottis sempervirens*	-
Redshanks	*Persicaria maculata*	-
Common Reed	*Phragmites australis*	-
Smaller cat's-ear	*Phleum bertolonii*	-
Timothy	*Phleum pratense*	-
Hawkweed Oxtongue	*Picris hieracioides*	-
Ribwort plantain	*Plantago lanceolata*	-
Greater Plantain	*Plantago major*	-
Hoary plantain	*Plantago media*	-
Annual Meadow-grass	*Poa annua*	-
Flattened Meadow-grass	*Poa compressa*	-
Smooth Meadow-grass	*Poa pratensis*	-
Common Polypody	*Polypodium vulgare*	-
Equal-leaved Knotgrass	*Polygonum arenastrum*	-
Knotgrass	*Polygonum aviculare*	-
White Poplar (seedling)	*Populus alba*	-
Grey Poplar (sapling)	*Populus x canescens*	-
Creeping Cinquefoil	*Potentilla reptans*	-
Selfheal	*Prunella vulgaris*	-
Wild Cherry	*Prunus avium*	-
Common Fleabane	*Pulicaria dysenterica*	-
Creeping Buttercup	*Ranunculus repens*	-
White Mignonette	*Reseda alba*	-
Wild Mignonette	*Reseda lutea*	-
Weld	*Reseda luteola*	-
Black Currant	*Ribes nigram*	-
Red Currant	*Ribes rubrum*	-
Gooseberry	*Ribes uva-crispa*	-
Field-rose	*Rosa arvensis*	-
Dog rose	*Rosa canina*	-
Bramble	*Rubus friticosus*	-
Curled Dock	*Rumex crispus*	-
Broad-leaved Dock	*Rumex obtusifolius*	-
Wood dock	*Rumex sanguineus*	-
Annual Pearlwort	*Sagina apetala*	-
Procumbent Pearlwort	*Sagina procumbens*	-
White Willow	*Salix alba*	-
Weeping willow	*Salix babylonica*	-
Goat willow	*Salix caprea*	-

Common name	Scientific name	Conservation Status
Goat Willow	*Salix caprea*	-
Grey Willow	*Salix cinerea*	-
Crack Willow	*Salix fragilis var. fragilis*	-
Water Figwort	*Scrophularia auriculata*	-
Biting Stonecrop	*Sedum acre*	-
Narrow-leaved ragwort	*Senecio inaequidens*	-
Common Ragwort	*Senecio jacobaea*	-
Sticky Groundsel	*Senecio viscosus*	-
Groundsel	*Senecio vulgaris*	-
Green Bristle-grass	*Setaria viridis*	-
White campion	*Silene latifolia*	-
Bladder Campion	*Silene vulgaris*	-
Hedge Mustard	*Sisymbrium officinale*	-
Bittersweet	*Solanum dulcamara*	-
Black nightshade	*Solanum nigrum*	-
Canadian Goldenrod	*Solidago canadensis*	-
Perennial Sow-thistle	*Sonchus arvensis*	-
Prickly Sow-thistle	*Sonchus asper*	-
Common sowthistle	*Sonchus oleraceus*	-
Hedge Woundwort	*Stachys sylvatica*	-
Common Chickweed	*Stellaria media*	-
Russian Comfrey	*Symphytum ´ uplandicum*	-
Tansy	*Tanacetum vulgare*	-
Common Dandelion	*Taraxacum sect. Ruderalia*	-
KnottedHedge-parsley	*Torilis nodosa*	-
Hop Trefoil	*Trifolium campestre*	-
Lesser trefoil	*Trifolium dubium*	-
Slender Trefoil	*Trifolium micranthum*	-
Red Clover	*Trifolium pratense*	-
White Clover	*Trifolium repens*	-
Scentless Mayweed	*Tripleurospermum inodorum*	-
Wheat	*Triticum aestivum*	-
Colt's-foot	*Tussilago farfara*	-
Common Nettle	*Urtica dioica*	-
Stingless Nettle	*Urtica dioica* ssp. *galeopsifolia*	-
Common Cornsalad	*Valerianella locusta*	-
Hybrid mullein	*Verbascum pulverulentum x thapsus*	-
Great mullien	*Verbascum thapsus*	-
Dark Mullein	*Verbascum nigram*	-
Vervain	*Verbena officinalis*	-
Wall Speedwell	*Veronica arvensis*	-
Hairy Tare	*Vicia hirsuta*	-
Common Vetch	*Vicia sativa*	-
Bird vetch	*Vicia cracca*	-

Common name	Scientific name	Conservation Status
Field Pansy	*Viola arvensis*	-
Squirreltail Fescue	*Vulpia bromoides*	-
Rat's-tail Fescue	*Vulpia myuros*	-

Figure 9: Phase 1 Habitat Plan CB4 Phase 2

4 EVALUATION

4.1 Invasive Species Survey

4.1.1 No Schedule 9 invasive species were found to be present within the boundary of the CB4 Phase 1b site. Non-Native Invasive Species (NNIS) of particular concern Cotoneaster was recorded external but adjacent to the site.

4.1.2 Tree of Heaven and Buddleia was recorded within the site and can be highly invasive in an unmanaged setting and should be controlled.

4.2 Reptile Surveys

4.2.1 The hard standing on the north of the site is not suitable to support reptiles. The Open Mosaic Habitat around the scrub on site is of limited suitability for reptiles as the stony substrate provides little cover.

4.2.2 Historically, in the wider Chesterton Sidings study area, the Grass Snake population was considered to be 'low' and the Common Lizard population was considered to be 'low / medium', and both were considered to be of District importance for the study area as a whole, including the CSI area.

4.2.3 In 2013 there were no Grass Snake and Common Lizard recorded in the CSI area and reptile fencing had been installed around the periphery of the CSI area to exclude them. This reptile exclusion and translocation continued though to 2015 and is recorded in the Ecological Design Strategy (EDS) produced by Atkins (2016). A total of 23 Common Lizards and 4 Grass Snakes were trapped and removed from CSI during 2015.

4.2.4 It is therefore considered that the reptiles found on site in 2018 is a remnant population that were missed in the previous translocation, or reptiles that have moved on to the site when the fencing was removed or damaged.

4.2.5 The relict population of Grass Snakes and Common Lizards present on site is considered to be of importance at a site level only.

4.2.6 A single Common Lizard and Grass Snake were recorded within the grassland in the south-western corner of the site, although no reptiles were seen across the remainder of the site.

4.2.7 A reptile translocation was carried out on site during March 2019 no reptiles were observed or caught on site during this exercise. Therefore, it is assumed that reptiles are now absent from site.

4.2.8 Since the translocation, it is unlikely that reptiles have re-colonised the site from the surrounds due to the changes to the site, remaining reptile fencing and location of construction compound acting as a barrier to recolonisation. Therefore, it is considered that reptiles are still absent from the site.

4.3 Breeding Bird Surveys

4.3.1 The number of species recorded in an area is a simple measure of diversity that can indicate its importance at each season of the year. Fuller (1980) gives the following breeding diversity criteria which are presented in Table 4.

Table 4.1: Breeding Diversity Criteria

National	Regional	County	Local
85+	0-84	50-69	25-49

4.3.2 Based on Fuller's criteria, the breeding bird assemblage of the survey area in 2018 (21) is of low local importance. However, it should be noted that Fuller's analysis was developed in the 1970's. Since then, species diversity has declined significantly (Eaton et al., 2015). As a result, Fuller's thresholds are too high for today's breeding bird populations. However, despite these changes in bird populations, and whilst also giving consideration to the number of species of conservation interest, it is still considered most likely that the breeding bird assemblage at the site is of no more than of local importance.

4.3.3 A breeding bird scoping survey was also undertaken on the 10th and 24th June 2019 in the area of the temporary carpark. No rare birds were found to be breeding. The potential for breeding birds on the site prior to clearance is considered to be similar to other parts of the CB4 study area.

4.3.4 The Phase 1 habitat walkover in 2021 found that the value of the site for breeding birds remained unchanged since the 2018 surveys and it was still considered that the breeding bird assemblage remains of local importance. The diversity and abundance of bird species recorded on site is likely to be unchanged since 2018 and therefore update surveys were not required in 2021.

4.4 Bat Surveys

Emergence/re-entry surveys - Trees

4.4.1 No bat species were recorded roosting within trees T1 or T2 on site during the 2020 surveys. Three species of bat were recorded commuting/foraging through and within the site. These included common pipistrelle; soprano pipistrelle and noctule.

4.4.2 Commuting and foraging habitats on site were assessed in accordance with Wray *et al.* (2010) with the common and soprano pipistrelle commuting and foraging habitat as having District, Local or Parish level importance with a score of 20 and noctule commuting and foraging habitat as having County importance with a score of 23. The scoring system for valuing bat roosts can be seen below in Table 4.2 and 4.3 below.

Table 4.2: The scoring system for valuing bat commuting routes (Wray *et al*. 2010)

Species	Number of bats	Roosts/potential roosts nearby	Type and complexity of linear features
Common (2)	Individual bats (5)	None (1)	Absence of (other) linear feature (1)
-	-	Small number (3)	Unvegetated fences and large field sizes (2)
Rarer (5)	Small number of bats (10)	Moderate number/Not known (4)	Walls, gappy or flailed hedgerows, isolated well-grown hedgerows, and moderate field sizes (3)
-	-	Large number of roosts, or close to a SSSI for the species (5)	Well-grown and well-connected hedgerows, small field sizes (4)

Rarest (20)	Large number of bats (20)	Close to or within a SAC for the species (20)	Complex network of mature well-established hedgerows, small fields and rivers/streams.

Table 4.3: The scoring system for valuing bat foraging areas (Wray *et al*. 2010)

Species	Number of bats	Roosts/potential roosts nearby	Type and complexity of linear features
Common (2)	Individual bats (5)	None (1)	Industrial or other site without established vegetation (1)
-	-	Small number (3)	Suburban areas or intensive arable land (2)
Rarer (5)	Small number of bats (10)	Moderate number/Not known (4)	Isolated woodland patches, less intensive arable and/or small towns and villages (3)
-	-	Large number of roosts, or close to a SSSI for the species (5)	Large or connected woodland blocks, mixed agriculture, and small villages/hamlets (4)
Rarest (20)	Large number of bats (20)	Close to or within a SAC for the species (20)	Mosaic of pasture, woodland and wetland areas (5)

Activity surveys

4.4.3 A total of three bat species were recorded during the three transect surveys, as well as an unknown Pipistrelle Bat and bat calls which could not be identified to species level. The species most commonly encountered were Common Pipistrelle, followed by Soprano Pipistrelle, and then Noctule.

4.4.4 The areas of highest activity were along the western edge of the site, and above the scrub and trees on the western side of the site, although bats were also recorded on the eastern side of the site.

4.4.5 Not all bat activity was observed (i.e. bats heard but not seen) and whilst the location of the bat recording has been mapped, this reflects the position of the recording device and only an approximate location of individual bats. During the surveys, few bats were visible making it difficult to determine the direction of travel, but it is considered likely that bats recorded on the eastern side of the site were commuting between areas of suitable foraging habitat.

4.4.6 Overall, the low number of bats recorded suggests that the Phase 1b site is not used by significant numbers of bats for commuting or foraging.

4.4.7 No evidence of bat roosts were found during the surveys. Common and Soprano Pipistrelles both normally emerge from their roost at around 20 minutes after sunset (BCT, 2010a/b) before flying off to feeding areas. Noctules typically emerge at or at times just before sunset (BCT, 2010c). Based on the timing of the Noctule contact 114 minutes after sunset, and the Soprano Pipistrelle contacts (between 56 and 102 minutes after sunset), the results do not suggest that any roosts of these species recorded are located close to the site.

4.4.8 Based on the timings of the first Common Pipistrelle contact on the second and third transects (44 and 49 minutes after sunset respectively), this does not suggest that these bats were roosting

close to the site. However, the first Common Pipistrelle contact on the first survey visit was 29 minutes after sunset. This suggests this bat was roosting in close proximity to the site.

Static monitoring

4.4.9 A total of seven species were recorded on the static detectors. Common Pipistrelle bats were most commonly encountered, followed by Soprano Pipistrelle and Noctule bats.

4.4.10 The data from the static detectors support the activity surveys in the analysis that the most commonly encountered bats on site are Common Pipistrelles, Soprano Pipistrelles and Noctules. However, whilst a large number of bat calls were recording during the duration of the monitoring period, it cannot be determined whether the calls are multiple bats or the same bat passing by the monitor multiple times.

4.4.11 Nathusius' Pipistrelle bats were recorded in June and September and both Brown Long-eared and Serotine bats were recorded in July. Three contacts from an unknown Myotis bat were recorded in September. However, these four species were not recorded during the transect surveys.

4.4.12 As shown in Tables 3.8 and 3.9, Common and Soprano Pipistrelle contacts comprised nearly all the total contacts recorded. Therefore, it is considered that the other species are only sporadically using the site.

Summary

4.4.13 The hardstanding and roads are considered to have little potential to support foraging bats. However, the vegetated areas are considered to have low – moderate bat foraging potential. The site does not contain linear features such as tree lines or hedgerows which would provide good value commuting habitat for bats although the pockets of scrub are likely to benefit bats commuting between areas of more favourable habitat in the wider area such as Milton Country Park to the north, the River Cam to the east and south, and Ditton Meadows and Stourbridge Common to the south.

4.4.14 Key areas of bat activity on the site were the scrub and trees, especially on the western side of the site which connects to suitable foraging habitat within allotments and the Bramblefields Local Nature Reserve, as well as potential roost sites in nearby buildings and mature trees.

4.4.15 The results suggest that the site is not used by large numbers of foraging or commuting bats. However, overall the site is considered to be of local value for foraging bats.

4.4.16 All of the Phase 1b site will be developed, although bats will still be able to commute along the Cambridgeshire Guided Busway and the railway track to the west and east respectively. The majority of the existing grassland, open mosaic habitat, trees and scrub will be removed, although new tree, shrub and ornamental planting is included in landscape plans for the site.

4.4.17 New planting should ideally include provision of trees that will be allowed to grow to mature height and plants selected for landscaping should include native flowering species.

4.4.18 Given the location of the site within Cambridge City, and the low number of bats recorded, it is considered that the loss of the scrub and trees on site will not have a significant adverse impact on the local bat population.

4.4.19 The Phase 1 habitat walkover in 2021 found that the value of the site for foraging and commuting bats remained unchanged/decreased since the 2018 surveys and it was still considered that the site was of local value for bats. The diversity and abundance of bat species recorded on site is likely to be unchanged since 2018 and therefore update surveys were not required in 2021.

4.4.20

4.5 Invertebrate Surveys

4.5.1 The survey identified 482 invertebrate species with 68 (14.1%) considered here as Species of conservation concern. This is a high proportion of scarce and rare species and confirms that the site continues to support a valuable assemblage of invertebrate species.

4.5.2 The survey was undertaken over 4 days and this allowed for more of the elusive and low-density species to be sampled.

4.5.3 Despite numerous changes to the habitat in some areas of the site, invertebrate diversity has not been reduced. The most important invertebrate assemblage at this site appears adapted to taking advantage of these open, sparsely vegetated habitats.

4.5.4 A copy of the report can be found in Appendix B (Gibbs, 2021).

4.6 Detailed Botanical Survey

4.6.1 The mosaic habitat found within the site is of varying condition and supports two notable species identified within the OMH lesser calamint *Clinopodium calamintha* designated as ‘Vulnerable’ and ‘Nationally Scarce’, and Burmuda grass *Cynodon dactylon* designated as ‘Nationally Rare’.

5 CONCLUSIONS

5.1 Invasive species

5.1.1 No Schedule 9 invasive species were found to be present within the boundary of the CB4 Phase 1b site, however *Cotoneaster Cotoneaster sp*, a Schedule 9 NNIS was recorded external but adjacent to the site.

5.1.2 Two species considered invasive were present on the site, Tree of Heaven *Ailanthus altissima* and Buddleia *Buddleja davidii*.

5.1.3 The control and management of invasive species on site will be required during construction.

5.2 Reptiles

5.2.1 The reptile survey recorded a single adult Common Lizard and a single juvenile Grass Snake on one occasion each on site.

5.2.2 These are the only reptile records across the whole Phase 1b area since the 2015 translocation undertaken by Atkins and probably represents a relict set of lizards missed in the previous translocation and a dispersing juvenile snake that had gained access to the area in the 2018 season.

5.2.3 Due to the small size of the site, and the small amount of suitable reptile habitat present, the loss of habitat within the proposed development area is not considered to have a significant adverse impact on the relict population of reptiles.

5.2.4 It is assumed that reptiles are absent from the site.

5.3 Breeding Birds

5.3.1 Two bird species of conservation importance were confirmed as breeding within the survey area in 2018. Dunnock and Song Thrush.

5.3.2 Any breeding population identified within the survey area is considered to be of national importance if it exceeded 1% of the national population. No breeding population of any species within the survey area approaches the 1% level of the national population.

5.3.3 The breeding bird assemblage at the site is considered of no more than of local importance.

5.4 Bats

5.4.1 The site has multiple species of bat using it for foraging/commuting with some rarer species such as noctule. The surveys have confirmed no roost sites for the surveyed area. Activity on site was again recorded as only low levels of bat activity.

5.5 Invertebrates

5.5.1 The survey confirms that the site continues to support a valuable assemblage of invertebrate species.

5.6 Detailed Botanical Survey

5.6.1 The site supports a mosaic habitat which in turn supports a variety of protected species. Habitats on site are of varying conditions.

5.7 Mitigation and Enhancement

5.7.1 Mitigation measures for a number of protected species will be required during construction. These will be detailed within the Construction Environmental Management Plan (CEMP) and Environmental Statement (ES).

5.7.2 Site enhancement will be required as part of the project to ensure net gain, this will be detailed in the Ecology Design Strategy.

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APPENDICES

Appendix A

Relevant Legislation

Reptiles

All common UK reptile species (Adder *Vipera berus*, Grass Snake *Natrix natrix*, Common Lizard *Zootoca vivipara* and Slow Worm *Anguis fragilis*) are protected through part of Section 9(1 and 5) of the Wildlife & Countryside Act 1981 (as amended). This prohibits:

- Intentional or reckless injuring or killing;
- Selling, offering or exposing for sale, or having in possession or transporting for the purpose of sale, any live or dead wild animal or any part of, or anything derived from, such an animal; or
- Publishing or causing to be published any advertisement likely to be understood as conveying buying or selling, or intending to buy or sell, any of those things.

