East Midlands Gateway
Phase 2 (EMG2)

Document DCO 6.9E/MCO 6.9E

ENVIRONMENTAL STATEMENT

Technical Appendices

Appendix 9E

Invertebrate Report

October 2025

09

The East Midlands Gateway Phase 2
and Highway Order 202X and The East Midlands Gateway
Rail Freight and Highway (Amendment) Order 202X

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East Midlands Gateway 2

ES Appendix 9E

INVERTEBRATE REPORT

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Executive Summary

- Invertebrate survey was commissioned of the EMG2 Project in June 2024 by FPCR Environment & Design Ltd on behalf of SEGRO PLC and was carried out by Christopher Kirby-Lambert, an experienced entomologist, between June and October 2024.
- 2628 records of 883 invertebrate species were made over the course of the survey. This included 32 Nationally Scarce species and 4 Red Data Book or Nationally Rare species.
- Survey of the EMG2 Main Site and Community Park produced 1807 records of 730 invertebrate species. Of these, 25 species (3.4%) have a formal national conservation status. 23 are Nationally Scarce and 2 are Nationally Rare or Red Data Book.
- Of the habitats within the EMG2 Main Site and Community Park, the arable fields and margins, grassy field margins, grassland, wetland and the majority of the hedges are considered to be of at most limited local importance for invertebrates.
- A number of mature and overmature trees, predominantly Ash, are present in the EMG2 Main Site and Community Park. These have numerous and diverse dead wood and decay features that support a saproxylic invertebrate fauna of very high local importance.
- Mitigation for habitat loss from the EMG2 Main Site will largely take place within the Community Parkarea. Suggested mitigation actions are: conversion of arable to neutral grassland and a subsequent cutting regime to encourage herbaceous vegetation and an open-structured sward; planting of species-rich hedges to break up larger fields; creation of small patches of scrub within grasslands through planting or, preferably, natural succession and planting of scattered low-density Oak along hedges and within fields to encourage open-grown parkland trees.
- Dead and decaying wood from trees being removed in the EMG2 Main Site should be translocated in as large pieces as possible to mitigation areas and installed in clusters close to existing mature Ash trees in a range of conditions, e.g. standing trunks, propped/attached aerial large-diameter dead wood, scattered and piled dead wood at tree bases.
- Survey of the Highway Works areas produced 828 records of 423 invertebrate species. Of these, 14 species (3.3%) have a formal national conservation status. 13 are Nationally Scarce and 3 are Nationally Rare or Red Data Book.
- Within the Highway Works area open habitats, particularly short sward and bare ground, are considered to be of limited local importance for their invertebrate assemblage. Woody vegetation and wetland habitats are considered to be of low importance.
- All habitats in the Highway Works area are of recent origin and the open habitats will likely benefit from disturbance which will create early successional conditions. Re-seeding of grasslands with the same “highway” mix and leaving areas of disturbed ground to natural succession should create habitat that will be quickly recolonised by associated invertebrates from adjacent road margins.
- The free-draining and low-nutrient status of the existing soils and substrate should be maintained. Continuation of current management should maintain good habitat structure. Planting of woody vegetation should be the minimum required for screening purposes. The creation of banks of free-draining material to increase habitat complexity and provide nesting habitat for aculeates.

Contents

1. Introduction

This report was commissioned by FPCR Environment & Design Ltd on behalf of SEGRO. It provides details of invertebrate surveys undertaken on land effected by the EMG2 Project.

The EMG2 Project comprises the following three main components:

DCO Application (DCO Scheme)

- EMG2 Works – Logistics and advanced manufacturing development located on the EMG2 Main Site south of East Midlands Airport and the A453, and west of the M1 motorway. The development includes HGV parking and a bus interchange, together with the provision of a Community Park and an upgrade to the EMG1 substation;
- Highways Works – works to the highway network: the A453 access junction works, significant improvements at Junction 24 of the M1, works to the wider highway network including the Active Travel Link, Hyam's Lane Works, L57 footpath upgrade, A6 Kegworth Bypass/A453 Junction Improvements and finger farm roundabout improvements, together with other works;

MCO Application (MCO Scheme)

- EMG1 Works – Additional warehousing development on Plot 16 together with works to increase the permitted height of the cranes at the EMG1 rail-freight terminal, improvements to the EMG1 public transport interchange, site management building and the EMG1 pedestrian crossing.

The EMG2 Works (with the exception of the EMG1 sub-station element which is excluded from this survey area) is bounded to the east by the A42 and M1 and the A453 along the northern boundary (SK 461 249). Surrounding land-use is dominated variously by grassland and arable field compartments bordered by hedgerows and scattered mature trees, with Diseworth village to the south-west.

The Highway Works comprises a complex and extensive area of road margins that will be modified to accommodate the highways mitigation that forms part of the EMG2 Project development plans, hereafter referred to as the Highway Works area.

The EMG1 Works area was added to the project redline boundary after the conclusion of invertebrate surveys so was not directly surveyed.

As each of these areas is to some degree spatially isolated, different in character and/or being surveyed for different purposes, they are each considered separately in the following report.

The survey of the EMG Works area and Highway Works areas aim to determine the nature and quality of the invertebrate fauna, identify the presence of any invertebrate species or assemblages of conservation importance, identify habitats or habitat features these invertebrates are dependent on or associated with, provide an assessment of the quality of the fauna and habitats of each area and provide advice for mitigation for losses incurred by the development.

2. Methods

2.1 Personnel

All work was carried out by Christopher Kirby-Lambert, an entomological consultant who specialises in terrestrial and freshwater invertebrate survey. He has fifteen years entomological experience and ten years of consultancy experience. He has successfully delivered invertebrate surveys for a wide range of organisations including Natural England, the Environment Agency, the National Trust, the Wildlife Trusts, Buglife, Froglife, the Freshwater Habitats Trust, and numerous commercial clients.

2.2 Timetable of work

Ten visits were made to sample the invertebrate fauna between June and October. The first visit was largely devoted to site familiarisation and planning. Table 1 gives details of the timetable of the survey.

Table 1. Timetable of work

Date	Time on site	Weather	Work carried out
June 11th	09.00 - 16.30	13ºC, grey and rainy, light westerly breeze, drier in afternoon.	site walkover and familiarisation, limited survey of highways areas.
June 12th	09.00 – 19.30	16ºC, mostly sunny, light westerly breeze.	survey of Main Site.
July 02nd	09.00 – 18.00	18ºC, sun and clouds, light westerly breeze.	survey of Main Site, setting vane traps on veteran trees.
July 10th	09.00 – 17.00	19ºC, clouds with occasional sunshine, moderate southerly wind.	survey of Main Site and highways areas.
July 18th	16.00 – 19.00	26ºC, sunny, light southerly breeze.	survey of highways areas, servicing traps.
July 26th	09.00 – 16.30	21ºC, mostly sunny, light westerly breeze.	survey of highways areas.
August 09th	10.00 – 16.00	22ºC, mostly sunny, moderate westerly wind.	survey of Main Site, servicing traps.
August 29th	09.00 – 18.30	19ºC, mostly sunny, light to moderate westerly breeze.	survey of Main Site, survey of highways areas, servicing traps.
September 19th	10.00 – 15.00	17ºC, sun and clouds, light northerly breeze.	survey of Main Site, servicing traps.
October 19th	10.00 – 15.00	16ºC, fog and overcast, light changeable breeze.	aquatic sampling, trap removal.

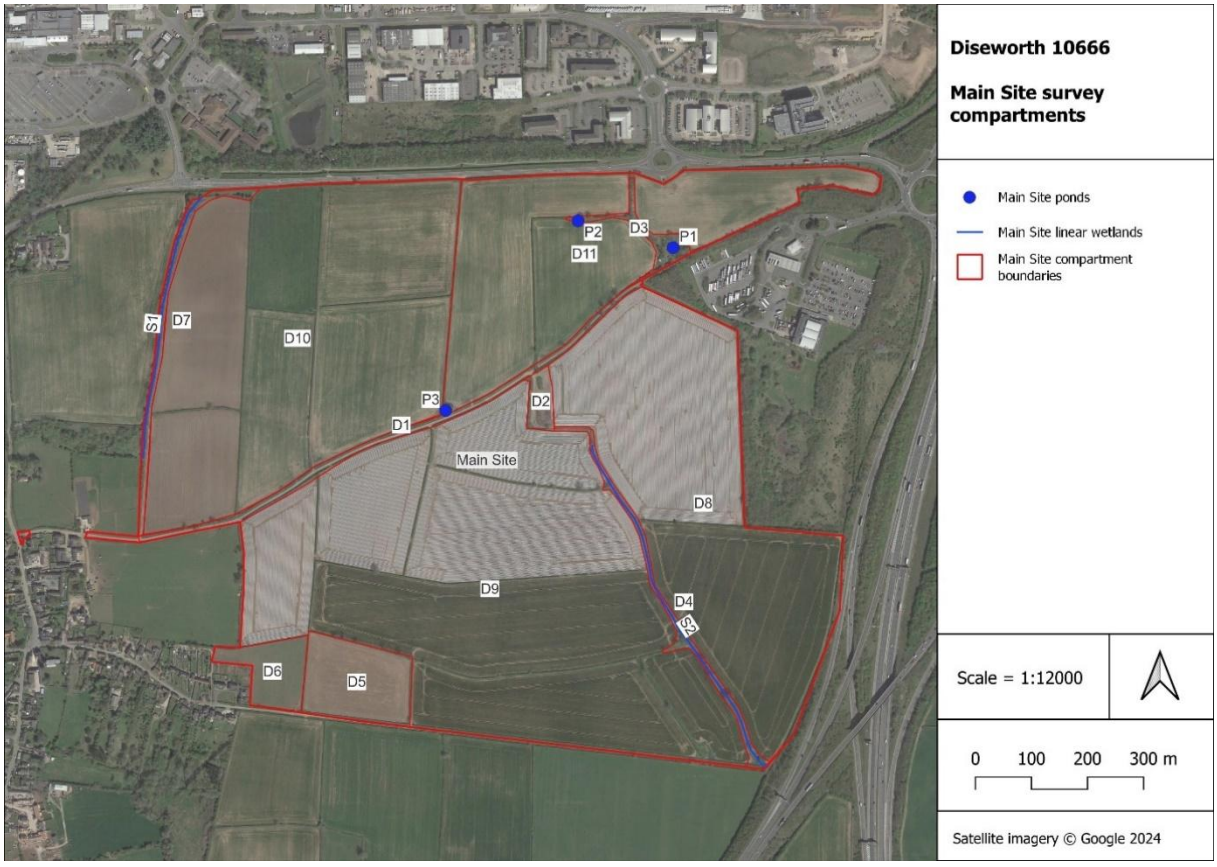
2.3 Survey units

2.3.1 EMG2 Works

The EMG2 Works (excluding the EMG1 sub station) site is extensive, but was largely occupied by cultivated arable farmland cropped with wheat or maize at the time of the survey. It was divided into 16 recording compartments for the purposes of the survey (Map 2).

Hyam's Lane (D1) runs south-west to north east through the site and is bordered by flowery ruderals, coarse grassy margins, shallow ditches and tall hedges. A seasonally wet pond (P3) is situated just to the north under a large willow *Salix* sp. A small dump area with ruderal vegetation and two over-mature Ash *Fraxinus excelsior* trees is situated just to the south of this (D2). A low-lying area in the north-east corner of the area supported willows and shaded wetland vegetation (D3) and two ponds (P1 and P2). To the south of D2 is a flowing ditch (S2) and a hedge with a large concentration of mature trees (D4) running south towards the site margin. Two fields were out of arable cultivation, one was coarse fallow grassland with a flowery grass track and band of mature Ash trees along its northern margin (D5). The second is improved pasture (D6). Along the north-west edge of the Main Site is a fast-flowing stream (S1) that is shaded by a large hedgerow with a mix of large willow and ash trees and a band of wet and structurally more complex field margin with temporary pools (D7). The remaining areas of the site were relatively uniform arable fields with narrow grassy field margins and species-poor, relatively heavily managed hedges, predominantly of Hawthorn Crataegus monogyna and Blackthorn Prunus spinosa. These were divided into four compartments of similar character: south-east (D8); south-west (D9); north-west (D10) and north-east, which also had a good concentration of over-mature Ash trees (D11).

Further details of all survey compartments in the EMG2 Works are given in Appendix 1.



Map 2. EMG2 Works survey compartments.

2.3.2 Highway Works

The Highway Works area is extensive and quite complex and was divided into eight large compartments for the purposes of survey (Map 3). Immediately to the north of the EMG2 Works heavily managed hedges and mown grass margins run along the A453 (H1). In places the grass margins are moderately floriferous and well-structured, especially around the southern roundabout and its surroundings. The centre of the roundabout is dense Field Maple with a band of flower rich "highways" seed-mix grassland dominated by Ox-eye Daisy around the margins. There is extensive young plantation woodland dominated by Oak, Blackthorn and Field Maple around the southern roundabout (H2).

To the north of the southern roundabout the A453 is bounded by banks dominated by floriferous "highways" seed-mix grassland with scattered planted woody vegetation (H3). The vegetation is fairly open-structured with patches of bare ground. There is a stretch of old road running north-south on the southern portion with a band of scrub to the east. The edges of the hard standing supported bands of short-ruderal vegetation.

To the east of the northern roundabout, where the A453 crosses the M1, lie two survey compartments dominated by dry, floriferous and relatively open structured, "motorway grassland" bordering the network of roads, cycleways and footpaths in the area. The compartment to the south of the A453 (Remembrance Way) (H4) also supports planted hawthorn, guelder rose, dogwood, alder for road screening and a small dry ditch. The compartment to the north (H5) is heavily bramble invaded in places and has a patch of more mature birch, willow and hazel.

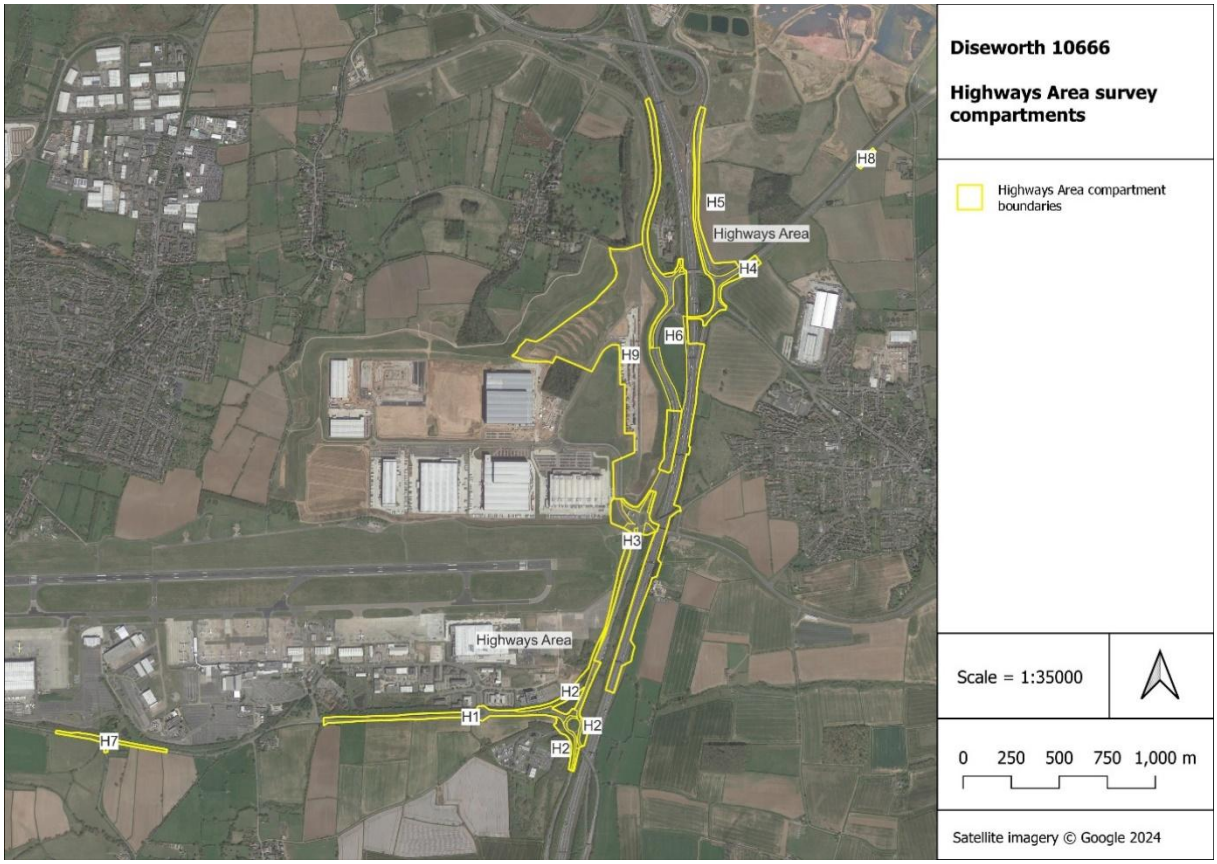
To the west of the roundabout (H6) is a complex network of small areas of road margin and short grassland or ruderal habitat as well as some bands of mature motorway screening scrub and trees. These areas were largely inaccessible due to the heavy traffic and physical barriers. A section of road margin along the western spur of the A453, running south of EMA, is included in the Highway Works area (H7). This area had heavily managed hazel hedges and species poor eutrophic roadside grassland. A small area of road margin to the north-west, along Remembrance way was the final section included in the Highway Works area (H8). This section included "motorway grassland" and some scrub.

EMG1 Works

An additional area of land (EMG1 Works; H9) was added to the project boundary after the conclusion of invertebrate surveys. This area was not directly surveyed but was briefly assessed at the time to provide context for surveyed areas. The habitats present within the EMG1 Works footprint appeared to be broadly similar to those found elsewhere in the Highway Works Area and are probably unlikely to support invertebrate assemblages of different character or quality to those found in the Highway Works area.

Further details of all survey compartments in the Highway Works area and the EMG1 Works are given in Appendix 2.

It should be noted that small changes to the overall EMG2 Project extent have occurred since the survey date (such as removal of Area H7 and some land within H9, and addition of very small areas of additional land.



Map 3. Highways Works and EMG1 Works area survey compartments.

2.4 Sampling methods

2.4.1 Sweep-netting

A lightweight folding circular aluminium frame 40 centimetres in diameter was fitted with a net bag supplied for sweep-netting by GB Nets and attached to an extending lightweight aluminium handle. Net strokes were reasonably rapid and penetrated as far into the vegetation as possible without the stroke being seriously slowed by its resistance. A maximum of fifty sweeps (counted as single strokes of the net) was taken before examining the catch. The sample was initially examined in the net, noting or capturing large, fast-moving or readily identified species. The remaining net contents were then emptied onto a white tray, and the material in the tray examined for smaller and slower animals.

2.4.2 Beating

Samples were taken from small diameter dead wood, tree and shrub foliage, ivy, and dense, tall herbaceous vegetation by holding a net under the foliage and tapping the branches or stems above sharply several times with a stout stick. Material was initially examined in the net, then emptied onto a white tray for further sorting.

2.4.3 Suction sampling

Suction sampling used a garden leaf-blower modified by taping a fine-meshed net in the inlet tube, following the method of Stewart & Wright (1998). The inlet tube was repeatedly pushed down into the

vegetation until ground contact was made. After fifty to one hundred ground contacts, the contents of the collection net were sieved through a 0.5 cm. mesh sieve onto a white tray for field sorting.

2.4.4 Active search of key features of value for invertebrates

Features of significance to invertebrates which are not sampled, or not necessarily adequately sampled, by sweeping, beating or suction sampling were investigated by close examination and hand searching. Attention was particularly paid to dead and decaying wood, accumulations of plant litter; the ground beneath wood, stones and other debris; the undersides of plant rosettes; and bare wet ground.

2.4.5 Direct observation

A small number of relatively large and readily identified species, especially butterflies, dragonflies, some grasshoppers and crickets, larger hoverflies, and some bees and wasps, can be seen without the need for specific search and identified from sight.

2.5.6 Pond netting

Aquatic invertebrates were samples using a standard 24cm pond net supplemented with a small hand sieve in very shallow water. Samples were placed on metal grids over sorting trays containing a shallow layer of water and active animals allowed to make their own way out prior to hand-searching. After removal or thinning of large and easily identified organisms, the collected material was concentrated by filtering through a fine meshed sieve and preserved along with representative animals from hand-sorting.

2.5.7 Vane traps

These traps were principally used to capture beetles associated with dead wood, and were attached to the trunks of trees by tape held in place with roofing tacks. Each was constructed from stiff but flexible clear plastic. Two intersecting vanes, each 40 cm by 20 cm, at right angles to one another, were suspended over a plastic funnel leading into a screw-topped plastic collecting bottle containing approximately 30ml. of glycerol/salt/detergent preservative.

Four vane traps were run in the EMG2 Main Site and Community Park from early July to October. Traps were serviced every 2-4 weeks. Not all traps were run during all trapping periods, but at least three traps were run in any given period. Table 1 gives details of the traps used.

Table 1. Details of vane traps

Trap	Grid ref.	Tree description	Trapping periods
V1	SK46282510	T51(U) Ash (*Fraxinus excelsior*): A large (15m tall, 730cm diameter) standing tree with stem failure at 7m and crown now composed largely of epicormic growth. Extensive hollowing of trunk extending downwards from crown break. Extensive large diameter	02/07/2024-18/07/2024 18/07/2024-09/08/2024 09/08/2024-29/08/2024 29/08/2024-19/09/2024 19/09/2024-19/10/2024: damaged by storm, no catch

		dead wood, fungal growth, heart rot and hollowing, exposed heart wood.	
V2	SK46252495	T14(U) Ash (*Fraxinus excelsior*): A large (18m tall, 700cm diameter) tree with extensive deadwood and dieback in the crown. Extensive large diameter dead wood, dead limbs, branch socket cavities.	02/07/2024-18/07/2024 18/07/2024-09/08/2024 09/08/2024-29/08/2024: fell from tree, no catch 29/08/2024-19/09/2024 19/09/2024-19/10/2024: damaged by storm, no catch
V3	SK45912457	T33(C) Ash (*Fraxinus excelsior*): A large (13m tall, 608cm diameter) standing tree that is nearly dead. Limited live growth in crown. Extensive large diameter dead wood, dead limbs, fungal growth, heart rot and hollowing, exposed heart wood.	02/07/2024-18/07/2024 18/07/2024-09/08/2024 09/08/2024-29/08/2024 29/08/2024-19/09/2024 19/09/2024-19/10/2024
V4	SK46222531	T65(C) Ash (*Fraxinus excelsior*): A relatively small tree (8m tall, 350cm diameter), basal cavity, heart rot and hollowing, broken branches and minor dead wood with delaminating bark. Crown dying back.	09/08/2024-29/08/2024 29/08/2024-19/09/2024 19/09/2024-19/10/2024: damaged by storm, no catch

2.5 Collection, storage, identification and curation of specimens

In active sampling readily identified species were noted in the field. Representative examples of other species were collected for later identification. A dry pooter made from a flexible polythene sample bottle and a combination of rigid plastic and flexible polythene tubing was used to capture most insects and retain them alive; for spiders, some soft-bodied insects and predacious species which damage other material if collected live into a dry pooter, a simple spider-pooter was used to gather up individual specimens which were then blown directly into a container of 60% propan-2-ol.

Dry-pooted material was kept alive until the completion of fieldwork, then killed using ethyl acetate vapour and either layered between sheets of tissue paper in a labelled plastic box or frozen for later examination under a 7-45x magnification binocular microscope.

Most material collected was identified within a few weeks of capture, and field or initial laboratory preservation were sufficient to retain it in good condition. Voucher specimens have been retained of all species with a national Red Data Book or Nationally Scarce status. These have been prepared and stored using standard curatorial methods and materials.

2.6 Identified groups

Though as wide a range as possible of invertebrates was identified, effort was concentrated on groups which are especially likely to be of value for assessment, are not excessively difficult to identify, and which are at least moderately familiar to the surveyor. Natural England Research Report NERR005 (Drake *et al*., 2007) gives guidance on useful groups in different habitats. The following list summarises all groups which were identified:

Araneae (spiders)
Coleoptera (beetles); Aderidae, Anthribidae, Apionidae, Byphillidae, Buprestidae, Byrrhidae, Cantharidae, Carabidae, Cerambycidae, Chrysomelidae, Ciidae, Cleridae, Coccinellidae,

Corylophidae, Cryptophagidae, Curculionidae, Dermestidae, Dytiscidae, Elateridae, Erotylidae, Haliplidae, Helophoridae, Histeridae, Hydraenidae, Hydrophilidae, Kateretidae, Laemophloidae, Latridiidae, Lucanidae, Melyridae, Mordellidae, Mycetophagidae, Nitidulidae, Noteridae, Oedemeridae, Phalacridae, Ptinidae, Rhynchitidae, Salpingidae, Scirtidae, Scraptiidae, Staphylinidae (excluding most Aleocharinae), Tenebrionidae, Throscidae
Crustacea (woodlice)
Dermaptera (earwigs)
Diptera (flies); Anisopodidae, some Anthomyiidae, Asilidae, Bibionidae, Calliphoridae, Chamaemyiidae, Conopidae, Dolichopodidae, Drosophilidae, Empididae, Ephydridae, some Hybotidae, some Lauxaniidae, Limoniidae, Lonchaeidae, Lonchopteridae, some Muscidae, Opomyzidae, Pallopteridae, Pipunculidae, Polleniidae, Psilidae, Rhagionidae, Sarcophagidae, Scathophagidae, Sciomyzidae, Sepsidae, Stratiomyidae, Syrphidae, some Tachinidae, Tephritidae, Therevidae, Tipulidae, Trixoscelidae, Ulidiidae.
Ephemeroptera (mayflies)
Hemiptera (bugs): Auchenorrhyncha, Heteroptera
Hirudinea (leeches)
Hymenoptera: Aculeata (bees, wasps, ants), some Symphyta (sawflies)
Lepidoptera (moths and butterflies): day-flying Macrolepidoptera, selected Microlepidoptera, and distinctive caterpillars
Mecoptera (scorpionflies)
Mollusca (snails)
Neuroptera (lacewings)
Odonata (dragonflies)
Opiliones (harvestmen)
Orthoptera (grasshoppers and crickets)
Psocoptera (barklice)
Trichoptera (caddisflies)

None of these groups was targeted to the extent of aiming for a complete species list.

