M60/M62/M66 Simister Island Interchange

TR010064

ENVIRONMENTAL STATEMENT APPENDICES

APPENDIX 8.11 TERRESTRIAL INVERTEBRATE SURVEY REPORT

APFP Regulation 5(2)(a)

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M60/M62/M66 Simister Island Interchange

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ENVIRONMENTAL STATEMENT APPENDICES
APPENDIX 8.11 TERRESTRIAL INVERTEBRATE SURVEY REPORT

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Appendix 8.11 Terrestrial invertebrate survey report

Executive summary

This technical report represents the findings of the terrestrial invertebrate surveys undertaken within the survey area for the M60/M62/M66 Simister Island Interchange (the 'Scheme'). The survey area comprised two areas of land, referred to as Site 1 and Site 2. Since surveys were undertaken the Order Limits has been reduced and Site 2 is now outside of the Zone of Influence for the Scheme as it is more than 400m from the Order Limits.

This report provides a summary of the field surveys that were undertaken between July and September 2021. The surveys comprised a variety of sampling methods including a walking observation transect, sweep netting/beating, ground searching, the deployment of a malaise trap and moth trapping.

The species recorded within Site 1 were generally widespread and typical of the habitats present on site. The site interest lies with species diversity rather than species rarity, particularly those associated with open grassland habitats such as tall ruderal vegetation. When considering the mosaic of habitats together, overall, the site is of moderate value to a wide range of commonly occurring invertebrates.

Species with a designated conservation status recorded in Site 1 were:

- Cinnabar moth (SoPI – Research only[1])
- Alder leaf beetle (nationally rare – considered an agricultural pest)
- Rustic moth *Hoplodrina blanda* (SoPI - Research only[1])
- *Phalacrocera replicata* (Nationally Scarce[2] crane fly associated with acid and sedge peats)

Most of the species recorded within Site 2 were generally widespread and typical of the habitats present on site. From the current results, the site interest lies with species diversity within open habitats such as the woodland glades, and potentially the sand banks present throughout the site. The diverse age structure and habitat mosaics present throughout Site 2 (deadwood/fungi, open glades, streams, bare ground), indicate the site is likely of high value for invertebrates in the local area. Further surveys were recommended to provide specialist input to ascertain a reliable reflection of the woodlands value to invertebrates, however due to the reduction in extent of the Order Limits resulting in Site 2 no longer being within the Zone of Influence for the Scheme (and therefore there is no potential for effects on invertebrates within Site 2), further surveys have not been undertaken.

[1] Not intended to be affected by requirements of the National Planning Policy Framework, Section 15, 179 (b) publication (2012), unlike other confirmed SoPI

[2] Species which have been recorded from 16-30 10km squares since 1980

Given the terrestrial invertebrate assemblage identified comprised mostly common and widespread species, these have been valued as being of **Local importance** in the study area.

1 Introduction

1.1 Purpose of the report

1.1.1 This technical report presents the findings of terrestrial invertebrate surveys undertaken as part of the M60/M62/M66 Simister Island Interchange (the 'Scheme'). The purpose of the surveys was to provide supporting information for the biodiversity assessment in Chapter 8: Biodiversity of the Environmental Statement (TR010064/APP/6.1).

1.1.2 The report identified suitable habitat within the provisional Order Limits available at the time of survey (discussed and presented in detail in the Environmental Scoping Report (TR010064/APP/6.6)) to support terrestrial invertebrate assemblages of nature conservation interest. Subsequent terrestrial invertebrate surveys were undertaken at two sites between July and September 2021. The terrestrial invertebrate survey report is presented in Section 2.

1.1.3 Section 3 provides an update to the findings of the original survey report in line with the Order Limits.

1.2 Aims and objectives

1.2.1 The aim of the desk and field-based surveys was to provide a robust ecological baseline for terrestrial invertebrates and to assess the value of the habitats present based on invertebrate assemblage so that the potential impacts of the Scheme can be fully assessed.

1.2.2 The key objectives of these surveys were to:

- Assess the survey area for habitat suitability to support notable terrestrial invertebrate assemblages
- Undertake field surveys to gather information relating to terrestrial invertebrate species diversity and abundance
- Establish a baseline to determine the importance of the survey area for terrestrial invertebrate assemblages
- Provide sufficient information to inform an assessment of potential impacts to terrestrial invertebrate assemblages so that appropriate mitigation could be developed, if required.

1.3 Evaluation of importance of ecological resource

1.3.1 Ecological Impact Assessment uses a hierarchical geographic framework to assign importance to ecological resources. This is based on an understanding of how the ecological resource may contribute to the conservation status or distribution of the species or habitat at a particular geographical scale.

1.3.2 The following geographical frame of reference is based on Design Manual for Roads and Bridges LA 108 Biodiversity (Highways England, 2020) to assess the importance of the terrestrial invertebrate assemblages within the survey area:

- International or European
- UK or National
- Regional e.g. North-West England
- County e.g., Greater Manchester
- Local (e.g. within 2km of the Scheme).

2 Terrestrial invertebrate survey report

M60 Simister Island

Terrestrial Invertebrate Surveys

July 2022

Control sheet

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Contents

1. Introduction

1.1 Bowland Ecology Ltd was commissioned by Jacobs to undertake terrestrial invertebrate surveys at two Sites within the M60 Junction Improvement Scheme (central NGR of site 1: SD 82793 06215; site 2: SD 80381 04434), which are subject to proposals for the improvement of existing motorway junctions.

1.2 Site 1 is located in Simister, Greater Manchester, near to junction 18 of the M60. The immediate surrounding land use is primarily agricultural, interspersed with areas of urban overspill; there is a golf course directly north which holds several ponds. The site comprises three main habitat types: semi-mature broadleaved woodland; tall ruderal vegetation, and marshy grassland.

1.3 Site 2 is located in Prestwich, Greater Manchester, near to junction 17 of the M60 and is within a Local Nature Reserve (LNR). The immediate surrounding area is a mixture of semi-natural habitats (including several LNRs) along with agricultural land, a golf course, and urban overspill. The site comprises mature broadleaved woodland, with glades creating small pockets of tall herb and scrub.

1.4 The purpose of the survey was to establish a baseline overview of the terrestrial invertebrate diversity on site, and assess the value of the habitats present on the basis of their invertebrate fauna. This report includes a description of survey methods, habitats present, and invertebrate fauna recorded, highlighting those of conservation significance.

2. Methodology

2.1 This report follows the Guidelines for Ecological Report Writing (CIEEM, 2017), and is in line with the British Standard BS42020:2013 'Biodiversity – Code of practice for planning and development'.

Terrestrial Invertebrate Surveys

2.2 The terrestrial invertebrate surveys comprised a variety of sampling methods to inform a comprehensive assessment of the site. These were: a walking observation transect; sweep netting/beating; ground searching; the deployment of a malaise trap and moth trapping. Details of each method are described below.

Transect

2.3 The transect methodology followed guidance published by Sevilleja *et al*. (2019) in order to provide a standardised baseline for any future surveys; two visits were undertaken at each site. This survey recorded species which could be identified through field characters, predominantly Lepidoptera and Hymenoptera, but also selected examples of other Orders, including Odonata, Coleoptera, and Diptera.

<u>Site 1</u>

2.4 The transect at this site was approximately 1 km in length and split into 10 sections based broadly on habitat type (Figure 1). The transect covered a variety of habitat types including tall ruderal vegetation, broadleaved woodland, scrub, marshy grassland, and also field margins comprising hedgerows with small patches of semi-improved grassland.

Figure 1: Transect route for site 1, with sections and malaise trap location.

Site 2

2.5 The transect was approximately 0.7 km in length, divided into 5 sections relating to variation in habitat type (Figure 2). The route aimed to encompass areas with varying woodland structure, and several small glades filled largely with Himalayan balsam and scattered scrub.

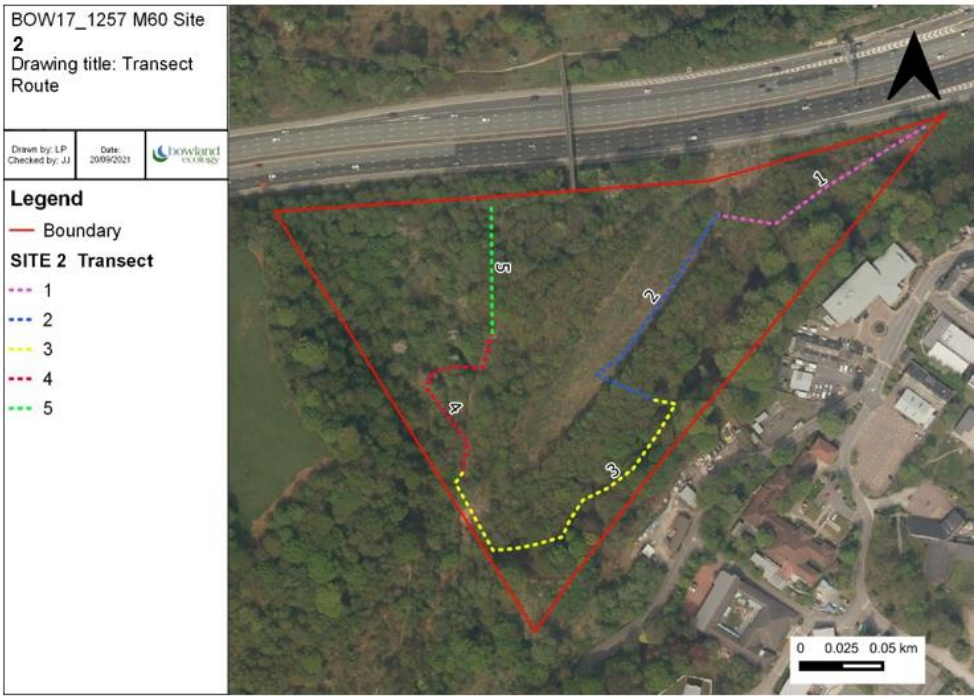

Figure 2: Transect route for site 2, with sections displayed.