Birds

All birds, their nests and eggs are afforded protection under the Wildlife and Countryside Act 1981, as updated by the Countryside and Rights of Way Act 2000. It is an offence to:

- intentionally kill, injure or take any wild bird;
- intentionally take, damage or destroy the nest of any wild bird while it is in use or being built; and
- intentionally take or destroy the egg of any wild bird.

Schedule 1 birds cannot be intentionally or recklessly disturbed when nesting and there are increased penalties for doing so. Licences can be issued to visit the nests of such birds for conservation, scientific or photographic purposes but not to allow disturbance during a development even in circumstances where that development is fully authorised by consents such as a valid planning permission.

Bats

All British bat species are fully protected under Schedule 5 of the Wildlife and Countryside Act 1981, as updated by the Countryside and Rights of Way Act 2000. All British bats are also included on Schedule 2 of The Conservation of Habitats and Species Regulations 2017 as European Protected Species. It is an offence to:

- intentionally or recklessly kill, injure or capture bats;
- deliberately or recklessly disturb bats (whether in a roost or not); and
- damage, destroy or obstruct access to bat roosts

A roost is defined as 'any structure or place which [a bat] uses for shelter or protection'. As bats tend to reuse the same roosts, legal opinion is that a roost is protected whether or not bats are present at the time of survey.

A licence will therefore be required by those who carry out any operation that would otherwise result in offences being committed.

The following bat species are listed as being of principal importance for the conservation of biodiversity in England, (commonly referred to as UKBAP Priority species): Barbastelle, Bechstein's, noctule, soprano pipistrelle, brown long-eared, greater horseshoe, and lesser horseshoe.

Appendix B

Invertebrate Survey Report

AN INVERTEBRATE SURVEY OF CHESTERTON SIDINGS, CAMBRIDGE NORTH STATION

David J. Gibbs

02 December 2021

This report was produced for RPS.

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This report should be quoted as:

Gibbs, D.J (2021). An invertebrate survey of Chesterton sidings, Cambridge North Station. Report to RPS.

Cover photograph: *Synanthedon formicaeformis* (Red-tipped Clearwing)

Contents

Figures

Tables

1 Summary

- The four days of sampling over eight dates in August 2020 and May and June 2021 produced a diversity of 482 species identified, a relatively high figure especially considering extreme weather conditions in August and cold conditions in May.
- Of these 68 (14.1%) are considered here as Species of conservation concern, 22 of them of RDB quality or equivalent.
- This is a very high quality, better than found in 2013, although that survey covered a larger area and with monthly sampling visits.
- While many key species are known to occur locally, some of them with good populations in the region, a few are otherwise rarely recorded, possibly unknown in Cambridgeshire.
- Of considerable interest is an Ichneumon wasp potentially new for Britain, but more research is needed. Also two cuckoo wasps otherwise only known from Kent.
- The Chesterton Sidings site is of the highest quality for its invertebrate communities, equivalent to some Breckland areas of conservation quality.
- Any loss of important habitat features will require mitigation either on or off site.
- The majority of any mitigation should be within or close to the 2021 survey area, OMH should predominate but include sallow, birch and poplar scrub and compartment D needs to be connected to the main mitigation area.
- Green roofs can be a very useful compliment to but cannot fully substitute for ground-level mitigation because the scrub and sallow-birch thicket component cannot be replicated on a roof.
- A management plant is required to ensure areas set aside for conservation are not scrubbed over, removal of invasive *Buddleja* and *Cotoneaster* should be prioritised.
- Repeat surveys every few years would be desirable to ensure mitigation areas and green roofs are maintaining the important invertebrate assemblages.

2 Introduction

The three days of survey of Chesterton Sidings adjacent to Cambridge North Station in 2021 are here combined with the results from the brief scoping survey in August 2020 to produce a robust four-day survey. This follows more extensive surveys done in 2013, and 2012 that covered a wider area (Kirby & Frost 2013). The 2013 survey, with monthly visits and a wide range of sampling techniques applied, recorded 1097 species of which 85 were Nationally scarce or RDB. Since then much has changes at this site, both in terms of clearance of some areas and the continued growth of scrub. After seven/eight years and with the ongoing changes to the habitat on site, it is reasonable to assume there will be changes in the invertebrate communities present. Much of the survey area is covered in dense birch and sallow scrub so sampling was confined to the open mosaic areas and the scrub margins. Over winter 2020-21 much scrub was cleared from large areas leaving bare substrate with very limited habitat remaining to sample. Two additional areas were added in 2021, not sampled in 2020, a small narrow strip beside the carpark and a long, narrow verge and adjacent scrub west of the guided Busway and south of the station.

3 Survey Methodology

3.1 Sampling Techniques

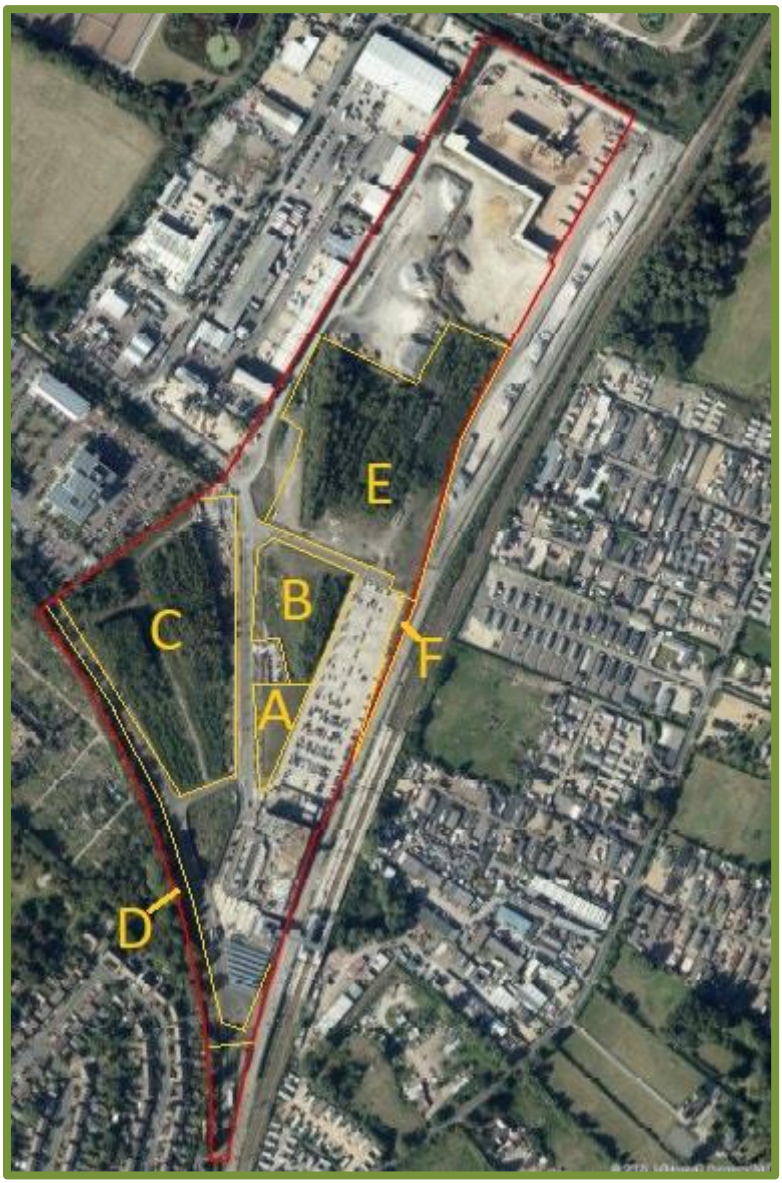
On each visit the whole of the survey area that was safely accessible was sampled using a sweep-net and by general searching. The time spent in each of the six compartments was in accordance with the size of the area and the extent of habitat that could be sampled. This varied from about half and hour in the small compartment F to over an hour in the larger compartments with plenty of habitat such as D and E.

Sweep-netting with a 40 cm diameter white-bag net was the main technique used. The net was swept from side to side as one paces steadily through the grass, herbage or scrub foliage. The same net was used to sample the foliage of sallow and birch along woodland/scrub margins. Specimens were extracted from the net with a pooter or, in the case of larger specimens, individually potted in 30ml soda glass tubes. When sampling was completed or the pooter became too full the contents were killed with ethyl acetate then transferred to 30ml soda glass tubes together with a data label.

Additionally a limited amount of ground searching was done in the open, sparsely vegetated areas, by looking under rocks and other debris.

The sample compartments are marked on the map (Fig 1).

Figure 1 Map showing sample compartments.



3.2SAMPLE TIMING

The site was visited on one occasion in mid-August spread over two dates, the 12 and 13th, and then again in early May 6-7th, late May 25-26th and finally in June 1st and 2nd. Four days allows good coverage across the season although the potentially important late June to July period was not covered.

3.3CONSTRAINTS

Every attempt was made to visit in warm, sunny and dry conditions, and on this survey, this proved very difficult. The need to book accommodation meant that the flexibility to take advantage of the best weather was not possible. On the 12 August conditions were very hot and humid, good conditions for Hymenoptera, but at 30°C+ it was too warm for many insects to be out in the open. The hot conditions generated thunderstorms over night and on the 13th it rained for two hours before work could start. On the 13th it was much cooler, and entirely overcast so sampling of compartment E was suboptimal. The spring of 2021 started very cold with ambient temperatures rarely sufficient for satisfactory sampling. On the 6 and 7 May it was cold, breezy but there was some sun although generally cloudy so conditions were certainly suboptimal. Conditions were similar from 25-26 May with low ambient temperature, cool wing but it was a bit sunnier with 50% cloud cover. The final visit on 1-2 July was warm dry and sunny, ideal conditions for sampling invertebrates.

Additionally the removal of large areas of vegetation over winter 2020-21 combined with the cold spring meant there was very little vegetation to sample in some areas, notably most of compartments A and C and a large part of compartment B. By July ruderal vegetation had developed on these areas and good samples were obtained.

3.4IDENTIFICATION

Where practical, invertebrates were identified in the field but wherever the slightest doubt existed, one or more specimens were collected for more detailed scrutiny. To achieve rigorously accurate identifications, specimens were identified using the author's own library and entomological collection. Where these proved insufficient, specimens were submitted to relevant experts. Selected specimens have been retained in the author's personal collection as vouchers.

3.5TAXONOMIC COVERAGE

It is desirable that as wide a taxonomic range as possible is identified, in order to sample numerous ecological types, i.e. invertebrates with widely differing natural histories. As there was only a limited amount of time available for identification, it was important to name the more readily identified groups which do not require very time-consuming techniques or are out with the experience of the worker.

The following orders and families of invertebrates were named to species.

Isopoda – Woodlice

Araneae – Spiders

Raphidiidae – Snake flies

Neuroptera - Lacewings

Odonata - Dragonflies and Damselflies

Orthoptera – Grasshoppers and crickets

Dermaptera – earwigs

Hemiptera, Auchenorrhyncha - Froghoppers, Leafhoppers and Planthoppers (excluding females of difficult genera)

Hemiptera, **Heteroptera - True Bugs** (excluding smaller Miridae)

Hemiptera – Aphididae (few conspicuous species only)

Lepidoptera – Butterflies and Moths

Coleoptera – **Beetles** (all except small Aleocharine rove beetles and other very small obscure families)

Diptera - True Flies (except, Cecidomyiidae, Chironomidae, Ceratopogonidae, Simulidae, Phoridae, Sphaeroceridae, and females of some groups which are not identifiable).

Hymenoptera, Aculeata – Sawflies, ants, wasps and bees

Mollusca – slugs and snails

3.6 ANALYSIS

The quality of the site for invertebrates has been assessed with reference to the species found which are considered to be nationally scarce or rare by the various Natural England Commissioned Reports published by JNCC (e.g. Falk 1991a; Falk 1991b; Hyman, 1992) and subsequently Natural England. These reviews place all nationally scarce species into categories according to their degree of rarity and their vulnerability to extinction and are accepted as the "official" JNCC/NE designations (see Appendix 1). The more recent ones also assess taxa with reference to IUCN threat categories.

Since the first reviews were published in the 1990's selected families have been updated and this process is ongoing. But this still leaves many groups (e.g. Tipulidae and Sciomyzidae) where statuses have remained unchanged for nearly 30 years while other families (e.g. Larger Brachycera Drake 2017) have been updated very recently. For this reason, in order to facilitate the greatest consistency with earlier surveys, species that were included in earlier reviews, but have lost their status recently, are included in the analysis. These species, no longer considered of conservation concern, are indicated as such in the species accounts. In addition, a number of species that still have official national status but are clearly much more frequent than formerly, and will probably have their status removed when their family is updated, are indicated as such.

Additionally an attempt has been made to gauge the value of the site within a local and regional context. Many of the Nationally Scarce species are also very uncommon in a local or regional context. Also many species which do not merit inclusion in "The reviews of scarce insects" are none-the-less scarce within the region. Biodiversity Action Plan and Amber List species are important here, although the BAP species are heavily skewed towards the Lepidoptera.

As a simple and readily comparable indication of quality, the proportion of Nationally Scarce and RDB species of the total diversity is calculated. The same is done just for the rarest taxa with RDB status. Depending on the habitat type, a proportion of scarce/RDB between 3-5% needs to be exceeded before it can be safely concluded that the site has some conservation significance. Very high-quality sites of national importance will have a proportion close to or exceeding 10% Nationally Scarce/RDB species.

4 Results

4.1 OVERALL RESULTS

The survey identified 482 species of invertebrate (Appendix 2), a very good diversity for four visits, especially given the rather sub-optimal weather conditions on three out of the four visits and, loss of significant areas of habitat before the 2021 surveys dates. A broad range of invertebrate groups was covered to a greater or lesser extent and the species list includes representatives of the following groups: woodlice, spiders, snakeflies, lacewings, dragonflies & damselflies, grasshoppers & crickets, earwigs, true bugs, froghoppers, aphids, moths, butterflies, beetles, true flies, sawflies, wasps, bees, ants and snails. The main technique of sweep-netting was most efficient at sampling flying insects with Diptera found in the greatest number (164 species, 34%). The second largest group found was Hymenoptera (125 species, 26%). Third most diverse was Coleoptera and Hemiptera (97 species each 20%), then Lepidoptera and (44 species 9%).

Of the 482 species identified by this survey, an impressive 68 (14.1%) are considered here as Species of conservation concern (defined in section 3.6). 14.1% is an exceptionally high proportion of scarce and rare species, comparable with some of our highest quality reserves, rich southern heathlands or ancient woodlands. This result is significantly better than found in the 2013 survey (Kirby & Frost 2013) when 6% scarce species were found. This strongly indicates that the quality found in 2013 is still present and far from diminished and, at least within the 2020-21 survey area, appears to be much improved. Also very impressive is the number of RDB species found (22 species 4.6%), a lower proportion than found during the one-day scoping survey, but much more likely to be reliable after all four days of survey data are included.

An analysis of the important species found reveals that several are not any longer of great conservation concern. In **Table 1** below twenty species have been highlighted in grey as no longer of national conservation status despite still having this status officially in most cases. These are species that have significantly increased in range and abundance in recent years, possibly due to more favourable climatic conditions, or were much overlooked in the past and have subsequently been shown to be commoner than thought. This proportion of scarce species that are getting commoner is about 30%, very typical for this kind of survey, and less than found on the one-day scoping survey (40%). The Four days has allowed more of the elusive and low-density species to be recorded. Nineteen species highlighted in yellow in the species column really do merit attention as they are judged still to be of national conservation significance not obviously increasing in abundance or range. Many of these are well known to be Breckland species (*Mogulones geographicus*, *Cerceris quinquefasciata* and *Hedychrum niemelai*), the dry, sparse vegetation at Chesterton Sidings being a good analogue of classic Breckland habitat. Others such as *Nemophora fasciella*, *Tachydromia connexa*, *Polistes dominulus*, *Hedychridium caputaureum, Holopyga ovata* and the *Temelucha* sp have too few regional records to say more than that they are likely to be regionally very important.

Table 1 Summary of scarce species.

