A83 Rest and Be Thankful

LTS EIAR VOLUME 4, APPENDIX 11.13 - TERRESTRIAL INVERTEBRATE REPORT

Transport Scotland

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A11-13 Terrestrial Invertebrate Report

A11-13.1 Introduction

Terms of Reference

A11-13.1.1 AtkinsRéalis WSP Joint Venture (AWJV) was commissioned by Transport Scotland as part of the A83 Rest and Be Thankful Project (hereafter referred to as the Proposed Scheme), to prepare a terrestrial invertebrate baseline report.

A11-13.1.2 Volume 2, Chapter 4: The Proposed Scheme, provides details of the construction works, the Receptor Sites and Natural Capital (NC) and Biodiversity Net Gain (BNG) enhancement sites. The findings for these enhancement sites are considered in Appendix 11.16: Enhancement Site Survey Report. They are not discussed within this report. The Proposed Scheme, excluding the NC and BNG enhancement sites, will be referred to as the Proposed Scheme (excl. NC & BNG) hereafter.

A11-13.2 Purpose of Report

A11-13.2.1 This report is intended to provide baseline information regarding terrestrial invertebrates to inform the Environmental Impact Assessment (EIA) Report for the Proposed Scheme.

A11-13.2.2 This report presents ecological information obtained during the following:

- a desk-study involving review of data available online undertaken in June 2024
- a field survey to record invertebrate assemblages within the Proposed Scheme (excl. NC & BNG) undertaken between 21 August 2023 and 24 August 2023
- a field survey to record the invertebrate assemblages within the Proposed Scheme (excl. NC & BNG) undertaken between 1 July 2024 and 5 July 2024 and

- incidental invertebrate records obtained during other ecological surveys undertaken in 2023 to inform the Proposed Scheme (excl. NC & BNG).

A11-13.3 Legislation

A11-13.3.1 See Volume 4, Appendix 11.2: Biodiversity Legislation, Policy and Guidance for a summary of key relevant legislation.

A11-13.4 Methodology

Desk Study

A11-13.4.1 The geographical area for obtaining ecological data through desk studies has been determined using CIEEM Guidelines for Biodiversity Data, CIEEM Guidelines for Preliminary Ecological Appraisal and professional judgement. Desk study data has been gathered through a data request and using online resources. In January 2023, a request for invertebrate records was submitted to and provided from the Argyll Biological Records Centre (ABReC) for a 2km buffer of the Proposed Scheme (excl. NC & BNG). Due to staff illness, ABReC was not able to provide a full data search report. ABRC confirmed their records could be downloaded from National Biodiversity Network (NBN) Atlas and used in any reports relating to the search (see Chapter 11: Biodiversity for details of communication with ABReC). The records were downloaded and reviewed in February 2023 from the NBN Atlas for a 2km buffer of the Proposed Scheme (excl. NC & BNG). Only records within the last 10 years were considered.

Incidental Invertebrate Records

A11-13.4.2 Invertebrate records obtained incidentally during wider ecological surveys of the Proposed Scheme (excl. NC & BNG) undertaken in 2023 are included for completeness.

Field Survey

A11-13.4.3 The terrestrial invertebrate survey area covered the Proposed Scheme (excl. NC & BNG) plus a 250m buffer. The central Ordnance Survey National Grid Reference (OSNGR) for the invertebrate survey area is NN 239063 and its

location is shown in Volume 3, Figure 11.13a: Invertebrate Sample Station Locations.

A11-13.4.4 Terrestrial invertebrate surveys were undertaken between 21 and 24 August in 2023 and between 1 and 5 July in 2024. All fieldwork was carried out using standardised sampling protocols for assessment of invertebrate assemblages of sites advocated by recognised good practice guidance namely Surveying terrestrial and freshwater invertebrates for conservation evaluation (NERR005). Fieldwork included both the siting and servicing of 3m x 3m grids of pitfall traps and a range of supplementary hand-collecting techniques recommended in Surveying terrestrial and freshwater invertebrates for conservation evaluation (NERR005). These survey methods aimed to provide a thorough inventory of the terrestrial invertebrate fauna present within the survey area.

A11-13.4.5 Eight sample stations were established in 2023 in areas of grassland, bog and scrub/woodland. A sample station is defined as an area of approximately 25m radially from a central sample point. Eight sample stations were again repeated in 2024 but with some slight alterations according to updated proposals for the Proposed Scheme (excl. NC & BNG) and as such, each sample station has been provided a suffix indicating the year, e.g. GC01_23, GC02_23/24. In addition to near repeat surveys of the eight sample stations, another eight sample stations were also subject to survey in 2024 bringing the total number of sample stations in 2024 to 16. The position of all sample stations was identified with a GPS-derived OSNGR and photographs of them were taken. Photographs were also taken of any other relevant invertebrate habitat features of interest (shown in Annex 11.13.A).

A11-13.4.6 A description of habitats was collected during the surveys. National Vegetation Classification (NVC) was used see Volume 4, Appendix 11.4: Designated Sites and Terrestrial Habitats and Volume 3, Figure 11.4b: Terrestrial Habitats (National Vegetation Classification) to accurately assess habitat suitability for important invertebrate populations.

A11-13.4.7 Table A11-13.1 summarises information on the location of the sample stations and the habitats present within them, including a ten-figure OSNGR. The locations of the sample stations are shown in Volume 3, Figure 11.13a Invertebrate Sample Station Locations.

Table A11-13.1 - Location and Description of Invertebrate Sample Stations

add	OSNGR	Description
GC01_23	NN 2465304805	Mix of old clear-fell with rough grassland and scrub and some species-rich grassland along edge of Old Military Road (OMR). Running up to the east bank of Croe Water.
GC02_23/24	NN 2433505265	Mix of acid bog, scrub and riparian habitats (including shingle bar) between the Croe Water and the OMR.
GC03_23/24	NN 2429506025	Birch scrub and *Myrica-Molinia* bog immediately to the east of A83. Conifer plantation just to the south. and crossed by steep, upper section of Croe Water. Moth trapping only in 2023.
GC04_23/24	NN 2387506435	Species-rich cattle grazed acid flushes.
GC05_23/24	NN 2344506855	Species-rich *Molinia-Juncus* flushes with abundant *Carum verticillatum*.
GC06_23/24	NN 2321507085	Steep, south—running stream gully and associated acid grassland and heath on rocky outcrops.
GC07_23/24	NN 22950730	*Molinia*-dominated grassland with patchy wet heath and dry heath on rock outcrops. Some patches of conifers.
GC08_23/24	NN 23170766	Acid bog, wet heath and *Molinia* around small bog pool.

add	OSNGR	Description
GC01_24	NN 2415905613	Mix of old forestry with some *Molinia* dominated bog with extensive *Sphagnum* carpets.
GCA	NN 2355306649	Bordering habitat between *Juncus* mire and *Equisetum* swamp.
GCB	NN 2385106269	Wet hollow dominated by *Menyanthes* and *Equisetum* surrounded by species-rich mire.
GCC	NN 2432605600	Drained *Juncus – Holcus* mire, relatively dry.
GCD	NN 2331107266	*Carex echinata* mire interspersed with rock outcrops – species-rich with some calcareous influence.
GCE	NN 2325007222	*Juncus – Holcus* mire on gently sloping ground adjacent to a watercourse.
GCF	NN 2320407116	Mixture of acid and neutral *Juncus* mire communities surrounding a steep rocky ravine with fast-flowing water.
GCG	NN 2334107099	Species-rich mire vegetation dominated by *Juncus* spp. bordering watercourse.
GCH	NN 2459004943	Species-rich roadside verge predominantly mixture of grassland and shade-tolerant woodland edge vegetation in the southern extent of the site.

A11-13.4.8 The main sampling techniques employed within each of the stations were as follows:

- 30-minute ground search. Each ground search was broken down into six 5-minute sub-samples, with the aim being to sample all small-scale variations within the habitat at each sample station.
- 40-minute spot-sweep sample. The surveyor aimed to cover all areas of the sample station. The time includes both targeted spot searching with a

net (30 minutes) and an additional 10-minute sweep sample. Each of the latter was broken down into five 2-minute sub-samples.

- 3x3m grids of pitfall traps set up in each sample station. In 2023, it was only possible to run these for GC01-GC08 for the four days over which this survey was undertaken. In 2024, pitfall traps were installed at GC01-GC08 between 20 and 22 May 2024 and were then collected between 1 and 5 July 2024. They were covered with chicken wire to prevent stock and small mammals accessing them. All pitfall traps were intact with good to moderate samples collected in most of the sample stations. The exception was GC05, where flooding resulted in only a small pitfall catch.

A11-13.4.9 Sampling has focused on the collection of those invertebrate groups considered most relevant to the upland habitats present at Glen Croe in Surveying terrestrial and freshwater invertebrates for conservation evaluation (NERR005). These were primarily in the following taxa: spiders (*Araneae*); beetles (*Coleoptera*), especially ground beetles (*Carabidae*) and rove beetles (*Staphylinidae*); and two-winged flies (*Diptera*), primarily craneflies (*Tipuloidea*) soldierflies and allies (Larger *Brachycera*), long-legged flies (*Dolichopodidae*) and hoverflies (*Syrphidae*).

A11-13.4.10 Other taxa collected were generally those considered in Surveying terrestrial and freshwater invertebrates for conservation evaluation (NERR005). All material was collected in tubes containing alcohol and has been examined microscopically and determined to species level. Voucher specimens of any important invertebrates recorded will be retained in the contractor's collection. Other groups that can be identified in the field such as dragonflies (*Odonata*), butterflies and day-flying moths (*Lepidoptera*) and grasshoppers, crickets and allies (*Orthopteroidea*) were also recorded.

A11-13.4.11 Table A11-13.2 lists invertebrates recorded during fieldwork undertaken within the survey area during 2023, Table A11-13.3 lists invertebrates recorded during fieldwork undertaken within the survey area during 2024. Paragraphs A11-13.5.6 – A11-13.5.28 list species with a formal conservation status that are regarded as key species when assessing the importance of the survey area for terrestrial invertebrates. In paragraph A11-13.5.29, this list of key

species is used to produce a list of key habitat features for invertebrates within the survey area. Key habitats are defined here as being those that support at least one of the key species identified.

A11-13.4.12 The codes in Table 11-13-1 and Table 11-12-3 refer to the sample stations in which species were recorded. The location of these survey units are shown in Volume 3, Figure 11.13a Invertebrate Sample Station Locations.

A11-13.4.13 The status categories given in the third column of Table 11-13-2 and Table 11-13-3 and after the scientific name in paragraphs A11-13.4.8 – A11-13.5.28. Table 11-13-3 refers to those species having a formal rarity/threat status ascribed to them by the UK government conservation agencies. These are defined as follows:

- VU – IUCN UK Red List, Vulnerable. Taxa which either have a very small British range and/or are declining rapidly with a quantifiable probability of becoming extinct if the causal factors for decline continue to operate.
- NT - IUCN UK Red List, Near Threatened. A taxon is Near Threatened when it has been evaluated against the IUCN criteria and does not currently qualify for Critically Endangered, Endangered or Vulnerable status, but is close to qualifying, or is likely to do so soon.
- NE – IUCN UK Red List, Not Evaluated. A taxon is Not Evaluated when it has not yet been evaluated against the criteria.
- SBL – Scottish Biodiversity List. Species assessed as being of Principal Importance for the maintenance and enhancement of biodiversity in Scotland by the Scottish Government.
- Na – Nationally Scarce Category A. Taxa thought to occur in between 16 and 30 10 km squares of the National Grid.
- Nb – Nationally Scarce Category B. Taxa thought to occur in between 30 and 100 10 km squares of the National Grid.
- NS – Nationally Scarce. In more recent second status reviews, the Na and Nb sub-divisions have been subsumed into a single category covering species occurring in 16 to 100 10km squares of the National

Grid. Unlike the previous 'N' category, which covered the same range, the amalgamation does not necessarily result from inadequate information on the British distribution.