2.7 Nomenclature

Nomenclature follows the UK Species Inventory (UKSI), as it stood when the species list was finalised in October 2024. However, name changes on this inventory are rather frequent and it is possible that some will have changed between the preparation of the species list and the finalising of this report.

2.8 Statuses

Most of the species recorded have been assigned at least one status. The better-known groups of invertebrates were assessed for formal conservation status in Red Data Books and National Reviews from the mid-1980s onwards, using criteria from the International Union for Conservation of Nature (IUCN) for the rarest (Red Data Book) species, and defining species believed to occur in 100 or fewer 10-kilometres squares of the National Grid as Nationally Notable (now known as Nationally Scarce). The earlier IUCN criteria have been superseded, but only a fraction of the fauna has yet been assessed, in published reviews, under the newer criteria. Other groups are under review, and further new sets of published statuses are likely soon to appear. Under the revised criteria, at the national level, countries are permitted to refine the definitions for the non-threatened categories and to define additional ones of their own. Collectively, these are referred to as the GB Rarity status.
In tables and appendices, formal conservation statuses have been abbreviated. The following lists give the statuses used in this report, and the abbreviations employed for them. The definitions of the formal statuses are given in Appendix 1.

Statuses from the old IUCN and national criteria:

Red Data Book category 1 (Endangered) (RDB1)
Red Data Book category 3 (Rare) (RDB3)
Red Data Book category K (Unknown) (RDBK)
Nationally Scarce category A (Na)
Nationally Scarce category B (Nb)
Nationally Scarce (N)

Statuses from the new IUCN and national criteria:

Nationally Rare (NR)
Nationally Scarce (NS)

Formal national statuses have been taken from the following sources.

Beetles	Alexander, 2015; Alexander, Dodd and Denton, 2014; Foster, 2010; Hubble, 2017; Hyman & Parsons, 1992, 1994; Lane, 2021
Flies	Falk, 1991b; Falk & Crossley, 2005; Falk *et al*., 2016; Falk & Pont, 2017
Bugs	Bantock, 2016; Kirby, 1992

For the most part, these provide the most recent published statuses assigned by Natural England, its predecessors English Nature and the Nature Conservancy Council, or the Joint Nature Conservation Committee. Current formal statuses are in principle listed in a spreadsheet available from the Joint Nature Conservation Committee at the JNCC Resource Hub (http://hub.jncc.gov.uk>assets). However, the results of at least one recent review have not been incorporated into the spreadsheet, and neither have some modified statuses for larger Brachycera, so at the time of writing there are points of divergence.

Shirt (1987) was the first publication to give definitive Red Data Book statuses to insects. Subsequent reviews proposed many changes to these statuses. Because the revised statuses were preceded by a “p” (for proposed) and not actually published in a Red Data Book, they have not been universally used as the formal status, the Shirt (1987) status being retained. Whatever the technicalities, the retention of any long-outdated status for a species where a formal published alternative exists is, for purposes of assessment, unhelpful, and in this report the most recent published estimate of status is given, without the use of “p”s. A “p” is, however, used for the statuses of some Calypterate and Acalypterate flies, for which there are recent, but provisional, reviews (Falk & Pont, 2017).

The list has also been checked for any species included in Section 41 of the NERC Act 2006 (“*species of principal importance for the conservation of biodiversity in England*") (abbreviated in tables and appendices as S41).

Species not falling into any formal conservation category have been assessed as either local or common. Neither term has a precise definition, and they are used in the context of this report only to distinguish between species of wide distribution and either broad or commonly met habitat requirements, and those which, because of more specialised habitat requirements, lesser mobility, or other cause, are of less frequent occurrence. These categories have been applied according to personal experience and the opinions of standard texts and are in part subjective.

2.9 Pantheon analysis

Pantheon is a database tool developed by Natural England and the Centre for Ecology & Hydrology to analyse invertebrate sample data (Webb *et al*., 2018). Users import lists of invertebrates into Pantheon, which then matches the species to the preferred name in the UK Species inventory before analysing the sample, attaching associated habitats and resources, assemblage types, habitat fidelity scores and other information against them. The analysis then displays much of this data as numerical scores. This information can be used to determine site quality by revealing whether the species list is indicative of good quality habitat, inform on species ecology and assist in management decisions by revealing the key ecological resources.

Not all the macro-invertebrate taxa are included in the database. To date over 13,000 species have been added, this being about a quarter of the total macro-invertebrate fauna (estimated at 37,000). It remains limited to those taxa and families where there is enough ecological information to give a fair level of coding accuracy. These include species such as beetles, flies, true bugs, moths, bees and many more. Pantheon also includes additional information such as conservation status and feeding guilds.

Pantheon has been developed from ISIS (Invertebrate Species-habitats Information System), which was born from a requirement for Natural England to undertake monitoring. Its original purpose was to use strict survey protocols to sample for notified invertebrate assemblages (e.g., a dead wood assemblage recognised in a SSSI citation). In response to feedback from users, a decision was taken to create a new version of ISIS, later re-named as Pantheon. It would not be solely linked to monitoring sites, would address problems raised in ISIS and would be available online.

Pantheon is still under development. It was launched as a first version in April 2018. Initially, the system will be maintained with no further changes. Comments will be gathered and its use monitored, and it is anticipated that this will lead to a further review and potential for further change. Its provisional status and the fact that it has now been left unchanged for some time limit its value. There are errors and omissions in the version released, and it has drifted further from reality in the period since as statuses have changed and more information has accumulated.

Assessment of ISIS assemblages remains a key part of Pantheon analysis, and one of its more useful components for current purposes, for assessment of the overall fauna of the survey area. ISIS interprets species lists by identifying assemblage types within a list and then assessing the conservation value of each based on the rarity of the species it contains. If the rarity score of an assemblage crosses a pre-set threshold the assemblage is assessed as being of favourable status, this indicates it is of SSSI quality. The program can theoretically work at any geographic scale, and so can be used to assess assemblages over the whole survey area. Use of data collected using non-standard methodologies, as in the present survey, can complicate interpretation of the conservation value of assemblages.

The assessment of assemblages is not without issues. The interests of different assemblages cannot be combined to provide an overall assessment of the interest of a site or a fauna; the assemblages identified cannot always be easily related to habitats and features on the site; analysis can sub-divide what is clearly a single functional assemblage on the ground, or combine assemblages more usefully regarded as separate; species which are usually, but not invariably, part of a particular assemblage can result in the identification of phantom assemblages, based on small numbers of species, and the appearance in the analysis of habitats which are not present on the site under investigation.

2.10 Saproxylic invertebrate analysis

The majority of the recorded species which have an association with dead wood are beetles. This is usually the case in general surveys, and saproxylic beetles are routinely used to assess the quality of the dead wood fauna of a site. There are two widely used methods for doing so. Alexander (2024) provides the most recent version of the Index of Ecological Continuity (IEC), based on species associated with the long-term continuity of dead-wood habitats, assessed on a three-point scale.

- Group 1 are species which are known to have occurred in recent times only in areas believed to be ancient woodland, mainly pasture woodland.
- Group 2 are species which occur mainly in areas believed to be ancient woodland with abundant dead-wood habitats, but which also appear to have been recorded from areas that may not be ancient or for which the locality data are imprecise.
- Group 3 are species which occur widely in wooded land, but which are collectively characteristic of ancient woodland with dead-wood habitats.

A score of one is given to species in Group 3, a score of two to those in Group 2, and a score of 3 to those in Group 1. The index is calculated by summing the scores for all species recorded. A score of 15-24 is suggested to be indicative of regional value, and 25-79 of national importance. Because this score is cumulative, it is heavily dependent on recording effort.

The second scoring system (Fowles *et al*., 1999) calculates a Saproxylic Quality Index (SQI) which is intended to be less dependent on recording effort than the IEC. Scores are assigned to saproxylic species according to their national status rather than the extent of their association with sites of long habitat continuity. The latest scoring system is provided online (Fowles, 2024). Summation of the scores for all species provides the Saproxylic Quality Score (SQS): dividing this score by the number of scoring species (N) and multiplying by 100 gives the Saproxylic Quality Index. A minimum of forty scoring species is recommended for the calculation of a reliable SQI. A score of 500 has been provisionally set as a threshold for national significance; no lower levels of significance have been defined.

2.11 Constraints and limitations

Overall, the survey went well and no major issues were encountered. No invertebrate survey aims to record all of the species present on a site. Even the most thorough survey will only present a snapshot of part of the invertebrate fauna. There were a number of additional constraints on the current survey.

Site coverage was generally good, however, several sections of the Highway Works area were only visually assessed as they were near impossible to safely access due to the presence of main roads and busy traffic, rail lines, fencing and/or other significant barriers to access. This was particularly the case in the complex survey area around the northern roundabout and area H6 was almost entirely assessed visually from adjacent accessible footpaths or from the road. None of these areas obviously held any features or habitats not present in nearby accessible roadside areas and were not considered likely to support invertebrate assemblages not present in those areas that could safely be accessed. Inaccessible areas included open-structured “highways mix” grassland, tall and short ruderal vegetation, plantation scrub and woodland. Three additional small areas were only visually assessed despite being accessible in theory. The three relatively small sections of roadside included within the survey boundary at Charnock Hill, in Diseworth village and along the A453 just past Bowell’s Barn were all early in the survey visited and assessed as being of low intrinsic interest for invertebrates and having no features or habitats not present in immediately adjacent areas. These areas were not surveyed further.

An additional area of land (EMG1 Works; H9) was added to the project redline boundary after the conclusion of invertebrate surveys. This area was not directly surveyed but was briefly assessed at the time to provide context for surveyed areas. The habitats present within the EMG1 Works footprint appeared to be broadly similar to those found elsewhere in the Highway Works area and are probably unlikely to support invertebrate assemblages of different character or quality to those found in the Highway Works area.

The extent of the EMG2 Works area included significant lengths of relatively uniform field margin and hedgerow, as well as extensive areas of cultivated arable land. On the first visit most margins and hedgerows were walked and visually assessed to identify areas and features of particular potential for invertebrates. For the sake of practicality, recording was limited to a fraction of the total length, selected to encompass the full variation of habitat features present in the area and to include those sections of the greatest obvious potential for invertebrates. Survey of the arable fields themselves and more thorough sampling of long stretches of hedgerow and field margin may conceivably have added species to the list but it is unlikely that these would have been of conservation significance or have altered the overall assessment of the interest of these areas.

All but two visits were made in good weather conditions. The first visit was washed out by heavy rain in the morning but, as this visit was predominantly for site familiarisation, this was not a significant issue. The weather on the final visit was also foggy and overcast but this will have had no impact on aquatic survey which was the primary aim of this visit. Two other visits, on July 10th and August 09th, were windy, making survey of exposed field margins difficult. However, the visits were still productive in sheltered areas.

The survey work started later than is ideal. The survey was commissioned and started in early June, after the active period of spring and many early summer invertebrate species. These species will have been missed in the survey. This was probably most noticeable for aculeate Hymenoptera, with many species that would be expected from the site having already finished their flight period. The interest of the ground-dwelling Coleopteran fauna, such as ground beetles and weevils, may also have been underestimated. These groups have spring and autumn generations when populations peak. The spring generations were missed and there was no strong autumn peak detectable during the survey, despite survey taking place at an appropriate time of year, perhaps due to atypical weather conditions.

The winter and spring of 2024 was exceptionally wet. This led to many invertebrates emerging later and in lower numbers than might otherwise be expected. The atypical spring had a knock-on effect later in the year, with invertebrate abundance, especially amongst Diptera, Hymenoptera and Lepidoptera being noticeably low through May, June and early July. Lower abundance means that species are more easily missed during survey. It seems likely that any invertebrate survey in 2024 might underestimate interest compared to what would have been found on a more average year.

All survey work was diurnal. No nocturnal survey or moth trapping was carried out. This means that any primarily nocturnal species are likely to have been missed during the survey.

Additional trapping methods, such as pitfall or water traps, would have caught additional species.

It is however not considered likely that the overall assessment of invertebrate assemblage quality will have been significantly affected by any of these additional limitations. Earlier survey commencement, a more typical spring and the use of a wider range of sampling methods would all have increased the number of species recorded but, given the habitats and features identified within the surveyed areas, are considered unlikely to have resulted in a different assessment of overall habitat quality and importance of the sites for invertebrates.

3. Results

A total of 2628 records of 883 mutually exclusive invertebrate taxa were made during the survey. Of these, thirty-five species (4.0%) have a formal national conservation status. Thirty-two are Nationally Scarce and four are Rare or Red Data Book. The recorded species cover a broad taxonomic range and are dominated by Coleoptera (beetles), with Diptera (true flies) and Hemiptera (true bugs) following in roughly equal proportions. The numbers and proportions of recorded taxa generally fall in line with what would be expected from a survey of the habitats found on the site and represent a good basic inventory list. The number of aculeate Hymenoptera recorded is lower than might be expected, even given the late start to the survey. This may be largely explained by the weather in 2024, which resulted in generally low aculeate activity.

Results will be considered separately for each of the survey areas.

3.1 EMG2 Works

A total of 1807 records of 730 mutually exclusive invertebrate taxa were made during the survey of the EMG2 Main Site and Community Park. Of these, twenty-five species (3.4%) have a formal national conservation status. Twenty-three are Nationally Scarce and two are Nationally Rare or Red Data Book. The recorded species cover a broad taxonomic range and are dominated by Coleoptera (beetles), with Diptera (true flies) and Hemiptera (true bugs) following in roughly equal proportions.

A taxonomic summary of the recorded taxa is given in Table 2. Table 3 lists species with a national or local conservation status. A full list of recorded taxa is given in Appendix 5. Details of all species with a formal national conservation status recorded during the survey are given in Appendix 8.

Table 2. Taxonomic summary of recorded species from the EMG2 Works

Group	Important sub-groups	Taxa	Spp. with status	Percentage with status
All		730	25	3.4%
Coleoptera (beetles)		263	16	6.1%
	Curculionoidea (weevils)	44	3	6.8%
	Chrysomelidae (leaf beetles)	37	2	5.4%
	Staphylinidae (rove beetles)	32		
	Carabidae (ground beetles)	32		
	Water beetles	26	1	3.8%
	Coccinellidae (ladybirds)	12		
	All saproxylic beetles	42	11	26.2%
Hemiptera (true bugs)		137	1	0.7%
	Heteroptera	95	1	1.1%
	Auchenorrhyncha (planthoppers)	42		
Diptera (true flies)		166	4	2.4%
	Syrphidae (hoverflies)	29	1	3.4%

	Dolichopodidae (long-footed flies)	18		
	Tipuloidea (craneflies)	17		
	Tephritidae (gall flies)	9		
	Stratiomyidae (soldierflies)	7		
Araneae (spiders)		59	0	
Hymenoptera (bees, wasps, ants and sawflies)		42	4	9.5%
	Apoidea (bees)	17	2	11.7%
	Wasps	10	2	20.0%
	Symphyta (sawflies)	10		
	Formicidae (ants)	4		
Lepidoptera (butterflies and moths)		19		
Mollusca (snails)		9		
Orthoptera (crickets and grasshoppers)		8		
Opiliones (harvestmen)		7		
Crustacea (woodlice)		6		
Trichoptera (caddisflies)		4		
Ephemeroptera (mayflies)		2		
Neuroptera (lacewings)		2		
Odonata (dragonflies and damselflies)		2		
Psocoptera (barklice)		2		
Dermaptera (earwigs)		1		
Diplopoda (millipedes)		1		
Hirudinea (leeches)		1		
*note that some species are counted more than once in separate sub-divisions, e.g. saproxylic beetles are also counted in the taxonomic sub-division to which they belong.				

Table 3. Species with formal conservation status recorded from the EMG2 Works

Group	Family	Species	English name	Status
Coleoptera	Aderidae	*Aderus populneus*	an ant-like leaf beetle	NS
Coleoptera	Anthribidae	*Platyrhinus resinosus*	Cramp-ball Fungus Weevil	Nb
Coleoptera	Apionidae	*Protapion difforme*	a seed weevil	Nb
Coleoptera	Chrysomelidae	*Agelastica alni*	Alder Leaf Beetle	NR
Coleoptera	Chrysomelidae	*Longitarsus ochroleucos*	a flea beetle	NS
Coleoptera	Cryptophagidae	*Cryptophagus ruficornis*	a cryptic fungus beetle	N
Coleoptera	Curculionidae	*Rhinocyllus conicus*	a weevil	Na
Coleoptera	Cleridae	*Tillus elongatus*	a checkered beetle	NS
Coleoptera	Helophoridae	*Helophorus dorsalis*	a crawling mud beetle	NS
Coleoptera	Latridiidae	*Enicmus rugosus*	a minute brown scavenger beetle	N

Group	Family	Species	English name	Status
Coleoptera	Melandryidae	*Abdera biflexuosa*	a false darkling beetle	NS
Coleoptera	Melyridae	*Anthocomus fasciatus*	Banded Malachite Beetle	NS
Coleoptera	Melyridae	*Dasytes plumbeus*	a soft-winged flower beetle	NS
Coleoptera	Mordellidae	*Mordellistena neuwaldeggiana*	a tumbling flower beetle	NS
Coleoptera	Mycetophagidae	*Pseudotriphyllus suturalis*	a fungus beetle	NS
Coleoptera	Salpingidae	*Lissodema denticolle*	a narrow-waisted bark beetle	NS
Diptera	Pipunculidae	*Cephalops pannonicus*	a big-headed fly	NS
Diptera	Scathophagidae	*Coniosternum decipiens*	Wandering Coniosternum	N
Diptera	Sepsidae	*Themira gracilis*	an ensign fly	pNS
Diptera	Syrphidae	*Pipiza lugubris*	Smudge-winged Pipiza	NS
Hemiptera	Miridae	*Lygus pratensis*	a plant bug	RDB3
Hymenoptera	Halictidae	*Lasioglossum malachurum*	Sharp-collared Furrow-bee	Nb
Hymenoptera	Halictidae	*Lasioglossum pauxillum*	Lobe-spurred Furrow-bee	Nb
Hymenoptera	Tiphiidae	*Tiphia minuta*	Small Tiphia	Nb
Hymenoptera	Vespidae	*Dolichovespula saxonica*	Saxon Wasp	pRDBK

3.1.1 Pantheon analysis

Invertebrate assemblages associated with four broad biotopes were identified in the EMG2 Works; open habitats, tree-associated, wetlands, and coastal. Most species are associated with either open habitats (354 spp.), tree-associated (173 spp.) or wetlands (132 spp.).

Table 4 summarises key results of the Pantheon analysis. It includes all biotopes, habitats and assemblages reported by Pantheon

Pantheon provides two sets of figures for “wet woodland”, one derived from species coded for wetland, the other from species coded for woodland. The lists for the two differ by a single species. Wet woodland is included in Table 4 in both the tree-associated and wetland categories, since it makes a moderate contribution to the totals for both categories, but none of the species involved is associated exclusively with wooded localities and it is best regarded, for current purposes, as a wetland grouping.

The percentage column in this table gives the proportion of the national fauna coded for the biotope, habitat or assemblage represented.

Table 4. Summary of key results of Pantheon analysis for the EMG2 Works

Broad biotope	Habitat	SAT	No. spp. species	%age	Spp.with national status	Reported condition
open habitats			354	8	9	
		F001 scrub edge	19	8	-	Favourable 19 pp., threshold 11
		F002 rich flower resource	17	7	2	Favourable 17 spp., threshold 15

Broad biotope	Habitat	SAT	No. spp. species	%age	Spp.with national status	Reported condition
		F003 scrub-heath & moorland	4	1	1	Unfavourable 4 spp., threshold 9
	tall sward & scrub		276	10	2	
	short sward & bare ground		62	5	5	
		F112 open short sward	10	5	-	Unfavourable 10 spp., threshold 13
		F111 bare sand & chalk	4	<1	-	Unfavourable 4 spp., threshold 19
	upland		4	3	-	
tree-associated			173	5	17	
	arboreal		78	6	3	
	decaying wood		66	6	11	
	shaded woodland floor		35	3	2	
	wet woodland		14	6	1	
		A212 bark & sapwood decay	33	7	6	Favourable 33 spp., threshold 19
		A213 fungal fruiting bodies	10	11	3	Favourable 10 spp., threshold 7
		A211 heartwood decay	6	4	2	Favourable 6 spp., threshold 6
		A215 epiphyte fauna	1	5	-	Unfavourable 1 spp., threshold 6
wetland			132	5	3	
	marshland		80	10	1	
		W211 open water on disturbed mineral sediments	1	2	-	Unfavourable 1 spp. threshold 6
	acid & sedge peats		42	4	2	
	running water		29	3	-	
		W126 seepage	1	2	-	Unfavourable 1 spp., threshold 6
	wet woodland		15	6	1	
	lake		2	2	-	
coastal			4	<1	-	
	sandy beach		2	2	-	
	saltmarsh		2	<1	-	
	brackish pools and ditches		1	<1	-	

Open habitats had the largest associated invertebrate assemblage (354 spp.) but supported only nine species with a formal conservation status. The majority of these species (276) are associated with tall sward and scrub, but these include relatively few species with formal conservation status (2). Short sward and bare ground had a much smaller number of associated species (62) but a larger proportion with a formal conservation status (5).

Five SATs (Specific Assemblage Types) were identified within the open habitat grouping. Only two, F001 scrub edge and F002 rich flower resource were assessed as being in favourable condition.

- The F001 scrub edge assemblage includes a taxonomically disparate range of species of generally low conservation interest. No species with formal status occur in this assemblage.
- The F002 rich flower resource assemblage (favourable) is made up of solitary bees and tends to reach favourable status on most sites when multiple survey visits are made in good weather. Two species with a formal conservation status are associated with this assemblage, but these statuses are outdated and both species are now common.
- F003 Scrub-heath and moorland is a rather odd and poorly named assemblage which routinely makes an appearance in Pantheon analyses of sites entirely lacking in heathland and moorland, and in such cases is best regarded as being associated with open-structured mosaics.
- The F111 bare sand and chalk assemblage is made up of only four species, all of which occur in other open habitats. The single species with a conservation status, *Rhinocyllus conicus*, is now relatively common on thistles in warm ruderal habitats.
- The F112 open short sward assemblage is composed mostly of phytophagous bugs and beetles, all of which are relatively common.

Tree-associated habitats form the next largest associated grouping, including 173 species associated with four habitats: arboreal, decaying wood, shaded woodland floor and wet woodland. Seventeen of these species have a formal conservation status and these habitats support the most significant invertebrate conservation interest. The arboreal grouping is the largest (78 spp.) subset of tree-associated species and is mostly associated with the foliage of hawthorn, oak, willow, field maple, blackthorn and other trees and shrubs that were present throughout the surveyed areas. Only three associated species have a formal conservation status, two of which are outdated. The next largest tree-associated grouping (66 spp.) is associated with decaying wood, and this grouping supported the largest proportion of species with a formal conservation status (11) of any invertebrate assemblage identified on the site. It is composed predominantly of saproxylic beetles associated with decaying ash and, to a smaller extent, oak. The shaded woodland floor assemblage (35 spp.) is composed largely of common Diptera. Many of the species coded for it occur more widely in shaded habitats with a significant leaf litter component, others are associated with this habitat for part of their life cycle but wander more widely as adults. The wet woodland grouping (14 spp.) will be considered under wetland.

Four SATs were identified within the arboreal grouping. Three, A212 bark and sapwood decay, A213 fungal fruiting bodies and A211 heartwood decay were considered to be in favourable condition:

- The A212 bark and sapwood decay included 33 species, six of which had a formal conservation status. The species assigned to this assemblage are largely associated with dead or dying small diameter branches and twigs as well as bark on ash, oak, elm, hazel, apple, ivy and pine. This assemblage is in favourable condition.
- The A213 fungal fruiting bodies included 10 species, three of which have a formal conservation status. These species are associated with fungal growth on ash and oak. This assemblage is in favourable condition.

- The A211 heartwood decay includes only six species but two of these have a formal conservation status. Heartwood decay habitats are relatively are and take a long time to develop so tend to support a disproportionately high number of rare species. In this case none of the species are exceptionally rare. This assemblage is associated with heartwood decay of ash trees on the Diseworth site. This assemblage is in favourable condition.
- The A215 epiphyte fauna assemblage is made up of a single common species and is of no significance.

Wetland habitats form the third large grouping (132 spp., 3 of them with formal status). The largest component (80 spp.) is associated with marshland habitat, but these include only a single species with formal status. The second largest component, “acid and sedge peats” include only 42 species, two of which have a formal status. The names of these habitats seem rather poorly chosen – “peatland” in this context does not necessarily contain any peat – and the distinction between them is tends to be at best obscure in lowland, non-acid wetlands. It is routine to find both habitats represented in single, reasonably uniform wetland areas. The “peatland” fauna is almost always, in these circumstances, of higher quality. Twenty-nine species are assigned to running water. The majority, however, are also assigned to other wetland categories and none are rare or even particularly uncommon. The remaining wetland habitats contain few species and relatively little interest. Wet woodland, with fifteen species, is the largest. Species in this category are variably associated with sheltered or shaded conditions, and it is doubtful that any require continuous tree cover. “Lake”, includes only two species of caddisfly that are also coded for other habitats.

