



# Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects

Environmental Statement

**Volume 3**

Appendix 20.11 - Invertebrate Survey Report

August 2022

Document Reference: 6.3.20.11

APFP Regulation: 5(2)(a)

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The data which we have prepared and provided is accurate, and has been prepared and provided in accordance with the CIEEM’s Code of Professional Conduct. We confirm that any opinions expressed are our best and professional bona fide opinions.



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**GLOSSARY OF ACRONYMS**

DCO	Development Consent Order
DEP	Dudgeon Offshore Wind Farm Extension Project
EP1HS	Extended Phase 1 Habitat Survey
ETG	Expert Topic Group
NBIS	Norfolk Biodiversity Information Service
PEIR	Preliminary Environmental Information Report
SEP	Sheringham Shoal Offshore Wind Farm Extension Project
WFE	Wild Frontier Ecology Ltd.
IUCN	International Union on the Conservation of Nature
RDB	Red Data Book
NVC	National Vegetation Classification
NERC	Natural Environment and Rural Communities Act 2006

## GLOSSARY OF TERMS

Term	Definition
DCO boundary / Order Limits	The area subject to the application for development consent, including all permanent and temporary works for SEP and DEP.
Dudgeon Offshore Wind Farm Extension Project (DEP)	The Dudgeon Offshore Wind Farm Extension onshore and offshore sites including all onshore and offshore infrastructure.
DEP onshore site	The Dudgeon Offshore Wind Farm Extension onshore area consisting of the DEP onshore substation site, onshore cable corridor, construction compounds, temporary working areas and onshore landfall area.
European site	Sites designated for nature conservation under the Habitats Directive and Birds Directive. This includes candidate Special Areas of Conservation, Sites of Community Importance, Special Areas of Conservation and Special Protection Areas, and is defined in regulation 8 of the Conservation of Habitats and Species Regulations 2017.
Evidence Plan Process (EPP)	A voluntary consultation process with specialist stakeholders to agree the approach, and information to support, the EIA and HRA for certain topics.
Expert Topic Group (ETG)	A forum for targeted engagement with regulators and interested stakeholders through the EPP.
Horizontal directional drilling (HDD) zones	The areas within the onshore cable route which would house HDD entry or exit points.
Jointing bays	Underground structures constructed at regular intervals along the onshore cable route to join sections of cable and facilitate installation of the cables into the buried ducts.
Landfall	The point at the coastline at which the offshore export cables are brought onshore, connecting to the onshore cables at the transition joint bay above mean high water
Onshore cable corridor	The area between the landfall and the onshore substation sites, within which the onshore cable circuits will be installed along with other temporary works for construction.
Onshore export cables	The cables which would bring electricity from the landfall to the onshore substation. 220 - 230kV.
Onshore Substation	Compound containing electrical equipment to enable connection to the National Grid.
PEIR boundary	The area subject to survey and preliminary impact assessment to inform the PEIR.
Sheringham Shoal Offshore Wind Farm Extension Project (SEP)	The Sheringham Shoal Offshore Wind Farm Extension onshore and offshore sites including all onshore and offshore infrastructure.
SEP onshore site	The Sheringham Shoal Wind Farm Extension onshore area consisting of the SEP onshore substation site, onshore cable corridor, construction compounds, temporary working areas and onshore landfall area.
Study area	Area where potential impacts from the project could occur, as defined for each individual Environmental Impact Assessment (EIA) topic.
The Applicant	Equinor New Energy Limited

## EXECUTIVE SUMMARY

Wild Frontier Ecology Ltd. was commissioned by Equinor New Energy Ltd. to undertake invertebrate surveys within the Development Consent Order (DCO) boundary associated with the onshore components of the proposed Sheringham Shoal Offshore Wind Farm Extension Project (SEP) and Dudgeon Offshore Wind Farm Extension Project (DEP). The surveys took place in summer 2021.

The invertebrate surveys were preceded by an Extended Phase 1 Habitat Survey (EP1HS) in 2020 and early 2021, which covered all accessible parts of the Preliminary Environmental Information Report (PEIR) boundary. From 2020 to 2021, the results of the EP1HS, along with results of other ecological surveys underway at the same time, were used to inform the site selection process. The PEIR boundary was accordingly refined into the narrower Development Consent Order (DCO) boundary. This refinement process drew on information obtained during the EP1HS (and other ecological surveys) with the aim of avoiding or minimising impact on areas and features identified as being of relatively high ecological value. Full results of the EP1HS are provided in **Appendix 20.1: Extended Phase 1 Habitat Survey Technical Appendix**. Invertebrate surveys took place in those parts of the DCO boundary which had been assessed as providing habitat capable of supporting rare invertebrates.

A data search was also undertaken by Norfolk Biodiversity Information Service (NBIS) in January 2021, which provided records of invertebrates with elevated conservation status within the PEIR boundary and surrounding 2km area. NBIS returned records of 60 moth species and seven aculeate hymenoptera (bees, wasps), but no other invertebrates within the PEIR boundary and within 2km of the landfall area. The desk study data also informed the site selection process. The invertebrate records were non-specific to the landfall area of the DCO boundary but could conceivably occur at the habitats there (although were unlikely to occur elsewhere within the DCO boundary). Most moth species listed pursuant to Section 41 of the NERC Act 2006 are widespread species listed for declines in populations, requiring research only. Beetle records for the landfall area were obtained separately from the Norfolk beetle recorder.

Using the EP1HS and NBIS data, a single site stood out as having high potential for rare invertebrates or important assemblages of invertebrates - the coastal area around the proposed landfall site at Weybourne. The combination of the coastal location and a series of suitable microhabitats (bare ground, short turf, nectar-rich vegetation, south-facing banks, waterbodies) contributed to this evaluation. Other areas within the DCO were discounted because the invertebrate habitats involved, such as hedgerows and field margins, were commonplace within an East Anglian context and considered less likely to hold specialist or habitat-specific species and communities of invertebrates.

Surveys concentrated on two main invertebrate groups, picked out as being likely to be rich on the site and potentially impacted by proposals. These were aculeate hymenoptera and ground-dwelling invertebrates, especially beetles (coleoptera) and bugs (hemiptera). Other groups were recorded but were not specifically targeted. Surveys used yellow water traps, vacuum sampling, sweep netting, direct capture of invertebrates and pitfall trapping techniques to sample invertebrate populations. The surveys were completed during suitable weather conditions between April and September 2021.

Surveys differentiated between habitats, collecting records from both the established fixed dune grassland (classified as SD8d under the National Vegetation Classification) and the dune annuals grassland (classified as SD19). The proposed construction compound area at the landfall location within the DCO boundary largely falls within the

SD19 habitat. Aculeate surveys also collected information from a new bank to the east of the DCO boundary which was especially rich in species.

The 2021 surveys recorded 432 species of invertebrate using the site, of which 41 had elevated conservation status.

The invertebrate species community using the SD19 dune annual habitat was broadly similar to that using the fixed dune habitat. There will be an impact on the invertebrate community from the proposal, as the setting up and use of a temporary compound, excavations and increased vehicular movements will all cause ground and vegetation disturbance, and the terrestrial invertebrates are all dependent upon the plant species, open ground and sandy soils for parts of their life cycles. However, there are reasons to conclude that any impacts on invertebrates will not be permanent, and populations will return once works are finished. Pre-works mitigation and monitoring is suggested to minimise impacts during works. This would potentially include creating low south-facing banks and creating construction exclusion zones in some areas.



## 1. BACKGROUND

Equinor New Energy Limited (hereafter Equinor) is proposing to extend the existing operational Sheringham Shoal Offshore Wind Farm and Dudgeon Offshore Wind Farm, named the Sheringham Extension Project (hereafter SEP) and Dudgeon Extension Project (hereafter DEP). SEP and DEP will consist of a number of offshore and onshore elements including the offshore wind turbines, offshore export cables and offshore substation(s). The offshore export cables will connect to shore on the North Norfolk coast, with onshore infrastructure connecting the offshore wind farms to the National Grid, which will comprise underground cables from landfall to an onshore substation and National Grid connection at Norwich Main. A full description of SEP and DEP is provided within **Chapter 5 Project Description**.

In 2021, WFE was commissioned by Equinor to undertake invertebrate surveys within areas that had been assessed as providing suitable habitat to support rare invertebrates or important assemblages of invertebrates during the EP1HS. The EP1HS was completed between 2020 and early 2021, and covered all accessible parts of the PEIR boundary, which was an earlier and wider iteration of the onshore grid connection cable corridor Order Limits. Data from the EP1HS (and other surveys) informed this site selection process, allowing the narrower, preliminary DCO boundary to avoid (or reduce impacts upon) particularly sensitive areas or features which had been identified within the PEIR boundary. Full results of the EP1HS are provided in **Appendix 20.1: Extended Phase 1 Habitat Survey Technical Appendix**. Invertebrate surveys took place in those parts of the preliminary DCO boundary which had been assessed as providing habitat capable of supporting rare invertebrates. Any such areas within the PEIR boundary but which (following the site selection process) were outside the preliminary DCO boundary were not surveyed because they were avoided.

The findings from the invertebrate surveys have been used to inform the ecological impact assessment of the proposed onshore grid connection for the SEP and DEP, presented in **Chapter 20 Onshore Ecology and Ornithology** of the Environmental Statement which accompanies the DCO application. The onshore components comprise a c.60km route with landfall location around Weybourne on the North Norfolk coast, with the onshore cable corridor then running southwards and eventually eastwards around the west and south sides of Norwich, where it is to connect with a proposed onshore electricity substation near Norwich Main Substation.

Maps showing the survey area are provided in **Figure 1 to Figure 3**, below.

This report outlines the aims, methods and results of the invertebrate surveys completed in 2021.

## 2. RELEVANT LEGISLATION

### 2.1 Non-Statutory County Site Designations

Local authorities designate certain areas as being of local conservation interest. The criteria for inclusion may vary between areas. Most individual counties have a similar scheme, within Norfolk such sites are designated as County Wildlife Sites (CWS). Designation of such sites does not itself confer statutory protection, but they are a material consideration when planning applications are being determined.

### 2.2 Species Designation and Protection

Over the past thirty years, numerous lists of conservation status have been produced: Red Lists, Biodiversity Action Plan Priority Lists, species listed on European Directives, species listed on the Schedules of the Wildlife & Countryside Act, together with lists of rare and scarce species. There is considerable overlap between these and some species appear on several of them.

Some invertebrate species are afforded legal protection under the Wildlife and Countryside Act 1981. Nine of these species occur in Norfolk. These are:

- Chalkhill Blue Butterfly *Lysandra coridon*
- Silver-studded Blue Butterfly *Plebejus argus*
- Purple Emperor Butterfly *Apatura iris*
- White Letter Hairstreak Butterfly *Stymonida w-album*
- Swallowtail Butterfly *Papilio machaon*
- White-clawed Crayfish *Austropotamobius pallipes*
- Norfolk Hawker Dragonfly *Aeshna isosceles*
- Fairy Shrimp *Chirocephalus diaphanus*
- Fen Raft Spider *Dolomedes plantarius*

There are species listed pursuant to Section 41 of the NERC Act 2006, known as Species of Principal Importance in England, or Priority Species, which require specific consideration in the planning process. See section 2.4 below.

### 2.3 Evaluation of Conservation Status

Other species have been afforded conservation status because of their rarity, local distribution or lack of knowledge of the species. Status at this level is not legal, but requires consideration within ecological impact assessment. There is an old and a new system for evaluation of conservation status, both of which are still used for different taxa. In the tables within this report, some statuses are reported in square brackets. This is to indicate that these are considered out of date and should be used with caution.

**The 'old' system** - has species having been evaluated using the pre-1994 International Union on the Conservation of Nature (IUCN) criteria: Categories are as follows:

- **Red Data Book category 1 (RDB 1) - Endangered.** Taxa in danger of extinction in Great Britain and whose survival is unlikely if the 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 as follows:



- Species which are known or believed to occur as only a single population within one 10km square of the Ordnance Survey National Grid Reference mapping system;
  - 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 10km squares; and/or
  - Species which are possibly extinct but have been recorded this century and if rediscovered would need protection.
- **Red Data Book category 2 (RDB 2) - Vulnerable.** 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 as follows:
    - Species declining throughout their range; and,
    - Species in vulnerable habitats.
  - **Red Data Book category 3 (RDB 3) - Rare.** 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. Criterion for inclusion is as follows:
    - Species which are estimated to exist in only fifteen or fewer 10km squares. This criterion may be relaxed where populations are likely to exist in over fifteen 10km squares but occupy small areas of especially vulnerable habitat.
  - **Red Data Book category 4 (RDB 4) - Out of Danger.** Taxa formerly meeting the criteria of one of the above categories, but which are now considered relatively secure because effective conservation measures have been taken or the previous threat to their survival in Great Britain has been removed.
  - **Red Data Book category 5 (RDB 5) - Endemic.** Taxa which are not known to occur naturally outside Great Britain. Taxa within this category may also be in any of the other RDB categories or not threatened at all.
  - **Red Data Book Appendix (RDB app.) - Extinct.** Taxa which were formerly native to Great Britain but have not been recorded since 1900.
  - **Red Data Book category I (RDB 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.
  - **Red Data Book category K (RDB K) - Insufficiently Known.** Taxa in Great Britain that are suspected but not definitely known, to belong to any of the above categories, because of lack of information.

- **Nationally Rare** is conventionally defined as species which are found in 15 or fewer hectads (10x10km squares) nationally.
- **Nationally Scarce** (also termed **Nationally Notable (Na, Nb, NS)** relates to species which are found in between 16 and 100 hectads. This category is subdivided into Nationally Scarce (Nationally Notable) A - species found in 16 to 30 hectads, and Nationally Scarce (Nationally Notable) B - species found in between 31 and 100 hectads.
- A status of **Local** is also sometimes used, referring to species found in between 101 and 300 hectads.

The 'New' system is a two-pronged approach that separates rarity from threat. Threat is calculated using internationally recognised post-2001 IUCN criteria. Not all species groups have been classified using the new system, so the old system is still relied on for those groups:

- EX - Extinct
- RE - Regionally Extinct
- CR - Critically Endangered
- CR(PE) - Critically Endangered (Possibly Extinct)
- EN - Endangered
- VU - Vulnerable
- NT - Near Threatened
- DD - Data Deficient
- LC - Least Concern
- NA - Not Assessed
- NE - Not Evaluated

## 2.4 Priority Species and Habitats

The Overarching National Policy Statement (NPS) for Energy (EN-1) (DECC 2011b) and the draft Overarching NPS for Energy (EN-1) (BEIS, 2021) contain guidance regarding the assessment of the potential impacts of projects on biodiversity. Paragraph 5.3.3 of the adopted NPS for Energy (EN-1) states that "Where the development is subject to EIA the applicant should ensure that the ES clearly sets out any effects on internationally, nationally and locally designated sites of ecological or geological conservation importance, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity." Paragraph 5.3.4 also states that "The applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests."

The adopted NPS (EN-1) includes further guidance on the approach to assessment of international sites, sites of special scientific interest, marine conservation zones, regional and local sites, and ancient woodland and veteran trees. It also considers biodiversity within developments, the protection of habitats and other species and mitigation.

Other priority species and habitats are a consideration under the National Planning Policy Framework (NPPF) 2021<sup>1</sup> (para 179b), placing responsibility on Local Planning Authorities to aim to conserve and enhance biodiversity and to encourage biodiversity in and around developments. There is a general biodiversity duty in the Natural Environment and Rural Communities (NERC) Act 2006 (Section 40) which requires every public body in the exercising of its functions to ‘have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity’. Biodiversity, as covered by the Section 40 duty, includes all biodiversity, not just the Habitats and Species of Principal Importance.

Section 41 of the NERC Act requires the Secretary of State to publish a list of certain species and habitats, being Species/Habitats of Principal Importance. These are species/habitats in England (also known as Priority Habitats/ Species) which had been identified as requiring action under the UK BAP, and which continue to be regarded as conservation priorities under the UK Post-2010 Biodiversity Framework. The protection of either Priority Species or Habitats is not statutory, but “specific consideration”<sup>2</sup> should be afforded by decision makers when dealing with them in relation to planning and development control. Also, there is an expectation that public bodies would refer to the Section 41 list when complying with the Section 40 duty.

Widespread Priority Invertebrate Species in East Anglia (which have no specific legal protection) include:

- Small heath butterfly *Coenonympha pamphilus*
- Wall butterfly *Lasiommata megera*
- Cinnabar moth *Tyria jacobaeae*
- White Ermine moth *Spilosoma lubricipeda*
- Many other common moth species.

