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Cumbria Metallurgical Coal Project

Ecology survey update report

August 2021

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	Name	**Position**	**Date**
Originated	Neil Beamsley	Principal Ecologist	03 August 2021
Reviewed	Peter Shepherd	Director	04 August 2021
Approved for issue to client	Peter Shepherd	Director	05 August 2021
Issued to client	Neil Beamsley	Principal Ecologist	05 August 2021

Disclaimer

Contents

1 Introduction

Background to commission

1.1 BSG Ecology was commissioned in April 2021 by West Cumbria Mining (WCM) to complete ecological survey and prepare an ecological survey report. The work has been commissioned in support of WCM's proposals to develop a new underground metallurgical coal mine and associated development (Cumbria County Council (CCC) planning reference 4/17/9007).

1.2 The proposed development is located to the south of the town of Whitehaven, in west Cumbria, at a central Ordnance Survey Grid Reference of NX 97239 15205.

1.3 Following the initial award of planning permission by Cumbria County Council (CCC) in 2018 (planning reference 4/17/9007), the application has been 'called-in' for public examination by the Secretary of State, and therefore a Public Inquiry will commence in September 2021. The findings of this report will therefore be used to inform and support WCMs case during this process in respect of potential impacts from the development upon important ecological interest features.

1.4 Within this report, the phrase 'the Site' has been used to refer to all habitats located within the development redline planning boundary. Where relevant, specific areas of the Site have been described separately.

Site description

1.5 Detailed habitat descriptions for all elements of the Site are provided within Chapter 11 (BSG Ecology 2018) and the supporting technical appendices of the project Environmental Statement (WCM 2018).

1.6 Any changes to the habitats recorded within the Site during the 2021 ecological update work are described in section 3 of this report.

Aim of the study

1.7 The aims of this report are to present the findings of the ecology survey work completed in 2021.

1.8 Survey work completed during 2021 is as follows:

- Update extended phase 1 habitat survey (Site redline)
- Phase 2 botanical survey (Main Mine Site, Main Band Colliery, Roska Park LWS and Bellhouse Gill LWS
- Update Phase 2 invertebrate assessment (Main Mine Site and Main Band Colliery)
- Update Breeding bird survey (Site redline + minimum 50m buffer where access allows)
- Update Bats – Static monitoring (Main Mine Site, Roska Park LWS and Bellhouse Gill LWS – Buried conveyor crossing points).
- Update Bats - Hedgerow commuting activity surveys and survey of a building.
- Update Large mammal survey (Site redline – badger, otter, water vole, red squirrel, brown hare)
- Update Great crested newt – Environmental DNA (8 ponds)
- Reptile surveys – Main Band Colliery.

1.9 The results of reptile survey work completed within the Main Mine Site (MMS) in 2019 are also presented in this report.

Personnel

1.10 The report has been written by Neil Beamsley CEcol, MCIEEM, Principal Ecologist at BSG Ecology. Neil has worked in the ecological sector for more than 19 years and he has undertaken ecological assessments on many different sites across the UK.

1.11 The report has been reviewed by Dr Peter Shepherd, Director at BSG Ecology.

1.12 Full details of staff experience can be found at www.bsg-ecology.com/people.

2 Methods

Desk study

2.1 The desk study presented within chapter 11 of the supporting Environmental Statement (BSG Ecology 2018) has been updated for the purposes of this report. The data has been obtained from a number of sources and these are summarised in Table 1 below.

2.2 A 2 km study area has been adopted as proportionate. The study area takes into account the size of the Site, the current land use and the impacts that might arise during the different stages of the development. Due to the large size of the Site, the 2km buffer has been taken from the Site boundary in all directions, rather than from the centre of the Site itself.

2.3 The Cumbria Biological Record Centre (CBRC) was contacted in May 2021 (see below) to obtain records of protected species and habitats within the desk study area.

2.4 A search has also been made of a range of openly available data sources such as the government MAGIC website, google earth, Ordnance Survey 1:25,000 mapping (via Bing maps) and the Cumbria County Council planning portal.

2.5 Reference has been made to habitats and species which have been identified as part of the Government's obligations as set out under Sections 40 and 41 of the (NERC) 2006. These species are a material consideration in the planning process.

***Table 1**: Data sources referenced in the assessment*

Data Source	Date Accessed / Received	Notes
MAGIC[1] (www.Magic.defra.gov.uk)	Most recently accessed 3 July 2021	A 2 km desk study area was adopted for statutory designated sites, Impact Risk Zones[2], S.41 habitats and species, European protected species licences.
CBRC	Data were requested in May 2021	A 2 km desk study area was adopted and data were requested on protected species, S.41 habitats and designated wildlife sites.
Bing maps (www.Magic.defra.gov.uk)	Most recently accessed 3 July 2021	A search was made for ponds within 500m of the Site (https://www.gov.uk/guidance/great-crested-newts-surveys-and-mitigation-for-development-projects). Habitats were assessed using aerial imagery.
Cumbria County Council online planning portal	Reviewed 2 July 2021	A search was made of ecological data submitted in support of other recent planning applications within the 2km search area to identify habitats and species which may need to be considered in reference to the development. https://planning.cumbria.gov.uk/

[1] Multi Agency Geographic Information for the Countryside (MAGIC).

[2] The Impact Risk Zones (IRZs) are a GIS tool developed by Natural England to make a rapid initial assessment of the potential risks posed by development proposals to: Sites of Special Scientific Interest (SSSIs), Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites. They define zones around each site which reflect the particular sensitivities of the features for which it is notified and indicate the types of development proposal which could potentially have adverse impacts.

Field survey

Phase 1 Habitat Survey

2.6 An update of the Phase 1 habitat surveys undertaken by BSG in 2016, 2017 and 2018 was undertaken on 11 May 2021 by Neil Beamsley. The vegetation and land use types present within the Site were classified with reference to industry guidance (JNCC, 2010), and a habitat map was produced. During the survey the weather was mild and dry with no wind. Cloud cover was approximately 20%.

2.7 The habitats present were also then classified in accordance with the UK Habitats (UKHAB) classification system (UK Habitats Classifications working group - May 2018), and assigned a habitat condition score (Defra metric 3.0 – Habitat Condition Assessment tool 2021). This additional stage being completed to allow an assessment of the impacts upon the habitats within the Site to be made using the Defra 3.0 Metric calculator. This Biodiversity Gain assessment will be provided separatley to the findings of this report. Habitats recorded within the Site are shown in Figure 1, section 4 of this report.

2.8 The survey included all areas of the development redline boundary, and where access allowed a buffer area of between 30-50m outside of the boundary. Access was available to all areas within the boundary.

2.9 The survey was then extended to include an assessment of the habitats present to determine their suitability for supporting protected species and S.41 species. The assessment was undertaken at the same time as the Phase 1 habitat survey. During the Site visit any signs of protected species that were observed were recorded. Full detailed of the phase 2 species survey are provided in the following sections.

2.10 During the survey a record was made of any invasive species that were present, such as Japanese knotweed *Fallopia japonica*, i.e. species included in Schedule 9 of the Wildlife and Countryside Act 1981 (as amended).

Phase 2 botanical survey

2.11 A botanical assessment of the ground flora within the woodland components of the Site, and update to previous botanical survey work within the Main Mine Site and Main Band Colliery (2016 and 2018) was completed on 22 May 2021 by Dr Peter Shepherd and Senior ecologist, Gemma Cone of BSG Ecology. The survey assessed the habitats present within the Main Mine Site, Roska Park woodland LWS, Bellhouse Gill woodland LWS and Main Band Colliery.

2.12 During the survey a record of the grass, herb, shrub and tree species present was made, and their relative abundance recorded using the DAFOR (Dominant, Abundant, Frequent, Occasional, Rare) recording system. Notes were also made on any moss, lichen and bryophyte species encountered. Each habitat was then mapped and photographed.

2.13 Weather conditions during this survey work were bright and clear, with no rain and a light breeze. Survey access was available to all of the survey areas.

Phase 2 invertebrate survey

2.14 An update to the invertebrate assessment previously completed in 2016 was completed between May and July 2021. This work considered habitats within the Main Mine Site and was extended to include the habitats within the Main Band Colliery of the Site.

Initial invertebrate habitat potential assessment

2.15 The Site was assessed for its potential to support important invertebrate assemblages by Dr Jim Fairclough MCIEEM, an experienced entomologist and Principal Ecologist at BSG Ecology, on 02 June 2020. For the purposes of the present survey, this comprised an assessment of two

areas: the former Marchon chemical works (the Main Mine Site), including northern margins of a closed landfill (Site A) and the Main Band Colliery (Site B). Site locations are shown on Figure9.