Two SATs are recognised within the wetland biotope, W211 open water on disturbed mineral sediment and W126 seepage, both of which are represented by a single common species and considered to be in unfavourable condition.

A tiny (4 spp.) coastal invertebrate assemblage was also identified. Two of these species are flies that are also coded for non-coastal wetland habitats and occur widely. Two are common bugs associated with Amaranthaceae and in this case are associated with goose-foot’s (*Chenopodium* spp.) in ruderal agricultural habitats.

3.1.2 Saproxylic Quality Index (SQI) and Index of Ecological Continuity (IEC)

A total of fourty-two species of qualifying saproxylic Coleoptera were recorded during the survey of the EMG2 Works, just over the threshold required for SQI analysis. Of these, eleven (26.2%) were Nationally Scarce. This represents the most significant concentration of species with a formal conservation status within the EMG2 Works and highlights the importance of the over-mature trees and their associated wood-decay features. The EMG2 Works as a whole achieves an SQI score of 364.3. and an IEC score of 12. Table 5 gives a full list of scoring species.

Table 5. Saproxylic Coleoptera used to calculate SQI and IEC for the EMG2 Works

Family	Species	Status	SQI score	IEC score
Aderidae	*Aderus populneus*	NS	8	2
Anthribidae	*Platyrhinus resinosus*	Nb	4	1
Biphyllidae	*Biphyllus lunatus*	very local	4	1
Buprestidae	*Agrilus laticornis*	local	4	
Cerambycidae	*Grammoptera ruficornis*	common	1	
Cerambycidae	*Leiopus nebulosus*	local	2	
Cerambycidae	*Pogonocherus hispidulus*	local	2	
Cerambycidae	*Rutpela maculata*	common	1	
Ciidae	*Cis bidentatus*	local	2	
Ciidae	*Cis castaneus*	local	2	
Ciidae	*Cis pygmaeus*	local	2	
Cleridae	*Thanasimus formicarius*	very local	4	1
Cleridae	*Tillus elongatus*	NS	8	1
Cryptophagidae	*Cryptophagus ruficornis*	N	8	
Curculionidae	*Hylesinus crenatus*	local	2	
Curculionidae	*Hylesinus taranio*	local	2	
Curculionidae	*Hylesinus varius*	common	1	
Curculionidae	*Magdalis armigera*	local	4	
Curculionidae	*Scolytus scolytus*	local	2	
Dermestidae	*Ctesias serra*	very local	4	
Erotylidae	*Triplax russica*	very local	4	1
Histeridae	*Abraeus perpusillus*	very local	4	
Laemophloeidae	*Cryptolestes ferrugineus*	local	2	
Latridiidae	*Enicmus rugosus*	N	8	2
Latridiidae	*Enicmus testaceus*	local	2	
Lucanidae	*Dorcus parallelipipedus*	local	2	
Melandryidae	*Abdera biflexuosa*	NS	8	1
Melyridae	*Anthocomus fasciatus*	NS	8	
Melyridae	*Dasytes plumbeus*	NS	8	
Melyridae	*Malachius bipustulatus*	common	1	
Mordellidae	*Mordellistena neuwaldeggiana*	NS	8	1
Mycetophagidae	*Mycetophagus quadripustulatus*	local	2	
Mycetophagidae	*Pseudotriphyllus suturalis*	NS	8	1
Nitidulidae	*Soronia grisea*	local	2	
Ptinidae	*Anobium inexspectatum*	local	4	
Ptinidae	*Anobium punctatum*	common	1	
Ptinidae	*Hemicoelus fulvicornis*	common	1	
Ptinidae	*Ochina ptinoides*	local	2	
Ptinidae	*Ptilinus pectinicornis*	common	1	
Salpingidae	*Lissodema denticolle*	NS	8	
Salpingidae	*Salpingus planirostris*	common	1	
Scraptiidae	*Anaspis frontalis*	common	1	
SQI:		**364.3**		

IEC:	**12**
Spp.:	**42**
Spp. with formal conservation status:	**11**

3.2 Highway Works

A total of 828 records of 423 mutually exclusive invertebrate taxa were made during the survey of the Highway Works areas. Of these, fourteen species (3.3%) have a formal national conservation status. Thirteen are Nationally Scarce and three are Nationally Rare or Red Data Book. The recorded species cover a broad taxonomic range and are dominated by Coleoptera (beetles), with Hemiptera (true bugs) and Diptera (true flies) following in roughly equal proportions.

A taxonomic summary of the recorded taxa is given in Table 6. Table 7 lists species with a national or local conservation status. A full list of recorded taxa is given in Appendix 6. Details of all species with a formal national conservation status recorded during the survey are given in Appendix 8.

Table 6. Taxonomic summary of recorded species from the Highway Works area

Group	Important sub-groups	Taxa	Spp. with status	Percentage with status
All		423	14	3.3%
Coleoptera (beetles)		143	7	4.9%
	Curculionoidea (weevils)	44	5	11.4%
	Chrysomelidae (leaf beetles)	24		
	Staphylinidae (rove beetles)	19		
	Carabidae (ground beetles)	17		
	Coccinellidae (ladybirds)	12		
Hemiptera (true bugs)		91	3	3.3%
	Heteroptera	60	2	3.3%
	Auchenorrhyncha (planthoppers)	32	1	3.1%
Diptera (true flies)		82	2	2.4%
	Syrphidae (hoverflies)	21		
	Tephritidae (gall flies)	9	1	11.1%
	Dolichopodidae (long-footed flies)	6		
	Stratiomyidae (soldierflies)	5		
	Tipuloidea (craneflies)	5		
	Sciomyzidae (snail-killing flies)	4		
Hymenoptera (bees, wasps, ants and sawflies)		27	2	7.4%
	Apoidea (bees)	15	1	6.7%

	Wasps	6	1	16.7%
	Formicidae (ants)	5		
Araneae (spiders)		38		
Lepidoptera (butterflies and moths)		17		
Orthoptera (crickets and grasshoppers)		8		
Mollusca (snails)		6		
Odonata (dragonflies and damselflies)		2		
Crustacea (woodlice)		3		
Opiliones (harvestmen)		3		
Psocoptera (barklice)		1		
Neuroptera (lacewings)		1		
Dermaptera (earwigs)		1		

Table 7. Species with formal conservation status recorded from the Highway Works area

Group	Family	Species	English name	Status
Coleoptera	Apionidae	*Oxystoma cerdo*	a seed weevil	Nb
Coleoptera	Apionidae	*Protapion difforme*	a seed weevil	Nb
Coleoptera	Cryptophagidae	*Atomaria scutellaris*	a silken fungus beetle	RDBK
Coleoptera	Curculionidae	*Magdalis cerasi*	a weevil	Nb
Coleoptera	Curculionidae	*Microplontus campestris*	a weevil	Nb
Coleoptera	Curculionidae	*Trichosirocalus barnevillei*	a weevil	Nb
Coleoptera	Melandryidae	*Abdera biflexuosa*	a false darkling beetle	NS
Diptera	Tachinidae	*Cistogaster globosa*	a bristle fly	RDB1
Diptera	Tephritidae	*Merzomyia westermanni*	Large Ragwort Picturewing	N
Hemiptera	Cixiidae	*Trigonocranus emmeae*	a lacehopper	Nb
Hemiptera	Coreidae	*Bathysolen nubilus*	Cryptic Leatherbug	NS
Hemiptera	Miridae	*Lygus pratensis*	a plant bug	RDB3
Hymenoptera	Crabronidae	*Crossocerus distinguendus*	a solitary wasp	Na
Hymenoptera	Halictidae	*Lasioglossum pauxillum*	Lobe-spurred Furrow-bee	Nb

3.2.1 Pantheon analysis

Invertebrate assemblages associated with four broad biotopes were identified on the site; open habitats, wetlands, tree-associated and coastal. Most species are associated with open habitats (283) or with smaller tree-associated (47) and wetland assemblages (30). This is unsurprising given that the habitat was largely open grassland with some young trees and shrubs and little in the way of wetland habitat present. Table 8 summarises key results of the Pantheon analysis. It includes all biotopes, habitats and assemblages reported by Pantheon.

The percentage column in this table gives the proportion of the national fauna coded for the biotope, habitat or assemblage represented in the 2024 figures.

Table 8. Summary of key results of Pantheon analysis of the Highway Works area

Broad biotope	Habitat	SAT	No. spp. species	%age	Spp.with national status	Reported condition
open habitats			283	6	11	
		F002 rich flower resource	14	6	1	Unfavourable 14 spp., threshold 15
		F001 scrub edge	9	4	1	Unfavourable 9 spp., threshold 11
		F003 scrub-heath & moorland	4	1	1	Favourable 4 spp., threshold 9
	tall sward & scrub		217	8	4	
	short sward & bare ground		70	5	7	
		F112 open short sward	17	9	1	Favourable 17 spp., threshold 13
		F111 bare sand & chalk	7	2	2	Unfavourable 7 spp., threshold 19
	upland		1	<1	-	
tree-associated			47	1	2	
	arboreal		37	3	-	
	decaying wood		6	<1	2	
	shaded woodland floor		5	<1	-	
		A212 bark & sapwood decay	5	<1	2	Unfavourable 5 spp., threshold 19
wetland			30	1	-	
	marshland		18	2	-	
	acid & sedge peats		13	1	-	
	running water		5	<1	-	
coastal			1	<1	-	
	brackish pools and ditches		1	<1	-	
	saltmarsh		1	<1	-	

Open habitats had overwhelmingly the largest associated invertebrate assemblage (283 spp.) and supported the largest number of species with a formal conservation status (11). The majority of these species (217) are associated with tall sward and scrub, but these include relatively few species with formal conservation status (4). Short sward and bare ground had a much smaller number of associated species (70) but a far larger proportion with a formal conservation status (7). The upland assemblage, made up of a single species that is also coded for tall sward and scrub, can be ignored.

Five SATs (Specific Assemblage Types) were identified within the open habitat grouping. Only one, F112 open short sward was assessed as being in favourable condition.

- The F001 scrub edge assemblage includes a taxonomically disparate range of species of generally low conservation interest. The single species with formal status, *Crossocerus distinguendus*, is a solitary wasp that nests on bare ground or wood and forages in scrub edges.
- The F002 rich flower resource assemblage is made up of solitary bees. This assemblage almost reaches favourable status (14 of 15) and would undoubtedly achieve this threshold if spring survey were undertaken or in a year with weather more conducive to bee activity.
- F003 Scrub-heath and moorland is a rather odd and poorly named assemblage which routinely makes an appearance in Pantheon analyses of sites entirely lacking in heathland and moorland, and in such cases is best regarded as being associated with open-structured mosaics.
- The small F111 bare sand and chalk assemblage is dominated by phytophagous bugs and beetles as well as two spiders. The two species with formal conservation status are *Trichosirocalus barnevillei*, a traditionally coastal phytophagous weevil associated with yarrow that is expanding inland along road systems, and the enigmatic lace-winged planthopper *Trigonocranus emmeae* who may be partially subterranean.
- The F112 open short sward assemblage (favourable) is composed mostly of phytophagous beetles and bugs, with rather small contributions from other groups. The single species with a formal conservation status, the Cryptic Leatherbug *Bathysolen nubilus*, is associated with Black Medick.

The tree-associated species identified include 47 associated with three habitats: arboreal, shaded woodland floor and decaying wood. The arboreal grouping is the largest (37 spp.) subset of tree-associated species and is associated with the foliage of screening scrub and plantation woodland bordering roads and cycleways. The decaying wood grouping (6 spp.) is small. This is to be expected in such a young site, in which there has been little time for the development of dead wood or a dead wood fauna. It does however include two species with a formal status which is relatively impressive for recent plantings. There is a very small grouping (5 spp.) that is considered to be associated with shaded woodland floor. Many of the species coded for it occur more widely in shaded habitats with a significant leaf litter component, others are associated with this habitat for part of their life cycle but wander more widely as adults.

A single SAT, A212 bark and sapwood decay, was identified in the arboreal assemblages. This assemblage included only five species but two of these have a formal conservation status, although both are relatively undemanding species associated with dead twigs and fine branches or with small-diameter standing dead wood. It was considered to be in unfavourable condition.

Wetland habitats form the other significant associated grouping (30 spp., none with formal status). The largest component (18 spp.) is associated with marshland habitat. The second largest component, “acid and sedge peats” include only 13 species. Another five species are assigned to running water. The only wetland habitat features in the area were a dry ditch and some seasonally damp low-lying ground. The small wetland assemblage is largely made up of flies that require damp ground rather than true wetland habitats.

A single species was assigned to the coastal invertebrate assemblage. This is a common cranefly that is also associated with non-coastal wetland habitats.

4. Assessment of invertebrate interest

4.1 EMG2 Works

The total number of scarce and rare species supported by a site is an important, and arguably the most important, factor determining its conservation value for invertebrates. It is a little-used measure, however, because complete recording of the invertebrates of any substantial site is effectively unachievable. Measures of species quality are generally used as a substitute. A robust rule of thumb is that 5-10% of species possessing a formal conservation status indicates a high-quality site and more than 10% indicates exceptional quality. Based on these guidelines, the EMG2 Works as a whole sits well below the threshold for high value, with 3.3% of recorded species possessing a formal conservation status. Many of these statuses are now outdated, however, and some species have unambiguously increased in recent years to an extent that makes formal conservation status inappropriate, so actual interest could be considered lower than this.

Invertebrate interest is not distributed evenly across the site and some habitats are clearly of higher interest than others. In particular, the invertebrate fauna associated with the over-mature hedgerow trees in the Main Site is of much higher interest than that associated with other features. The interest of each of the main habitats present will therefore be considered separately below.

4.1.1 Open habitats

Open habitats in the EMH2 Works are represented by arable margins; grassy field margins, fallow grassland and improved pasture.

Open habitats supported the largest component of the invertebrate fauna recorded from the EMG2 Works (354 spp.). Only 9 (2.8%) of these had a conservation status however. One of these, the Cinnabar Moth *Tyria jacobaeae* is listed under S41 for research purposes only and is generally common. Six more of the species with a formal conservation status associated with open habitats have become much more common since their statuses were assigned. The remaining two species, the flea beetle *Longitarsus ochroleucos* and the seed weevil *Protapion difforme*, are genuinely scarce but have widespread distributions and are not particularly demanding in their habitat requirements.

Arable margins have the capacity to support high quality invertebrate assemblages when they are broad, well-structured and are situated on free-draining soils. None of these are the case at the Diseworth site. The soil is generally clay or has a strong clay component, margins are narrow, with cropping almost to the hedges in many fields, and the structure is simple with a limited arable margin ruderal flora. These factors strongly limit the potential for arable margin invertebrate assemblages. Isolated areas of broader margin, disturbed tracks and neglected corners provide better structured habitat but none were found to support significant arable margin invertebrate assemblages.

Grassland in the EMG2 Works are predominantly restricted to narrow bands of nutrient enriched, coarsely structured, species poor grassland at the margins of arable fields. These are of limited interest and support an invertebrate assemblage dominated by common and undemanding species. There are scattered sections of more floriferous and species rich grassland across the site but these are very limited in extent. Bird's-foot Trefoil *Lotus corniculatus*, Common Knapweed *Centaurea nigra* and Ox-eye Daisy *Leucanthemum vulgare* were frequent. It is unclear if these are remnants of pre-existing better quality grassland or the results of more recent seeding events. These areas supported a somewhat more diverse invertebrate assemblage but one still largely composed of common species.

The two uncropped fields in the south-west (D5 and D6) are the only significant areas of grassland present on the site. D6 is a species poor improved pasture that supported very limited invertebrate interest. The tall open-structured fallow grassland and floriferous grassy track of D5 were of somewhat higher quality and better structured but were still species poor and nutrient enriched. They supported no invertebrate assemblages of conservation importance.

Two open habitat SAT's were identified as being in favourable condition by Pantheon analysis. The F001 scrub edge assemblage includes a taxonomically disparate range of species of generally low conservation interest and is associated with the boundary between hedged and adjacent field margins. No species with formal status occur in this assemblage. The F002 rich flower resource assemblage is made up of solitary bees and tends to reach favourable status on most sites when multiple survey visits are made in good weather. Two species with a formal conservation status are associated with this assemblage, but these statuses are outdated and both species are now common.

Overall, the open-habitats of the EMG2 Works support the largest invertebrate assemblage, but it is of relatively low conservation value. The invertebrate assemblages recorded are largely composed of common species that would be expected to occur wherever similar habitats are found in the wider countryside. Habitat quality is generally higher towards the margins of the site, particularly the north-west margin (D7), along Hyam's Lane (D1), and along the flowing drainage ditch (D4).

4.1.2 Wetland habitats

Wetland habitats in the EMG2 Works included permanent and temporary ponds, a stream, a flowing ditch, shallow drainage ditches and temporary pools in wheel ruts.

A moderately sized wetland fauna was recorded (132 spp.) but this included only three species (2.3%) with a formal conservation status. The fly *Themira gracilis* is potentially under-recorded and its status is poorly known. It is associated with mammal dung and can be found in very low quality and eutrophic habitats. The Wandering Coniosternum *Coniosternum decipiens* does not have a well understood ecology. It is scarce but is known to wander widely. A single individual was found in the wetland habitat in (D3). The Nationally Scarce mud beetle *Helophorus dorsalis* is associated with shaded shallow muddy pools, often with dead leaves. It was found in shallow, seasonally flooded, shaded vehicle tracks adjacent to the stream running along the north-west margin of the EMG2 Works.

The three ponds (P1. P2, P3), stream (S1) and flowing drainage ditch (S2) in the EMG2 Works all supported very limited aquatic invertebrate fauna faunas composed entirely of common species. P1 and P2 are both heavily shaded and eutrophic due to agricultural run-off. P3 seems to be rain fed so has somewhat higher water quality, although it is still heavily shaded. S1 seems to have reasonably good water quality but is simple in structure and had a limited number of micro-habitats for aquatic invertebrates. S2 was very shallow and heavily eutrophic due to agricultural run-off. There was almost no aquatic invertebrate fauna present (4 spp.).

The wetland habitats of greatest importance on the EMG2 Works actually seem to be the temporary pools created in deep wheel ruts across the site. These shallow muddy pools with flooded grass margins supported a moderate fauna of water beetles and wetland marginal beetles, bugs and flies.

Overall, the wetland habitats of the EMG2 Works support limited invertebrate interest. The wetland habitat feature of greatest interest are flooded wheel ruts and an associated early successional wetland fauna.

4.1.3 Hedges

The hedgerows on the EMG2 Works are mostly of limited interest. Many of them are dense and closely managed with little opportunity to flower or fruit profusely. The field margins largely have abrupt transitions from cropped arable through a narrow band of coarse grassland to a steep and dense hedge. This simple structure is not conducive to high invertebrate interest. The hedges are better structured in places, especially along Hyam's Lane (H1) along the north-west site margin (H7), in boundaries around the north-east corner (H3) and in the south-west corner around H5 and H6, being larger, more species rich and with broader and more complex transitions to open habitat at the base.

The general structure and management of the hedges in the EMG2 Works limits the availability of habitat niches and therefore the quality of the invertebrate fauna. Nonetheless, the scrub edge SAT F001, based largely on the fauna of the boundary between hedges and grassy field margins, achieves favourable status, although it supports no rare species. The hedges also supported some uncommon saproxylic Coleoptera such as *Aderus populneus* and *Lissodema denticolle* on the extensive small diameter dead wood found in the flailed hedges. Overall, the associated invertebrate fauna can be considered in line with expectations from the wider agricultural countryside, with the hedges being unexceptional but providing an important contribution to overall habitat complexity on the site.

The hedges are considered to be of low to moderate importance for invertebrates.

4.1.4 Trees

The hedges in the EMG2 Works include a large number of mature, overmature and senescent hedgerow trees. The majority of these are Ash, although several oaks, large Field Maples, Willows, a single Poplar and a single Scot's Pine are also present. These supported a relatively large associated invertebrate assemblage (173 spp.).

These trees supported a significant foliage associated arboreal invertebrate assemblage (78 spp.) but only three of the had a formal conservation status. Only the Smudge-winged Pipiza *Pipiza lugubris* is of any note, with the other species now being relatively common, but the ecology of this species is obscure. Smaller components are associated with shaded woodland floors and wet woodland but neither are significant.

The most important tree-associated invertebrate assemblage is that of decaying wood habitats (66 spp.), eleven (16.6%) of which have a formal conservation status, representing a respectable saproxylic invertebrate assemblage, especially for an arable dominated agricultural area.

Three decaying wood SATs were identified as being in favourable condition. The A212 bark and sapwood decay included 33 species, six of which, the false darkling beetle *Abdera biflexuosa*, the Banded Malachite Beetle *Anthocomus faciatus*, the soft-winged flower beetle *Daystes plumbeus* the minute brown scavenger beetle *Enicmus rugosus*, the tumbling flower beetle *Mordellistena neuwaldeggiana* and the narrow-waisted bark beetle *Lissodema denticolle* were Nationally Scarce. The species assigned to this assemblage are largely associated with dead or dying small diameter branches and twigs as well as bark on ash, oak, elm, hazel, apple, ivy and pine. The A213 fungal fruiting bodies included 10 species, three of which, the cryptic fungus beetle *Cryptophagus ruficornis*, the fungus beetle *Pseudotriphyllus suturalis* and the Cramp Ball Fungus Weevil *Platyrhinus resinosus*, are Nationally Scarce. These species are associated with fungal growth on ash and oak. The A211 heartwood decay includes only six species but two of these, the banded ant-like leaf beetle *Aderus populneus* and the checkered beetle *Tillus elongatus* are Nationally Scarce. This assemblage is associated with heartwood decay of ash trees on the Diseworth site.

A total of fourty-two species of qualifying saproxylic Coleoptera were recorded during the survey of the EMG2 Works, just over the threshold required for SQI analysis. Of these, eleven (26.2%) were Nationally Scarce. This represents the most significant concentration of species with a formal conservation status within the EMG2 Works and highlights the importance of the over-mature trees and their associated wood-decay features.

The EMG2 Works as a whole achieves an SQI score of 364.3. This would place it not far below the nearby old parkland site of Donington Park SSSI (SQI 377.5).

The EMG2 Works achieves an IEC score of 12. This score is an indicator of habitat continuity rather than just faunal quality. A score of 12 falls below the generally accepted threshold for a site of regional importance (15). A score of 12 indicates that the site has a long habitat continuity and is of high local importance for its saproxylic beetle assemblage at a minimum.

4.1.5 Overall assessment of invertebrate interest

The survey indicates that the EMG2 Works as a whole is of high local importance for its invertebrate fauna, based almost entirely on the saproxylic beetles associated with wood decay habitats. This assessment is based on the following data and reasoning:

- The overall percentage of scarce species within the recorded assemblage (3.3%) is indicative of a relatively low-quality site, at most of local importance. This percentage represents an overestimate of interest as many species have outdated statuses.

- Open habitats (arable margins, grassy field margins and improved and fallow grassland) support assemblages composed largely of common and widespread invertebrate species and are considered to be of low importance.

- Wetland habitats (ponds, ditches, streams, seasonally wet wheel ruts, seasonally wet swamp and wet willow scrub) support assemblages composed largely of common and widespread invertebrate species. Ponds and ditches are eutrophic and simple in structure. Other wetland habitats are generally species poor and degraded by adjacent agriculture. They are considered to be of low importance.

- Hedgerows are generally rather poorly structured but with some larger and better-structured stretches. They support an invertebrate fauna largely composed of common and widespread species but including some uncommon saproxylic species associated with small diameter dead wood. They are considered to be of low to moderate local importance.

- Mature and overmature hedgerow trees in the Main Site support extensive and diverse wood decay habitat features and a large associated fauna of saproxylic beetles, including eleven species with a formal conservation status. Three decaying wood SATs, A212 bark and sapwood decay, A213 fungal fruiting bodies and A211 heartwood decay were assessed as being in favourable condition; the SQI score of 364.3 indicates high value. An IEC score of 12 indicates good habitat continuity. They are considered to be of very high local importance.

4.2 Highway Works

The Highway Works area as a whole sits well below the threshold for high value, with 3.3% of recorded species possessing a formal conservation status (14 spp.). Many of these statuses are now outdated, however, and some species have unambiguously increased in recent years to an extent that makes formal conservation status inappropriate, so actual interest could be considered lower than this.

Invertebrate interest is not distributed evenly across the site and some habitats are clearly of higher interest than others. The interest of each of the main habitats present will therefore be considered separately below.

4.2.1 Open habitats

Open habitats are predominant in the Highway Works area and are represented by tall and short sward grassland, open scrub and bare ground mosaics. These habitats support overwhelmingly the largest invertebrate assemblage (283 spp.). and the majority of the species with formal conservation status (11 of 14).

The largest component of the invertebrate assemblage recorded was associated with tall sward and scrub (217 spp.) but only three species, the seed weevils *Oxystoma craccae* and *Protapion difforme* and the Large Ragwort Picturewing fly *Merzomyia westermanni*, possess a formal conservation status. All of these are now more common than their status might suggest and do not have particularly demanding habitat requirements so are not considered to be of individual conservation importance.