## 2.5 Policy

Section 15 of the NPPF (2021) (Conserving and Enhancing the Natural Environment) outlines the approach that decision makers should adopt when considering ecological issues within the planning framework, including the principles of the Mitigation Hierarchy. This espouses that in addressing impacts on valued features, avoidance should be the first option considered, followed by mitigation (minimising negative impacts). Where avoidance and mitigation are not possible, compensation for loss of features can be used as a last resort. Paragraph 180(d) of the NPPF requires opportunities to incorporate biodiversity improvements in and around development as part of the design, especially where this can secure measurable **net gains** for biodiversity or enhance public access to nature where this is appropriate. Paragraph 179 specifies that plans should identify, map and safeguard components of local wildlife-rich habitats and wider ecological networks, including locally designated sites (such as CWS). It also promotes the conservation, restoration and enhancement of

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<sup>1</sup> MHCLG (2021). National Planning Policy Framework. UK Government

<sup>2</sup> JNCC (2015) UK BAP priority species and habitats



priority habitats and ecological networks and the protection and recovery of priority species.

## 3. STUDY OBJECTIVES

### 3.1 Field Survey

The objectives of the field survey were to use indicative invertebrate groups (aculeate hymenoptera, hemiptera and coleoptera) to evaluate the importance of the selected site for invertebrates as a whole. Another main objective was to identify and locate populations of rare and scarce species within these groups (and species outwith these groups where encountered), in order to inform impact assessment and mitigation options.

### 3.2 Report

The objectives of the report were to accurately disseminate the results of the field survey, and to provide an evaluation of the importance of the habitats; also to put forward appropriate mitigation measures where important habitat and populations of species are likely to be impacted.

## 4. SURVEY METHODS

### 4.1 Desk Study

#### 4.1.1 Norfolk Biodiversity Information Service Invertebrate Records

A data search was undertaken in January 2021 where a request was made to NBIS for all biological records of species of conservation concern within the PEIR boundary and surrounding 2km area. Conservation concern is defined by NBIS; species qualify when they meet one or more of 112 specific criteria such as being listed as species of conservation concern in key guidance documents. Examples include the British Red Data Book, certain International Union for the Conservation of Nature (IUCN) listings or UK BAP species, for example.

#### 4.1.2 Other Data Sources

A survey of the landfall area using mainly pitfall trapping was previously conducted in 2015 by the Norfolk beetle recorder, Martin Collier, who has made results available.

### 4.2 Site Selection

The site selection process and the refinement from PEIR boundary to DCO boundary throughout 2020 and early 2021 actively excluded many areas of relatively high ecological value from the Order Limits. Although the refined DCO boundary is still extensive, much of the land included within it comprises intensively farmed habitat of low to moderate value to invertebrates. Many of these habitats are extensive in a district or county context, for example arable fields, margins and hedgerows. The sandy dune grassland of the coastal area at Weybourne was perceived as being much more unusual in a county context, and appeared to have several features, listed below, which suggested a high likelihood of an unusual, specialised invertebrate fauna:

- Open sandy bare ground
- South-facing banks
- High flowering plant diversity
- Good vegetation structure with scrub, tall herb and diverse edge habitat.
- Areas of mud and open water
- Coastal location

To support the site selection, the coastal area in North Norfolk is defined as being an Important Invertebrate Area<sup>3</sup>. The site also falls within the descriptions of high diversity sites listed by Buglife.<sup>4</sup>

This site was therefore taken forward for more intensive invertebrate surveys. Other sites such as river valleys were considered (and one particular invertebrate species, white-clawed crayfish *Austropotamobius pallipes* was surveyed for); however, many of the habitats in those locations showed little suitable potential for supporting a specialised invertebrate fauna. For example, many of the watercourses within the DCO

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<sup>3</sup> Important Invertebrate Areas - Buglife (accessed 4<sup>th</sup> May 2022)

<sup>4</sup> Good-practice-planning-LPAs.pdf (██████████) (accessed 4<sup>th</sup> May 2022)



boundary would be likely to support numbers of wetland invertebrates, but there were no particular features of the watercourse within the DCO boundary which suggested they would be richer in invertebrates there as opposed to the rest of the watercourse. Therefore, most likely the same fauna would be found in abundance upstream and downstream of the crossing point and impacts of SEP and DEP on this fauna would therefore be less likely as a result.

In the broad area selected, around the landfall area known as Weybourne Camp, an area larger than the DCO boundary was surveyed. This was because the DCO boundary was undergoing further refinement at the time the surveys were designed and carried out; and also because surveying the additional areas gave a wider context to the surveys and findings which would prove useful in analysing and interpreting the results.

### 4.3 Site Definition

Figure 1 to Figure 3 show the area covered by the invertebrate surveys.

### 4.4 Field Survey

Survey work was commenced on 22<sup>nd</sup> April 2021 and continued through to 7<sup>th</sup> September 2021. The surveys were undertaken by Robert Yaxley BSc (Hons) CEcol CEnv MCIEEM and Nick Owens MA PhD (Cantab.).

The following visits (in suitable weather conditions) were subsequently made by R. Yaxley and N. Owens to selected areas to undertake intensive invertebrate sampling:

- 22<sup>nd</sup> April 2021. Sweep netting, direct capture, beating vegetation, water traps.
- 7<sup>th</sup> May 2021. Pitfall trapping, vacuum sampling, water traps.
- 24<sup>th</sup> May 2021. Pitfall trap retrieval.
- 23<sup>rd</sup> June 2021. Vacuum sampling, water traps
- 20<sup>th</sup> July 2021. Vacuum sampling, water traps
- 18<sup>th</sup> August 2021. Vacuum sampling, water traps.
- 7<sup>th</sup> September 2021. Sweep netting, direct capture, water traps.

The site was evaluated as having high potential for aculeate hymenoptera (bees and wasps) due to the amounts of sandy bare ground

Sampling methods included vacuum sampling (McCulloch Partner GBV325 Garden Vacuum), sweep net, lightweight butterfly net, pitfall trapping (see Appendix 3, Photo 8) and beating tray. Samples were collected (e.g. Photo 7), and placed in 70% alcohol on site, and then preserved until sorted and identified. Photographs were taken on site, and also of selected specimens for identification.

Identification of aculeate hymenoptera was made by Nick Owens (Photo 6). Identifications of other groups were largely made by Robert Yaxley BSc CEcol CEnv MCIEEM using current literature and online resources (references available for specific groups on request). Specimens of beetle species with elevated conservation status (and some other difficult species) were verified by Martin Collier, Norfolk beetle recorder.

The survey was conducted in terms of an investigation as opposed to a repeatable study, and therefore took a loosely structured approach, with the survey points varying

between visits according to seasonal and daily weather conditions. As the season progressed, survey effort moved towards the eastern end of the site where the predicted landfall position was indicated. Water traps were placed in sunny areas near to nectar sources or concentrations of aculeates. Vacuum sampling was undertaken in a range of different vegetation lengths and structures on each visit. Sampling locations are shown on **Figure 2** to **Figure 3**.

### 5.5 Data Analysis

Invertebrate data was analysed using the Pantheon<sup>5</sup> tool for analysing invertebrate samples. The tool is able to assign species various characteristics in terms of habitat associations, and derives an index for favourable condition of that habitat.

### 5.6 Constraints and Limitations of Survey

The surveys are not, and were never designed to be, a complete inventory of invertebrates on the site; however they do provide an indication of the site's value for invertebrates. This may mean that rare species are present on the site which have not been recorded or identified. However, the survey was able to identify which parts of the site held greatest value for invertebrates as a whole, so it is considered that effective avoidance/ mitigation can be proposed which should protect the most valued areas and associated species.

There were no particular time constraints associated with the survey; however early-season weather was cold in 2021, which may have provided a limitation on the range of early season invertebrate species detected.

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<sup>5</sup>  (Developed by Natural England / Centre for Ecology and Hydrology)

Figure 1. Invertebrate Survey Area

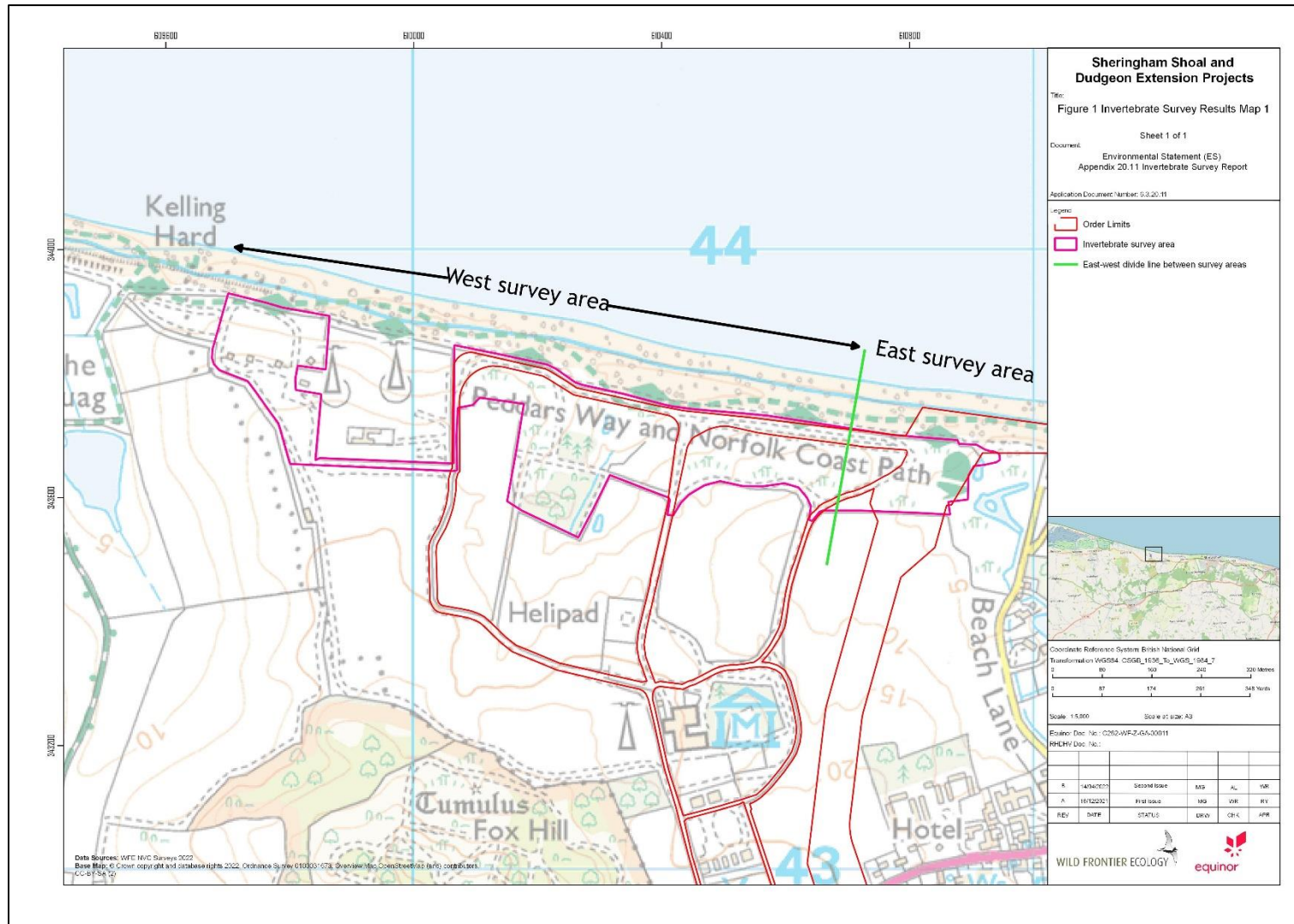




Figure 2. Sampling Points and Dates - western part of landfall area

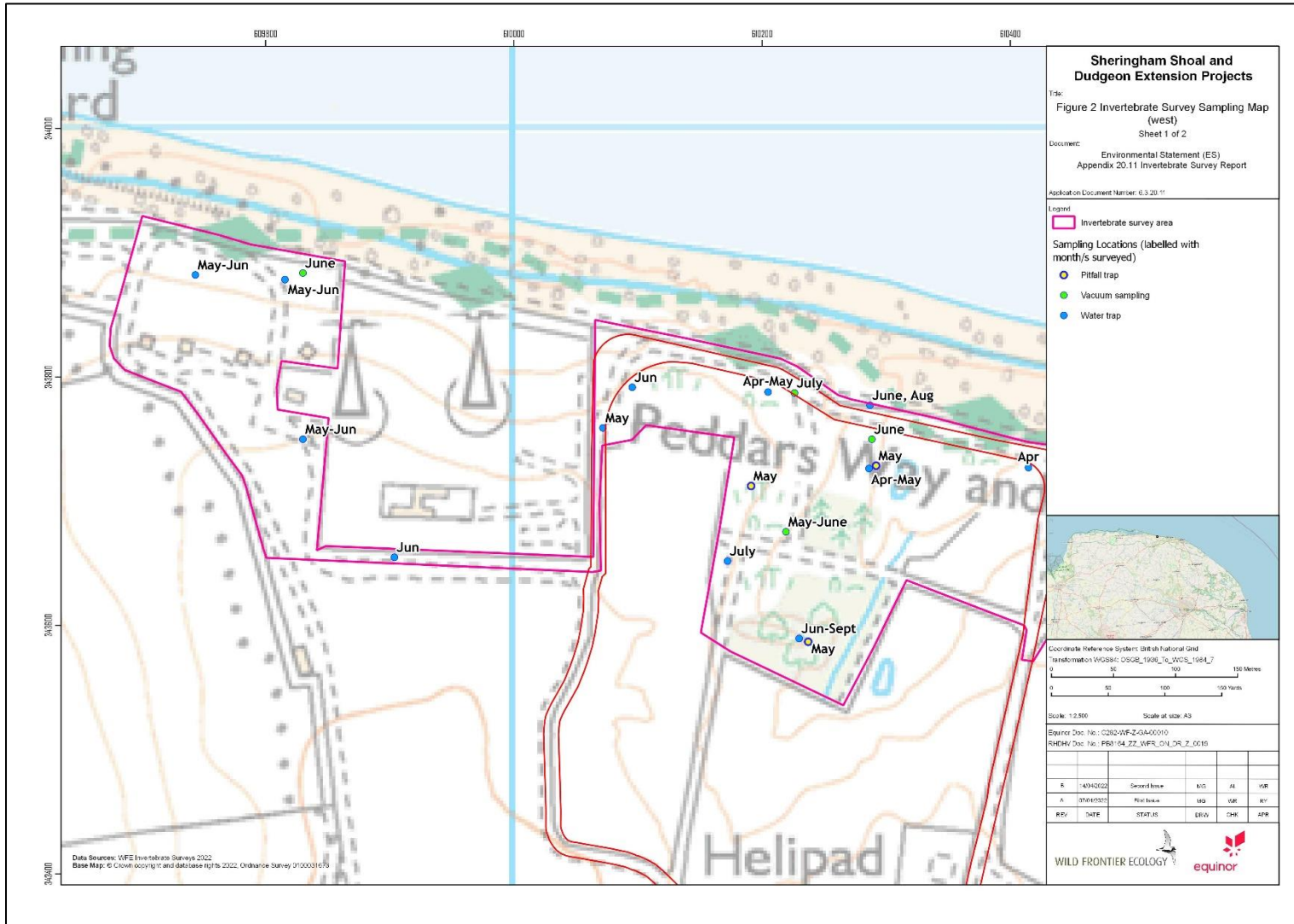




Figure 3. Sampling Points and Dates - eastern part of landfall area



## 5. RESULTS

### 5.1 Desk Study

#### 5.1.1 Norfolk Biodiversity Information Service Invertebrate Records

The NBIS data search returned a number of invertebrate records for Weybourne parish, some of which may refer to the landfall site area. These are detailed in **Table 1**.