2.16 The distribution and extent of such features informed the nature of targeted invertebrate surveys that were subsequently conducted at the Site. To enable a baseline characterisation of the Site for invertebrates, the habitat assessment included observations of features that might limit invertebrate interest, as well as those which might be of particular value for invertebrates.

Targeted survey for invertebrates

2.17 Terrestrial habitats with potential to support important invertebrate assemblages (identified during the habitat potential assessment) were subject to targeted survey. The main habitats targeted included: mosaic habitat of grassland and scrub, patchily distributed aggregations of bare ground and crushed rock substrate, marshy and seasonally inundated areas, and areas of ephemeral/ neutral grassland with dense patches of flowering plants. Therefore, the survey was designed to target the collection of key indicator groups associated with such habitat. This approach relates to the guidance set out in Drake *et al*. (2007); which lists many of the target taxa of field layer and arboreal assemblages and their value in assessment. Coleoptera (beetles), aculeate Hymenoptera (bees, ants and wasps), Hemiptera (true bugs)and Orthoptera (grasshoppers and crickets) are four orders that are strongly represented in such assemblages; therefore these orders were targeted by the surveys. Certain families (and suborders) of the order Diptera (flies) (e.g. Syrphidae (hoverflies) and other families of the larger Brachycera were also targeted. This approach was also extended to ensure that survey included a systematic search for all species of butterflies and day-flying moths (Lepidoptera) present within the Site during each survey visit.

2.18 The following sampling methods were employed: pan traps, pitfall traps, window trap, sweep-netting, beating and grubbing. These methods are described below.

Pan Traps

2.19 Clusters of three to five pan (or water) traps were set out in flower-rich areas of the Sites A & B in May, June and July. The pan traps comprised a mixture of yellow, blue and white plastic trays into which a small amount of water was poured (along with a few drops of detergent to break the surface tension). Such traps mimic large flowers and attract flying insects of many groups' especially aculeate Hymenoptera and certain Diptera, which become trapped in the fluid and can be collected later. During each visit the traps were set in the morning and collected in at the end of the day; therefore were each collecting invertebrates for periods of at least 6 hrs.

Pitfall Traps

2.20 Pitfall traps were set out in clusters of three to five, at various parcels within the Sites A & B. Pitfall trapping involved the use of circular plant pot trays (24 cm diameter x 5 cm depth) sunk into an excavated circular hole with the tray rims flush with the surrounding ground level. Preserving fluid (and a drop of detergent to break the surface tension) was poured into the trays until they were half full. Lastly, a piece of mesh was secured over the tray to prevent capture of small mammals, amphibians and reptiles. Traps were operational during the period 30 May to 15 June 2021.

Window Trap

2.21 One window flight interception trap (referred to hereafter as 'window trap') was used to capture winged insects flying along through the wet woodland at Site B. The trap was composed of four 2 L. plastic drinks bottles, securely locked in place at the base, and so contained within a circular plant pot tray (24 cm diameter x 5 cm depth), which also acted as a roof to shield the trap from excessive rain water. Wire fittings were used to bind the four bottles to the circular tray. An outward facing rectangular hole (the 'window') was cut out of each bottle. The constructed trap was inverted and therefore suspended from its base by hanging it from a branch. Approximately 30 ml of preserving fluid, comprising 1 part ethylene glycol (antifreeze) to 2 parts water was poured into each bottle via the 'windows' made on each bottle.

2.22 The trap was operational during the period from 30 May 15 June 2021.

Sweep Netting

2.23 Sweep netting was conducted in May, June and July 2021 across various parts of Sites A and B. Sweep netting involved walking at a steady pace through the vegetation and passing an entomologist's sweep net back and forth through vegetation in a figure of eight motion. Sweep netting was accompanied by 'spot-sweeping' where individual invertebrates were targeted and collected via a single sweep.

Beating

2.24 Beating is a useful technique for extracting arboreal invertebrates from overhanging branches. This method involves placing a beating tray beneath a branch before delivering several sharp blows to the branch, sending any dislodged invertebrates into the beating tray for inspection. Beating was conducted in May, June and July 2021 across various parts of Sites A and B, targeting scrub and lower reaches of wet woodland canopy (Site B).

Grubbing

2.25 Grubbing is the name generally applied to the extraction of invertebrates by hand from a variety of media such as: dead wood or fungi and under bark; from moist cracked ground in seasonally inundated habitats; or from dense aggregations of leaf matter and detritus (e.g. base of grass tussocks, fern shuttlecocks and leafy / woody deposits). If appropriate, to assist in the detection of small beetles, material was sieved or placed in a bucket of water to capture invertebrates moving to the surface. Grubbing from such media took place in June 2021, across various parts of Sites A and B.

Pond Netting

2.26 A pond net with a narrow (0.5 mm mesh size) was passed through areas of standing water to sample aquatic invertebrates. This method was reserved for Site B, in temporary pools within the wet woodland, and in the three concrete lined ponds in the south of the site.

Photograph 1: Pitfall trap in situ.

Photograph 2: Window trap in situ.

Photograph 3: Pan trap in situ.

Survey dates and weather conditions

2.27 Table 2 shows the weather conditions on the days of survey and gives details of the weather in the week preceding surveys.

Table 2: Weather conditions during terrestrial invertebrate surveys

Survey date	Survey type	Survey Effort (Hours)	Weather conditions
11 May 2021	Habitat potential assessment of the Site; Targeted survey (sweep, beat, pond net, pan trap, search for lepidoptera)	8	Preceding week: Wet, windy and cool. Date of Survey: Warm and dry. Gentle breeze. Cloud cover – 1-3 Oktas. Max temp. 15ºC.
30 May 2021	Targeted survey (sweep, beat, pitfall & window trap setting, search for lepidoptera)	5	Preceding week: Dry and warm; breezy. Date of Survey: Hot and dry. Light breeze. Cloud cover – 1-2 Oktas. Max temp. 22ºC.
14 – 15 June 2021	Targeted terrestrial survey (sweep, beat, grub, pond net, pan trap, pitfall and window trap retrieval, search for lepidoptera)	9	Preceding week: Mostly dry and warm with occasional rain showers. Dates of Survey: Warm and dry. Light breeze. Cloud cover – 2-4 Oktas. Max temp. 17ºC.
8 July 2021	Targeted terrestrial survey (sweep, beat, pan trap, search for lepidoptera)	5.5	Preceding week: Wet, windy and cool. Date of Survey: Warm and dry. Light breeze. Cloud cover – 4-6 Oktas. Max temp. 18ºC.

Sample Sorting and Identification

2.28 For all surveys, whilst some species could be identified in the field, the majority of specimens were stored in 70% IMS for later identification, using a stereoscopic microscope with the aid of identification literature. For all target groups identification was taken down to species level.

Data Analysis

2.29 The results and discussion section places a value on the rare and notable invertebrates found at the two sites dependent on their current national status. Further information on status definitions and criteria of invertebrate groups can be found in Appendix 1.

Pantheon Assemblage Analysis

2.30 The list of species derived from the invertebrate surveys was analysed using the "Pantheon" database tool developed by Natural England and the Centre for Ecology and Hydrology (Webb *et al*., 2018). For each species recognised by Pantheon, various attributes relating to associated habitats and resources, assemblage types and habitat fidelity scores are placed against them. Reports can then be generated including those that provide:

- information on each individual species entered into the database;
- a list of species belonging to different feeding guilds (e.g. xylophagous, saprophagous, nectivorous);
- a list of species with different associations (e.g. to certain groups of plant, fungi or animal);
- a summary of the number of species within the sample that have a particular score or fidelity and, if relevant an overall score that provides insight into the quality of the site that the sample has come from; and
- summary tables that assess where species live and what assemblages they are associated with.

2.31 In the context of the present assessment, it is the report that Pantheon provides relating to where species live and with which assemblages they are associated, that is most useful in evaluating the relative importance of a site for its invertebrates. This considers the habitats and resources used by an invertebrate species at various hierarchical levels, from broad biotopes (e.g. tree associated, wetland, coastal) at the highest level, down to specific habitats (e.g. tall sward and scrub, decaying wood, arboreal, marshland) at a mid-level, and resources (e.g. sapwood & bark decay, heart-rot and fungal fruiting bodies all associated with the decaying wood habitat) at the finest level. The assessment also considers the "ISIS" (Invertebrate Species-habitat Information System) assemblage types that had previously been developed by Natural England (Drake et al., 2007). The original Specific Assemblage Types (SATs) are therefore carried forward in their original form, although 'Habitats' have replaced the ISIS Broad Assemblage Types (BATs).

2.32 SATs include only habitat specific species, which are normally faithful to a single habitat or resource, which are often closely associated with sites of higher conservation value. Analysis of SATs is helpful to inform the determination of the nature conservation value of a site for invertebrates; sites with high-scoring SATs are considered to have good quality invertebrate assemblages.