A smaller assemblage is associated with short sward and bare ground habitats (70 spp.), but seven of these possess a formal conservation status. The Nationally Scarce weevils *Micropolontus campestris* and *Trichosirocalus barnevillei* are associated with common plants and are now widespread and relatively common on “highway seedmix” grasslands and road margins, which provide ideal habitats. The Lobe-spurred Furrow-bee *Lasioglossum pauxillum* is now common and of no conservation importance. The solitary wasp *Crossocerus distinguendus* is decidedly local and required bare ground for nesting and sheltered open habitats for hunting and foraging. The Cryptic Leatherbug *Bathysolen nubilus* feeds on Black Medick in open habitats and is mostly restricted to south-east England. It has expanded north and west in recent years and was becoming increasingly common but now seems to be undergoing a decline. This may be the first record for Leicestershire. The lacehopper *Trigonocranus emmeae* is very rarely recorded but widespread and known from a range of open habitats. It is probably largely subterranean and therefore likely to be under-recorded.

The open short sward SAT is considered to be in favourable condition by Pantheon analysis, the only SAT assessed as such from the Highways Area. This further highlights the importance of open short sward habitats and bare ground mosaics in this area.

The grassland in the Highway Works area is generally quite well-structured and floristically rich, as is typical of “highways seedmix” grasslands on well-drained and nutrient poor road margins. Disturbance by management and rabbits has maintained areas of very short sward and patches of bare ground that support the greatest concentration of invertebrate interest. The juxtaposition of patches of sheltering scrub, flower rich grassland, bare ground and many important invertebrate foodplants provide high quality habitat for many invertebrate species and assemblages.

The open habitats within the Highway Works area are considered to be of moderate quality but limited overall importance for invertebrates.

4.2.2 Wetland habitats

There was little in the way of wetland habitat within the Highway Works area. A dry ditch and band of vegetation indicative of damp conditions were the only features identified. Only a very small wetland assemblage (30 spp.) was identified and none of the associated species had a formal conservation status. The only value of the wetland habitat features are as a component of wider structural diversity within area H4.

Wetland habitats within the Highway Works area support very limited invertebrate interest and are of low conservation value.

4.2.3 Woody vegetation

There was relatively little invertebrate interest associated with woody vegetation in the Highway Works area. A small tree-associated assemblage was recorded (47 spp.) but this was largely made up of common and widely distributed species. Thirty-seven of these are associated with the foliage of trees and shrubs, no species of conservation significance occurred in this assemblage.

A small number of species (6) associated with decaying wood were recorded from the amture plantation woodland of H2. This includes both tree-associated species with a formal conservation status recorded from the Highway Works area, the weevil *Magdalis cerasi* and the false darkling beetle *Abdera biflexuosa*. Both of these species are associated with small-diameter dead wood and can occur in heavily shaded conditions. It seems likely that both species will occur more widely in the surrounding area as the plantation in H2 is not particularly old. The H2 plantation woodland is the oldest and best-established area of plantation within the highways area. Whilst dense and generally poorly-structured it did have a large volume of small diameter dead-wood created by shading out of lower branches and entire trees. The remaining woody-vegetation is largely young screening shrubs and trees that have not had time to develop any significant invertebrate fauna.

Overall, the habitat provided by woody vegetation is of low quality. The more mature plantation woodland of H2 supports limited saproxylic interest but the foliage feeding assemblage recorded across the Highways Area is composed entirely of common and widespread species.

4.2.4 Overall assessment of invertebrate interest

The overall value for invertebrates of the Highway Works area is considered to be low and of at most local significance. This assessment is based on the following data and reasoning:

- The overall percentage of scarce species within the recorded assemblage (3.3%) is indicative of a relatively low-quality site, at most of local importance. This percentage represents an overestimate of interest as many species have outdated statuses.

- The well-structured and flower-rich grassland, open short sward and bare ground mosaics, are of moderate to high quality and support several scarce invertebrates, however, these habitats and habitat features are very widespread at the margins of the extensive road network in the area and are recently created. The invertebrate fauna is likely to be shared with much of the road margin habitat in the broader region and any losses due to works are likely to rapidly recolonise from adjacent road margins. They are considered to be of low to moderate local importance.

- Wetland habitats are very limited (a ditch and some seasonally wet species poor grassland) and support a small assemblage of common invertebrate species. It is of low importance

- The woody vegetation in the Highway Works area is considered to be of low importance for its invertebrate fauna. Young planted scrub and trees support a foliage feeding fauna of common species. Some interest is associated with dead and decaying wood in the young plantation woodlands of H2 but this is not large and is likely to be shared with adjacent plantation woodland.

5. Mitigation and management advice

5.1 EMG2 Works

It has to be assumed that almost all of the habitat within the EMG2 Works footprint will be lost or at least modified to a significant extent. There are significant areas of habitat creation on the EMG2 Main site and within the Community Park.

Some habitat will be retained within the EMG2 Works, in particular the north-west marginal stream along with associated hedges and trees will be retained with an adjacent buffer strip as part of the Community Park.

The loss of the arable will be of little consequence to the invertebrate fauna. The arable margins, where most invertebrate interest tends to be concentrated, were narrow and supported a limited ruderal flora and associated invertebrates. The invertebrate fauna is likely to be present on arable margins in the wider countryside. Mitigation options would include:

- If any arable is retained within the project footprint: Leave a 5m margin at the edge of retained arable fields that is ploughed but not seeded to allow a ruderal arable margin flora to develop and provide habitat for associated invertebrate species.

The grassy field margins and two grass fields present in the EMG2 Works are of low quality, being nutrient enriched, species poor and limited in extent. They support an invertebrate fauna composed largely of widespread and common species. Their loss could be compensated for by conversion of arable to grassland and subsequent management to maintain a good structure and floristic composition. Mitigation advice would be:

- Convert arable fields to grassland through natural succession or seeding with a suitable neutral grassland native seed mix.

- Ongoing management of newly created grasslands will be required to prevent scrub invasion and maintain an open-structure conducive to high invertebrate interest.

- The ideal management of grasslands is through grazing, preferably by sheep or cattle. This is likely to be impractical here however and cutting will be required to maintain open conditions.

- Cutting and removal of arisings will be necessary to reduce nutrient input to the site and to reduce the build-up of thatch which suppresses the germination of desirable herbaceous species.

- Spring and summer cuts should be staggered so that not all vegetation is cut at the same time – for example, by assigning a number of cutting blocks and cutting only one at a time, with several weeks between to allow re-growth.

- Some areas of grassland (at least 10%) should be left un-cut each year to add structural diversity and to provide hibernation sites for invertebrates. The uncut section should be rotated every year, meaning that no areas are left uncut for more than a year. This will prevent scrub invasion.

- Access should be encouraged and unsurfaced paths across the grasslands created to add further structural diversity. Trampling along paths and creation of disturbed patches, e.g. near benches, creates areas of short and open-structured vegetation and patches of bare ground that support a different invertebrate fauna and provide nesting sites for aculeate Hymenoptera. Disturbance would be particularly beneficial where the ground is sandier, such as E3.

- The creation of banks of free-draining sandy soil will further enhance structural complexity and encourage nesting aculeate colonies. These do not necessarily need to be tall, banks of 1-2m can still provide important habitat. These should preferably be south facing and moderately steep so as to maintain open conditions. Creation of banks of a range of substrates, from clay to sand and a range of slopes will provide greatest habitat diversity.

The wetland habitats that will be lost from the EMG2 Works are all heavily degraded and support little invertebrate interest.

Hedgerows (excluding hedgerow trees) on the EMG2 Works are generally fairly species-poor and heavily managed, although larger, more species-rich and fairly mature hedges are also present. Mitigation for the loss of hedgerows presents something of a challenge. A network of new hedges will be created on-site with a wider species mix and more sympathetic management. Mitigation and management advice is:

- Planting of species-rich hedgerows within the green infrastructure would be beneficial. Reasonably sized gaps should be maintained in any planted hedges so that they do not act as an impermeable barrier to the movement of open habitat species.

- Avoid excessive planting of woody vegetation. Care should be taken not to compromise open habitats or excessively shade existing trees or hedges. Open habitats supported the majority of the invertebrate species recorded, including many with a formal conservation status, whilst many of the species associated with existing woody vegetation prefer or require the tree or shrubs to be in open sunny conditions.

- Planting of scrub with gentle transitions to surrounding grassland provides a more natural vegetation structure and tends to give better results for invertebrates. These will support species associated with woody vegetation, and if placed close to one another to give a stepping-stone effect still allow movement of these species through the environment without impeding the movement of open habitat species. Several scrub clumps could be planted or encouraged within and at the edges of newly created grass fields. These should be managed to avoid invasion of grassland.

The overmature trees and their extensive associated wood decay habitats are, by a wide margin, the single most valuable and irreplaceable identified feature of the EMG2 Works for invertebrates. They

are also the most challenging habitat to mitigate for any loss, damage or disturbance. However, it is essential that the saproxylic invertebrate assemblage associated with the trees is accounted for in any mitigation for the proposed development.

A caveat to any further mitigation advice is that the default recommendation and advice when dealing with such habitat features for wildlife conservation is to avoid any disturbance wherever possible. The loss of old trees and their associated habitat niches can never be entirely mitigated. The associated invertebrate interest is accumulated over many decades or even centuries and the wood decay habitats they depend on are the product of a complex history of ageing, damage, disease, environmental conditions and landscape history and connectivity that are unlikely to ever be accurately replicated. Environmental conditions are likely to be markedly different from those that occurred earlier in the life of the tree, habitat connectivity is likely to have been disrupted by land use changes and there are likely to be fewer source populations of saproxylic invertebrates present in the wider landscape from which colonisers can arrive. The creation of replacement habitat therefore inevitably takes a significant amount of time to accumulate a saproxylic invertebrate fauna and often will never (within a human lifetime at least) support similar levels of interest.

The removal of the trees at Diseworth may be less damaging than it first appears if appropriate mitigation is enacted. Living but senescent trees are best for saproxylic invertebrates as they continually produce new dead and decaying wood and maintain a wide range of rot types, stages of decay and types of dead wood over a long period. The trees with the greatest range of wood decay features and largest volumes of deadwood on the EMG2 Works are predominantly Ash. Ash trees mature and senesce fairly quickly and have relatively short lifespans (compared to say an Oak). Many of the trees in the EMG2 Works are likely to be close to the end of their natural lives – e.g. decades rather than centuries before death – at which point the provision of new decay features ends and the associated invertebrate interest inevitably declines over the next few decades until most active decay has ceased and few habitat niches remain. This lifespan is likely to be further shortened by ash dieback, evidence of which is present in at least some of the Ash trees in the EMG2 Works.

If the removal of mature and over-mature trees is unavoidable the aim should be to conserve as much of the dead and decaying wood in a state as close to its prior condition as possible. On the EMG2 Works the features of the greatest importance for invertebrates are heart rot, hollowing trunks and large dead and decaying limbs.

Mitigation will involve two main stages, the preservation of as much deadwood as possible and securing long-term habitat continuity. Preservation of deadwood will involve translocation to the site margins or into mitigation areas. Mitigation advice is:

- Move any large diameter dead wood to the margins of the EMG2 Main Site or onto the mitigation areas and install it in a range of conditions, e.g. standing trunks, propped/attached aerial large-diameter dead wood, scattered and piled dead wood at tree bases etc. aiming to provide a good approximation of the conditions found on the development site. Figure 1 illustrates examples of similar installations of translocated dead wood carried out by FPCR on another site.

- Conserve heart rot features through the development by keeping the main trunks of the large trees intact through removal, or where this is impossible, in as large a pieces as possible. Any opening up of or cutting into heart rot or decay cavities should be avoided as this will seriously compromise the habitat value of the feature.

- The trunks should be moved to the mitigation site as quickly as possible. The main trunks should be installed as standing deadwood within or immediately adjacent to hedgerows and in semi-shaded conditions to replicate their current environmental conditions as closely as possible.

- Large attached limbs will need to be removed for translocation purposes but should ideally be placed above ground level at the mitigation site, e.g. propped or attached to the standing

trunks to maintain similar environmental conditions as fallen dead wood provides a very different habitat for a different assemblage of species to attached dead wood.

- Other dead wood needing to be removed from the development site should be placed around the base of the translocated tree trunks in semi-shaded conditions. Translocation of dead wood should take place in the winter when saproxylic invertebrates are dormant.

- Avoid planting woody vegetation close to the translocated dead wood. Partial shading by existing trees or hedges will be beneficial but heavy shading by planted scrub will lead to a rapid loss of invertebrate interest.

- Translocated dead wood should be situated close to mature Ash trees where possible to provide greater potential for habitat continuity and allow species moving from translocated dead wood to colonise suitable wood decay habitats in living mature Ash trees.

- Translocated deadwood should be situated in several clusters across the green infrastructure, and protected to reduce risk of failure due to weather, environmental conditions, vandalism etc. and to increase the likelihood of saproxylic species spreading to other areas of suitable habitat. These clusters should be situated close to concentrations of existing mature Ash trees with decay features and dead wood. Some suitable locations are identified within the veteran tree mitigation strategy, which is appended to the LEMP.

- Veteranisation methods could be used to accelerate the provision of decaying wood habitat features on existing trees through actions such as breaking branches, damaging trunks or using jagged or coronet cuts of limbs to encourage wood decay. A detailed assessment of trees in any mitigation areas would be required to identify any that might usefully be veteranised without compromising existing interest or features.

- Planting of Oak or Ash at low density along hedgerows to create future hedgerow standards and in the centre of fields with the aim of creating high-quality open-grown parkland trees would be beneficial in the long term by providing continuity of arboreal and dead wood habitats.

Figure 1. Examples of translocation of dead wood and installation as standing trunks and propped aerial dead wood carried out by FPCR at another site.

5.2 Highway Works

Mitigation for habitat loss in the Highway Works area should be achievable within the area itself. All of the habitats present in the Highway Works area are of recent origin and none are of exceptional quality. The well-structured and flower-rich grassland, open short sward and bare ground mosaics, are of moderate to high quality and support several scarce invertebrates, however, these habitats and habitat features are very widespread at the margins of the extensive road network in the area and are recently created. The invertebrate fauna is likely to be shared with much of the road margin habitat in the broader region and any losses due to works are likely to rapidly recolonise from adjacent road margins and the excellent connectivity of the Highways Area with near identical habitats in adjacent road margins means that habitats are likely to be quickly re-colonised if suitable habitats are re-created.

Disturbance of the open habitats in the Highway Works area may actually be beneficial to the invertebrate fauna as it will re-start the successional and create open early successional habitats that are required by some of the scarcer species recorded Mitigation advice would be:

- Re-create open-structured grassland that is lost or damaged through re-seeding of new road margins with the same “highways” seed-mix originally used and maintaining current cutting regime to limit succession.

- Ensure no top-soil is brought in and maintain the free-draining and nutrient-poor status of the soil on the road margins.

- Control invasion of open habitats by bramble and scrub invasion through cutting and mechanical removal.

- Create steep banks of a mix of substrates including free-draining sandy soil and clay to enhance structural complexity and encourage nesting aculeate colonies. These do not necessarily need to be tall, banks of 1-2m can still provide important habitat, although taller banks provide a greater area of habitat These should preferably be south facing and moderately steep so as to maintain open conditions. Creation of banks of a range of substrates, from clay to sand and a range of slopes will provide greatest habitat diversity.

- Keep planting of woody vegetation to the minimum required for screening purposes etc.. Where planting is necessary use locally appropriate native species such as those below:

  Hawthorn (*Crataegus monogyna*)
  Blackthorn (*Prunus spinosa*)
  Field Maple (*Acer campestre*)
  Elm (*Ulmus* spp.)
  Grey Willow (*Salix cinerea*)
  Elder (*Sambucus nigra*)
  Wayfaring Tree (*Viburnum lantana*)

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Appendix 1 – EMG2 Works compartment details

Comp.	Name	Centroid grid reference	Description	Photos
D1	Hyam's Lane	SK46092498	A large track bordered by flowery tall ruderals and a narrow strip of coarse grassland, becoming damp and supporting patches of rush *Juncus* sp. at the north-east end. Hedges 2-4m tall, thick and predominantly Hawthorn *Crataegus monogyna*, Blackthorn *Prunus spinosa* and Field Maple *Acer campestre* with scattered Elm *Ulmus* spp.. Numerous hedgerow trees were present along the lane, mostly Ash *Fraxinus excelsior* but with some Oaks *Quercus robur*. Several ash trees are over-mature and have extensive decay features.	

D2	Dump area	SK46242500	A dump area just to the south of Hyam's Lane with a large manure pile and several spoil piles with ruderal vegetation. This area has extensive bare ground dominated by mayweeds *Matricaria* sp. and Knotgrass *Polygonum aviculare* due to vehicle activity. The spoil heaps support dense bramble *Rubus* spp. scrub. To the north, west and south the area was bordered by Blackthorn *Prunus spinosa* and Hawthorn *Crataegus monogyna* hedges. The manure heap supported a range of tall ruderals including Great Willowherb *Epilobium hirsutum,* Stinging Nettle *Urtica dioica,* Creeping Thistle *Cirsium arvense* and Spear Thistle *Cirsium vulgare,* mayweeds, docks *Rumex* spp. and goosefoots *Chenopodium* spp.. The Margins are largely species poor tall grassland with Hogweed *Heracleum sphondylium*, with patches of more species rich and open-structured grassland on the northern edge. Two mature ashes with extensive decay features and deadwood are present on the southern boundary.	

D3	Damp corner	SK46472528	A low-lying area in the north-east corner supporting Reed Canary-grass *Phalaris arundinacea* dominated wetland vegetation around a small and steep-sided permanent pond with murky water and no aquatic vegetation (P1). Tall ruderals dominated by Stinging Nettle *Urtica dioica* and bramble *Rubus* spp. on slopes. The area is shaded by willows *Salix* spp.. Large parts of this area are probably under standing water during the winter. A damp track with willowherbs *Epilobium* spp. and rushes *Juncus* spp. runs through bramble scrub just to the west of this hollow.	
D4	Trees and ditch	SK46442471	This is the largest and most complex field boundary in the EMG Works and follows the course of a flowing ditch draining higher ground on the site. It includes Hawthorn dominated hedges and narrow grassy field margins of similar character to elsewhere on the site (see. D8-D11) as well as several overmature ashes trees with decay features including large diameter attached and fallen dead wood, exposed heartwood and heartwood decay and hollowing. A single very large Pedunculate Oak *Quercus robur* with some dead wood is also present. Further diversity of woody vegetation s provided by dense young Elm, several large willows, a single mature Scots Pine *Pinus sylvestris* and a single marge Grey Poplar *Populus* x *canescens*. A band of Great Willowherb and bramble dominated wetland vegetation also occurs in open sections along the ditch.	

D5	Far corner rough grassland	SK45922450	An arable field left to go fallow relatively recently. It was cut in autumn. This field has developed a species-poor tall sward with a significant ruderal component and invading ash seedlings. The sward was relatively open-structured and had patches of bare ground that are somewhat conducive to invertebrate interest. The grassy track along the northern margin of the field is better established and more species rich and floriferous with Bird's-foot Trefoil *Lotus corniculatus*, Wild Carrot *Daucus carota*, Red Bartsia *Odontites vernus*, Red Clover *Trifolium pratense*, White Clover *Trifolium repens* and Ox-eye Daisy *Leucanthemum vulgare*. Surrounded by tall and dense Hawthorn dominated hedges which, to the north, include several very large Ash trees with numerous decay features including attached and fallen large diameter dead wood, exposed heartwood, heartwood decay and heart-rot cavities.	

D6	Far corner improved pasture	SK45772452	Species poor improved pasture.	
D7	Stream and trees in NW	SK45552508	The north-western margin of the EMG2 Works is one of the more complex areas of the site. It is marked by a tall hawthorn dominated hedgerow and band of trees running along a stream (S1). The trees are mature and dense, composed predominantly of willows and ash. Below the trees is a band of tall ruderals with Hogweed, Great Willowherb, Stinging Nettle and Bramble. To the east of the trees is a disturbed grassy track and arable margin that is wet in low-lying areas. These low-lying areas had numerous deep wheel ruts that were flooded during the survey.	
D8	Arable fields to south of Hyam's (E)	SK46532497	Most field margins within the EMG Works are narrow, grass dominated and species-poor. More floriferous patches, with Ox-eye Daisy, Lesser	No photo

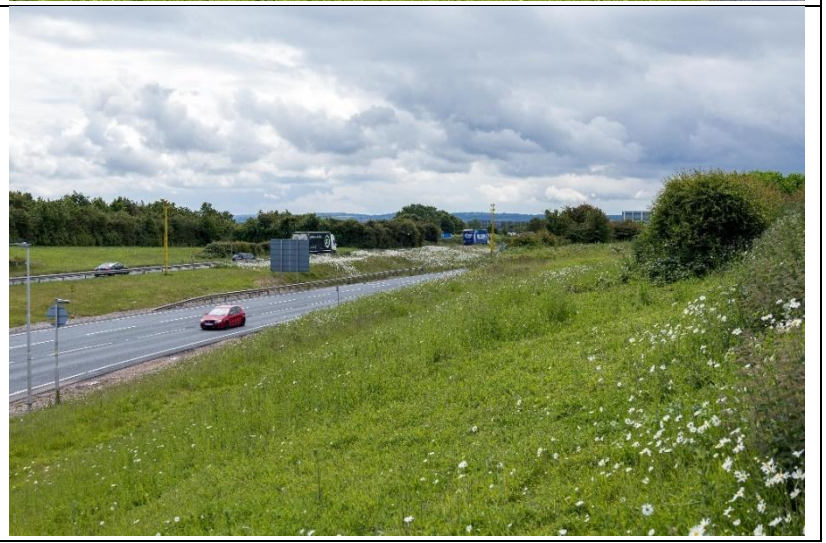
			Knapweed *Centaurea nigra* and Bird's-foot Trefoil can be found in small patches scattered throughout. Hogweed *Heracleum sphondylium* is frequent to abundant across the field margins and is an important nectar source. Thistles *Cirsium* spp. are also frequent. In disturbed areas along tracks and at field edges there are areas of open-structured short ruderal vegetation with *Matricaria*, *Plantago major*, *Polygonum aviculare*, *Chenopodium* spp. etc.. Soil is generally clayey and poorly draining but some patches of silty/sandy freer draining material are apparent. Deep ruts on tracks and low-lying hollows have a tendency to form temporary pools with exposed bare mud and mats of floating grass. Hedges are mostly of moderate size, 8-10 feet tall, dense and closely managed, although becoming gappier in paces. The dominant hedgerow shrub is Hawthorn *Cratageus monogyna*, although some are dominated by Blackthorn *Prunus spinosa*. Elder *Sambucus nigra* is fairly frequent throughout and Elm *Ulmus* spp. and Field Maple *Acer campestre* are also frequent in hedges. The hedges at the site margins and along the central track are larger and more diverse with Field Maple and Blackthorn becoming more abundant and, in some places, dominant. Hedgerwo trees are predominantly Ash.	
D9	Arable fields to south of Hyam's (W)	SK46062468	As D8.	No photo

D10	Arable fields to north of Hyam's (W)	SK45822512	As D8.	No photo
D11	Arable fields to north of Hyam's (E)	SK46352532	As D8 but with many overmature hedgerow Ash trees with extensive decay features including large diameter attached and fallen dead wood, exposed heartwood and heartwood decay and hollowing.	
P1	Pond and wetland area	SK46472527	a small and steep-sided permanent pond with murky water and no aquatic vegetation. This area is largely shaded by willows and is probably under standing water during the winter.	No photo
P2	Permanent field pond	SK46312532	A neglected field pond that lies at the edge of a hedge to the north-west of P1. This is a moderate sized pond, steep edged for the most part with a slightly shallower margin to the east. The pond is almost entirely shaded by bramble, willow and ash. It is filled with leaf litter and appears muddy and eutrophic.	No photo
P3	Seasonal field pond	SK46072499	A shallow depression that was wet in autumn situated immediately north of the track and hedge, around half-way along its length. It is almost entirely shaded by willow and bramble with a deep litter layer but the water was clear. The margins were flooded grass.	No photo
S1	Stream along NW margin	SK45552508	A sizeable shallow stream running along the western margin north of Hyam's Lane. It is heavily shaded by mature ash and willows. The stream is shallow, mostly 10-20cm, but around 2m wide with a bed of stones and cobbles. Deeper pools with silty bottoms were present in places. The margins are steep with bare mud, Ivy *Hedera helix* and bramble *Rubus* spp. are dominant on the banks.	No photo

S2	Flowing ditch	SK46442471	A shallow flowing ditch runs from the dump area southwards to the margin of the site. The ditch is shallow, <5cm, but had water in it throughout the year and was approximately 2-3 ft wide at water level. In places it is open and bordered by Great Willowherb *Epilobium hirsutum*, *Solanum nigrum* and dense bramble *Rubus* spp.. In the middle of its course the ditch is deeply channelised and entirely shaded by Hawthorn.	No photo

Appendix 2 – Highway Works area compartment details

Comp.	Location	Centroid grid reference	Description	Photos
H1	Southern roundabout and A453 western branch	SK46782545	An area of road margin with well-structured short-sward grassland, moderately species-rich with abundant Black Medick *Medicago lupulina*, Self-heal *Prunella vulgaris*, Clovers *Trifolium* spp. and patches of bare ground as well as fairly floriferous taller grassland along the A453 and around the southern roundabout. The centre of the roundabout is dense Field Maple with a band of flower rich “highways” seed-mix grassland dominated by Ox-eye Daisy around the margins.	