- LC – Least Concern. A taxon that has been evaluated against the IUCN red list criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened.

Pantheon Analysis

A11-13.4.14 Pantheon software (Webb *et al.*, 2018) was used to analyse the results of the sampling undertaken within the survey area. Pantheon is freely accessible software that provides several reports on invertebrate assemblages. These reports cover taxonomic information, conservation status, larval and adult feeding guilds, broad biotope, habitat, resource and traits, species assemblage types and published indices.

A11-13.4.15 The combined summary of the results was included, and the results were used to inform any recommendations provided.

Survey Limitations

A11-13.4.16 This study was subject to several constraints that should be considered when interpreting the results of the survey work. Firstly, 2023 survey work was confined to a single late-summer block, which was beyond the peak May-July period when the greatest diversity and abundance of adult insects are active. The single sample also meant that pitfall traps could only be put out for the four-day period and in combination with the poor weather and access restrictions (see below), this collectively meant that the pitfall catches were very small.

A11-13.4.17 The weather during the fieldwork in both 2023 and 2024 was cool, windy and wet, which is considered likely to have reduced the diversity of species recorded. This was especially the case with flying insects such as flies (*Diptera*), with the vegetation being too wet for effective spot-sweep sampling to be undertaken.

A11-13.4.18 Lastly, during 2023 it was only possible to look at land within the ownership lin the middle of the Proposed Scheme (excl. NC & BNG) farmland on the first two days of fieldwork. This land covered a large part of the survey area and included some of the highest-quality habitats, especially the very extensive area of cattle-grazed flushes between High Glen Croe and Laigh Glen Croe. Further survey of the farm and surrounding flush habitats was subsequently undertaken in 2024.

A11-13.4.19 These limitations are considered in the interpretation of the results and have been utilised in the creation of appropriate recommendations. Overall, these limitations are not considered to have an overall significant detriment to the impact assessment.

A11-13.5 Results

Desk Study

A11-13.5.1 The desk study returned records for seven terrestrial invertebrate species between 2014 and 2024 within 2km of the Proposed Scheme (excl. NC & BNG) as follows:

- A ground beetle *Carabus granulatus*, a single 2023 record from the ABRC Dataset, approximately 650m northeast of the Proposed Scheme (excl. NC & BNG) adjacent the Croe Water. NE on the IUCN.
- Small heath *Coenonympha pamphilus* a single 2023 record from the ABRC Dataset, approximately 1.5km northeast of the Proposed Scheme (excl. NC & BNG) close to Beinn Ime. Small heath is an SBL and LC on the IUCN.
- Glow worm *Lampyris noctiluca,* a single 2019 record from the Soldier Beetles and Allies Recording Scheme, directly adjacent the Proposed Scheme (excl. NC & BNG). NT on the IUCN.
- Common hawker *Aeshna juncea*, a single 2018 record from the British Dragonfly Society Recording Scheme, approximately 300m south of the Proposed Scheme (excl. NC & BNG). LC on the IUCN.

- Large red damselfly *Pyrrhosoma nymphula*, two 2018 records from the British Dragonfly Society Recording Scheme, approximately 1km southeast of the Proposed Scheme (excl. NC & BNG) adjacent the A83. LC on the IUCN.
- Short-palped cranefly *Limonia nubeculosa* a single 2017 record from the UK Cranefly Recording Scheme, approximately 80m south of the Proposed Scheme (excl. NC & BNG). NE on the IUCN.
- Scotch Argus *Erebia aethiops*, a single 2014 records from the ABRC Dataset, approximately 300m north of the Proposed Scheme (excl. NC & BNG) north of the A83. LC on the IUCN.

Incidental Invertebrate Records

A11-13.5.2 Two incidental records were recorded during wider ecological surveys in 2023. Cinnabar moth *Tyria jacobaeae* caterpillars (a common and widespread species in Scotland) were located within the Proposed Scheme (excl. NC & BNG) and an unidentified species of wood ant nest was recorded within marshy acid grassland habitat approximately 100m south of the Proposed Scheme (excl. NC & BNG).

Field Survey

A11-13.5.3 Glen Croe has a mix of 'upland' grassland, bog and heath habitats that are typical of the oceanic fringes of western Britain. Grasslands are mostly of the U4 and U5 NVC types and are dominated by common bent *Agrostis capillaris*, sheep's fescue *Festuca ovina* and mat-grass *Nardus stricta*. There are also extensive stands of bracken *Pteridium aquilinum* grassland in which this species stands over an impoverished U4 understorey. Bogs at Glen Croe are mostly soligenous M6c/d, M23a/b and M25 NVC poor-fens that are either dominated by, or have, mosaics of purple moor-grass *Molinia caerulea*, soft rush *Juncus effusus* and sharp-flowered rush *Juncus acutiflorus*. In some places, the *Molinia* bogs have abundant bog myrtle *Myrica gale*. In places where cattle grazing prevents *Molinia* and rushes becoming dominant, these mires can be quite species-rich, with a wider range of plants present, including marsh violet *Viola palustris*, whorled caraway *Carum verticillatum*,

devil's-bit scabious *Succisa pratensis*, round-leaved sundew *Drosera rotundifolia*, common butterwort *Pinguicula vulgaris*, bog asphodel *Narthecium ossifragum*, common cottongrass *Eriophorum angustifolium*, various small sedges *Carex spp*. and lawns of bog-mosses, amongst which *Sphagnum denticulatum* and *S. fallax* are prominent. Very locally, where groundwater is more base-rich, mildly calcicolous species such as marsh marigold *Caltha palustris*, grass-of-Parnassus *Parnassia palustris*, marsh lousewort *Pedicularis palustris* and 'brown mosses', such as *Calliergonella cuspidata* may also occur in these flush bogs.

A11-13.5.4 Mire and rush pasture are mostly wet M25 and M23, in which ericaceous dwarf-shrubs (primarily ling *Calluna vulgaris* and cross-leaved heath *Erica tetralix*) are co-dominant with tussocky purple moor-grass, though there are also some small stands in which the latter is less prominent and there is usually some deergrass *Trichophorum cespitosum agg.* and a high cover of bog-mosses (mostly *Sphagnum cuspidatum*, and *S. papillosum*). In a few places where there are deeper peats and a higher cover of hare's-tail cottongrass *Eriophorum vaginatum*, this community is itself transitional towards M17 blanket bog. Drier stands of H12 upland heath characterised by ling, bilberry *Vaccinium myrtillus*, bell heather *Erica cinerea* and pleurocarpous mosses such as *Hylocomium splendens, Hypnum jutlandicum* and *Pleurozium schreberi* are mostly confined to thin soils on and around rock outcrops or on banks along the edge of forestry tracks.

A11-13.5.5 The woodland and scrub are dominated by planted or self-seeding exotic conifers. Stands of native woodland vegetation are confined to a few small patches of wet woodland dominated by grey willow *Salix cinerea* and eared willow *Salix aurita* and an area of upland birch *Betula sp.* scrub just above the point where the Croe Water crosses the A83 (sample station GC03 on Volume 3, Figure 11.13a: - Invertebrates Sample Station Locations). There is also a scatter of broadleaved trees and shrubs elsewhere on the site, primarily rowan *Sorbus aucuparia*, willows, birch, ash *Fraxinus excelsior* and sycamore *Acer pseudoplatanus*.

Table A11-13.2 - List of Invertebrates Recorded 2023

Scientific Name	Common Name	Status	Sample Station ('23')
Deroceras laeve	Marsh slug	n/a	GC08
Arion ater	Large black slug	n/a	GC04,06,07, 08
Oxychilus alliarius	Garlic snail	n/a	GC04
Nesovitrea hammonis	Rayed glass snail	n/a	GC04,07, 08
Aeshna juncea	Common Hawker dragonfly	n/a	GC01,06
Cordulegaster boltonii	Golden-ringed dragonfly	n/a	GC02,05
Lamproplax picea	A ground bug	n/a	GC07
Stygnocoris sabulosus	A ground bug	n/a	GC01,02,04,06,07
Hespercorixa castanea	A lesser water boatman	n/a	GC08
Agabus sturmii	A diving beetle	n/a	GC08
Macrosaldula scotica	A shore bug	n/a	GC02
Salda littoralis	A shore bug	NS	GC02
Livia juncorum	A Psyllid bug	n/a	GC02
Cryptostemma alienum	A Dipsocorid bug	NS	GC02
Agabus bipustulatus	A diving beetle	n/a	GC06
Hydroporus obscurus	A diving beetle	n/a	GC08
Hydroporus tristis	A diving beetle	n/a	GC08
Cicindela campestris	Green tiger beetle	n/a	GC04
Trechus obtusus	A ground beetle	n/a	GC02,04
Bembidion atrocaeruleum	A ground beetle	n/a	GC02
Bembidion geniculatum	A ground beetle	NS	GC02
Bembidion tetracolum	A ground beetle	n/a	GC02

Scientific Name	Common Name	Status	Sample Station (‘23’)
Poecilus cupreus	A ground beetle	n/a	GC04
Poecilus versicolor	A ground beetle	n/a	GC04,08
Pterostichus diligens	A ground beetle	n/a	GC04,06,07
Pterostichus rhaeticus	A ground beetle	n/a	CG04,07
Pterostichus madidus	A ground beetle	n/a	GC06
Amara communis	A ground beetle	n/a	GC06
Limodromus assimilis	A ground beetle	n/a	CG02
Anacaena globulus	A Hydrophilid water beetle	n/a	GC06,07,08
Helophorus flavipes	A Helophorid water beetle	n/a	GC08
Nicrophorus investigator	A sexton beetle	n/a	GC03
Nicrophorus vespilloides	A sexton beetle	n/a	GC06
Olophrum fuscum	A rove beetle	n/a	GC08
Lesteva sicula	A rove beetle	n/a	GC04
Geodromicus nigrita	A rove beetle	n/a	GC02
Bryaxis curtisii	A rove beetle	n/a	GC05
Pselaphus heisei	A rove beetle	n/a	GC06
Tachyporus atriceps	A rove beetle	n/a	GC06
Aleochara sparsa	A rove beetle	n/a	GC02
Myllaena brevicornis	A rove beetle	n/a	GC04,06,07,08
Myllaena intermedia	A rove beetle	n/a	GC04,05
Atheta aquatica	A rove beetle	n/a	GC08
Atheta castanoptera	A rove beetle	n/a	GC02,07
Atheta hypnorum	A rove beetle	n/a	GC04

Scientific Name	Common Name	Status	Sample Station (‘23’)
Geostiba circellaris	A rove beetle	n/a	GC04
Stenus impressus	A rove beetle	n/a	GC01,02,05,06,07,08
Stenus fulvicornis	A rove beetle	n/a	GC04,05
Stenus flavipes	A rove beetle	n/a	GC02
Stenus nitidiusculus	A rove beetle	n/a	GC04,05,08
Stenus boops	A rove beetle	n/a	GC04
Stenus brunnipes	A rove beetle	n/a	GC04
Lathrobium brunnipes	A rove beetle	n/a	GC04,08
Othius subuliformis	A rove beetle	n/a	GC06
Quedius fuliginosus	A rove beetle	n/a	GC05
Quedius boops	A rove beetle	n/a	GC08
Quedius maurorufus	A rove beetle	n/a	GC04,06,08
Ocypus aeneocephalus	A rove beetle	n/a	GC02
Staphylinus erythropterus	A rove beetle	n/a	GC04,05,08
Erichsonius cinerascens	A rove beetle	n/a	GC08
Anoplotrupes stercorosus	A dor beetle	n/a	GC04
Contacyphon hilaris	A marsh beetle	n/a	GC01,02,04
Contacyphon padi	A marsh beetle	n/a	GC02,05
Contacyphon variabilis	A marsh beetle	n/a	GC08
Byrrhus pilula	A pill beetle	n/a	GC02
Zorochros minimus	A click beetle	n/a	GC02
Aphidecta obliterata	Larch ladybird	n/a	GC04,06,07
Cassida rubiginosa	Thistle tortoise beetle	n/a	GC01