2.33 The original role of ISIS was to guide Natural England on assessing the conservation value of SSSIs for their invertebrate assemblages (especially for the purposes of Common Standards Monitoring). This was done by identifying whether an assemblage associated with a site was in a "favourable condition" (i.e. where it was considered to be of sufficient condition to meet the threshold criteria for an assemblage of SSSI-level value). However, whilst the condition assessment function is still retained within Pantheon, it is not the sole use. Accordingly, the analysis may be used in other situations (e.g. by nature reserve managers or those assessing the effects of a development) to help understand which assemblages (SATs) within a site are likely to be important.

2.34 A useful measure of the quality of a site for its invertebrate assemblage is to count and assign scores that are more heavily weighted towards the rarer species. The Species Quality Index (SQI) is a numerical scoring system contained within Pantheon that does exactly this. Each species recorded from a sample is given a Species Quality Score (SQS) based on their conservation status. The SQI is the sum of all SQSs divided by the number of species in that sample. This score is multiplied by 100 to give a 3 figure value without decimal places (e.g.100 rather than a 1.00). This SQI score is preferred to the SQS since it eliminates, to a greater extent the effect of

recorder effort. Notwithstanding this, sites where little effort has been made to record the common species could result in overly amplified SQI scores. There is presently no published guidance on what SQI score might be classed as 'good' or 'average' as this might vary between habitats and regions (e.g. northern vs. southern England). However, as a general rule of thumb, based on the experience of the assessor, a habitat with an SQI score exceeding 125 is likely to be of some value and merit further consideration.

Personnel

2.35 The team for this survey and reporting involved the following personnel:

- Dr Jim Fairclough BSc, PhD, MCIEEM (Principal Ecologist, BSG Ecology): Jim led the field surveys, identified certain invertebrates in the field and laboratory (notably aquatic invertebrates), and prepared the technical report. He studied invertebrates for his PhD and has worked full-time as a professional ecologist since 2003, during which time he has completed invertebrate surveys and assessment at over 100 development sites.
- Don Stenhouse MSc, FRES: Don completed the identification of most invertebrates He is a fellow of the Royal Entomological Society and Curator of Natural Science at Bolton Museum. He specialises in invertebrate identification, particularly Coleoptera, and has carried out work for a wide range of clients across the UK over the last fifteen years.

Breeding bird survey

2.36 Breeding birds survey were completed on three occasions between May and June 2021. Each survey was completed using a walkover technique where a constant search effort was employed during each survey visit, with the same survey transect being walked on all occasions, however the surveyor walked this in both a clockwise and anti-clockwise direction to remove any potential bias relating to the timing of bird activity in the results obtained.

2.37 All surveys were carried out by Neil Beamsley CEcol, MCIEEM, who is an experienced ornithological surveyor (www.bsg-ecology.com/people/neil_beamsley).

2.38 All surveys were completed during the morning (see Table 3 below), which is the period when breeding birds are most vocal. All birds were recorded using standard British Trust for Ornithology species and behaviour codes. The resultant data were subsequently analysed to create maps of breeding bird activity and to estimate the numbers of breeding pairs within the Site. The following approach was used to characterise breeding bird activity:

- Birds were considered to be probably breeding (Pr) if singing, displaying or carrying nest material; if adults repeatedly alarmed; if there was disturbance display; if adults were seen carrying food; or if there were territorial disputes.
- If nests or young were found the species was confirmed as breeding (B).
- If birds were present within the Site in low numbers amongst suitable nesting habitat, the birds were considered to be possibly breeding (Po).
- Species that were present but where no suitable nesting habitat was present were considered not to be breeding (N).

2.39 Estimates of territory numbers have been assigned to each breeding species recorded on Site using the territory analysis approach described by Bibby et al (2000). Notable species, in terms of their rarity or abundance, are then considered further. Territories for the those species confirmed or considered likely to be breeding within the Site are shown in Figures 2, 3, 4 and 5 in section 4 of this report..

2.40 A summary of the dates, times and weather conditions encountered during each survey visit is provided in Table 3 below.

Table 3 – Timings and weather conditions of bird survey

Date	Start time	Finish time	Duration	Weather
11.5.21	05:30	08:50	3hrs 20	Dry, light cloud, light breeze, no rain
17.5.21	05:30	09:00	3hrs 30	Dry, full cloud, light breeze, no rain
03.6.21	04:40	08:30	3hrs 50	Dry, full cloud, no wind, no rain

2.41 Variation in the duration in survey visits can be accounted for by the varying degree of activity encountered during each survey visit. As the breeding season progresses more bird fledge and therefore the time taken during survey to record them increases.

Bat survey – Static monitoring

2.42 A review of the bat survey data gathered previously by BSG Ecology in support of the development (See chapter 11 – Ecology – (BSG Ecology 2018)), identified that the levels of bat foraging and commuting activity within the Site were generally very low. With the generally poorly connected, open and exposed nature of the habitats present likely to be a significant factor in the low numbers recorded, these habitats being of low suitability to bats. The habitats present in 2021 were found to be consistent with those recorded in 2018. Therefore, it was assessed that the likely level of bat activity would remain very similar to those previously recorded in 2018.

2.43 Bat transect and static monitoring in 2018, did however detect three areas within the Site where bat foraging activity was slightly greater, these were: vegetation along the southern boundary of the Main Mine Site, the St Bees road crossing point through Roska Park LWS and the proposed conveyor crossing location in Bellhouse Gill LWS. These three areas have therefore been targeted as part of the 2021 survey update and are referred to as monitoring locations 1, 2 and 3.

2.44 Wildlife Acoustics SM4+ full spectrum static bat detectors were deployed at each of the three location identified in paragraph 2.46 for a period of five nights during both May 2021 and June 2021 (the core bat activity period). The resultant sound files were then converted from MP4 into ZCA files to allow analysis using the Analook acoustic analysis software. These sound files were analysed manually by experienced ecologists (Matthew Breadin and Neil Beamsley of BSG ecology). The results of this analysis are summarised in section 3 of this report.

2.45 Three static detectors were deployed between 13 and 17 May 2021 (five nights) and again between 21 and 25 June 2021 (5 nights). Each deployment coincided with periods of mostly calm and dry weather (See figure 6 for the three locations sampled).

Bat Activity Survey

2.46 Dusk activity surveys for bats have been completed at two locations within the Site during the 2021 update survey

Bat Hedgerow survey 2021

2.47 Two dusk activity surveys have been completed of hedgerows associated with the Rail Loading Facility (RLF) elements of the project (see figure 6 for survey locations). The hedgerows will be directly affected by the installation of the RLF infrastructure and were identified by the earlier 2018 data (see Chapter 11-Ecology) as being features used by low to occasionally moderate levels of commuting and forging bats.

2.48 On each occasion, the hedgerows, which form a an inverted ‘u’ shape, were surveyed by two trained surveyors who sought to box-in the survey areas and cover all bat activity along the hedgerows, in addition to the edge of the adjacent woodland (survey areas are shown in Figure

6). Each surveyor used an Anabat express Frequency Division (FD) bat detector, with a Batbox Duet FD detector to allow identification of calls in the field. Surveyors also used a Sannace Infra-red CCTV system to record all activity along the central sections of the survey area. Each of the two CCTV cameras used was deployed alongside an additional Anabat Express detector with bat calls and the CCTV footage being analysed at a later data to ensure all bat activity was recorded and accounted for.

2.49 Survey was completed from 15 minutes before dusk, to 90 minutes after dusk in accordance with the approach described within the Bat Conservation Trusts survey guidelines (Collins, ed 2016). Survey was completed by Hannah Breadin, Matt Breadin, Gemma Cone and Neil Beamsley. All of whom a very experienced bat surveyors from BSG Ecology. Times and weather conditions during each survey are shown in table 4 below.

Main Mine Site security building survey 2021

2.50 A single dusk activity survey was completed of the former Marchon chemical works security building, which stands to the east of the entrance into the Main Mine Site in July 2021. Two trained surveyors from BSG Ecology (Matt Breadin and Shona Velazquez) stood at opposites sides of the building, to 'Box-in' the building and ensure that any bats emerging from the structure could be reliably detected. Each surveyor used a Bat-box duet FD bat detector to allow for call to be identified in the field, in combination with an Anabat Express static bat detector to allow all calls recorded to be checked at a later date using the analook acoustic analysis software.

2.51 Survey was completed from 15 minutes before dusk, to 90 minutes after dusk in accordance with the approach described within the Bat Conservation Trusts survey guidelines (Collins, ed 2016). Times and weather conditions during each survey are shown in table 4 below.