H2	Southern roundabout plantation woodlands	SK46902547	Young plantation woodland dominated by Oak and Blackthorn with Apple *Malus* sp. and Dogwood *Cornus sanguineus* present at margin. No understory vegetation but a fair amount of small-diameter deadwood due to shading out of lower branches and some trees. Young Oak and Ash plantation woodland. Very densely planted with some small-diameter dead wood.	
H3	A453 margins between southern and central roundabout	SK47182623	The margins of the A453 north of the southern roundabout and around the central roundabout. The largest area is a large bank to the west of the A453 with floriferous “highways” seed-mix grassland on an east-facing slope with Ox-eye Daisy, Black Medick, Common Knapweed, Perforate St-Hohn’s-wort *Hypericum perforatum*, Bird’s-foot Trefoil and Common Ragwort *Jacobaeae senecionis*. The vegetation is fairly open-structured with patches of bare ground. There is a stretch of old road running north south on the southern portion with a band of scrub to the east, with Ash, Field Maple, Hawthorn etc.. The edges of the hard standing supported bands of short-ruderal vegetation.	

H4	Margins of paths and cycleway east of northern roundabout and south of A453	SK47762770	The surroundings of the roads, cycleway and footpath east of the northern roundabout and south of the A453 (Remembrance Way). Dominated by dry “motorway grassland” that is moderately species rich, floriferous and fairly open-structured. Ox-eye Daisy is abundant with frequent Red Campion *Silene dioica*, Great Willowherb Hogweed, tare *Vicia* spp., Common Knapweed, forget-me-nots *Myostis* spp., Yarrow *Achillea milleifolium*, Bristly Ox-tongue *Picris echinioides*, Fleabanes *Conyza* spp., Creeping Cinquefoil *Potentilla reptans* and other yellow Asteraceae. Bramble is abundant in dense patches and bordering the cycleway and footpath, invading open grassland. Bee Orchids *Ophrys apifera* are frequent. To the north-west of the cycle track woody vegetation has been planted to screen the road, this included Hawthorn, Guelder-rose *Viburnum lantanum*, Dogwood *Cornus sanguineus*, Alder *Alnus glutinosa,* Hazel *Corylus avellana* and oak. A small dry ditch runs along the eastern edge with Grey Willow *Salix cinerea* and an adjacent band of damper vegetation with more *Great Willowherb* and patches of Common Fleabane *Pulicaria dysenterica*.	

H5	Margins paths and cycleway E of northern roundabout and north of A435	SK47592783	As H4, with bramble abundant with a small belt of Silver Birch *Betula pendula,* Hazel, and willows Salix spp. to the north of the cycleway. There are areas of short-ward and open structured grassland with Yarrow, Bird's-foot Trefoil, and Melilots *Melilotus* spp. abundant.	
H6	Margins W and N of northern roundabout	SK47362774	A complex network of small areas of road margin and short grassland or ruderal habitat to the west of the roundabout. This area includes some bands of mature motorway screening scrub and trees. These areas were largely inaccessible due to the heavy traffic and physical barriers.	No photo
H7	Far margins of west branch A453	SK44492527	A section of road margin along the western spur of the A453, running south of EMA, is included in the Highway Works area. This area had heavily managed hazel hedges and species poor eutrophic roadside grassland.	No photo
H8	Remembrance way – far north-east	SK48422832	A small area of road margin to the north-west, along Remembrance way was the final section included in the Highways Area. This section included "motorway grassland" and some scrub.	No photo
H9	EMG1 works	SK46992745	EMG1 works: added after survey completion. Not surveyed.	No photo

Appendix 3 – National Status definitions

Statuses from old IUCN and national criteria

Red Data Book category 1 - Endangered (RDB1)
Taxa in danger of extinction in Great Britain and whose survival is unlikely if causal factors continue operating. Included are those taxa whose numbers have been reduced to a critical level or whose habitats have been so dramatically reduced that they are deemed to be in immediate danger of extinction. Also included are some taxa that are possibly extinct. Criteria for inclusion are: species which are known or believed to occur as only a single population within one hectad of the National Grid; species which only occur in habitats known to be especially vulnerable; species which have shown a rapid or continuous decline over the last twenty years and are now estimated to exist in five or fewer hectads; species which are possibly extinct but have been recorded within the last century and if rediscovered would need protection.

Red Data Book category 2 – Vulnerable (RDB2)
Taxa believed likely to move into the Endangered category in the near future if the causal factors continue operating. Included are taxa of which most or all of the populations are decreasing because of over-exploitation, extensive destruction of habitat or other environmental disturbance; taxa with populations that have been seriously depleted and whose ultimate security is not yet assured; and taxa with populations that are still abundant but are under threat from serious adverse factors throughout their range. Criteria for inclusion are: species declining throughout their range; species in vulnerable habitats.

Red Data Book category 3 – Rare (RDB3)
Taxa with small populations in Great Britain that are not at present Endangered or Vulnerable but are at risk. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. Included are species which are estimated to exist in only fifteen or fewer hectads. This criterion may be relaxed where populations are likely to exist in over fifteen hectads but occupy small areas of especially vulnerable habitat.

Red Data Book category K - Insufficiently Known (RDBK)
Taxa that are suspected, but not definitely known, because of lack of information, to belong to Red Data Book category 1, 2 or 3. Included are species recently discovered or recognised in Great Britain, which may prove to be more widespread in the future; species 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; and 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.

Red Data Book category I - Indeterminate
Taxa considered to be Endangered, Vulnerable or Rare in Great Britain, but where there is not enough information to say which of the three categories (RDB 1 to 3) is appropriate.

Nationally Scarce category A (Na)
Taxa which do not fall within RDB categories but which are nonetheless uncommon in Great Britain and are thought to occur in 30 or fewer hectads of the National Grid or, for less well-recorded groups, within seven or fewer vice-counties.

Nationally Scarce category B (Nb)
Taxa which do not fall within RDB categories but which are nonetheless uncommon in Great Britain and are thought to occur in between 31 and 100 hectads of the National Grid or, for less-well recorded groups, between eight and twenty vice-counties.

Nationally Scarce (N)
For some less well-recorded groups and species, it has not been possible to determine which of the Nationally Scarce categories (A or B) is most appropriate for scarce species. These species have been assigned to an undivided Nationally Scarce category.

Statuses from current IUCN and national criteria

Endangered (EN)
A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future, as defined by any of the following criteria (C and D omitted).

A. Population reduction in the form of either of the following:
1. An observed, estimated, inferred or suspected reduction of at least 50% over the last 10 years or three generations, whichever is the longer, based on (and specifying) any of the following:
a. direct observation
b. an index of abundance appropriate for the taxon
c. a decline in area of occupancy, extent of occurrence and/or quality of habitat
d. actual or potential levels of exploitation
e. the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.
2. A reduction of at least 50%, projected or suspected to be met within the next ten years or three generations, whichever id the longer, based on (and specifying) any of b,c,d,or e above.

B. Extent of occurrence estimated to be less than 5000 km² or area of occupancy estimated to be less than 500 km², and estimates indicating any two of the following:
1. Severely fragmented or known to exist at no more than five locations.
2. Continuing decline, observed, inferred or projected, in any of the following:
a. extent of occurrence
b. area of occupancy
c. area, extent and/or quality of habitat
d. number of locations or subpopulations
e. number of mature individuals.
3. Extreme fluctuations in any of the following
a. extent of occurrence
b area of occupancy
c. number of locations or subpopulations
d. number of mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild is at least 20% within 20 years or five generations, whichever is the longer.

Vulnerable (VU)
A taxon is considered Vulnerable if it fulfils any of the following criteria.

A. Reduction in population size based on any of the following:
1. An observed, estimated, inferred or suspected population size reduction of 70% or more over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible and understood and ceased.
2. An observed, estimated, inferred or suspected population size reduction of 50% or more over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased or may not be understood or may not be reversible.
3. A population size reduction of 50% or more, projected or suspected to be met within the next ten years or three generations, whichever is the longer.
4. An observed, estimated, inferred or suspected population size reduction of 50% or more over any ten year or three generation period, whichever is the longer, where the time period must include both the past and the future, and where the reduction or its causes may not have ceased or may not be understood or may not be reversible.

B. Geographic range in the form of either B1 (extent of occurrence) or B2 (area of occupancy) or both:

1. Extent of occurrence estimated to be less than 500 km^2, and estimates including at least two of a-c:
    a. Severely fragmented or known to exist at no more than five locations
    b. Continuing decline, observed, inferred or projected, in extent of occurrence, area of occupancy, area, extent or quality of habitat, number of locations or subpopulations, or number of mature individuals
    c. Extreme fluctuation in extent of occurrence, area of occupancy, number of locations or subpopulations, or number of mature individuals.
2. Area of occupancy estimated to be less that 500 km^2, and estimates including at least two of a-c:
    a. Severely fragmented or known to exist at no m more than five locations
    b. Continuing decline, observed, inferred or projected, in extent of occurrence, area of occupancy, area, extent or quality of habitat, number of locations or subpopulations, or number of mature individuals
    c. Extreme fluctuations in area of occupancy, extent of occurrence, number of locations of subpopulations, or number of mature individuals.

C. Population size estimated to be fewer than 2500 mature individuals and either:
1. An estimated continuing decline of at least 20% within five years or two generations, whichever is the longer, or
2. A continuing decline, observed, projected or inferred, in numbers of mature individuals and at least one of the following:
    a. Population structure either with no subpopulation estimated to contain more than 250 mature individuals or at least 95% of mature individuals in one subpopulation
    b. Extreme fluctuations in the number of mature individuals.

D. Population size estimated to number fewer than 350 mature individuals.
E. Quantitative analysis showing the probability of extinction in the wild is at least 20% within 20 years or five generations, whichever is the longer.

Lower Risk (LR)
A taxon is Lower Risk where it has been evaluated, does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable. Taxa included in the LR category can be separated into the following subcategories.

1. **Conservation Dependent (CD).** Taxa, which are the focus of a continuing taxon-specific or habitat-specific conservation programme targeted towards the taxon in question, the cessation of which would result in the taxon qualifying for one of the threatened categories above within a period of five years.
2. **Near Threatened (NT).** Taxa which do not qualify for Conservation Dependent, but which are close to qualifying for Vulnerable - in Britain, defined as occurring in 15 or fewer hectads but not CR, EN or VU. The absolute count of hectads is, in this review, considered subordinate to evidence of decline on an extent not qualifying the species for CR, EN or VU.
4. **Least Concern (LC).** Taxa, which do not qualify for Conservation Dependent, Near Threatened or National Scarce subcategories - in Britain, this covers all species found on evaluation not to fit into any of the other categories.

Nationally Rare (NR)
Species recently recorded from 15 or fewer hectads of the Ordnance Survey national grid in Great Britain.

Nationally Scarce (NS)
Species recently recorded from between 16 and 100 hectads of the Ordnance Survey national grid in Great Britain.

Appendix 4 – full list of recorded species: EMG2 Works

Group	Family	Species	Status
Araneae	Agelenidae	*Agelena labyrinthica*	common
Araneae	Agelenidae	*Tegenaria agrestis*	common
Araneae	Agelenidae	*Tegenaria silvestris*	common
Araneae	Agelenidae	*Textrix denticulata*	common
Araneae	Amaurobiidae	*Amaurobius fenestralis*	common
Araneae	Araneidae	*Araneus diadematus*	common
Araneae	Araneidae	*Araniella cucurbitina*	common
Araneae	Araneidae	*Araniella opisthographa*	common
Araneae	Araneidae	*Larinioides cornutus*	common
Araneae	Araneidae	*Mangora acalypha*	common
Araneae	Araneidae	*Nuctenea umbratica*	common
Araneae	Araneidae	*Zygiella x-notata*	common
Araneae	Araneidae	*Agalenatea redii*	local
Araneae	Araneidae	*Gibbaranea gibbosa*	local
Araneae	Clubionidae	*Clubiona brevipes*	common
Araneae	Clubionidae	*Clubiona comta*	common
Araneae	Dictynidae	*Dictyna arundinacea*	common
Araneae	Dictynidae	*Dictyna uncinata*	common
Araneae	Dictynidae	*Nigma walckenaeri*	common
Araneae	Gnaphosidae	*Drassyllus pusillus*	common
Araneae	Gnaphosidae	*Haplodrassus signifer*	common
Araneae	Gnaphosidae	*Micaria micans*	common
Araneae	Gnaphosidae	*Micaria pulicaria*	common
Araneae	Linyphiidae	*Erigone atra*	common
Araneae	Linyphiidae	*Erigone dentipalpis*	common
Araneae	Linyphiidae	*Linyphia triangularis*	common
Araneae	Linyphiidae	*Savignia frontata*	common
Araneae	Linyphiidae	*Tenuiphantes flavipes*	common
Araneae	Linyphiidae	*Tenuiphantes mengei*	common
Araneae	Linyphiidae	*Tenuiphantes tenuis*	common
Araneae	Linyphiidae	*Ostearius melanopygius*	local
Araneae	Lycosidae	*Pardosa amentata*	common
Araneae	Lycosidae	*Pardosa prativaga*	common
Araneae	Lycosidae	*Pardosa pullata*	common
Araneae	Lycosidae	*Trochosa ruricola*	common
Araneae	Philodromidae	*Philodromus albidus*	common
Araneae	Philodromidae	*Philodromus aureolus*	common
Araneae	Philodromidae	*Philodromus cespitum*	common
Araneae	Philodromidae	*Philodromus dispar*	common
Araneae	Philodromidae	*Tibellus oblongus*	common
Araneae	Philodromidae	*Philodromus praedatus*	local
Araneae	Pisauridae	*Pisaura mirabilis*	common
Araneae	Salticidae	*Euophrys frontalis*	common

Araneae	Salticidae	*Heliophanus flavipes*	common
Araneae	Salticidae	*Salticus cingulatus*	common
Araneae	Segestriidae	*Segestria senoculata*	common
Araneae	Tetragnathidae	*Metellina mengei*	common
Araneae	Tetragnathidae	*Pachygnatha clercki*	common
Araneae	Tetragnathidae	*Pachygnatha degeeri*	common
Araneae	Tetragnathidae	*Tetragnatha extensa*	common
Araneae	Tetragnathidae	*Tetragnatha montana*	common
Araneae	Theridiidae	*Anelosimus vittatus*	common
Araneae	Theridiidae	*Enoplognatha ovata*	common
Araneae	Theridiidae	*Neottiura bimaculata*	common
Araneae	Theridiidae	*Phylloneta impressa*	common
Araneae	Theridiidae	*Steatoda bipunctata*	common
Araneae	Thomisidae	*Ozyptila simplex*	common
Araneae	Thomisidae	*Xysticus cristatus*	common
Araneae	Thomisidae	*Xysticus kochi*	local
Chilopoda	Lithobiidae	*Lithobius forficatus*	common
Coleoptera	Aderidae	*Aderus populneus*	NS
Coleoptera	Anthribidae	*Platyrhinus resinosus*	Nb
Coleoptera	Apionidae	*Ceratapion gibbirostre*	common
Coleoptera	Apionidae	*Ceratapion onopordi*	common
Coleoptera	Apionidae	*Ischnopterapion loti*	common
Coleoptera	Apionidae	*Ischnopterapion virens*	common
Coleoptera	Apionidae	*Omphalapion hookerorum*	common
Coleoptera	Apionidae	*Perapion violaceum*	common
Coleoptera	Apionidae	*Protapion apricans*	common
Coleoptera	Apionidae	*Protapion assimile*	common
Coleoptera	Apionidae	*Protapion fulvipes*	common
Coleoptera	Apionidae	*Protapion trifolii*	common
Coleoptera	Apionidae	*Oxystoma craccae*	local
Coleoptera	Apionidae	*Protapion difforme*	Nb
Coleoptera	Biphyllidae	*Biphyllus lunatus*	local
Coleoptera	Buprestidae	*Agrilus laticornis*	local
Coleoptera	Cantharidae	*Cantharis figurata*	common
Coleoptera	Cantharidae	*Cantharis flavilabris*	common
Coleoptera	Cantharidae	*Cantharis lateralis*	common
Coleoptera	Cantharidae	*Cantharis livida*	common
Coleoptera	Cantharidae	*Rhagonycha fulva*	common
Coleoptera	Cantharidae	*Rhagonycha nigriventris*	common
Coleoptera	Carabidae	*Agonum emarginatum*	common
Coleoptera	Carabidae	*Agonum fuliginosum*	common
Coleoptera	Carabidae	*Amara aenea*	common
Coleoptera	Carabidae	*Amara plebeja*	common
Coleoptera	Carabidae	*Amara similata*	common
Coleoptera	Carabidae	*Badister bullatus*	common
Coleoptera	Carabidae	*Bembidion biguttatum*	common
Coleoptera	Carabidae	*Bembidion guttula*	common

Coleoptera	Carabidae	*Bembidion genei*	common
Coleoptera	Carabidae	*Bembidion lampros*	common
Coleoptera	Carabidae	*Bembidion lunulatum*	common
Coleoptera	Carabidae	*Bembidion mannerheimii*	common
Coleoptera	Carabidae	*Bembidion obtusum*	common
Coleoptera	Carabidae	*Bembidion properans*	common
Coleoptera	Carabidae	*Bembidion quadrimaculatum*	common
Coleoptera	Carabidae	*Calodromius spilotus*	common
Coleoptera	Carabidae	*Demetrias atricapillus*	common
Coleoptera	Carabidae	*Harpalus affinis*	common
Coleoptera	Carabidae	*Harpalus rufipes*	common
Coleoptera	Carabidae	*Loricera pilicornis*	common
Coleoptera	Carabidae	*Microlestes minutulus*	common
Coleoptera	Carabidae	*Notiophilus biguttatus*	common
Coleoptera	Carabidae	*Notiophilus substriatus*	common
Coleoptera	Carabidae	*Ophonus rufibarbis*	common
Coleoptera	Carabidae	*Oxypselaphus obscurus*	common
Coleoptera	Carabidae	*Paranchus albipes*	common
Coleoptera	Carabidae	*Poecilus cupreus*	common
Coleoptera	Carabidae	*Pterostichus melanarius*	common
Coleoptera	Carabidae	*Pterostichus niger*	common
Coleoptera	Carabidae	*Pterostichus strenuus*	common
Coleoptera	Carabidae	*Trechus obtusus*	common
Coleoptera	Carabidae	*Acupalpus meridianus*	local
Coleoptera	Cerambycidae	*Grammoptera ruficornis*	common
Coleoptera	Cerambycidae	*Grammoptera ruficornis var. holomelina*	local
Coleoptera	Cerambycidae	*Leiopus nebulosus*	local
Coleoptera	Cerambycidae	*Pogonocherus hispidulus*	local
Coleoptera	Cerambycidae	*Rutpela maculata*	local
Coleoptera	Chrysomelidae	*Altica lythri*	common
Coleoptera	Chrysomelidae	*Altica oleracea*	common
Coleoptera	Chrysomelidae	*Altica palustris*	common
Coleoptera	Chrysomelidae	*Aphthona euphorbiae*	common
Coleoptera	Chrysomelidae	*Bruchidius varius*	common
Coleoptera	Chrysomelidae	*Bruchus loti*	common
Coleoptera	Chrysomelidae	*Bruchus rufimanus*	common
Coleoptera	Chrysomelidae	*Bruchus rufipes*	common
Coleoptera	Chrysomelidae	*Cassida rubiginosa*	common
Coleoptera	Chrysomelidae	*Cassida vibex*	common
Coleoptera	Chrysomelidae	*Chaetocnema concinna*	common
Coleoptera	Chrysomelidae	*Chaetocnema hortensis*	common
Coleoptera	Chrysomelidae	*Crepidodera aurata*	common
Coleoptera	Chrysomelidae	*Crepidodera aurea*	common
Coleoptera	Chrysomelidae	*Crepidodera fulvicornis*	common
Coleoptera	Chrysomelidae	*Crepidodera plutus*	common
Coleoptera	Chrysomelidae	*Cryptocephalus pusillus*	common

Coleoptera	Chrysomelidae	*Gastrophysa polygoni*	common
Coleoptera	Chrysomelidae	*Lochmaea crataegi*	common
Coleoptera	Chrysomelidae	*Longitarsus luridus*	common
Coleoptera	Chrysomelidae	*Longitarsus melanocephalus*	common
Coleoptera	Chrysomelidae	*Longitarsus pratensis*	common
Coleoptera	Chrysomelidae	*Oulema obscura*	common
Coleoptera	Chrysomelidae	*Oulema rufocyanea*	common
Coleoptera	Chrysomelidae	*Phaedon armoraciae*	common
Coleoptera	Chrysomelidae	*Phaedon tumidulus*	common
Coleoptera	Chrysomelidae	*Phratora laticollis*	common
Coleoptera	Chrysomelidae	*Phyllotreta nemorum*	common
Coleoptera	Chrysomelidae	*Phyllotreta undulata*	common
Coleoptera	Chrysomelidae	*Phyllotreta vittula*	common
Coleoptera	Chrysomelidae	*Plagiodera versicolora*	common
Coleoptera	Chrysomelidae	*Psylliodes affinis*	common
Coleoptera	Chrysomelidae	*Psylliodes dulcamarae*	common
Coleoptera	Chrysomelidae	*Chaetocnema picipes*	local
Coleoptera	Chrysomelidae	*Phyllotreta ochripes*	local
Coleoptera	Chrysomelidae	*Agelastica alni*	NR
Coleoptera	Chrysomelidae	*Longitarsus ochroleucus*	NS
Coleoptera	Ciidae	*Cis bidentatus*	local
Coleoptera	Ciidae	*Cis bilamellatus*	local
Coleoptera	Ciidae	*Cis castaneus*	local
Coleoptera	Ciidae	*Cis pygmaeus*	local
Coleoptera	Cleridae	*Thanasimus formicarius*	local
Coleoptera	Cleridae	*Tillus elongatus*	NS
Coleoptera	Coccinellidae	*Adalia bipunctata*	common
Coleoptera	Coccinellidae	*Adalia decempunctata*	common
Coleoptera	Coccinellidae	*Coccidula rufa*	common
Coleoptera	Coccinellidae	*Coccinella septempunctata*	common
Coleoptera	Coccinellidae	*Exochomus quadripustulatus*	common
Coleoptera	Coccinellidae	*Harmonia axyridis*	common
Coleoptera	Coccinellidae	*Propylea quatuordecimpunctata*	common
Coleoptera	Coccinellidae	*Psyllobora viginti duopunctata*	common
Coleoptera	Coccinellidae	*Rhyzobius litura*	common
Coleoptera	Coccinellidae	*Tytthaspis sedecimpunctata*	common
Coleoptera	Coccinellidae	*Scymnus frontalis*	local
Coleoptera	Coccinellidae	*Stethorus punctillum*	local
Coleoptera	Corylophidae	*Corylophus cassidoides*	local
Coleoptera	Corylophidae	*Sericoderus lateralis*	local
Coleoptera	Cryptophagidae	*Cryptophagus distinguendus*	common
Coleoptera	Cryptophagidae	*Cryptophagus punctipennis*	common
Coleoptera	Cryptophagidae	*Cryptophagus scanicus*	common
Coleoptera	Cryptophagidae	*Cryptophagus ruficornis*	N
Coleoptera	Curculionidae	*Amalus scortillum*	common
Coleoptera	Curculionidae	*Anthonomus rubi*	common
Coleoptera	Curculionidae	*Archarius salicivorus*	common

Coleoptera	Curculionidae	*Ceutorhynchus typhae*	common
Coleoptera	Curculionidae	*Dorytomus tortrix*	common
Coleoptera	Curculionidae	*Euophryum confine*	common
Coleoptera	Curculionidae	*Hylesinus crenatus*	common
Coleoptera	Curculionidae	*Hylesinus varius*	common
Coleoptera	Curculionidae	*Hypera nigrirostris*	common
Coleoptera	Curculionidae	*Hypera postica*	common
Coleoptera	Curculionidae	*Nedyus quadrimaculatus*	common
Coleoptera	Curculionidae	*Orchestes quercus*	common
Coleoptera	Curculionidae	*Orchestes hortorum*	common
Coleoptera	Curculionidae	*Parethelcus pollinarius*	common
Coleoptera	Curculionidae	*Phyllobius roboretanus*	common
Coleoptera	Curculionidae	*Rhamphus oxyacanthae*	common
Coleoptera	Curculionidae	*Rhamphus pulicarius*	common
Coleoptera	Curculionidae	*Rhinoncus pericarpius*	common
Coleoptera	Curculionidae	*Scolytus scolytus*	common
Coleoptera	Curculionidae	*Sitona hispidulus*	common
Coleoptera	Curculionidae	*Sitona lineatus*	common
Coleoptera	Curculionidae	*Sitona obsoletus*	common
Coleoptera	Curculionidae	*Sitona sulcifrons*	common
Coleoptera	Curculionidae	*Tychius junceus*	common
Coleoptera	Curculionidae	*Tychius picirostris*	common
Coleoptera	Curculionidae	*Glocianus distinctus*	local
Coleoptera	Curculionidae	*Hylesinus taranio*	local
Coleoptera	Curculionidae	*Magdalis armigera*	local
Coleoptera	Curculionidae	*Orchestes pilosus*	local
Coleoptera	Curculionidae	*Rhinocyllus conicus*	Na
Coleoptera	Dermestidae	*Anthrenus verbasci*	common
Coleoptera	Dermestidae	*Ctesias serra*	local
Coleoptera	Dytiscidae	*Agabus bipustulatus*	common
Coleoptera	Dytiscidae	*Agabus didymus*	common
Coleoptera	Dytiscidae	*Agabus nebulosus*	common
Coleoptera	Dytiscidae	*Hydroglyphus geminus*	common
Coleoptera	Dytiscidae	*Hydroporus melanarius*	common
Coleoptera	Dytiscidae	*Hydroporus memnonius*	common
Coleoptera	Dytiscidae	*Hydroporus nigrita*	common
Coleoptera	Dytiscidae	*Hydroporus palustris*	common
Coleoptera	Dytiscidae	*Hydroporus planus*	common
Coleoptera	Dytiscidae	*Hydroporus tessellatus*	common
Coleoptera	Dytiscidae	*Hygrotus confluens*	common
Coleoptera	Dytiscidae	*Hygrotus inaequalis*	common
Coleoptera	Elateridae	*Agriotes lineatus*	common
Coleoptera	Elateridae	*Athous bicolor*	common
Coleoptera	Elateridae	*Athous haemorrhoidalis*	common
Coleoptera	Erotylidae	*Triplax russica*	local
Coleoptera	Haliplidae	*Haliplus lineatocollis*	common
Coleoptera	Helophoridae	*Helophorus aequalis*	common