Scientific Name	Common Name	Status	Sample Station (‘23’)
Lochmaea caprea	A leaf beetle	n/a	GCO1,02
Longitarsus luridus	A flea beetle	n/a	GC01
Perapion violaceum	An Apionid weevil	n/a	GC01,02
Protapion fulvipes	An Apionid weevil	n/a	GC02
Anthonomus brunnipennis	A weevil	Nb	GC01,02,07
Rhinoncus pericarpius	A weevil	n/a	GC04
Pieris napi	Green-veined white butterfly	n/a	GC05,06,08
Erebia aethiops	Scotch argus butterfly	n/a	GC02,03,05,06,07,08
Aglais io	Peacock butterfly	n/a	GC04
Lycaena phlaeas	Small copper butterfly	n/a	GC04
Lasiocampa quercus	Oak eggar moth	n/a	GC04
Camptogramma bilineata	Yellow shell moth	n/a	GC03
Epirrhoe alternata	Common carpet moth	n/a	GC03,06,07
Hydriomena furcata	July highflyer moth	n/a	GC03
Cosmorhoe ocellata	Purple bar moth	n/a	GC08
Eulithis testata	Chevron moth	n/a	GC06
Dysstroma citrata	Dark marbled carpet moth	n/a	GC03,06
Mesotype didymata	Twin-spot carpet	n/a	GC06,07
Eupithecia nanata	Narrow-winged pug moth	n/a	GC06,07
Phragmatobia fuliginosa	Ruby tiger moth	n/a	GC01,04,07
Eilema depressa	Buff footman moth	n/a	GC03
Eilema lurideola	Common footman moth	n/a	GC03
Acronicta rumicis	Knot grass moth	n/a	GC01,04,07

Scientific Name	Common Name	Status	Sample Station (‘23’)
Stilbia anomala	Anomalous moth	VU	GC03
Amphipoea sp	Ear moth agg.	n/a	GC03
Apamea monoglypha	Dark arches moth	n/a	GC03
Mesapamea sp	Common rustic agg	n/a	GC03
Brachylomia viminalis	Minor shoulder-knot moth	NT; SBL	GC03
Ceramica pisi	Broom moth	VU; SBL	GC07
Lycophotia porphyrea	True lover’s knot moth	VU	GC06,07
Noctua comes	Lesser yellow underwing	n/a	GC03
Xestia xanthographa	Square-spot rustic	n/a	GC03
Eugnorisma glareosa	Autumnal rustic moth	NT; SBL	GC03
Tipula staegeri	A mottle cranefly	n/a	GC05
Tipula paludosa	Meadow white-stripe cranefly	n/a	GC01,02,04,05,06,07,08
Tipula scripta	Common saw-tailed mottle cranefly	n/a	GC04,05
Pedicia rivosa	Giant triangle cranefly	n/a	GC06
Tricyphona immaculata	Common black hairy-eye cranefly	n/a	GC06,07
Erioptera fuscipennis	Common black splay cranefly	n/a	GC04,05
Eloeophila maculata	A cranefly	n/a	GC05,08
Euphylidorea meigenii	Common black longtail cranefly	n/a	GC02,04,05,06,07,08
Pilaria decolor	A cranefly	n/a	GC04,05,08
Phylidorea squalens	Dull bog longtail cranefly	n/a	GC02,04,08
Rhipidia maculata	Peppered comb-horn cranefly	n/a	GC04,05
Cheilosia fraterna	Orange-shinned blacklet hoverfly	n/a	GC02,05
Chrysotoxum arcuatum	A hoverfly	n/a	GC01

Scientific Name	Common Name	Status	Sample Station ('23')
Episyrphus balteatus	Marmalade hoverfly	n/a	GC04
Eristalis intricarius	Furry dronefly	n/a	GC02,06
Eristalis nemorum	Stripe-faced dronefly	n/a	GC02
Eristalis pertinax	Tapered dronefly	n/a	GC02,06,07
Eristalis tenax	Common dronefly	n/a	GC01,02,06,07
Helophilus pendulus	A sun-fly	n/a	GC01,02,04,05
Leucozona glaucia	Pale-saddled Leucozona hoverfly	n/a	GC01
Melanostoma mellinum	Short grass hoverfly	n/a	GC01,02,04,05,06,07
Melanostoma scalare	Slender grass hoverfly	n/a	GC06,07
Meliscaeva cinctella	Banded Meliscaeva hoverfly	n/a	GC01,02,04,06,07
Parasyrphus malinellus	Dark-legged forest syrph hoverfly	n/a	GC02
Platycheirus albimanus	Grey-spotted boxer hoverfly	n/a	GC06,07
Platycheirus occultus	Dusky marsh boxer hoverfly	n/a	GC08
Platycheirus rosarum	Twin-spot boxer hoverfly	n/a	GC05
Sericomyia silentis	Yellow-barred peat hoverfly	n/a	GC01,02,05,06,07
Syrphus torvus	Hairy-eyed Syrphus	n/a	GC06
Volucella bombylans	Bumblebee plumehorn hoverfly	n/a	GC01,02,06
Scathophaga stercoraria	A dung fly	n/a	GC04,05,06,07,08
Scathophaga suilla	A dung fly	n/a	GC04,08
Bombus lucorum agg.	White-tailed bumblebee	n/a	GC01,02,04,06,07,08
Bombus lucorum/terrestris	Buff-tailed/white-tailed bumblebee workers	n/a	GC01,02,04,05,06,07,08
Bombus hortorum	Garden bumblebee	n/a	GC02
Bombus monticola	Mountain bumblebee	SBL	GC01,02,06,07

Scientific Name	Common Name	Status	Sample Station (‘23’)
Bombus pratorum	Early bumblebee	n/a	GC01,02
Bombus muscorum	Moss carder bumblebee	SBL	GC06
Bombus pascuorum	Common carder bumblebee	n/a	GC01,02,04,05,06,07,08
Formica lemani	Northern silky ant	n/a	GC02
Lasius niger	Black garden ant	n/a	GCO1
Myrmica ruginodis	A red ant	n/a	GC01,02,04,05,06,07,08
Trichoniscus pusillus	Common pigmy woodlouse	n/a	GC06
Neobisium carcinoides	A false scorpion	n/a	GC08
Chthonius ischnocheles	A false scorpion	n/a	GC06
Nemastoma bimaculatum	A harvestman spider	n/a	GC04,05,06,07
Ero furcata	A Mimetid spider	n/a	GC04
Walckenaeria cuspidata	A money spider	n/a	GC06,07
Gnathonarium dentatum	A money spider	n/a	GC05,08
Pocadicnemis pumila	A money spider	n/a	GC04,05,08
Gonatium rubens	A money spider	n/a	GC04,05
Hilaira excisa	A money spider	n/a	GC04
Tapinopa longidens	A money spider	n/a	GC04
Bolyphantes luteolus	A money spider	n/a	GC06,07
Tenuiphantes zimmermanni	A money spider	n/a	GC04,05,06,07
Palliduphantes ericaeus	A money spider	n/a	GC04
Pachygnatha clercki	A Tetragnathid spider	n/a	GC04
Metellina segmentata	A Tetragnathid spider	n/a	GC01,02,05,06,07,08

Scientific Name	Common Name	Status	Sample Station (‘23’)
Araneus diadematus	Garden cross spider	n/a	GC02,06
Araneus quadratus	An orb-weaving spider	n/a	GC01,02,03,04,05,06, 07
Pardosa agricola	A wolf spider	n/a	GC02
Agroeca proxima	A Liocranid spider	n/a	GC06
Clubiona trivialis	A Clubionid spider	n/a	GC07

Table A11-13.3 - List of Invertebrates Recorded in 2024

Scientific Name	Common Name	Status	Sample Station ('_24')
Deroceras laeve	Marsh Slug	n/a	GC02,08,F
Arion ater	Large Black Slug	n/a	GC04,05,F
Arion circumscriptus	An Arionid slug	n/a	GCF
Arion hortensis agg.	Garden Slug	n/a	GCG
Arion intermedius	Hedgehog slug	n/a	GC05,F
Arianta arbustorum	Copse Snail	n/a	GCG
Cepaea nemoralis	Brown-lipped Snail	n/a	GC05
Zenobiella subrufescens	Brown snail	n/a	GCF
Oxychilus alliarius	Garlic Snail	n/a	GCF
Oxychilus cellarius	Cellar snail	n/a	GCF
Nesovitrea hammonis	Rayed Glass Snail	n/a	GC06,A,F
Vitrea crystallina	Common Crystal Snail	n/a	GCG
Columella aspera	A whorl snail	n/a	GCF, G
Vitrina pellucida	Pellucid glass snail	n/a	GCF
Ommatoiulus sabulosus	Banded millipede	n/a	GCF

Scientific Name	Common Name	Status	Sample Station ('_24')
Pyrrhosoma nymphula	Large Red Damselfly	n/a	GCC
Cordulegaster boltonii	Golden-ringed Dragonfly	n/a	GCH
Monalocoris filicis	Bracken Bug	n/a	GCH
Pithanus maerkeli	A Mirid bug	n/a	GC05, H
Aphrophora alni	A leafhopper	n/a	GCF
Philaenus spumarius	A leafhopper	n/a	GC05, F, H
Evacanthus interruptus	A leafhopper	n/a	GCF
Delphacodes venosus	A Delphacid planthopper	n/a	GC02
Oncodelphax pullula	A Delphacid planthopper	Nb	GC02
Hydroporus longicornis	A diving beetle	NT	GC05
Hydroporus nigrita	A diving beetle	n/a	GC05
Cychrus caraboides	A ground beetle	n/a	GCH
Loricera pilicornis	A ground beetle	n/a	GCH
Trechus rubens	A ground beetle	NS	GC01
Abax parallelepipedus	A ground beetle	n/a	GC01,03,06

Scientific Name	Common Name	Status	Sample Station ('_24')
Pterostichus vernalis	A ground beetle	n/a	GCH
Pterostichus diligens	A ground beetle	n/a	GC01,03,04,05,08
Pterostichus strenuus	A ground beetle	n/a	GC02
Pterostichus niger	A ground beetle	n/a	GC01
Pterostichus rhaeticus	A ground beetle	n/a	GC02,03,04,05,06,07,08,A
Pterostichus madidus	A ground beetle	n/a	GC01,H
Amara lunicollis	A ground beetle	n/a	GC01
Anisodactylus binotatus	A ground beetle	n/a	GC01
Harpalus latus	A ground beetle	n/a	GC01,H
Bradycellus sharpi	A ground beetle	n/a	GCF
Agonum fuliginosum	A ground beetle	n/a	GC03,07
Agonum gracile	A ground beetle	n/a	GC02,05
Anacaena globulus	A Hydrophilid water beetle	n/a	GC01,02,03,04,05,F
Megasternum concinnum	A Hydrophilid beetle	n/a	GC01
Agathidium atrum	A Leiodid beetle	n/a	GC01