**Table 1. Species of Conservation Concern Returned by NBIS Data Search**

Taxon group	Scientific name	English Name	Conservation status
Moth	<i>Hepialus humuli</i>	Ghost Moth	S41 Priority Species (research only)
Moth	<i>Crombrugghia distans</i>	Breckland Plume	Breck Special*
Moth	<i>Calamotropha paludella</i>	Bulrush Veneer	Nb
Moth	<i>Crambus hamella</i>	Dark Grass-veneer	Nb
Moth	<i>Pediasia contaminella</i>	Waste Grass-veneer	Nb
Moth	<i>Schoenobius gigantella</i>	Giant Water-veneer	Nb
Moth	<i>Watsonalla binaria</i>	Oak Hook-tip	S41 Priority Species (research only)
Moth	<i>Trichiura crataegi</i>	Pale Eggar	S41 Priority Species (research only)
Moth	<i>Scopula marginepunctata</i>	Mullein Wave	S41 Priority Species (research only)
Moth	<i>Timandra comae</i>	Blood-vein	S41 Priority Species (research only)
Moth	<i>Phibalapteryx virgata</i>	Oblique Striped	Breck Special
Moth	<i>Scotopteryx chenopodiata</i>	Shaded Broad-bar	S41 Priority Species (research only)
Moth	<i>Xanthorhoe ferrugata</i>	Dark-barred Twin-spot Carpet	S41 Priority Species (research only)
Moth	<i>Pelurga comitata</i>	Dark Spinach	S41 Priority Species (research only)
Moth	<i>Ecliptopera silaceata</i>	Small Phoenix	S41 Priority Species (research only)
Moth	<i>Melanthia procellata</i>	Pretty Chalk Carpet	S41 Priority Species (research only)
Moth	<i>Chesias legatella</i>	Streak	S41 Priority Species (research only)
Moth	<i>Lithostege griseata</i>	Grey Carpet	RDB3: S41 Priority Species
Moth	<i>Chiasmia clathrata</i>	Latticed Heath	S41 Priority Species (research only)
Moth	<i>Ennomos fuscantaria</i>	Dusky Thorn	S41 Priority Species (research only)
Moth	<i>Lycia hirtaria</i>	Brindled Beauty	S41 Priority Species (research only)
Moth	<i>Hemistola chrysoprasaria</i>	Small Emerald	S41 Priority Species



Taxon group	Scientific name	English Name	Conservation status
			(research only)
Moth	<i>Spilosoma lutea</i>	Buff Ermine	S41 Priority Species (research only)
Moth	<i>Spilosoma lubricipeda</i>	White Ermine	S41 Priority Species (research only)
Moth	<i>Arctia caja</i>	Garden Tiger	S41 Priority Species (research only)
Moth	<i>Tyria jacobaeae</i>	Cinnabar	S41 Priority Species (research only)
Moth	<i>Tyta luctuosa</i>	Four-spotted	RDB2: S41 Priority Species
Moth	<i>Acronicta psi</i>	Grey Dagger	S41 Priority Species (research only)
Moth	<i>Acronicta rumicis</i>	Knot Grass	S41 Priority Species (research only)
Moth	<i>Amphipyra tragopoginis</i>	Mouse Moth	S41 Priority Species (research only)
Moth	<i>Asteroscopus sphinx</i>	Sprawler	S41 Priority Species (research only)
Moth	<i>Allophyes oxyacanthae</i>	Green-brindled Crescent	S41 Priority Species (research only)
Moth	<i>Heliothis virescens</i>	Marbled Clover	IUCN (pre 1994) Rare
Moth	<i>Caradrina morpheus</i>	Mottled Rustic	S41 Priority Species (research only)
Moth	<i>Hoplodrina blanda</i>	Rustic	S41 Priority Species (research only)
Moth	<i>Helotropha leucostigma</i>	Crescent	S41 Priority Species (research only)
Moth	<i>Hydraecia micacea</i>	Rosy Rustic	S41 Priority Species (research only)
Moth	<i>Amphipoea oculatea</i>	Ear Moth	S41 Priority Species (research only)
Moth	<i>Rhizedra lutosa</i>	Large Wainscot	S41 Priority Species (research only)
Moth	<i>Apamea remissa</i>	Dusky Brocade	S41 Priority Species (research only)
Moth	<i>Apamea anceps</i>	Large Nutmeg	S41 Priority Species (research only)
Moth	<i>Litoligia literosa</i>	Rosy Minor	S41 Priority Species (research only)
Moth	<i>Cirrhia icteritia</i>	Sallow	S41 Priority Species (research only)
Moth	<i>Cirrhia gilvago</i>	Dusky-lemon Sallow	S41 Priority Species (research only)
Moth	<i>Agrochola lychnidis</i>	Beaded Chestnut	S41 Priority Species (research only)
Moth	<i>Agrochola litura</i>	Brown-spot Pinion	S41 Priority Species (research only)

Taxon group	Scientific name	English Name	Conservation status
Moth	<i>Agrochola helvola</i>	Flounced Chestnut	S41 Priority Species (research only)
Moth	<i>Atethmia centrago</i>	Centre-barred Sallow	S41 Priority Species (research only)
Moth	<i>Mniotype adusta</i>	Dark Brocade	S41 Priority Species (research only)
Moth	<i>Orthosia gracilis</i>	Powdered Quaker	S41 Priority Species (research only)
Moth	<i>Tholera cespitis</i>	Hedge Rustic	S41 Priority Species (research only)
Moth	<i>Melanchra persicariae</i>	Dot Moth	S41 Priority Species (research only)
Moth	<i>Ceramica pisi</i>	Broom Moth	S41 Priority Species (research only)
Moth	<i>Leucania comma</i>	Shoulder-striped Wainscot	S41 Priority Species (research only)
Moth	<i>Euxoa tritici</i>	White-line Dart	S41 Priority Species (research only)
Moth	<i>Euxoa nigricans</i>	Garden Dart	S41 Priority Species (research only)
Moth	<i>Diarsia rubi</i>	Small Square-spot	S41 Priority Species (research only)
Moth	<i>Noctua orbona</i>	Lunar Yellow Underwing	Breck Special, S41 Priority Species
Moth	<i>Xestia agathina</i>	Heath Rustic	S41 Priority Species (research only)
Moth	<i>Eugnorisma glareosa</i>	Autumnal Rustic	S41 Priority Species (research only)
Aculeate hymenopteran	<i>Andrena bimaculata</i>	Large Gorse Mining Bee	Nb
Aculeate hymenopteran	<i>Lasioglossum pauxillum</i>	Lobe-spurred Furrow Bee	Na
Aculeate hymenopteran	<i>Dolichovespula media</i>	Median wasp	Na
Aculeate hymenopteran	<i>Bombus muscorum</i>	Moss Carder-bee	S41 Priority Species
Aculeate hymenopteran	<i>Bombus ruderarius</i>	Red-shanked Carder-bee	S41 Priority Species
Aculeate hymenopteran	<i>Bombus ruderatus</i>	Large Garden (Ruderal) Bumblebee	S41 Priority Species
Aculeate hymenopteran	<i>Bombus rupestris</i>	Red-tailed (Hill) Cuckoo Bee	Nb

\*Breck Special - Species identified as Breckland specialists by the Breckland Biodiversity audit 2010

Many of the above species have elevated conservation status on the basis of widespread population decline, and the actions required for each of these Priority Species are for research only (i.e. there are no conservation actions). Therefore while their potential presence is worth noting, it has limited implications for site assessment or mitigation.

### 5.1.2. Other Data Sources

The 2015 beetle survey produced a list of 133 species, of which ten have elevated conservation status, as listed in **Table 2** below. The full list is given in Annex 1.

**Table 2. Beetles of Conservation Concern from 2015 survey**

Family	Scientific name	English Name	Conservation status
Carabidae	<i>Amara lucida</i>	Ground beetle	Nb
Cryptophagidae	<i>Atomaria scutellaris</i>	Silken fungus beetle	RDB K
Curculionidae	<i>Cathormiocerus aristatus</i>	Weevil	Nb
Curculionidae	<i>Gronops lunatus</i>	Weevil	Nb
Curculionidae	<i>Neliocarus (Strophosoma) faber</i>	Weevil	Nb
Curculionidae	<i>Orthochaetes setiger</i>	Weevil	Nb
Curculionidae	<i>Sibinia primita</i>	Weevil	Nb
Helophoridae	<i>Helophorus nubilus</i>	Water scavenger beetle	NS
Histeridae	<i>Onthophilus punctatus</i>	Clown beetle	RDB K
Staphylinidae	<i>Oxypoda lurida</i>	Rove beetle	Nb

## 5.2 Field Surveys

Field surveys produced a list of 432 species of invertebrate within the study site. A full list is given in Annex 2. The survey found specimens of 41 species of Conservation Concern, listed in Table 3, which should be taken forward, either individually, or as an assemblage, for assessment. Approximately one third of the UK's bee species (76 species of Andrenidae and Apidae in total) were found on site.

**Table 3. Species of Conservation Concern Recorded on Site**

Taxon group	Family	Scientific name	English name	Conservation status	On-site status and notes
Hymenoptera (Aculeata)	Andrenidae	<i>Andrena alfkenella</i>	Alfken’s mini-mining bee	RDB3	Found in small numbers, mainly in western half of site. Nests in sandy/ chalky banks, likes to visit Apiaciae
Hymenoptera (Aculeata)	Andrenidae	<i>Andrena bimaculata</i>	Large gorse mining bee	Nb	Found mainly in fixed dune areas across the site. Nests in sandy soil, likes to visit Ulex spp. Parasitised by <i>Nomada fulvicornis</i> .
Hymenoptera (Aculeata)	Andrenidae	<i>Andrena hattorfiana</i>	Large scabious mining bee	RDB3	One male recorded in the west of the site in fixed dune habitat. Collects pollen from field scabious <i>Knautia arvensis</i> (present on site).
Hymenoptera (Aculeata)	Andrenidae	<i>Andrena marginata</i>	Small scabious mining bee	Na	One female recorded in the west of the site in fixed dune habitat. Collects pollen from field scabious <i>Knautia arvensis</i> (present on site).
Hymenoptera (Aculeata)	Andrenidae	<i>Andrena trimmerana</i>	Trimmer’s mining bee	Nb	One female from west of site and two (a female and a male) from the east: Generally distributed, having been recorded from coastal landslips and cliffs and, inland, from heaths, open woodland, chalk grassland, fens, commons and gardens. Parasitised by <i>Nomada marshamella</i> .
Lepidoptera	Arctiidae	<i>Arctia caja</i>	Garden tiger	S41 Priority Species (research only)	Caterpillar seen in June in fixed dune area. Caterpillar feeds on a number of herbaceous plants.
Coleoptera	Curculionidae	<i>Aulacobaris picicornis</i>	A weevil	Nb	Recorded in June in fixed dune grassland. Larvae feed on wild mignonette <i>Reseda lutea</i> .
Coleoptera	Carabidae	<i>Bembidion iricolor</i>	A ground beetle	NS	Recorded from CWS to the west of the MOD compound. Very little available information about life cycle, but most Bembidion are ground dwelling hunters, often in damper habitats.

Taxon group	Family	Scientific name	English name	Conservation status	On-site status and notes
Hymenoptera (Aculeata)	Apidae	<i>Bombus rupestris</i>	Red-tailed cuckoo bee	Nb	One female recorded in September in the extreme east of the site. Parasite of red-tailed bumblebee <i>Bombus lapidarius</i> .
Coleoptera	Curculionidae	<i>Brachysomus echinatus</i>	A weevil	Nb	Recorded in May in the fixed dune grassland. On the roots of various plant species in grassy places.
Coleoptera	Curculionidae	<i>Cathormiocerus aristatus</i>	A weevil	Nb	Recorded across the site, May and August. On plant roots, uses <i>Plantago</i> species but probably polyphagous (photo 10)
Hymenoptera (Aculeata)	Crabronidae	<i>Cerceris quinquefasciata</i>	Five-banded weevil wasp	S41 Priority Species	Recorded in August near a tank track edge in the eastern half of the site. Nests gregariously in sandy sunny areas. Preys on adult weevils.
Hymenoptera (Aculeata)	Chrysididae	<i>Cleptes nitidulus</i>	Chrysidid wasp	Na	One male recorded in the west of the site. Parasite of Tenthredid sawflies.
Lepidoptera	Nymphalidae	<i>Coenonympha pamphilus</i>	Small heath	S41 Priority Species: RDB NT	Recorded in June in the west of the site. Larvae found at the base of tussocks of various grass species.
Hymenoptera (Aculeata)	Apidae	<i>Dasypoda hirtipes</i>	Pantaloon bee	[Nb]	Recorded at either end of the site in August. Females mainly excavate their nests in sandy, sparsely vegetated, level soil.
Coleoptera	Curculionidae	<i>Gronops lunatus</i>	A weevil	Nb	Recorded across the site through the season. Host plants include <i>Spergularia</i> spp. And <i>Cerastium</i> spp. Adults are nocturnal and spend daylight hours around the roots of the host plant (photo 9).
Lepidoptera	Nymphalidae	<i>Hipparchia semele</i>	Grayling	S41 Priority Species: RDB VU	Two (mating pair) seen along northern edge of site in July. Feeds on various grasses.
Hymenoptera (Aculeata)	Apidae	<i>Lasioglossum malachurum</i>	Sharp-collared furrow bee	Nb	Recorded frequently across the site. Nests in aggregations, occasionally of considerable extent, especially in exposed soil at the base of coastal

Taxon group	Family	Scientific name	English name	Conservation status	On-site status and notes
					cliffs and similar unstable locations where vegetation is sparse. Nest burrows are often observed in the hard trodden soil of footpaths.
Hymenoptera (Aculeata)	Apidae	<i>Lasioglossum pauxillum</i>	Lobe-spurred furrow bee	Na	Nest aggregation at west end of the site. Nests in small to large aggregations, mainly on level, sparsely vegetated soil.
Lepidoptera	Nymphalidae	<i>Lasiommata megera</i>	Wall butterfly	S41 Priority Species: RDB NT	One seen in June. Caterpillar feeds on various grasses; overwinters as a larva.
Odonata	Libellulidae	<i>Libellula fulva</i>	Broad-bodied Chaser	NT	One seen by pond in June. Larvae are aquatic, adults generally stay near water.
Hymenoptera (Aculeata)	Apidae	<i>Megachile leachella</i>	Silvery leaf-cutter bee	[Nb]	Nests recorded in fixed dune grassland in June. Nest burrows are excavated in the soil. Occasionally nests occur in compact and extensive aggregations.
Diptera	Sarcophagidae	<i>Miltogramma germari</i>	A fly	pNS	Found in July on bund to east of site. Parasite of burrowing aculeates.
Coleoptera	Curculionidae	<i>Neliocarus (Strophosoma) faber</i>	A weevil	Nb	Found across the site through the season. Feeds on a variety of plant species. Larvae are found in the soil.
Hymenoptera (Aculeata)	Apidae	<i>Nomada fucata</i>	Painted nomad bee	Na	Found across the site. Cleptoparasitic on <i>Andrena flavipes</i> . Its current abundance suggests that its Notable status should be revised.
Hymenoptera (Aculeata)	Apidae	<i>Nomada fulvicornis</i>	Orange-horned nomad bee	RDB3	Found across the site in April/ May. Cleptoparasitic on <i>Andrena bimaculata</i> and <i>A. tibialis</i> .
Hymenoptera (Aculeata)	Apidae	<i>Nomada zonata</i>	Variable nomad bee	RDB DD	Found across the site in April and May. Cleptoparasitic on <i>Andrena dorsata</i> .
Hymenoptera	Crabronidae	<i>Nysson dimidiatus</i>	Small-spurred	Nb	Recorded in July near new bank to east of site.



Taxon group	Family	Scientific name	English name	Conservation status	On-site status and notes
(Aculeata)			digger wasp		Parasitic, perhaps of <i>Lindenius albilabris</i> at this site, although <i>Harpactus tumidulus</i> is the usual recognised host species.
Coleoptera	Curculionidae	<i>Orthochaetes setiger</i>	A weevil	Nb	Recorded in August in fixed dune grassland. Larvae form a mine in a range of herbaceous species.
Hymenoptera (Aculeata)	Crabronidae	<i>Pemphredon lethifer</i>	Little black wasp	RDB3	Recorded by MOD compound in June. Nests mainly in stems of <i>Rubus</i> species (Rosaceae), but may also utilise small branches, old wood, or the cigar galls formed on common reed by the chloropid fly <i>Lipara lucens</i> .
Hymenoptera (Aculeata)	Crabronidae	<i>Philanthus triangulum</i>	Bee wolf	[RDB2]	Recorded in July from fixed dune area. This wasp nests in both level sandy exposures and in vertical soil faces. In view of the recent expansion of its range, this status should be revised.
Hymenoptera (Aculeata)	Sphecidae	<i>Podalonia affinis</i>	Mud wasp	RDB3	Recorded in August adjacent to reedbed at eastern end of site. Nests in burrows in coastal sandy soils. Preys on large noctuid moth caterpillars. Recent work indicates that it may be more widespread than previously thought.
Hymenoptera (Aculeata)	Sphecidae	<i>Podalonia hirsuta</i>	Hairy sand wasp	Nb	Recorded in August adjacent to reedbed at eastern end of site. Nests in burrows in coastal sandy soils. Preys on large noctuid moth caterpillars.
Hymenoptera (Aculeata)	Pompilidae	<i>Priocnemis coriacea</i>	A spider wasp	Na	Recorded from west end of site in May. Preys on spiders. Little is known about nesting biology but <i>Priocnemis</i> in general use existing cavities.
Coleoptera	Curculionidae	<i>Sibinia primita</i>	A weevil	Nb	Recorded in dune annual community in August. Larvae feed on pearlworts and spurreys.
Hymenoptera (Aculeata)	Apidae	<i>Sphecodes longulus</i>	Little sickle-jawed blood bee	Na	Recorded near bank and reedbed to east of site in July. A cleptoparasite of mining bees of the

Taxon group	Family	Scientific name	English name	Conservation status	On-site status and notes
					genus <i>Lasioglossum</i> .
Hymenoptera (Aculeata)	Apidae	<i>Sphecodes reticulatus</i>	Reticulate blood-bee	Na	Recorded in August at the edge of a track. Cleptoparasite. Some <i>Andrena</i> species have been implicated as hosts, including <i>A. argentata</i> , <i>A. dorsata</i> (second brood) and <i>A. barbilabris</i> .
Diptera	Tachinidae	<i>Townsendiellomyia nidicola</i>	Browntail botherer	DD but rare*	Found around brown-tail moth caterpillar webs in bramble thickets at the western end of the site. Parasitic on the moth larvae (photo 11)
Lepidoptera	Lasiocampidae	<i>Trichiura crataegi</i>	Pale eggar	S41 Priority Species (research only)	In bramble across the site. Larvae feed on and make webs in blackthorn <i>Prunus spinosa</i> and hawthorn <i>Crataegus monogyna</i> .
Lepidoptera	Erebidae	<i>Tyria jacobaeae</i>	Cinnabar moth	S41 Priority Species (research only)	Seen in June in fixed dune area. Larvae feed on ragwort <i>Jacobaea vulgaris</i> .