Species	National Status	Current status nationally	East Anglia Status
Nigma walckenaeri	**(Nationally Scarce a) None**	Slowly spreading	well established and not uncommon
Bathysolen nubilus	**Nationally Scarce b**	still rare but probably increasing in range	East Anglia is an important area for the species
Gonocerus acuteangulatus	**(RDB1) None**	Remarkable increase in range and food-plant.	newly invading Cambridgeshire
Lygus pratensis	**RDB3**	Massively increased, no longer of conservation concern	As national situation
Asiraca clavicornis	**Nationally Scarce b**	Possibly increasing and spreading but still local	Few local records but perhaps becoming more frequent.
Nemophora fasciella	**Nationally Scarce a**	Very local are rarely encountered, all recent records in Eastern England	Rare in Cambridgeshire but potentially an important area.
Phyllocnistis xenia	**Nationally Scarce b**	Slowly increasing in range but mainly eastern	An eastern species
Cydia servillana	**Nationally Scarce b**	Local and rarely encountered, possibly elusive so overlooked	Very local in area buy probably under recorded
Synanthedon formicaeformis	**Nationally Scarce b**	Local and elusive but probably commoner than records suggest	Fairly frequent in the Brecks and Cambridgeshire.
Bembecia ichneumoniformis	**Nationally Scarce b**	Now known to be too common to merit scarce status, much overlooked	Probably common but under recorded
Calophasia lunula	**RDB3**	Much increased in range and no longer of RDB status	Frequent in East Anglia
Hecatera dysodea	**RDBK**	Much increased in range and no longer of RDB status	Frequent in East Anglia

Dasytes plumbeus	**Nationally Scarce b**	Local but probably under recorded	Probably not uncommon but under recorded
Hippodamia variegata	**Nationally Scarce b**	becoming commoner	RDB listed, apparently rare in East Anglia but this likely to be out of date
Mordellistena acuticollis	**RDBK**	Very local but likely to be under recorded, probably spreading	several records in region, overlooked
Mordellistena pseudopumila	**RDBK**	Very local but likely to be under recorded, becoming much commoner	Much overlooked, local status uncertain
Variimorda villosa	**Nationally Scarce b**	Widespread but very local	On the edge of its range here so rare.
Bruchus atomarius	**Nationally Scarce b**	Widespread but local	Local. Probably overlooked
Cryptocephalus rufipes	**RDBK**	A recent coloniser, otherwise only known in Essex, likely to become commoner	First Cambridgeshire record, newly colonising.
Podagrica fuscicornis	**Nationally Scarce b**	widespread but very local	Relatively frequent in Cambridgeshire which seems to be an important area for it.
Podagrica fuscipes	**Nationally Scarce a**	widespread but very local	Relatively frequent in East Anglia and southeast England
Aulacobaris picicornis	**Nationally Scarce b**	Very local and scarce, mainly in Eastern England	Few local records but Brecks possibly important
Glocianus punctiger	**Nationally Scarce b**	Very local and scarce, mainly in Eastern England	Few local records but Brecks possibly important
Mogulones geographicus	**Nationally Scarce b**	Very local and scarce, mainly in Eastern England	Few local records but Brecks an important area
Stenocarus ruficornis	**Nationally Scarce b**	A very widespread species but rarely found.	Rare in East Anglia but known from Cambridgeshire where local
Polydrusus flavipes	**Nationally Scarce b**	Widespread but probably overlooked	seems to be very local in area, with few or no records close to Cambridge
Polydrusus formosus	**Nationally Scarce a**	Much increased and probably no longer of conservation concern	Seems to be frequent in region
Chorisops nagatomii	**Nationally Scarce**	Much commoner than formerly and probably no longer deserving of National status	Fairly frequent in Cambridgeshire
Platypalpus albicornis	**(Nationally Scarce) None**	More widely recorded than formerly and much under recorded	Probably not rare nut overlooked
Tachydromia connexa	**RDB3**	Widely scattered and very rare or much under recorded	Probably new for Cambridgeshire
Meligramma trianguliferum	**Nationally Scarce**	Widespread but elusive and rarely encountered	Local and scarce
Triglyphus primus	**Nationally Scarce**	Widespread and elusive so probably under recorded	Cambridgeshire possibly an important area for this hoverfly
Volucella zonaria	**Nationally Scarce**	Much expanded in range and fairly frequent	Likely to be common around the city
Urophora solstitialis	**(RDB3) Nationally Scarce a**	Increasingly recorded, either increasing or more often identified	The Brecks are an important area for this species
Oxyna parietina	**Nationally Scarce b**	Increasingly recorded, probably overlooked formerly	Probably fairly frequent
Tephritis divisa	**RDBK**	A recent arrival, much increased, no longer of conservation concern	Now well established and common
Tephritis matricariae	**RDBK**	A recent arrival, much increased, no longer of conservation concern	Now well established and locally frequent.
Homoneura mediospinosa	**RDB3**	Rare and little recorded, traditionally associated with ancient woodland	Seems to be new for Cambridgeshire

Homoneura notata	**pNationally Scarce**	Scattered and infrequent	Scarce but probably under recorded
Homoneura patelliformis	**Nationally Scarce**	Widespread but scattered and poorly recorded	Possibly new for Cambridgeshire but under recorded
Homoneura thalhammeri	**Nationally Scarce**	Widespread and increasingly recorded, probably not of conservation concern any more.	Probably frequent but few records in region.
Pseudolyciella pallidiventris	**RDBK**	Poorly recorded but clearly commoner than this status suggests	Probably frequent but few records in region.
Sapromyza quadricincta	**Nationally Scarce**	Poorly recorded but clearly commoner than this status suggests	Probably frequent but few records in region.
Oscinimorpha arcuata	**pNationally Scarce**	Widespread but very local and under recorded	Local and scattered but probably under recorded
Oscinimorpha sordidissima	**pNationally Scarce**	Widespread but very local and under recorded	Local and scattered but probably under recorded
Trachysiphonella scutellata	**(Nationally Scarce) None**	Widespread and frequent but under recorded	Local and scattered probably frequent.
Rondania fasciata	**Nationally Scarce**	Local and infrequently recorded in recent years	Known in region but not in the city.
Gastrolepta anthracina	**None (RDB2)**	No official status but seems to be very uncommon	Very local and probably under recorded
Solieria fenestrata	**None (Nationally Scarce)**	Widespread but local and very uncommon, probably overlooked	Very scare in region
Actia lamia	**None (Nationally Scarce)**	No official status but proposed, possibly getting commoner	Probably locally frequent
Temelucha cf decorata	**New for Britain**	Needs confirmation, could be one of two species, either would be new for Britain	The two males found on this survey are the only ones known from Britain
Crossocerus distinguendus	**Nationally Scarce a**	Probably a recent colonist, apparently becoming commoner and spreading	Still very local in in Cambridgeshire
Pemphredon morio	**Nationally Scarce b**	Although widespread in England, rarely encountered	Very rare in East Anglia but one record in Cambridge
Philanthus triangulum	**RDB2**	The Beewolf has expanded remarkably in range and abundance and no longer of conservation concern	Well established in region
Polistes dominulus	**RDBK**	Probably increasing but still very infrequent	Few if any other East Anglian breeding records away from Thames estuary.
Cerceris quinquefasciata	**RDB3**	Although not quite as restricted as formerly, still rare and local	The Brecks and Thames gateway are the national strongholds for this species
Andrena trimmerana	**Nationally Scarce b**	Confined to southern England and S Wales, possibly getting commoner	Common in Essex but much rarer in Cambridgeshire
Hylaeus cornutus	**Nationally Scarce a**	Southern and eastern species, possibly increasing but still scarce	Well recorded in Cambridgeshire and the Brecks
Hylaeus pictipes	**Nationally Scarce a**	Southeast England, very scattered elsewhere	Populations centred in Essex and the Brecks
Hylaeus signatus	**Nationally Scarce b**	Widespread, predominantly southern, evidence that it was becoming commoner possibly not sustained	Scattered but good population in the Brecks to Cambridgeshire
Lasioglossum pauperatum	**RDB3**	Very local with nearly all recent records from Essex	Rare but there are records close to Cambridge
Lasioglossum pauxillum	**Nationally Scarce a**	Widely distributed in S England, apparently getting commoner and spreading	Frequent in the region

Heriades truncorum	**RDBK**	Very local and uncommon, some evidence of increased range but probably due to more intensive recording of bees.	Local but well established in East Anglia, especially the Brecks.
Hylaeus signatus	**Nationally Scarce b**	Although not quite as restricted as formerly, still uncommon and local	Scattered, mainly in the Brecks.
Sphecodes crassus	**Nationally Scarce b**	Widespread in Britain but very local and probably over-looked	Widespread but mainly in the Brecks.
Hedychridium caputaureum	**First for Britain**	New For Britain	At time of record only known British locality [subsequently a predated record from Kent]
Hedychrum niemelai	**RDB3**	Very local in southern England.	Good populations in the Brecks
Holopyga ovata	**RDBK**	Discovered in Kent in 2020, this is the third British record and most northerly	New for east Anglia
Lasius brunneus	**Nationally Scarce a**	Patchily distributed in England and Wales, getting commoner and apparently spreading	Uncommon in region but probably becoming commoner.

4.2 ASSESSMENT OF COMPARTMENTS

The sample sizes at a compartment level were good, only that from the small, linear compartment F being rather too small to be confident that the result is robust. Some of the compartments changed dramatically between the 2020 and 2021, especially compartment C, but the majority of the data comes from the three days in 2021, so it is reasonable to assume that these results are relevant to the compartments as they were in June 2021.

4.2.1 Compartment A

This small area is mostly dry, sparsely vegetated ruderal mosaic with a range of flowering plants and developing shrubs. The woody plants are all still little more than saplings so there are no shady areas. Over winter 2020/21 this area was flailed and in part dug over, much reducing the vegetation, but it was recovering by June 2021. 121 species recorded, a quite remarkable diversity for such a small, level site with no significant scrub element. Of these 15 have conservation status to some degree, a very impressive 15%, very similar to the overall result. Three species have RDB or equivalent status, a proportion of 2.5%, also very high. Four of the key species are no longer of much or any conservation concern, but even if these are excluded, we still have 9% species of conservation concern.

4.2.2 Compartment B

Much of the area is very like compartment A with the addition of a dense strip of Sallow and Birch scrub along the eastern margin. Most of the open area of ruderal and perennial flora was severely flailed in winter 2020/21 so almost devoid of vegetation in spring 2021. Although not the largest compartment, it proved to be very diverse, the 160 species exceeding the total found in the much larger compartment E. Of these 16 (10%)are considered here to be of conservation significance, a good result but lower than found in any of the other compartments. Six of these have RDB or equivalent status, a proportion of 3.8%, a very good quality. Seven of the species found here are probably no longer of much conservation concern, so if these are excluded we get a proportion of 5.6% species of conservation concern, low relative to the overall result (even with the lower concern species excluded). However, it was this compartment that produced both of the most important finds of the survey the two species new for Britain the ichneumon *Temelucha* cf *decorata* and the Chrysididae *Hedychridium caputaureum* which very much compensates for the overall lower quality.

4.2.3 Compartment C

A relatively large area, in August 2020 much of this compartment was covered in dense thicket and only accessible along the margins, and in the southern part dense developing scrub only accessible in small parts. Through the scrubbed over areas were open tracks with a good flora which produced most of the invertebrates recorded. The limited access meant that relatively few invertebrates were recorded despite the hot conditions, but amongst them were enough scarce species to show the potential of the area. Over winter all the thicket was cleared, leaving only a few trees and hedgerow along the north side, and a few other patches of vegetation around the margins. Despite this clearance work, over the four days 183 species were recorded, the second most productive area, the vast majority of these recorded in 2021, after the removal of almost all vegetation. Of these 27 are considered here to be of conservation significance to a greater or lesser degree, a proportion of 15%, which is an extraordinarily high. Even more impressive is the 10(5.5%) RDB or equivalent species found. Nine of the species recorded are probably no longer of much conservation concern, but even with these species excluded, we still have almost 10% scarce species, clearly indicating habitat considerable value for invertebrates.

4.2.4 Compartment D

This compartment was not included in the 2020 scoping survey, so the results are from just the three days in 2021, two of them cold and suboptimal. The area is long and narrow, consisting of a grassy roadside verge and the scrub and trees backing it, some of it recently planted. At the very southern end there is some rougher, more ruderal habitat, with exposed substrate and some nice perennial flora. The three samples in May and June produced 189 species, the highest diversity of any compartment on this survey, despite fewer samples that compartments A,B,C and E. Of these 23 are of conservation significance, a proportion of 12%, a little lower than the overall result but given the variability of such data, and the lack of an August sample, it can be seen as very similar in quality to the main body of the site. If the species that are no longer of much conservation concern are excluded, we still have a proportion of 7.4% which is highly indicative of habitat supporting important invertebrate communities.

4.2.5 Compartment E

This is the most northerly compartment consisting of areas of open mosaic that were readily accessible but much of the area is densely scrubbed over and the northern part of the compartment difficult to access with only small semi-open areas. The August sample was taken in poor conditions, while still warm, it was overcast and had been raining for much of the morning. Only the June 2021 sample was in ideal conditions. This is the only compartment sampled in both 2020 and 2021 that remained unchanged, other than some fly-tipping in one corner. A total of 149 species were recorded, most of them in 2021, a relatively low number compared to the smaller compartment B, in large part due to the poor weather conditions during the sampling and difficulty of access. Of these a total of 29 have conservation significance higher than any other compartment despite the lower diversity found. This gives a proportion of 19%, significantly better than the overall result and the best of the six compartments. The 9 (6%) RDB or equivalent species found is also the highest proportion on the survey. If the 9 species of limited conservation concern are excluded we still get a proportion of key species of 13.4%, an exceptionally high quality. Add to this the presence of *Temelucha ?decorata* new for Britain and *Holopyga ovata* third British record, and compartment E is an excellent habitat with much potential.

4.2.6 Compartment F

This very small area of habitat squeezed between the car park and the railway line fence was not part of the 2020 survey, so only two May and one June sample was taken. It is dominated by coarse herbaceous vegetation, and a steep east-facing bank has much potential for nesting Hymenoptera. Only 72 species recorded, a diversity that reflects the small size of the

compartment and lack of August sample. Nevertheless if yielded eight species of conservation significance a proportion of 11%, lower than the overall result but still indicative of good quality habitat. Three of these species are RDB or equivalent, a proportion of 4% which is very high. Although this compartment has a lower proportion of scarce species than most (only compartment B is lower) only one of these is a species that is no longer of much conservation concern, the much overlooked beetle *Mordellistena pseudopumila*. Two of the species found here are very important, the rare digger wasp *Cerceris quinquefasciata* (widespread on the survey area) and the cuckoo wasp *Holopyga ovata* otherwise only known from two records in Kent in 2020 and one other from compartment E on this survey.

5 Key Species

5.1 Red Data Book

5.1.1 *Gonocerus acuteangulatus* Box Bug (RDB1) None

Historically a very localised species, until recently only known from Box Hill, Surrey. Recently it has been found elsewhere, and now occurs widely in the south-east of England and beyond. Formerly it was entirely confined to Box *Buxus sempervirens* but since its spread has been recorded exploiting different food plants, including hawthorn, buckthorn, yew and plum trees. Given this distributional increase and greater range of hosts, its RDB1 status has been reviewed and removed (Bantock 2016). One swept in compartment E

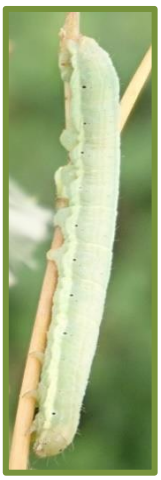
5.1.2 *Lygus pratensis* RDB3

This largely green mirid bug was formerly known from southern Britain from Kent to Hampshire and north to Berkshire, mostly confined to southern heaths. However, it seems that this bug has recently undergone a dramatic range expansion. It is now widespread throughout much of southern Britain and is much commoner than its RDB3 status suggests (British Bugs). Older records come from rides in ancient woodland, open herb-rich areas and heathland. On the continent known to be polyphagous with two generations annually (Kirby 1992). Noted in compartments B and E

5.1.3 *Calophasia lunula* Toadflax Brocade RDB3

This very attractive moth and its even more striking larvae arrived in Britain around 1950 and was initially restricted to the south-east and central southern coasts of England. Since than it has spread north and inland, recently arriving in South Wales (pers. obs.). There is some suggestion that it is declining again (UK Moths) but if so this is not reflected in its range. Mainly frequents shingle beaches and grassy waysides, so called brown-field sites often proving favourable. It has two generations, sometimes overlapping, from May to August, and migrants sometimes appear away from the main stronghold in July and August. The larvae, which feed on toadflax (*Linaria* sp), can be found from late June to October. Both larvae and one adult in compartments C and D

5.1.4 *Hecatera dysodea* Small Ranunculus RDBK



This attractively patterned grey and white moth was frequent in parts of East Anglia and London up to 1895. It then declined rapidly and had all but disappeared by 1912, subsequent records in the early 20th century probably referring to migrants. It was absent from Britain as a breeding species from before WW2 to the late 1990's when small colonies became established in Essex and Kent. Over the last 20 years it has slowly consolidated its presence, and in the last 10 years has rapidly spread across England, and is now frequent across much of south-central England and South Wales. The

remarkably reversed fortunes of this species means that it is no longer of conservation concern. However, the reasons for its extinction in Britain in the early 20th century is unexplained so this moth is still of interest until it is certain that its current success is permanent. The caterpillars feed on *Lactuca serriola* Prickly Lettuce. Larvae noted in compartment E.

5.1.5 *Mordellistena acuticollis* RDBK

This tiny black beetle is a recent arrival in Britain and is difficult to identify so its true status is as yet uncertain. It was first recorded in Britain in Kent in 1984 and has subsequently spread across southeast England west to south Wiltshire (Hodge 2002) Bath and Birmingham, with several records in East Anglia (NBN). Known from woodland margins and rough, weedy grasslands where it has been found in association with creeping thistle. Adults are recorded in July (Hyman & Parsons 1992). Swept in compartment C.

5.1.6 *Mordellistena pseudopumila* RDBK

This elongate black flower beetle is one of several similar species which require dissection and critical examination for correct identification. Very little known in Britain with all records on NBN being in the south and east from Cornwall to Norfolk, also South Wales (pers. obs.), very likely to be much overlooked. Known from chalk grassland where the larvae probably develop within plant stems. Adults recorded in May (Hyman & Parsons 1992). Swept in compartments C and F.

5.1.7 *Cryptocephalus rufipes* RDBK

This attractive pot-beetle (Chrysomelidae) is a very recent arrival in the UK when it was found in south Essex in 2018 (Telfer 2019). Subsequently it was found elsewhere in Essex and in London and it seems likely to spread rapidly. This is probably the first record for Cambridgeshire. This beetle feeds on Willows and Sallows (*Salix*) and poplars (*Populus*) and the first records were from habitat broadly similar to that at Chesterton Sidings. An earlier species than many of the genus adults appearing predominantly in June (Telfer 2019). One swept in compartment E.

5.1.8 *Tachydromia connexa* RDB3

This small black Hybotid fly with banded wings is widespread in England and Scotland but most are old records with very few post-1960 observations. None of the recent records are from Cambridgeshire but one is from Huntingdonshire (Falk & Crossley 2005) and one from Essex (Mapmate data).Known from river shingle, a gravel pit and a chalk quarry. A single female swept in compartment C.

5.1.9 *Tephritis divisa* RDBK

This attractive gall fly was recorded new to Britain from Sussex in August 2004, when they were swept off bristly oxtongue on the outskirts of Bognor Regis. Later the same month the fly was found to be present in large numbers at the original site and was also notes two other Sussex sites in September 2004. Examination of reference collection turned up another specimen from Newhaven, August 2002 showing that the species had been present in Britain for several years. Subsequently the species has been recorded in Essex where it is now well established along the Thames Gateway, with scattered records in North Essex (Hodge, 2005). There is even a recent record from Somerset so it is now well established in Britain and seemingly spreading rapidly in common with several other colonising Tephritids. *Tephritis divisa* is a native of southern Europe. The larvae develop in the flower heads of *Helminthotheca* (*Picris*) *echioides* and possibly other related species. Frequent, recorded in compartments A, B, C and D.