Scientific Name	Common Name	Status	Sample Station ('_24')
Choleva fagniezi	A Leiodid beetle	n/a	GC01
Choleva oblonga	A Leiodid beetle	n/a	GC01
Choleva spadicea	A Leiodid beetle	n/a	GC01
Olophrum fuscum	A rove beetle	n/a	GCG
Lesteva sicula	A rove beetle	n/a	GC02,03,F
Bryaxis curtisii	A rove beetle	n/a	GC01,G
Pselaphus heisei	A rove beetle	n/a	GCF
Tachinus rufipes	A rove beetle	n/a	GC02
Tachyporus dispar	A rove beetle	n/a	GC01
Ocalea picata	A rove beetle	n/a	GC01
Oxypoda elongatula	A rove beetle	n/a	GCG
Oxypoda procerula	A rove beetle	n/a	GC08
Myllaena brevicornis	A rove beetle	n/a	GCF
Myllaena minuta	A rove beetle	n/a	GC04
Atheta aquatica	A rove beetle	n/a	GC01,06

Scientific Name	Common Name	Status	Sample Station ('_24')
Atheta brunneipennis	A rove beetle	n/a	GC01
Atheta obtusangula	A rove beetle	n/a	GC02
Aloconota insecta	A rove beetle	n/a	GC02
Geostiba circellaris	A rove beetle	n/a	GC04
Drusilla canaliculata	A rove beetle	n/a	GC01
Anotylus rugosus	A rove beetle	n/a	GC02
Stenus impressus	A rove beetle	n/a	GCF, G
Stenus cicindeloides	A rove beetle	n/a	GCH
Stenus nitidiusculus	A rove beetle	n/a	GC02, B, G
Stenus providus	A rove beetle	n/a	GCF
Stenus pusillus	A rove beetle	n/a	GC04
Stenus brunnipes	A rove beetle	n/a	GC01,H
Lathrobium brunnipes	A rove beetle	n/a	GC01
Lathrobium fulvipenne	A rove beetle	n/a	GC01
Othius subuliformis	A rove beetle	n/a	GC03

Scientific Name	Common Name	Status	Sample Station ('_24')
Quedius fuliginosus	A rove beetle	n/a	GC02,03,08,G
Quedius umbrinus	A rove beetle	n/a	GC03
Platydracus latebricola	A rove beetle	n/a	GC04
Staphylinus erythropterus	A rove beetle	n/a	GC02,03,04,05,06,07,08
Contacyphon padi	A marsh beetle	n/a	GC04
Agriotes obscurus	A click beetle	n/a	GC01
Hypnoidus riparius	A click beetle	n/a	GC01,02
Actenicerus sjaelandicus	A click beetle	n/a	GC04,06
Aplotarsus incanus	A click beetle	n/a	GCH
Cantharis pallida	A soldier beetle	n/a	GC02, B, C
Cantharis paludosa	A soldier beetle	n/a	GC08,B
Propylea quattuordecimpunctata	14-spot Ladybird	n/a	GC02
Plateumaris discolor	A reed beetle	n/a	GC02
Gastrophysa viridula	Dock Leaf Beetle	n/a	GCG
Lochmaea caprea	A leaf beetle	n/a	GCH

Scientific Name	Common Name	Status	Sample Station ('_24')
Lochmaea suturalis	Heather Beetle	n/a	GCH
Sphaeroderma rubidum	A flea beetle	n/a	GCH
Neocrepidodera transversa	A flea beetle	n/a	GCH
Neocoenorrhinus germanicus	A Rhynchitid weevil	n/a	GCH
Perapion curtirostre	An Apionid weevil	n/a	GCG
Perapion violaceum	An Apionid weevil	n/a	GCH
Limnobaris dolorosa	A weevil	n/a	GCH
Anthonomus brunnipennis	A weevil	Nb	GCH
Dorytomus taeniatus	A weevil	n/a	GCH
Micrelus ericae	A weevil	n/a	GCF, H
Tropiphorus obtusus	A weevil	Nb	GCG
Tropiphorus terricola	A weevil	Nb	GCG
Otiorhynchus singularis	A weevil	n/a	GCH
Hypera conmaculata	A weevil	n/a	GCG
Aphantopus hyperantus	Ringlet butterfly	n/a	GCH

Scientific Name	Common Name	Status	Sample Station ('_24')
Boloria selene	Small Pearl-bordered Fritillary butterfly	VU;SBL	GCF, H
Saturnia pavonia	Emperor moth	n/a	GC07
Xanthorhoe montanata	Silver Ground Carpet moth	n/a	GCH
Odezia atrata	Chimney Sweeper moth	n/a	GC06, F, H
Apamea crenata	Clouded-bordered Brindle moth	n/a	GCH
Dolichopeza albipes	Ghost Cranefly	n/a	GCH
Tipula alpium	A long-palp cranefly	n/a	GCH
Tipula pruinosa	Dark-spot Yam cranefly	n/a	gcb
Pedicia rivosa	Giant Triangle cranefly	n/a	GC05
Erioptera flavata	Common Yellow Splay cranefly	n/a	GCB
Molophilus occultus	Twin-triangle Mol cranefly	n/a	GCB
Neolimnomyia batava	Brown Pitted-longtail cranefly	n/a	GCB
Pilaria decolor	Plain Water-longtail cranefly	n/a	GCB
Rhagio scolopaceus	Downlooker Snipefly	n/a	GC02,04,05,H
Dolichopus atripes	A long-headed fly	n/a	GCB

Scientific Name	Common Name	Status	Sample Station ('_24')
Rhaphium longicorne	A long-headed fly	n/a	GCB
Episyrphus balteatus	Marmalade Hoverfly	n/a	GCC, F, H
Lejogaster metallina	Green Marsh Hoverfly	n/a	GCB, H
Leucozona lucorum	A hoverfly	n/a	GCH
Melanostoma mellinum	Short Grass Hoverfly	n/a	GC02, 05
Melanostoma scalare	Slender Grass Hoverfly	n/a	GCH
Platycheirus granditarsus	A hoverfly	n/a	GCC
Platycheirus scutatus	A boxer hoverfly	n/a	GCB
Sericomyia lappona	A hoverfly	n/a	GC02
Sericomyia silentis	Yellow-barred Peat Hoverfly	n/a	GCH
Sphegina clunipes	Common Pufftail hoverfly	n/a	GCF
Phytomyza calthophila	A leaf-mining fly	Na	GC05
Scathophaga stercoraria	A dung fly	n/a	GCH
Bombus lucorum/terrestris	Buff-tailed/White-tailed Bumblebee workers	n/a	GCH
Bombus hortorum	Garden Bumblebee	n/a	GC01, H

Scientific Name	Common Name	Status	Sample Station ('_24')
Bombus monticola	Mountain Bumblebee	SBL	GCH
Bombus pratorum	Early Bumblebee	n/a	GCH
Bombus pascuorum	Common Carder Bumblebee	n/a	GC01, F, H
Formica lemani	Northern Silky Ant	n/a	GC01,02,03,H
Myrmica ruginodis	A red ant	n/a	GC01,02,03,04,05,06,08,A,F,G,H
Myrmica scabrinodis	A red ant	n/a	GC01,04,05,06
Trichoniscus pusillus	Common Pigmy Woodlouse	n/a	GC06,F
Oniscus asellus	Common Shiny Woodlouse	n/a	GCH
Philoscia muscorum	Common Striped Woodlouse	n/a	GCF
Neobisium carcinoides	A false scorpion	n/a	GC03
Chthonius ischnocheles	A false scorpion	n/a	GC01,F
Nemastoma bimaculatum	A harvestman spider	n/a	GC05, F
Mitostoma chrysomelas	A harvestman spider	n/a	GCF
Mitopus morio	A harvestman spider	n/a	GCG, H
Megabunus diadema	A harvestman spider	n/a	GCF

Scientific Name	Common Name	Status	Sample Station ('_24')
Enoplognatha ovata	Common Candy-striped Comb-foot spider	n/a	GCG
Walckenaeria atrotibialis	A money spider	n/a	GC01
Walckenaeria obtusa	A money spider	NS	GC08
Walckenaeria furcillata	A money spider	NS; Amber	GC01
Walckenaeria vigilax	A money spider	n/a	GC01
Hypselistes jacksoni	A money spider	NS; Amber	GCA
Gonatium rubens	A money spider	n/a	GC08
Oedothorax retusus	A money spider	n/a	GC08
Pelecopsis mengei	A money spider	n/a	GC01
Diplocephalus permixtus	A money spider	n/a	GC02,08
Saaristoa abnormis	A money spider	n/a	GC03
Bathyphantes parvulus	A money spider	n/a	GC01,02,03
Bolyphantes luteolus	A money spider	n/a	GC01,03
Tenuiphantes zimmermanni	A money spider	n/a	GC02
Palliduphantes pallidus	A money spider	n/a	GC01

Scientific Name	Common Name	Status	Sample Station (‘_24’)
Metellina segmentata	A Tetragnathid spider	n/a	GCF, H
Araneus diadematus	Garden Cross Spider	n/a	GCC, G
Araniella cucurbitina	An orb-weaving spider	n/a	GCH
Alopecosa pulverulenta	A wolf spider	n/a	GC08
Neon reticulatus	A jumping spider	n/a	GC01

Key Invertebrate Records

A11-13.5.6 149 invertebrate species were recorded in the survey area in August 2023. Of these, 11 were key species as defined above. 170 species were recorded in 2024 of which 12 are key species, all bar two of which (the weevil *Anthonomus brunnipennis* and the Mountain Bumblebee) are additions, giving a total of 21 key species recorded from the site in 2023-24. Further information on each key species is provided below. Five moths (the Anomalous, Minor Shoulder-knot, Broom Moth, True Lover's Knot and Autumnal Rustic) have declined severely in the UK overall, with this decline being most marked in parts of the English lowlands, which has led to their inclusion on the UK Red List. However, they are still relatively common and do not appear to have decreased so markedly in the western part of their range.

A Dipsocorid bug *Cryptostemma alienum* NS.

A11-13.5.7 There are two British *Cryptostemma* species, both of which are small, delicate bugs of a reddish-brown colouration. This species is distinguished from the very rare *C. waltli* by its larger size, tapering sides to the thorax (parallel in *C. waltli*) and the form of the abdominal apex in males, which is highly modified into asymmetrical claspers in this species. *C. waltli* is a specialist inhabitant of shingle bars at the edge of fast-flowing streams and rivers in northern and western Britain where it is believed to be predator on other very small invertebrates. It is most often found by turning over stones close to the water's edge. In the survey area, adults were found under stones on the shingle bar at the edge of sample station GC02.

A shore bug *Salda littoralis* NS.

A11-13.5.8 The genus *Salda* has three British species, all of which are relatively large, predominantly black shorebugs with forewings that barely overlap each other. *S. littoralis* is distinguished from its congeners by the short, golden pubescence on the forewings. Like the other members of the genus, it is primarily a northern and western upland species, though there are also scattered sites in the lowlands. It is found on exposed sediments at the edge

of both standing and running water. In the survey area, adults were found on a silty shingle bar at the edge of the Croe Water (sample station GC02).

A Delphacid froghopper *Oncodelphax pullula*. Nb.

A11-13.5.9 This small Delphacid has a pale creamy-brown to yellowish ground colour with contrasting black forewings and abdominal apex in males. The genital segment of males is long-oval when viewed from behind with stout, strongly toothed styles and the appendages of the anal tube elongate and parallel-sided. It is a very scarce insect, confined to scattered high-quality mires and poor fens with concentrations of records from sites in the Scottish Highlands, Wales and East Anglia. It favours open wetlands where there is an abundance of the sedges *Carex* spp. on which it feeds. At Glen Croe, a single male was collected in a pitfall trap set in *Sphagnum* bog at GC02 in 2024.