\*Identification and status confirmed by Chris Raper of the Natural History Museum. This species has no official conservation status, but has very few records nationally (mainly on the south coast), perhaps due to under-recording.

## 6. PRELIMINARY ANALYSIS AND DISCUSSION

The Pantheon tool was used to analyse the overall species assemblage. The preliminary analysis indicates the following:

- The assemblage returned **favourable invertebrate habitat condition** evaluations for “rich flower resource”, “bare sand and chalk”, “open short sward” and “scrub edge”.
- The number of species recorded with elevated conservation value, as a proportion of the overall number of species recorded, indicates that the site is of **County/ Regional** value for its invertebrate assemblage.
- Many of the species found are associated as much with dry “open ground” as with coastal habitat.
- Around a quarter of the species were associated with tall swards and scrub.
- 40% of the species were associated with sandy habitat.

The species list indicates a community of species present on the site, with a number of species accompanied by their parasites or predators.

The assemblage of invertebrates includes a number of species of Conservation Concern. The surveys show that almost all of these species are associated with habitat features on site (and are therefore likely to be breeding there), which include a south-facing bank of recent origin, open fixed dune grassland (Code SD8d in National Vegetation Classification (NVC)), dune annual grassland (SD19 in NVC) and scrub (W23 and W24 in NVC). The NVC map is included for cross-reference purposes in **Figure 8**.

The survey results from different areas indicate that many species are widespread across the main habitats on site, which are the fixed dune (SD8d, Photo 2) and dune annual (SD19, Photo 3) habitats. It is thought that both the fixed dune vegetation and dune annual communities are important for invertebrates, with the fixed dune having more vegetation and nectar/ pollen sources, and the dune annual community providing open ground for mining and basking. **Figure 4** and **Figure 5** indicate the other habitats, such as the south-facing bank (Photos 1 and 4) to the east of the emerging DCO boundary, which have breeding populations of species of Conservation Concern. The works for the proposed cable landfall are largely due to take place within the dune annual community, which has high proportions of flat bare ground, but relatively low proportions of flower rich sward and is frequently disturbed in places. The origin of the SD19 plant community is from ground that has previously been disturbed by military vehicles from the Muckleburgh Collection, or (at the eastern end of the site) by the previous Dudgeon onshore cable route compound. It is considered that the current high diversity of invertebrates on the site has been aided by the creation of bare ground as a result of these activities. Manipulation of dune communities to create mobile dune systems, with associated bare ground and habitat niches, are encouraged in other areas in the UK through the Dynamic Dunescapes initiative<sup>6</sup>.

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<sup>6</sup> Jones, L.1, Rooney, P.2, Rhymes. J.2 and Dynamic Dunescapes partners (2021). The Sand Dune Managers Handbook. Version 1, June 2021. Produced for the Dynamic Dunescapes (DuneLIFE) project: LIFE17 NAT/UK/000570; HG-16-0864361

Aculeate species are largely mining or burrowing species, or their parasites, with nest chambers underground. They therefore often rely on exposures of bare ground, which indicates the likelihood of adaptability and opportunism within their survival strategies as new bare ground becomes available and other areas become too heavily vegetated for their use.

Beetles and bugs have varying like strategies, with some species living most of their life cycle above ground, while others make use of at least the very top layers of turf and bare ground. Weevils, one of the species groups with a number of scarce species present, generally feed on specific species of plants in the larval stage. Many species are therefore vulnerable to ground and vegetation disturbance impacts.

The presence of a previous temporary compound in the SD19 area (**Figure 3**), together with the current favourable condition of the invertebrate assemblage of open habitats as assessed by Pantheon, suggests that the assemblage there should, in time, be robust in coping with the temporary ground disturbance caused by the SEP and DEP proposals. However, a temporary impact at Local up to County level on some species is almost certain. The ability of the invertebrate community to opportunistically exploit suitable features is demonstrated by the rich community on the new bank to the east of the compound site, which was constructed in 2018.

Fixed dune communities (SD8d) appear to take longer to recover (where they have been visibly altered in recent times, the vegetation has returned as SD19 rather than SD8d). Rather little SD8d will be affected by the works, and it is considered there will still be an acceptable balance of fixed dune and dune annual community across the site to retain favourable condition for invertebrates post-works.

## 6.1 Mitigation and Further Survey

In order to mitigate such impacts, some pre-works mitigation is suggested. A number of low south-facing banks could be engineered in the year before works are due to start, to provide new habitat for burrowing invertebrates such as aculeates. Post-works landscaping could also retain some modest south-facing bank features. The bund to the east of the proposed compound is due to be removed under a planning enforcement order at some point in the near future, so the future of the species which use the newly created habitat there is uncertain, but given they have colonized the bund since it has been constructed (2018), recolonization of any suitable habitat provided post-works will be likely.

A repeat invertebrate survey should be undertaken in the year before construction. This should mark any nests/ burrows of species of Conservation Concern (listed in Table 3) and where possible these will be avoided by works and marked as Construction Exclusion Zones. It is acknowledged that both finding the nesting places and avoidance may not always be possible. Where avoidance is not possible, further actions can be considered, depending on the status of the species on the site and the habitats involved.

The pond (restored in 2020, see **Figure 1** for location, and Photo 5), although not studied in detail within this survey, is without doubt a major source of invertebrate diversity on the site. It will be entirely avoided by works.

Post-construction, it is considered that natural regeneration of plant growth would be the best option in the SD19 dune annual areas, potentially accelerated by seed collection from retained dune annual areas. This would leave sufficient open ground for recolonization by mining aculeates and provide suitable colonizing areas for many of the coleopteran species.

Figure 4. Invertebrate Survey Results Maps - average species of Conservation Concern per visit per sampling point

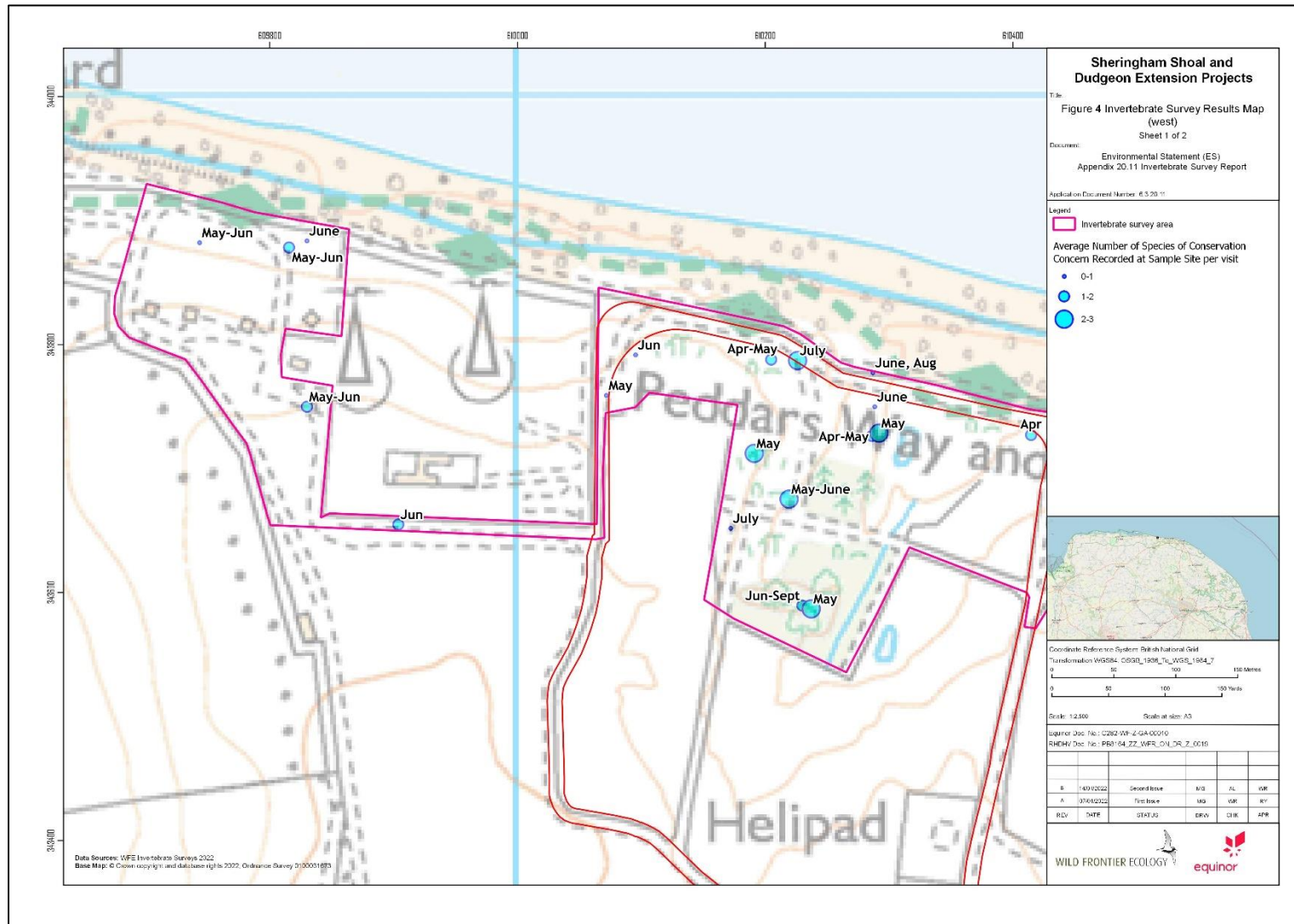




Figure 5. Invertebrate Survey Results Maps - average species of Conservation Concern per visit per sampling point

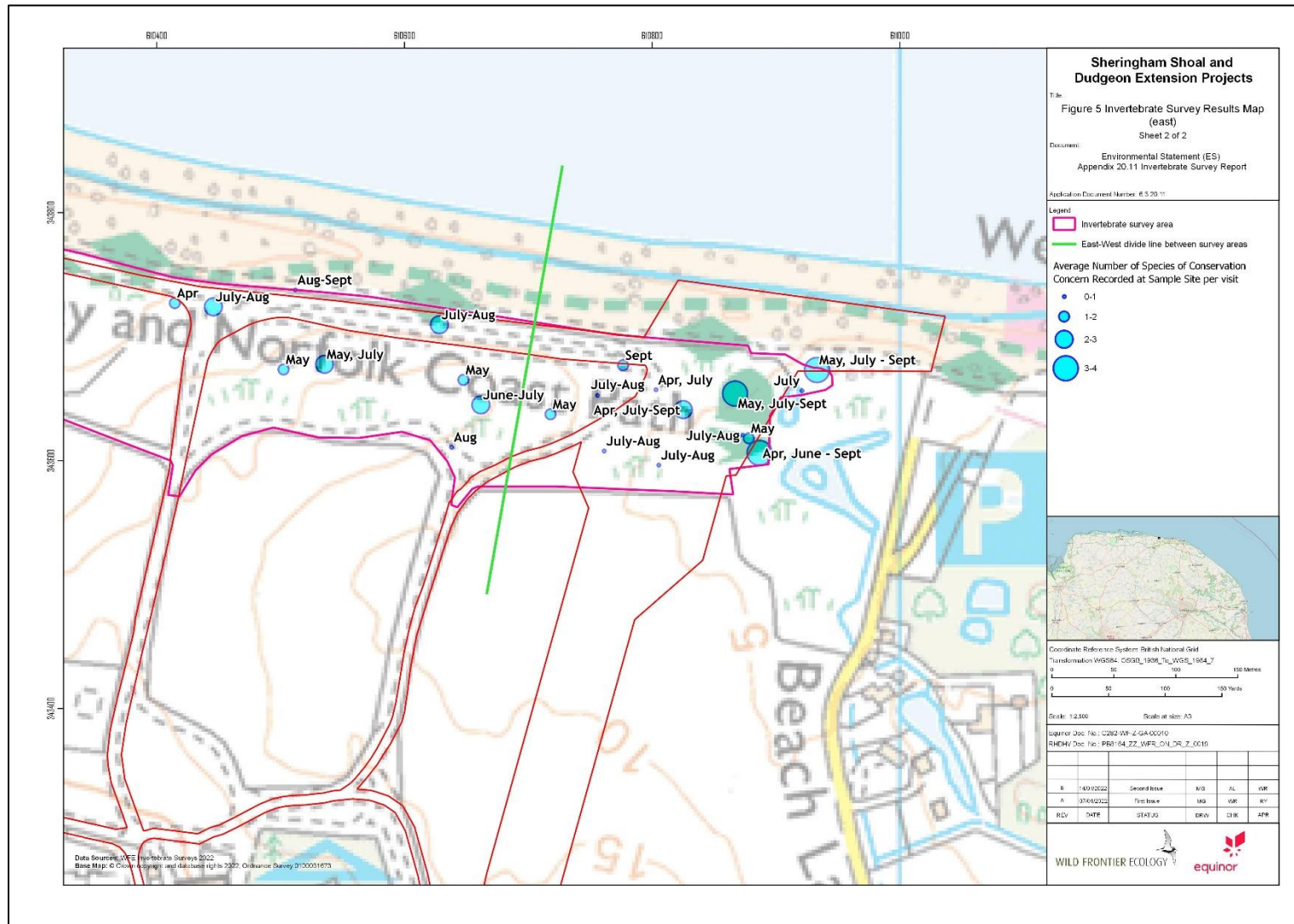




Figure 6. Invertebrate Survey Results Maps - total number of species of Conservation Concern for each sampling point