Table 4 – Timings and weather conditions of dusk activity survey

Date	Survey location	Start/Finish time	Sunset	Weather	Surveyors
21.6.21	Hedges	21:35 – 23:30	21:50	Fine, dry, still	MB+HB
8.7.21	Hedges	21:24 – 23:11	21:41	Fine, dry, still	NB+GC
21.7.21	Security building	21:20 – 23:05	21:34	Fine, dry, light breeze	MB+SV

Large Mammal survey

2.52 A survey for large mammal field signs was completed by Neil Beamsley on 11 May 2021. This survey covered the Site, and where safe access would allow a 50m additional survey buffer area. During this survey, the surveyor walked the area looking for any activity and field signs which may suggest the presence of otter *Lutra lutra*, badger *Meles meles*, Water vole *Arvicola amphibius*, red squirrel *Sciurus vulgaris* and brown hare *Lepus europaeus.*

2.53 Survey included all areas of scrub, woodland and the Pow beck watercourse to the east of the St Bees railway line, in addition to all areas of the Site. A note was made of any field signs encountered such as footprints, droppings, feeding remains, potential rest and shelter areas and individual animals.

Trail camera monitoring

2.54 Following the initial large mammal walkover survey on 11 May 2021, signs of badger activity were recorded on the small watercourse located immediately north of the Main Band Colliery, which then flows under the St Bees railway line via a culvert. Two Spy-point IR 7 passive monitoring (trail) cameras were therefore deployed to monitor this location from the 11 May until 21 June (a total of 43 days). The location of the two trail cameras deployed is shown in Figure 6, section 4 of this report).

Great crested newt survey 2021

2.55 The results of the great crested newt survey work completed previously in support of the development are provided in Chapter 11 (BSG Ecology 2018) of the supporting Environmental Statement.

2.56 8 ponds were found to be present either within the Site or in a 250m radius of the Site boundary during the updated to the extended phase 1 habitat survey in May 2021. The pond previously located within the Main Mine Site and that had previously been previously surveyed (Chapter 11 2018), was found to be completely dry in May 2021.

2.57 In order to establish the presence or likely absence of great crested newt within each pond, water samples were collected to permit the detection of great crested newt genetic material within each pond using eDNA analysis techniques.

2.58 The use of eDNA analysis has been highlighted by Natural England (https://www.gov.uk/guidance/great-crested-newts-surveys-and-mitigation-for-development-projects, accessed 7 July 2021) as a way of gaining information about the presence or likely absence of great crested newts within a site. Guidance published by Defra (Biggs et al., 2014) describes a sampling method, which has been adopted for the ponds included in this study.

2.59 Water samples were collected from Ponds 1-8 in May 2021, which is within the recommended survey period (mid-April to the end of June). Samples were collected by Neil Beamsley and Jim Fairclough of BSG Ecology. A total of 20 samples were taken from each pond using a specialist sampling kit provided by Sure-screen and using the standard sampling method (Biggs et al., 2014). The samples were then labelled and sent for analysis on 31 May 2020, and the results were provided on 5 June 2021.

2.60 Table 5 (below) provide the location of each of the 8 ponds sampled using eDNA sampling techniques in 2021.

Table 5 – Edna sampling locations 2021.

Pond number	OSNG location	Description
1	NX 96645 15335	Pond located in leachate facility South of MMS
2	NX 98345 14429	One of three interconnected concrete basin MBC
3	NX 98345 14429	One of three interconnected concrete basin MBC
4	NX 98345 14429	One of three interconnected concrete basin MBC
5	NX 98281 14693	Ornamental pond private garden
6	NX 98348 14685	Pond located in private garden
7	NX 98337 14720	Pond located in private garden
8	NX 98345 14740	Pond located in private garden

Reptile survey 2019 and 2021

2.61 This report provides an update on two reptile surveys completed in support of the proposed mine development. Survey of the Main Mine Site was completed in 2019. This survey was completed following the initial grant of planning permission in 2018 and was commissioned in order to provide information necessary to discharge a planning condition. The methods and results of this survey were not included within Chapter 11 9BSG Ecology 2018), so have been provided as part of this update report.

2.62 A second update survey for reptiles has been completed at the Main Band Colliery in 2021. The methods used are described in the following sections, and the results described in section 3 of this report. The location of the reptile tiles deployed and any species recorded are provided in Figures 6 and 7 in section 4 of this report.

Reptile survey 2019 - Main Mine Site

2.63 Following the initial grant of planning permission by Cumbria County Council, survey was completed of the Main Mine Site during July and August 2019. A total of 120 artificial refugia, comprising 50x50cm squares of bitumastic roofing felt were installed and checked on a total of seven occasions when weather conditions were favourable for survey.

2.64 Table **6** (below) shows the dates and weather conditions experienced during each survey visit.

Date	Start time	End time	Temp	Wind	Cloud	Rain
12.07.19	11:00	15:00	16	F1	30%	Nil
17.07.19	09:00	11:00	16	F1	100%	Nil
01.08.19	09:30	11:30	16	F1-2	40%	Nil
08.08.19	10:30	12:20	17	F1-2	30%	Nil
15.08.19	12:00	13:45	17	F4	50%	Nil
21.08.19	12:00	13:40	16	F4	90%	Nil
29.08.19	11:00	12:30	16	F4	60%	Nil

Reptile survey 2021 - Main Band Colliery

2.65 At the time of writing this report, survey is being updated for reptiles by BSG Ecology within the Main Band Colliery element of the Site. A total of 50 artificial refugia comprising 50x50cm squares of bitumastic felt were installed in this area on 22 June 2021. The tiles were allowed to 'bed-in' for a period of 8 days and have been checked on the following dates.

Table **7** - Weather conditions and dates of reptile surveys, June and July 2021

Date	Time	Temp (^{0}C)	Wind	Rain	Cloud
30.6.21	17:30-18:15	17	Light	Nil	60%
6.7.21	10:00-10:45	16	Nil	Nil	40%
8.7.21	10:00-10:45	17	Nil	Nil	50%
15.7.21	09:00-10:00	19	Nil	Nil	80%
18.7.21	10:15–11:00	16	Nil	Nil	5%
21.7.21	10:00-10:40	17	Nil	Nil	50%

24.7.21	09:45 – 10:45	15	Nil	Nil	30%

Limitations to methods

2.66 No access restrictions have been experienced during any of the ecology survey work completed in 2021. Therefore, site access is not considered to be a limiting factor with any of the survey data.

2.67 Survey work for all species and habitats has been completed within the relevant industry standard survey guidelines (i.e. within the recommended survey period), and therefore survey timings are not considered to be a limiting factor.

2.68 Invertebrate surveys conducted between May and July cover a large part of the optimal survey period for invertebrates. However, certain species active only in late summer and autumn may have been missed. Notwithstanding this, it is considered that the surveys that were undertaken at the Site during 2021 provide a good representation of the invertebrate assemblages likely to be present.

2.69 The survey approach has been designed with reference to guidance set out in Drake et al. (2007). It should be noted that the confidence in the ISIS / Pantheon analysis of SATs is reduced where survey work does not follow the precise ISIS sampling protocols. Since the objectives of the present survey were to identify a broad a range of invertebrates across target groups in predicted key areas of habitat, the methods employed do vary slightly from the ISIS protocol. In such instances Webb et al. (2018) advises that caution is applied when using the SAT assessments, and that confidence in a favourable condition should be considered as 'Medium' for semi-ISIS compliant samples. In the present context, the analysis is considered to be broadly indicative; and may therefore give further steer to help understand which assemblages within the Site are likely to be important.

3 Results

3.1 In the following section the results of the 2021 update survey and 2019 reptile survey of the Main Mine Site are presented.

3.2 In cases where no significant and discernible difference between the 2018 (Chapter 11 – Ecology 2018) survey baseline and that recorded in 2021 has been detected, then reference is made to the 2018 assessment

Desk study

3.3 No new statutory and non-statutory designated sites have been identified within the search area. No new Habitats of Principal Importance (HPI) have been identified from a search of MAGIC.gov.uk. The desk study information and contained within Chapter 11 of the ES (BSG Ecology 2018) are therefore considered to provide an accurate reflection of the broad habitat types and species found within the Site.

Extended phase 1 habitat survey

3.4 No new habitat types have been identified within the Site during the 2021 update. The pond previously recorded within the Main Mine Site is no longer holding any water and is starting to be encroached by coarse grass species from the surrounding habitats.

3.5 Habitat descriptions contained within Chapter 11 (BSG Ecology 2018) are therefore considered to provide an accurate reflection of the broad habitat types and species found within the Site.

Phase 2 botanical survey

Main Mine Site

3.6 The update Phase 2 botanical survey of the Main Mine site shows that the habitats present are broadly comparable with those described within Chapter 11 (BSG Ecology 2018). Some areas of the grassland have become more coarse in composition and a greater percentage of scrub cover is now evident. This is considered to be part of the natural course of ecological succession for a site of this nature.