A diving beetle Hydroporus longicornis. NT.

A11-13.5.10 *Hydroporus* is the largest British genus of diving beetles, with 28 species, which are very rarely more than 5mm in length. *H. longicornis* is a dull pitchy-black beetle with reddish appendages and a parallel-sided body shape. It is most reliably identified by examination of the male aedeagus, which has a long, slender process at its tip. It is widely but locally distributed in northern and western districts and there are a few 'relict' colonies in lowland areas such as the Kent and Sussex Weald. *H. longicornis* is a specialist inhabitant of slow-flowing runnels and seepages, usually in acid mires, though it can also be found occasionally in fens and woodland. At Glen Croe, adults (including males) were collected in species-rich *Molinia-Juncus* flushes at GC05 in 2024.

A ground beetle *Trechus rubens*. NS.

A11-13.5.11 The seven British *Trechus* species are all relatively small, shiny ground beetles with strongly curved frontal furrows on the head. *T. rubens* is one of only two species in the genus exceeding 5mm in length. It is of a pitchy-reddish colour with large eyes and strongly iridescent elytra. Though it is quite widely distributed across Britain, most sites are in Scotland and northern England, and it is extremely scarce in the south. Most records are from

coniferous woodland, often near streams and this was exactly its habitat at Glen Croe; a single adult being collected in a pitfall trap set in a cleared coniferous plantation by the Croe Water (GC01) in 2024.

A ground beetle Bembidion geniculatum NS.

A11-13.5.12 The sub-genus *Bembidionetolitzkya* includes four British species, all of which are small, metallic green or blue ground beetles. *B. geniculatum* is distinguished from others in this group by a combination of its relatively small size, pointed elytral apex and the form of the male aedeagus. It is a northern species that is most frequent in Scotland and northern England, though with outlying populations in the Welsh uplands. It is a specialist of exposed riverine sediments, which is found on shingle bars at the edge of upland streams and rivers. In the survey area it was recorded on shingle by the Croe Water, on the edge of sample station GC02.

A weevil Anthonomus brunnipennis Nb.

A11-13.5.13 Within the genus *Anthonomus, A. brunnipennis* is one of only two species without a clear pattern of hairs on the elytra. It can be separated from the common *A. rubi* by its smaller size and broader second antennal segment. The elytra are often reddish-brown in colour. It is primarily a northern and western species, with its main populations in Scotland, northern England and Wales. There are also a few ‘relict’ populations in southern England. It is found in a range of open habitats, such as acid grassland, bogs, heaths and wood edges, where there are good stands of its main foodplant, Tormentil *Potentilla erecta*. It is also believed to occasionally use other *Potentilla* species. In the survey area, adults were collected in the ground searches in sample stations GC01, GC02 and GC07 in 2023 and in GCH in 2024.

A weevil Tropihorus obtusus Nb.

A11-13.5.14 This is one of the three British representatives of this genus. Like the two other species, it a mid-sized, dark brown weevil, but *T. obtusus* lacks the well-marked elytral shoulders of its congeners and has the apex of the fore tibiae with less dense setae and a more strongly angled outer margin. It is confined to Scotland and northern England, where it is found in a range of open

habitats. It is thought to be a parthenogenic species that feeds on a wide range of plants. A single specimen was tapped from mixed tall grassland at Glen Croe in sample station GCH on the 5th of July 2024.

A weevil Tropiphorus terricola Nb.

A11-13.5.15 The three British *Tropiphorus* are all rather squat, mid-sized, broad-nosed weevils that are of a dark brown ground colour. *T. terricola* is one of two species with well-marked elytral shoulders and it lacks the raised elytral striae of *T. elevatus*. This species has a wide but very local distribution across Britain but is absent from southwest England and much of northern and central Wales. It is a parthenogenic species that is found in a range of open habitats where it feeds on a wide range of plants. At Glen Croe, a single specimen was tapped from mixed tall grassland in GCH on the 5th of July 2024.

Small Pearl-bordered Fritillary *Boloria selene* VU; SBL.

A11-13.5.16 The Small Pearl-bordered Fritillary can be distinguished from the very similar Pearl-bordered Fritillary *B. euphrosyne* by the less reddish-brown ground colour and more extensive network of silver-white spots on the underside of the hindwing. It was formerly distributed widely across Britain but has been lost from most of its former woodland colonies in southern and eastern England as a result of the cessation of coppice management. It remains very locally common in Scotland, Wales and northern and western England, where it is found in a variety of open habitats, including Bracken slopes, wood-edges and valley bogs. In the former two habitats, the caterpillar feeds on Common Dog-violet *Viola riviniana*, while in the latter, it utilises Marsh Violet *Viola palustris*. At Glen Croe, a few adults were seen nectaring on Marsh Thistle flowers in the sheltered gully at sample station GCF on the 4th of July 2024 and another singleton was seen in flight at GCH on the following day.

The Anomalous moth *Stilbia anomala* VU; SBL.

A11-13.5.17 The Anomalous is a dark grey moth with paler reniform and orbicular stigmata and a characteristic elongate outline. It is primarily a moorland species of northern and western Britain though there are a few populations in lowland

districts. It is associated with dry heath and grassland habitats, where the larvae feed on fine-leaved grasses; Wavy Hair-grass *Avenella flexuosa* being especially favoured. It has shown a strong decline in Britain, especially in more southern and/or lowland districts though it is still locally common in the north. In the survey area, an adult was recorded in the moth trap set up in sample station GC03.

Minor Shoulder-knot moth *Brachylomia viminalis* NT; SBL.

A11-13.5.18 The ground colour of the Minor Shoulder-knot varies from a pale grey to much black-brown with the former being more frequent in the south and darker forms becoming increasingly prevalent towards the north. It has relatively well-marked reniform and orbicular stigmata and black stripes at the base of the forewings (see Photograph 9, Annex 11.13.A). The larva is green with a well-marked cream dorsal stripe. It is widely distributed throughout Britain though the strongest populations are in the north and west but has declined severely, especially in lowland districts of England, which has resulted in its inclusion on the UK Red List as a Near Threatened species. The Minor Shoulder-knot is an inhabitant of wet woodland and scrubby wetlands, with its larvae feeding inside folded leaves of broad-leaved willows such as Grey Willow and Eared Willow. In the survey area, a single adult was recorded in the moth trap set up in sample station GC03.

Broom Moth *Ceramica pisi*. VU; SBL.

A11-13.5.19 The Broom Moth is an easily recognised species, both as adult and larva. The former have the forewings grey-brown to chestnut-brown in colour with a well-marked, jagged, creamy-yellow sub-marginal line. The larvae are brown to green with bright yellow dorsal and lateral stripes (see Photograph 8, Table 11.13.A). They are polyphagous, with frequently used foodplants including bracken, heathers, willows, larch and bramble. It has a very wide distribution in Britain, from the Shetlands to the south coast of England. It has been found in a very wide range of habitats, including grassland, lowland farmland and gardens, but its largest populations are on moorland habitats in upland regions of western Britain. In recent years, the Broom Moth has undergone a considerable decline in both its British abundance and distribution that is

particularly acute in the lowlands of central and southern England. This has resulted in its inclusion as a Vulnerable species on the recent micromoth Red List. In the survey area, a single larva was found during the spot-sweep sample in sample station GC06.

True Lover's Knot moth *Lycophotia porphyrea*. VU.

A11-13.5.20 The True Lover's Knot is an easily recognised Noctuid moth in which the ground colour of the forewings is reddish-brown with white reniform and orbicular stigmata and cross-lines that are edged black and some other black and white dots and streaks. Larvae are also very distinctive with a similar reddish-brown colour and black-edged cream lines and streaks that afford it excellent camouflage when at rest on the heather plants that constitute the usual foodplant. It is widely distributed across Britain but is undergoing an ongoing steep decline that has resulted in its inclusion in the most recent Red List as a Vulnerable species. This decline is steepest in the English lowlands and it remains a common and widespread moth on the heaths and moors of northern and western Britain. Larvae feed up in late summer and autumn on Ling and Bell Heather. In the survey area, larvae were beaten from the former hostplant in sample stations GC06 and GC07.

Autumnal Rustic moth *Eugnorisma glareosa*. NT; SBL.

A11-13.5.21 The Autumnal Rustic is a very easily recognised Noctuid moth in which the forewing is a smooth grey-brown with two black, quadrilateral markings and some smaller black spots (see Photograph 9, Table 11.13.A). It is widely distributed in Britain but increasingly localised and is experiencing a sharp and ongoing decline that has resulted in it being accorded Near Threatened status in the recent macromoth Red List. It is found in a variety of dry, open habitats such as unimproved grassland heathland and scrubby wood margins. The mottled brown larva has a broad, cream-coloured lateral stripe and is widely polyphagous on various grasses and forbs. In the survey area, adults were recorded in the moth trap set up in sample station GC03.

A leaf-mining fly *Phytomyza calthophila* Na.

A11-13.5.22 Like most members of this very large genus of small, predominantly black leaf-mining flies, *P. calthophila* is best distinguished as an adult by microscopic examination of the male genitalia. It is widely, but very locally distributed across Scotland and northern England with a very few other records from Wales and southern England. Larvae feed in a winding corridor in leaves of Marsh Marigold, with the form of this being diagnostic; the other UK Agromyzid associated with *Caltha*, *P. calthivora*, has a mine that starts as a corridor but then widens into a blotch. At Glen Croe, larval mines of *P. calthophila* were found in Marsh Marigold leaves in GC05 on the 2nd of July 2024.

Mountain Bumblebee *Bombus monticola*. SBL.

A11-13.5.23 The Mountain Bumblebee is a very distinctive species with black and lemon-yellow hair bands on the thorax and a bright orange-red abdomen that is black at the base (see Photograph 11, Table 11.13.A). As its name suggests, it is a moorland species of northern and western Britain with populations occurring throughout Scotland and northern England, in the Welsh mountains and on Dartmoor and Exmoor in the southwest. There is clear evidence of decline in the southern part of its range, but it has also shown a significant decline, estimated to be greater than 25% in Scotland, which has resulted in its inclusion on the Scottish Biodiversity List. The reasons for its decline are not fully understood but climate change and habitat degradation are certainly implicated. Colonies of the mountain bumblebee are highly reliant on large expanses of heather moorland where heathers and bilberry are important sources of pollen and nectar. Flushes or in-bye fields with an abundance of flowers such as devil's-bit scabious, common knapweed *Centaurea nigra* and thistles are also an important element in the habitat mosaic required by this species. In the survey area, it is still quite widely distributed with records coming from sample stations GC01, 02, 06 and 07 in 2023 and from GCH in 2024.

Moss Carder Bumblebee *Bombus muscorum*. SBL.

A11-13.5.24 This ginger-brown bumblebee is superficially very similar to *B. humilis*, but *B. muscorum* is more densely haired, giving it a somewhat velvety appearance in the field. *B. muscorum* also lacks the black hairs on the thorax above the wing base that are present in *B. humilis*. The habitat requirements of *B. muscorum* are centred around large expanses of moderately tall, but non-tussocky flower-rich habitats. On grassland sites, *B. muscorum* shows a preference for flowers with long corollae including clovers, labiates and knapweeds, whilst on moorland sites in northern and western Britain, it utilizes heathers. Queens emerge from hibernation in May, with workers active from June onwards and males and new queens appearing from July. *B. muscorum* nests are constructed in a similar way to those of *B. humilis*, being formed on the surface of the ground in tall, open grassland and being covered with moss and dead leaves. Nests house between 40 and 100 workers.