5.1.10 *Tephritis matricariae* RDBK

This gallfly with patterned wings was only added to the British list in 2000 based on specimens found in April of that year at Sandwich Bay (Clemons 2000). Since then it has spread rapidly around the Kent coast and with a few records inland (Clemons 2004) and it is now recorded in London (NBN). It is clearly colonising this country fast and is known in the Brecks (pers. obs). The original records were from the dunes at Sandwich and since it has been found on grassy areas in Canterbury and chalk downland between Folkestone and Dover. The larvae develop in the capitula of *Crepis* with *vesicaria*, *taraxacifolia* and *capillaris* the most likely species to be favoured (Clemons 2000). Adults seem to be active from April to September. Only noted in compartment E.

5.1.11 *Homoneura mediospinosa* RDB3

This small yellow Lauxanid fly is recorded widely in Southern England (Hampshire, Sussex, Kent, Surrey, Hertfordshire, Norfolk, Huntingdonshire, Northamptonshire, Herefordshire and Worcestershire) and an isolated record from North Wales (Merionethshire). No records from Cambridgeshire but known from adjacent Norfolk and Huntingdonshire. Certainly a very scarce species but also likely to be overlooked. Most records refer to damp broad-leaved woodland, but also from wetlands, possibly in shaded situations or associated woods. Its biology unknown; larvae of this genus are generally believed to develop in decaying vegetable matter including fallen leaves. Adults recorded from May to July (Falk, Ismay & Chandler 2016). A male swept in compartment E.

5.1.12 *Pseudolyciella pallidiventris* RDBK

A grey and yellow Lauxanid fly which, until recently, was confused with two other species in Britain. For this reason the true status and distribution of this species is yet to be fully elucidated but this is one of the less frequent ones. Thus far it is known from rather more than a dozen sites in England north to Yorkshire but it is certainly under recorded at this time and a future review will very likely demote or remove its status. Known from Cambridgeshire, probably frequent. Probably prefers woodland. Its larval biology is unknown but other members of this genus (*sensu lato*) have been reared from a range of situations including leaf litter, soil, dead wood, bird nests and moss. Adults recorded from June to September (Falk, Ismay & Chandler 2016). Noted in compartments C and D.

5.1.13 *Gastrolepta anthracina* None (RDB2)

This shiny black paraisitoid fly is widely scattered across southern England north to Cheshire, but mainly in the London area. At least one record from near Cambridge (NBN). This species has no official conservation status but has been proposed for such in a draft review covering Tachinidae yet to be published (Falk & Pont in prep.). It may ultimately not be afforded this status but is certainly a scarce species worthy of some conservation status. Found in compartments C and D.

5.1.14 *Polistes dominulus* European Paper Wasp (RDBK)

This social wasp has no official status as when these were applied the species was assumed to be only a vagrant to this country. However, it is now clearly present as a breeding species in the southeast of England so deserving of some attention. Apart from isolated records presumed to be casual introductions, all records are in the vicinity of the Thames or further south so a Cambridge record is particularly noteworthy. These wasps construct nests in April, often closely associated with human habitation, lasting to October, or even later. Initially worker

females are produced, with males appearing towards the end of the year. Females mate in the early autumn and hibernate, the males and unmated worker females dying. They are non-selective predators, taking a wide range of invertebrates, also visit a variety of flowers, Fennel being particularly favoured (BWARS). Three seen in compartments A and C, with both sexes noted strongly suggesting a nest close by.

5.1.15 *Cerceris quinquefasciata* 5-banded Tailed Digger Wasp RDB3/BAP

The 5-banded Tailed Digger Wasp is a very rare and restricted species with records scattered across the south from Cornwall to Norfolk. Most records are from the Brecks, the Thames estuary and Oxfordshire (Edwards 1997) and it has recently reappeared on the Dorset heaths. The Brecks are perhaps the most important stronghold for this species in Britain so this Cambridge population is likely to be derived form there. Frequents open, sandy situations such as heathland and sand pits and other disturbed locations. They nest in bare or sparsely vegetated, sandy substrates where fully exposed to the sun, hard substrates, such as the margins of paths, seem to be particularly favourable. Nests are stocked with small weevils averaging 50 per cell, and with about 10 cells per nest this wasp requires a very large population of these beetles. They are known to take a variety of weevil species with *Apion* and *Strophosoma* recorded in Britain. Adults recorded from mid-July to late August (Falk 1991a). Frequent, found in compartments B,C,D and F.

5.1.16 *Philanthus triangulum* Bee Wolf RDB2

The Bee-wolf is a large, spectacular black and yellow wasp which not long ago was a great rarity in this country. Once confined to just a couple of sites on the Isle of White (Richards 1980) it is now widespread over southern England and expanding northwards rapidly (Edwards 1997). In the light of this great increase in range its status will have to be downgraded to Nb or probably removed altogether. Well established in East Anglia. It frequents warm sunny areas on light, well-drained soil where it digs nests up to 1m in length with 3-34 lateral chambers. These are stocked with worker honeybees Apis mellifera (Edwards op.cit.). Only seen in compartment B.

5.1.17 *Lasioglossum pauperatum* RDB3

This small black solitary bee is very local nationally, recorded from several southern counties as far north as Norfolk and as far west as Devon, but with very few recent records except in south Essex near the Thames where it seems to be reasonably widespread. Away from its stronghold in South Essex and North Kent, it is very scattered but there is a record close to Cambridge (NBN). It is presumed to nest in light soils in sunny situations. Pollen sources are unknown, but flower visits include *Senecio* and *Crepis* (BWARS). Found in compartment E.

5.1.18 *Heriades truncorum* RDBK

This small, black solitary bee has always been considered to be scarce, mostly associated with the Surrey commons. Its apparent association with pines in southern England led to the assumption that it was a recent arrival in Britain. However, it is now known that it is not dependant on pine. Restricted to south-east England south of the Thames and east of the Solent and in East Anglia, east Essex and the Brecks. There are several records in Cambridge on NBN. They build their nests in beetle burrows in dead wood, occasionally holes in brickwork or bramble stems, in sunny positions. Females stock their nests with pollen from yellow daises (Edwards 2007). Found in compartments A and D.

5.1.19 *Hedychridium caputaureum* First for Britain

This attractive red and green cuckoo wasp is the first example recorded in Britain as far as can be discovered. It is very close to the common *Hedychridium roseum* (also recorded on this survey) differing only in the metallic colours of the thorax and nature of punctures on the tergites. After comparing the male specimen with my reference material of *H. roseum*, I sent photographs to the European expert, Dr Juho Paukkunen who agrees with the identification

(however he has not seen specimens). It seems unlikely to have colonised Cambridge first so this is either a very rare and overlooked resident species, or its arrival on more coastal localities has not been noticed because of the great similarity with *H. roseum* [subsequently a record from 2004 in Kent has come to my notice, so it appears that this species has been in Britain at least 17 years without being noticed]. Known to be a parasitoid of *Astata minor*, a species not known in Britain, but on the continent can be found in the absence of this wasp so presumably also uses *Astata boops* (Juho Paukkunen in litt. Paukkunen *et al*. 2015) and the Kent individual was photographed at the nest of *Astata boops*. A single male swept in compartment B.

5.1.20 *Hedychrum niemelai* RDB3

This beautiful blue and red metallic cuckoo-wasp has a very restricted distribution in Dorset, Hampshire, Surrey and the Thames Valley with a few localities in Cornwall. There are old and very scattered records north to Lincolnshire, including the Brecks (Edwards & Telfer 2002) and now known to be well established in the Brecks (pers. obs, BWARS). Found on open sandy areas, particularly heaths, coastal dunes and sand pits and has a requirement for exposed substrate. It is a parasitoid of *Cerceris* wasps, perhaps only using *C. quinquefasciata* in this country, itself now a rare insect. Adults recorded from June to September. Found in compartments C and D.

5.1.21 *Holopyga ovata* None (RDBK)

Another very striking cuckoo wasp, this one historically only known from Sark and Jersey in the Channel Islands (BWARS). It was first discovered on mainland UK in North Kent just last year, with a second being found, also in Kent, a short while after in 2020 (Dodd & Hodge 2021). It has no official status because species on the Channel Island only were not included in the review of Aculeate Hymenoptera. Associated with open sandy habitats with some bare soil between April and June visiting various flowers including Fennel, wild mignonette and wild parsnip (BWARS). A parasitoid of the sphecid wasp *Astata boops*. Swept in compartments E and F.

5.2NATIONALLY SCARCE

5.2.1 *Nigma walckenaeri* (Nationally Scarce a) None

This attractive small green spider is mainly a species of the Thames Valley, East Anglia and the East Midlands and in the west the Severn Valley. Appears to be getting more frequent with many recent records outside this range and its national status was removed in a recently updated review (Harvey et al 2017). Found on hedgerows, scrub, parks and suburban gardens. They construct a web across the curved surface lilac, forsythia, holly and ivy being favoured. Although adults can be found in most months, mainly from August to October (Spider and Harvestman Recording Scheme). One female swept in compartment B.

5.2.2 *Bathysolen nubilus* Cryptic Leatherbug Nationally Scarce b

This well camouflaged Coreid bug was historically very rare but has expanded its range in the south-east and East Anglia, although is still very much an eastern species. They feed on members of the pea family, particularly Black Medick *Medicago lupulina* on a variety of dry and sparsely vegetated habitats. Nymphs can be found June to August. It is very terrestrial and unobtrusive so quite likely to be under-recorded (Bantock 2016). One adult found in compartment A.

5.2.3 *Asiraca clavicornis* Nationally Scarce b

A very distinctive planthopper with long conspicuous antennae, formerly widely distributed in the southern England but recent records are all from the vicinity of the Thames estuary, especially the London area. However recent records have occurred in East Anglia (including close to Cambridge) and west to Somerset. Occurs in open sunny conditions in grassy areas sometimes with sparse scrub. Many recent records are from ruderal areas showing its capacity

to colonise new habitat. Adults overwinter so are found in spring and late summer (Kirby 1992). Swept in compartments C, E and F.

5.2.4 *Nemophora fasciella* Nationally Scarce a

This attractive long-horned moth is a very scarce species in Britain, found mainly in the south and south-east of England, but also northwards into south Yorkshire and Lancashire and west to Devon, but all recent records are in eastern England. Several records in the vicinity of Cambridge (NBN). The adults are on the wing from June to July, flying in sunshine over its food-plant and other flowers. Recorded from wasteland, road verges, embankments and downland. The larvae feed on seeds and lower leaves of Black Horehound *Ballota nigra*, and possibly White Deadnettle *Lamium album* (UK Moths). A single male swept from vegetation in compartment D, although not close to any *Ballota*, this plant does occur further south in compartment D and across the road in compartment C.

5.2.5 *Phyllocnistis xenia* Nationally Scarce b

This tiny white micromoth was first encountered in Britain in 1974, when it was found on grey poplar (*Populus canescens*) in east Kent. Since then it has expanded its range throughout south-east England and has been found in Suffolk, Norfolk, Cambridge and Hampshire. Also found on white poplar (*P. alba*) where the larva forms a thin silvery translucent gallery on the upper surface of the leaves, then folds the leaf edge over and pupates in a cocoon in the fold. Adults are on the wing between July and September in two generations, the second brood probably overwintering as an adult. Mines can be found from June to August or September (UK Moths). Numerous mines found in compartment E.

5.2.6 *Cydia servillana* Nationally Scarce b

This tortrix moth is locally distributed over England from the Midlands southwards. There are several records to the north and east of Cambridge (NBN). Found along damp woodland margins and hedgerows where the foodplants, Goat willow *Salix caprea* and Grey willow *S. cinerea* grow. The larva feeds internally in a slender twig of sallow, causing a slight swelling or gall, which can be difficult to find. The twigs chosen are generally one or two years old. As the moth emerges, the pupal exuviae protrudes from the exit hole making vacated galls easier to detect. The adults fly in June and July, from afternoon into the evening. A single female swept in compartment E.

5.2.7 *Synanthedon formicaeformis* Red-tipped Clearwing Nationally Scarce b

The Red-tipped clearwing is a very attractive and, like most of this family, exceedingly elusive moth which is widespread in England, just reaching southern Scotland (Heath & Emmet 1985). There are a reasonable number of records from east Anglia including the Brecks and Cambridgeshire (NBN). Frequents marshy areas, withy beds and similar wetland sites. The eggs are laid in crevices in the bark of *Salix* species, in this country the osier *S. viminalis* is favoured but *S. caprea* is also used. The larvae bores just under the bark, occasionally deeper in the wood, showing little outward sign of its presence, the life cycle is said to last one year. The moths emerge from the end of May to late July (Heath & Emmet op.cit.). Two noted in the field in compartments C and E.

5.2.8 *Bembecia ichneumoniformis* Six-belted Clearwing Nationally Scarce b

The Six-belted Clearwing is, like all clearwings, an elusive species in the field looking more like a wasp than a moth. It is well distributed across southern England north to Cambridgeshire with records from Yorkshire and South Wales (Heath & Emmet 1985; NBN). Records in East Anglia are surprisingly few, and none on NBN close to Cambridge, but likely to be overlooked. Occurs on calcareous downland, cliffs, quarries which offer a south facing aspect and a warm microclimate. The eggs are laid on *Lotus* or *Anthyllis*, the larvae feeding in a silken tunnel with in the root. Adults are on the wing from the end of June to mid-August. Only noted in compartment D.

5.2.9 *Dasytes plumbeus* Nationally Scarce b

This small, black, false soldier beetle is widespread in England and South Wales. Not infrequent in East Anglia, especially between the Brecks and Cambridge (NBN). Possibly under recorded due to difficulty in identification. Frequents chalk pits, cliff tops grazing levels and other grassland sites. Adults recorded in June and early July (Hyman & Parsons 1992). Swept in compartments B and E.

5.2.10 *Hippodamia variegata* Adonis' Ladybird Nationally Scarce b

The Adonis Ladybird is a black and red species with a very variable number of spots on the elytra. Mainly found in southern and eastern England, very local elsewhere (Hyman & Parsons 1992) but in recent years it has shown a very rapid increase and northward spread, perhaps no longer meriting its national status. In Cambridgeshire now appears to be widespread and well established (NBN). Although it is mainly coastal it occurs on a variety of dry weedy habitats, with brown-field sites seemingly very suitable. Adults active from June to September, probably over wintering as an adult in dry situations (Hyman & Parsons 1992). This ladybird proved common across compartments A,B,C and E.

5.2.11 *Variimorda villosa* Nationally Scarce b

A rather odd looking black and grey beetle with a long-pointed abdomen, often called a tumbling flower beetle. It is widespread in the southern half of England and South Wales (Hyman & Parsons 1992). Almost absent from East Anglia, but known from Cambridgeshire and counties to the west (NBN). It is associated with ancient broad-leaved woodland and pasture woodland and is a grade 3 indicator. The larvae may develop in dead wood or, more likely, plant stems. Adults are usually found on umbellifers between May and September (Hyman & Parsons op. cit.). Found in compartment D.

5.2.12 *Bruchus atomarius* Nationally Scarce b

This small black seed beetle is widespread in southern and central England and also recorded in Wales. There are several records scattered across East Anglia, especially in the western part including Cambridgeshire (NBN). Frequents rough grassland on neutral or calcareous soils, hedge banks, road verges and woodland margins. It is associated with vetches, recorded from *Vicia sativa, V. cracca and V. sepium*. The larvae develop in pods, adults recorded in June and from August to October (Hyman & Parsons 1992). Recorded in compartment E.

5.2.13 *Podagrica fuscicornis* Nationally Scarce b

This blue and orange leaf beetle is largely confined to southeast England with isolated records north to Cumbria and in South Wales (Cox 2007). East Anglia, especially the western part, around Cambridgeshire, seems to be a centre of distribution (NBN).). Found in grassland, scrub and disturbed ground where its foodplant, Musk Mallow, or less frequently other *Malva* species, are present. The larvae feed on the roots of Mallow plants, adults from June to September (Hyman & Parsons 1992). Swept in compartment F.

5.2.14 *Podagrica fuscipes* Nationally Scarce a

This blue and orange leaf beetle is a very local species recorded across England north to Nottinghamshire and with records in Cumbria on NBN. The vast majority of records are in the Southeast and East Anglia including several in Cambridgeshire and West Norfolk (NBN). Occurs on grassland, scrub, wood margins and disturbed ground, often coastal sites. It is associated with Mallow *Malva*, larvae probably developing on the roots of the plant in the spring with adults emerging in late summer. Adults recorded from May to September (Hyman & Parsons 1992). Swept in compartments A, D and F.

5.2.15 *Aulacobaris picicornis* Nationally Scarce b

This bluish black weevil is very much a beetle of southeast England, extending into the Midlands and the South West formerly. Known from Cambridgeshire and with several records in the Brecks and West Norfolk. Found in grassland and disturbed locations, particularly on calcareous soils. In Britain it is associated with Wild mignonette *Reseda lutea*, the larvae feeding within the stems. Adults recorded from April to October (Hyman & Parsons 1992). Noted in compartments C and D.

5.2.16 *Glocianus punctiger* Nationally Scarce b

This small black weevil is widespread in England and Wales but very scattered and local. In East Anglia it is scattered but relatively frequent in the Brecks with several records close to Cambridge (NBN). Usually found on coastal grassland, especially on sandy soil, but also on other types of grassland. Phytophagous and associated with dandelions, adults recorded from May to August (Hyman & Parsons 1992). Only found in compartment E.

5.2.17 *Mogulones geographicus* Nationally Scarce b

This relatively robust and distinctively marked weevil is widespread in England and also known from South Wales and southeast Scotland. The Brecks is a stronghold for this species, with records in nearby West Norfolk and Cambridgeshire (NBN). Frequents disturbed ground, grassland and coastal areas where it is phytophagous on viper's bugloss. The larvae develop in the root of the plant pupating in the soil. Adults recorded from April to October (Hyman & Parsons 1992). Noted in compartment C.