Roska Park (and Benhow Woodland) LWS

3.7 The following additional target notes are provided in regard to the woodland habitats associated with Roska Park LWS. Roska Park woodland comprises the vegetation to the west of the St Bees Road and Benhow Wood comprises the vegetation found to the east of the road. The location of the habitat components and Target Notes (TN) described in the following sections are shown in Figure 10a, section 4 of this report.

Roska Park Wood

3.8 TN 1. Former quarry area between the water pipe and road about 1 to 2m below the road level. Open canopy with sycamore *Acer pseudoplatanus*, hazel *Corylus avellana*, ash *Fraxinus excelsior*, hawthorn *Crataegus monogyna* and beech *Fagus sylvatica* on the boundary with the road. Trees have been pruned under the overhead wires. Ground flora dominated by ransoms *Allium ursinum* with dog's mercury *Mercurialis perennis*, smaller amount of bluebell *Hyacinthoides non-scripta*. Other species include wood dock *Rumex sanguineus*, primrose *Primula vulgaris*, wood millet *Milium effusum*, red campion *Silene dioica*, tufted hair grass *Deschampsia cespitosa*, wood sedge *Carex sylvatica*, remote sedge *Carex remota*, sweet woodruff *Galium odoratum*, wood stitchwort *Stellaria holostea*, nettle-leaved bellflower *Campanula trachelium*, male fern *Dryopteris filix-mas*, soft shield fern *Polystichum setiferum* and harts tongue fern *Phyllitis scolopendrium*.

3.9 TN 2. Natural part of the gill upstream from the former quarry area described in TN1 is about 10m below the road and supports dense carpets of ransoms *Allium ursinum* on the floor of gill and greater proportion of bluebell *Hyacinthoides non-scripta* on the steeper slopes. Same range of species as

recorded elsewhere in the gill. Stream goes into a culvert and this passes under the quarry fill and the road.

Benhow Wood.

3.10 TN3. Embankment off the road is very steep and drops to about 20 m below the road. The ground flora has been heavily poached and grazed by cattle with large areas of bare ground. Close to the southern boundary by the old limekiln sites a range of tipped material including asbestos and plastic has been dumped partially blocking the outfall of the culvert under the road. Remnants of the original flora are still present including ransoms *Allium ursinum*, bluebell *Hyacinthoides non-scripta*, primrose *Primula vulgaris*, and creeping jenny *Lysimachia nummularia*. In the wetter sections close to the stream there are seepages with opposite leaved golden saxifrage *Chrysosplenium oppositifolium*. The cattle poaching and grazing has also encouraged stands of nettle *Urtica dioica*.

Bellhouse Gill woodland LWS

3.11 The following Target Notes relate to the Bellhouse Gill Woodland LWS. The location of the habitat components and Target Notes (TN) described in the following sections are shown in Figure 10a, section 4 of this report.

3.12 TN1. Ancient, wooded gill. The northern part of the wood has been partially buried by infill of inert waste and topsoil. Two small streams appear near the north eastern boundary and eventually merge into a single meandering stream. The upper slopes are dominated by dense carpets of bluebell *Hyacinthoides non-scripta* with a range of other woodlands plants including, sweet woodruff *Galium odoratum*, wood sorrel *Oxalis acetosella*, tufted hair grass *Deschampsia cespitosa*, dog's mercury *Mercurialis perennis*, pignut *Conopodium majus*, and Wood sedge *Carex sylvatica*. Ash *Fraxinus excelsior* and sycamore *Acer pseudoplatanus* dominate the canopy with understorey of hazel *Corylus avellana* and wych elm *Ulmus glabra*. Along the stream where the gradient is flatter there is a stream side community with ransoms *Allium ursinum* and male fern *Dryopteris filix-mas* and wetlands plants such as meadowsweet *Filipendula ulmaria*, opposite leaved golden saxifrage *Chrysosplenium oppositifolium*, remote sedge *Carex remota*, creeping jenny *Lysimachia nummularia*, and large bittercress *Cardamine amara.*

3.13 TN2. At the point where the proposed crossing by the conveyor is located the gill is at its narrowest and is relatively shallow and with a more gradual gradient than upper and lower parts of the gill. A number of elm trees have been felled/fallen and are regenerating. As such there is no canopy to speak off and as a consequence, bramble *Rubus fruticosus* and to a less extent nettle *Urtica dioica* have grown up and dominate much of the ground flora. However, under this layer there is still dog's mercury *Mercurialis perennis*, ransoms *Allium ursinum*, wood sedge *Carex sylvatica*, wood sorrel *Oxalis acetosella*, male fern *Dryopteris filix mas*, pignut *Conopodium majus* and opposite leaved golden saxifrage *Chrysosplenium oppositifolium*.

Main Band Colliery

3.14 The following Target Notes relate to the Main Band Colliery. The location of the habitat components and Target Notes (TN) described in the following sections are shown in Figure 10a, section 4 of this report.

3.15 TN1. Marshy Grassland on the southern edge of the site south of the access road. Tall grassland damp to wet in places being colonised by grey willow scrub. Yorkshire fog *Holcus lanatus* (A), false oat grass *Arrhenatherum elatius* (LF), and meadow foxtail *Alopecurus pratensis* (LA) dominate the grass sward with patches of compact rush *Juncus conglomeratus* (LA), red fescue *Fesuca rubra* (LF), tufted hair grass *Deschampsia cespitosa* (O) and sweet vernal grass *Anthoxanthum odoratum* (O). A range of forbs characteristic of damp conditions occur including; northern marsh orchid *Dactylorhiza purpurella* (O), wild angelica *Angelica sylvestris* (O), water mint *Mentha aquatica* (R), creeping buttercup *Ranunculus repens* (LF), marsh thistle *Cirsium palustre* (LF), bog stitchwort *Stellaria uliginosa* (R), oval sedge *Carex ovalis* (O), valerian *Valeriana dioica*(O) and bitter sweet *Solanum dulcamara* (O)

3.16 TN2. Shelter belt on southern boundary with birch *Betula sp*. (F), alder *Alnus glutinosa* (F), pedunculate oak *Quercus robur* (O), nettle *Urtica dioica* (A), bramble *Rubus fruticosus,* (LF), common cleavers *Galium aparine* (LA).

3.17 TN3. Dry access road track bed leading up to the weighbridge. Fine leaved grassland with a variety of herbs. Crested dog's tail *Cynosurus cristatus* (F), Yorkshire fog *Holcus lanatus* (O), red fescue *Festuca rubra* (F), sweet vernal grass *Anthoxanthum odoratum* (L), cock's-foot grass *Dactlyis glomerata* form the grass sward with (O), ribwort plantain *Plantago lanceolata* (F), red clover *Trifolium pratense* (F), springy turf moss *Rhytidiadelphus squarrosus* (A), glaucous sedge *Carex flacca* (LF), common knapweed *Centaurea nigra*(O), lesser trefoil *Trifolium dubium* (O), coltsfoot *Tussilago farfara* (F), ox-eye daisy *Leucanthemum vulgare* (O), selfheal *Prunella vulgaris* (F) black medick *Medicago lupulina* (LF), and field forget-me-not *Myosotis arvensis* (L) present.

3.18 TN4. Lagoons and ditch. Sege warbler breeding in scrub and reed. Wetland plants include greater reedmace *Typha* latifolia, common reed *Phragmites australis*, remote sedge *Carex remota*, figwort *Scrophularia nodosa*, cuckoo flower *Cardamine pratensis*, jointed rush *Juncus articulatus*, brooklime *Veronica beccabunga*, and hemlock water dropwort *Oenanthe crocata*.

3.19 TN5. Banks on the eastern side of the hardstanding support a dry sparse grassland and lichen community. Silver hair grass *Aira caryophyllea* (O), lichens *Cladonia* spp. (LA), ling heather *Calluna vulgaris* (R), squirrel tail fescue *Vulpia bromoides* (LA), cock's-foot grass *Dactylis glomerata* (O), common spotted orchid *Dactylorhiza fuchsia* (R), white clover *Trifolium repens* (LF), ox-eye daisy *Leucanthemum vulgare* (LF), mouse-ear hawkweed *Pilosella officinarum* (LD), hair moss *Polytrichum* sp (LA), and *dog lichen Peltigera* sp. (O) are present.

Invertebrates

Site A - Main Mine Site

3.20 Site A comprises two distinct areas: the former Marchon chemical works and the northern margins of a closed landfill. See Figure 9, section 4 of this report for the survey areas.

Former Marchon chemical works

3.21 This area is formed across several terraces that provide topographical diversity. Localised structural diversity is provided by small willow shrubs, however, overall, this area is exposed to prevailing south-westerly and westerly winds, and rarely were sheltered areas experienced during the surveys. The terraces include a mosaic of habitats dominated by parcels of semi-improved neutral grassland interspersed with areas of bare ground / exposed concrete and tarmac, ephemeral/short perennial vegetation, and rows of stored crushed aggregate materials covered in species-rich herbs. The semi-improved neutral grassland is mostly species-poor, with tall grasses dominant and frequent tall ruderal; vegetation including nettles, thistles and umbellifers.