2.6 All surveys were performed during optimal weather conditions and during peak summer when butterfly abundance is considered highest (Sevilleja et al. 2019), full survey and weather details as specified in the methodology are outlined in Table 1 below:

Table 1: Weather, timings, and surveyor details for transect surveys.

Site	Date & visit	Surveyors	Start and end time	Wind start and end (Beaufort scale)	Start and end Temperature (°C)	Cloud cover (CC) per section	Rain
1	15.07.21 V1, ALL SECTIONS	Lucy Pocock (LP) BSc (Hons); Mark Breaks (MB) BSc (Hons)	11:35 - 12:30	1, 1	23, 24	1-8=0%, 9-10= 10%	NIL
1	02.08.21, V2 **SECTIONS 4-10 ONLY***	LP, MB	11:05 – 11:35	0, 1	17, 18	4-10= 50%	NIL

1	25.08.21 V2, **SECTIONS 1-3 ONLY***	LP	11:30 – 12:00	0, 1	18, 19	1-2=40%, 3= 60%	NIL
2	22.07.21, V1, ALL SECTIONS	LP, Steve Muddiman (SM), BSc (Hons), MSc	11:00 – 11:30	0, 0	28, 28	1-5 = 0%	NIL
2	04.08.21, V2, ALL SECTIONS	MB, Sam Robinson (SR), BA (Hons)	13:25 – 14:00	1, 1	21, 21	1-5= 30%	NIL

**See limitations section*

Active searches

2.7 A sweep netting and ground search survey for each site was repeated on four occasions between July and September, following guidance outlined in Drake *et al.* (2007). The locations of sampling areas were chosen strategically to encompass the broad habitat types present on site; the specific locations were flexible depending on the environmental conditions present on the day of survey. For example, searches were targeted in areas with dappled/direct sunlight, where insects are more likely to be present. Approximate sample locations for each site are displayed in Figures 3 and 4 below. Beating was performed opportunistically when passing suitable, accessible canopy/shrub cover.

2.8 In order for repeatability and comparability with any future surveys, the methodology followed timed searching methods comprising a ten-minute search per feature/broad habitat type, divided into 5, 2-minute searches (where appropriate) to avoid concentrating the search effort onto one 'hot-spot'. The timings included both searching *and* collecting.

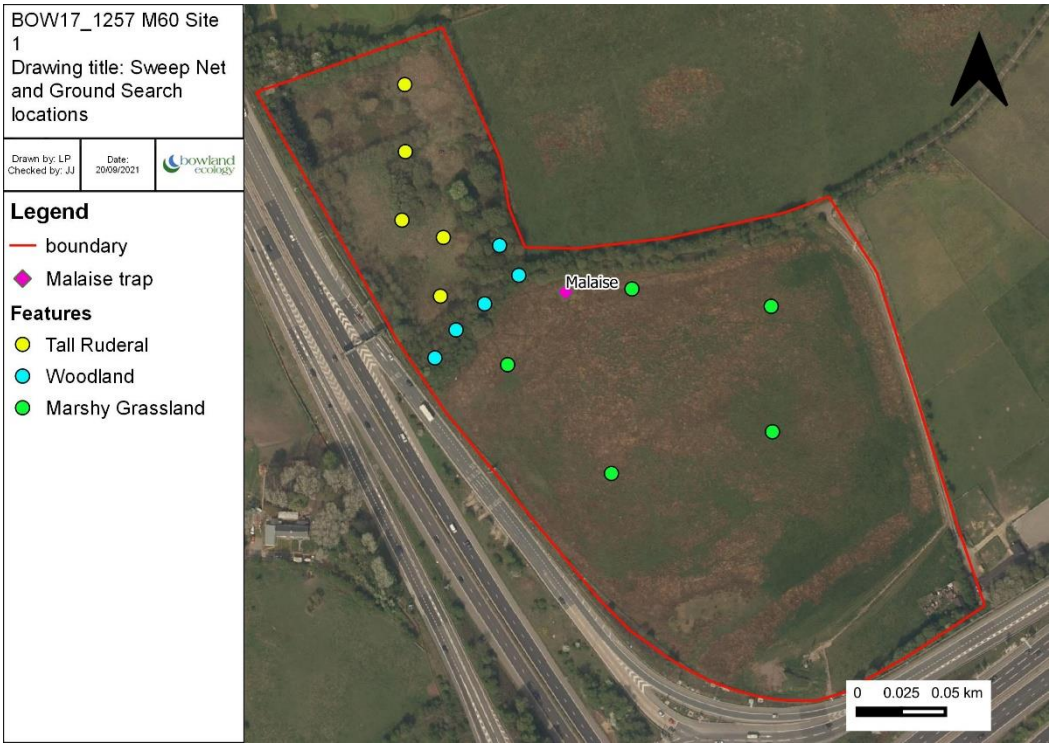

Figure 3: Approximate survey locations of sweep net and ground searching surveys at site 1.

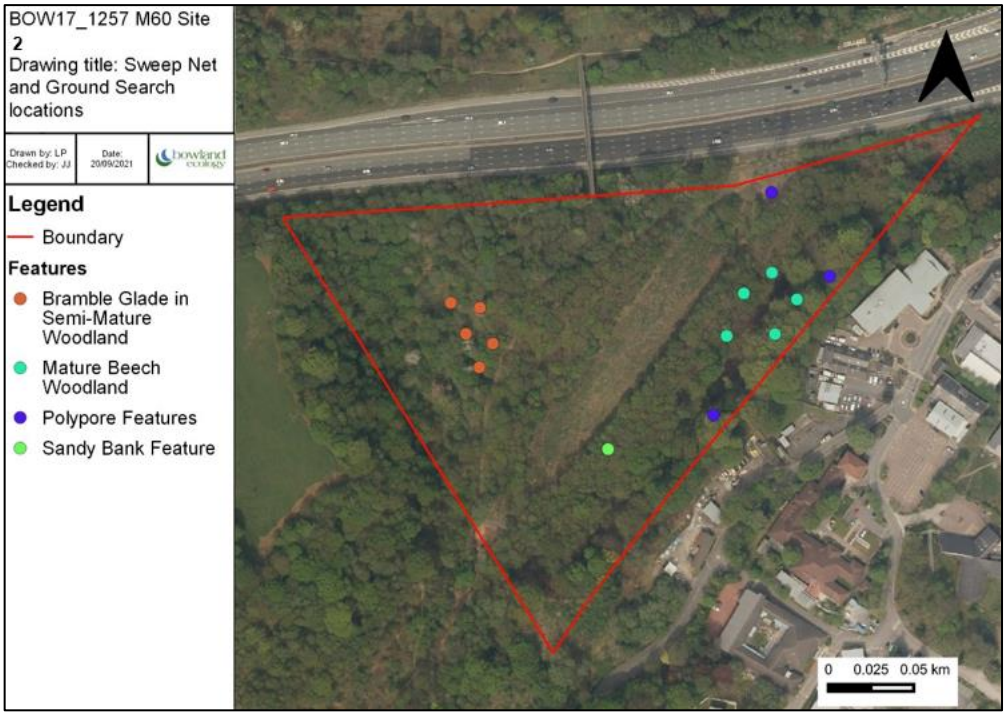

Figure 4: Approximate survey locations of sweep net and ground searching surveys at site 2.

2.9 All surveys were performed during optimal weather conditions apart from visit 3 of site 1 (see limitations); full survey and weather details are outlined in Table 2 below.

Table 2: *Weather, timings, and surveyor details for sweep and ground search surveys.*

Site & Visit	Date	Time	Surveyors	Weather
1, V1	15.07.21	12:30	LP, MB	Dry, sunny, 24°C, BF1, 0% CC
1, V2	02.08.21	11:45	LP, MB	Dry, partly cloudy, 19°C, BF1, 50% CC
1, V3	20.08.21	12:00	LP, Luke Hall (LH) BSc (Hons)	Light drizzle, overcast, 18°C, BF0, 100% CC
1, V4	06.09.21	12:00	LP, MB	Partly cloudy, 22°C, BF1, 40% CC
2, V1	22.07.21	12:00	LP, SM	Dry, sunny, 28°C, BF0, 0% CC
2, V2	04.08.21	12:00	MB, SR	Dry, partly cloudy, 21°C, BF1, 30% CC
2, V3	25.08.21	13:00	LP	Dry, partly cloudy, 19°C, BF1, 60% CC
2, V4	09.09.21	12:30	LP, Lauren Hadfield (LHa) BSc (Hons)	Dry, scattered clouds, 25°C, BF0, 10% CC

Passive sampling (site 1 only)

2.10 A malaise trap (Figure 6) was deployed in the same location at site 1 over four separate 1 week periods, the timings of which aimed to target a variety of species according to seasonality. The trap was placed along the margin of the woodland and marshy grassland, which featured scattered scrub along its length. The location is displayed in Figure 5 below.

2.11 A moth trap (5W 12V Portable Actinic 'Heath' Model) was deployed on top of a 200 x 200 m white sheet and placed in two different locations over four visits (see limitations). Given the lack of mains power source, this trap specification is considered suitable to capture a wide range of moth species. The trap was placed in marshy grassland amongst several alder saplings for two periods, and within a small clearing amongst tall ruderal vegetation for a further two periods; this tall ruderal vegetation was, however, cut before the final survey resulting in large open areas of short grassland (see limitations). The trap locations are displayed in Figure 5.