A11-13.5.25 *B. muscorum* is now primarily coastal in southern England and Wales, and most inland colonies have been lost, though as with the brown-banded carder bumblebee, there is still a strong population on Salisbury Plain. In northern England and Scotland the Moss Carder Bumblebee is more widespread, occurring both on the coast and inland on heather moors. Some of the Scottish islands have particularly strong populations. *B. muscorum* continues to decline nationally, and it has therefore been included on Section 41 of the NERC Act as a Species of Principal Importance for the Conservation of Biodiversity in England. In the survey area, a single male was recorded feeding on flowering Ling in sample station GC06.

A money spider *Walckenaeria obtusa*. NS.

A11-13.5.26 *W. obtusa* is one of the species in this large genus in which males lack any significant modifications to the carapace. Identification is therefore reliant on careful examination of the form of the male palp or female epigyne. It is very widely but locally distributed across Britain, though most records are from southern regions and it appears to have declined significantly. Its ecology is poorly understood, though most records relate to specimens collected at ground level in litter and moss in broadleaved woodland. A single female was

found at Glen Croe in a pitfall trap set in *Molinia* grassland and wet heath at GC08 in 2024.

A money spider *Walckenaeria furcillata*. NS; Amber.

A11-13.5.27 The extraordinary forward-pointing lobe on its carapace makes males of this species unmistakeable. Females can only be reliably distinguished by careful examination of the epigyne. *W. furcillata* is very locally distributed across much of Britain, though it becomes rarer to the north, with only a handful of Scottish records. It appears to have declined severely and has therefore been placed on the Amber list. Its ecology is poorly understood but it has been found at ground level, in litter, moss and grass tussocks, in heathland and a range of other habitats, including calcareous grassland, wetlands and deciduous woodland. Two females and a male were found at Glen Croe in pitfall traps set in scrubby acid grassland near the riverbank at GC01 in 2024.

A money spider Hypselistes jacksoni NS.

A11-13.5.28 *H. jacksoni* is the only British species of the genus. It is a relatively distinctive money spider, in which the carapace and legs are usually bright orange-red and the shiny, coriaceous abdomen is deep black. The sternum is strongly edged with black and in the male, the head is strongly raised, with pitted grooves on each side of this elevation. Both the male palp and female epigyne are characteristic. This is a scarce, but widely distributed spider, which is usually found amongst moss and litter on lowland acid bogs and wet heaths. It has its British stronghold in Wales, with English populations in the Pennines, North York Moors, on the south-west peninsula, and the lowland valley mires of Dorset, Hampshire and Surrey. It also has a wide, but very scattered distribution in Scotland. There are a couple of isolated colonies on relict mire habitats in Norfolk. An adult was collected at Glen Croe during a ground search of very wet *Juncus-Equisetum* bog at sample station GCA on the 2nd of July 2024.

Key Invertebrate Habitats

A11-13.5.29 The key invertebrate habitats identified within the survey area and the invertebrates associated with them are shown in Table A11-13.4 below.

Table A11-13.4 - Key Invertebrate Habitats

Key Habitat	Associated Key Species
Dry grass-heath	A weevil *Anthonomus brunnipennis* The Anomalous moth *Stilbia anomala* True Lover's Knot moth *Lycophotia porphyrea* Autumnal Rustic moth *Eugnorisma glareosa* Mountain Bumblebee *Bombus monticola* Moss Carder Bumblebee *Bombus muscorum* A money spider *Walckenaeria furcillata*
Exposed riverine sediments	A Dipsocorid bug *Cryptostemma alienum* A shore bug *Salda littoralis* A ground beetle *Bembidion geniculatum.*
Wet heath and bog	A Delphacid froghopper *Oncodelphax pullula* A diving beetle *Hydroporus longicornis* A weevil *Anthonomus brunnipennis* Small Pearl-bordered Fritillary *Boloria selene* Broom Moth *Ceramica pisi* A leaf-mining fly *Phytomyza calthophila* A money spider *Walckenaeria obtusa* A money spider *Hypselistes jacksoni*
Flower-rich tall grassland	A weevil *Tropiphorus obtusus* A weevil *Tropiphorus terricola* Mountain Bumblebee Moss Carder Bumblebee
Willow scrub	Minor Shoulder-knot moth *Brachylomia viminalis*

Dry Grass-heath

A11-13.5.30 This habitat feature was assessed as being of Local Importance for invertebrates based on the results of the 2023-24 survey.

A11-13.5.31 As defined here, this habitat feature embraces both stands of acid grassland and heathland on more mineral-based soils, often where steep slopes have prevented the build-up of a peat substrate. Areas of Ericaceous dwarf-shrubs are particularly important as these provide feeding or foraging resources for the two bumblebees and some of the moths on the key species list. Note that stands of acid grassland with a high cover of bracken are excluded. Stands of this habitat feature are most frequent on and around rock outcrops, where they may be at least partially protected from stock with grazing pressure appearing to be quite high, especially on the slopes to the northeast of the road. The Proposed Scheme (excl. NC & BNG) boundary comprises a broken strip that largely follows the line of the OMR with this habitat feature occurring along much of its length. Though the works within the Proposed Scheme (excl. NC & BNG) may destroy or disturb some areas of this habitat feature, it will be trivial in the context of the total extent of this habitat feature present within the Site and in the wider area. The primary management issues impacting this habitat across the wider buffer zone are the level of grazing and possibly the extent of bracken.

Exposed Riverine Sediments

A11-13.5.32 This habitat feature was assessed as being of Local Importance for invertebrates based on the results of the 2023-24 surveys.

A11-13.5.33 There are a number of shingle bars along the margins of the Croe Water that lie within the MTS buffer zone. These have a moderately diverse invertebrate fauna that includes three Nationally Scarce species. No management of these features should be required provided that the natural hydrology of the Croe Water catchment is unchanged.

Wet Heath and Bog

A11-13.5.34 This habitat feature was assessed as being of Local Importance for invertebrates based on the results of the 2023-24 surveys.

A11-13.5.35 This habitat feature includes a compendious range of mire vegetation that includes both soligenous bogs along the line of the various small streams and runnels that run down the steep slopes and cross the A83 and OMR. It also includes the more extensive *Molinia-Juncus* bogs and wet heaths on flatter ground below the OMR. The invertebrate fauna of this habitat feature was expected to be richer than the results suggest, given the high quality of some of the soligenous mires on farmland west of the OMR. These are mostly situated within the MTS buffer zone.

A11-13.5.36 Only a very small area of this habitat feature is likely to be directly affected by the Proposed Scheme (excl. NC & BNG).

Flower-rich Grassland

A11-13.5.37 This habitat feature was assessed as being of Local Importance for invertebrates based on the results of the 2023-24 surveys.

A11-13.5.38 This habitat feature includes a compendious range of mire vegetation that includes both soligenous bogs along the line of the various small streams and runnels that run down the steep slopes and cross the A83 and OMR. It also includes the more extensive *Molinia-Juncus* bogs and wet heaths on flatter ground below the OMR. The invertebrate fauna of this habitat feature was expected to be richer than the results suggest, given the high quality of some of the soligenous mires on farmland west of the OMR. These are mostly situated within the MTS buffer zone.

A11-13.5.39 Only a very small area of this habitat feature is likely to be directly affected by the Proposed Scheme (excl. NC & BNG).

Willow Scrub

A11-13.5.40 This habitat feature was assessed as being of no more than Local Importance for invertebrates based on the results of the 2023-24 surveys.

A11-13.5.41 Areas of scrub are currently of very limited extent, most being very small, fragmented patches of willow and birch along the lower slopes of the Croe Water that lie within the Survey Area.

Coniferous Woodland

A11-13.5.42 This habitat feature is assessed as being of no more than Local Importance for invertebrates based on the results of the 2023-24 surveys.

Pantheon Results

A11-13.5.43 The Pantheon results for 2023 – 2024 are presented in Table A11-13.5 below.

Table A11-13.5 - Pantheon Results

Broad Biotope	Habitat	Species Assemblage Type	No. spp	% Representation	Species Quality Indices	Species with Conservation Status	Conservation Status	Code	Reported Condition
Open habitats	Open habitats	Scrub-heath & moorland	17	5	118	2	NS|S41 Priority Species - research only	F003	Favourable (17 species, 9 required)
Wetland	Acid & sedge peats	Sphagnum bog	11	10	125	1	Nb	W312	Favourable (11 species, 8 required)
Open habitats	Open habitats	Rich flower resource	5	2	100	1	EN (European)|S41 Priority Species	F002	Unfavourable (5 species, 15 required)
Wetland	Running water	Shingle banks	5	9	160	1	NS	W111	Unfavourable (5 species, 9 required)

Broad Biotope	Habitat	Species Assemblage Type	No. spp	% Representation	Species Quality Indices	Species with Conservation Status	Conservation Status	Code	Reported Condition
Open habitats	Open habitats	Scrub edge	2	<1	100	n/a	n/a	F001	Unfavourable (2 species, 11 required)
Open habitats	Short sward & bare ground	Bare sand & chalk	1	<1	100	n/a	n/a	F111	Unfavourable (1 species, 19 required)
Open habitats	Open habitats	Epiphyte fauna	1	5	100	n/a	n/a	A215	Unfavourable (1 species, 3 required)
Open habitats	Tall sward & scrub	Montane & upland	1	<1	100	n/a	n/a	F221	Unfavourable (1 species, 8 required)

A11-13.6 Discussion and Conclusion

A11-13.6.1 Invertebrate surveys undertaken within the Proposed Scheme (excl. NC & BNG) focused on collection of those invertebrate groups considered most relevant to the upland habitats present. These were primarily in the following taxa: spiders (Araneae); beetles (Coleoptera), especially ground beetles (Carabidae) and rove beetles (Staphylinidae); and two-winged flies (Diptera), primarily craneflies (Tipuloidea) soldierflies and allies (Larger Brachycera), long-legged flies (Dolichopodidae) and hoverflies (Syrphidae).

A11-13.6.2 The Proposed Scheme (excl. NC & BNG) contains key terrestrial invertebrate habitat; dry grass-heath, exposed riverine sediments, wet heath and bog, flower-rich tall grassland, willow scrub and coniferous woodland which is associated with 21 species of conservation importance as listed in Table A11-13.2 and Table A11-13.3.