5.2.18 *Stenocarus ruficornis* Nationally Scarce b

This mostly black ceutorhyncid weevil is widespread in Britain north to Inverness and west to Cornwall but predominantly southern and eastern. Appears to be very local in East Anglia, mainly in the western part including the Brecks and Cambridgeshire (NBN). Found on roadside verges, field margins and disturbed ground on base-rich and sandy soils. Associated with poppies *Papaver*, the larvae feeding at the roots. Adults recorded from March to November (Hyman & Parsons 1992). Found in compartment C.

5.2.19 *Polydrusus flavipes* Nationally Scarce b

This bright green weevil is widespread in England but local and possibly overlooked due to confusion with similar species. In East Anglia it is almost absent, the nearest records to Cambridge being Peterborough (NBN). Frequents open woodland and pasture-woodland. Usually associated from young oak and aspen but a range of other trees have been recorded as food plants. Adults recorded from May to September (Hyman & Parsons 1992). Swept in compartments B and E.

5.2.20 *Polydrusus formosus* Nationally Scarce a

This brilliant green leaf-weevil was formerly very locally distributed across southern England north to north Somerset, but has recently shown a remarkable expansion and can now be found across the country. In this region there are several records around Cambridgeshire

(NBN). Occurs in broad-leaved woodland along rides, clearings and at the fringes. It is phytophagous, recorded from hazel, oak, alder, birch, cherry and rose. Adults are found from May to September (Hyman & Parsons 1992). Noted in all compartments except F.

5.2.21 *Chorisops nagatomii* Nationally Scarce

This small metallic green and yellow soldier fly is widespread but very local in southern England north to Yorkshire and South Wales. NBN data suggests not uncommon in the Cambridge area. Perhaps now known to be too frequent to justify its national status. Its habitat preferences are far from clear, being taken in broadleaved woodland, parkland, wetlands and riparian habitats. The larval requirements are not known but circumstantial evidence suggests that it develops in damp leaf litter, perhaps close to streams. Adults are recorded from July to September; the male sometimes found in numbers around large trees (Falk 1991b). Swept from scrub in compartment E.

5.2.22 *Platypalpus albicornis* (Nationally Scarce) None

This small hybotid fly with yellow antennae is now known to be much more frequent and widespread than formerly, now known from 14 counties (Falk & Crossley 2005). There are several records from East Anglia, including in the Cambridge area (NBN). No data on habitat or biology available. Adults in June and July (Mapmate data). Swept in compartment D.

5.2.23 *Meligramma trianguliferum* Nationally Scarce

This small hoverfly is scarce and local, widespread but with the majority of records from the south of England, especially in the Home Counties. In East Anglia mainly in the western part, including around Cambridge and the Brecks. Usually found in woodland, along margins and rides, also isolated scrub patches on heathland and moorland. The larvae feed on a range of aphids, especially on fruit trees and shrubs. Adults are elusive, possibly arboreal, recorded from April to September (Ball et al 2011). One swept in compartment D.

5.2.24 *Triglyphus primus* Nationally Scarce

This distinctive small black hoverfly is very local and scattered across the southern half of England north to Yorkshire but not further southwest than Wiltshire. There is a concentration of records along the Thames valley and Cambridgeshire. Found in a broad range of habitats, but usually in thermophilic environments including heathland, dry grassland and "brown-field" sites. Larvae are aphidophagus and are probably specific to the galls of *Cryptosiphum artemisiae* on *Artemisia vulgaris* Mugwort. Adults elusive so possibly commoner than records suggest, occasionally found in numbers on flowers (Ball et al 2011). Swept in compartment D.

5.2.25 *Volucella zonaria* Nationally Scarce

This striking black and yellow fly is the largest and most conspicuous of all the British hoverflies; it is predominantly a species of south east England, especially around London. Further north it is a relatively recent colonist, but it has now become frequent and is well established, especially in and around towns and cities. Nearly all records are in or around the city of Bristol where it is now not too uncommon. Occurs in scrub, heath, woodland and ruderal sites well into towns and cities, seems to prefer urban areas. The larvae develop as commensals in nests of wasps including *Vespula germanica* and *V. vulgaris*. Thought to feed on organic debris in the bottom of the nest; adults are on the wing June to October and can frequently be seen feeding at flowers. In some years resident populations are supplemented by migrants from the continent, especially the females (Falk 1991b, Ball et al 2011). Noted in compartment B.

5.2.26 *Urophora solstitialis* (RDB3) Nationally Scarce a

This gall fly was formerly confined to just a few counties in southern England and South Wales. More recently records have come from a wide area of southern and midland England

north to Lincolnshire. Although it is still officially RDB3, this is likely to be reduced to Nationally Scarce when an updated review is published. There are several localities in East Anglia, particularly around the Brecks and near Cambridge (NBN). Most records are from calcareous grassland and scrub where its host plants, musk and welted thistles, grow. The larvae form galls in the flowerheads of these thistles. Adults recorded from May to September (Falk 1991b, Clemons 1996, Clemons 2004). Found in compartment A.

5.2.27 *Oxyna parietina* Nationally Scarce b

Another rarely seen tephritid fly distributed across south-central England north to Durham and west to the Wirral (Clemons 1996). Several records from the vicinity of Cambridge (NBN) and likely to be under recorded. The larvae mine the stems of mugwort; adults recorded from May to September (Clemons op cit.). Swept in compartments C,D,E and F.

5.2.28 *Homoneura patelliformis* pNationally Scarce

This small, yellow lauxanid fly has a scattered distribution over south England predominantly in the midlands. Records scattered widely in England as far north as Warwickshire and Northamptonshire but no records for East Anglia on NBN but well recorded in Essex and known from the Brecks (pers. obs.). It does not have official national status because it was not known in Britain when the relevant review was published; at the time it was confused with another species which was given Nb status. Most commonly found by sweeping scrub, isolated shrubs, trees and adjacent tall herbage or coarse grasses and shows a preference for sallow on post-industrial sites such as old tips, disused railway lines. Biology unknown; larvae of this genus are generally believed to develop in decaying vegetable matter including fallen leaves. Adults recorded from June to September (Falk et al 2016). Swept in compartment B.

5.2.29 *Homoneura notata* pNationally Scarce

A small, yellow fly with brown-spotted wings, known from southern counties in England and South Wales, from Cornwall, to Kent, north to Northamptonshire and Glamorgan (NBN). In East Anglia records are few, but likely to be under recorded (NBN). Recorded from a range of habitats including coastal scrub, fen, mid-dune grassland and a site at the edge of the East Anglian Brecklands. Biology unknown; larvae of this family are generally believed to develop in decaying vegetable matter, including fallen leaves (Falk et al 2016). Swept from scrub in compartment B and C.

5.2.30 *Homoneura thalhammeri* pNationally Scarce

This small yellowish fly has a scattered distribution over south England north to Yorkshire and in south Wales. Given provisional Nationally Scarce status in Falk et al. (2016). Records scattered widely in England as far north as Yorkshire, South Wales; also Skokholm Island, Pembrokeshire (Falk et al. 2016). Where recording has been intensive this species has been found more frequently so is no doubt over looked and perhaps no longer deserving its national status. Most often found by sweeping scrub, isolated shrubs, trees and adjacent tall herbage or coarse grasses. Its biology is unknown but larvae of this genus are generally believed to develop in decaying vegetable matter including fallen leaves. Adults recorded from June to September (Falk et al. 2016). Swept in compartment D.

5.2.31 *Sapromyza quadricincta* pNationally Scarce

This yellow Lauxanid fly has a scattered distribution in southern England north to Warwickshire one locality in Wales. Very little recorded in East Anglia, a couple of Norfolk records on NBN). Frequents woodland, woodland edge, scrub and occasionally gardens, one record from saltmarsh. Its biology is unknown but the larvae of this family are generally believed to develop in decaying vegetable matter including fallen leaves. Adults are recorded from June to October (Falk et al 2016). Recorded in all compartments except F.

5.2.32 *Oscinimorpha arcuata* pNationally Scarce

A small chloropid fly with a scattered distribution in southern England north to Lincolnshire and Anglesey in Wales, with only a few post-1960 records. Records scattered across East Anglia both coastal and inland (NBN) likely to be under recorded. Found in grassland in a range of situations, including coastal, on chalk and in the vicinity of a dry pond. A common feature may be good drainage or dry conditions. Its biology is unknown but probably phytophagous and some related species develop in labiates. Adults recorded in June and July (Falk et al 2016). Swept in compartments A and E.

5.2.33 *Oscinimorpha sordidissima* pNationally Scarce

This very small, black chloropid fly is known from scattered localities in England north to Norfolk and with isolated records in Wales and Scotland but localised and possibly under-recorded to some extent with eight known post-1960 sites. In East Anglia it is recorded from Norfolk and Cambridgeshire. Frequents dry grassland in a range of situations, including on heathland and chalk downs, cliffs and fixed dunes. Biology unknown but the larvae are probably phytophagous and some related species use labiates. Adults are recorded from May to September (Falk et al 2016). Swept in compartments A and C.

5.2.34 *Trachysiphonella scutellata* (Nationally Scarce) None

A tiny black and yellow frit fly known to be widespread in southern England. This species is now considered to be too frequent to merit nationally scarce status so will be deleted from the list in a forthcoming review. In East Anglia it is almost entirely known from the Brecks and Cambridge (NBN). Frequents short dry grassland, both calcareous and acid. Biology unknown. Adults recorded from June to August (Falk & Ismay draft). Swept in compartments Cand D.

5.2.35 *Rondania fasciata* Nationally Scarce

This tiny and distinctive parasitoid fly is recorded in the south of England, from Dorset to Kent to Cambridgeshire, Worcestershire, Leicester and Yorkshire, and Scotland (Elgin). Only about a dozen post-1960 localities. A few records to the north of Cambridge (NBN). Found in broadleaved woodland and also on calcareous grassland, possibly with a requirement for older trees. The larvae develop as parasitoides of adults of the weevil *Phyllobius argentatus*. Adults active in May and June (Falk & Pont in prep.). One from compartment E.

5.2.36 *Solieria fenestrata* None (Nationally Scarce)

This nondescript paraisitoid fly is known from Southern England, northwards to Worcestershire and Warwickshire with several post-1960 records, but the species is probably under-recorded. There are a couple of records in East Anglia on NBN, including one just southwest of Cambridge (NBN). Recorded from calcareous grassland, including post-industrial sites on calcareous soils. Its larval ecology is unknown. Adults on the wing from May to August (Falk & Pont in prep.). Found in compartment B.

5.2.37 *Actia lamia* None (Nationally Scarce)

This small parasitoid fly is widespread in Southern England, Wales and with one locality in Scotland. There are about 5 post-1960 localities but it appears to be getting more frequent. Not in Falk (1991b) so status unofficial but will probably be added when the review is next updated. Scattered across East Anglia including in the vicinity of Cambridgeshire (NBN). Frequents marshes, wet grasslands and woodlands, and dry scrubby grassland. The larvae are parasitoides of *Epiblema* caterpillars (Lepidoptera, Tortricidae), stem- and root-borers and concealed feeders on shrubs and herbs, and have been reared in Britain from species on Marsh Thistle (*Cirsium palustre*). Adults from May to July (Falk & Pont in prep.). Swept in compartment A.

5.2.38 *Crossocerus distinguendus* Nationally Scarce a

This small, black digger wasp is largely concentrated in the south and east of England but is spreading north and west suggesting that may be a recent colonist. In East Anglia it is frequent in Essex, more scattered further north, including close to Cambridge. It frequents a variety of open habitats including sand and gravel workings and urban gap environments. Nesting aggregations are usually found in sandy soil and on one occasion in a rockery, abroad it also nests in dead wood. The females provision their nests with aphids. Adults are recorded from June to August (Falk 1991a). Only noted in compartment E.

5.2.39 *Pemphredon morio* Nationally Scarce b

This shiny black sphecid wasp is widespread in England north to Yorkshire with about 35 post-1970 records. Very rare in East Anglia with just a few widely scattered records (BWARS) but there is one in Cambridge (NBN). Recorded in a variety of habitats including open woodland, parkland, hedgerows and heathlands, has a requirement for dead trees, stumps or old fence posts in which to nest. It nests in old beetle tunnels in dead wood where it creates a system of branching tunnels with a cell at the end of each. The cells are provisioned with aphids, perhaps high in trees where they are difficult to record, adults recorded from May to August (Falk 1991a). Swept in compartment C.

5.2.40 *Andrena trimmerana* Trimmer's Mining Bee Nationally Scarce b

The Trimmer's Mining Bee is a large brown bee confined to southern England and south Wales, prefers the coast but also recorded from various habitats inland. In East Anglia it is frequent in the south, Essex and near London, but more scattered further north (BWARS). No longer considered to be of conservation concern by BWARS. Nests in sparsely vegetated grassland in warm, sunny situations; probably collects most of its pollen from *Salix* and *Prunus*. Double brooded flying from mid-March to late April and early July to late September (Falk 1991b). Noted in compartment F.

5.2.41 *Hylaeus cornutus* Spined Hylaeus Nationally Scarce a

This distinctive small black bee is largely confined to southern counties of England with a very definite eastern bias extending north to Lincolnshire. The most westerly record is an old one from east Devon (Falk 1991a). Even in the south east it is generally rare but there has been a noticeable increase in records in recent years. In East Anglia it is fairly well recorded, especially in the Cambridge and Brecks area (BWARS). Frequents various open habitats especially calcareous grassland where they probably collect pollen from a variety of flowers. The nesting requirements are poorly known but probably needs sunny situations where they utilise hollow dead stems of herbaceous plants (Edwards & Telfer 2001). Found in compartment C.

5.2.42 *Hylaeus pictipes* Little Yellow-face Bee Nationally Scarce a

This small yellow-faced bee is largely confined to southeast England with just a very few scattered records northwest to Shropshire. In East Anglia it is known from Essex and around the Brecks (BWARS). Found in open woodland, fens, dunes and occasionally urban gardens. Forages for pollen from a wide variety of plant families. It nests in the hollowed out, pithy centres of bramble and rose stems and in old woodworm holes in dead gorse. Adults found from June to late August (Edwards 2007). Found in compartment D.

5.2.43 *Hylaeus signatus* Large Yellow-faced Bee Nationally Scarce b

This is the largest of the yellow-faced bees and is widespread in southern England north to Norfolk and Warwickshire with about 30 post-1970 sites (Falk 1991a). There was evidence that this bee was becoming commoner, with many more sites found in the 1990's (M. Edwards pers.comm.) but over the last few years it has become scarce again. In East Anglia it is rather scattered but with a concentration of records from the Brecks to Cambridge area (BWARS). Occurs on downland, heathland, disturbed situations, gardens and open

woodlands. It is closely associated with *Reseda* from which the adults collect all their pollen. Nests are known from banks with bare soil, the mortar in walls or in the dead stems of *Rubus* or *Rosa*. It is single brooded with adults found from June to September (Falk op.cit.). One male found in compartment A,D and E.

5.2.44 *Lasioglossum pauxillum* Lobe-spurred Furrow Bee Nationally Scarce a

A small shiny black mining bee very hard to distinguish from numerous commoner species. It has a very scattered distribution in southern England north to Herefordshire and is local with about 20 post 1970 sites (Falk 1991a) but has become much more frequent in recent years so may longer merit its national status (M. Edwards pers. comm.). In East Anglia it is well distributed and can be frequent, including the vicinity of Cambridge (NBN). Inhabits a wide variety of situations including calcareous grassland, probably needs bare or sparsely vegetated soil in warm, sunny situations for nesting. Overseas it has been shown to be eusocial with several females using one nest; females fly from April to September with males coming out later in July to October. Pollen requirements in Britain are unknown (Falk op.cit.). Found in compartments A,C and E.

5.2.45 *Sphecodes crassus* Nationally Scarce b

This small black and red cuckoo-bee is very widely distributed in England and Wales as far north as Yorkshire. It is a very difficult species to identify so its true status is not easy to assess but it is certainly very local. In East Anglia it is widespread with concentration in Essex, the Brecks and Cambridgeshire (BWARS). Lives in a variety of habitats including heathland, calcareous grassland, soft rock cliffs, landslips and abandoned quarries. It is a cleptoparasite of the mining bee genus *Lasioglossum*. Suspected hosts include *L. nitidiusculum, L. parvulum, L. morio, L. pauxillum* and *L. fulvicorne*, one of which was recorded during this survey. Whatever the host is, it will almost certainly have a requirement for areas of bare soil or sparse vegetation in sunny spots where they can dig their nests. Adult females are on the wing from May to August, males from July to September; frequenting flowers such as *Calluna, Heracleum, Jasione, Achillea, Tripleurospermum, Angelica* and *Cirsium* (Falk 1991a). Males noted in compartment A C and E.

5.2.46 *Lasius brunneus* Nationally Scarce a

This brown and orange ant is confined to southern central England with centres of population around the Thames Valley and the Severn Vale including the Forest of Dean. Well established in the southern part of East Anglia but much more local further north but known from Cambridge (NBN). Found in broad-leaved woodland and parkland where they nest in hollows in mature trees and stumps, most often oak. Winged sexuals can be found in June or early July (Edwards 1998; Falk 1991a). Noted in compartments C,D and E.

5.3BAP/S41, LOCALLY SIGNIFICANT

5.3.1 *Coenonympha pamphilus* Small Heath BAP

This is a widespread butterfly and can be found over most of the British Isles with the exception of the Shetlands and Orkneys and mountainous regions (NBN). It lives in discrete colonies and adults rarely venture far from the colony. Not confined to heathland and can be found in a wide variety of habitats. Populations found in the north have one generation each year, while populations in the south have two generations each year and possibly three in exceptional years. Both population and range declining, hence its addition to the Priority List of UK Biodiversity Action Plan Species. Adults can be found continuously from late May until mid-September as a result (UK Butterflies). Several noted in compartments B C and E.