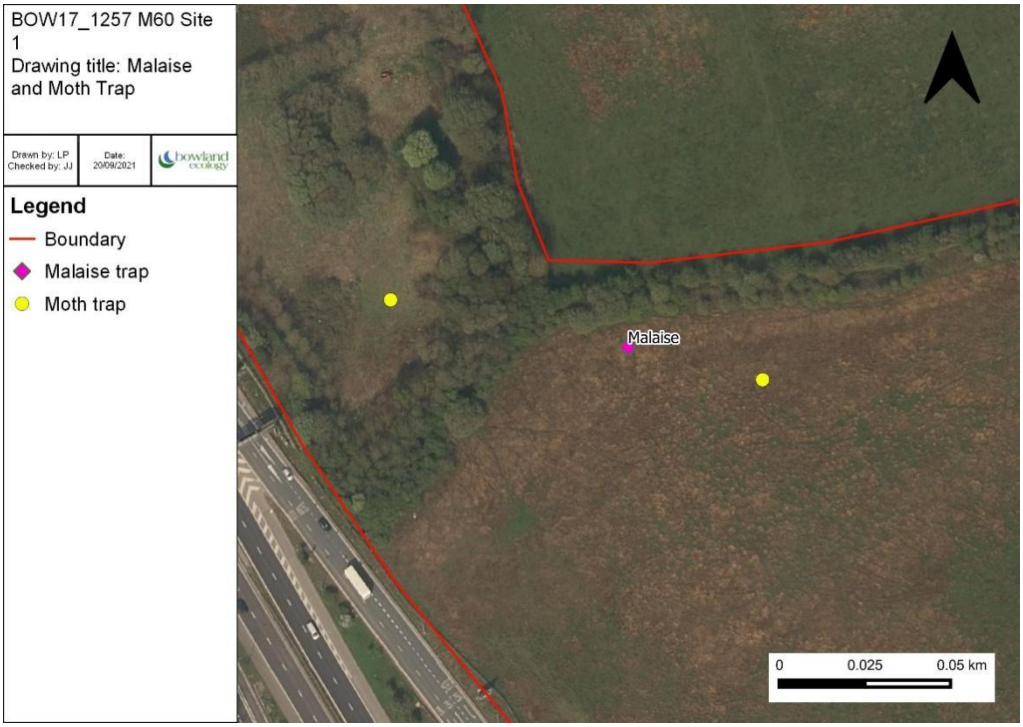

Figure 5: Moth and malaise trap locations at site 1.

Figure 6: Malaise trap at site 1 within marshy grassland.

2.12 Due to security issues, neither of the above static trapping methods were deployed at site 2 (See limitations). Furthermore, security issues at site 1 prevented the moth trap from being left out over-night. Therefore, the moth trap was erected at sunset and was manned for 2-3 hours, with all species recorded

during that time frame. Specific survey and weather details are displayed in Table 3 below:

Table 3: *Weather, timings, and surveyor details for malaise and moth trapping surveys.*

Site & Visit	Method	Date	Time	Surveyors	Moon Phase	Weather
1, V1	Malaise	16/07/21-23/07/21	Set: 12:00 Collect: 13:00	LP, MB	First quarter to full moon	Mostly sunny with scattered clouds, average day time temperature of 27°C. No rain.
1, V2	Malaise	02/08/21-09/08/21	Set: 12:00 Collect: 15:00	LP, Jack Taylor (JT) BSc (Hons)	Third quarter to a new moon	Mostly sunny with scattered clouds, average day time temperature of 18.5°C. Rain on the 5th, 7th, 8th.
1, V3	Malaise	16/08/21-23/08/21	Set: 12:00 Collect: 11:00	LP, MB	First quarter to full moon	Mostly overcast with some partly cloudy days. Average day time temperature of 17°C. Rain on 17th only.
1, V4	Malaise	06/09/021-13/09/21	Set: 12:00 Collect: 13:00	LP, MB	New moon to first quater	Mostly partly cloudy. Average day time temperature of 17°C. Light rain on 12th only.
1, V1	Moth	15/07/21	Start: 21:20 Sunset:21:31 End: 00:00	MB, Jack Morris (JM)	Waxing crescent	Dry, BF1, 18°C, 0% CC
1, V2	Moth	03/08/21	Start: 21:00 Sunset:21:02 End: 21:02	MB, JM	Waning crescent	Dry, BF1, 10 - 17°C, 10% CC
1, V3	Moth	07/09/21	Start: 19:45 Sunset:19:45 End: 22:45	MB, LP	New moon	Dry, BF1, 15-25°c, 0% CC.
1, V4	Moth	15/09/21	Start: 19:26 Sunset:16:26 End:22:26	MB, LP	Waxing gibbous	Dry, BF1, 13-15°C, 40% CC

Data analysis and identification

2.13 Whilst some identification could be performed in the field (all Lepidoptera were identified in the field), most samples were stored in 70% iso-propyl alcohol for subsequent identification. The identification of specimens was performed with a stereo microscope primarily by Lucy Pocock BSc (Hons) under the supervision of Steve Muddiman BSc (Hons), MPhil. Lucy is an Ecologist nearing completion of an Entomology MSc at Harper Adams University, in addition, Lucy is also part

of the invertebrate team at Lancashire Wildlife Trust's Species Reintroduction Group. Steve holds a Zoology BSc and Entomology MPhil., along with 30+ years of experience as an entomologist. He is a Fellow of the Royal Entomological Society and has described 21 species of insects new to science. Mark Breaks BSc (Hons) and Jack Morris BSc (Hons) identified those species suited to their specialism, particularly Lepidoptera, Odonata, Hymenoptera, and Coleoptera. Both Jack and Mark are Ecologists with strong interests in amateur Entomology. Identified orders were largely restricted to those with reliable/available literature, including those listed in the reference list.

2.14 Families identified were selected according to the presence of good taxonomic and ecological information, which were representative of the habitats sampled, and those which are well recorded nationally to enable access to reliable species information. Those included were:

- Coleoptera: Cantharidae, Carabidae, Cerambycidae, Chrysomelidae, Coccinellidae, Curculionidae, Elateridae, Latridiidae, Silphidae, and Stenus cicindeloides;
- Dermaptera: Forficulidae;
- Diptera: mainly Agromyzidae, Dolichopodidae, Empididae, Syrphidae, and Tipulidae;
- Hemiptera: Acanthosomatidae, Anthocoridae, Aphrophoridae, Cicadellidae, Cixiidae, Miridae, and Pentatomidae;
- Hymenoptera: Apidae; Cynipidae; Ichneumonidae (those with distinct identifying features), Tenthredinidae, and Vespidae;
- Lepidoptera: Blastobasidae, Choreutidae, Crambidae, Depressariidae, Erebidae, Gelechiidae, Geometridae, Gracillariidae, Hesperiidae, Lycaenidae, Noctuidae, Notodontidae, Nymphalidae, Peleopodidae, Pieridae, Pyralidae, Tortricidae, and Zygaenidae;
- Odonata: Aeshnidae, Coenagrionidae, and Libellulidae; and
- Orthoptera: Acrididae.

2.15 Following identification, the resulting data was inputted into Pantheon software. Pantheon is a tool developed by Natural England and the Centre for Ecology & Hydrology to analyse invertebrate sample data. Pantheon applies associated habitats and resources, assemblage types (adapted from the Invertebrate Species-habitat Information System [ISIS]), conservation status, habitat fidelity scores and other information to an invertebrate species list. The analysis then produces two key metrics, describes below. These metrics can be used to determine comparative site quality, by indicating relative habitat quality and assist in management decisions by revealing the key ecological resources present.

2.16 The first key metric is the Species Quality Index (SQI). This is a numerical scoring system which measures the quality of a location on the basis of its invertebrate assemblage through counting and assigning scores weighted towards rarer species. Each species recorded from a sample is given a Species Quality Score (SQS) based on its conservation status. The SQI is the sum of all

SQSs divided by the number of species in that sample. This score is multiplied by 100 to give a three-figure value without decimal places (e.g.100 rather than a 1.00). The SQI score accounts for surveyor effort, however failure to record common species could result in overly amplified SQI scores. There is presently no published guidance on what SQI score might be classed as 'good' or 'average', as this might vary between habitats and regions (e.g. Northern vs. Southern England). However, generally a habitat with an SQI score exceeding 125 is likely to be of some value and merit further consideration.

2.17 The second metric, Species Assemblage Types (SATs) are generally regarded as the most valuable metrics for assessing site quality. This is because SATs are made up of species with a high degree of habitat specialisation. Such species tend to be both uncommon and representative of sites supporting habitat of quality in terms of conservation value. However, SATs often require targeted sampling of specific habitat features and are not always well represented in broadscale surveys designed to gain an overall, or baseline assessment of a site's value and conservation designations.

Limitations

2.18 Ecological surveys are limited by factors that affect the presence of plants and animals such as the time of year, migration patterns and behaviour. Therefore, the survey of the study area has not produced a complete list of invertebrates. Particularly, the spring period has been omitted from the study and should be considered when assessing invertebrate assemblages. As this study is to gain a baseline overview of the site's invertebrate diversity, at present this is not considered a significant constraint. If further surveys are required, the full invertebrate season should be considered.

2.19 At site 1, access was restricted to sections 1-3 by landowners during the second transect visit. Therefore, sections 1-3 were re-visited on a later date once access had been arranged. Given the optimal weather conditions and a similar species assemblage recorded to visit 1, it is not considered to affect the overall conclusions of this report.