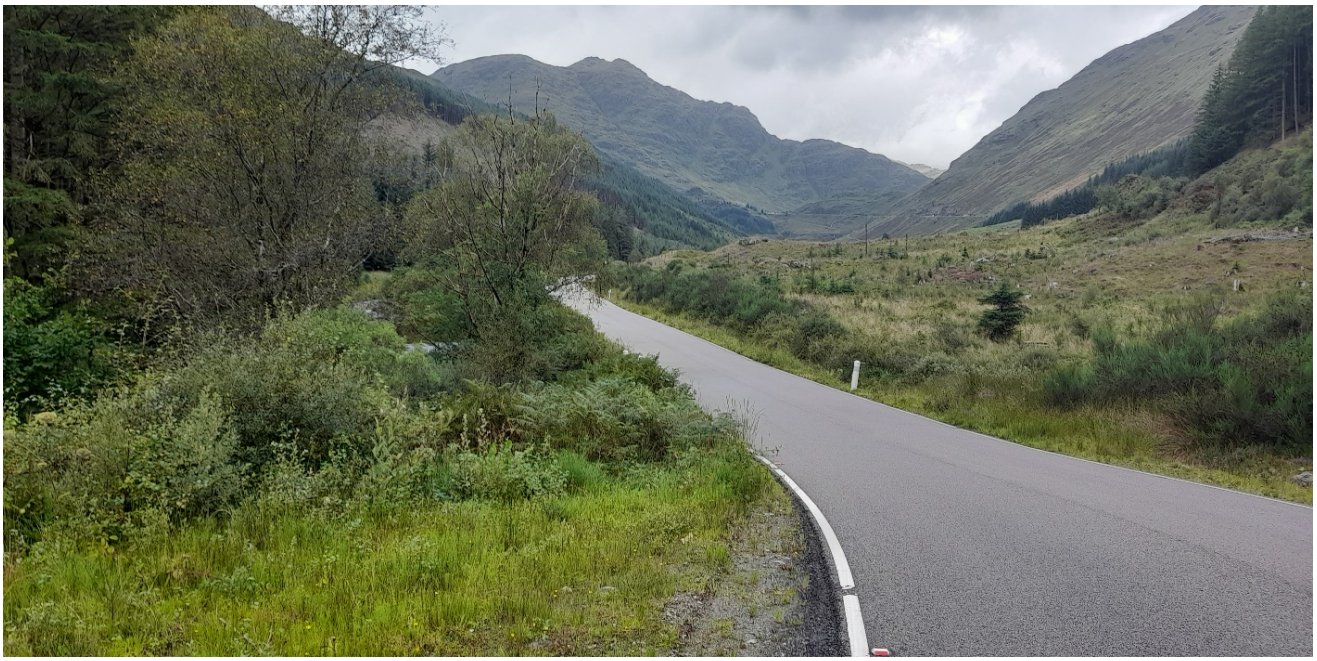
A11-13.6.3 The results of the 2023-24 survey suggest that overall, a provisional assessment of no more than Local Importance for invertebrates at Glen Croe is justified using the CIEEM's GFR.

A11-13.6.4 It is recommended that mitigation measures are implemented during the construction phase to try to protect key terrestrial invertebrate habitats and that the site is enhanced with the incorporation of native, wetland and flower-rich habitats.

Annexes

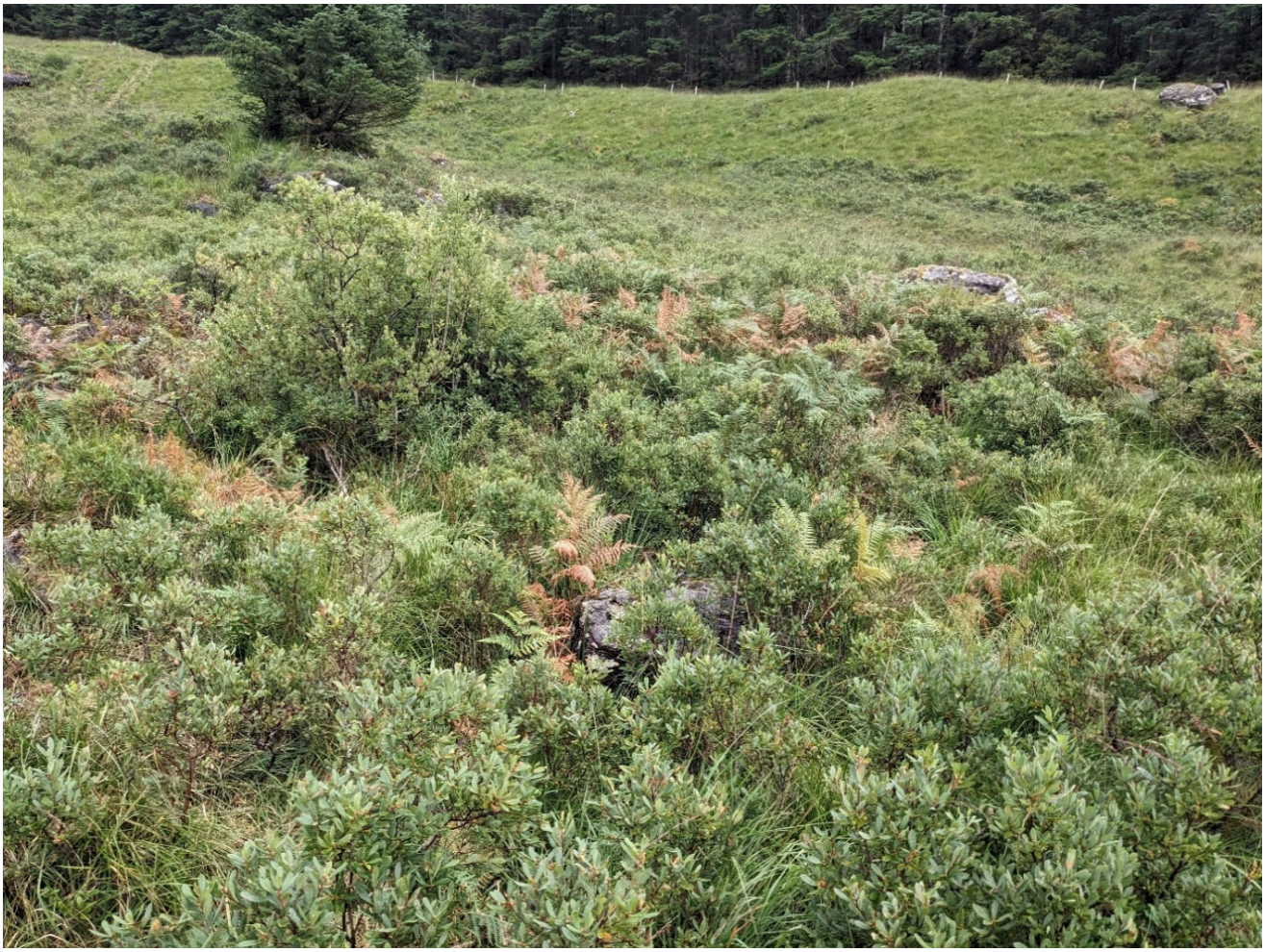
Annex 11.13.A. Photographs

Photograph 1: Sample station GC01_23 – Mixed grassland heath and scrub



Photograph 2: Sample station GC02_23/24 – *Molinia* bog with *Succisa pratensis*

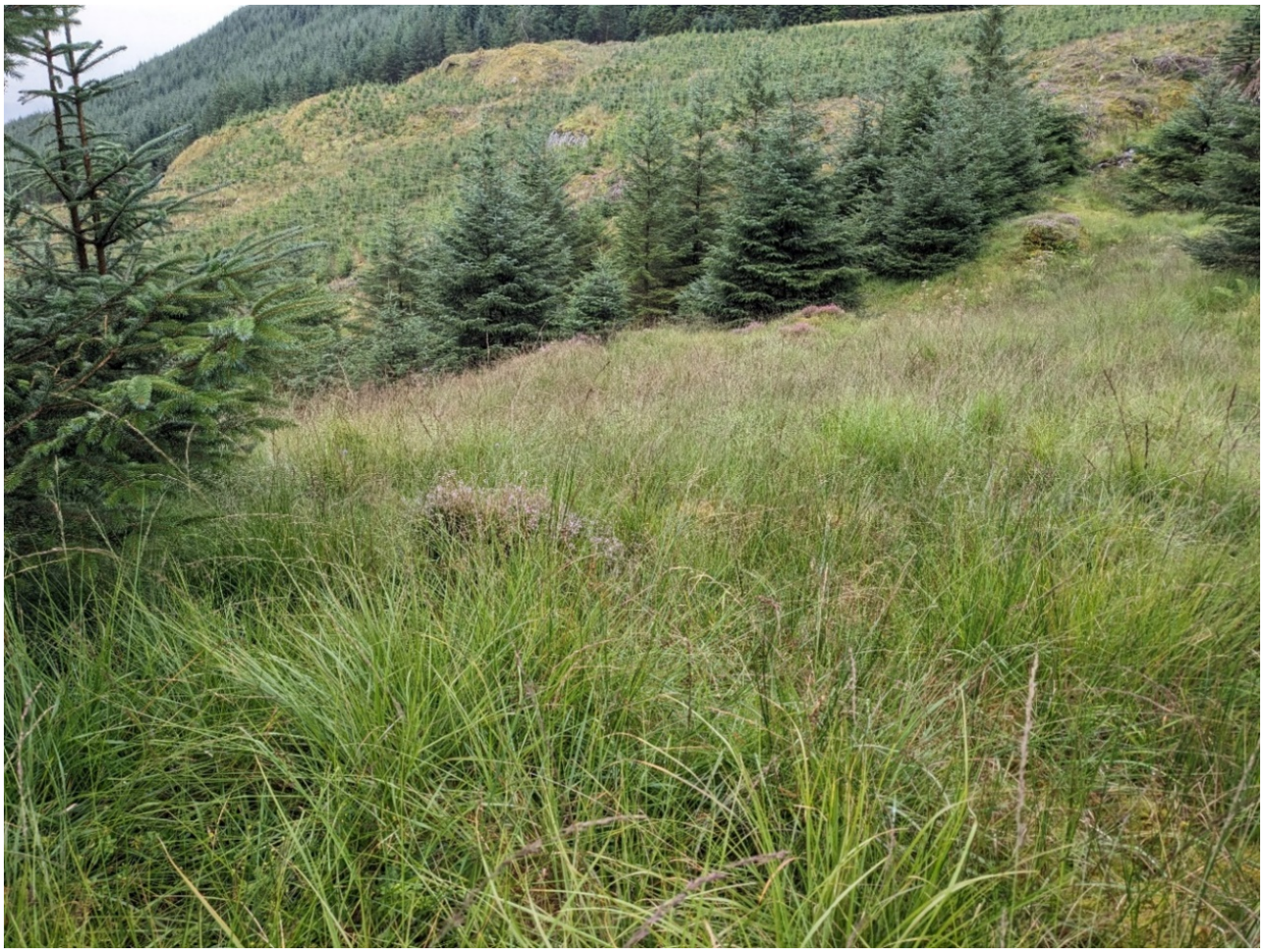
Photograph 3: Sample station GC03_23/24 – *Myrica-Molinia* bog



Photograph 4: Sample station GC05_23/24 – Species-rich *Juncus acutiflorus-Molinia caerulea* flushes

Photograph 5: Sample station GC05_23/24 – Species-rich *Juncus acutiflorus-Molinia caerulea* flushes

Photograph 6: Sample station GC06_23/24 – *Molinia caerulea-Calluna vulgaris* bog with self-seeded conifers