Coleoptera	Helophoridae	*Helophorus brevipalpis*	common
Coleoptera	Helophoridae	*Helophorus grandis*	common
Coleoptera	Helophoridae	*Helophorus minutus*	common
Coleoptera	Helophoridae	*Helophorus obscurus*	common
Coleoptera	Helophoridae	*Helophorus dorsalis*	NS
Coleoptera	Histeridae	*Abraeus perpusillus*	local
Coleoptera	Hydraenidae	*Ochthebius minimus*	common
Coleoptera	Hydrophilidae	*Anacaena limbata*	common
Coleoptera	Hydrophilidae	*Cercyon ustulatus*	common
Coleoptera	Hydrophilidae	*Cryptopleurum minutum*	common
Coleoptera	Hydrophilidae	*Hydrobius fuscipes*	common
Coleoptera	Hydrophilidae	*Megasternum concinnum agg.*	common
Coleoptera	Kateretidae	*Brachypterus glaber*	common
Coleoptera	Kateretidae	*Brachypterus urticae*	common
Coleoptera	Laemophloeidae	*Cryptolestes ferrugineus*	local
Coleoptera	Latridiidae	*Cartodere bifasciata*	common
Coleoptera	Latridiidae	*Corticaria impressa*	common
Coleoptera	Latridiidae	*Corticarina minuta*	common
Coleoptera	Latridiidae	*Cortinicara gibbosa*	common
Coleoptera	Latridiidae	*Enicmus testaceus*	common
Coleoptera	Latridiidae	*Enicmus transversus*	common
Coleoptera	Latridiidae	*Latridius minutus*	common
Coleoptera	Latridiidae	*Enicmus histrio*	local
Coleoptera	Latridiidae	*Enicmus rugosus*	N
Coleoptera	Lucanidae	*Dorcus parallelipipedus*	local
Coleoptera	Melandryidae	*Abdera biflexuosa*	NS
Coleoptera	Melyridae	*Cordylepherus viridis*	common
Coleoptera	Melyridae	*Malachius bipustulatus*	common
Coleoptera	Melyridae	*Anthocomus fasciatus*	NS
Coleoptera	Melyridae	*Dasytes plumbeus*	NS
Coleoptera	Mordellidae	*Mordellistena neuwaldeggiana*	NS
Coleoptera	Mycetophagidae	*Mycetophagus quadripustulatus*	common
Coleoptera	Mycetophagidae	*Pseudotriphyllus suturalis*	NS
Coleoptera	Nitidulidae	*Meligethes aeneus*	common
Coleoptera	Nitidulidae	*Soronia grisea*	local
Coleoptera	Noteridae	*Noterus clavicornis*	common
Coleoptera	Oedemeridae	*Oedemera lurida*	common
Coleoptera	Oedemeridae	*Oedemera nobilis*	common
Coleoptera	Phalacridae	*Olibrus aeneus*	common
Coleoptera	Phalacridae	*Olibrus corticalis*	common
Coleoptera	Phalacridae	*Phalacrus fimetarius*	common
Coleoptera	Phalacridae	*Stilbus testaceus*	common
Coleoptera	Ptinidae	*Anobium punctatum*	common
Coleoptera	Ptinidae	*Hemicoelus fulvicornis*	common
Coleoptera	Ptinidae	*Ochina ptinoides*	common
Coleoptera	Ptinidae	*Ptilinus pectinicornis*	common
Coleoptera	Ptinidae	*Anobium inexspectatum*	local

Coleoptera	Ptinidae	*Ernobius pini*	local
Coleoptera	Ptinidae	*Stegobium paniceum*	local
Coleoptera	Rhynchitidae	*Tatianaerhynchites aequatus*	common
Coleoptera	Salpingidae	*Salpingus planirostris*	common
Coleoptera	Salpingidae	*Lissodema denticolle*	NS
Coleoptera	Scirtidae	*Contacyphon coarctatus*	common
Coleoptera	Scirtidae	*Contacyphon ochraceus*	common
Coleoptera	Scraptiidae	*Anaspis frontalis*	common
Coleoptera	Scraptiidae	*Anaspis garneysi*	common
Coleoptera	Scraptiidae	*Anaspis maculata*	common
Coleoptera	Scraptiidae	*Anaspis regimbarti*	common
Coleoptera	Staphylinidae	*Anotylus inustus*	common
Coleoptera	Staphylinidae	*Anotylus rugosus*	common
Coleoptera	Staphylinidae	*Anotylus tetracarinatus*	common
Coleoptera	Staphylinidae	*Astenus lyonessius*	common
Coleoptera	Staphylinidae	*Cypha longicornis*	common
Coleoptera	Staphylinidae	*Drusilla canaliculata*	common
Coleoptera	Staphylinidae	*Metopsia clypeata*	common
Coleoptera	Staphylinidae	*Ocypus brunnipes*	common
Coleoptera	Staphylinidae	*Oxytelus laqueatus*	common
Coleoptera	Staphylinidae	*Philonthus cognatus*	common
Coleoptera	Staphylinidae	*Philonthus tenuicornis*	common
Coleoptera	Staphylinidae	*Platystethus cornutus*	common
Coleoptera	Staphylinidae	*Quedius semiobscurus*	common
Coleoptera	Staphylinidae	*Sepedophilus marshami*	common
Coleoptera	Staphylinidae	*Sepedophilus nigripennis*	common
Coleoptera	Staphylinidae	*Stenus bimaculatus*	common
Coleoptera	Staphylinidae	*Stenus brunnipes*	common
Coleoptera	Staphylinidae	*Stenus comma*	common
Coleoptera	Staphylinidae	*Stenus crassus*	common
Coleoptera	Staphylinidae	*Stenus fulvicornis*	common
Coleoptera	Staphylinidae	*Stenus nitidiusculus*	common
Coleoptera	Staphylinidae	*Stenus ossium*	common
Coleoptera	Staphylinidae	*Stenus similis*	common
Coleoptera	Staphylinidae	*Sunius propinquus*	common
Coleoptera	Staphylinidae	*Tachyporus chrysomelinus*	common
Coleoptera	Staphylinidae	*Tachyporus hypnorum*	common
Coleoptera	Staphylinidae	*Tachyporus nitidulus*	common
Coleoptera	Staphylinidae	*Tachyporus obtusus*	common
Coleoptera	Staphylinidae	*Tasgius ater*	common
Coleoptera	Staphylinidae	*Tasgius globulifer*	common
Coleoptera	Staphylinidae	*Tasgius morsitans*	common
Coleoptera	Staphylinidae	*Lithocharis ochracea*	local
Coleoptera	Tenebrionidae	*Lagria hirta*	common
Coleoptera	Tenebrionidae	*Nalassus laevioctostriatus*	local
Coleoptera	Throscidae	*Trixagus obtusus*	local
Crustacea	Armadillidiidae	*Armadillidium vulgare*	common

Crustacea	Asellidae	*Asellus aquaticus*	common
Crustacea	Asellidae	*Asellus meridianus*	common
Crustacea	Gammaridae	*Gammarus pulex*	common
Crustacea	Philosciidae	*Philoscia muscorum*	common
Crustacea	Porcellionidae	*Porcellio scaber*	common
Dermaptera	Forficulidae	*Forficula auricularia*	common
Diptera	Anisopodidae	*Sylvicola cinctus*	common
Diptera	Anisopodidae	*Sylvicola punctatus*	common
Diptera	Anthomyiidae	*Anthomyia pluvialis*	common
Diptera	Anthomyiidae	*Anthomyia procellaris*	common
Diptera	Asilidae	*Dioctria baumhaueri*	common
Diptera	Asilidae	*Leptogaster cylindrica*	common
Diptera	Bibionidae	*Dilophus febrilis*	common
Diptera	Calliphoridae	*Calliphora vicina*	common
Diptera	Calliphoridae	*Lucilia caesar*	common
Diptera	Calliphoridae	*Lucilia illustris*	common
Diptera	Calliphoridae	*Lucilia richardsi*	common
Diptera	Calliphoridae	*Lucilia silvarum*	common
Diptera	Chamaemyiidae	*Chamaemyia polystigma*	common
Diptera	Dolichopodidae	*Argyra leucocephala*	common
Diptera	Dolichopodidae	*Campsicnemus curvipes*	common
Diptera	Dolichopodidae	*Chrysotus blepharosceles*	common
Diptera	Dolichopodidae	*Chrysotus gramineus*	common
Diptera	Dolichopodidae	*Dolichopus festivus*	common
Diptera	Dolichopodidae	*Dolichopus griseipennis*	common
Diptera	Dolichopodidae	*Dolichopus plumipes*	common
Diptera	Dolichopodidae	*Dolichopus trivialis*	common
Diptera	Dolichopodidae	*Dolichopus ungulatus*	common
Diptera	Dolichopodidae	*Medetera truncorum*	common
Diptera	Dolichopodidae	*Poecilobothrus nobilitatus*	common
Diptera	Dolichopodidae	*Rhaphium appendiculatum*	common
Diptera	Dolichopodidae	*Rhaphium caliginosum*	common
Diptera	Dolichopodidae	*Sciapus longulus*	common
Diptera	Dolichopodidae	*Sympycnus pulicarius*	common
Diptera	Dolichopodidae	*Syntormon pallipes*	common
Diptera	Dolichopodidae	*Xanthochlorus ornatus*	local
Diptera	Dolichopodidae	*Micromorphus sp. female*	n/a
Diptera	Drosophilidae	*Drosophila suzukii*	common
Diptera	Empididae	*Empis aestiva*	common
Diptera	Empididae	*Empis albinervis*	common
Diptera	Empididae	*Empis livida*	common
Diptera	Ephydridae	*Hydrellia griseola*	common
Diptera	Ephydridae	*Hydrellia maura*	common
Diptera	Ephydridae	*Ilythea spilota*	common
Diptera	Ephydridae	*Parydra coarctata*	common
Diptera	Ephydridae	*Parydra fossarum*	common
Diptera	Ephydridae	*Parydra quadripunctata*	common

Diptera	Ephydridae	*Scatella paludum*	common
Diptera	Ephydridae	*Scatella stagnalis*	common
Diptera	Ephydridae	*Scatella tenuicosta*	common
Diptera	Ephydridae	*Scatella silacea*	local
Diptera	Hybotidae	*Platypalpus annulipes*	common
Diptera	Hybotidae	*Platypalpus calceatus*	common
Diptera	Hybotidae	*Platypalpus cothurnatus*	common
Diptera	Hybotidae	*Platypalpus minutus*	common
Diptera	Hybotidae	*Platypalpus pallidicornis*	common
Diptera	Hybotidae	*Tachypeza nubila*	common
Diptera	Lauxaniidae	*Calliopum aeneum*	common
Diptera	Lauxaniidae	*Sapromyza quadripunctata*	common
Diptera	Limoniidae	*Cheilotrichia cinerascens*	common
Diptera	Limoniidae	*Dicranomyia chorea*	common
Diptera	Limoniidae	*Dicranomyia modesta*	common
Diptera	Limoniidae	*Dicranomyia morio*	common
Diptera	Limoniidae	*Erioconopa trivialis*	common
Diptera	Limoniidae	*Molophilus griseus*	common
Diptera	Limoniidae	*Symplecta hybrida*	common
Diptera	Limoniidae	*Symplecta stictica*	common
Diptera	Limoniidae	*Molophilus bifidus*	local
Diptera	Lonchaeidae	*Lonchaea cf. caucasica*	?
Diptera	Lonchaeidae	*Lonchaea tarsata*	local
Diptera	Lonchopteridae	*Lonchoptera bifurcata*	common
Diptera	Lonchopteridae	*Lonchoptera lutea*	common
Diptera	Muscidae	*Graphomya maculata*	common
Diptera	Muscidae	*Graphomya minor*	common
Diptera	Muscidae	*Lispe tentaculata*	common
Diptera	Muscidae	*Mesembrina meridiana*	common
Diptera	Opomyzidae	*Geomyza tripunctata*	common
Diptera	Opomyzidae	*Opomyza florum*	common
Diptera	Opomyzidae	*Opomyza germinationis*	common
Diptera	Pallopteridae	*Palloptera ustulata agg.*	common
Diptera	Pipunculidae	*Eudorylas obscurus*	common
Diptera	Pipunculidae	*Tomosvaryella geniculata*	common
Diptera	Pipunculidae	*Cephalops varipes*	local
Diptera	Pipunculidae	*Jassidophaga fasciata*	local
Diptera	Pipunculidae	*Cephalops pannonicus*	NS
Diptera	Polleniidae	*Pollenia angustigena*	common
Diptera	Polleniidae	*Pollenia pediculata*	common
Diptera	Polleniidae	*Pollenia rudis*	common
Diptera	Psilidae	*Chamaepsila rosae*	common
Diptera	Rhagionidae	*Chrysopilus asiliformis*	common
Diptera	Rhagionidae	*Chrysopilus cristatus*	common
Diptera	Sarcophagidae	*Sarcophaga haemorrhoa*	common
Diptera	Sarcophagidae	*Sarcophaga incisilobata*	common
Diptera	Sarcophagidae	*Sarcophaga subvicina*	common

Diptera	Sarcophagidae	*Sarcophaga variegata*	common
Diptera	Scathophagidae	*Scathophaga stercoraria*	common
Diptera	Scathophagidae	*Norellisoma spinimanum*	local
Diptera	Scathophagidae	*Conisternum decipiens*	N
Diptera	Sciomyzidae	*Coremacera marginata*	common
Diptera	Sciomyzidae	*Limnia unguicornis*	common
Diptera	Sciomyzidae	*Trypetoptera punctulata*	local
Diptera	Sepsidae	*Sepsis fulgens*	common
Diptera	Sepsidae	*Sepsis neocynipsea*	common
Diptera	Sepsidae	*Sepsis punctum*	common
Diptera	Sepsidae	*Themira annulipes*	common
Diptera	Sepsidae	*Themira minor*	common
Diptera	Sepsidae	*Themira putris*	common
Diptera	Sepsidae	*Themira gracilis*	pNS
Diptera	Stratiomyidae	*Beris vallata*	common
Diptera	Stratiomyidae	*Chloromyia formosa*	common
Diptera	Stratiomyidae	*Chorisops tibialis*	common
Diptera	Stratiomyidae	*Microchrysa flavicornis*	common
Diptera	Stratiomyidae	*Microchrysa polita*	common
Diptera	Stratiomyidae	*Pachygaster atra*	common
Diptera	Stratiomyidae	*Pachygaster leachii*	common
Diptera	Syrphidae	*Cheilosia pagana*	common
Diptera	Syrphidae	*Chrysogaster solstitialis*	common
Diptera	Syrphidae	*Episyrphus balteatus*	common
Diptera	Syrphidae	*Eristalinus sepulchralis*	common
Diptera	Syrphidae	*Eristalis arbustorum*	common
Diptera	Syrphidae	*Eristalis interruptus*	common
Diptera	Syrphidae	*Eristalis pertinax*	common
Diptera	Syrphidae	*Eristalis tenax*	common
Diptera	Syrphidae	*Eupeodes corollae*	common
Diptera	Syrphidae	*Eupeodes latifasciatus*	common
Diptera	Syrphidae	*Eupeodes luniger*	common
Diptera	Syrphidae	*Helophilus pendulus*	common
Diptera	Syrphidae	*Melanostoma mellinum*	common
Diptera	Syrphidae	*Melanostoma scalare*	common
Diptera	Syrphidae	*Neoascia podagrica*	common
Diptera	Syrphidae	*Orthonevra nobilis*	common
Diptera	Syrphidae	*Pipizella viduata*	common
Diptera	Syrphidae	*Platycheirus albimanus*	common
Diptera	Syrphidae	*Platycheirus angustatus*	common
Diptera	Syrphidae	*Platycheirus clypeatus*	common
Diptera	Syrphidae	*Platycheirus peltatus*	common
Diptera	Syrphidae	*Sphaerophoria scripta*	common
Diptera	Syrphidae	*Syritta pipiens*	common
Diptera	Syrphidae	*Syrphus ribesii*	common
Diptera	Syrphidae	*Syrphus torvus*	common
Diptera	Syrphidae	*Xylota segnis*	common

Diptera	Syrphidae	*Cheilosia soror*	local
Diptera	Syrphidae	*Chrysotoxum verralli*	local
Diptera	Syrphidae	*Pipiza lugubris*	NS
Diptera	Tachinidae	*Eriothrix rufomaculata*	common
Diptera	Tachinidae	*Loewia foeda*	common
Diptera	Tachinidae	*Phasia obesa*	common
Diptera	Tachinidae	*Siphona geniculata*	common
Diptera	Tachinidae	*Tachina fera*	common
Diptera	Tachinidae	*Phasia hemiptera*	local
Diptera	Tephritidae	*Anomoia purmunda*	common
Diptera	Tephritidae	*Euleia heraclei*	common
Diptera	Tephritidae	*Sphenella marginata*	common
Diptera	Tephritidae	*Tephritis cometa*	common
Diptera	Tephritidae	*Tephritis formosa*	common
Diptera	Tephritidae	*Tephritis leontodontis*	common
Diptera	Tephritidae	*Tephritis neesii*	common
Diptera	Tephritidae	*Terellia ruficauda*	common
Diptera	Tephritidae	*Urophora stylata*	common
Diptera	Therevidae	*Thereva nobilitata*	common
Diptera	Tipulidae	*Nephrotoma appendiculata*	common
Diptera	Tipulidae	*Nephrotoma flavescens*	common
Diptera	Tipulidae	*Nephrotoma flavipalpis*	common
Diptera	Tipulidae	*Tipula lunata*	common
Diptera	Tipulidae	*Tipula oleracea*	common
Diptera	Tipulidae	*Tipula paludosa*	common
Diptera	Tipulidae	*Nephrotoma cornicina*	local
Diptera	Ulidiidae	*Herina lugubris*	common
Diptera	Ulidiidae	*Physiphora alceae*	common
Ephemeroptera	Baetidae	*Baetis rhodani*	common
Ephemeroptera	Baetidae	*Baetis scambus*	common
Hemiptera	Acanthosomatidae	*Acanthosoma haemorrhoidale*	common
Hemiptera	Anthocoridae	*Anthocoris nemoralis*	common
Hemiptera	Anthocoridae	*Anthocoris nemorum*	common
Hemiptera	Anthocoridae	*Orius laevigatus*	common
Hemiptera	Anthocoridae	*Orius majusculus*	common
Hemiptera	Anthocoridae	*Orius niger*	common
Hemiptera	Anthocoridae	*Anthocoris simulans*	local
Hemiptera	Aphrophoridae	*Aphrophora alni*	common
Hemiptera	Aphrophoridae	*Neophilaenus lineatus*	common
Hemiptera	Aphrophoridae	*Philaenus spumarius*	common
Hemiptera	Aphrophoridae	*Neophilaenus campestris*	local
Hemiptera	Berytidae	*Berytinus minor*	common
Hemiptera	Berytidae	*Berytinus signoreti*	common
Hemiptera	Cicadellidae	*Adarrus ocellaris*	common
Hemiptera	Cicadellidae	*Alebra albostriella*	common
Hemiptera	Cicadellidae	*Alebra wahlbergi*	common
Hemiptera	Cicadellidae	*Allygus mixtus*	common

Hemiptera	Cicadellidae	*Anaceratagallia ribauti*	common
Hemiptera	Cicadellidae	*Anoscopus albifrons*	common
Hemiptera	Cicadellidae	*Anoscopus serratulae*	common
Hemiptera	Cicadellidae	*Aphrodes makarovi*	common
Hemiptera	Cicadellidae	*Arthaldeus pascuellus*	common
Hemiptera	Cicadellidae	*Balclutha punctata*	common
Hemiptera	Cicadellidae	*Cicadella viridis*	common
Hemiptera	Cicadellidae	*Deltocephalus pulicaris*	common
Hemiptera	Cicadellidae	*Empoasca decipiens*	common
Hemiptera	Cicadellidae	*Eupteryx aurata*	common
Hemiptera	Cicadellidae	*Eupteryx urticae*	common
Hemiptera	Cicadellidae	*Eurhadina concinna*	common
Hemiptera	Cicadellidae	*Eurhadina pulchella*	common
Hemiptera	Cicadellidae	*Euscelis incisus*	common
Hemiptera	Cicadellidae	*Iassus lanio*	common
Hemiptera	Cicadellidae	*Idiocerus lituratus*	common
Hemiptera	Cicadellidae	*Kybos virgator*	common
Hemiptera	Cicadellidae	*Macropsis prasina*	common
Hemiptera	Cicadellidae	*Macropsis scotti*	common
Hemiptera	Cicadellidae	*Macrosteles viridigriseus*	common
Hemiptera	Cicadellidae	*Mocydia crocea*	common
Hemiptera	Cicadellidae	*Populicerus laminatus*	common
Hemiptera	Cicadellidae	*Ribautiana debilis*	common
Hemiptera	Cicadellidae	*Ribautiana ulmi*	common
Hemiptera	Cicadellidae	*Typhlocyba quercus*	common
Hemiptera	Cicadellidae	*Zyginidia scutellaris*	common
Hemiptera	Cicadellidae	*Aguriahana stellulata*	local
Hemiptera	Cicadellidae	*Zonocyba bifasciata*	local
Hemiptera	Cicadellidae	*Edwardsiana sp.*	n/a
Hemiptera	Cicadellidae	*Kybos sp.*	n/a
Hemiptera	Cixiidae	*Tachycixius pilosus*	common
Hemiptera	Coreidae	*Coreus marginatus*	common
Hemiptera	Coreidae	*Coriomeris denticulatus*	common
Hemiptera	Coreidae	*Gonocerus acuteangulatus*	common
Hemiptera	Corixidae	*Callicorixa praeusta*	common
Hemiptera	Corixidae	*Sigara falleni*	common
Hemiptera	Corixidae	*Sigara lateralis*	common
Hemiptera	Corixidae	*Sigara nigrolineata*	common
Hemiptera	Delphacidae	*Javesella dubia*	common
Hemiptera	Delphacidae	*Javesella pellucida*	common
Hemiptera	Delphacidae	*Stenocranus minutus*	common
Hemiptera	Delphacidae	*Eurybregma nigrolineata*	local
Hemiptera	Gerridae	*Gerris lacustris*	common
Hemiptera	Gerridae	*Gerris thoracicus*	common
Hemiptera	Lygaeidae	*Cymus claviculus*	common
Hemiptera	Lygaeidae	*Cymus melanocephalus*	common
Hemiptera	Lygaeidae	*Drymus sylvaticus*	common

Hemiptera	Lygaeidae	*Heterogaster urticae*	common
Hemiptera	Lygaeidae	*Scolopostethus affinis*	common
Hemiptera	Lygaeidae	*Scolopostethus thomsoni*	common
Hemiptera	Microphysidae	*Loricula elegantula*	common
Hemiptera	Miridae	*Adelphocoris lineolatus*	common
Hemiptera	Miridae	*Amblytylus nasutus*	common
Hemiptera	Miridae	*Apolygus lucorum*	common
Hemiptera	Miridae	*Atractotomus mali*	common
Hemiptera	Miridae	*Campyloneura virgula*	common
Hemiptera	Miridae	*Capsus ater*	common
Hemiptera	Miridae	*Closterotomus norwegicus*	common
Hemiptera	Miridae	*Closterotomus trivialis*	common
Hemiptera	Miridae	*Conostethus venustus*	common
Hemiptera	Miridae	*Deraeocoris flavilinea*	common
Hemiptera	Miridae	*Deraeocoris lutescens*	common
Hemiptera	Miridae	*Deraeocoris ruber*	common
Hemiptera	Miridae	*Dicyphus epilobii*	common
Hemiptera	Miridae	*Dicyphus globulifer*	common
Hemiptera	Miridae	*Grypocoris stysi*	common
Hemiptera	Miridae	*Heterotoma planicornis*	common
Hemiptera	Miridae	*Leptopterna dolabrata*	common
Hemiptera	Miridae	*Liocoris tripustulatus*	common
Hemiptera	Miridae	*Lopus decolor*	common
Hemiptera	Miridae	*Lygocoris pabulinus*	common
Hemiptera	Miridae	*Lygus rugulipennis*	common
Hemiptera	Miridae	*Notostira elongata*	common
Hemiptera	Miridae	*Oncotylus viridiflavus*	common
Hemiptera	Miridae	*Orthops campestris*	common
Hemiptera	Miridae	*Orthops kalmii*	common
Hemiptera	Miridae	*Orthotylus flavosparsus*	common
Hemiptera	Miridae	*Orthotylus marginalis*	common
Hemiptera	Miridae	*Orthotylus ochrotrichus*	common
Hemiptera	Miridae	*Orthotylus prasinus*	common
Hemiptera	Miridae	*Orthotylus tenellus*	common
Hemiptera	Miridae	*Phytocoris tiliae*	common
Hemiptera	Miridae	*Phytocoris varipes*	common
Hemiptera	Miridae	*Pinalitus cervinus*	common
Hemiptera	Miridae	*Pithanus maerkelii*	common
Hemiptera	Miridae	*Plagiognathus arbustorum*	common
Hemiptera	Miridae	*Plagiognathus chrysanthemi*	common
Hemiptera	Miridae	*Polymerus nigritus*	common
Hemiptera	Miridae	*Psallus ambiguus*	common
Hemiptera	Miridae	*Psallus confusus*	common
Hemiptera	Miridae	*Psallus perrisi*	common
Hemiptera	Miridae	*Psallus varians*	common
Hemiptera	Miridae	*Stenodema calcarata*	common
Hemiptera	Miridae	*Stenodema laevigata*	common