2.20 During the ground and sweep survey, visit 3 of site 1, infrequent rain produced sub-optimal survey conditions. In addition, some days of the malaise trap deployment rain was also recorded. However, considering the warm temperature, abundance of insects recorded, and the number of other visits completed during optimal weather conditions, these constraints are not considered to affect the overall conclusions of this report.

2.21 Due to access restrictions mentioned in section 2.17, the moth trap was deployed in a different area (marshy grassland) on the second visit. Once access was re-arranged to the tall ruderal section, the vegetation had been cleared. Moth numbers had declined significantly between the 2 visits at the tall ruderal vegetation area, however, due to low moth numbers also recorded on the second visit to the marshy grassland, it is likely that seasonality was the main cause of moth decline. The varying locations is not considered a significant constraint as it captures the heterogeneity within the site.

2.22 Security related issues prevented some sampling methods for site 2. Therefore, it is likely that the number of recorded species was greatly reduced due to a lack of passive sampling. The overall assessment of this site should reflect this

limitation. Future surveys site 2 should consider pitfall deployment in secluded locations, along with deadwood surveys for saproxylic species.

2.23 It should be noted that the confidence in the Pantheon analysis is reduced where survey work does not follow the precise ISIS sampling protocols. Since the objective of the survey was to identify a broad range of invertebrates across key areas of habitat, the methods employed do vary slightly from the ISIS protocol. In such instances Webb et al. (2018) advises that caution is applied when using the assessments, and that confidence in scores should be considered as 'Medium' for semi-ISIS compliant samples. In the present context, the analysis is considered to be broadly indicative; and may therefore help to understand which assemblages within the survey area are likely to be important.

3. Results

Site Description

Site 1

3.1 Site 1 is immediately surrounded by arable fields along with a horse paddock, and a golf course holding several ponds. To the west, the M60/M66 motorway runs parallel to the site boundary. Three main habitat types forming site 1 comprise marshy grassland to the south and tall ruderal vegetation to the north, divided by a narrow strip of semi-mature broad-leaved woodland:

Marshy grassland (Fig.7) - Marshy grassland dominates the southern end of the site, covering approximately 5.6 ha, and forming a low hill of around 100 m above sea level (ASL). A small depression at the southern hill footing appears to hold water, although it was dry at the time of survey. Small scrapes created through borehole trials have resulted in small pools at the peak of the hill, common darters (*Sympetrum striolatum*) were witnessed egg laying in these newly created pools. The vegetation lies on loam (clay and silt dominated) soil, derived from glacial till. The area is open and void from shade and it is currently unmanaged; however, the ground appears poached, suggestive of historic cattle grazing. The vegetative species composition is dominated by soft rush (*Juncus effusus*) with abundant Yorkshire fog (*Holcus lanatus*), sweet vernal grass (*Anthoxanthum odoratum*), crested dogs tail (*Cynosurus cristatus*), common couch grass (*Elymus repens*), perennial rye grass (*Lolium perenne*), and common bent grass (*Agrostis capillaris*), with frequent ragwort (*Jacobaea vulgaris*) and spear thistle (*Cirsium vulgare*). The hill footings (particularly the southwestern slope) are more diverse, with additional species comprising sneezewort (*Achillea ptarmica*), meadow vetchling (*Lathyrus pratensis*), birds foot trefoil (*Lotus corniculatus*), scattered alder (*Alnus glutinosa*) saplings, and a small number of common spotted orchid (*Dactylorhiza fuchsii*).

Figure 7: Marshy grassland at site 1

Tall Ruderal Vegetation (Fig. 8) - Tall ruderal vegetation covers approximately 1.2 ha of the northern section of the site. Topographically, the land is flat and vegetation lies on loam (sand dominated) derived from glacial fluvial deposits; a small section at the north-eastern corner is formed from peat. The vegetation is dense and unmanaged, it is dominated by creeping thistle (*Cirsium arvense*) and

common nettle (*Urtica dioica*), with abundant common hogweed (*Heracleum sphondylium*), ragwort, and bramble (*Rubus fruticosus agg.*).

Figure 8: Tall ruderal vegetation at site 1

Broadleaved woodland (Fig. 9) – Semi-mature broadleaved woodland (approximately 0.5 ha) dissects the tall ruderal and marshy grassland, along with an additional smaller section present within the tall ruderal area. The woodland is of a uniform age structure with limited standing/fallen deadwood and little evidence of regeneration. The habitat has developed over flat ground and features the same soil composition as the adjacent marshy grassland. A public footpath runs through the area and there are no signs of any woodland management, resulting in a dense canopy with a sparse understory and very little ground flora. The woodland canopy is dominated by oak (*Quercus robur*), alder, rowan (*Sorbus aucuparia*), and ash (*Fraxinus excelsior*), the understory comprises hawthorn (*Crataegus monogyna*), holly (*Ilex aquifolium*), and elder (*Sambucus nigra*), with common nettle, common hogweed, herb robert (*Geranium robertianum*), lady fern (*Athyrium filix-femina*), bramble, and small numbers of broad-leaved helleborine (*Epipactis helleborine*), all of which forms a denser structure edging the path. Towards the west is a patch of ornamental species with a large stand of bamboo (*Fargesia* sp.) and other garden ornamental plants present throughout the ground flora.

Figure 9: Woodland at site 1

Site 2

3.2 Site 2 is located within Philips Park Local Nature Reserve (LNR), and Mere Clough LNR. It is bordered by the M60 to the north, along with urban and arable areas to the east. Topographically, the land forms a steep hill and valley with freely draining, slightly acidic sandy soil (sand to sandy loam), formed from glacial fluvial deposits. The site is dominated by mature and semi-mature broadleaved woodland with small glades and several streams present. It is open to the public and is a popular walking route/amenity area, with abundant bare sandy ground used by off-road cyclists. These patches of sandy ground have become a feature for invertebrates, with evidence of Hymenoptera utilising the sand banks displayed at various places within the site (Fig. 10).

Figure 10: Sand banks within site 2.

3.3 The woodland has two main species compositions comprising a mature broadleaved woodland to the east, which is dominated by beech with occasional sycamore (*Acer pseudoplatanus*), horse chestnut (*Aesculus hippocastanum*), and alder (*Alnus glutinosa*). This transitions into a younger semi-mature woodland to the west, which comprises predominately oak (*Quercus* sp.) and silver birch (*Betula pendula*). Species present within the woodland understory include holly (*Ilex aquifolium*) and rhododendron (*Rhododendron ponticum* sp. agg.); there is signs of woodland regeneration with abundant saplings dominating the shrub layer. There appears to be no evidence of woodland management. Where there are canopy gaps, small woodland glades have formed, most of which are dominated solely by Himalayan balsam. In some smaller areas of dappled sun light, bramble dominates the shrub layer (Fig. 11). Other ground flora includes enchanter's nightshade (*Circaea lutetiana*), bracken (*Pteridium aquilinum*), *Cotoneaster* sp., and Japanese knotweed (*Reynoutria japonica*). Both standing and fallen deadwood, along with various fungi were present particularly throughout the mature beech section of the woodland,

including several areas of deadwood with polypore (Fig. 12). Polypore was searched manually with a pooter, along with an aerial sweep and ground search of the surrounding area.

Figure 11 & 12: Young woodland at site 2, with bramble dominated openings; tree stump with polypore.

Transect

Site 1

3.4 The transect of Site 1 recorded 38 species on visit one and 46 species on visit two. In total, 59 species were recorded over both visits, a full species list can be viewed in Appendix A. The most frequently recorded insect orders were Lepidoptera, Diptera, and Odonata; accounting for 69% of total species. As anticipated, 33 species were associated with open habitats, along with ten wetland and two tree-associated species. Only one of these species holds a conservation designation (See Appendix B for full conservation status description). The cinnabar moth (*Tyria jacobaeae*) is a Species of Principal Importance (SPI) (Research only[1]), it is mainly associated with ragwort, the larval food plant.

3.5 The alder leaf beetle (*Agelastica alni*), associated with alder trees, was found in abundance during the surveys. It is currently designated a Nationally Rare species (NR); however, it is widely accepted that this species' range and population has recently increased significantly, and that the status requires updating.

Site 2

3.6 The transect of site two recorded 14 species on visit one and 29 species on visit two. In total, 23 species were recorded over both visits, a full species list can be viewed in Appendix A. The most frequently recorded insect orders were Lepidoptera and Hymenoptera; accounting for 64% of total species. 18 species were associated open habitats, along with four tree-associated species, and three wetland species. One of these species, the cinnabar moth, holds a conservation designation, as mentioned above.

[1] A research only designation identifies species with a significant population decline in the past 25 years. They are not yet a 'rare' species and are not intended to be affected by requirements of the National Planning Policy Framework, Section 15, 179 (b) publication (2012), unlike other confirmed SPI.

Passive Sampling

Site 1

3.7 In total, 70 different species of moth were recorded over the four moth trap visits to site 1 (Appendix A). Species associated with plants (41), open habitats (28), and tree-associated (18) habitats were most frequently recorded, one wetland species was recorded. Of these results, two hold a conservation designation:

- Cinnabar moth, a SPI (Research only[2]). This moth is mainly associated with ragwort; and
- The rustic moth *(Hoplodrina blanda),* a SPI (Research only[2]). This moth is mainly associated with plantains (*Plantago*) sp. and dock (*Rumex)* sp.