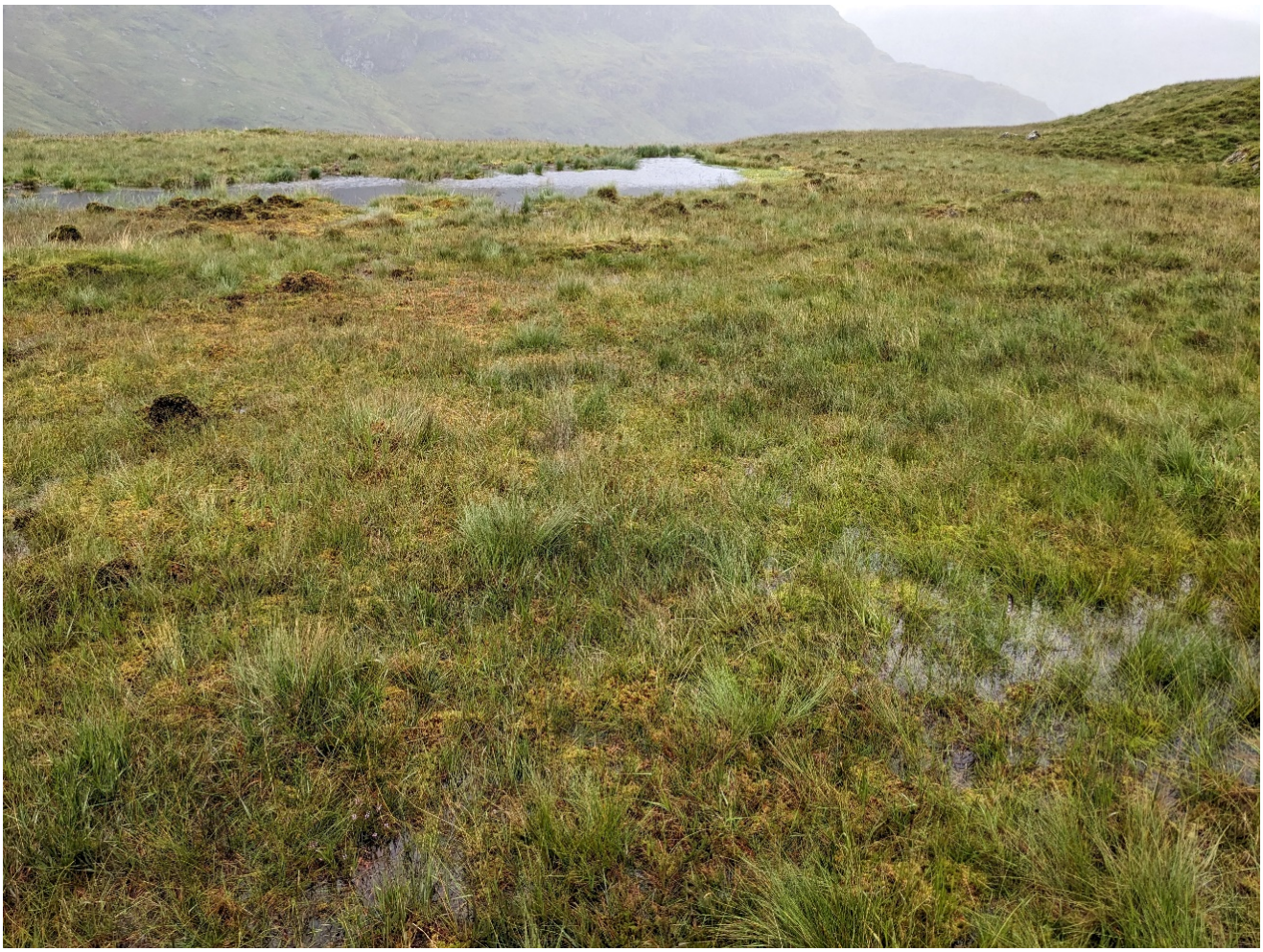


Photograph 7: Sample station GC07_23/24 – *Calluna vulgaris-Erica tetralix-Molinia caerulea* rush pasture

Photograph 8: Broom moth larva on *Molinia caerulea* – sample station GC07

Photograph 9: Autumnal Rustic and Minor Shoulder-knot moths – sample station GC03

Photograph 10: Sample station GC08_23/24 – *Sphagnum-Eriophorum* mire around bog pool



Photograph 11: Mountain Bumblebee *Bombus monticola* – sample station GC06

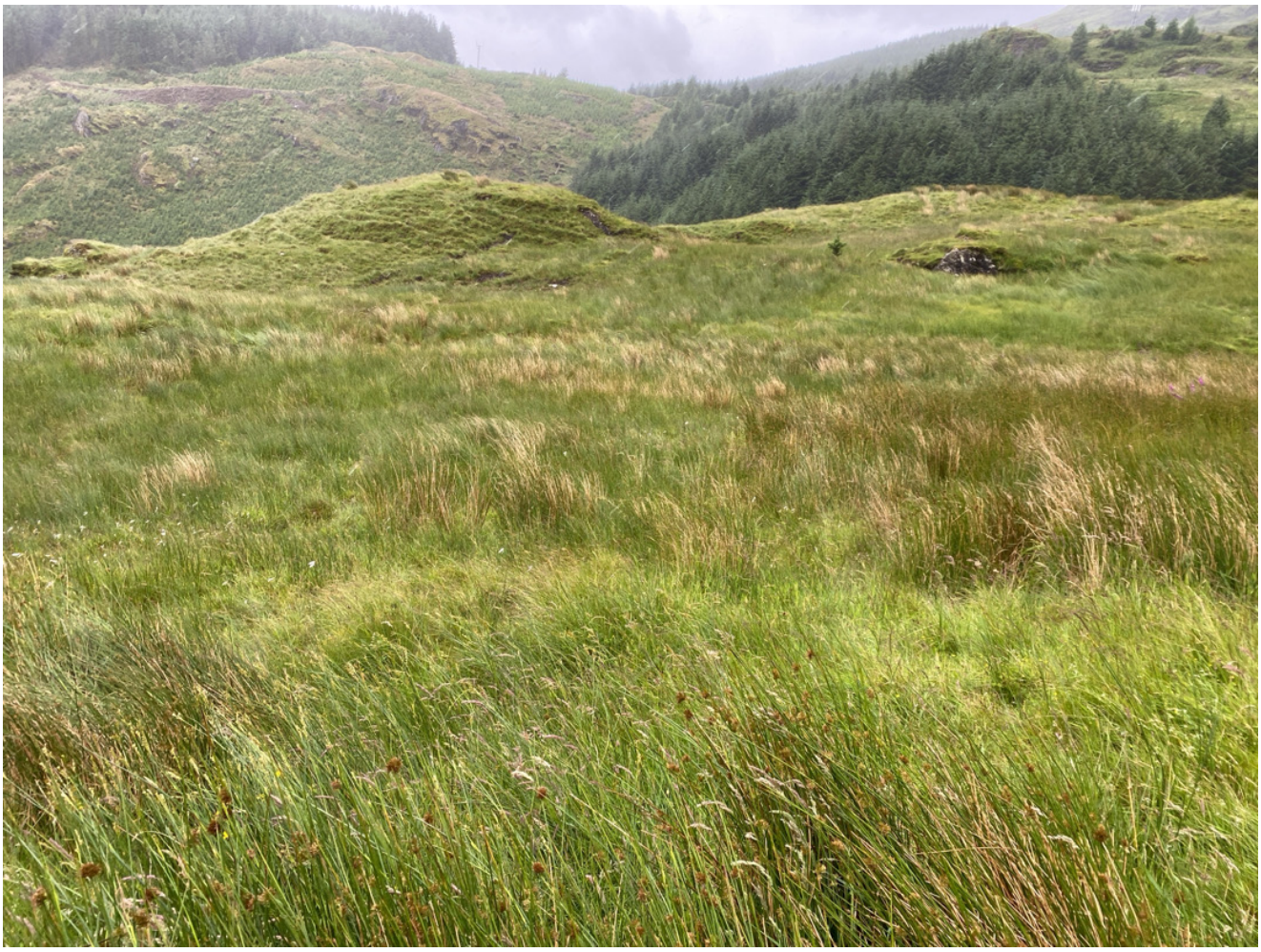
Photograph 12: Sample station GCA, *Equisetum* swamp and *Juncus-Holcus* mire interface

Photograph 13: Sample station GCB, *Menyanthes* wet hollow

Photograph 14: Sample station GCC, drained M23 *Juncus* mire

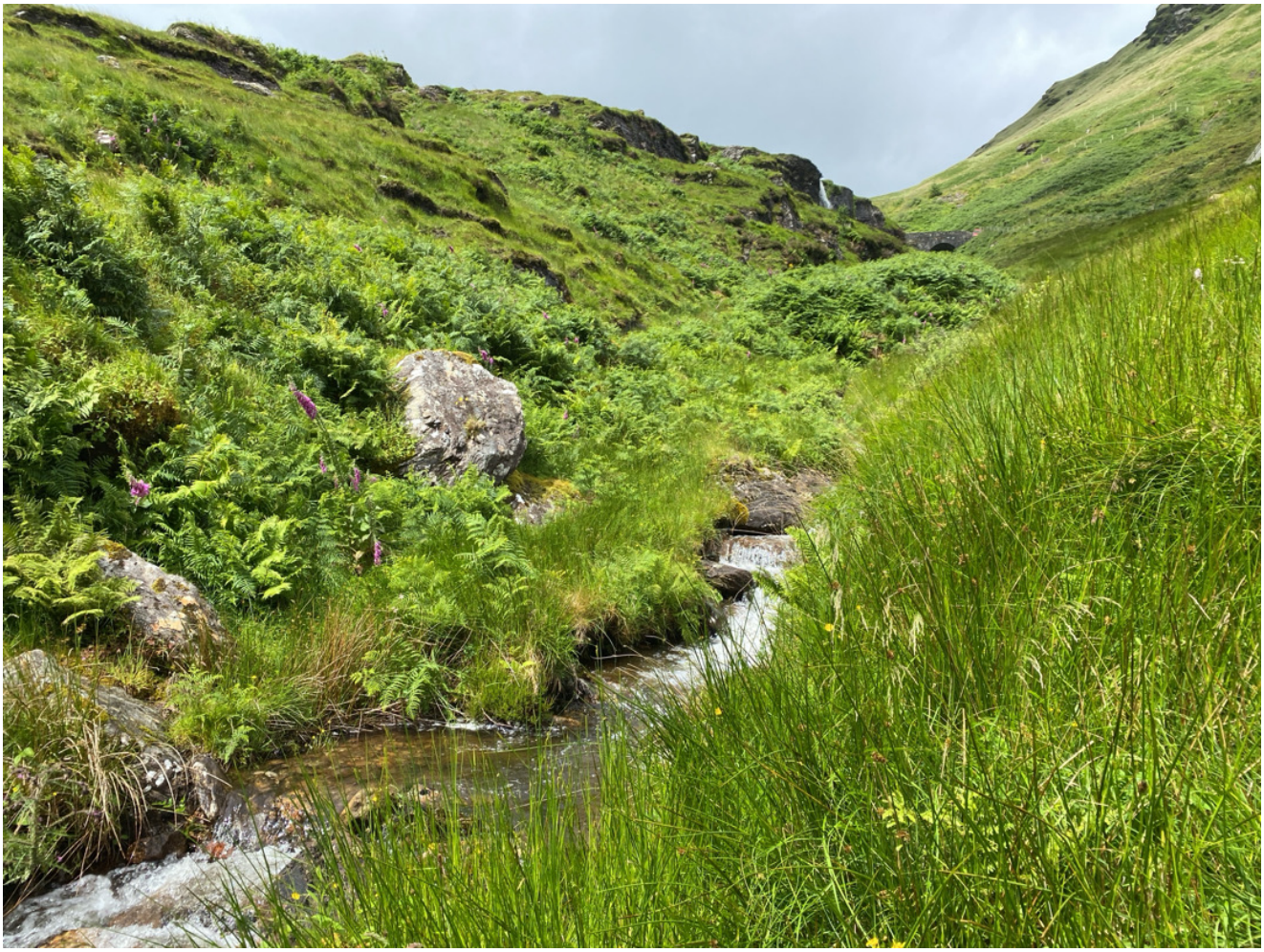
Photograph 15: Sample station GCD, scattered M6 mire community interspersed with mildly calcareous rock outcrops

Photograph 16: Sample station GCE, gently sloping ground with M23 *Juncus effusus* rush pasture bordering watercourses



Photograph 17: Sample station GCF, M6 mire and M23 rush pasture communities with scattered but dense stands of bracken along steep ravine edges.

Photograph 18: Sample station GCG, species-rich mire bordering watercourse.



Photograph 19: Sample station GCH, species-rich shrubby-grassland verges bordering the Old Military Road in the south of the site.