Hemiptera	Miridae	*Stenotus binotatus*	common
Hemiptera	Miridae	*Salicarus roseri*	local
Hemiptera	Miridae	*Lygus pratensis*	RDB3
Hemiptera	Nabidae	*Himacerus apterus*	common
Hemiptera	Nabidae	*Himacerus major*	common
Hemiptera	Nabidae	*Himacerus mirmicoides*	common
Hemiptera	Nabidae	*Nabis rugosus*	common
Hemiptera	Nabidae	*Himacerus boops*	local
Hemiptera	Pentatomidae	*Aelia acuminata*	common
Hemiptera	Pentatomidae	*Dolycoris baccarum*	common
Hemiptera	Pentatomidae	*Eysarcoris venustissimus*	common
Hemiptera	Pentatomidae	*Eurydema oleracea*	common
Hemiptera	Pentatomidae	*Palomena prasina*	common
Hemiptera	Pentatomidae	*Pentatoma rufipes*	common
Hemiptera	Pentatomidae	*Podops inuncta*	common
Hemiptera	Piesmatidae	*Parapiesma quadratum*	common
Hemiptera	Piesmatidae	*Piesma maculatum*	common
Hemiptera	Rhopalidae	*Corizus hyoscyami*	common
Hemiptera	Rhopalidae	*Rhopalus subrufus*	common
Hemiptera	Rhopalidae	*Stictopleurus punctatonervosus*	common
Hemiptera	Saldidae	*Saldula saltatoria*	common
Hemiptera	Scutelleridae	*Eurygaster testudinaria*	common
Hemiptera	Tingidae	*Physatocheila dumetorum*	common
Hemiptera	Tingidae	*Tingis ampliata*	common
Hemiptera	Tingidae	*Tingis cardui*	common
Hemiptera	Tingidae	*Derephysia foliacea*	local
Hirudinea	Glossiphoniidae	*Glossiphonia verrucata*	local
Hymenoptera	Andrenidae	*Andrena minutula*	common
Hymenoptera	Andrenidae	*Andrena nitida*	common
Hymenoptera	Andrenidae	*Colletes hederae*	common
Hymenoptera	Apidae	*Apis mellifera*	common
Hymenoptera	Apidae	*Bombus lapidarius*	common
Hymenoptera	Apidae	*Bombus lucorum agg.*	common
Hymenoptera	Apidae	*Bombus pascuorum*	common
Hymenoptera	Apidae	*Bombus terrestris*	common
Hymenoptera	Argidae	*Arge melanochra*	common
Hymenoptera	Argidae	*Arge pagana*	common
Hymenoptera	Cephidae	*Calameuta pallipes*	common
Hymenoptera	Cephidae	*Cephus pygmaeus*	common
Hymenoptera	Colletidae	*Colletes daviesanus*	common
Hymenoptera	Colletidae	*Hylaeus communis*	common
Hymenoptera	Crabronidae	*Crossocerus annulipes*	common
Hymenoptera	Crabronidae	*Passaloecus singularis*	common
Hymenoptera	Crabronidae	*Trypoxylon attenuatum*	common
Hymenoptera	Formicidae	*Lasius niger*	common
Hymenoptera	Formicidae	*Myrmica rubra*	common
Hymenoptera	Formicidae	*Myrmica ruginodis*	common

Hymenoptera	Formicidae	*Myrmica scabrinodis*	common
Hymenoptera	Halictidae	*Halictus tumulorum*	common
Hymenoptera	Halictidae	*Lasioglossum morio*	common
Hymenoptera	Halictidae	*Lasioglossum leucozonium*	common
Hymenoptera	Halictidae	*Lasioglossum lativentre*	local
Hymenoptera	Halictidae	*Lasioglossum malachurum*	Nb
Hymenoptera	Halictidae	*Lasioglossum pauxillum*	Nb
Hymenoptera	Ichneumonidae	*Pimpla rufipes*	common
Hymenoptera	Megachilidae	*Megachile willughbiella*	common
Hymenoptera	Tenthredinidae	*Aproceros leucopoda*	common
Hymenoptera	Tenthredinidae	*Athalia cordata*	common
Hymenoptera	Tenthredinidae	*Dolerus aericeps*	common
Hymenoptera	Tenthredinidae	*Rhogogaster chlorosoma*	common
Hymenoptera	Tenthredinidae	*Tenthredo scrophulariae*	common
Hymenoptera	Tenthredinidae	*Macrophya rufipes*	local
Hymenoptera	Tiphiidae	*Tiphia minuta*	Nb
Hymenoptera	Vespidae	*Ancistrocerus gazella*	common
Hymenoptera	Vespidae	*Ancistrocerus parietinus*	common
Hymenoptera	Vespidae	*Vespula germanica*	common
Hymenoptera	Vespidae	*Vespula vulgaris*	common
Hymenoptera	Vespidae	*Dolichovespula saxonica*	local
Hymenoptera	Vespidae	*Vespa crabro*	local
Lepidoptera	Choreutidae	*Anthophila fabriciana*	common
Lepidoptera	Erebidae	*Orgyia antiqua*	common
Lepidoptera	Erebidae	*Tyria jacobaeae*	common
Lepidoptera	Hesperiidae	*Ochlodes sylvanus*	common
Lepidoptera	Lycaenidae	*Neozephyrus quercus*	local
Lepidoptera	Noctuidae	*Noctua fimbriata*	common
Lepidoptera	Nymphalidae	*Aglais io*	common
Lepidoptera	Nymphalidae	*Aglais urticae*	common
Lepidoptera	Nymphalidae	*Aphantopus hyperantus*	common
Lepidoptera	Nymphalidae	*Maniola jurtina*	common
Lepidoptera	Nymphalidae	*Pararge aegeria*	common
Lepidoptera	Nymphalidae	*Polygonia c-album*	common
Lepidoptera	Nymphalidae	*Pyronia tithonus*	common
Lepidoptera	Nymphalidae	*Vanessa atalanta*	common
Lepidoptera	Pieridae	*Pieris brassicae*	common
Lepidoptera	Pieridae	*Pieris napi*	common
Lepidoptera	Pieridae	*Pieris rapae*	common
Lepidoptera	Sphingidae	*Sphinx ligustri*	common
Lepidoptera	Ypsolophidae	*Ochsenheimeria urella*	local
Mecoptera	Panorpidae	*Panorpa communis*	common
Mollusca	Cochlicopidae	*Cochlicopa lubrica*	common
Mollusca	Helicidae	*Cepaea hortensis*	common
Mollusca	Helicidae	*Cepaea nemoralis*	common
Mollusca	Helicidae	*Cornu aspersum*	common
Mollusca	Hygromiidae	*Monacha cantiana*	common

Mollusca	Hygromiidae	*Trochulus hispidus*	common
Mollusca	Lymnaeidae	*Galba truncatula*	common
Mollusca	Planorbidae	*Gyraulus crista*	common
Mollusca	Pupillidae	*Pupilla muscorum*	common
Neuroptera	Chrysopidae	*Chrysoperla carnea agg.*	common
Neuroptera	Chrysopidae	*Dichochrysa ventralis*	common
Odonata	Aeshnidae	*Aeshna mixta*	common
Odonata	Libellulidae	*Sympetrum striolatum*	common
Opiliones	Phalangiidae	*Dicranopalpus ramosus*	common
Opiliones	Phalangiidae	*Lacinius ephippiatus*	common
Opiliones	Phalangiidae	*Leiobunum rotundum*	common
Opiliones	Phalangiidae	*Mitopus morio*	common
Opiliones	Phalangiidae	*Opilio canestrinii*	common
Opiliones	Phalangiidae	*Opilio saxatilis*	common
Opiliones	Phalangiidae	*Paroligolophus agrestis*	common
Orthoptera	Acrididae	*Chorthippus albomarginatus*	common
Orthoptera	Acrididae	*Chorthippus brunneus*	common
Orthoptera	Acrididae	*Pseudochorthippus parallelus*	common
Orthoptera	Meconemmidae	*Meconema thalassinum*	common
Orthoptera	Phaneropteridae	*Leptophyes punctatissima*	common
Orthoptera	Tetrigidae	*Tetrix subulata*	common
Orthoptera	Tetrigidae	*Tetrix undulata*	common
Orthoptera	Tettigonidae	*Roeseliana roeselii*	common
Psocoptera	Stenopsocidae	*Graphopsocus cruciatus*	common
Psocoptera	Trogiidae	*Cerobasis guestfalica*	common
Trichoptera	Limnephilidae	*Limnephilus rhombicus*	common
Trichoptera	Polycentropidae	*Plectronemia conspersa*	common
Trichoptera	Polycentropodidae	*Cyrnus flavidus*	common
Trichoptera	Psychomyiidae	*Tinodes waeneri*	common

Appendix 5 – full list of recorded species: Highway Works

Group	Family	*Species*	Status
Araneae	Araneidae	*Agalenatea redii*	local
Araneae	Araneidae	*Araneus diadematus*	common
Araneae	Araneidae	*Araniella cucurbitina*	common
Araneae	Araneidae	*Larinioides cornutus*	common
Araneae	Araneidae	*Mangora acalypha*	common
Araneae	Araneidae	*Nuctenea umbratica*	common
Araneae	Araneidae	*Zilla diodia*	common
Araneae	Araneidae	*Zygiella x-notata*	common
Araneae	Cheiracanthiidae	*Cheiracanthium erraticum*	common
Araneae	Dictynidae	*Dictyna arundinacea*	common
Araneae	Dictynidae	*Dictyna uncinata*	common
Araneae	Gnaphosidae	*Drassyllus pusillus*	common
Araneae	Gnaphosidae	*Micaria micans*	common
Araneae	Hahniidae	*Hahnia nava*	common
Araneae	Linyphiidae	*Bathyphantes gracilis*	common
Araneae	Linyphiidae	*Erigone atra*	common
Araneae	Linyphiidae	*Erigone dentipalpis*	common
Araneae	Linyphiidae	*Linyphia triangularis*	common
Araneae	Linyphiidae	*Tenuiphantes mengei*	common
Araneae	Linyphiidae	*Tenuiphantes tenuis*	common
Araneae	Lycosidae	*Pardosa palustris*	common
Araneae	Lycosidae	*Pardosa pullata*	common
Araneae	Philodromidae	*Philodromus albidus*	common
Araneae	Philodromidae	*Philodromus aureolus*	common
Araneae	Philodromidae	*Philodromus cespitum*	common
Araneae	Philodromidae	*Philodromus dispar*	common
Araneae	Philodromidae	*Tibellus oblongus*	common
Araneae	Salticidae	*Euophrys frontalis*	common
Araneae	Salticidae	*Heliophanus flavipes*	common
Araneae	Salticidae	*Talavera aequipes*	local
Araneae	Tetragnathidae	*Pachygnatha degeeri*	common
Araneae	Theridiidae	*Enoplognatha ovata*	common
Araneae	Theridiidae	*Neottiura bimaculata*	common
Araneae	Theridiidae	*Phylloneta impressa*	common
Araneae	Theridiidae	*Phylloneta sisyphia*	common
Araneae	Thomisidae	*Ozyptila praticola*	local
Araneae	Thomisidae	*Ozyptila sanctuaria*	local
Araneae	Thomisidae	*Xysticus cristatus*	common
Coleoptera	Apionidae	*Betulapion simile*	common
Coleoptera	Apionidae	*Catapion seniculus*	common
Coleoptera	Apionidae	*Ceratapion gibbirostre*	common
Coleoptera	Apionidae	*Ceratapion onopordi*	common
Coleoptera	Apionidae	*Eutrichapion ervi*	common

Coleoptera	Apionidae	*Holotrichapion pisi*	common
Coleoptera	Apionidae	*Ischnopterapion loti*	common
Coleoptera	Apionidae	*Ischnopterapion virens*	common
Coleoptera	Apionidae	*Oxystoma cerdo*	Nb
Coleoptera	Apionidae	*Oxystoma craccae*	local
Coleoptera	Apionidae	*Oxystoma pomonae*	common
Coleoptera	Apionidae	*Perapion hydrolapathi*	common
Coleoptera	Apionidae	*Protapion apricans*	common
Coleoptera	Apionidae	*Protapion assimile*	common
Coleoptera	Apionidae	*Protapion difforme*	Nb
Coleoptera	Apionidae	*Protapion fulvipes*	common
Coleoptera	Apionidae	*Protapion nigritarse*	common
Coleoptera	Apionidae	*Stenopterapion tenue*	common
Coleoptera	Byrrhidae	*Cytilus sericeus*	local
Coleoptera	Byrrhidae	*Simplocaria semistriata*	local
Coleoptera	Cantharidae	*Cantharis decipiens*	common
Coleoptera	Cantharidae	*Rhagonycha fulva*	common
Coleoptera	Carabidae	*Agonum marginatum*	common
Coleoptera	Carabidae	*Amara tibialis*	common
Coleoptera	Carabidae	*Badister bullatus*	common
Coleoptera	Carabidae	*Bembidion guttula*	common
Coleoptera	Carabidae	*Bembidion lampros*	common
Coleoptera	Carabidae	*Bembidion obtusum*	common
Coleoptera	Carabidae	*Curtonotus aulicus*	common
Coleoptera	Carabidae	*Microlestes minutulus*	common
Coleoptera	Carabidae	*Notiophilus biguttatus*	common
Coleoptera	Carabidae	*Notiophilus palustris*	local
Coleoptera	Carabidae	*Notiophilus substriatus*	common
Coleoptera	Carabidae	*Olisthopus rotundatus*	common
Coleoptera	Carabidae	*Paradromius linearis*	common
Coleoptera	Carabidae	*Poecilus cupreus*	common
Coleoptera	Carabidae	*Pterostichus madidus*	common
Coleoptera	Carabidae	*Pterostichus vernalis*	common
Coleoptera	Chrysomelidae	*Altica lythri*	common
Coleoptera	Chrysomelidae	*Altica palustris*	common
Coleoptera	Chrysomelidae	*Bruchidius varius*	common
Coleoptera	Chrysomelidae	*Bruchus rufimanus*	common
Coleoptera	Chrysomelidae	*Cassida rubiginosa*	common
Coleoptera	Chrysomelidae	*Cassida vibex*	common
Coleoptera	Chrysomelidae	*Chaetocnema concinna*	common
Coleoptera	Chrysomelidae	*Chaetocnema hortensis*	common
Coleoptera	Chrysomelidae	*Chrysolina hyperici*	common
Coleoptera	Chrysomelidae	*Crepidodera aurata*	common
Coleoptera	Chrysomelidae	*Cryptocephalus moraei*	local
Coleoptera	Chrysomelidae	*Cryptocephalus pusillus*	common
Coleoptera	Chrysomelidae	*Galerucella lineola*	common
Coleoptera	Chrysomelidae	*Lochmaea crataegi*	common

Coleoptera	Chrysomelidae	*Longitarsus flavicornis*	common
Coleoptera	Chrysomelidae	*Longitarsus luridus*	common
Coleoptera	Chrysomelidae	*Longitarsus melanocephalus*	common
Coleoptera	Chrysomelidae	*Longitarsus pratensis*	common
Coleoptera	Chrysomelidae	*Longitarsus succineus*	common
Coleoptera	Chrysomelidae	*Oulema rufocyanea*	common
Coleoptera	Chrysomelidae	*Phyllotreta nemorum*	common
Coleoptera	Chrysomelidae	*Sphaeroderma rubidum*	local
Coleoptera	Chrysomelidae	*Sphaeroderma testaceum*	common
Coleoptera	Coccinellidae	*Adalia bipunctata*	common
Coleoptera	Coccinellidae	*Coccinella septempunctata*	common
Coleoptera	Coccinellidae	*Halyzia sedecimguttata*	common
Coleoptera	Coccinellidae	*Harmonia axyridis*	common
Coleoptera	Coccinellidae	*Nephus redtenbacheri*	local
Coleoptera	Coccinellidae	*Propylea quatuordecimpunctata*	common
Coleoptera	Coccinellidae	*Psyllobora vigintiduopunctata*	common
Coleoptera	Coccinellidae	*Rhyzobius litura*	common
Coleoptera	Coccinellidae	*Scymnus frontalis*	local
Coleoptera	Coccinellidae	*Subcoccinella vigintiquatuorpunctata*	common
Coleoptera	Coccinellidae	*Tytthaspis sedecimpunctata*	common
Coleoptera	Cryptophagidae	*Atomaria fuscata*	common
Coleoptera	Cryptophagidae	*Atomaria scutellaris*	common
Coleoptera	Curculionidae	*Anthonomus rubi*	common
Coleoptera	Curculionidae	*Dorytomus melanophthalmus*	common
Coleoptera	Curculionidae	*Dorytomus tortrix*	common
Coleoptera	Curculionidae	*Graptus triguttatus*	Nb
Coleoptera	Curculionidae	*Hypera miles*	local
Coleoptera	Curculionidae	*Hypera nigrirostris*	common
Coleoptera	Curculionidae	*Hypera plantaginis*	common
Coleoptera	Curculionidae	*Hypera postica*	common
Coleoptera	Curculionidae	*Hypera venusta*	local
Coleoptera	Curculionidae	*Magdalis cerasi*	Nb
Coleoptera	Curculionidae	*Mecinus pascuorum*	common
Coleoptera	Curculionidae	*Mecinus pyraster*	common
Coleoptera	Curculionidae	*Microplontus campestris*	Nb
Coleoptera	Curculionidae	*Nedyus quadrimaculatus*	common
Coleoptera	Curculionidae	*Parethelcus pollinarius*	common
Coleoptera	Curculionidae	*Rhamphus pulicarius*	common
Coleoptera	Curculionidae	*Sitona hispidulus*	common
Coleoptera	Curculionidae	*Sitona humeralis*	common
Coleoptera	Curculionidae	*Sitona lineatus*	common
Coleoptera	Curculionidae	*Sitona obsoletus*	common
Coleoptera	Curculionidae	*Sitona sulcifrons*	common
Coleoptera	Curculionidae	*Trichosirocalus barnevillei*	Nb
Coleoptera	Curculionidae	*Trichosirocalus troglodytes*	common
Coleoptera	Curculionidae	*Tychius junceus*	common

Coleoptera	Curculionidae	*Tychius meliloti*	local
Coleoptera	Curculionidae	*Tychius picirostris*	common
Coleoptera	Elateridae	*Agriotes pallidulus*	common
Coleoptera	Elateridae	*Athous bicolor*	common
Coleoptera	Helophoridae	*Helophorus minutus*	common
Coleoptera	Hydrophilidae	*Megasternum concinnum agg.*	common
Coleoptera	Kateretidae	*Brachypterus glaber*	common
Coleoptera	Latridiidae	*Cartodere bifasciata*	common
Coleoptera	Latridiidae	*Cortinicara gibbosa*	common
Coleoptera	Melyridae	*Abdera biflexuosa*	NS
Coleoptera	Melyridae	*Cordylepherus viridis*	common
Coleoptera	Melyridae	*Malachius bipustulatus*	common
Coleoptera	Mordellidae	*Mordellistena acuticollis*	local
Coleoptera	Mordellidae	*Mordellistena pumila*	local
Coleoptera	Nitidulidae	*Meligethes aeneus*	common
Coleoptera	Nitidulidae	*Meligethes nigrescens*	common
Coleoptera	Oedemeridae	*Oedemera lurida*	common
Coleoptera	Oedemeridae	*Oedemera nobilis*	common
Coleoptera	Phalacridae	*Olibrus aeneus*	common
Coleoptera	Phalacridae	*Olibrus affinis*	common
Coleoptera	Phalacridae	*Olibrus corticalis*	common
Coleoptera	Phalacridae	*Olibrus liquidus*	common
Coleoptera	Phalacridae	*Stilbus oblongus*	local
Coleoptera	Phalacridae	*Stilbus testaceus*	common
Coleoptera	Scraptiidae	*Anaspis garneysi*	common
Coleoptera	Staphylinidae	*Astenus lyonessius*	common
Coleoptera	Staphylinidae	*Cypha longicornis*	common
Coleoptera	Staphylinidae	*Drusilla canaliculata*	common
Coleoptera	Staphylinidae	*Metopsia clypeata*	common
Coleoptera	Staphylinidae	*Philonthus carbonarius*	common
Coleoptera	Staphylinidae	*Philonthus cognatus*	common
Coleoptera	Staphylinidae	*Quedius levicollis*	common
Coleoptera	Staphylinidae	*Quedius persimilis*	common
Coleoptera	Staphylinidae	*Sepedophilus nigripennis*	common
Coleoptera	Staphylinidae	*Stenus brunnipes*	common
Coleoptera	Staphylinidae	*Stenus clavicornis*	common
Coleoptera	Staphylinidae	*Stenus fulvicornis*	common
Coleoptera	Staphylinidae	*Stenus nanus*	common
Coleoptera	Staphylinidae	*Stenus ossium*	common
Coleoptera	Staphylinidae	*Sunius propinquus*	common
Coleoptera	Staphylinidae	*Tachyporus chrysomelinus*	common
Coleoptera	Staphylinidae	*Tachyporus hypnorum*	common
Coleoptera	Staphylinidae	*Tachyporus nitidulus*	common
Coleoptera	Staphylinidae	*Xantholinus linearis*	common
Crustacea	Armadillidiidae	*Armadillidium vulgare*	common
Crustacea	Philosciidae	*Philoscia muscorum*	common
Crustacea	Porcellionidae	*Porcellio scaber*	common

Dermaptera	Forficulidae	*Forficula auricularia*	common
Diptera	Asilidae	*Dioctria baumhaueri*	common
Diptera	Asilidae	*Leptogaster cylindrica*	common
Diptera	Conopidae	*Sicus ferrugineus*	common
Diptera	Dolichopodidae	*Campsicnemus curvipes*	common
Diptera	Dolichopodidae	*Chrysotus gramineus*	common
Diptera	Dolichopodidae	*Dolichopus griseipennis*	common
Diptera	Dolichopodidae	*Dolichopus ungulatus*	common
Diptera	Dolichopodidae	*Scellus notatus*	common
Diptera	Dolichopodidae	*Sciapus longulus*	common
Diptera	Empididae	*Empis livida*	common
Diptera	Ephydridae	*Ilythea spilota*	common
Diptera	Ephydridae	*Scatella stagnalis*	common
Diptera	Ephydridae	*Scatella tenuicosta*	common
Diptera	Hybotidae	*Platypalpus calceatus*	common
Diptera	Hybotidae	*Platypalpus minutus*	common
Diptera	Hybotidae	*Platypalpus pallidicornis*	common
Diptera	Limoniidae	*Dicranomyia autumnalis*	common
Diptera	Limoniidae	*Dicranomyia morio*	common
Diptera	Limoniidae	*Symplecta stictica*	common
Diptera	Lonchopteridae	*Lonchoptera lutea*	common
Diptera	Opomyzidae	*Geomyza tripunctata*	common
Diptera	Opomyzidae	*Opomyza germinationis*	common
Diptera	Pipunculidae	*Pipunculus campestris*	common
Diptera	Pipunculidae	*Tomosvaryella geniculata*	common
Diptera	Polleniidae	*Pollenia rudis*	common
Diptera	Sarcophagidae	*Sarcophaga aratrix*	common
Diptera	Sarcophagidae	*Sarcophaga carnaria*	common
Diptera	Sarcophagidae	*Sarcophaga haemorrhoa*	common
Diptera	Sarcophagidae	*Sarcophaga pumila*	common
Diptera	Sarcophagidae	*Sarcophaga rosellei*	common
Diptera	Sarcophagidae	*Sarcophaga variegata*	common
Diptera	Scathophagidae	*Scathophaga stercoraria*	common
Diptera	Sciomyzidae	*Coremacera marginata*	common
Diptera	Sciomyzidae	*Euthycera fumigata*	local
Diptera	Sciomyzidae	*Limnia unguicornis*	common
Diptera	Sciomyzidae	*Pherbellia cinerella*	common
Diptera	Sepsidae	*Sepsis fulgens*	common
Diptera	Sepsidae	*Sepsis punctum*	common
Diptera	Sepsidae	*Themira annulipes*	common
Diptera	Sepsidae	*Themira putris*	common
Diptera	Stratiomyidae	*Chloromyia formosa*	common
Diptera	Stratiomyidae	*Chorisops tibialis*	common
Diptera	Stratiomyidae	*Oxycera trilineata*	local
Diptera	Stratiomyidae	*Pachygaster atra*	common
Diptera	Stratiomyidae	*Pachygaster leachii*	common
Diptera	Syrphidae	*Cheilosia latifrons*	common