3.8 39 species in total were identified in the malaise trap, this was from an approximate 10% sub-sample. The first visit produced the highest abundance of insects; however, the majority of this catch comprised *Nephrotoma flavipalpis,* a species of crane fly (*Tipulidae*) which is fairly frequent and widespread in Britain. The most frequently encountered order was Diptera, accounting for 75% of the total catch. 15 species were associated with wetland habitats, 12 with open habitats, and 8 with woodland. Of the species recorded, one holds a conservation designation; *Phalacrocera replicata,* a species of crane fly with a Nationally Scarce status associated with acid and sedge peats.

3.9 Other noteworthy species include the hoverfly *Platycheirus granditarsus,* a widespread but local species in Britain, which prefers wet meadows and the edge of water bodies.

Active Sampling

Site 1

3.10 24 species were recorded from the sweep and ground searches at site 1. The most frequently encountered order was Hemiptera, accounting for 70% of the total sample. Most species were associated with open habitats (7), trees (5), and plants (5). None of the collected species hold a conservation designation.

3.11 Noteworthy species include *Sciapus platypterus,* a long-legged fly associated with shaded woodland and often recorded around hedgerows and on tree trunks; the species is widespread in Britain but not frequently encountered. *Orthotylus flavinervis* is a locally common Hemiptera species, associated with alder and sycamore.

Site 2

3.12 28 species were recorded from the active searches at site 2. The most frequently encountered order was Coleoptera, accounting for 45% of the total sample. Most species were associated with open habitats (11), plant-associated (9), and tree-associated (7). Of the collected specimens, one holds a conservation

[2] A research only designation identifies species with a significant population decline in the past 25 years. They are not yet a 'rare' species and are not intended to be affected by requirements of the *National Planning Policy Framework, Section 15, 179 (b)* publication (2012), unlike other confirmed SPI.

designation, *Zabrus tenebrioides*, is a Nationally Scarce (NS) ground beetle associated largely with arable landscapes, though this is where it draws most attention due to being an agricultural pest. This is an unusual record for this area where the species is likely at it's current range limit.

3.13 Other noteworthy species include *Notiophilus rufipes* a ground beetle with a local status, often found among leaf litter or under logs in woodland, particularly in damp shaded areas, and *Dryomyza anilis*, collected from aerial polypore sweeping. This Diptera species is associated with decaying organic matter including carrion, dung, and fungi, it is fairly frequent in England and Wales.

3.14 One specimen of Ichneumonidae (*Tersilochinae* sp.) was collected from sand mound habitat, however identification proved difficult due to poor confidence in literature owing to the constantly evolving taxonomy of Hymenoptera. However, the solitary wasp *Crossocerus quadrimaculatus* was identified during sweep surveys (readily identifiable by a spine at the bottom of the occipital carina), this species requires exposed sand for nesting and likely also utilises the sand mounds on site.

Pantheon Analysis

Site 1

Species Quality Index (SQI)

3.15 Overall, 171 species were recorded at site 151 of which were used to calculate the SQI score of 111 for the whole site. Species not included in the Pantheon database were omitted from the analysis. When the site is broken down into broad biotopes (Table 3), the SQI score increases for tree-associated and wetland biotypes scoring 126 and 135, respectively. However, a cautionary approach should be taken with such figures, due to the low number of species used to generate the score. When specific habitats within biotypes are examined (Table 4), tree-associated (broadleaved arboreal) habitats consistently produced higher SQI scores throughout the classification levels (141). When expanded into assessment of traits and resources (Table 5), arboreal canopies scored an SQI of 144 with a total of 20 species, along with broadleaved woodland only, scoring 150 based on 18 species. Again, these calculations are based on too few species to be fully reliable. All other assessments either scored 100 or were based on too few species to produce a reliable estimate.

Table 3: Broad biotopes

Broad biotope	No. of species	% representation	SQI	Species with conservation status	Conservation status
open habitats	72	2	100	25	23 LC (Global); 1 NT; 2 Section 41 Priority Species - research only; 1 NE (Global); 1 DD
tree-associated	33	<1	126	15	13 LC (Global); 2 DD; 1 NR
wetland	23	<1	135	2	1 Notable; 1 LC (Global)

first prev 1 next last — Showing records 1 to 3 of 3

Table 4: Habitats

Broad biotope	Habitat	No. of species	% representation	SQI	Species with conservation status	Conservation status
open habitats	tall sward & scrub	66	2	100	24	23 LC (Global); 1 NT; 1 DD; 2 Section 41 Priority Species - research only
tree-associated	arboreal	21	2	141	12	11 LC (Global); 1 DD; 1 NR
tree-associated	shaded woodland floor	11	<1	⚠100	2	2 LC (Global)
wetland	acid & sedge peats	10	<1	⚠130	2	1 Notable; 1 LC (Global)
wetland	marshland	10	1	⚠146		
wetland	running water	5	<1	⚠100		
wetland	wet woodland	4	1	⚠100		
tree-associated	wet woodland	4	2	⚠100		
open habitats	short sward & bare ground	2	<1	⚠100		
tree-associated	decaying wood	1	<1	⚠100	1	1 DD

first prev 1 next last — Showing records 1 to 10 of 10

Table 5: Resources

Broad biotope	Habitat	Resource	No. of species	% representation	SQI	Species with conservation status	Conservation status
open habitats	tall sward & scrub	habitats >> sward/field layer	57	4	100	24	1 DD; 23 LC (Global); 1 NT; 2 Section 41 Priority Species - research only
tree-associated	arboreal	canopy	20	2	144	11	10 LC (Global); 1 DD; 1 NR
tree-associated	arboreal	conifer or broadleaved >> broadleaved only	18	2	150	11	10 LC (Global); 1 DD; 1 NR
open habitats	tall sward & scrub	soil humidity >> dry	18	3	100	10	9 LC (Global); 1 NT; 1 Section 41 Priority Species - research only
open habitats	tall sward & scrub	soil humidity >> damp	13	3	⚠100	4	4 LC (Global)
tree-associated	shaded woodland floor	conifer or broadleaved >> broadleaved only	11	1	⚠100	2	2 LC (Global)
wetland	marshland	shallow freshwater pond	6	2	⚠167		
tree-associated	shaded woodland floor	shadiness	6	<1	⚠100	1	1 LC (Global)

Species Assemblage Types (SATs)

3.16 The SATs included in the ISIS analysis are presented in Table 6 below. Of these, the SAT with the highest SQI based on the number of reported species was 'rich flower resource', with 5 species, followed by 'scrub edge', with 3 species. The 'rich flower resource' category is an assemblage that is often well represented in flower-rich grassland sites such as the tall ruderal area to the north of this site, paired with unmanaged field margins. However, the number of associated species is not high enough to provide a reliable SQI result for the SATs. The reported condition for each SAT was unfavourable.

Table 6: SAT results

Broad biotope	Habitat	Code	SAT	No. of species	% representation	SQI	Conservation status	Species with conservation status	Reported condition
open habitats		F002	rich flower resource	5	2	100	1 NE (Global); 1 DD	2	Unfavourable (5 species, 15 required)
open habitats		F001	scrub edge	3	1	100	1 LC (Global)	1	Unfavourable (3 species, 11 required)
		A215	epiphyte fauna	1	5	100	1 LC (Global)	1	Unfavourable (1 species, 3 required)
wetland	acid & sedge peats	W314	reed-fen & pools	1	<1	100	1 LC (Global)	1	Unfavourable (1 species, 11 required)

first prev 1 next last Showing records 1 to 4 of 4

Site 2

SQI

3.17 Overall, 55 species were recorded at site 2, 46 of which were used to calculate the SQI score of 130 for the whole site. Species not included in the Pantheon database were omitted from the analysis. When the site is broken down into broad biotypes (Table 7), the SQI score decreases for open habitats to 111. Tree-associated and wetland biotypes score 170 and 186 respectively, however, these scores should not be used as the sample size was less than 15. When specific habitats within biotopes are examined (Table 8), tall sward and scrub scored the most reliable SQI of 100. However, the sample size for this (22) is still considered low for an accurate representation of site quality. All other habitats such as tree-associated arboreal, and open habitats short sword and bare ground, present SQIs of 250 and above, though all are not representative due to a low sample size and should not be used for evaluation. When expanded into assessment of traits and resources (Table 9), the highest confidence SQI was sward/field layer, scoring 100 from a sample of 16 species. All other scores were based on species counts of 7 or less and therefore not representative.

Table 7: Broad biotopes

Broad biotope	No. of species	% representation	SQI	Species with conservation status	Conservation status
open habitats	28	<1	111	6	1 NE (Global); 3 LC (Global); 1 NT; 1 NS; 1 Section 41 Priority Species - research only
tree-associated	10	<1	170	2	1 LC (Global); 1 NR; 1 DD
wetland	4	<1	186		

first prev 1 next last Showing records 1 to 3 of 3

Table 8: Habitats

Broad biotope	Habitat	No. of species	% representation	SQI	Species with conservation status	Conservation status
open habitats	tall sward & scrub	22	<1	100	3	3 LC (Global); 1 Section 41 Priority Species - research only
tree-associated	shaded woodland floor	6	<1	100	1	1 LC (Global)
tree-associated	arboreal	4	<1	275	1	1 NR; 1 DD
wetland	acid & sedge peats	2	<1	100		
open habitats	short sward & bare ground	2	<1	250	2	1 NS; 1 NT
wetland	marshland	1	<1	250		

first prev 1 next last — Showing records 1 to 6 of 6

Table 9: Resources

Broad biotope	Habitat	Resource	No. of species	% representation	SQI	Species with conservation status	Conservation status
open habitats	tall sward & scrub	habitats >> sward/field layer	16	1	100	2	2 LC (Global); 1 Section 41 Priority Species - research only
open habitats	tall sward & scrub	soil humidity >> damp	7	2	100		
tree-associated	shaded woodland floor	conifer or broadleaved >> broadleaved only	6	<1	100	1	1 LC (Global)
tree-associated	arboreal	canopy	4	<1	275	1	1 DD; 1 NR
tree-associated	arboreal	foliage	4	<1	275	1	1 NR; 1 DD
tree-associated	shaded woodland floor	humidity >> damp	3	1	100		
tree-associated	arboreal	foliage >> leaves and/or stems	3	1	333	1	1 DD; 1 NR
open habitats	tall sward & scrub	soil humidity >> variable humidity	3	<1	100		
open habitats	tall sward & scrub	habitats >> litter & ground layer	3	<1	100		

SATs

3.18 The SATs included in the ISIS analysis are presented in Table 10 below. Of these, the SAT with the highest SQI based on the number of reported species was 'rich flower resource', with 6 species, followed by 'scrub edge', with 2 species. However, the number of species associated at the site is not high enough to provide a reliable result. The reported condition for each SAT was

unfavourable. Though dominated by Himalayan balsam, glades within the woodland likely provide rich nectar sources for insects resulting in the higher representation for the rich flower resource category.