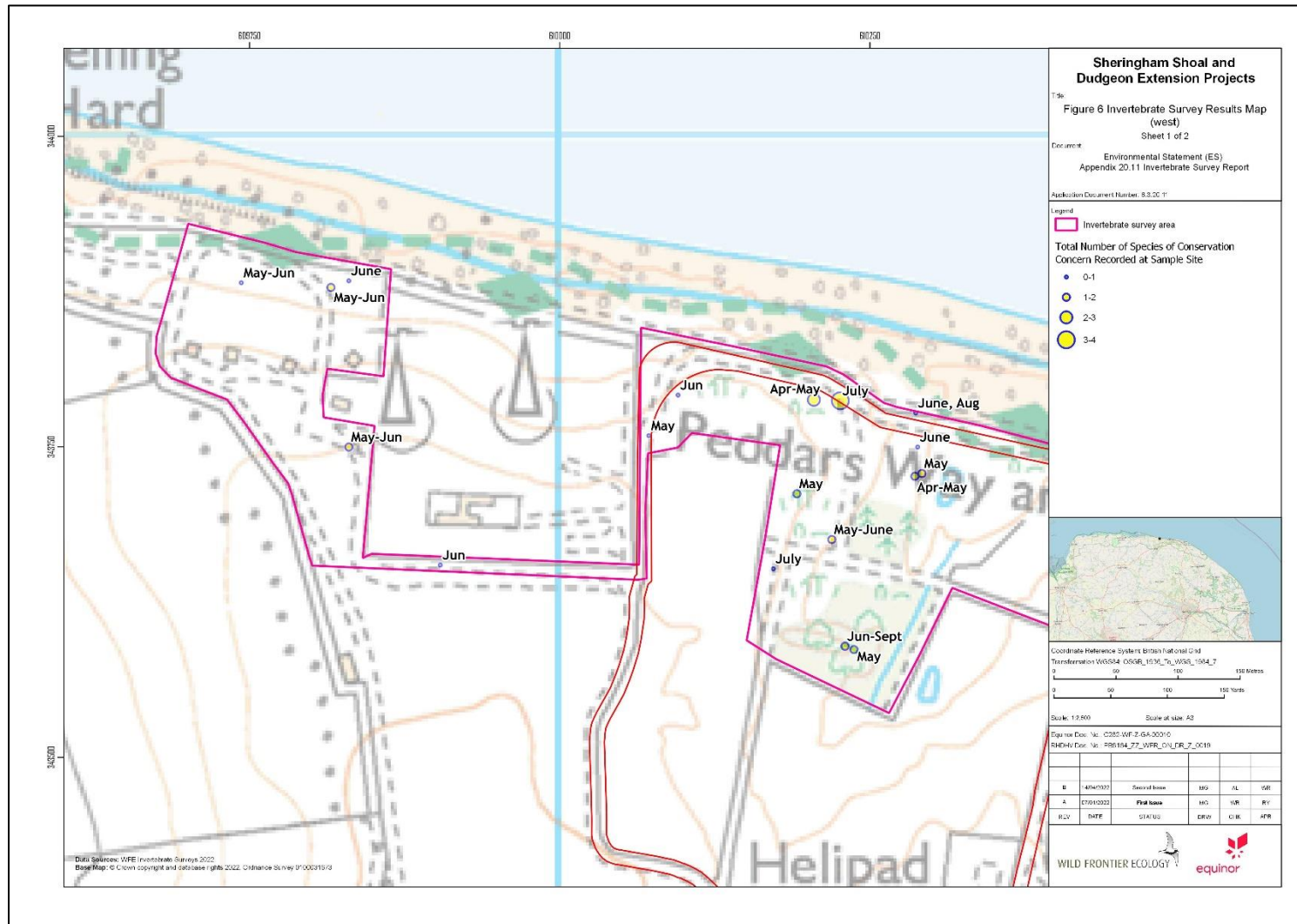


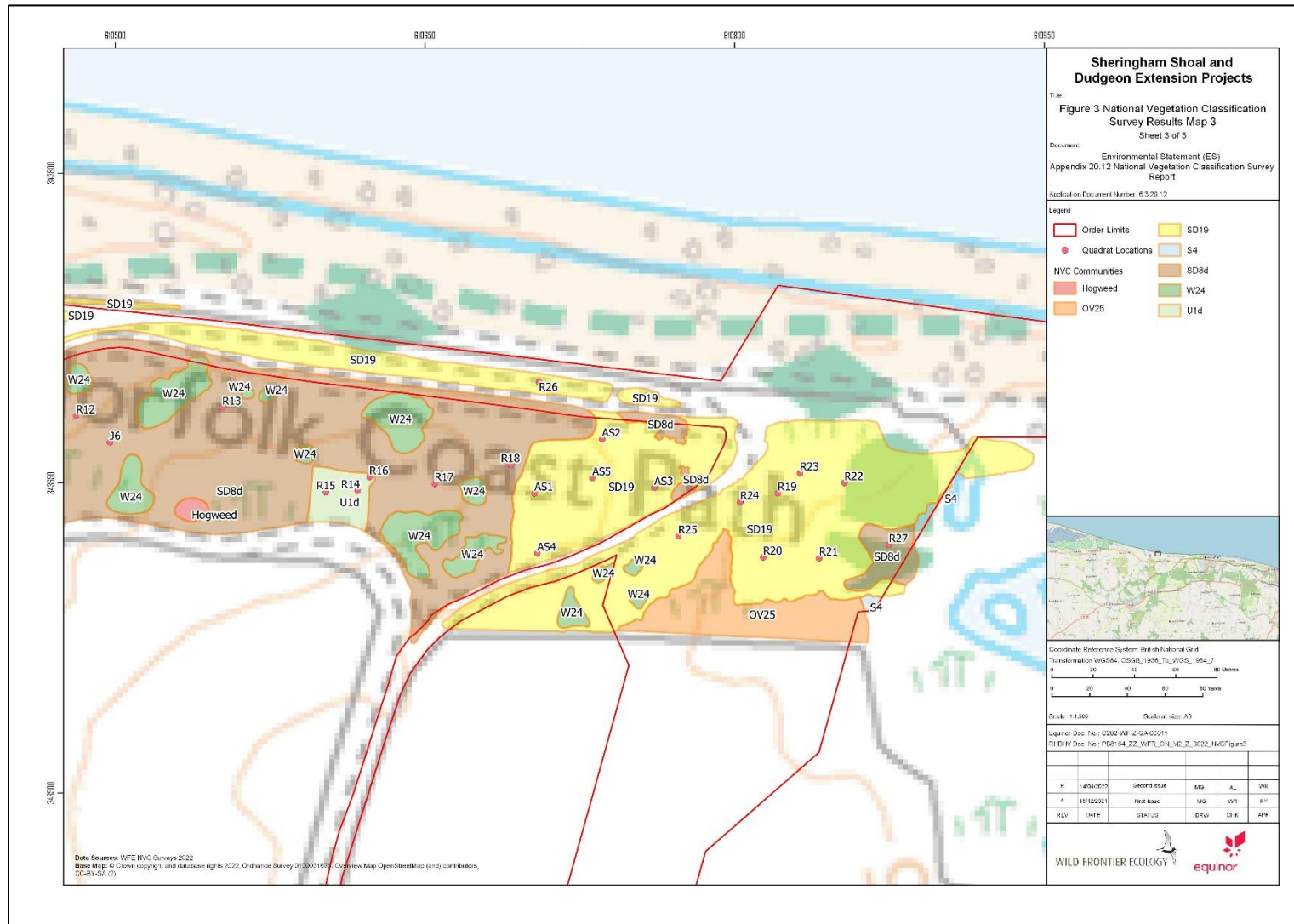
Figure 7. Invertebrate Survey Results Maps- total number of species of Conservation Concern for each sampling point







Figure 9. NVC Communities (reproduced from Appendix 22.12 and included for reference, see text in section 6).



## 7. CONCLUSIONS

Surveys of the landfall area site have identified 41 species of Conservation Concern, associated with dry, sandy open ground and areas of high floristic diversity. Habitats considered to be of greatest importance for invertebrates comprise fixed dunes, dune annual communities, bare sandy ground, scrub and the restored pond.

The invertebrate community is considered to be of county/ regional importance due to the number of species with elevated conservation status present.

Most fixed dune habitats are avoided by the DCO boundary, but approximately 1.3ha of the dune annual community will be impacted by the works. Mitigation in terms of pre-works survey, habitat creation and specific avoidance measures including Construction Exclusion Zones would reduce the overall impact on invertebrate populations. Post-works it is considered that natural regeneration of plant growth would be the best option in the SD19 dune annual areas, potentially accelerated by seed collection from retained dune annual areas. This would leave sufficient open ground for recolonization by mining aculeates and provide suitable colonizing areas for many of the coleopteran species. Post-construction monitoring would be appropriate to ensure the success of mitigation measures.

## Annex 1. 2015 data

Weybourne Camp beetles recorded by Martin Collier in 2015		Norfolk status		Status
Family	Recommended Name	Records	Hectads	
Apionidae	<i>Apion haematodes</i>	144	33	
Apionidae	<i>Apion rubens</i>	33	12	
Apionidae	<i>Aspidapion aeneum</i>	54	32	
Apionidae	<i>Ceratapion onopordi</i>	90	34	
Apionidae	<i>Perapion marchicum</i>	117	29	
Byrrhidae	<i>Simplocaria semistriata</i>	121	25	
Cantharidae	<i>Cantharis rustica</i>	267	52	
Carabidae	<i>Agonum viduum</i>	61	32	
Carabidae	<i>Amara aenea</i>	630	49	
Carabidae	<i>Amara bifrons</i>	131	23	
Carabidae	<i>Amara communis</i>	170	42	
Carabidae	<i>Amara eurynota</i>	46	18	
Carabidae	<i>Amara familiaris</i>	277	41	
Carabidae	<i>Amara lucida</i>	42	11	NS
Carabidae	<i>Amara tibialis</i>	376	34	
Carabidae	<i>Anchomenus dorsalis</i>	141	43	
Carabidae	<i>Bembidion assimile</i>	180	37	
Carabidae	<i>Bembidion lampros</i>	522	60	
Carabidae	<i>Bembidion obtusum</i>	187	46	
Carabidae	<i>Bembidion properans</i>	207	39	
Carabidae	<i>Bembidion quadrimaculatum</i>	239	53	
Carabidae	<i>Calathus cinctus</i>	130	24	
Carabidae	<i>Calathus fuscipes</i>	1044	39	
Carabidae	<i>Chlaenius nigricornis</i>	21	12	
Carabidae	<i>Cicindela campestris</i>	264	34	
Carabidae	<i>Dyschirius politus</i>	39	14	NS
Carabidae	<i>Harpalus affinis</i>	494	43	
Carabidae	<i>Harpalus rubripes</i>	287	32	
Carabidae	<i>Harpalus rufipes</i>	565	50	
Carabidae	<i>Harpalus tardus</i>	531	28	
Carabidae	<i>Laemostenus terricola</i>	101	26	
Carabidae	<i>Loricera pilicornis</i>	453	53	
Carabidae	<i>Nebria brevicollis</i>	497	53	
Carabidae	<i>Nebria salina</i>	372	33	
Carabidae	<i>Notiophilus aquaticus</i>	346	31	
Carabidae	<i>Notiophilus biguttatus</i>	535	63	
Carabidae	<i>Notiophilus germinyi</i>	46	15	
Carabidae	<i>Notiophilus palustris</i>	181	46	
Carabidae	<i>Notiophilus substriatus</i>	149	30	
Carabidae	<i>Olisthopus rotundatus</i>	42	12	
Carabidae	<i>Ophonus puncticeps</i>	26	13	
Carabidae	<i>Paradromius linearis</i>	508	60	
Carabidae	<i>Platyderus depressus</i>	90	31	
Carabidae	<i>Poecilus versicolor</i>	577	43	
Carabidae	<i>Pterostichus madidus</i>	952	53	
Carabidae	<i>Pterostichus minor</i>	298	43	
Carabidae	<i>Pterostichus nigrita</i>	151	40	
Carabidae	<i>Pterostichus strenuus</i>	436	58	
Carabidae	<i>Syntomus foveatus</i>	685	44	
Carabidae	<i>Synuchus vivalis</i>	58	18	
Carabidae	<i>Trechus quadristriatus</i>	401	55	
Carabidae	<i>Trichocellus placidus</i>	146	36	

Weybourne Camp beetles recorded by Martin Collier in 2015		Norfolk status		Status
Family	Recommended Name	Records	Hectads	
Chrysomelidae	<i>Aphthona euphorbiae</i>	306	50	
Chrysomelidae	<i>Aphthona nonstriata</i>	180	40	
Chrysomelidae	<i>Chaetocnema hortensis</i>	382	44	
Chrysomelidae	<i>Longitarsus dorsalis</i>	282	40	
Chrysomelidae	<i>Longitarsus luridus</i>	135	48	
Chrysomelidae	<i>Longitarsus parvulus</i>	186	44	
Chrysomelidae	<i>Phyllotreta nigripes</i>	131	46	
Chrysomelidae	<i>Phyllotreta nodicornis</i>	44	14	
Chrysomelidae	<i>Psylliodes affinis</i>	58	29	
Coccinellidae	<i>Coccinella septempunctata</i>	1377	65	
Coccinellidae	<i>Coccinella undecimpunctata</i>	239	35	
Coccinellidae	<i>Scymnus frontalis</i>	134	28	
Cryptophagidae	<i>Atomaria atricapilla</i>	79	34	
Cryptophagidae	<i>Atomaria linearis</i>	196	39	
Cryptophagidae	<i>Atomaria nigrirostris</i>	118	42	
Cryptophagidae	<i>Atomaria scutellaris</i>	61	22	
Curculionidae	<i>Cathormiocerus aristatus</i>	43	9	Nb
Curculionidae	<i>Graptus triguttatus</i>	75	16	
Curculionidae	<i>Gronops lunatus</i>	37	16	Nb
Curculionidae	<i>Hypera postica</i>	72	25	
Curculionidae	<i>Mogulones asperifoliarum</i>	70	31	
Curculionidae	<i>Nedyus quadrimaculatus</i>	455	62	
Curculionidae	<i>Neliocarus faber</i>	125	19	Nb
Curculionidae	<i>Orthochaetes setiger</i>	37	9	Nb
Curculionidae	<i>Otiorhynchus ovatus</i>	312	35	
Curculionidae	<i>Otiorhynchus singularis</i>	210	44	
Curculionidae	<i>Philopodon plagiatum</i>	222	22	
Curculionidae	<i>Rhinoncus castor</i>	322	26	
Curculionidae	<i>Rhinoncus pericarpus</i>	115	44	
Curculionidae	<i>Sciaphilus asperatus</i>	38	20	
Curculionidae	<i>Sibinia primita</i>	22	13	Nb
Curculionidae	<i>Sitona humeralis</i>	111	29	
Curculionidae	<i>Sitona lineatus</i>	1043	68	
Curculionidae	<i>Trachyphloeus angustisetulus</i>	85	19	
Curculionidae	<i>Trachyphloeus scabricul</i>	452	17	
Elateridae	<i>Agriotes acuminatus</i>	78	31	
Elateridae	<i>Agriotes obscurus</i>	375	49	
Elateridae	<i>Agriotes sputator</i>	311	42	
Helophoridae	<i>Helophorus nubilus</i>	26	12	NS
Histeridae	<i>Kissister minimus</i>	187	21	
Histeridae	<i>Margarinotus purpurascens</i>	93	15	
Histeridae	<i>Onthophilus punctatus</i>	38	13	RDB K
Latridiidae	<i>Cartodere nodifer</i>	301	56	
Latridiidae	<i>Corticarina minuta</i>	316	46	
Latridiidae	<i>Corticinara gibbosa</i>	601	64	
Latridiidae	<i>Enicmus transversus</i>	157	47	
Leiodidae	<i>Catops grandicollis</i>	61	19	
Leiodidae	<i>Ptomaphagus medius</i>	23	11	
Leiodidae	<i>Ptomaphagus subvillosus</i>	192	30	
Nitidulidae	<i>Glischrochilus hortensis</i>	509	54	
Nitidulidae	<i>Meligethes aeneus</i>	881	68	
Scarabaeidae	<i>Amphimallon solstitiale</i>	76	25	
Scarabaeidae	<i>Hoplia philanthus</i>	58	23	
Scarabaeidae	<i>Melinopterus prodromus</i>	230	44	



Weybourne Camp beetles recorded by Martin Collier in 2015		Norfolk status		Status
Family	Recommended Name	Records	Hectads	
Scarabaeidae	<i>Onthophagus similis</i>	445	33	
Silphidae	<i>Silpha tristis</i>	299	25	
Staphylinidae	<i>Amischa analis</i>	704	51	
Staphylinidae	<i>Anotylus inustus</i>	42	20	
Staphylinidae	<i>Anotylus rugosus</i>	756	61	
Staphylinidae	<i>Bledius opacus</i>	97	13	
Staphylinidae	<i>Cypha longicornis</i>	102	38	
Staphylinidae	<i>Geostiba circellaris</i>	185	44	
Staphylinidae	<i>Gyrophypnus angustatus</i>	132	33	
Staphylinidae	<i>Lobrathium multipunctum</i>	74	17	
Staphylinidae	<i>Ontholestes murinus</i>	52	23	
Staphylinidae	<i>Othius laeviusculus</i>	249	30	
Staphylinidae	<i>Ousipalia caesula</i>	50	12	
Staphylinidae	<i>Oxypoda lurida</i>	26	13	
Staphylinidae	<i>Pella limbata</i>	155	20	
Staphylinidae	<i>Philonthus sanguinolentus</i>	34	22	
Staphylinidae	<i>Platystethus capito</i>	15	7	
Staphylinidae	<i>Quedius boops</i>	133	25	
Staphylinidae	<i>Quedius semiaeneus</i>	183	21	
Staphylinidae	<i>Rugilus orbiculatus</i>	171	48	
Staphylinidae	<i>Stenus brunnipes</i>	236	47	
Staphylinidae	<i>Stenus nanus</i>	57	15	
Staphylinidae	<i>Tachyporus pusillus</i>	251	25	
Staphylinidae	<i>Tasgius ater</i>	106	24	
Staphylinidae	<i>Xantholinus gallicus</i>	152	27	
Staphylinidae	<i>Xantholinus linearis</i>	945	56	
Staphylinidae	<i>Xantholinus longiventris</i>	349	53	