Diptera	Syrphidae	*Chrysotoxum verralli*	local
Diptera	Syrphidae	*Episyrphus balteatus*	common
Diptera	Syrphidae	*Eristalis arbustorum*	common
Diptera	Syrphidae	*Eristalis pertinax*	common
Diptera	Syrphidae	*Eristalis tenax*	common
Diptera	Syrphidae	*Eupeodes corollae*	common
Diptera	Syrphidae	*Eupeodes latifasciatus*	common
Diptera	Syrphidae	*Eupeodes luniger*	common
Diptera	Syrphidae	*Melanostoma mellinum*	common
Diptera	Syrphidae	*Melanostoma scalare*	common
Diptera	Syrphidae	*Paragus haemorrhous*	common
Diptera	Syrphidae	*Pipizella viduata*	common
Diptera	Syrphidae	*Platycheirus albimanus*	common
Diptera	Syrphidae	*Platycheirus clypeatus*	common
Diptera	Syrphidae	*Sphaerophoria scripta*	common
Diptera	Syrphidae	*Syritta pipiens*	common
Diptera	Syrphidae	*Syrphus ribesii*	common
Diptera	Syrphidae	*Syrphus vitripennis*	common
Diptera	Syrphidae	*Volucella zonaria*	common
Diptera	Syrphidae	*Xanthogramma citrofasciatum*	common
Diptera	Tachinidae	*Cistogaster globosa*	RDB1
Diptera	Tachinidae	*Eriothrix rufomaculata*	common
Diptera	Tachinidae	*Siphona geniculata*	common
Diptera	Tachinidae	*Tachina fera*	common
Diptera	Tephritidae	*Chaetorellia jaceae*	common
Diptera	Tephritidae	*Merzomyia westermanni*	N
Diptera	Tephritidae	*Tephritis divisa*	common
Diptera	Tephritidae	*Tephritis formosa*	common
Diptera	Tephritidae	*Tephritis neesii*	common
Diptera	Tephritidae	*Terellia serratulae*	common
Diptera	Tephritidae	*Urophora jaceana*	common
Diptera	Tephritidae	*Urophora quadrifasciata*	common
Diptera	Tephritidae	*Urophora stylata*	common
Diptera	Tipulidae	*Nephrotoma flavescens*	common
Diptera	Tipulidae	*Tipula oleracea*	common
Diptera	Trixoscelidae	*Trixoscelis obscurella*	common
Hemiptera	Anthocoridae	*Anthocoris nemoralis*	common
Hemiptera	Anthocoridae	*Anthocoris nemorum*	common
Hemiptera	Anthocoridae	*Orius majusculus*	common
Hemiptera	Anthocoridae	*Orius niger*	common
Hemiptera	Aphrophoridae	*Aphrophora alni*	common
Hemiptera	Aphrophoridae	*Neophilaenus lineatus*	common
Hemiptera	Aphrophoridae	*Philaenus spumarius*	common
Hemiptera	Berytidae	*Berytinus minor*	common
Hemiptera	Berytidae	*Berytinus montivagus*	common
Hemiptera	Cicadellidae	*Alnetoidea alneti*	common
Hemiptera	Cicadellidae	*Anaceratagallia ribauti*	common

Hemiptera	Cicadellidae	*Anoscopus albifrons*	common
Hemiptera	Cicadellidae	*Anoscopus serratulae*	common
Hemiptera	Cicadellidae	*Aphrodes makarovi*	common
Hemiptera	Cicadellidae	*Arthaldeus pascuellus*	common
Hemiptera	Cicadellidae	*Cicadula quadrinotata*	common
Hemiptera	Cicadellidae	*Empoasca decipiens*	common
Hemiptera	Cicadellidae	*Eupelix cuspidata*	common
Hemiptera	Cicadellidae	*Eupteryx aurata*	common
Hemiptera	Cicadellidae	*Euscelis incisus*	common
Hemiptera	Cicadellidae	*Idiocerus lituratus*	common
Hemiptera	Cicadellidae	*Kybos ludus*	common
Hemiptera	Cicadellidae	*Kybos smaragdula*	common
Hemiptera	Cicadellidae	*Macropsis cerea*	common
Hemiptera	Cicadellidae	*Macropsis fuscula*	common
Hemiptera	Cicadellidae	*Macropsis prasina*	common
Hemiptera	Cicadellidae	*Megophthalmus scanicus*	common
Hemiptera	Cicadellidae	*Mocydiopsis attenuata*	common
Hemiptera	Cicadellidae	*Oncopsis alni*	common
Hemiptera	Cicadellidae	*Populicerus albicans*	common
Hemiptera	Cicadellidae	*Psammotettix confinis*	common
Hemiptera	Cicadellidae	*Ribautiana tenerrima*	common
Hemiptera	Cicadellidae	*Zyginidia scutellaris*	common
Hemiptera	Cixiidae	*Trigonocranus emmeae*	Nb
Hemiptera	Coreidae	*Bathysolen nubilus*	NS
Hemiptera	Coreidae	*Coreus marginatus*	common
Hemiptera	Coreidae	*Coriomeris denticulatus*	common
Hemiptera	Delphacidae	*Javesella pellucida*	common
Hemiptera	Delphacidae	*Kosswigianella exigua*	common
Hemiptera	Delphacidae	*Stenocranus minutus*	common
Hemiptera	Lygaeidae	*Kleidocerys resedae*	common
Hemiptera	Lygaeidae	*Nysius huttoni*	common
Hemiptera	Miridae	*Adelphocoris lineolatus*	common
Hemiptera	Miridae	*Apolygus lucorum*	common
Hemiptera	Miridae	*Blepharidopterus angulatus*	common
Hemiptera	Miridae	*Campyloneura virgula*	common
Hemiptera	Miridae	*Capsus ater*	common
Hemiptera	Miridae	*Closterotomus norwegicus*	common
Hemiptera	Miridae	*Deraeocoris flavilinea*	common
Hemiptera	Miridae	*Deraeocoris ruber*	common
Hemiptera	Miridae	*Dicyphus epilobii*	common
Hemiptera	Miridae	*Dicyphus tamaninii*	local
Hemiptera	Miridae	*Europiella artemisiae*	common
Hemiptera	Miridae	*Heterotoma planicornis*	common
Hemiptera	Miridae	*Leptopterna dolabrata*	common
Hemiptera	Miridae	*Leptopterna ferrugata*	common
Hemiptera	Miridae	*Liocoris tripustulatus*	common
Hemiptera	Miridae	*Lopus decolor*	common

Hemiptera	Miridae	*Lygus pratensis*	RDB3
Hemiptera	Miridae	*Lygus rugulipennis*	common
Hemiptera	Miridae	*Megalocoleus molliculus*	common
Hemiptera	Miridae	*Notostira elongata*	common
Hemiptera	Miridae	*Oncotylus viridiflavus*	common
Hemiptera	Miridae	*Orthocephalus saltator*	common
Hemiptera	Miridae	*Orthops campestris*	common
Hemiptera	Miridae	*Orthotylus adenocarpi*	common
Hemiptera	Miridae	*Orthotylus nassatus*	common
Hemiptera	Miridae	*Orthotylus tenellus*	common
Hemiptera	Miridae	*Phylus coryli*	common
Hemiptera	Miridae	*Phytocoris ulmi*	common
Hemiptera	Miridae	*Phytocoris varipes*	common
Hemiptera	Miridae	*Pinalitus cervinus*	common
Hemiptera	Miridae	*Pithanus maerkelii*	common
Hemiptera	Miridae	*Plagiognathus arbustorum*	common
Hemiptera	Miridae	*Plagiognathus chrysanthemi*	common
Hemiptera	Miridae	*Psallus varians*	common
Hemiptera	Miridae	*Stenodema calcarata*	common
Hemiptera	Miridae	*Stenodema laevigata*	common
Hemiptera	Miridae	*Stenotus binotatus*	common
Hemiptera	Nabidae	*Himacerus apterus*	common
Hemiptera	Nabidae	*Himacerus boops*	local
Hemiptera	Nabidae	*Himacerus mirmicoides*	common
Hemiptera	Pentatomidae	*Aelia acuminata*	common
Hemiptera	Pentatomidae	*Dolycoris baccarum*	common
Hemiptera	Pentatomidae	*Eurydema oleracea*	common
Hemiptera	Pentatomidae	*Palomena prasina*	common
Hemiptera	Pentatomidae	*Podops inuncta*	common
Hemiptera	Rhopalidae	*Stictopleurus abutilon*	common
Hemiptera	Rhopalidae	*Stictopleurus punctatonervosus*	common
Hemiptera	Scutelleridae	*Eurygaster testudinaria*	common
Hemiptera	Tingidae	*Acalypta parvula*	common
Hymenoptera	Andrenidae	*Andrena dorsata*	common
Hymenoptera	Andrenidae	*Andrena flavipes*	common
Hymenoptera	Andrenidae	*Andrena minutula*	common
Hymenoptera	Apidae	*Apis mellifera*	common
Hymenoptera	Apidae	*Bombus hortorum*	common
Hymenoptera	Apidae	*Bombus lapidarius*	common
Hymenoptera	Apidae	*Bombus lucorum agg.*	common
Hymenoptera	Apidae	*Bombus pascuorum*	common
Hymenoptera	Apidae	*Bombus terrestris*	common
Hymenoptera	Apidae	*Nomada fabriciana*	common
Hymenoptera	Apidae	*Nomada flavoguttata*	common
Hymenoptera	Cephidae	*Cephus pygmaeus*	common
Hymenoptera	Colletidae	*Hylaeus brevicornis*	common
Hymenoptera	Crabronidae	*Cerceris rybyensis*	common

Hymenoptera	Crabronidae	*Crossocerus distinguendus*	Na
Hymenoptera	Crabronidae	*Lindenius albilabris*	common
Hymenoptera	Crabronidae	*Psenulus concolor*	common
Hymenoptera	Formicidae	*Lasius flavus*	common
Hymenoptera	Formicidae	*Lasius niger*	common
Hymenoptera	Formicidae	*Myrmica rubra*	common
Hymenoptera	Formicidae	*Myrmica ruginodis*	common
Hymenoptera	Formicidae	*Myrmica scabrinodis*	common
Hymenoptera	Gasteruptiidae	*Gasteruption jaculator*	common
Hymenoptera	Halictidae	*Halictus tumulorum*	common
Hymenoptera	Halictidae	*Lasioglossum leucopus*	common
Hymenoptera	Halictidae	*Lasioglossum pauxillum*	Nb
Hymenoptera	Pompilidae	*Priocnemis parvula*	local
Lepidoptera	Erebidae	*Tyria jacobaeae*	common
Lepidoptera	Hesperiidae	*Thymelicus sylvestris*	common
Lepidoptera	Lycaenidae	*Polyommatus icarus*	common
Lepidoptera	Noctuidae	*Autographa gamma*	common
Lepidoptera	Notodontidae	*Cerura vinula*	common
Lepidoptera	Nymphalidae	*Aglais io*	common
Lepidoptera	Nymphalidae	*Aglais urticae*	common
Lepidoptera	Nymphalidae	*Aphantopus hyperantus*	common
Lepidoptera	Nymphalidae	*Maniola jurtina*	common
Lepidoptera	Nymphalidae	*Pyronia tithonus*	common
Lepidoptera	Nymphalidae	*Vanessa atalanta*	common
Lepidoptera	Pieridae	*Gonepteryx rhamni*	common
Lepidoptera	Pieridae	*Pieris brassicae*	common
Lepidoptera	Pieridae	*Pieris napi*	common
Lepidoptera	Pieridae	*Pieris rapae*	common
Lepidoptera	Tortricidae	*Tortrix viridana*	common
Lepidoptera	Zygaenidae	*Zygaena filipendulae*	common
Mollusca	Helicidae	*Cepaea nemoralis*	common
Mollusca	Helicidae	*Cornu aspersum*	common
Mollusca	Hygromiidae	*Cernuella virgata*	common
Mollusca	Hygromiidae	*Monacha cantiana*	common
Mollusca	Hygromiidae	*Trochulus hispidus*	common
Mollusca	Hygromiidae	*Xeroplexa intersecta*	common
Neuroptera	Hemerobiidae	*Micromus variegatus*	common
Odonata	Aeshnidae	*Aeshna grandis*	common
Odonata	Libellulidae	*Sympetrum striolatum*	common
Opiliones	Phalangiidae	*Dicranopalpus ramosus*	common
Opiliones	Phalangiidae	*Lacinius ephippiatus*	common
Opiliones	Phalangiidae	*Phalangium opilio*	common
Orthoptera	Acrididae	*Chorthippus albomarginatus*	common
Orthoptera	Acrididae	*Chorthippus brunneus*	common
Orthoptera	Acrididae	*Pseudochorthippus parallelus*	common
Orthoptera	Meconemmidae	*Meconema meridionale*	local
Orthoptera	Meconemmidae	*Meconema thalassinum*	common

Orthoptera	Phaneropteridae	*Leptophyes punctatissima*	common
Orthoptera	Tetrigidae	*Tetrix undulata*	common
Orthoptera	Tettigonidae	*Roeseliana roeselii*	common
Psocoptera	Ectopsocidae	*Ectopsocus petersi*	common

Appendix 6 – Scarce species accounts

Group	Family	Species	Common name	Status	Species account
Coleoptera	Aderidae	*Aderus populneus*	Brown-belted Ant-like Leaf Beetle	NS	A tiny and lightly patterned beetle associated with decaying hardwood of a range of species in woodlands, fens and hedgerows. Local but widely distributed across central and south-east England and East Anglia. There are indications that it is currently undergoing a range expansion.
Coleoptera	Anthribidae	*Platyrhinus resinosus*	Cramp-ball Fungus Weevil	Nb	A sturdy and cryptically coloured broad-nosed weevil whose larvae develop in fruiting bodies of the fungus whose larvae develop in fruiting bodies of the fungus *Daldinia concentrica* on broadleaved trees, particularly ash. It is found in broad-leaved woodland, but also occurs on isolated trees in hedgerows.
Coleoptera	Apionidae	*Oxystoma cerdo*	a seed-weevil	Nb	Widely distributed, somewhat local, but increasing and no longer deserving of formal status; found in hedgerows, lightly managed grasslands and scrub/grass mosaics and transitions; on vetches, especially tufted vetch *Vicia cracca*.
Coleoptera	Apionidae	*Protapion difforme*	a seed-weevil	Nb	A small weevil, black with red legs, which feeds on clovers. It is particularly associated with damp grassland. It is local, but relatively frequent in some areas, across south and central England.
Coleoptera	Chrysomelidae	*Agelastica alni*	Alder Leaf Beetle	NR	A fairly large beetle, deep metallic blue with a violet reflection. It feeds mainly on alder foliage in wetlands, river banks and wet areas in woodlands. Until recently it was considered a great rarity but has rapidly

					expanded and is now common across central and southern England.
Coleoptera	Chrysomelidae	*Longitarsus ochroleucus*	a flea beetle	NS	A tiny yellow flea beetle with black tips to the hind femora. It feeds on ragworts (*Jacobaeae* and *Senecio* spp.) in grasslands, commons, woodlands, arable margins, sand and chalk pits and disturbed ground. It is widely scattered and rarely recorded but seems to have declined significantly and has only been recorded from England in recent years.
Coleoptera	Cleridae	*Tillus elongatus*	a checkered beetle	NS	Larvae and adults are active predators of wood-boring beetles of the family Ptinidae, especially *Ptilinus pectinicornis*, and can occur almost wherever such beetles occur in large numbers. The most characteristic habitat is standing dead timber of broadleaved trees in sun, but it can also occur in shaded woodland under a dense canopy, and has been reared in some numbers from dead ivy with *Ochina ptinoides*. Despite its substantial size and distinctive appearance, this is an easily overlooked species, probably largely nocturnal and, when not active, inaccessible in often hard wood.

Coleoptera	Coccinellidae	*Hippodamia variegata*	Adonis' Ladybird	Nb	Adonis' ladybird. A distinctively marked red, black and white ladybird found in low open-structured vegetation on dry ground. It has been recorded from heathland, dry grassland, parkland, sand dunes, riverbanks, ruderal vegetation in mineral workings, derelict and setaside arable land. It is widespread but local in southern and eastern England, much more local further north and west, recorded from south Wales but not known from Scotland. Though especially associated with coastal sites, there are many inland records and it appears to be increasing inland, especially in post-industrial sites. The Nationally Scarce status currently applied to this species cannot be justified.
Coleoptera	Cryptophagidae	*Cryptophagus ruficornis*	a cryptic fungus beetle	N	A tiny reddish-brown beetle that feeds on the fungus *Daldinia concentrica* on dead branches and stumps. It is probably local in England and Wales with a scatter of records into Soctland and Ireland. It is diffcult to identify and likely to be underecorded.
Coleoptera	Curculionidae	*Larinus carlinae*	Thistle-bud Weevil	Nb	A fairly large weevil associated with thistles (*Cirsium* spp. and *Carduus* spp.). Formerly a scarce southern species, it is increasing in range and frequency, and is now reasonably widespread and common.
Coleoptera	Curculionidae	*Magdalis barbicornis*	Pear Weevil	Na	A black weevil whose larvae develop inside twigs and branches of rosaceous trees and shrubs, including hawthorn, apple, pear, medlar and *Sorbus* species. Recorded from woodland, hedges, gardens and orchards, this species is widely but locally distributed in southern England to as far north as North Lincolnshire.

Coleoptera	Curculionidae	*Magdalis cerasi*	a weevil	Nb	A black weevil, the larvae of which develop beneath the bark of twigs and small branches of broadleaved trees and shrubs. Oak is the most frequent host, but it has also been recorded from several members of the Rosaceae. It is found in woodland, hedgerows, scrub and more isolated trees and shrubs. It is a local southern species, but quite widely distributed in England north to Yorkshire.
Coleoptera	Curculionidae	*Microplontus campestris*	a weevil	Nb	A small patterned weevil which feeds on ox-eye daisy *Leucanthemum vulgare*, growing in grassland, disturbed ground and field margins. Though widespread in England and recorded from parts of Wales, this is a local species. It seems likely, however, that its current status over-estimates its rarity.
Coleoptera	Curculionidae	*Rhinocyllus conicus*	Thistle-head Weevil	Na	A fairly large weevil associated with thistles (*Cirsium* spp. and *Carduus* spp.). Formerly a scarce southern species, it is increasing in range and frequency, and is doubtfully worthy of its current status.
Coleoptera	Curculionidae	*Trichosirocalus barnevillei*	a weevil	Nb	A small but rather brightly patterned weevil, associated with yarrow *Achillea millefolium* growing in open-structured, often short-turf, grassland and on disturbed ground, in unshaded places on well-drained soils. The biology is not known in detail; it may be a winter-breeder. It is a predominantly south-eastern species, not found west of Hampshire or north of Leicestershire.

Coleoptera	Helophoridae	*Helophorus dorsalis*	a crawling mud beetle	NS	*H. dorsalis* is most often found in pools in lowland woodland with some exposed substratum of clay or mud in addition to beds of dead leaves. Most sites are of a relict nature, but some are in plantations and suburban woodland. The modern distribution of this species appears to indicate a decided contraction in, in that the species is largely confined to Central England, with mostly much older records for the south. Losses from southern England are hard to explain, especially considering the 20th Century discovery of other species indicating continuous woodland cover in counties where *dorsalis* was once recorded.
Coleoptera	Latridiidae	*Enicmus rugosus*	a minute brown scavenger beetle	N	A tiny dark brown beetle that lives under the bark of deadwood, mainly in oak but also in ash, beech, alder, and pine trees. It usually lives associated with fungi of the Lycoperdacea, Polyporacea, and myxomycetes. It has a local but widespread distribution across England and South Wales.
Coleoptera	Melyridae	*Abdera biflexuosa*	a false darkling beetle	NS	A small but distinctively marked saproxylic beetle. Larvae develop in decaying lower tree branches, usually of oak, which have been shaded out by the tree's own canopy. It is widespread but local in England, and has also been recorded from Wales.
Coleoptera	Melyridae	*Anthocomus fasciatus*	Banded Malachite Beetle	NS	A widespread species doubtfully worthy of its status; found especially in transitional and mosaic habitats such as hedgerows and wood margins, but with no very strong habitat associations; it is regarded as saproxylic, and it has been suggested that larvae may be predators living in the tunnels of wood-boring beetles.

Coleoptera	Melyridae	*Dasytes plumbeus*	a soft-winged flower beetle	NS	A small black beetle with a greyish metallic reflection and partly yellow appendages. It is found chiefly at transitions between woody and herbaceous vegetation, such as woodland margins and fringe, mature hedgerows, and scrub mosaics, especially on calcareous soils. The larvae are believed to develop in dcaying wood. It is a predominantly southern species, but scattered records extend into northern England.
Coleoptera	Mordellidae	*Mordellistena neuwaldeggiana*	a tumbling flower beetle	NS	Local within a rather restricted range in southern and eastern counties, but more frequently recorded in recent years and by no means rare; saproxylic, having been reared from branches of hornbeam and field maple in the early stages of decay, and associated with a much wider range of broadleaved trees and shrubs.
Coleoptera	Mycetophagidae	*Pseudotriphyllus suturalis*	a fungus beetle	NS	Widespread in southern and central England, extending north into Scotland; associated with bracket fungi, especially sulphur polypore and dryad's saddle, growing on broadleaved trees.
Coleoptera	Ptinidae	*Anobium inexspectatum*	a wood-boring beetle	Nb	Saproxylic; burrows in dead stems of ivy; reasonably frequent, and perhaps increasing; doubtfully worthy of its status.
Coleoptera	Salpingidae	*Lissodema denticolle*	a narrow-waisted bark beetle	NS	Widespread but somewhat local in southern Britain north to the Humber, very local further north; doubtfully worthy of formal status; saproxylic, often associated with quite fine dead branches or twigs of a range of broadleaved trees and shrubs, though also recorded from pine; especially frequent in sheltered but reasonably sunny situations

					such as wood margins and rides and hedgerows.
Diptera	Pipunculidae	*Cephalops pannonicus*	a big-headed fly	NS	A species of somewhat uncertain ecology, parasitic on planthoppers; recorded from woodland, grassland and fen, and reared from the very common *Stenocranus minutus*, it is not obvious why this species should be scarce; it has been recorded more frequently in recent years.
Diptera	Scathophagidae	*Coniosternum decipiens*	Wandering Coniosternum	N	A medium-sized grey and brown dung fly that is widespread but localised in Britain. It seems to be most strongly associated with sedge-rich wetlands but its exact habitat preferences remain unclear. It has been recorded from a wide range of wetland types including coastal grazing marsh, fens, wet heath, wet woodland, and even recently developed wetlands on brownfield sites. It has also been recorded well away from wetlands so is likely quite mobile.
Diptera	Sepsidae	*Themira gracilis*	an ensign fly	pNS	A small black fly associated with the dung of horses and sometimes cattle. It is rarely recorded but seems to be relatively widespread in western Britain. It may occur at low density and be under-recorded as only a single male was found among many hundreds of individuals of common species of Sepsidae at the Diseworth site.

Diptera	Syrphidae	*Pipiza lugubris*	Smudge-winged Pipiza	NS	A scarce species of hoverfly with scattered records in southern and western England and South Wales. Its ecology is poorly understood, it has been recorded from a wide range of habitats and its preferences and requirements remain obscure.
Diptera	Tachinidae	*Cistogaster globosa*	a bristle fly	RDB1	A distinctively shaped and patterned fly, parasitic on the shieldbug *Aelia acuminata* and found in dry grassland on a range of soils. Though formerly a very rare species, this fly, has increased greatly in frequency and range in recent years, as has its host, and it is now a quite frequent species in the south-east in habitats including roadside verges, abandoned arable land and brownfield sites.
Diptera	Tephritidae	*Merzomyia westermanni*	Large Ragwort Picturewing	N	A large gall fly with heavily and distinctively patterned wings. Frequent but rather local in southern and midland counties of England, and seemingly commoner than in the recent past; the formal status is open to doubt; associated chiefly with hoary ragwort growing on poorly-drained clay soils, but occasionally recorded from common ragwort; larvae develop in the flower-heads.
Hemiptera	Cixiidae	*Trigonocranus emmeae*	a planthopper	Nb	A small planthopper of open dry habitats. The larvae are root-feeders and they, and some adults, are entirely subterranean. It is perhaps especially frequent on gravelly ground, but also occurs where the substrate is dominated by sand, and on clay provided the surface layers are summer-dry and the ground is sloping. This was a relatively late addition to the British list, and records have been slow to accumulate, but the pattern suggests a long-established but easily

					overlooked species which has benefited greatly from quarries and other brownfield sites. It is rather difficult to be sure of current status, or of any trends.
Hemiptera	Coreidae	*Bathysolen nubilus*	Cryptic Leatherbug	NS	Local but widespread in southern England and East Anglia; more frequent than formerly, but perhaps now in a period of decline after rapid expansion; sparsely vegetated habitats including breckland, quarries, sandpits and other brownfield sites and the edges of roads and tracks; feeds on members of the pea family, particularly black medick.
Hemiptera	Miridae	*Lygus pratensis*	a plant bug	RDB3	Formerly a scarce species of woodland rides, now much increased and generally common in southern counties, and of no conservation significance
Hymenoptera	Crabronidae	*Crossocerus distinguendus*	a solitary wasp	Na	A small black solitary wasp. Probably a fairly recent arrival, increasing in frequency and range in the south-east since its first report in the 1970s
Hymenoptera	Halictidae	*Lasioglossum malachurum*	Sharp-collared Furrow-bee	Nb	A small brown bee, formerly rare but found increasingly widely and commonly since 1990. It is now common in much of southern England and no longer deserving of a formal conservation status. It occurs in a range of open habitats, including coastal cliffs and landslips, abandoned quarries, commons, chalk grassland and private gardens; ground-nesting.

Hymenoptera	Halictidae	*Lasioglossum pauxillum*	Lobe-spurred Furrow-bee	Na	Has expanded dramatically in recent decades and is now locally common across southern England and into the midlands; no longer deserving of a formal conservation status; in a wide range of dry habitats but perhaps especially calcareous grasslands and brownfield sites.
Hymenoptera	Tiphiidae	*Tiphia minuta*	Small Tiphia	Nb	A small black wasp, widespread in Britain but probably under-recorded and doubtfully worthy of its status. It is found in a range of reasonably open habitats, including heathland, grassland, open woodland, mosaic habitats, and coastal dunes. It is a parasite of subterranean beetle larvae.