Table 10: SAT results

Broad biotope	Habitat	SAT	No. of species	% representation	SQI	Conservation status	Species with conservation status	Code	Reported condition
open habitats		rich flower resource	6	2	100	1 NE (Global); 1 LC (Global)	2	F002	Unfavourable (6 species, 15 required)
open habitats		scrub edge	2	<1	100			F001	Unfavourable (2 species, 11 required)
open habitats		scrub-heath & moorland	2	<1	250	1 NS	1	F003	Unfavourable (2 species, 9 required)
open habitats	short sward & bare ground	bare sand & chalk	1	<1	100	1 NT	1	F111	Unfavourable (1 species, 19 required)

first prev 1 next last

Showing records 1 to 4 of 4

4. Conclusion

Site 1

4.1 The species present are generally widespread and typical of the habitats present on site. The site interest lies with species diversity rather than species rarity, particularly those associated with open grassland habitats such as tall ruderal vegetation. When considering the mosaic of habitats together, overall, the site is of moderate value to a wide range of commonly occurring invertebrates.

4.2 The Pantheon analysis of this species list shows that the value of this site lies largely in its open habitats. Specifically, the tall sward and scrub areas such as the tall ruderal in the northern section of the site and the field margins; the mosaic of this habitat with marshy grassland to the south also likely enhances the value of this habitat for insects. On a landscape (broad biotope) level, the greatest number of recorded species was attributed to the 'Open habitats' classification, with 72 recognised species. 33 and 23 species were 'tree-associated' and 'wetland-associated', respectively. Proportionately, the 'Open habitats' classification supports a greater number of species than the other two assemblages in terms of the national pool of species attributed in the Pantheon database. The representation of this entire species pool, was 2%, compared with <1% and <1% of the national species pools represented from the survey data for the tree-associated and wetland assemblages, respectively at a biotope level. These findings would be expected in consideration of passive sampling effort being concentrated largely on open grassland and wetland habitats.

4.3 The survey of this site is considered sufficient to provide a baseline overview of the sites value for invertebrates. This report provides detail to enable effective mitigation/management of habitats at the site with respect to invertebrates and should be used accordingly, the table in Appendix A can be referred to for specific species associations. Future surveys should target the habitats of value as outlined above.

Site 2

4.4 Most of the species present are generally widespread and typical of the habitats present on site. From the current results, the site interest lies with species diversity within open habitats such as the woodland glades, and potentially the sand banks present throughout the site. Further surveys are needed with specialist input to ascertain a reliable reflection of the woodlands value to invertebrates (see paragraph 4.6). Given the diverse age structure and habitat mosaics present throughout the site (deadwood/fungi, open glades, streams, bare ground), the site is likely of high value for invertebrates in the local area.

4.5 The results reliability for this site was poor due to the small species list produced. Therefore, conclusions must be treated with caution. Considering this, the Pantheon analysis of this species list shows that the value of this site lies largely in its open habitats. Specifically, flower rich glades within the woodland. On a landscape (broad biotope) level, the greatest number of recorded species was attributed to the 'Open habitats' classification, with 28 recognised species. 10 and 4 species were 'tree-associated' and 'wetland-associated', respectively. All of the biotope classifications supported <1% of species represented in the national species pool. These findings would be expected given the lack of passive sampling effort in this location.

4.6 Site 2 would benefit from further survey to more thoroughly assess the value for invertebrates. Though based on limited species numbers, high SQI scores in categories ‘tree associated - arboreal’ and ‘open habitats – short sward and bare ground’ indicate potential for high quality habitats. Therefore, it is recommended that targeted surveys are performed within bare sandy ground/banks across the site and samples sent to a Hymenoptera specialist, along with further arboreal surveys; preferably utilising passive methods within the canopy (out of reach of public) with an aim to capture the diverse age range within the woodland structure. Mature sections of woodland to the east, would further benefit from a deadwood and more in-depth fungi survey.

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Appendix A – Full species results list

Order	Family	Vernacular	Species	Site 1	Site 2	Associations	Conservation Designations
Coleoptera	Cantharidae	Common red soldier beetle	Rhagonycha fulva	x	x	Arthropoda	
Coleoptera	Carabidae	Ground beetle	Loricera pilicornis		x		
Coleoptera	Carabidae	Ground beetle	Notiophilus rufipes		x	Arthropoda, Plantae	
Coleoptera	Carabidae	Great blackclock	Pterostichus niger		x		
Coleoptera	Carabidae	Ground beetle	Zabrus tenebrioides		x	Short grassland	NS
Coleoptera	Cerambycidae	Golden-bloomed grey Longhorn beetle	Agapanthia villosoviridescens		x		
Coleoptera	Chrysomelidae	Alder leaf beetle	Agelastica alni	x	x	Alnus, Corylus, Salix	DD;NR – under review
Coleoptera	Chrysomelidae	Green dock leaf beetle	Gastrophysa viridula	x		Asteraceae	
Coleoptera	Chrysomelidae	Viburnum leaf beetle	Pyrrhalta viburni		x		
Coleoptera	Coccinellidae	7-spot ladybird	Coccinella septempunctata	x	x		
Coleoptera	Coccinellidae	11-spot ladybird	Coccinella undecimpunctata	x			
Coleoptera	Coccinellidae	Harlequin ladybird	Harmonia axyridis	x			
Coleoptera	Coccinellidae	14-spotted ladybird	Propylea quattuordecimpunctata	x			
Coleoptera	Curculionidae	Beech leaf-miner beetle	Orchestes fagi		x		
Coleoptera	Elateridae	Click beetle	Agriotes pallidulus		x		

Coleoptera	Latridiidae	N/A	Corticarina		x		
Coleoptera	Silphidae	Common sexton beetle	Nicrophorus vespilloides	x			
Coleoptera	Staphylinidae	Grey rove beetle	Stenus cicindeloides		x		
Dermaptera	Forficulidae	Common earwig	Forficula auricularia	x	x		
Diptera	Agromyzidae	Holly leaf miner	Phytomyza ilicis	x	x		
Diptera	Agromyzidae	Buttercup leaf miner	Phytomyza ranunculi	x			
Diptera	Calliphoridae	Common green bottle fly	Lucilia sericata	x			
Diptera	Chloropidae	N/A	Cetema cereris	x			
Diptera	Cylindrotomidae	Crane fly	Phalacrocera replicata	x		Damp woodland	NS
Diptera	Dolichopodidae	Long-legged fly	Argyra argyria	x		Arthropoda, Fagales	
Diptera	Dolichopodidae	Long-legged fly	Argyra diaphana	x		Arthropoda, Fagales	
Diptera	Dolichopodidae	Long-legged fly	Dolichopus popularis	x		Arthropoda	
Diptera	Dolichopodidae	Long-legged fly	Dolichopus simplex	x		Arthropoda	
Diptera	Dolichopodidae	Long-legged fly	Dolichopus trivialis	x		Arthropoda	
Diptera	Dolichopodidae	Long-legged fly	Dolichopus wahlbergi	x		Arthropoda, Fagales	
Diptera	Dolichopodidae	Long-legged fly	Medetera jacula	x		Fagales	DD
Diptera	Dolichopodidae	Semaphore fly	Poecilobothrus nobilitatus	x		Arthropoda	
Diptera	Dolichopodidae	Long-legged fly	Sciapus platypterus	x		Arthropoda, Plantae	
Diptera	Dolichopodidae	Long-legged fly	Sybistroma obscurellum	x		Arthropoda, Plantae	
Diptera	Dryomyzidae	N/A	Neuroctena anilis	x	x	Fagales, Plantae, Vertebrata	
Diptera	Empididae	Dance fly	Empis livida	x		Arthropoda	
Diptera	Hybotidae	Dance fly	Hybos culiciformis	x	x	Diptera, Plantae	
Diptera	Muscidae	Noon fly	Mesembrina meridiana	x			
Diptera	Rhagionidae	Snipe fly	Rhagio lineola	x	x	Plantae	