## Annex 2. Full Species List from 2021 Surveys.

Taxon Group	Family	Species	English Name	Conservation Status
Araneae	Araneidae	<i>Araneus diadematus</i>	Garden spider	Lower concern
Araneae	Araneidae	<i>Araniella sp</i>	A spider	Lower concern
Araneae	Theridiidae	<i>Enoplognatha ovata</i>	A spider	Lower concern
Araneae	Theridiidae	<i>Episinus angulatus</i>	A spider	Lower concern
Araneae	Salticidae	<i>Euophrys frontalis</i>	A spider	Lower concern
Araneae	Araneidae	<i>Gibbaranea gibbosa</i>	A spider	Lower concern
Araneae	Salticidae	<i>Heliophanus cupreus</i>	A spider	Lower concern
Araneae	Salticidae	<i>Heliophanus cupreus/flavipes</i>	A spider	Lower concern
Araneae	Salticidae	<i>Heliophanus sp.</i>	A spider	Lower concern
Araneae	Araneidae	<i>Metellina sp.</i>	A spider	Lower concern
Araneae	Theridiidae	<i>Neottiura bimaculata</i>	A spider	Lower concern
Araneae	Pisauridae	<i>Pisaura mirabilis</i>	Nursery web spider	Lower concern
Araneae	Theridiidae	<i>Tetragnatha extensa</i>	Common stretch spider	Lower concern
Araneae	Philodromidae	<i>Tibellus sp imm male</i>	A spider	Lower concern
Araneae	Thomisidae	<i>Xysticus cristatus</i>	Common crab spider	Lower concern
Coleoptera	Anthicidae	<i>Anthicus antherinus</i>	An antlike flower beetle	Lower concern
Coleoptera	Apionidae	<i>Apion frumentarium</i>	A weevil	Lower concern
Coleoptera	Apionidae	<i>Apion haematodes</i>	A weevil	Lower concern
Coleoptera	Apionidae	<i>Apion rubens</i>	A weevil	Lower concern
Coleoptera	Apionidae	<i>Aspidapion aeneum</i>	A weevil	Lower concern
Coleoptera	Apionidae	<i>Ceratapion onopordi</i>	A weevil	Lower concern
Coleoptera	Apionidae	<i>Exapion ulicis</i>	A weevil	Lower concern
Coleoptera	Apionidae	<i>Ischnopterapion modestum</i>	A weevil	Lower concern
Coleoptera	Apionidae	<i>Malvapion malvae</i>	A weevil	Lower concern
Coleoptera	Apionidae	<i>Perapion curtirostre</i>	A weevil	Lower concern
Coleoptera	Apionidae	<i>Perapion violaceum</i>	A weevil	Lower concern
Coleoptera	Apionidae	<i>Protapion apricans</i>	A weevil	Lower concern
Coleoptera	Apionidae	<i>Protapion fulvipes</i>	A weevil	Lower concern
Coleoptera	Apionidae	<i>Pseudapion rufirostre</i>	A weevil	Lower concern
Coleoptera	Apionidae	<i>Taenapion urticarium</i>	A weevil	Lower concern
Coleoptera	Attelabidae	<i>Tatianaerhynchites aequatus</i>	Apple fruit weevil	Lower concern
Coleoptera	Byrrhidae	<i>Byrrhus fasciatus</i>	Banded pill beetle	Lower concern
Coleoptera	Byrrhidae	<i>Simplocaria semistriata</i>	A pill beetle	Lower concern
Coleoptera	Byturidae	<i>Byturus tomentosus</i>	Raspberry beetle	Lower concern
Coleoptera	Cantharidae	<i>Malthinus flaveolus</i>	A cantharid beetle	Lower concern

Taxon Group	Family	Species	English Name	Conservation Status
Coleoptera	Cantharidae	<i>Rhagonycha fulva</i>	Common red soldier beetle	Lower concern
Coleoptera	Carabidae	<i>Acupalpus dubius</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Amara aenea</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Amara communis</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Amara familiaris</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Amara lunicollis</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Amara plebeja</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Amara similata</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Amara tibialis</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Anchomenus dorsalis</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Bembidion iricolor</i>	A ground beetle	NS
Coleoptera	Carabidae	<i>Bembidion lampros</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Bembidion properans</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Bembidion quadrimaculatum</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Calathus fuscipes</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Calathus melanocephalus</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Calathus rotundicollis</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Cicindela campestris</i>	Green tiger beetle	Lower concern
Coleoptera	Carabidae	<i>Demetrias atricapillus</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Elaphrus riparius</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Harpalus affinis</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Harpalus rufipes</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Harpalus tardus</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Laemostenus terricola</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Nebria brevicollis</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Notiophilus biguttatus</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Paradromius linearis</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Philorhizus melanocephalus</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Poecilus cupreus</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Poecilus versicolor</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Pterostichus madidus</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Pterostichus niger</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Syntomus foveatus</i>	A ground beetle	Lower concern
Coleoptera	Carabidae	<i>Trechus quadristriatus</i>	A ground beetle	Lower concern
Coleoptera	Cerambycidae	<i>Pseudovadonia livida</i>	Fairy ring longhorn beetle	Lower concern
Coleoptera	Chrysomelidae	<i>Altica sp</i>	A flea beetle	Lower concern
Coleoptera	Chrysomelidae	<i>Aphthona nonstriata</i>	Iris flea beetle	Lower concern
Coleoptera	Chrysomelidae	<i>Apteropeda orbiculata</i>	A flea beetle	Lower concern
Coleoptera	Chrysomelidae	<i>Batophila aerata</i>	A flea beetle	Lower concern
Coleoptera	Chrysomelidae	<i>Cassida rubiginosa</i>	Tortoise beetle	Lower concern

Taxon Group	Family	Species	English Name	Conservation Status
Coleoptera	Chrysomelidae	<i>Chaetocnema hortensis</i>	Corn flea beetle	Lower concern
Coleoptera	Chrysomelidae	<i>Chaetocnema sp</i>	A flea beetle	Lower concern
Coleoptera	Chrysomelidae	<i>Chrysolina polita</i>	Knotgrass leaf beetle	Lower concern
Coleoptera	Chrysomelidae	<i>Crepidodera aurata</i>	A flea beetle	Lower concern
Coleoptera	Chrysomelidae	<i>Cryptocephalus pusillus</i>	A leaf beetle	Lower concern
Coleoptera	Chrysomelidae	<i>Longitarsus dorsalis</i>	A flea beetle	Lower concern
Coleoptera	Chrysomelidae	<i>Longitarsus luridus</i>	A flea beetle	Lower concern
Coleoptera	Chrysomelidae	<i>Longitarsus pratensis/reichei</i>	A flea beetle	Lower concern
Coleoptera	Chrysomelidae	<i>Oulema melanocephalus/cyanea</i>	Cereal leaf beetle	Lower concern
Coleoptera	Chrysomelidae	<i>Phaedon tumidulus</i>	Celery leaf beetle	Lower concern
Coleoptera	Chrysomelidae	<i>Phyllotreta undulata</i>	Turnip flea beetle	Lower concern
Coleoptera	Chrysomelidae	<i>Sphaeroderma testaceum</i>	A flea beetle	Lower concern
Coleoptera	Coccinellidae	<i>Coccinella septempunctata</i>	Seven spot ladybird	Lower concern
Coleoptera	Coccinellidae	<i>Coccinella undecimpunctata</i>	11 spot ladybird	Lower concern
Coleoptera	Coccinellidae	<i>Exochomus quadripustulatus</i>	Pine ladybird	Lower concern
Coleoptera	Coccinellidae	<i>Harmonia axyridis</i>	Harlequin ladybird	Lower concern
Coleoptera	Coccinellidae	<i>Harmonia quadripunctata</i>	Cream-streaked ladybird	Lower concern
Coleoptera	Coccinellidae	<i>Nephus redtenbacheri</i>	Red-patched ladybird	Lower concern
Coleoptera	Coccinellidae	<i>Psyllobora vigintiduopunctata</i>	22 spot ladybird	Lower concern
Coleoptera	Coccinellidae	<i>Rhizobius litura</i>	A rhizobius ladybird	Lower concern
Coleoptera	Coccinellidae	<i>Scymnus frontalis</i>	Angle-spot ladybird	Lower concern
Coleoptera	Coccinellidae	<i>Scymnus suturalis</i>	Conifer ladybird	Lower concern
Coleoptera	Coccinellidae	<i>Subcoccinella vigintiquatuor punctata</i>	24 spot ladybird	Lower concern
Coleoptera	Coccinellidae	<i>Tytthus sedecimpunctata</i>	16 spot ladybird	Lower concern
Coleoptera	Corylophidae	<i>Corylophus cassidoides</i>	A minute fungus beetle	Lower concern
Coleoptera	Cryptophagidae	<i>Atomaria sp</i>	A silken fungus beetle	Lower concern
Coleoptera	Cryptophagidae	<i>Micrambe ulicis</i>	A silken fungus beetle	Lower concern
Coleoptera	Curculionidae	<i>Anthonomus rubi</i>	A weevil	Lower concern
Coleoptera	Curculionidae	<i>Aulacobaris picicornis</i>	A weevil	Nb
Coleoptera	Curculionidae	<i>Barypeithes pellucidus</i>	A weevil	Lower concern

Taxon Group	Family	Species	English Name	Conservation Status
Coleoptera	Curculionidae	<i>Brachysomus echinatus</i>	A weevil	Nb
Coleoptera	Curculionidae	<i>Cathormiocerus aristatus</i>	A weevil	Nb
Coleoptera	Curculionidae	<i>Ceutorhynchus obstructus</i>	A weevil	Lower concern
Coleoptera	Curculionidae	<i>Cionus tuberculosus</i>	A weevil	Lower concern
Coleoptera	Curculionidae	<i>Glocianus distinctus</i>	A weevil	Lower concern
Coleoptera	Curculionidae	<i>Graptus triguttatus</i>	A weevil	Lower concern
Coleoptera	Curculionidae	<i>Gronops lunatus</i>	A weevil	Nb
Coleoptera	Curculionidae	<i>Hypera nigrirostris</i>	A weevil	Lower concern
Coleoptera	Curculionidae	<i>Hypera postica</i>	A weevil	Lower concern
Coleoptera	Curculionidae	<i>Mogulones asperifoliarium</i>	A weevil	Lower concern
Coleoptera	Curculionidae	<i>Nedyus quadrimaculatus</i>	A weevil	Lower concern
Coleoptera	Curculionidae	<i>Neliocarus faber</i>	A weevil	Nb
Coleoptera	Curculionidae	<i>Neliocarus sus</i>	A weevil	Lower concern
Coleoptera	Curculionidae	<i>Orthochaetes setiger</i>	A weevil	[Nb]
Coleoptera	Curculionidae	<i>Otiorhynchus ovatus</i>	A weevil	Lower concern
Coleoptera	Curculionidae	<i>Parathelcus pollinarius</i>	A weevil	Lower concern
Coleoptera	Curculionidae	<i>Philopeton plagiatum</i>	A weevil	Lower concern
Coleoptera	Curculionidae	<i>Phyllobius roboretanus</i>	A weevil	Lower concern
Coleoptera	Curculionidae	<i>Rhinoncus castor</i>	A weevil	Lower concern
Coleoptera	Curculionidae	<i>Rhinoncus perpendicularis</i>	A weevil	Lower concern
Coleoptera	Curculionidae	<i>Romualdius scaber</i>	A weevil	Lower concern
Coleoptera	Curculionidae	<i>Sciaphilus asperatus</i>	A weevil	Lower concern
Coleoptera	Curculionidae	<i>Sibinia primita</i>	A weevil	Nb
Coleoptera	Curculionidae	<i>Sitona hispidulus</i>	A weevil	Lower concern
Coleoptera	Curculionidae	<i>Sitona lepidus</i>	A weevil	Lower concern
Coleoptera	Curculionidae	<i>Sitona lineatus</i>	A weevil	Lower concern
Coleoptera	Curculionidae	<i>Trachyphloeus scabriculus</i>	A weevil	Lower concern
Coleoptera	Curculionidae	<i>Trichosirocalus troglodytes</i>	A weevil	Lower concern
Coleoptera	Curculionidae	<i>Tychius junceus</i>	A weevil	Lower concern
Coleoptera	Curculionidae	<i>Tychius picicornis</i>	A weevil	Lower concern
Coleoptera	Elateridae	<i>Agriotes obscurus</i>	A click beetle	Lower concern
Coleoptera	Elateridae	<i>Agriotes sputator</i>	A click beetle	Lower concern
Coleoptera	Elateridae	<i>Agrypnus murinus</i>	A click beetle	Lower concern
Coleoptera	Elateridae	<i>Athous haemorrhoidalis</i>	A click beetle	Lower concern
Coleoptera	Histeridae	<i>Kissister minimus</i>	A hister beetle	Lower concern
Coleoptera	Hydrophilidae	<i>Cercyon sp</i>	A dung beetle	Lower concern
Coleoptera	Kateretidae	<i>Brachypterus urticae</i>	Nettle pollen beetle	Lower concern

Taxon Group	Family	Species	English Name	Conservation Status
Coleoptera	Latridiidae	<i>Corticaria impressa</i>	A mould beetle	Lower concern
Coleoptera	Latridiidae	<i>Corticarina minuta</i>	A mould beetle	Lower concern
Coleoptera	Latridiidae	<i>Enicmus histrio</i>	A mould beetle	Lower concern
Coleoptera	Leiodidae	<i>Ptomaphagus subvillosus</i>	A small carrion beetle	Lower concern
Coleoptera	Malachiidae	<i>Malachius bipustulatus</i>	Common malachite beetle	Lower concern
Coleoptera	Nitidulidae	<i>Glischrochilus hortensis</i>	A nitidulid beetle	Lower concern
Coleoptera	Nitidulidae	<i>Meligethes aeneus</i>	A pollen beetle	Lower concern
Coleoptera	Nitidulidae	<i>Meligethinae sp</i>	A pollen beetle	Lower concern
Coleoptera	Oedemeridae	<i>Oedemera lurida</i>	A false oil beetle	Lower concern
Coleoptera	Oedemeridae	<i>Oedemera nobilis</i>	Thick-legged flower beetle	Lower concern
Coleoptera	Phalacridae	<i>Stilbus testaceus</i>	A shining flower beetle	Lower concern
Coleoptera	Ptilidae	<i>Ptenidium sp</i>	A feather-winged beetle	Lower concern
Coleoptera	Scarabaeidae	<i>Hoplia philanthus</i>	Welsh chafer	Lower concern
Coleoptera	Scirtidae	<i>Cyphon sp prob coarctatus</i>	A marsh beetle	Lower concern
Coleoptera	Silphidae	<i>Phosphuga atrata</i>	Black carrion beetle	Lower concern
Coleoptera	Silphidae	<i>Silpha tristis</i>	A carrion beetle	Lower concern
Coleoptera	Staphylinidae	<i>Bledius gallicus</i>	A rove beetle	Lower concern
Coleoptera	Staphylinidae	<i>Falagrioma thoracica</i>	A rove beetle	Lower concern
Coleoptera	Staphylinidae	<i>Megalinus glabratus</i>	A rove beetle	Lower concern
Coleoptera	Staphylinidae	<i>Metopsia clypeata</i>	A rove beetle	Lower concern
Coleoptera	Staphylinidae	<i>Ocyopus aeneocephalus</i>	A rove beetle	Lower concern
Coleoptera	Staphylinidae	<i>Ocyopus olens</i>	Devil's Coach-horse	Lower concern
Coleoptera	Staphylinidae	<i>Quedius schatzmayri</i>	A rove beetle	Lower concern
Coleoptera	Staphylinidae	<i>Sepedophilus ?nigripennis</i>	A rove beetle	Lower concern
Coleoptera	Staphylinidae	<i>Sepedophilus littoreus</i>	A rove beetle	Lower concern
Coleoptera	Staphylinidae	<i>Stenichnus collaris</i>	A rove beetle	Lower concern
Coleoptera	Staphylinidae	<i>Stenus brunripes</i>	A rove beetle	Lower concern
Coleoptera	Staphylinidae	<i>Stenus clavicornis</i>	A rove beetle	Lower concern
Coleoptera	Staphylinidae	<i>Stenus fulvicornis/ latifrons</i>	A rove beetle	Lower concern
Coleoptera	Staphylinidae	<i>Stenus nitidiusculus</i>	A rove beetle	Lower concern
Coleoptera	Staphylinidae	<i>Stenus ossium</i>	A rove beetle	Lower concern
Coleoptera	Staphylinidae	<i>Stenus providus</i>	A rove beetle	Lower concern
Coleoptera	Staphylinidae	<i>Stenus subgenus hypostenus</i>	A rove beetle	Lower concern
Coleoptera	Staphylinidae	<i>Tachyporus nitidulus</i>	A rove beetle	Lower concern
Coleoptera	Staphylinidae	<i>Tachyporus solutus</i>	A rove beetle	Lower concern