3.22 The most species-rich areas are those overlying crushed aggregates, that are formed into rows / banks thus providing topographical diversity. Here, frequently occurring plants of value to phytophagous and nectar and pollen feeding species of invertebrate include: viper's bugloss *Echium vulgare*, rosebay willowherb *Chamaenerion angustifolium*, ox-eye daisy *Leucanthemum vulgare*, creeping buttercup *Ranunculus repens*, colt's-foot *Tussilago farfara*, hogweed *Heracleum sphondylium,* cow parsley *Anthriscus sylvestris*, bird's-foot trefoil *Lotus corniculatus*, hop trefoil *Trifolium campestre*, red clover *Trifolium pratense*, yarrow *Achillea millefolium*, ragwort *Jacobaea vulgaris*, common knapweed *Centaurea nigra*, common teasel *Dipsacus fullonum* and various small yellow composites (including dandelion *Taraxacum officinale* agg. autumn hawkbit *Scorzoneroides autumnalis* and cat's-ear *Hypochaeris radicata*). The loose substrate and frequent patches of bare substrate are also likely to be important for thermophilic (warmth-loving) species many of which may create burrows (e.g. solitary bees and wasps) in exposed soils or seek refuge in crevices within the substrate (e.g. ground and rove beetles). At the margins of the concrete platforms are species of rocky substrates, including the matt-forming biting stonecrop Sedum acre.

Photograph 4: Species-rich banks with exposed substrate in background and concrete platforms with patchy ephemeral vegetation in foreground (July, 2021)

Photograph 5: Unmanaged, species-poor grassland in foreground (May, 2021)

3.23 Structural diversity across the Site is complemented by a diversity of plants, providing a plentiful source of nectar and pollen for invertebrates (such as aculeate Hymenoptera), as well as foliage to feed on for phytophagous species, whereby the greater the diversity of plants the more likely it is that specific species solely associated with a particular plant will be represented at the Site.

Northern margins of closed landfill

3.24 The northern margin of the closed landfill and southern margin of Marchon chemical works is delineated by a bank of planted shrubs. Included are several species of willow Salix sp., hawthorn *Crataegus monogyna,* blackthorn *Prunus spinosa*, common gorse *Ulex europaeus*, wild privet *Ligustrum vulgare*, hazel *Coryllus avellana*, elder *Sambucus nigra*, guelder rose *Viburnum opulus* and dogwood *Cornus sanguinea*. Collectively these form a wind-break, so that areas in the lee are more sheltered and invertebrates will benefit from a locally warmer microclimate. They also provide additional structural complexity to the wider site, offering sources of nectar and pollen early in the year. Beneath and alongside the shrub belt, the ground is damp and favours a number of species of wetter ground, including common fleabane *Pulicaria dysenterica*, ragged robin *Lychnis flos-cuculi* marsh orchid *Dactylorhiza* sp. and creeping buttercup. These were seen to be well visited by a wide range of invertebrates during the surveys.

Photograph 6: Shrub belt (southern edge of Marchon chemical works) (May, 2021)

Photograph 7: Shrub belt (northern edge of former landfill site) (July, 2021)

3.25 Overall, Site A meets the criteria for the Priority Habitat Open Mosaic Habitat on Previously Developed Land as outlined in Table 8 below. Each of these criteria must be met for an area of habitat to be defined as Open Mosaic Habitat.

Table 8: Comparison of the site against criteria used to identify Open Mosaic Habitat

Criterion	Site Assessment	Site Meets Criterion?
The area of open mosaic habitat is at least 0.25 ha in size.	Habitat mosaic comprising scrub, ruderal vegetation, grassland and bare ground exceeds 0.25 ha. within the Site.	**Yes**
Known history of disturbance at the site or evidence that soil has been removed or severely modified by previous use(s) of the site. Extraneous materials/substrates such as industrial spoil may have been added.	The Site has been previously developed and is has been subject to extensive demolition work.	**Yes**
The site contains some vegetation. This will comprise early successional communities consisting mainly of stress-tolerant species (e.g. indicative of low nutrient status or drought). Early successional communities are composed of (a) annuals, or (b) mosses/liverworts, or (c) lichens, or (d) ruderals, or (e) inundation species, or (f) open grassland, or (g) flower-rich grassland, or (h) heathland.	Habitats present within the Site include examples of early successional communities including: annuals; mosses and liverworts; tall ruderal and locally distributed flower-rich grassland habitats.	**Yes**
The site contains un-vegetated, loose bare substrate and pools may be present.	Un-vegetated bare ground is also present. Pools are not present.	**Partially met**
The site shows spatial variation, forming a mosaic of one or more of the early successional communities (a)–(h) above (criterion 3) plus bare substrate, within 0.25 ha.	Vegetation communities throughout the Site (especially within the central part of the former Marchon chemical works) form a complex mosaic.	**Yes**

3.26 Main Band Colliery – Site B - includes a number of discrete habitats including a concrete pad at the centre that is surrounded by bare ground, species-rich grassland, dry heath species-poor neutral grassland, tall ruderal vegetation scrub and wet woodland. The species-rich grassland is predominately located on an artificial bank immediately south of the concrete pad. Included here are a variety of herbs favoured by invertebrates, including: ox-eye daisy, mouse-ear hawkweed *Pilosella officinarum*, creeping buttercup, colt's-foot, hogweed, bird's-foot trefoil Lotus corniculatus, hop trefoil, red clover, white clover Trifolium repens, yarrow *Achillea millefolium*, common knapweed, rough hawkbit *Leontodon hispidus* and dandelion *Taraxacum officinale agg*.. Lichen *Cladonia sp*. and heather *Calluna vulgaris* are patchily distributed and indicate slightly acidic conditions.

Photograph 8: Species-rich grassland with bare substrate (June, 2021)

Photograph 9: Tanks in south of Site B (June 2021)

3.27 Bramble scrub is located throughout the site, including at the margins of the grassland, and gives way to wet woodland in waterlogged areas to the north and west of the central concrete pad. Willow (mostly grey willow *Salix cinerea*), common alder *Alnus glutinosa* and silver birch *Betula pendula* are all abundant. There is little dead wood (standing or fallen) to benefit saproxylic invertebrate assemblages. However, conditions are sheltered and humid so are likely to benefit a range of invertebrates associated with still and humid air, such as craneflies and hoverflies. The ground flora beneath includes valerian *Valeriana officinalis*, meadowsweet *Filipendula ulmaria*, hemlock water dropwort *Oenanthe crocata* and wild angelica *Angelica sylvestris*, all of which have broad inflorescences of white flowers that are important nectar and pollen sources for invertebrates. During the site visit in early May, the wet woodland included a number of seasonal pools of standing water. These had completely dried out by the visit in June.

Photograph 10: Wet woodland in north of Site B (June 2021)

Photograph 11: Ephemeral pool in wet woodland (May 2021)

3.28 In the south of the Site are three concrete-lined tanks. These hold water and the two furthest north include marginal vegetation dominated by bulrush *Typha latifolia*. The tank furthest south was not vegetated. Common duckweed *Lemna minor* was forming a veil over the two northern tanks by the time of the visit on 14-15 June. This is most likely limiting the invertebrate interest of the tanks by blocking out light from penetrating and enabling a more diverse aquatic flora to establish.

3.29 Although Site B has a known history of disturbance, the juxtaposition of open mosaic habitats is such that they do not attain the required area (0.25 hectares) to be considered as a UK priority habitat.

3.30 Overall, due to the range of habitats within Site B and the relatively good condition of these for invertebrates, it is considered likely to be an important area for invertebrate assemblages.

Invertebrate Species Assemblage

3.31 The results of the targeted invertebrate survey provide an indication of the relative species diversity within the targeted groups of invertebrates. Over 800 specimens were collected or recorded over the course of the survey, allowing 269 species to be identified from Sites A and B. 172 species from Site A and 147 species from Site B.

3.32 Of the target groups Coleoptera was the dominant order recorded at 133 species, and other well represented groups included were the Hemiptera (30 species), Hymenoptera (27 species), Diptera (28 species) and Lepidoptera (15 species). Other groups included Aranaeae (spiders), Dermaptera (earwigs), Isopoda (woodlice), Julida (snake millipedes), Lithobiomorpha (centipedes), Mecoptera (scorpionflies), Opiliones (harvestmen), Gastropoda (snails and slugs) and Orthoptera (grasshoppers and crickets).