Diptera	Scathophagidae	Yellow dung fly	Scathophaga stercoraria	x	x	Bos, Diptera	
Diptera	Stratiomyidae	Black soldier fly	Hermetia illucens	x			
Diptera	Syrphidae	Marmalade hoverfly	Episyrphus balteatus	x	x	Aphididae	
Diptera	Syrphidae	Hoverfly	Eristalis horticola	x			
Diptera	Syrphidae	Hoverfly	Eristalis nemorum	x			
Diptera	Syrphidae	Hoverfly	Eristalis pertinax	x			
Diptera	Syrphidae	Tapered dronefly	Eristalis tenax	x	x		
Diptera	Syrphidae	Footballer hoverfly	Helophilus pendulus	x			
Diptera	Syrphidae	Large footballer hoverfly	Helophilus trivittatus	x			
Diptera	Syrphidae		Melanostoma mellinum	x	x	Arthropoda	
Diptera	Syrphidae	Hoverfly	Melanostoma scalare	x		Arthropoda	
Diptera	Syrphidae	Hoverfly	Platycheirus granditarsus	x		Aphididae	Widespread but local
Diptera	Syrphidae	Hoverfly	Platycheirus rosarum	x		Aphididae, Fagales	
Diptera	Syrphidae	Common snout hoverfly	Rhingia campestris	x			
Diptera	Syrphidae	Pied hoverfly	Scaeva pyrastri	x		Aphididae	
Diptera	Syrphidae	Hoverfly	Sphaerophoria interrupta	x		Aphididae	
Diptera	Syrphidae	Long hoverfly	Sphaerophoria scripta	x		Aphididae	
Diptera	Syrphidae	Common banded hoverfly	Syrphus ribesii	x	x	Aphididae	
Diptera	Syrphidae	Bumble-bee mimic hoverfly	Volucella bombylans	x		Bombus, Vespula	
Diptera	Tipulidae	Crane fly	Nephrotoma flavipalpis	x		Plantae	

Diptera	Opomyzidae	N/A	opomyza germinationis	x		Brachypodium, Poaceae	
Hemiptera	Acanthosomatidae	Hawthorn shield bug	Acanthosoma haemorrhoidale	x		Crataegus	
Hemiptera	Anthocoridae	Common flower bug	Anthocoris nemorum	x	x		
Hemiptera	Aphrophoridae	Alder spittlebug	Aphrophora alni	x			
Hemiptera	Aphrophoridae	Meadow spittlebug	Philaenus spumarius	x	x		
Hemiptera	Cicadellidae	Green leafhopper	Cicadella viridis	x		Juncus	
Hemiptera	Cixiidae	Planthopper	Cixius nervosus	x	x		
Hemiptera	Miridae	Black-kneed caspid	Blepharidopterus angulatus	x		Alnus, Betula, Fagales, Tetranychus	
Hemiptera	Miridae	Plant bug	Deraeocoris flavilinea	x			
Hemiptera	Miridae	Plant bug	Grypocoris (Lophyromiris) stysi	x	x	Apiaceae, Heracleum sphondylium, Urtica	
Hemiptera	Miridae	Meadow plant bug	Leptopterna dolabrata	x		Poaceae	
Hemiptera	Miridae	Plant bug	Mecomma ambulans	x	x		
Hemiptera	Miridae	Bracken bug	Monalocoris filicis		x	Polypodiales, Pteridium aquilinum	
Hemiptera	Miridae	Plant bug	Orthotylus flavinervis	x		Acer pseudoplatanus, Alnus, Arthropoda	
Hemiptera	Miridae	Plant bug	Plagiognathus arbustorum	x		Urtica	
Hemiptera	Miridae	Grass bug	Stenodema laevigata		x	Poaceae	
Hemiptera	Nabidae	Marsh damsel bug	Nabis limbatus	x		Arthropoda	
Hemiptera	Pentatomidae	Green shield bug	Palomena prasina	x		Corylus, Fagales	
Hemiptera	Pentatomidae	Bronze shield bug	Troilus luridus	x		Arthropoda, Fagales	

Hymenoptera	Apidae	European honey bee	Apis mellifera	x	x		
Hymenoptera	Apidae	Common carder bee	Bombus (Thoracobombus) pascuorum	x	x		
Hymenoptera	Apidae	Tree bumble bee	Bombus hypnorum		x	Asteraceae, Fagales	
Hymenoptera	Apidae	Red-tailed bumble bee	Bombus lapidarius	x	x		
Hymenoptera	Apidae	Whit-tailed bumble bee	Bombus lucorum	x			
Hymenoptera	Apidae	Early bumble bee	Bombus pratorum		x	Asteraceae, Fagales	
Hymenoptera	Apidae	Buff-tailed bumble bee	Bombus terrestris	x	x		
Hymenoptera	Braconidae	Parasitoid wasp	Rhyssalinae		x		
Hymenoptera	Crabronidae	Solitary wasp	Crossocerus quadrimaculatus		x		
Hymenoptera	Cynipidae	Silk button gall wasp	Neuroterus numismalis		x		
Hymenoptera	Cynipidae	Spangle gall wasp	Neuroterus quercusbaccarum		x		
Hymenoptera	Ichneumonidae	Parasitoid wasp	Enicospilus	x			
Hymenoptera	Ichneumonidae	Parasitoid wasp	Ephialtes manifestator	x			
Hymenoptera	Ichneumonidae	Black slip wasp	Pimpla rufipes	x			
Hymenoptera	Ichneumonidae	N/A	Tersilochinae	x			
Hymenoptera	Tenthredinidae	Sawfly	Cladius compressicornis	x			
Hymenoptera	Tenthredinidae	Sawfly	Cladius pectinicornis	x			
Hymenoptera	Vespidae	Common wasp	Vespula vulgaris	x			

Lepidoptera	Blastobasidae	Dingy dowd moth	Blastobasis adustella	x		Plantae	
Lepidoptera	Choreutidae	Common nettle tap	Anthophila fabriciana	x		Urtica dioica	
Lepidoptera	Crambidae	Water veneer moth	Acentria ephemerella	x		Elodea canadensis	
Lepidoptera	Crambidae	Grass moth	Agriphila straminella	x	x		
Lepidoptera	Crambidae	Grass moth	Eudonia pallida	x		Calliergonella cuspidata	
Lepidoptera	Crambidae	Beautiful China-mark	Nymphula nitidulata	x		Sparganium	
Lepidoptera	Crambidae	Mother of pearl	Pleuroptya ruralis	x			
Lepidoptera	Crambidae	Common grey	Scoparia ambigualis	x			
Lepidoptera	Depressariidae	Moth	Agonopterix ocellana	x		Salix	
Lepidoptera	Erebidae	Dingy footman	Eilema griseola	x		Ascomycota, Fagales	
Lepidoptera	Erebidae	Common footman	Eilema lurideola	x			
Lepidoptera	Erebidae	Small fan-foot	Herminia grisealis	x		Clematis, Fagales, Rubus	
Lepidoptera	Erebidae	The snout	Hypena proboscidalis	x		Urtica dioica	
Lepidoptera	Erebidae	The Balckneck	Lygephila pastinum	x			
Lepidoptera	Erebidae	Straw dot	Rivula sericealis	x			
Lepidoptera	Erebidae	Cinnabar moth	Tyria jacobaeae	x	x	Jacobaea vulgaris	Section 41 Priority Species - research only
Lepidoptera	Gelechiidae	Moth	Bryotropha terrella	x		Poaceae	
Lepidoptera	Gelechiidae	Moth	Helcystogramma rufescens	x		Poaceae	
Lepidoptera	Geometridae	Common white wave	Cabera pusaria	x		Asteraceae, Fagales	
Lepidoptera	Geometridae	Red-green carpet	Chloroclysta siterata	x		Fagales, Quercus	

Lepidoptera	Geometridae	V-pug	Chloroclystis v-ata	x		Ribes, Sambucus
Lepidoptera	Geometridae	Green carpet	Colostygia pectinataria	x		Galium
Lepidoptera	Geometridae	Common marbled carpet	Dysstroma truncata	x		
Lepidoptera	Geometridae	Engrailed moth	Ectropis crepuscularia	x		Asteraceae, Fagales
Lepidoptera	Geometridae	Canary-shouldered thorn	Ennomos alniaria	x		Asteraceae, Fagales
Lepidoptera	Geometridae	Common carpet	Epirrhoe alternata	x		
Lepidoptera	Geometridae	Wormwood pug	Eupithecia absinthiata	x		Achillea millefolium, Calluna, Erica, Jacobaea vulgaris
Lepidoptera	Geometridae	Large emerald	Geometra papilionaria	x		Alnus, Betula, Corylus
Lepidoptera	Geometridae	Double-striped pug	Gymnoscelis rufifasciata	x		Ilex, Ulex
Lepidoptera	Geometridae	Riband wave	Idaea aversata	x		Rumex, Taraxacum
Lepidoptera	Geometridae	Small fan-footed wave	Idaea biselata	x		Asteraceae, Plantae
Lepidoptera	Geometridae	Clouded silver	Lomographa temerata	x		Crataegus monogyna, Prunus spinosa
Lepidoptera	Geometridae	Brimstone	Opisthograptis luteolata	x		Crataegus monogyna, Prunus spinosa
Lepidoptera	Geometridae	Small rivulet	Perizoma alchemillata	x		Galeopsis
Lepidoptera	Geometridae	Flame carpet	Xanthorhoe designata	x		Brassica
Lepidoptera	Gracillariidae	Horse-chestnut leaf miner	Cameraria ohridella		x	Aesculus hippocastanum
Lepidoptera	Hesperiidae	Large skipper	Ochlodes sylvanus	x		Brachypodium pinnatum, Brachypodium sylvaticum, Dactylis glomerata, Molinia caerulea
Lepidoptera	Hesperiidae	Small skipper	Thymelicus sylvestris	x		Alopecurus pratensis, Brachypodium sylvaticum, Dactylis glomerata, Holcus lanatus, Holcus mollis, Phleum pratense