Taxon Group	Family	Species	English Name	Conservation Status
Coleoptera	Staphylinidae	<i>Tasgius winkleri</i>	A rove beetle	Lower concern
Coleoptera	Staphylinidae	<i>Xantholinus longiventris</i>	A rove beetle	Lower concern
Dermaptera	Forficulidae	<i>Forficula auricularia</i>	Common earwig	Lower concern
Diptera	Anthomyiidae	<i>Leucophora personata</i>	An anthomyiid fly	Lower concern
Diptera	Bibionidae	<i>Biblio johannis</i>	A St Mark's fly	Lower concern
Diptera	Bombyliidae	<i>Bombylius major</i>	Dark-edged bee fly	Lower concern
Diptera	Conopidae	<i>Sicus ferrugineus</i>	Thick-headed fly	Lower concern
Diptera	Conopidae	<i>Thecophora atra</i>	A conopid fly	Lower concern
Diptera	Limnophilidae	<i>Austrolimnophila ochracea</i>	A crane fly	Lower concern
Diptera	Sarcophagidae	<i>Miltogramma germari</i>	A sarcophagid fly	pNS
Diptera	Scathophagidae	<i>Scathophaga stercoraria</i>	Yellow dung fly	Lower concern
Diptera	Stratomyidae	<i>Oxycera rara</i>	Four-barred major	Lower concern
Diptera	Stratomyidae	<i>Pachygaster atra</i>	Dark-winged black	Lower concern
Diptera	Stratomyidae	<i>Pachygaster leachii</i>	Yellow-legged black	Lower concern
Diptera	Stratomyidae	<i>Stratiomys singularior</i>	Flecked general	Lower concern
Diptera	Syrphidae	<i>Cheilosia bergenstammi</i>	Ragwort Cheilosia	Lower concern
Diptera	Syrphidae	<i>Cheilosia griseiventris</i>	Grey-vented Cheilosia	Lower concern
Diptera	Syrphidae	<i>Cheilosia variabilis</i>	Figwort Cheilosia	Lower concern
Diptera	Syrphidae	<i>Cheilosia vernalis(?)</i>	A hoverfly	Lower concern
Diptera	Syrphidae	<i>Chrysotoxum festivum</i>	A hoverfly	Lower concern
Diptera	Syrphidae	<i>Eristalinus aeneus</i>	A hoverfly	Lower concern
Diptera	Syrphidae	<i>Eristalis pertinax</i>	Drone fly	Lower concern
Diptera	Syrphidae	<i>Eristalis tenax</i>	Drone fly	Lower concern
Diptera	Syrphidae	<i>Eupeodes luniger</i>	A hoverfly	Lower concern
Diptera	Syrphidae	<i>Eupeodes sp</i>	A hoverfly	Lower concern
Diptera	Syrphidae	<i>Helophilus pendulus</i>	Footballer hoverfly	Lower concern
Diptera	Syrphidae	<i>Syrphus ribesii</i>	A hoverfly	Lower concern
Diptera	Tabanidae	<i>Chrysops relictus</i>	Deer fly	Lower concern
Diptera	Tachinidae	<i>Gymnocheta viridis</i>	A tachinid fly	Lower concern
Diptera	Tachinidae	<i>Townsendiellomyia nidicola</i>	Browntail botherer	DD but rare
Diptera	Tephritidae	<i>Euleia heraclei</i>	Celery fly	Lower concern
Diptera	Tipulidae	<i>Tipula paludosa</i>	European crane fly	Lower concern
Glomerida	Glomeridae	<i>Glomeris marginata</i>	Pill millipede	Lower concern
Hemiptera	Berytidae	<i>Berytinus minor</i>	A stilt bug	Lower concern



Taxon Group	Family	Species	English Name	Conservation Status
Hemiptera	Berytidae	<i>Berytinus signoreti</i>	A stilt bug	Lower concern
Hemiptera	Berytidae	<i>Gampsocoris punctipes</i>	A stilt bug	Lower concern
Hemiptera	Cercopidae	<i>Philaenus spumarius</i>	Common froghopper	Lower concern
Hemiptera	Cicadellidae	<i>Agallia cf venosa</i>	A leafhopper	Lower concern
Hemiptera	Cicadellidae	<i>Agallia consobrina</i>	A leafhopper	Lower concern
Hemiptera	Cicadellidae	<i>Anoscopus serratulae</i>	A leafhopper	Lower concern
Hemiptera	Cicadellidae	<i>Aphrodes sp</i>	A leafhopper	Lower concern
Hemiptera	Cicadellidae	<i>Aphrodes sp (prob bicinctus)</i>	A leafhopper	Lower concern
Hemiptera	Cicadellidae	<i>Eupelix cuspidata</i>	A leafhopper	Lower concern
Hemiptera	Cicadellidae	<i>Eupteryx notata</i>	A leafhopper	Lower concern
Hemiptera	Cicadellidae	<i>Megopthalmus scabripennis</i>	A leafhopper	Lower concern
Hemiptera	Cicadellidae	<i>Mocydiopsis parvicauda</i>	A leafhopper	Lower concern
Hemiptera	Delphacidae	<i>Cixus nervosus</i>	A lacehopper	Lower concern
Hemiptera	Delphacidae	<i>Dicranotropis hamata</i>	A lacehopper	Lower concern
Hemiptera	Delphacidae	<i>Javesella dubia</i>	A lacehopper	Lower concern
Hemiptera	Delphacidae	<i>Kosswigianella exidua</i>	A lacehopper	Lower concern
Hemiptera	Lygaeidae	<i>Cymus glandicolor</i>	A ground bug	Lower concern
Hemiptera	Lygaeidae	<i>Drymus sylvaticus</i>	A ground bug	Lower concern
Hemiptera	Lygaeidae	<i>Kleidocerys resedae</i>	A ground bug	Lower concern
Hemiptera	Lygaeidae	<i>Nysius thymi/ ericae</i>	A ground bug	Lower concern
Hemiptera	Lygaeidae	<i>Peritrechus geniculatus</i>	A ground bug	Lower concern
Hemiptera	Lygaeidae	<i>Peritrechus lundii</i>	A ground bug	Lower concern
Hemiptera	Lygaeidae	<i>Scolopostethus affinis</i>	A ground bug	Lower concern
Hemiptera	Lygaeidae	<i>Scolopostethus thomsoni</i>	A ground bug	Lower concern
Hemiptera	Lygaeidae	<i>Stygnocoris fuliginus</i>	A ground bug	Lower concern
Hemiptera	Lygaeidae	<i>Trapezonotus sp.</i>	A ground bug	Lower concern
Hemiptera	Miridae	<i>Adelphocoris lineolatus</i>	A plant bug	Lower concern
Hemiptera	Miridae	<i>Capsus ater</i>	A plant bug	Lower concern
Hemiptera	Miridae	<i>Closterotomus norvegicus</i>	A plant bug	Lower concern
Hemiptera	Miridae	<i>Dicyphus annulatus</i>	A plant bug	Lower concern
Hemiptera	Miridae	<i>Dicyphus errans</i>	A plant bug	Lower concern
Hemiptera	Miridae	<i>Liocoris tripustulatus</i>	A plant bug	Lower concern
Hemiptera	Miridae	<i>Lygus maritimus</i>	A plant bug	Lower concern
Hemiptera	Miridae	<i>Macrotylus paykulli</i>	A plant bug	Lower concern
Hemiptera	Miridae	<i>Mecomma dispar</i>	A plant bug	Lower concern
Hemiptera	Miridae	<i>Megalonotus sp.</i>	A plant bug	Lower concern
Hemiptera	Miridae	<i>Orthocephalus saltator</i>	A plant bug	Lower concern
Hemiptera	Miridae	<i>Phytocoris varipes</i>	A plant bug	Lower concern

Taxon Group	Family	Species	English Name	Conservation Status
Hemiptera	Miridae	<i>Pithanus maerkelii</i>	A plant bug	Lower concern
Hemiptera	Miridae	<i>Plagiognathus arbustorum</i>	A plant bug	Lower concern
Hemiptera	Miridae	<i>Plagiognathus chrysanthemi</i>	A plant bug	Lower concern
Hemiptera	Miridae	<i>Stenodema calcarata</i>	A plant bug	Lower concern
Hemiptera	Miridae	<i>Stenodema laevigata</i>	A plant bug	Lower concern
Hemiptera	Miridae	<i>Stenotus binotatus</i>	A plant bug	Lower concern
Hemiptera	Nabidae	<i>Himacerus major</i>	Grey damselbug	Lower concern
Hemiptera	Nabidae	<i>Himacerus mirmicoides</i>	Ant damselbug	Lower concern
Hemiptera	Pentatomidae	<i>Dolycoris baccarum</i>	Hairy shield bug	Lower concern
Hemiptera	Pentatomidae	<i>Palomena prasina</i>	Green shield bug	Lower concern
Hemiptera	Pentatomidae	<i>Piezodorus lituratus</i>	Gorse shield bug	Lower concern
Hemiptera	Pentatomidae	<i>Podops inuncta</i>	Tortoise shield bug	Lower concern
Hemiptera	Rhopalidae	<i>Corizus hyoscyami</i>	Cinnamon bug	Lower concern
Hemiptera	Rhopalidae	<i>Rhopalus subrufus</i>	Rhopalid bug	Lower concern
Hemiptera	Saldidae	<i>Saldula saltatoria</i>	Shore bug	Lower concern
Hemiptera	Thyreocoridae	<i>Thyreocoris scarabaeoides</i>	Scarab shieldbug	Lower concern
Hemiptera	Tingidae	<i>Acalypta parvula</i>	A lace bug	Lower concern
Hemiptera	Tingidae	<i>Derephysia foliacea</i>	A lace bug	Lower concern
Hemiptera	Tingidae	<i>Kalama tricornis</i>	A lace bug	Lower concern
Hemiptera	Tingidae	<i>Tingis ampliata</i>	A lace bug	Lower concern
Hymenoptera	Chrysididae	<i>Hedychridium ardens</i>	A chrysidid wasp	Lower concern
Hymenoptera	Chrysididae	<i>Hedychrum niemelai</i>	A chrysidid wasp	Lower concern
Hymenoptera	Chrysididae	<i>Hedychrum nobile</i>	A chrysidid wasp	Lower concern
Hymenoptera	Formicidae	<i>Lasius niger</i>	Black ant	Lower concern
Hymenoptera	Formicidae	<i>Myrmica rubra</i>	Red ant	Lower concern
Hymenoptera	Mutillidae	<i>Myrmosa atra</i>	Black-headed velvet ant	Lower concern
Hymenoptera (Aculeata)	Andrenidae	<i>Andrena alfkenella</i>	Alfken's mini-miner	[RDB3]
Hymenoptera (Aculeata)	Andrenidae	<i>Andrena bicolor</i>	Gwynne's mining bee	Lower concern
Hymenoptera (Aculeata)	Andrenidae	<i>Andrena bimaculata</i>	Large gorse mining bee	[Nb]
Hymenoptera (Aculeata)	Andrenidae	<i>Andrena clarkella</i>	Clarke's mining bee	Lower concern
Hymenoptera (Aculeata)	Andrenidae	<i>Andrena denticulata</i>	Grey-banded mining bee	Lower concern
Hymenoptera (Aculeata)	Andrenidae	<i>Andrena dorsata</i>	Short-fringed mining bee	Lower concern
Hymenoptera (Aculeata)	Andrenidae	<i>Andrena flavipes</i>	Yellow-legged mining bee	Lower concern
Hymenoptera (Aculeata)	Andrenidae	<i>Andrena fulva</i>	Tawny mining bee	Lower concern
Hymenoptera	Andrenidae	<i>Andrena haemorrhhoa</i>	Orange-tailed	Lower concern

Taxon Group	Family	Species	English Name	Conservation Status
(Aculeata)			mining bee	
Hymenoptera (Aculeata)	Andrenidae	<i>Andrena hattorfiana</i>	Large scabious bee	[RDB3]
Hymenoptera (Aculeata)	Andrenidae	<i>Andrena marginata</i>	Small scabious mining bee	[Na]
Hymenoptera (Aculeata)	Andrenidae	<i>Andrena minutula</i>	Common mini-miner	Lower concern
Hymenoptera (Aculeata)	Andrenidae	<i>Andrena nigroaenea</i>	Buffish mining bee	Lower concern
Hymenoptera (Aculeata)	Andrenidae	<i>Andrena nitida</i>	Grey-patched mining bee	Lower concern
Hymenoptera (Aculeata)	Andrenidae	<i>Andrena ovatula</i>	Small gorse mining bee	Lower concern
Hymenoptera (Aculeata)	Andrenidae	<i>Andrena scotica</i>	Chocolate mining bee	Lower concern
Hymenoptera (Aculeata)	Andrenidae	<i>Andrena semilaevis</i>	Shiny-margined mini-miner	Lower concern
Hymenoptera (Aculeata)	Andrenidae	<i>Andrena subopaca</i>	Impunctate mini-mining bee	Lower concern
Hymenoptera (Aculeata)	Andrenidae	<i>Andrena thoracica</i>	Cliff mining bee	Lower concern
Hymenoptera (Aculeata)	Andrenidae	<i>Andrena trimmerana</i>	Trimmer's mining bee	[Nb]
Hymenoptera (Aculeata)	Andrenidae	<i>Andrena wilkella</i>	Wilke's mining bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Anthophora plumipes</i>	Hairy footed flower bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Apis mellifera</i>	Honey bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Bombus barbutellus</i>	Barbut's cuckoo bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Bombus cryptarum (possible)</i>	Cryptic bumblebee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Bombus hortorum</i>	Garden bumblebee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Bombus hypnorum</i>	Tree bumblebee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Bombus jonellus</i>	Heath bumblebee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Bombus lapidarius</i>	Red-tailed bumblebee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Bombus lucorum agg.</i>	White-tailed bumblebee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Bombus pascuorum</i>	Common carder bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Bombus pratorum</i>	Early bumblebee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Bombus rupestris</i>	Red tailed cuckoo bee	[Nb]
Hymenoptera (Aculeata)	Apidae	<i>Bombus sylvestris</i>	Forest cuckoo bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Bombus terrestris</i>	Buff-tailed bumblebee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Bombus vestalis</i>	Vestal cuckoo bee	Lower concern
Hymenoptera	Apidae	<i>Colletes hederæ</i>	Ivy bee	Lower concern

Taxon Group	Family	Species	English Name	Conservation Status
(Aculeata)				
Hymenoptera (Aculeata)	Apidae	<i>Colletes marginatus</i>	Margined colletes	[Na]
Hymenoptera (Aculeata)	Apidae	<i>Colletes succinctus</i>	Heather colletes	
Hymenoptera (Aculeata)	Apidae	<i>Dasypoda hirtipes</i>	Pantaloon bee	[Nb]
Hymenoptera (Aculeata)	Apidae	<i>Epeolus variegatus</i>	Black-thighed epeolus	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Halictus rubicundus</i>	Orange-legged furrow bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Halictus tumulorum</i>	Bronze furrow bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Hylaeus brevicornis</i>	Short-horned yellow-face bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Hylaeus communis</i>	Common yellow-face bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Hylaeus dilatatus</i>	Chalk yellow-face bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Hylaeus hyalinatus</i>	Hairy yellow-face bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Hylaeus pectoralis</i>	Reed yellow-face bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Lasioglossum cupromicans</i>	Turquoise furrow bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Lasioglossum lativentre</i>	Furry-claspered furrow bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Lasioglossum leucopus</i>	White-footed green furrow bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Lasioglossum leucozonium</i>	White-zoned furrow bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Lasioglossum malachurum</i>	Sharp-collared furrow bee	[Nb]
Hymenoptera (Aculeata)	Apidae	<i>Lasioglossum minutissimum</i>	Least furrow bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Lasioglossum morio</i>	Brassy mining bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Lasioglossum pauxillum</i>	Lobe-spurred furrow bee	[Na]
Hymenoptera (Aculeata)	Apidae	<i>Lasioglossum punctatissimum</i>	Long-faced furrow bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Lasioglossum villosulum</i>	Shaggy furrow bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Megachile centuncularis</i>	Patchwork leaf-cutter bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Megachile leachella</i>	Silvery leafcutter bee	[Nb]
Hymenoptera (Aculeata)	Apidae	<i>Nomada fabriciana</i>	Fabricius' nomad bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Nomada flava</i>	Flavous nomad bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Nomada flavoguttata</i>	Little nomad bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Nomada fucata</i>	Painted nomad bee	[Na]

Taxon Group	Family	Species	English Name	Conservation Status
Hymenoptera (Aculeata)	Apidae	<i>Nomada fulvicornis</i>	Orange-horned nomad bee	RDB3
Hymenoptera (Aculeata)	Apidae	<i>Nomada goodeniana</i>	Gooden's nomad bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Nomada leucophthalma</i>	Early nomad bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Nomada marshamella</i>	Marsham's nomad bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Nomada zonata</i>	Variable nomad bee	RDB DD
Hymenoptera (Aculeata)	Apidae	<i>Osmia spinulosa</i>	Spined mason bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Sphecodes ephippius</i>	Bare-saddled blood bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Sphecodes longulus</i>	Little sickle-jawed blood bee	[Na]
Hymenoptera (Aculeata)	Apidae	<i>Sphecodes monilicornis</i>	Box-headed blood bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Sphecodes puncticeps</i>	Sickle-jawed blood bee	Lower concern
Hymenoptera (Aculeata)	Apidae	<i>Sphecodes reticulatus</i>	Reticulate blood bee	[Na]
Hymenoptera (Aculeata)	Chrysididae	<i>Cleptes nitidulus</i>	A chrysidid wasp	Na
Hymenoptera (Aculeata)	Crabronidae	<i>Astata boops</i>	A solitary wasp	Lower concern
Hymenoptera (Aculeata)	Crabronidae	<i>Cerceris arenaria</i>	Sand tailed digger wasp	Lower concern
Hymenoptera (Aculeata)	Crabronidae	<i>Cerceris quinquefasciata</i>	Five-banded weevil wasp	S41
Hymenoptera (Aculeata)	Crabronidae	<i>Cerceris ruficornis</i>	A digger wasp	Lower concern
Hymenoptera (Aculeata)	Crabronidae	<i>Cerceris rybyensis</i>	Ornate-tailed digger wasp	Lower concern
Hymenoptera (Aculeata)	Crabronidae	<i>Crossocerus quadrimaculatus</i>	Four-spotted digger wasp	Lower concern
Hymenoptera (Aculeata)	Crabronidae	<i>Diodontus luperus</i>	A solitary wasp	Lower concern
Hymenoptera (Aculeata)	Crabronidae	<i>Diodontus minutus</i>	Minute black wasp	Lower concern
Hymenoptera (Aculeata)	Crabronidae	<i>Dryudella pinguis</i>	A solitary wasp	Lower concern
Hymenoptera (Aculeata)	Crabronidae	<i>Epyris niger</i>	A cuckoo wasp	Lower concern
Hymenoptera (Aculeata)	Crabronidae	<i>Lindenius albilabris</i>	A solitary wasp	Lower concern
Hymenoptera (Aculeata)	Crabronidae	<i>Mellinus arvensis</i>	Field digger wasp	Lower concern
Hymenoptera (Aculeata)	Crabronidae	<i>Nysson dimidiatus</i>	Small-spurred digger wasp	[Nb]
Hymenoptera (Aculeata)	Crabronidae	<i>Nysson trimaculatus</i>	A digger wasp	[Nb]
Hymenoptera (Aculeata)	Crabronidae	<i>Oxybelus uniglumis</i>	Common spiny digger wasp	Lower concern
Hymenoptera	Crabronidae	<i>Pemphredon lethifer</i>	Little black	RDB3