3.33 The majority of the species recorded (ca. 85%) are without a status, being widely distributed and common, and exhibiting little habitat specificity. However, 34 species are regarded as locally common or Locally Scarce, with six species being Species of Principal Importance, Nationally Scarce or Rare. The full list of invertebrates recorded within the Site is displayed in tabular format in Appendix 2.

COLEOPTERA (BEETLES)

Curculionidae (True Weevils) *Grypus equiseti* - GB Status: Nationally Scarce (Notable B)

3.34 As the vernacular name suggests this distinctive weevil is usually found on horsetail *Equisetum species* but is apparently restricted to field horsetail *E. arvense* and marsh horsetail *E. palustre* (Duff, 2016). It is typically found in fens, mires and other wet places such as damp meadows.

3.35 This species has not been reviewed since Hyman & Parsons (1992), has a wide distribution and is commoner than the status suggests, and should be regarded as local.

3.36 Two specimens were taken, one from a pitfall trap and one from sweeping, both in Site A on 15 June 2021.

Staphylinidae (Rove beetles) *Ocypus nitens* - GB Status: Nationally Scarce (Notable A)

3.37 Although it is widely distributed across England there are relatively few records for this fairly large rove beetle. There are few records for Vice County 70 (Cumberland), most being many years old, the most recent being 2003. According to Lott and Anderson (2011) the species can be found on both open and shaded environments on dry to damp soils. This rather broad flexibility in habitat choice suggests that it may be commoner than records indicate. Two specimens were identified from the Site A, within a pitfall trap set on 15 June 2021.

HEMIPTERA (BUGS)

Lygaeidae (ground bugs) *Megalonotus dilatatus* – UK Status: Nationally Scarce (Notable)

3.38 According to the British Bugs website (2021) 'although scarce, this species is found widely across southern Britain in mainly sandy heathland and grassland habitats, as well as coastal dunes'. There are relatively few records for this bug, although it is widespread and recorded as far north as Yorkshire. This record is new for Vice County 70.

3.39 One specimen was taken from a pitfall trap set in scrub at the toe of the landfill of Site A, on 15 June 2021.This is outside of the development boundary.

LEPIDOPTERA (BUTTERFLIES AND MOTHS)

Erebidae (Moth) *Tyria jacobaeae* – Section 41 listed Species of Principal Importance (Research only)

3.40 This species, Cinnabar moth, is a common species that is well distributed throughout most of England and is listed on Section 41 of the NERC Act (2006) for research purposes only. It is frequently found in open grassy habitats including waste ground, gardens and woodland rides, but is most frequent on well drained rabbit-grazed grassland, mature sand dunes and heathland. The larvae of this species feed on common ragwort, and this plant was common in open areas of the Site. Larvae and adults were found in across both Sites in June and July.

Nymphalidae (Butterfly) *Coenonympha pamphilus* UK status: Near Threatened. Section 41 listed Species of Principal Importance

3.41 Small heath butterflies typically occur in well-drained semi-improved grassland habitats where they lay their eggs on fine grasses such as fescues (*Festuca spp*.), meadow grasses (*Poa spp*.) and bents (*Agrostis spp*.) (Asher et al., 2001). The species was recorded frequently at Site A during late May and June 2021.

3.42 According to the UK Butterflies site, this small nymphalid 'has shown a severe decline over the long term and is therefore a priority species for conservation efforts'. It also shows a positive abundance change between 2005 and 2014.

Nymphalidae (Butterfly) *Hipparchia semele* UK status: Vulnerable. Section 41 listed Species of Principal Importance

3.43 Grayling was recorded frequently within Site A on 22 July. A single butterfly was also recorded from Site B during the survey on 22 July . UK Butterflies states that 'This butterfly has suffered severe declines over the long term and is therefore a priority species for conservation efforts'. Butterfly Conservation (2013) state that 'many colonies occur in coastal habitats such as sand dunes, saltmarsh, undercliffs and clifftops. Inland colonies are found on lowland heathland, limestone pavement, scree and brownfield sites such as old quarries, railway lines and derelict industrial areas.'

3.44 It is described by Butterfly Conservation (2013) as occupying habitats 'characterised by sparse vegetation, sheltered sunny spots and plenty of bare ground in open situations.' Less commonly, the Grayling still occurs on calcareous grassland or in open woodland on stony ground.

Pantheon Assemblage Analysis

3.45 As explained in the methodology section, the Pantheon database has been used principally to help understand which terrestrial invertebrate assemblages within the Site are likely to be important. The species lists for Sites A and B, derived from the invertebrate surveys were entered into Pantheon. The data output from the analysis is shown in Tables 9 and 10 below, which considers invertebrate assemblages at two different levels.

Broad Biotopes

Table 9: Summary of Pantheon output for Broad Biotopes

	Site A		Site B	
Broad biotope	**No. of species**	**Species with conservation status**	**No. of species**	**Species with conservation status**
open habitats	118	6	85	1
wetland	17	1	41	-
tree-associated	13	-	12	-
shaded woodland floor	1	-		
coastal			1	-

3.46 Table 9 shows that there are five broad biotypes across the two sites recognised by Pantheon. The best represented is that belonging to open habitats, which is unsurprising given that much of the survey effort targeted this broad biotope that includes grassland, herb communities and open, bare ground not associated with woodland closed canopies. The recording of a good proportion of invertebrates from the open habitats points towards this being an important feature of both sites. This is further emphasised at Site A by the presence of six species with conservation status from this biotope.

3.47 The wetland biotope is shown to be fairly well-represented, particularly for Site B; here there was permanent water and temporary water in the form of seasonal pools in the wet woodland. Wetland covers a range of habitats including permanent wetlands and waterbodies, lake margins, and areas of land whose soil is saturated with moisture either permanently or seasonally. The tree-associated biotype didn't return a large data set from either site, and in the case of Site B, which has some woodland present (wet woodland), it may indicate that this habitat of limited value for invertebrates or that sampling techniques did not target those species associated with woodland habitat; more likely it will be a combination of the two factors.

3.48 Only two of these biotypes are considered to require further scrutiny as the tree-associated, shaded woodland floor and coastal biotypes have fewer than 15 species in each.

Habitats

Table 10: Summary of Pantheon output for Habitats

		Site A			Site B		
Broad biotope	**Habitat**	**No. of species**	**SQI**	**Species with conservation status**	**No. of species**	**SQI**	**Species with conservation status**
Open habitats	Tall sward & scrub	88	103	1 (*Ocypus nitens*)	68	100	0
	Short sward & bare ground	25	125	4 (*Grypus equiseti, Megalonotus dilates, Coenonympha pamphilus, Hipparchia semele*)	13	N/A	1 (*Coenonympha pamphilus)*
Wetland	Marshland	5	N/A	1 (*Grypus equiseti*)	25	100	0
Other habitats with fewer than ten species at both sites: Shaded woodland floor, acid & sedge peats, marshland, running water, decaying wood, arboreal.							

3.49 Table 10 adds a finer level of detail to Table 9, sub-dividing broad biotopes into habitats. The most prominent habitat that features at both sites is that of 'tall sward scrub' that lies within the broad biotope of open habitats. Whilst belonging to the open habitats biotope, it could be considered as intermediate with the tree-associated biotope, since the definition of this habitat in Pantheon, as 'Areas of dense herbage or partial shade where a humid microclimate is maintained at ground level. Dominance by woody plants is limited by exposure, grazing or cutting of vegetation, but they often form an important component of the habitat' leans on the importance of woody plants. The number of species with a recognised conservation status associated with this habitat is low at both sites, with only one such species of the 88 recorded at Site A, and no species conservation status out of the 68 species recorded at Site B, which is reflected by a low SQI scores.

3.50 The short sward and bare ground habitat at Site A was represented by 25 species, four of which have a recognised conservation status. This habitat type includes areas where disturbance as a result of direct human activity in a brownfield context has removed or maintained vegetation to create areas of bare or sparsely vegetated ground. *Grypus equiseti, Megalonotus dilates, Coenonympha pamphilus,* and *Hipparchia semele* were all recorded from the areas of open mosaic habitat, which reflect the short sward and bare ground habitat description. The SQI score for this habitat is relatively high at Site A and likely suggesting that this assemblage of invertebrates is a valuable feature of the Site. Site B, however, had fewer invertebrates associated with this habitat (13 species) and therefore did not return a reliable SQI score.

3.51 Marshland habitat at Site B was represented by 25 species, that will have been taken from the concrete lined ponds and ephemeral wet woodland pools. However, no species had conservation status and therefore the SQI was low, inferring that this habitat did not support an important invertebrate assemblage. Wetland habitat was absent from Site A, therefore species recorded from this are only likely to have been vagrants or associated with some of the damp areas that are locally distributed in Site A.