Lepidoptera	Lycaenidae	Small copper	Lycaena phlaeas	x		Rumex acetosa, Rumex acetosella, Rumex obtusifolius	
Lepidoptera	Noctuidae	Dark spectacle	Abrostola triplasia	x		Urtica dioica	
Lepidoptera	Noctuidae	Light arches	Apamea lithoxylaea	x		Poaceae	
Lepidoptera	Noctuidae	Dark arches	Apamea monoglypha	x		Dactylis, Poaceae	
Lepidoptera	Noctuidae	Slender brindle	Apamea scolopacina	x		Poaceae	
Lepidoptera	Noctuidae	Silky wainscot	Chilodes maritima	x		Phragmites australis	
Lepidoptera	Noctuidae	The dun-bar	Cosmia trapezina	x		Asteraceae, Fagales	
Lepidoptera	Noctuidae	The rustic	Hoplodrina blanda	x		Plantago, Rumex	Section 41 Priority Species - research only
Lepidoptera	Noctuidae	Common rustic	Mesapamea secalis agg.	x			
Lepidoptera	Noctuidae	The cloaked minor	Mesoligia furuncula	x		Poaceae	
Lepidoptera	Noctuidae	The smokey wainscot	Mythimna impura	x		Poaceae	
Lepidoptera	Noctuidae	Lesser yellow underwing	Noctua comes	x		Asteraceae	
Lepidoptera	Noctuidae	Broad-bordered yellow underwing	Noctua fimbriata	x			
Lepidoptera	Noctuidae	Lesser broad-bordered yellow underwing	Noctua janthe	x			
Lepidoptera	Noctuidae	Large yellow underwing	Noctua pronuba	x	x	Asteraceae	
Lepidoptera	Noctuidae	Flame shoulder	Ochropleura plecta	x		Plantago, Rumex	
Lepidoptera	Noctuidae	Lempke’s gold spot	Plusia putnami	x		Calamagrostis	

Lepidoptera	Noctuidae	Six-striped rustic	Xestia sexstrigata	x		Asteraceae	
Lepidoptera	Noctuidae	Square-spot rustic	Xestia xanthographa	x		Asteraceae	
Lepidoptera	Notodontidae	Buff-tip	Phalera bucephala	x		Asteraceae, Fagales	
Lepidoptera	Notodontidae	Coxcomb prominent	Ptilodon capucina	x		Asteraceae, Fagales	
Lepidoptera	Nymphalidae	Peacock butterfly	Aglais io		x	Humulus lupulus, Urtica dioica, Urtica urens	
Lepidoptera	Nymphalidae	Small tortoise shell	Aglais urticae	x		Plantae, Urtica dioica, Urtica urens	
Lepidoptera	Nymphalidae	Ringlet	Aphantopus hyperantus	x		Brachypodium sylvaticum, Dactylis glomerata, Deschampsia cespitosa, Elytrigia repens, Plantae	
Lepidoptera	Nymphalidae	Meadow brown	Maniola jurtina	x	x	Brachypodium sylvaticum, Dactylis glomerata, Helictotrichon pubescens	
Lepidoptera	Nymphalidae	Speckled wood	Pararge aegeria	x	x	Brachypodium sylvaticum, Dactylis glomerata, Elytrigia repens, Holcus lanatus	
Lepidoptera	Nymphalidae	Comma	Polygonia c-album	x		Humulus lupulus, Salix, Ulmus, Urtica dioica	
Lepidoptera	Nymphalidae	Gate keeper	Pyronia tithonus		x	Plantae	
Lepidoptera	Peleopodidae	Long-horned flat body	Carcina quercana	x		Fagales	
Lepidoptera	Pieridae	Large white	Pieris brassicae	x	x	Reseda lutea, Tropaeolum majus	
Lepidoptera	Pieridae	Green-veined white	Pieris napi	x	x	Alliaria petiolata, Brassica oleracea, Cardamine amara, Cardamine pratensis, Raphanus raphanistrum, Rorippa nasturtium-aquaticum, Sinapis arvensis, Sisymbrium officinale, Tropaeolum majus	
Lepidoptera	Pieridae	Small white	Pieris rapae	x	x	Alliaria petiolata, Brassica oleracea, Lepidium draba, Reseda lutea, Sinapis arvensis, Sisymbrium officinale, Tropaeolum majus	

Lepidoptera	Pyralidae	Grey knot-horn	Acrobasis advenella	x		Crataegus monogyna	
Lepidoptera	Pyralidae	Bee moth	Aphomia sociella	x		Fagales	
Lepidoptera	Tortricidae	Maple button	Acleris forsskaleana	x		Acer	
Lepidoptera	Tortricidae	Common yellow conch	Agapeta hamana	x		Cirsium	
Lepidoptera	Tortricidae	Timothy tortrix	Aphelia paleana	x		Asteraceae	
Lepidoptera	Tortricidae	Common marble	Celypha lacunana	x		Asteraceae	
Lepidoptera	Tortricidae	Marbled piercer	Cydia splendana	x		Castanea sativa, Juglans, Quercus	
Lepidoptera	Tortricidae	Grey poplar bell	Epinotia nisella	x			
Lepidoptera	Tortricidae	Marbled bell	Eucosma campoliliana	x		Senecio	
Lepidoptera	Tortricidae	Hoary bell	Eucosma cana	x		Centaurea, Cirsium	
Lepidoptera	Tortricidae	Smoky-barred marble	Lobesia abscisana	x		Cirsium arvense	
Lepidoptera	Tortricidae	Triple-blotched bell	Notocelia trimaculana	x		Crataegus	
Lepidoptera	Tortricidae	Dark fruit-tree tortrix	Pandemis heparana	x		Malus, Pyrus	
Lepidoptera	Tortricidae	The bud moth	Spilonota ocellana	x		Asteraceae, Fagales	
Lepidoptera	Tortricidae	Green oak tortrix	Tortrix viridana	x		Quercus	
Lepidoptera	Zygaenidae	Narrow-bordered five-spot burnet	Zygaena lonicerae	x		Fabaceae	
Neuroptera		Lacewing	Neuroptera	x			
Odonata	Aeshnidae	Brown hawker	Aeshna grandis	x		Arthropoda	
Odonata	Aeshnidae	Common hawker	Aeshna juncea		x	Arthropoda	
Odonata	Aeshnidae	Emperor dragonfly	Anax imperator	x		Arthropoda	
Odonata	Coenagrionidae	Common blue damsel fly	Enallagma cyathigerum	x		Arthropoda	

Odonata	Coenagrionidae	Blue-tailed damselfly	Ischnura elegans	x		Arthropoda	
Odonata	Coenagrionidae	Large red damselfly	Pyrrhosoma nymphula	x		Arthropoda	
Odonata	Libellulidae	Common darter	Sympetrum striolatum	x	x	Arthropoda	
Opiliones	Phalangiidae	Harvestman	Phalangiidae	x			
Orthoptera	Acrididae	Common field grasshopper	Chorthippus brunneus	x			
Orthoptera	Acrididae	Meadow grasshopper	Chorthippus parallelus	x			
Orthoptera	Acrididae	Common green grasshopper	Omocestus viridulus	x	x		

Appendix B – Conservation status

The Conservation Status of a species constitutes the threat and rarity status from published reviews. This is complicated by the fact that there are two different systems in place – an 'old' system, that combines threat and rarity, and a 'new' system that separates these. New reviews replace the old conservation status, the conservation status is also used to generate the SQI. Sample quality can simply be derived from the overall number of species with a conservation status, and the number of species within each type of status. The 'New' system is a two-pronged approach that separates rarity from threat.

Threat is calculated using internationally recognised post-2001 IUCN criteria: EX – Extinct; RE - Regionally Extinct; CR - Critically Endangered; CR(PE) - Critically Endangered (Possibly Extinct); EN – Endangered; VU – Vulnerable; NT - Near Threatened; DD - Data Deficient; LC - Least Concern; NA - Not Assessed; NE - Not Evaluated.

Rarity is calculated using the Great Britain Rarity Status: Nationally Rare - Those which have been recorded from between 1-15 British hectads (10 km x 10 km squares) within a given date class where there is reasonable confidence that exhaustive recording would not find them in more hectads; Nationally Scarce - Those which have been recorded from between 16-100 hectads within a given date class where there is reasonable confidence that exhaustive recording would not find them in more hectad. Species can have a status in both the threat and rarity categories above (e.g. Carabus intricatus is both Near Threatened and Nationally rare).

The 'old' system - species have been evaluated using the pre-1994 criteria: Extinct - Listed as RDB App or Extinct; RDB 1 – Endangered; RDB 2 – Vulnerable; RDB 3 – Rare; RDB K - Insufficiently Known; RDB I – Indeterminate; Na - Notable A; Nb - Notable B; Notable - Notable or Nationally Scarce; NR (marine) - Nationally Rare (marine species); NS (marine) - Nationally Scarce (marine species); Unknown - A few micromoths are listed as status Unknown; None - Not rare or scarce; Not reviewed - The taxon was not assessed for rarity in the review; New to Britain - Recently added to the British list and not yet reviewed, but it is still rare as far as we know; Not native - The taxon is thought not to be native.

3 Evaluation

3.1.1 Given that the terrestrial invertebrate assemblages identified comprised common and widespread species, these have been ranked as of **Local Importance** in the study area.

3.1.2 The findings of the terrestrial invertebrate survey report recommended further terrestrial invertebrate surveys of Site 2 (located within Philips Park Local Nature Reserve and Mere Clough Local Nature Reserve), which at the time of reporting was within the provisional Order Limits. The Order Limits no longer encompass these areas and as such it is deemed appropriate that further surveys are no longer necessary.