5.3.2 *Temelucha cf decorata* New for Britain

This attractively marked Ichneumon wasp appears to be a species hitherto not recorded in Britain. The two specimens are both male, and as such not at all easy to determine with confidence. They seem to key to *T. tricolorata*, but a European specialist Zoltan Vas, to

whom I send photographs, has suggested that it might be *T. decorata*. Whatever species it is, it is quite different from any of the four species currently accepted as British. *T. decorata* has previously been claimed as British, but these records have been rejected as erroneous (Broad 2016; pers.comm.). If this wasp does prove to be a species new for Britain it will be one of the most important find of this survey and significantly enhance the conservation importance of the site. *Temelucha* and are parasitoids of a wide range of small lepidopteran larvae in concealed habitats, leaf folds, flower heads or tunnels (Heydari et al 2020). A single male swept from a sallow bush in compartment B in 2020 and another in compartment E in 2021.

6 Site Evaluation

The previous very extensive survey (Kirby & Frost 2013) amply demonstrated the quality of this site for conservation at the time. Subsequently there have been numerous changes and these are still ongoing. Many areas have been cleared since 2013 and then subsequently developed an open mosaic habitat, while in other areas scrub encroachment has continued to the point of rendering some areas inaccessible. Even as recently as winter 2020-21, large areas of habitat were completely destroyed, notably in compartment C. This might have been expected to have significantly reduced the diversity and quality of this compartment. However this does not seem to be the case, with diversity here only exceeded by compartment D and quality only exceeded by compartment E. Had the original habitat not been completely eliminated before the May and June 2021 surveys, then compartment C would likely be even more productive.

It appears that the assemblage of invertebrates that is most important at this site is adapted to rapidly taking advantage of these very open, sparsely vegetated habitats that have much bare substrate, ruderal plants and high insolation. This is very analogous to the Brecks habitat, and it is clear that there is much overlap in the invertebrate fauna found here and in the Brecklands.

Complete loss of then open mosaic habitat and birch/sallow scrub at Chesterton Sidings would result in a significant loss of biodiversity in the local area (City) and Region. Indeed given that this site harbours two species not known from any other British site at the moment, complete loss of the site could result in the elimination of some species from the county. Of course many of the rare invertebrates found on this survey are likely to occur elsewhere in the region, particularly in the Brecks, but this should not be assumed to be the case until evidence is available of their presence elsewhere. Development and mitigation needs to proceed on the assumption that this is the only national or regional site for some species.

7 Recommendations

If the biodiversity is to be maintained in the area, then considerable mitigation is desirable. Bothe the open mosaic habitat and the sallow/birch scrub need to be maintained and managed within the site boundary or close by if probable biodiversity loss is to be avoided.

1. The recommendations cited in the 2103 report for mitigation and management still stand as there is no evidence for any loss or even reduction in the quality of the invertebrate communities present at Chesterton Sidings.
2. Further destruction of habitat at the site should not proceed until mitigation is in place.
3. The value of the birch/sallow scrub woodland, as well as developing poplar scrub, is most valuable along the edges where it transitions into the OMH. Isolated bushes and trees can also be very important. The dense, shaded internal parts of birch/sallow thicket is less important and can be opened out by driving rides through, creating glades and “scalloping” the margins to increase the extent of the transition zones.
4. Within the boundary of the site, some areas of dense thicket that are not lost to development, can be sacrificed to increase the area of OMH.
5. The loss of open mosaic habitat is also occurring through scrub encroachment so an ongoing program of management is needed to ensure the greatest range of habitats is

maintained, particularly those that are important for the rarest species found on this survey.

6. Compartment D is rather different to the remainder, but nevertheless species dependent on the OMH were recorded here. The grassy verge needs to be managed by an annual late cut to prevent scrub encroachment. The scrub bordering the grassy areas can be pushed back in places to provide an opportunity for the development of a transition zone.
7. To maintain the population of the rare moth *Nemophora fasciella*, the amount of *Ballota nigra* (Black Horehound) in compartment D should be increased. Only a few plants were noticed during the survey, a couple at the far southern end of compartment D and several along the margin of compartment C across the road from D. If those in compartment C are lost, there may not be sufficient to maintain the population.
8. Tree planting should be avoided in all mitigation areas, natural regeneration should be sufficient to maintain the woody flora component of the habitat. Before any trees are planted a well evidenced conservation argument is needed. Any trees planted should be native species, not just to the UK but should be grown from seeds or cuttings taken close to the site.
9. Onsite mitigation areas should ideally be contiguous, or if not then a corridor of habitat included to join them. For example if Compartment E and F are used as OMH mitigation, then the northern part of compartment C needs to be used to provide a habitat corridor joining it to compartment D.
10. Green roofs can be a good compliment to ground level mitigation, but cannot substitute for it completely. The scrub and birch-sallow thicket components cannot be replicated on green roofs, and tall perennial herbage is also unlikely to thrive in the soil depths that are possible on green roofs.
11. Ideally a green roof should have some variability in soil depth, providing areas very prone to drought and areas more resistant to drought. This also provides small slopes where fossorial aculeated can nest.
12. Planting should predominantly include species present on site, especially those known to harbour scarce invertebrates particularly *Reseda lutea* (Wild Mignonette), *Echium vulgare* (Viper's-bugloss), *Linaria vulgaris* (Common Toadflax) and *Papaver* (Poppies). Also important plants for pollen and nectar sources such as *Lotus corniculatus* (Common Bird's-foot-trefoil), *Anthyllis vulneraria* (Kidney Vetch) and species of yellow Asteraceae such as *Crepis*, *Hypochaeris* and *Leontodon*.
13. While green roofs cannot accommodate scrub, small patches of very drought-prone *Rubus* agg (Bramble) can provide nesting opportunities for may small Aculeate Hymenoptera.
14. Ongoing monitoring of both green roofs and ground-level mitigation areas will be highly desirable to ensure that the important invertebrate assemblages are persisting.

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9 Appendix 1: British conservation status categories – definitions.

The following definitions are those used by the JNCC review of the status's of scarce invertebrates of Great Britain.

Red Data Book Category 1. **RDB1-ENDANGERED**

- Taxa in danger of extinction if causal factors continue unabated. Includes species occurring as a single colony or only in habitats which are much reduced and highly threatened or which have shown a rapid and continuous decline.

Red Data Book Category 2. **RDB2-VULNERABLE**

- Taxa believed likely to move into the endangered category in the near future if the causal factors continue operating. Includes species of which most or all populations are decreasing and those which are confined to vulnerable habitats.

Red Data Book Category 3. **RDB3-RARE**

- Taxa with small populations that are not at present endangered or vulnerable, but are at risk; usually localised within restricted geographical areas or habitats or are thinly scattered over a wider range. Includes species estimated to exist in only fifteen or less post 1970 10km squares or, if more, then in vulnerable habitat.

Red Data Book Category 4. **RDBK – Data deficient**

- Taxa that are suspected, but not definitely known, to belong to any of the above categories, because of lack of information. Includes taxa recently discovered or recognised in Great Britain which may prove to be more widespread in the future; taxa with very few or perhaps only a single known locality but which belong to poorly recorded or taxonomically difficult groups; species known from very few localities but which occur in inaccessible habitats or habitats which are seldom sampled; species with very few or perhaps only a single known locality and of questionable native status, but not clearly falling into the category of recent colonist, vagrant or introduction.

Nationally Scarce Category a. **Na**

- Taxa which do not fall within the RDB categories but which are uncommon in Great Britain and are known to occur in 30 or fewer 10km squares or, in less well recorded groups, within seven or fewer vice-counties.

Nationally Scarce Category b. **Nb**

- Taxa which do not fall within the RDB categories but which are uncommon in Great Britain and are known to occur in between 31 and 100 10km squares or, in less well recorded groups, between eight and twenty vice-counties.

10 Appendix 2: Species list.

Order: Family	Taxon	Vernacular	National Status	A	B	C	D	E	F
Isopoda: Armadillidiidae	*Armadillidium vulgare*	Common Pill Woodlouse		X					
Araneae: Theridiidae	*Neottiura bimaculata*							X	
Araneae: Dictynidae	*Nigma walckenaeri*		**Nationally Scarce a**		X				
Araneae: Anyphaenidae	*Anyphaena accentuata*							X	
Araneae: Thomisidae	*Xysticus cristatus*						X		
Araneae: Salticidae	*Heliophanus cupreus*								X
Raphidioptera: Raphidiidae	*Xanthostigma xanthostigma*					X	X	X	
Neuroptera: Hemerobiidae	*Micromus variegatus*				X				
Odonata: Coenagriidae	*Enallagma cyathigerum*	Common Blue Damselfly				X		X	
Orthoptera: Meconematidae	*Meconema thalassinum*	Oak Bush Cricket						X	
Orthoptera: Meconematidae	*Meconema thalassinum*	Oak Bush Cricket				X	X		
Orthoptera: Phaneropteridae	*Leptophyes punctatissima*	Speckled Bush Cricket				X	X	X	X
Orthoptera: Acrididae	*Chorthippus brunneus*	Common Field Grasshopper		X	X	X		X	
Dermaptera: Forficulidae	*Forficula auricularia*	Common Earwig				X			X
Heteroptera: Acanthosomatidae	*Elasmostethus interstinctus*	Birch Shieldbug				X			
Heteroptera: Acanthosomatidae	*Elasmucha grisea*	Parent Bug				X			
Heteroptera: Pentatomidae	*Aelia acuminata*	Bishop's Mitre Shieldbug					X		
Heteroptera: Pentatomidae	*Dolycoris baccarum*	Hairy Shieldbug		X		X			X
Heteroptera: Pentatomidae	*Eysarcoris venustissimus*	Woundwort Shieldbug					X		
Heteroptera: Pentatomidae	*Palomena prasina*	Common Green Shieldbug		X	X	X	X	X	X
Heteroptera: Pentatomidae	*Pentatoma rufipes*	Red-legged Shieldbug			X				
Heteroptera: Pentatomidae	*Piezodorus lituratus*	Gorse Shieldbug		X					
Heteroptera: Coreidae	*Bathysolen nubilus*	Cryptic Leatherbug	**Nationally Scarce b**	X					

Order: Family	Taxon	Vernacular	National Status	A	B	C	D	E	F
Heteroptera: Coreidae	*Coreus marginatus*	Dock Bug			X	X	X		X
Heteroptera: Coreidae	*Coriomeris denticulatus*	Denticulate Leatherbug		X			X	X	X
Heteroptera: Coreidae	*Gonocerus acuteangulatus*	Box Bug	**(RDB1) None**					X	
Heteroptera: Rhopalidae	*Brachycarenus tigrinus*					X			
Heteroptera: Rhopalidae	*Corizus hyoscyami*			X					
Heteroptera: Rhopalidae	*Stictopleurus abutilon*						X		
Heteroptera: Rhopalidae	*Stictopleurus punctatonervosus*			X	X	X	X	X	
Heteroptera: Lygaeidae	*Kleidocerys resedae*				X	X	X	X	X
Heteroptera: Lygaeidae	*Nysius huttoni*			X	X	X			
Heteroptera: Lygaeidae	*Nysius senecionis*			X		X		X	
Heteroptera: Lygaeidae	*Nysius thymi*						X		
Heteroptera: Berytidae	*Gampsocoris punctipes*							X	
Heteroptera: Berytidae	*Neides tipularius*				X				
Heteroptera: Miridae	*Adelphocoris lineolatus*							X	
Heteroptera: Miridae	*Dicyphus annulatus*							X	
Heteroptera: Miridae	*Dicyphus globulifer*			X			X		
Heteroptera: Miridae	*Leptopterna ferrugata*			X					
Heteroptera: Miridae	*Lygus maritimus*				X				
Heteroptera: Miridae	*Lygus pratensis*		**RDB3**		X			X	
Heteroptera: Miridae	*Stenodema laevigata*						X		
Auchenorrhyncha: Aphrophoridae	*Aphrophora alni*				X				
Auchenorrhyncha: Aphrophoridae	*Aphrophora salicina*				X				
Auchenorrhyncha: Aphrophoridae	*Philaenus spumarius*			X	X	X			
Auchenorrhyncha: Cicadellidae	*Idiocerus stigmaticalis*					X			
Auchenorrhyncha: Cicadellidae	*Viridicerus ustulatus*							X	
Auchenorrhyncha: Cicadellidae	*Oncopsis flavicollis*				X				

Order: Family	Taxon	Vernacular	National Status	A	B	C	D	E	F
Auchenorrhyncha: Delphacidae	*Asiraca clavicornis*		**Nationally Scarce b**			X		X	X
Sternorrhyncha: Aphididae	*Tuberolachnus salignus*	Large Grey Willow Aphid			X				
Lepidoptera: Nepticulidae	*Ectoedemia occultella*	a moth			X				
Lepidoptera: Adelidae	*Nemophora fasciella*	a moth	**Nationally Scarce a**				X		
Lepidoptera: Adelidae	*Adela reaumurella*	a moth			X				
Lepidoptera: Adelidae	*Nematopogon swammerdamella*	a moth					X		
Lepidoptera: Incurvariidae	*Incurvaria masculella*	a moth					X		
Lepidoptera: Gracillariidae	*Phyllocnistis xenia*	a moth	**Nationally Scarce b**					X	
Lepidoptera: Yponomeutidae	*Yponomeuta cagnagella*	Spindle Ermine					X		
Lepidoptera: Plutellidae	*Plutella xylostella*	Diamond-back Moth				X			
Lepidoptera: Oecophoridae	*Esperia sulphurella*	a moth				X			
Lepidoptera: Gelechiidae	*Aproaerema anthyllidella*	a moth			X				
Lepidoptera: Choreutidae	*Anthophila fabriciana*	a moth					X		
Lepidoptera: Tortricidae	*Ditula angustiorana*	Red-barred Tortrix					X		
Lepidoptera: Tortricidae	*Syndemis musculana*	a moth					X		
Lepidoptera: Tortricidae	*Cacoecimorpha pronubana*	Carnation Tortrix							X
Lepidoptera: Tortricidae	*Epiphyas postvittana*	Light Brown Apple Moth					X		
Lepidoptera: Tortricidae	*Aethes tesserana*	a moth						X	X
Lepidoptera: Tortricidae	*Cochylis dubitana*	a moth		X					
Lepidoptera: Tortricidae	*Notocelia cynosbatella*	a moth					X		
Lepidoptera: Tortricidae	*Cydia servillana*	a moth	**Nationally Scarce b**					X	
Lepidoptera: Tortricidae	*Grapholita compositella*	a moth			X				
Lepidoptera: Sesiidae	*Synanthedon formicaeformis*	Red-tipped Clearwing	**Nationally Scarce b**			X		X	
Lepidoptera: Sesiidae	*Bembecia ichneumoniformis*	Six-belted Clearwing	**Nationally Scarce b**				X		
Lepidoptera: Hesperiidae	*Thymelicus sylvestris*	Small Skipper				X			
Lepidoptera: Pieridae	*Anthocharis cardamines*	Orange-tip				X	X		

Order: Family	Taxon	Vernacular	National Status	A	B	C	D	E	F
Lepidoptera: Pieridae	*Pieris brassicae*	Large White			X				
Lepidoptera: Pieridae	*Pieris napi*	Green-veined White				X	X		
Lepidoptera: Nymphalidae	*Coenonympha pamphilus*	Small Heath	**BAP**		X	X		X	
Lepidoptera: Nymphalidae	*Maniola jurtina*	Meadow Brown		X	X			X	X
Lepidoptera: Nymphalidae	*Pyronia tithonus*	Gatekeeper				X			
Lepidoptera: Nymphalidae	*Vanessa atalanta*	Red Admiral				X		X	
Lepidoptera: Nymphalidae	*Aglais io*	Peacock		X	X				X
Lepidoptera: Nymphalidae	*Aglais urticae*	Small Tortoiseshell				X			
Lepidoptera: Lycaenidae	*Lycaena phlaeas*	Small Copper						X	
Lepidoptera: Lycaenidae	*Celastrina argiolus*	Holly Blue					X		
Lepidoptera: Lycaenidae	*Polyommatus icarus*	Common Blue			X	X			
Lepidoptera: Pyralidae	*Homoeosoma sinuella*	a moth		X			X	X	X
Lepidoptera: Crambidae	*Pyrausta despicata*	a moth		X					
Lepidoptera: Crambidae	*Agriphila geniculea*	a moth			X				
Lepidoptera: Geometridae	*Aplocera plagiata*	Treble-bar						X	
Lepidoptera: Erebidae	*Orgyia antiqua*	Vapourer		X					
Lepidoptera: Noctuidae	*Acronicta leporina*	Miller						X	
Lepidoptera: Noctuidae	*Cucullia verbasci*	Mullein						X	
Lepidoptera: Noctuidae	*Calophasia lunula*	Toadflax Brocade	**RDB3**			X	X		
Lepidoptera: Noctuidae	*Hecatera dysodea*	Small Ranunculus	**RDBK**					X	
Coleoptera: Carabidae	*Bembidion quadrimaculatum*				X				
Coleoptera: Carabidae	*Harpalus affinis*			X					
Coleoptera: Carabidae	*Harpalus rubripes*							X	
Coleoptera: Staphylinidae	*Omalium rivulare*				X				
Coleoptera: Staphylinidae	*Ocypus olens*	Devil's Coach-horse		X					
Coleoptera: Scarabaeidae	*Agrilinus ater*				X				