Taxon Group	Family	Species	English Name	Conservation Status
(Aculeata)			wasp	
Hymenoptera (Aculeata)	Crabronidae	<i>Philanthus triangulum</i>	Bee wolf	[RDB2]
Hymenoptera (Aculeata)	Crabronidae	<i>Tachysphex pompiliformis</i>	A square-headed wasp	Lower concern
Hymenoptera (Aculeata)	Crabronidae	<i>Trypoxylon ?medium</i>	A spider wasp	Lower concern
Hymenoptera (Aculeata)	Crabronidae	<i>Trypoxylon attenuatum</i>	Slender wood-borer wasp	Lower concern
Hymenoptera (Aculeata)	Pompilidae	<i>Anoplius nigerrimus</i>	A spider wasp	Lower concern
Hymenoptera (Aculeata)	Pompilidae	<i>Arachnospila anceps</i>	A spider wasp	Lower concern
Hymenoptera (Aculeata)	Pompilidae	<i>Arachnospila spissa</i>	A spider wasp	Lower concern
Hymenoptera (Aculeata)	Pompilidae	<i>Arachnospila trivialis</i>	A spider wasp	Lower concern
Hymenoptera (Aculeata)	Pompilidae	<i>Episyron rufipes</i>	A spider wasp	Lower concern
Hymenoptera (Aculeata)	Pompilidae	<i>Evagetes crassicornis</i>	A spider wasp	Lower concern
Hymenoptera (Aculeata)	Pompilidae	<i>Priocnemis coriacea</i>	A spider wasp	[Na]
Hymenoptera (Aculeata)	Pompilidae	<i>Priocnemis parvula</i>	A spider wasp	Lower concern
Hymenoptera (Aculeata)	Pompilidae	<i>Priocnemis perturbator</i>	A spider wasp	Lower concern
Hymenoptera (Aculeata)	Pompilidae	<i>Priocnemis susterai</i>	A spider wasp	Lower concern
Hymenoptera (Aculeata)	Sphecidae	<i>Ammophila sabulosa</i>	Red-banded sand wasp	Lower concern
Hymenoptera (Aculeata)	Sphecidae	<i>Podalonia affinis</i>	Mud wasp	[RDB3]
Hymenoptera (Aculeata)	Sphecidae	<i>Podalonia hirsuta</i>	Hairy sand wasp	Nb
Hymenoptera (Aculeata)	Vespidae	<i>Vespula germanica</i>	German wasp	Lower concern
Isopoda	Armadillidiidae	<i>Armadillidium vulgare</i>	Pill woodlouse	Lower concern
Isopoda	Philosciidae	<i>Philoscia muscorum</i>	Common striped woodlouse	Lower concern
Isopoda	Porcellionidae	<i>Porcellio scaber</i>	Rough woodlouse	Lower concern
Lepidoptera	Nymphalidae	<i>Aglais io</i>	Peacock	Lower concern
Lepidoptera	Pieridae	<i>Anthocharis cardamines</i>	Orange tip	Lower concern
Lepidoptera	Choreutidae	<i>Anthophila fabriciana</i>	Nettle tap	Lower concern
Lepidoptera	Arctiidae	<i>Arctia caja</i>	Garden tiger	S41 (research only)
Lepidoptera	Lycaenidae	<i>Aricia agestis</i>	Brown argus	Lower concern
Lepidoptera	Lycaenidae	<i>Callophrys rubi</i>	Green hairstreak	Lower concern
Lepidoptera	Geometridae	<i>Camptogramma bilineata</i>	Yellow shell	Lower concern
Lepidoptera	Tortricidae	<i>Celypha lacunana</i>	Dark strawberry tortrix	Lower concern

Taxon Group	Family	Species	English Name	Conservation Status
Lepidoptera	Pyralidae	<i>Chrysoteuchia culmella</i>	Garden grass-veener	Lower concern
Lepidoptera	Nymphalidae	<i>Coenonympha pamphilus</i>	Small heath	S41: RDB NT
Lepidoptera	Erebidae	<i>Euproctis chrysorrhoea</i>	Brown-tail	Lower concern
Lepidoptera	Erebidae	<i>Euproctis similis</i>	Yellow-tail	Lower concern
Lepidoptera	Lasiocampidae	<i>Euthrix potatoria</i>	Drinker	Lower concern
Lepidoptera	Nymphalidae	<i>Hipparchia semele</i>	Grayling	S41: RDB VU
Lepidoptera	Lasiocampidae	<i>Lasiocampa quercus</i>	Oak eggar	Lower concern
Lepidoptera	Nymphalidae	<i>Lasiommata megera</i>	Wall butterfly	S41: RDB NT
Lepidoptera	Pieridae	<i>Pieris napi</i>	Green-veined white	Lower concern
Lepidoptera	Lycaenidae	<i>Polyommatus icarus</i>	Common blue	Lower concern
Lepidoptera	Nymphalidae	<i>Pyronia tithonus</i>	Gatekeeper	Lower concern
Lepidoptera	Thymelicidae	<i>Thymelicus sylvestris</i>	Small skipper	Lower concern
Lepidoptera	Lasiocampidae	<i>Trichiura crataegi</i>	Pale eggar	S41 research only
Lepidoptera	Erebidae	<i>Tyria jacobaeae</i>	Cinnabar moth	S41 research only
Lepidoptera	Nymphalidae	<i>Vanessa atalanta</i>	Red admiral	Lower concern
Lepidoptera	Zygaenidae	<i>Zygaena sp</i>	Five spot/ Narrow bordered five spot burnet	Lower concern
Odonata	Aeshnidae	<i>Anax imperator</i>	Emperor dragonfly	Lower concern
Odonata	Coenagrionidae	<i>Coenagrion puella</i>	Azure damselfly	Lower concern
Odonata	Coenagrionidae	<i>Erythromma najas</i>	Small red-eyed damselfly	Lower concern
Odonata	Coenagrionidae	<i>Ischnura elegans</i>	Blue tailed damselfly	Lower concern
Odonata	Libellulidae	<i>Libellula fulva</i>	Broad-bodied chaser	NT
Odonata	Libellulidae	<i>Orthetrum cancellatum</i>	Black-tailed skimmer	Lower concern
Odonata	Libellulidae	<i>Sympetrum fonscolombii</i>	Red veined darter	Lower concern
Orthoptera	Acrididae	<i>Chorthippus brunneus</i>	Field grasshopper	Lower concern
Orthoptera	Tettigoniidae	<i>Conocephalus fuscus</i>	Long-winged conehead	Lower concern
Orthoptera	Phaneropteridae	<i>Leptophyes punctatissima</i>	Speckled bush-cricket	Lower concern
Orthoptera	Tettigoniidae	<i>Roeseliana roeselii</i>	Roesel's bush-cricket	Lower concern
Orthoptera	Tetrigidae	<i>Tetrix subulata</i>	Slender groundhopper	Lower concern
Orthoptera	Tetrigidae	<i>Tetrix undulata</i>	Common groundhopper	Lower concern
Phalangiidae	Opiliones	<i>Dicranopalpus ramosus agg</i>	Harvestman	Lower concern
Polydesmida	Polydesmidae	<i>Polydesmus sp</i>	Flat millipede	Lower concern





Taxon Group	Family	Species	English Name	Conservation Status
Pulmonata	Helicidae	<i>Cornu aspersa</i>	Garden snail	Lower concern
Pulmonata	Lauriidae	<i>Lauria cylindracea</i>	Common chrysalis snail	Lower concern
Pulmonata	Pupillidae	<i>Pupilla muscorum</i>	Moss chrysalis snail	Lower concern
Pulmonata	Hygromiidae	<i>Trochulus hispidus</i>	Hairy snail	Lower concern
Pulmonata	Vertiginidae	<i>Vertigo pygmaea</i>	Common whorl snail	Lower concern

## Annex 3: Photographs

Photo 1. Habitat - the south-facing bank to the east of the site, with reedbed to the left.







Photo 2. Nectar-rich fixed dune grassland in the west of the site. Much visited by bees and other aculeates.







Photo 3. Dune annual grassland in the east of the site. In places open ground is used for basking and burrowing by various invertebrate species.







Photo 4. South-facing bank created in 2018; although this is due to be removed, it has proved an excellent habitat for a number of scarce and rare bees and wasps. Creating similar but much smaller features are a possibility for mitigating impacts.





Photo 5. The restored pond on site - an important feature for aquatic invertebrates, not focused on in this survey.

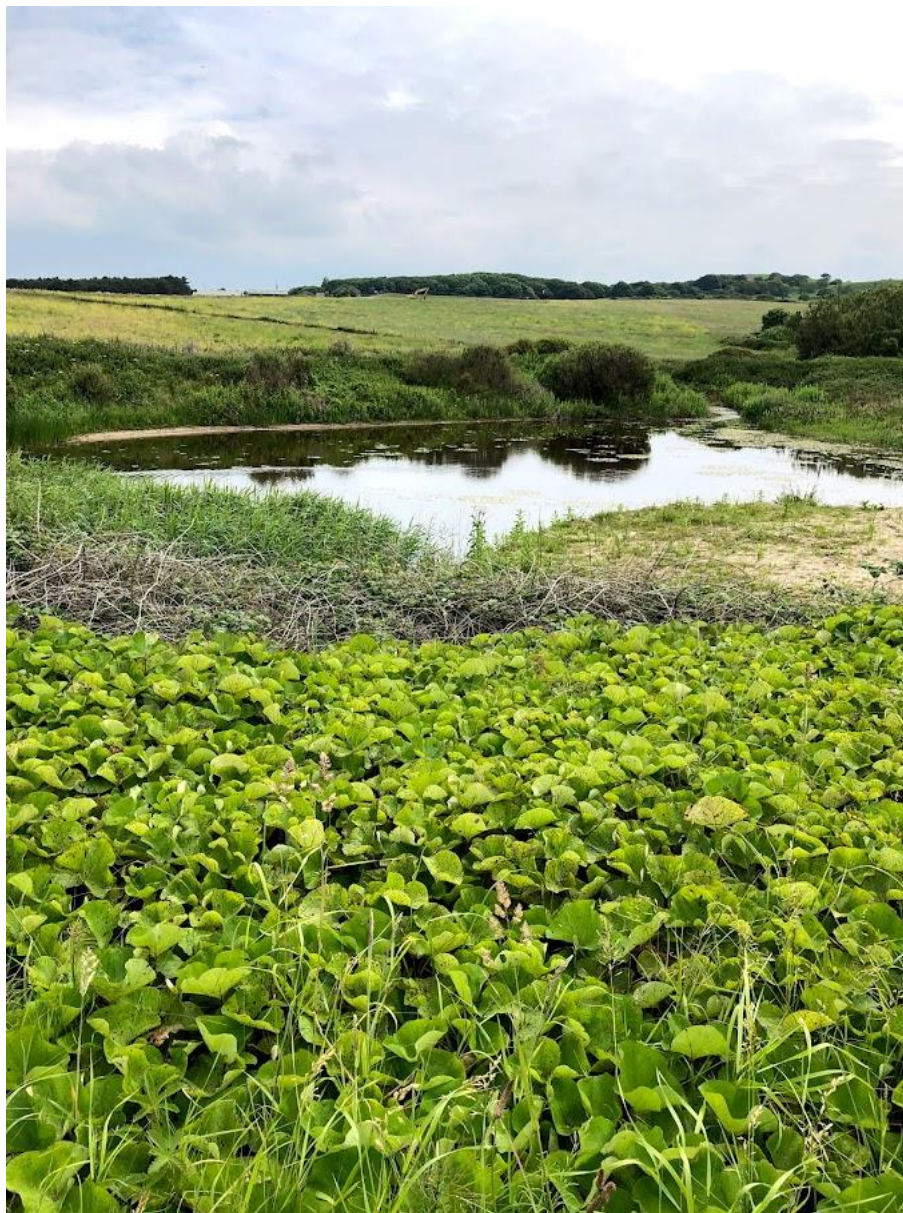




Photo 6: Aculeate Reference Collection assembled by Nick Owens



Photo 7. Processing a vacuum sample





Photo 8: Installing a pitfall trap.

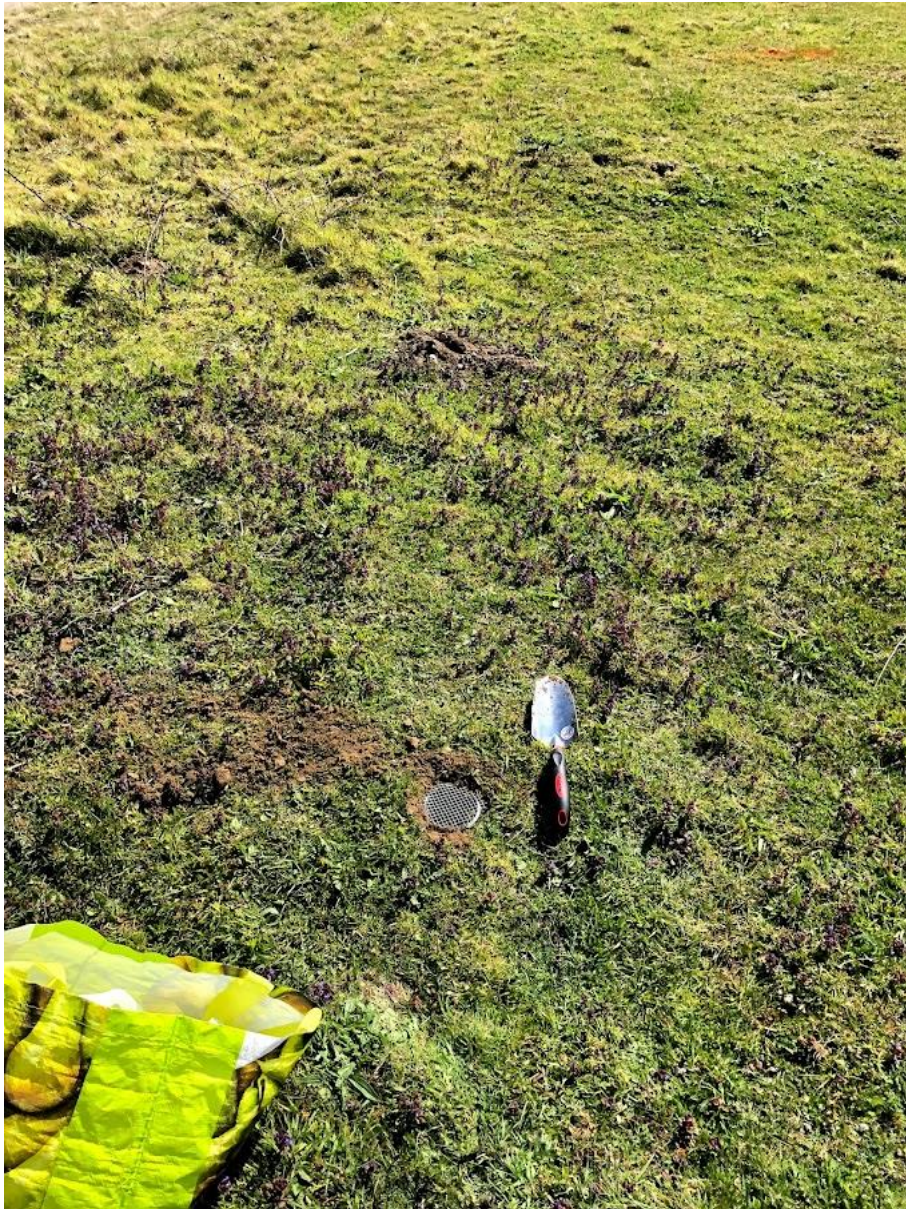


Photo 9: Notable weevil *Gronops lunatus* from a vacuum sample.



Photo 10. Notable weevil *Cathormiocerus aristatus*, from a vacuum sample.





Photo 11. Tachinid fly *Townsendiellomyia nidicola* female looking to lay eggs into brown-tail moth caterpillars in their web on a bramble thicket.