Order: Family	Taxon	Vernacular	National Status	A	B	C	D	E	F
Coleoptera: Cantharidae	*Cantharis decipiens*						X		
Coleoptera: Cantharidae	*Cantharis lateralis*							X	
Coleoptera: Cantharidae	*Rhagonycha fulva*			X	X			X	X
Coleoptera: Dermestidae	*Anthrenus verbasci*						X		
Coleoptera: Melyridae	*Dasytes aeratus*					X	X	X	
Coleoptera: Melyridae	*Dasytes plumbeus*		**Nationally Scarce b**		X			X	
Coleoptera: Melyridae	*Cordylepherus viridis*			X		X	X	X	
Coleoptera: Melyridae	*Malachius bipustulatus*	Malachite Beetle					X		
Coleoptera: Cryptophagidae	*Antherophagus pallens*			X					
Coleoptera: Phalacridae	*Olibrus affinis*			X	X	X	X	X	X
Coleoptera: Phalacridae	*Olibrus liquidus*							X	
Coleoptera: Kateretidae	*Brachypterolus pulicarius*								X
Coleoptera: Nitidulidae	*Epuraea aestiva*							X	
Coleoptera: Nitidulidae	*Meligethes aeneus*	Common Pollen Beetle		X	X	X	X	X	X
Coleoptera: Nitidulidae	*Meligethes nigrescens*					X	X		
Coleoptera: Coccinellidae	*Rhyzobius chrysomeloides*				X		X	X	X
Coleoptera: Coccinellidae	*Rhyzobius litura*					X	X		
Coleoptera: Coccinellidae	*Scymnus interruptus*					X			
Coleoptera: Coccinellidae	*Adalia bipunctata*	2-spot Ladybird		X		X	X		
Coleoptera: Coccinellidae	*Adalia decempunctata*	10-spot Ladybird				X			
Coleoptera: Coccinellidae	*Calvia quattuordecimguttata*	Cream-spot Ladybird			X		X		
Coleoptera: Coccinellidae	*Coccinella septempunctata*	7-spot Ladybird		X	X	X	X	X	X
Coleoptera: Coccinellidae	*Harmonia axyridis*	Harlequin Ladybird			X	X		X	X
Coleoptera: Coccinellidae	*Hippodamia variegata*	Adonis' Ladybird	**Nationally Scarce b**	X	X	X		X	
Coleoptera: Coccinellidae	*Propylea quattuordecimpunctata*	14-spot Ladybird				X	X	X	X
Coleoptera: Coccinellidae	*Psyllobora vigintiduopunctata*	22-spot Ladybird					X		

Order: Family	Taxon	Vernacular	National Status	A	B	C	D	E	F
Coleoptera: Coccinellidae	*Tytthaspis sedecimpunctata*	16-spot Ladybird		X			X		
Coleoptera: Coccinellidae	*Subcoccinella vigintiquattuorpunctata*	24-spot Ladybird					X		
Coleoptera: Mordellidae	*Mordellistena acuticollis*		**RDBK**			X			
Coleoptera: Mordellidae	*Mordellistena pseudopumila*		**RDBK**			X			X
Coleoptera: Mordellidae	*Mordellochroa abdominalis*						X		
Coleoptera: Mordellidae	*Variimorda villosa*		**Nationally Scarce b**				X		
Coleoptera: Tenebrionidae	*Lagria hirta*				X				
Coleoptera: Tenebrionidae	*Isomira murina*				X				
Coleoptera: Oedemeridae	*Oedemera lurida*			X	X	X	X	X	X
Coleoptera: Oedemeridae	*Oedemera nobilis*	Swollen-thighed Beetle		X	X	X	X		X
Coleoptera: Scraptiidae	*Anaspis fasciata*						X	X	
Coleoptera: Scraptiidae	*Anaspis garneysi*					X			
Coleoptera: Scraptiidae	*Anaspis maculata*					X	X	X	
Coleoptera: Scraptiidae	*Anaspis regimbarti*					X	X		
Coleoptera: Cerambycidae	*Grammoptera ruficornis*					X			
Coleoptera: Cerambycidae	*Stenurella melanura*			X		X			X
Coleoptera: Cerambycidae	*Stictoleptura rubra*					X			
Coleoptera: Cerambycidae	*Tetrops praeustus*					X			
Coleoptera: Chrysomelidae	*Bruchus atomarius*		**Nationally Scarce b**					X	
Coleoptera: Chrysomelidae	*Bruchus rufipes*					X			
Coleoptera: Chrysomelidae	*Oulema duftschmidi*								X
Coleoptera: Chrysomelidae	*Cryptocephalus fulvus*	a pot beetle				X	X		
Coleoptera: Chrysomelidae	*Cryptocephalus labiatus*	a pot beetle			X				
Coleoptera: Chrysomelidae	*Cryptocephalus moraei*	a pot beetle				X			X
Coleoptera: Chrysomelidae	*Cryptocephalus pusillus*	a pot beetle			X				
Coleoptera: Chrysomelidae	*Cryptocephalus rufipes*	a pot beetle	**RDBK**					X	

Order: Family	Taxon	Vernacular	National Status	A	B	C	D	E	F
Coleoptera: Chrysomelidae	*Chrysolina hyperici*			X		X			
Coleoptera: Chrysomelidae	*Phratora vulgatissima*	Blue Willow Beetle			X				
Coleoptera: Chrysomelidae	*Aphthona euphorbiae*			X	X				
Coleoptera: Chrysomelidae	*Phyllotreta nigripes*			X					
Coleoptera: Chrysomelidae	*Podagrica fuscicornis*		**Nationally Scarce b**						X
Coleoptera: Chrysomelidae	*Podagrica fuscipes*		**Nationally Scarce a**	X			X		X
Coleoptera: Anthribidae	*Bruchela rufipes*			X	X	X	X	X	X
Coleoptera: Rhynchitidae	*Tatianaerhynchites aequatus*	Apple Fruit Rhynchites				X	X		
Coleoptera: Apionidae	*Apion frumentarium*					X			
Coleoptera: Apionidae	*Aspidapion aeneum*			X			X		
Coleoptera: Apionidae	*Aspidapion radiolus*			X			X		
Coleoptera: Apionidae	*Betulapion simile*				X			X	
Coleoptera: Apionidae	*Holotrichapion pisi*			X					
Coleoptera: Apionidae	*Malvapion malvae*			X			X		X
Coleoptera: Apionidae	*Perapion hydrolapathi*					X	X	X	X
Coleoptera: Apionidae	*Stenopterapion meliloti*			X		X			
Coleoptera: Curculionidae	*Aulacobaris picicornis*		**Nationally Scarce b**			X	X		
Coleoptera: Curculionidae	*Archarius salicivorus*	Willow Gall Weevil				X			
Coleoptera: Curculionidae	*Dorytomus taeniatus*					X			
Coleoptera: Curculionidae	*Mecinus pascuorum*					X			
Coleoptera: Curculionidae	*Rhinusa antirrhini*					X		X	
Coleoptera: Curculionidae	*Rhamphus pulicarius*					X	X	X	
Coleoptera: Curculionidae	*Ceutorhynchus obstrictus*				X	X	X	X	
Coleoptera: Curculionidae	*Ceutorhynchus pallidactylus*	Cabbage Stem Weevil				X	X	X	
Coleoptera: Curculionidae	*Glocianus punctiger*		**Nationally Scarce b**					X	
Coleoptera: Curculionidae	*Mogulones geographicus*		**Nationally Scarce b**			X			

Order: Family	Taxon	Vernacular	National Status	A	B	C	D	E	F
Coleoptera: Curculionidae	*Rhinoncus pericarpius*							X	
Coleoptera: Curculionidae	*Stenocarus ruficornis*		**Nationally Scarce b**			X			
Coleoptera: Curculionidae	*Trichosirocalus troglodytes*			X		X	X	X	
Coleoptera: Curculionidae	*Otiorhynchus ovatus*								X
Coleoptera: Curculionidae	*Phyllobius argentatus*	Silver-green Leaf Weevil				X			
Coleoptera: Curculionidae	*Phyllobius pyri*	Common Leaf Weevil				X			
Coleoptera: Curculionidae	*Polydrusus cervinus*				X	X			
Coleoptera: Curculionidae	*Polydrusus flavipes*		**Nationally Scarce b**		X			X	
Coleoptera: Curculionidae	*Polydrusus formosus*		**Nationally Scarce a**	X	X	X	X	X	
Coleoptera: Curculionidae	*Polydrusus impressifrons*				X			X	
Coleoptera: Curculionidae	*Sitona lineatus*					X			
Coleoptera: Curculionidae	*Hypera postica*	Clover Leaf Weevil			X				
Coleoptera: Curculionidae	*Hypera rumicis*				X				
Diptera: Tipulidae	*Nephrotoma appendiculata*				X		X		
Diptera: Tipulidae	*Nephrotoma flavescens*			X		X	X		X
Diptera: Tipulidae	*Tipula vernalis*					X		X	
Diptera: Limoniidae	*Molophilus griseus*						X		
Diptera: Limoniidae	*Symplecta hybrida*				X				
Diptera: Bibionidae	*Bibio anglicus*			X			X	X	
Diptera: Bibionidae	*Bibio hortulanus*				X				
Diptera: Bibionidae	*Bibio marci*								X
Diptera: Mycetophilidae	*Leia bimaculata*				X				
Diptera: Sciaridae	*Schwenckfeldina carbonaria*				X				
Diptera: Stratiomyidae	*Beris vallata*				X	X			
Diptera: Stratiomyidae	*Chorisops nagatomii*		**Nationally Scarce**					X	
Diptera: Stratiomyidae	*Nemotelus pantherinus*					X		X	X

Order: Family	Taxon	Vernacular	National Status	A	B	C	D	E	F
Diptera: Stratiomyidae	*Pachygaster atra*			X		X			X
Diptera: Stratiomyidae	*Chloromyia formosa*						X	X	
Diptera: Stratiomyidae	*Microchrysa flavicornis*				X				
Diptera: Stratiomyidae	*Microchrysa polita*						X		
Diptera: Stratiomyidae	*Sargus flavipes*					X			
Diptera: Stratiomyidae	*Oplodontha viridula*			X	X				X
Diptera: Asilidae	*Machimus atricapillus*					X			
Diptera: Asilidae	*Neoitamus cyanurus*				X				
Diptera: Asilidae	*Dioctria baumhaueri*			X	X				
Diptera: Hybotidae	*Euthyneura myrtilli*						X		
Diptera: Hybotidae	*Drapetis assimilis*						X		
Diptera: Hybotidae	*Drapetis pusilla*				X				
Diptera: Hybotidae	*Platypalpus albicornis*		**(Nationally Scarce) None**				X		
Diptera: Hybotidae	*Platypalpus annulipes*					X			
Diptera: Hybotidae	*Platypalpus longiseta*				X	X			
Diptera: Hybotidae	*Platypalpus minutus*						X		
Diptera: Hybotidae	*Platypalpus optivus*					X			
Diptera: Hybotidae	*Tachydromia connexa*		**RDB3**			X			
Diptera: Empididae	*Empis nuntia*						X		
Diptera: Empididae	*Empis nigritarsis*				X				
Diptera: Empididae	*Hilara maura*						X	X	
Diptera: Empididae	*Rhamphomyia tarsata*						X		
Diptera: Dolichopodidae	*Microphor holosericeus*					X			
Diptera: Dolichopodidae	*Dolichopus griseipennis*				X			X	
Diptera: Dolichopodidae	*Dolichopus nubilus*			X					
Diptera: Dolichopodidae	*Scellus notatus*			X	X	X			

Order: Family	Taxon	Vernacular	National Status	A	B	C	D	E	F
Diptera: Dolichopodidae	*Sciapus wiedemanni*							X	
Diptera: Dolichopodidae	*Syntormon pallipes*				X	X			X
Diptera: Lonchopteridae	*Lonchoptera bifurcata*				X				
Diptera: Syrphidae	*Melanostoma mellinum*	a hoverfly					X		
Diptera: Syrphidae	*Platycheirus albimanus*	a hoverfly					X		
Diptera: Syrphidae	*Platycheirus scutatus*	a hoverfly		X					
Diptera: Syrphidae	*Chrysotoxum bicinctum*	a hoverfly				X			
Diptera: Syrphidae	*Epistrophe eligans*	a hoverfly					X		
Diptera: Syrphidae	*Episyrphus balteatus*	a hoverfly		X	X		X		
Diptera: Syrphidae	*Eupeodes luniger*	a hoverfly							X
Diptera: Syrphidae	*Meligramma trianguliferum*	a hoverfly	**Nationally Scarce**				X		
Diptera: Syrphidae	*Scaeva pyrastri*	a hoverfly				X			
Diptera: Syrphidae	*Sphaerophoria rueppellii*	a hoverfly			X			X	
Diptera: Syrphidae	*Sphaerophoria scripta*	a hoverfly		X	X	X	X	X	X
Diptera: Syrphidae	*Syrphus ribesii*	a hoverfly				X			
Diptera: Syrphidae	*Rhingia campestris*	a hoverfly					X		
Diptera: Syrphidae	*Melanogaster hirtella*	a hoverfly					X		
Diptera: Syrphidae	*Eristalinus sepulchralis*	a hoverfly			X				
Diptera: Syrphidae	*Eristalis intricaria*	a hoverfly			X				
Diptera: Syrphidae	*Eristalis pertinax*	a hoverfly				X	X		
Diptera: Syrphidae	*Pipizella viduata*	a hoverfly					X	X	
Diptera: Syrphidae	*Triglyphus primus*	a hoverfly	**Nationally Scarce**				X		
Diptera: Syrphidae	*Volucella zonaria*	a hoverfly	**Nationally Scarce**		X				
Diptera: Syrphidae	*Syritta pipiens*	a hoverfly			X	X	X	X	X
Diptera: Pipunculidae	*Tomosvaryella geniculata*			X					
Diptera: Micropezidae	*Micropeza corrigiolata*				X				

Order: Family	Taxon	Vernacular	National Status	A	B	C	D	E	F
Diptera: Psilidae	*Chamaepsila nigricornis*			X	X	X	X		X
Diptera: Conopidae	*Conops quadrifasciatus*					X			
Diptera: Conopidae	*Sicus ferrugineus*							X	
Diptera: Lonchaeidae	*Lonchaea chorea*							X	
Diptera: Piophilidae	*Prochyliza nigrimana*							X	
Diptera: Ulidiidae	*Seioptera vibrans*	a picture-winged fly			X				
Diptera: Tephritidae	*Urophora quadrifasciata*					X			
Diptera: Tephritidae	*Urophora solstitialis*		**(RDB3) Nationally Scarce a**	X					
Diptera: Tephritidae	*Urophora stylata*			X		X		X	
Diptera: Tephritidae	*Campiglossa misella*			X	X	X	X		X
Diptera: Tephritidae	*Oxyna parietina*		**Nationally Scarce b**			X	X	X	X
Diptera: Tephritidae	*Tephritis cometa*			X				X	
Diptera: Tephritidae	*Tephritis divisa*		**RDBK**	X	X	X	X		
Diptera: Tephritidae	*Tephritis formosa*					X			
Diptera: Tephritidae	*Tephritis matricariae*		**RDBK**					X	
Diptera: Tephritidae	*Tephritis neesii*				X	X			
Diptera: Tephritidae	*Tephritis vespertina*						X		
Diptera: Tephritidae	*Terellia ruficauda*			X		X		X	X
Diptera: Tephritidae	*Terellia serratulae*			X					
Diptera: Tephritidae	*Euleia heraclei*						X		X
Diptera: Lauxaniidae	*Homoneura mediospinosa*		**RDB3**					X	
Diptera: Lauxaniidae	*Homoneura patelliformis*		**Nationally Scarce**		X				
Diptera: Lauxaniidae	*Homoneura notata*		**pNationally Scarce**		X	X			
Diptera: Lauxaniidae	*Homoneura thalhammeri*		**Nationally Scarce**				X		
Diptera: Lauxaniidae	*Calliopum aeneum*			X	X	X	X	X	
Diptera: Lauxaniidae	*Pseudolyciella pallidiventris*		**RDBK**			X	X		

Order: Family	Taxon	Vernacular	National Status	A	B	C	D	E	F
Diptera: Lauxaniidae	*Minettia tabidiventris*				X			X	
Diptera: Lauxaniidae	*Minettia fasciata*				X	X	X	X	
Diptera: Lauxaniidae	*Minettia tubifer*				X				
Diptera: Lauxaniidae	*Sapromyza quadricincta*		**Nationally Scarce**	X	X	X	X	X	
Diptera: Lauxaniidae	*Sapromyza quadripunctata*			X	X	X	X	X	
Diptera: Chamaemyiidae	*Chamaemyia herbarum*							X	
Diptera: Sciomyzidae	*Pherbellia cinerella*			X	X	X	X	X	X
Diptera: Clusiidae	*Clusiodes albimanus*						X		
Diptera: Clusiidae	*Clusiodes verticalis*				X				
Diptera: Agromyzidae	*Melanagromyza pubescens*	a leaf-miner fly			X				
Diptera: Agromyzidae	*Liriomyza flaveola*	a leaf-miner fly			X				
Diptera: Agromyzidae	*Liriomyza orbona*	a leaf-miner fly				X			
Diptera: Agromyzidae	*Phytomyza continua*	a leaf-miner fly				X			
Diptera: Agromyzidae	*Phytomyza crassiseta*	a leaf-miner fly		X					
Diptera: Agromyzidae	*Chromatomyia farfarella*	a leaf-miner fly				X			
Diptera: Agromyzidae	*Napomyza lateralis*	a leaf-miner fly			X				
Diptera: Opomyzidae	*Geomyza tripunctata*				X				
Diptera: Chloropidae	*Chlorops pumilionis*				X	X			
Diptera: Chloropidae	*Lasiosina herpini*			X					
Diptera: Chloropidae	*Meromyza nigriventris*					X			
Diptera: Chloropidae	*Meromyza athletica*					X			
Diptera: Chloropidae	*Thaumatomyia glabra*			X		X	X	X	
Diptera: Chloropidae	*Thaumatomyia hallandica*			X		X	X	X	
Diptera: Chloropidae	*Thaumatomyia notata*			X	X		X	X	
Diptera: Chloropidae	*Oscinella frit*			X	X		X	X	
Diptera: Chloropidae	*Oscinella nigerrima*							X	

Order: Family	Taxon	Vernacular	National Status	A	B	C	D	E	F
Diptera: Chloropidae	*Oscinimorpha arcuata*		**pNationally Scarce**	X				X	
Diptera: Chloropidae	*Oscinimorpha sordidissima*		**pNationally Scarce**	X		X			
Diptera: Chloropidae	*Trachysiphonella scutellata*		**(Nationally Scarce) None**			X	X		
Diptera: Chloropidae	*Tricimba cincta*						X		
Diptera: Heleomyzidae	*Heteromyza rotundicornis*						X		
Diptera: Trixoscelididae	*Trixoscelis frontalis*			X	X	X			
Diptera: Drosophilidae	*Scaptomyza pallida*			X			X		
Diptera: Ephydridae	*Psilopa nitidula*			X	X				
Diptera: Ephydridae	*Hydrellia griseola*			X	X				
Diptera: Ephydridae	*Philygria vittipennis*			X					
Diptera: Scathophagidae	*Scathophaga stercoraria*			X	X		X		X
Diptera: Anthomyiidae	*Anthomyia procellaris*					X		X	
Diptera: Anthomyiidae	*Botanophila fugax*			X			X		
Diptera: Anthomyiidae	*Delia coarctata*						X		
Diptera: Anthomyiidae	*Delia florilega*			X		X			
Diptera: Anthomyiidae	*Delia platura*			X	X	X	X		X
Diptera: Anthomyiidae	*Pegomya flavifrons*						X		
Diptera: Fanniidae	*Fannia armata*				X		X		
Diptera: Fanniidae	*Fannia corvina*						X		
Diptera: Fanniidae	*Fannia polychaeta*				X			X	
Diptera: Fanniidae	*Fannia rondanii*						X		
Diptera: Fanniidae	*Fannia sociella*						X		
Diptera: Muscidae	*Coenosia infantula*				X				
Diptera: Muscidae	*Coenosia testacea*			X	X	X	X	X	X
Diptera: Muscidae	*Schoenomyza litorella*			X		X	X		X
Diptera: Muscidae	*Hydrotaea floccosa*						X		

Order: Family	Taxon	Vernacular	National Status	A	B	C	D	E	F
Diptera: Muscidae	*Helina lasiophthalma*			X		X			
Diptera: Muscidae	*Helina reversio*						X		
Diptera: Calliphoridae	*Melanomya nana*					X	X		
Diptera: Rhinophoridae	*Phyto discrepans*					X			
Diptera: Sarcophagidae	*Sarcophaga nigriventris*			X					
Diptera: Sarcophagidae	*Sarcophaga variegata*					X			
Diptera: Sarcophagidae	*Sarcophaga incisilobata*				X				
Diptera: Tachinidae	*Dinera grisescens*				X				
Diptera: Tachinidae	*Rondania fasciata*		**Nationally Scarce**					X	
Diptera: Tachinidae	*Eriothrix rufomaculata*				X	X		X	
Diptera: Tachinidae	*Gastrolepta anthracina*		**None (RDB2)**			X	X		
Diptera: Tachinidae	*Lydella stabulans*					X			
Diptera: Tachinidae	*Phryxe nemea*						X		
Diptera: Tachinidae	*Pseudoperichaeta nigrolineata*						X		
Diptera: Tachinidae	*Pales pavida*						X		
Diptera: Tachinidae	*Platymya fimbriata*						X		
Diptera: Tachinidae	*Phania funesta*					X	X		
Diptera: Tachinidae	*Phasia pusilla*			X		X	X	X	
Diptera: Tachinidae	*Solieria fenestrata*		**None (Nationally Scarce)**		X				
Diptera: Tachinidae	*Actia lamia*		**None (Nationally Scarce)**	X					
Diptera: Tachinidae	*Siphona geniculata*				X				
Hymenoptera: Tenthredinidae	*Allantus togatus*	a sawfly			X				
Hymenoptera: Tenthredinidae	*Fenusa pumila*	a sawfly					X		
Hymenoptera: Tenthredinidae	*Cladius pectinicornis*	a sawfly			X	X			
Hymenoptera: Tenthredinidae	*Hoplocampa crataegi*	a sawfly					X		
Hymenoptera: Tenthredinidae	*Hoplocampa pectoralis*	a sawfly				X	X	X	

Order: Family	Taxon	Vernacular	National Status	A	B	C	D	E	F
Hymenoptera: Tenthredinidae	*Euura atra*	a sawfly			X		X	X	
Hymenoptera: Tenthredinidae	*Euura mucronata*	a sawfly				X			
Hymenoptera: Tenthredinidae	*Euura leucapsis*	a sawfly						X	
Hymenoptera: Tenthredinidae	*Euura leucosticta*	a sawfly						X	
Hymenoptera: Tenthredinidae	*Euura viduatus*	a sawfly						X	
Hymenoptera: Tenthredinidae	*Euura annulatus*	a sawfly		X					
Hymenoptera: Tenthredinidae	*Stauronematus platycerus*	a sawfly						X	
Hymenoptera: Tenthredinidae	*Dolerus niger*	a sawfly		X					
Hymenoptera: Tenthredinidae	*Tenthredopsis scutellaris*	a sawfly					X		
Hymenoptera: Ichneumonidae	*Barylypa propugnator*	an ichneumon				X			
Hymenoptera: Ichneumonidae	*Therion circumflexum*	an ichneumon					X		
Hymenoptera: Ichneumonidae	*Exetastes adpressorius*	an ichneumon		X					
Hymenoptera: Ichneumonidae	*Collyria coxator*	an ichneumon						X	
Hymenoptera: Ichneumonidae	*Collyria trichophthalma*	an ichneumon			X				
Hymenoptera: Ichneumonidae	*Pristomerus vulnerator*	an ichneumon					X		
Hymenoptera: Ichneumonidae	*Temelucha ?decorata*	an ichneumon	**?New for Britain**		X			X	
Hymenoptera: Ichneumonidae	*Aritranis director*	an ichneumon					X		
Hymenoptera: Ichneumonidae	*Hoplocryptus bellosus*	an ichneumon						X	
Hymenoptera: Ichneumonidae	*Diplazon laetatorius*	an ichneumon					X		X
Hymenoptera: Ichneumonidae	*Enizemum ornatum*	an ichneumon				X			
Hymenoptera: Ichneumonidae	*Homotropus haemorrhoidalis*	an ichneumon			X				
Hymenoptera: Ichneumonidae	*Homotropus pictus*	an ichneumon			X	X	X		
Hymenoptera: Ichneumonidae	*Promethes sulcator*	an ichneumon			X				
Hymenoptera: Ichneumonidae	*Sussaba pulchella*	an ichneumon		X	X				
Hymenoptera: Ichneumonidae	*Syrphophilus bizonarius*	an ichneumon		X	X	X	X	X	X
Hymenoptera: Ichneumonidae	*Woldstedtius biguttatus*	an ichneumon			X				

Order: Family	Taxon	Vernacular	National Status	A	B	C	D	E	F
Hymenoptera: Ichneumonidae	*Amblyteles armatorius*	an ichneumon		X			X		
Hymenoptera: Ichneumonidae	*Ctenichneumon panzeri*	an ichneumon					X		
Hymenoptera: Ichneumonidae	*Ephialtes manifestator*	an ichneumon					X		
Hymenoptera: Ichneumonidae	*Scambus buolianae*	an ichneumon			X				
Hymenoptera: Ichneumonidae	*Zaglyptus multicolor*	an ichneumon					X		
Hymenoptera: Ichneumonidae	*Aneuclis melanaria*	an ichneumon			X			X	
Hymenoptera: Ichneumonidae	*Polyblastus cothurnatus*	an ichneumon						X	
Hymenoptera: Ichneumonidae	*Xorides fuligator*	an ichneumon					X		
Hymenoptera: Gasteruptiidae	*Gasteruption jaculator*	a parasitic wasp				X			
Hymenoptera: Proctotrupidae	*Proctotrupes gravidator*	a parasitic wasp		X					
Hymenoptera: Crabronidae	*Harpactus tumidus*	a digger wasp		X				X	
Hymenoptera: Crabronidae	*Crossocerus podagricus*	a digger wasp					X		X
Hymenoptera: Crabronidae	*Crossocerus nigritus*	a digger wasp			X			X	
Hymenoptera: Crabronidae	*Crossocerus distinguendus*	a digger wasp	**Nationally Scarce a**					X	
Hymenoptera: Crabronidae	*Crossocerus varus*	a digger wasp			X				
Hymenoptera: Crabronidae	*Ectemnius continuus*	a digger wasp		X					
Hymenoptera: Crabronidae	*Entomognathus brevis*	a digger wasp					X		
Hymenoptera: Crabronidae	*Lindenius albilabris*	a digger wasp				X	X		
Hymenoptera: Crabronidae	*Oxybelus uniglumis*	Common Spiny Digger Wasp						X	X
Hymenoptera: Crabronidae	*Trypoxylon attenuatum*	Slender Wood Borer Wasp			X				
Hymenoptera: Crabronidae	*Diodontus luperus*	a digger wasp				X			X
Hymenoptera: Crabronidae	*Passaloecus gracilis*	a digger wasp						X	
Hymenoptera: Crabronidae	*Passaloecus singularis*	a digger wasp						X	
Hymenoptera: Crabronidae	*Pemphredon inornata*	a digger wasp					X		
Hymenoptera: Crabronidae	*Pemphredon lethifer*	a digger wasp			X	X			
Hymenoptera: Crabronidae	*Pemphredon lethifer*	a digger wasp			X		X		

Order: Family	Taxon	Vernacular	National Status	A	B	C	D	E	F
Hymenoptera: Crabronidae	*Pemphredon lugubris*	Mournful Wasp					X		
Hymenoptera: Crabronidae	*Pemphredon morio*	a digger wasp	**Nationally Scarce b**			X			
Hymenoptera: Crabronidae	*Spilomena troglodytes*	a digger wasp			X				
Hymenoptera: Crabronidae	*Mimumesa dahlbomi*	a digger wasp					X		
Hymenoptera: Crabronidae	*Psenulus pallipes*	Pale Footed Black Wasp						X	
Hymenoptera: Crabronidae	*Cerceris quinquefasciata*	5-banded Tailed Digger Wasp	**RDB3**		X	X	X		X
Hymenoptera: Crabronidae	*Cerceris rybyensis*	Ornate Tailed Digger Wasp		X	X	X	X	X	X
Hymenoptera: Crabronidae	*Philanthus triangulum*	Bee Wolf	**RDB2**		X				
Hymenoptera: Andrenidae	*Andrena fulva*	Tawny Mining Bee					X		
Hymenoptera: Andrenidae	*Andrena bicolor*	Gwynne's Mining Bee		X		X	X		
Hymenoptera: Andrenidae	*Andrena trimmerana*	Trimmer's Mining Bee	**Nationally Scarce b**						X
Hymenoptera: Andrenidae	*Andrena nigroaenea*	Buffish Mining Bee				X			
Hymenoptera: Andrenidae	*Andrena minutula*	Common Mini-miner			X	X	X	X	X
Hymenoptera: Andrenidae	*Andrena semilaevis*	Shiny-margined Mini-miner					X	X	
Hymenoptera: Andrenidae	*Andrena subopaca*	Impunctate Mini-miner						X	
Hymenoptera: Andrenidae	*Andrena dorsata*	Short-fringed Mining Bee			X	X	X		
Hymenoptera: Andrenidae	*Andrena haemorrhoa*	Orange-tailed Mining Bee					X		
Hymenoptera: Andrenidae	*Andrena flavipes*	Yellow-legged Mining Bee			X		X		
Hymenoptera: Apidae	*Apis mellifera*	Western Honey Bee		X	X	X	X	X	
Hymenoptera: Apidae	*Bombus lucorum sens. lat.*	White-tailed Bumblebee			X		X		X
Hymenoptera: Apidae	*Bombus terrestris*	Buff-tailed Bumblebee		X	X	X	X	X	X
Hymenoptera: Apidae	*Bombus hortorum*	Small Garden Bumblebee							X
Hymenoptera: Apidae	*Bombus lapidarius*	Red-tailed Bumblebee		X	X	X	X		
Hymenoptera: Apidae	*Bombus vestalis*	Vestal Cuckoo Bee					X		
Hymenoptera: Apidae	*Bombus hypnorum*	Tree Bumblebee						X	
Hymenoptera: Apidae	*Bombus pratorum*	Early Bumblebee				X	X		

Order: Family	Taxon	Vernacular	National Status	A	B	C	D	E	F
Hymenoptera: Apidae	*Bombus pascuorum*	Common Carder Bee		X	X	X	X	X	X
Hymenoptera: Apidae	*Nomada flavoguttata*	Little Nomad Bee		X				X	
Hymenoptera: Apidae	*Nomada sheppardana*	Sheppard's Nomad Bee					X		X
Hymenoptera: Colletidae	*Colletes similis*	Bare-saddled Colletes		X	X				
Hymenoptera: Colletidae	*Hylaeus cornutus*	Spined Hylaeus	**Nationally Scarce a**			X			
Hymenoptera: Colletidae	*Hylaeus communis*	Common Yellow-face Bee			X	X	X		
Hymenoptera: Colletidae	*Hylaeus dilatatus*	Chalk Yellow-face Bee		X	X	X	X	X	X
Hymenoptera: Colletidae	*Hylaeus pictipes*	Little Yellow-face Bee	**Nationally Scarce a**				X		
Hymenoptera: Colletidae	*Hylaeus brevicornis*	Short-horned Yellow-face Bee				X			
Hymenoptera: Colletidae	*Hylaeus signatus*	Large Yellow-face Bee	**Nationally Scarce b**	X			X	X	
Hymenoptera: Colletidae	*Hylaeus hyalinatus*	Hairy Yellow-face Bee				X		X	X
Hymenoptera: Halictidae	*Halictus tumulorum*	Bronze Furrow Bee			X			X	
Hymenoptera: Halictidae	*Lasioglossum leucopus*	White-footed Furrow Bee		X	X				
Hymenoptera: Halictidae	*Lasioglossum morio*	Green Furrow Bee		X	X	X	X	X	X
Hymenoptera: Halictidae	*Lasioglossum minutissimum*	Least Furrow Bee				X			
Hymenoptera: Halictidae	*Lasioglossum parvulum*	Smooth-gastered Furrow Bee				X			
Hymenoptera: Halictidae	*Lasioglossum pauperatum*	Squat Furrow Bee	**RDB3**					X	
Hymenoptera: Halictidae	*Lasioglossum villosulum*	Shaggy Furrow Bee		X	X	X		X	
Hymenoptera: Halictidae	*Lasioglossum leucozonium*	White-zoned Furrow Bee			X				
Hymenoptera: Halictidae	*Lasioglossum albipes*	Bloomed Furrow Bee		X					
Hymenoptera: Halictidae	*Lasioglossum pauxillum*	Lobe-spurred Furrow Bee	**Nationally Scarce a**	X		X		X	
Hymenoptera: Halictidae	*Sphecodes crassus*	Swollen-thighed Blood Bee	**Nationally Scarce b**	X		X		X	
Hymenoptera: Halictidae	*Sphecodes ephippius*	Bare-saddled Blood Bee					X	X	
Hymenoptera: Halictidae	*Sphecodes geoffrellus*	Geoffroy's Blood Bee						X	
Hymenoptera: Megachilidae	*Heriades truncorum*	Large-headed Resin Bee	**RDBK**	X			X		
Hymenoptera: Megachilidae	*Hoplitis claviventris*	Welted Mason Bee			X		X	X	

Order: Family	Taxon	Vernacular	National Status	A	B	C	D	E	F
Hymenoptera: Megachilidae	*Osmia spinulosa*	Spined Mason Bee					X		
Hymenoptera: Megachilidae	*Osmia caerulescens*	Blue Mason Bee				X	X		
Hymenoptera: Melittidae	*Melitta leporina*	Clover Melitta			X		X		
Hymenoptera: Bethylidae	*Epyris bilineatus*	a solitary wasp			X				
Hymenoptera: Bethylidae	*Epyris niger*	a solitary wasp						X	
Hymenoptera: Chrysididae	*Hedychridium caputaureum*	a cuckoo wasp	**First for Britain**		X				
Hymenoptera: Chrysididae	*Hedychridium roseum*	a cuckoo wasp		X		X			
Hymenoptera: Chrysididae	*Hedychrum niemelai*	a cuckoo wasp	**RDB3**			X	X		
Hymenoptera: Chrysididae	*Holopyga ovata*	a cuckoo wasp	**RDBK**					X	X
Hymenoptera: Chrysididae	*Pseudomalus auratus*	a cuckoo wasp			X				
Hymenoptera: Dryinidae	*Anteon jurineanum*	a solitary wasp				X			
Hymenoptera: Formicidae	*Lasius brunneus*	an ant	**Nationally Scarce a**			X	X	X	
Hymenoptera: Formicidae	*Lasius niger*	an ant				X			
Hymenoptera: Vespidae	*Ancistrocerus gazella*	a mason wasp						X	
Hymenoptera: Vespidae	*Ancistrocerus parietum*	Wall Mason Wasp							X
Hymenoptera: Vespidae	*Polistes dominula*	a paper wasp	**RDBK**	X		X			
Pulmonata: Hygromiidae	*Cernuella virgata*	Striped Snail		X					
		total diversity	**482**	121	160	183	189	149	72
		all scarce/RDB	**68**	15	16	27	23	29	8
		% scarce/RDB	**14.1**	12	10	15	12	19	11
		no RDB	**22**	3	6	10	7	9	3
		% RDB	**4.6**	2.5	3.8	5.5	3.7	6	4

Appendix C

Bat Survey Data

Trees one and two

Surveyor location	Species	Time of first call (minutes past sunset)	Total contacts
1st survey results – 6 August 2020			
Surveyor 1: South-west T2 AP	Common pipistrelle	21:07 (18 min)	1
Surveyor 2: East of T1 MF		No bats seen*	
2nd survey results – 20 August 2020			
Surveyor 1: South of T2 AS	Noctule	20:12 (-2 min)	1
	Common pipistrelle	20:40 (26 min)	17
	Soprano pipistrelle	21:31 (77 min)	1
Surveyor 2: East of T1 MF	Common pipistrelle	20:41 (27 min)	16
	Soprano pipistrelle	21:49 (95 min)	1
IR camera: west of T1		No bat activity recorded by camera	
3rd survey results – 01 September 2020			
Surveyor 1: South of T2 AS	Common pipistrelle	20:07 (6 min)	13
	Soprano pipistrelle	20:09 (8 min)	5
	Noctule	20:22 (21 min)	1
Surveyor 2: East of T1 MF	Common pipistrelle	20:07 (6 min)	9
	Pipistrelle sp.	20:09 (8 min)	4
	Noctule	20:22 (21 min)	1
	Soprano pipistrelle	20:32 (31 min)	1
IR camera: west of T1		No bat activity recorded by camera	

*Only one detector used during survey

Appendix D

Invasive Species Photographs

Photograph 1. Cotoneaster

Photograph 2. Tree of Heaven

Photograph 3. Buddleia