Specific Assemblage Types

3.52 The only Specific Assemblage Type with 'Favourable' condition was that of the 'rich flower resource', associated with Site A. This suggests that the open habitats within Site A have an important resource of large flower patches capable of supporting a range of associated species (especially *Aculaeate Hymenoptera).* The flower patches were prominent throughout the surveys, with dandelions

providing sources of nectar and pollen early in the season, followed by an array of umbellifers, composites and legumes in mid-summer, and the promise of a different range of composites in late summer. Flower-rich resources may also include those associated with woody species (e.g., ivy, hawthorn, gorse and willow) as well as those associated with more typical herbaceous flowering plants. As explained in Pantheon, the detection of this assemblage is relevant in that it flags up the importance of the floral resource within Site A.

3.53 It is not appropriate to assess favourable condition of any of the other Specific Assemblage Types (SATs) recognised by Pantheon at either Site. This is because for all SATs recognised, the number of species was below the threshold levels to make a meaningful assessment of condition. This is likely to be explained by the fact that the other habitats sampled are not of sufficiently high quality to support enough species with specialised habitat requirements.

Breeding Bird survey

3.54 Table 11 below shows the number of nesting territories identified during the breeding bird survey completed in 2021. Territories are shown for the following key areas: The Main Mine Site, The Conveyor route (which includes Roska Park and Benhow wood), Main Band Colliery and Bellhouse Gill Woodland and the Rail Loading Facility. The table indicates if the species was considered to be breeding and the estimated number of territories present. The location of each territory is shown in Figures 2, 3, 4 and 5 in section 4 of this report.

3.55 Species are listed in accordance with their conservation status as described by the British Trust for Ornithology Bird of Conservation Concern (BoCC) report (December 2015). Species are colour coded – **Red** - Species of high conservation concern, **Amber** – Species of Moderate Conservation Concern and **Green** – species of least conservation concern

Table 11 – Breeding bird survey results 2021

		Number of territories per area			
Species	**BTO Code**	**Main Mine Site**	**Route of Conveyor**	**Main Band Colliery and Bellhouse Gill Woodland**	**Rail loading facility**
Linnet	**LI**	1	0	0	0
Skylark	**S.**	3	0	0	0
Song Thrush	**ST**	1	0	1	1
Starling	**SG**	0	0	1	0
Bullfinch	**BF**	0	0	1	1
Meadow pipit	**MP**	4	0	0	0
Willow warbler	**WW**	0	0	0	1
Blackbird	**B.**	2	2	4	3
Blackcap	**BC**	0	0	1	0
Blue Tit	**BT**	0	0	2	1

Chiff Chaff	**CC**	0	1	3	3
Goldfinch	**GO**	1	0	1	0
Greater Spotted Woodpecker	**GS**	0	0	1	0
Jackdaw	**JD**	0	0	1	0
Magpie	**MG**	0	1	0	0
Pheasant	**PH**	0	1	0	0
Robin	**R.**	0	2	2	3
Wheatear	**W.**	1	0	0	0
Whitethroat	**WH**	2	2	1	3
Wood pigeon	**WP**	0	0	1	0
Wren	**WR**	0	0	0	1
Sedge warbler	**SW**	1	0	4	2
Stonechat	**SC**	1	0	0	0
	Total Nesting Species	10	6	14	10
	Total Territories	17	11	24	19

3.56 In summary, breeding bird survey in 2021 has recorded a total of 23 species which are considered likely to be breeding within the Site, or in the habitats immediately adjacent to the site boundary. A total of 71 breeding territories have been identified.

3.57 Of the 23 species considered to be resident breeding species, four are listed on the BoCC red list, three are listed on the BoCC amber list and the remaining 16 are listed on the BoCC green list.

3.58 In addition to the 23 species considered to be breeding within the Site, 15 further species were recorded during survey but were not considered to be a breeding species, these were: Raven *Corvus corax*, swift *Apus apus*, sand martin *Riparia riparia*, house martin *Delichon urbicum*, swallow *Hirundo rustica*, garden warbler *Sylvia borin*, buzzard *Buteo buteo*, chaffinch *Fringilla coelebs*, goldcrest *Regulus regulus*, Canada goose *Branta canadensis* , pied wagtail *Motacilla alba*, rook *Corvus frugilegus,* carrion crow *Corvus corone*, mallard *Anas platyrhynchos*, and reed bunting *Emberiza schoeniclus*.

3.59 In total 38 bird species were recorded during the 2021 update survey.

Bat static surveys

3.60 Tables 12 to 17 below provide a summary of the number of bat passes recorded by each of the three static bat detectors during May and June 2021. The average number of bat passes per night per species are provided as the figure in brackets.

	Table 12 – May 2021 Location 1 - Main Mine Site					
	13/05/2021	**14/05/2021**	**15/05/2021**	**16/05/2021**	**17/05/2021**	**Total**
Common Pipistrelle	82	26	174	45	43	370 (74)
Soprano Pipistrelle	1	1	172	1	0	175 (35)
Myotis sp	0	0	0	1	0	1 (0.2)

	Table 13 – May 2021 Location 2 – Roska Park Woodland					
	13/05/2021	**14/05/2021**	**15/05/2021**	**16/05/2021**	**17/05/2021**	**Total**
Common Pipistrelle	262	1085	192	221	630	2390 (478)
Soprano Pipistrelle	2	13	7	4	12	38 (7.6)
***Myotis* Sp.**	0	0	0	0	3	3 (0.6)

	Table 14– May 2021 Location 3 – Bellhouse Gill Woodland					
	13/05/2021	**14/05/2021**	**15/05/2021**	**16/05/2021**	**17/05/2021**	**Total**
Common Pipistrelle	103	90	191	453	301	1138 (227.6)
Soprano Pipistrelle	18	13	37	19	37	124 (20.66)
***Myotis sp*.**	2	7	11	11	10	41 (8.2)

	Table 15 June 2021 – Location 1 – Main Mine Site					
	21/06/2021	**22/06/2021**	**23/06/2021**	**24/062021**	**25/06/2021**	**Total**
Common Pipistrelle	129	199	219	58	152	757 (151.40)
Soprano Pipistrelle	5	11	14	4	2	36 (7.2)
***Myotis* Sp.**	1	0	2	0	0	3 (0.6)

	Table 16 – June 2021 – Location 2 – Roska Park woodland					
	21/06/2021	**22/06/2021**	**23/06/2021**	**24/062021**	**25/06/2021**	**Total**
Common Pipistrelle	532	610	416	696	253	2507 (501.6)
Soprano Pipistrelle	9	21	61	6	7	104 (20.5)
Noctule	0	0	1	0	0	1 (0.2)
Myotis Sp.	4	0	0	0	0	4 (0.8)

	Table 17 - June 2021 – Location 3 – Bellhouse Gill Woodland					
	21/06/2021	**22/06/2021**	**23/06/2021**	**24/06/2021**	**25/06/2021**	**Total**
Common Pipistrelle	555	610	404	997	265	2831 (566.20)
Soprano Pipistrelle	6	90	30	376	9	511 (102.2)
***Myotis* Sp.**	3	1	0	244	2	250 (50)

3.61 Static survey during 2021 has shown that low numbers of common and soprano pipistrelle used the Main Mine Site (location 1) during both the May and June 2021 survey period. Individual passing records of a *Myotis* species of bat were also recorded.

3.62 Static surveys of Roska Park woodland (Location 2) Indicate a broadly similar pattern of bat activity in both May and June 2021. Common pipistrelle was the most commonly recorded species, with an average of 500 passes per night during the June survey period. Less regular activity by soprano pipistrelle was also recorded, with very sporadic activity by Noctule and *Myotis* bat species.

3.63 The greatest levels of foraging and commuting activity were recorded at Bellhouse Gill woodland (location 3). As with Roska Park, common pipistrelle was the most frequently recorded species, with a peak of 997 passes recorded during the evening of 24 June 2021. Less frequent activity by soprano pipistrelle was also recorded with sporadic activity by *Myotis* and noctule bats. An abnormal peak of 244 *Myotis* bat passes was recorded at location 3 on 24 June. It is noted that this also coincides with peaks for common and soprano pipistrelle during the June 2021 monitoring period. It is suggested therefore that these may have been caused by factors such as local weather conditions in this location

during this evening, causing local bat populations to alter their more regular foraging and commuting patterns.

Hedgerow survey

3.64 No significant bat activity was recorded in association with any of the sections of hedgerows surveyed on 21 June or 8 July 2021. Bat activity, exclusively by common pipistrelle was recorded in the woodland to the west of the survey locations, but no bats were seen using the hedgerows for commuting or foraging activity.

Former Marchon Chemical works security building.

3.65 Two common pipistrelle bats were recorded emerging from mortar gaps at the west facing ridge of this building. The bats emerged approximately 35 and 42 minutes after sunset and existed the site to the south. No bats were seen to return to the building during the survey.

3.66 Background bat activity was no more than sporadic, with occasional commuting passes by common pipistrelle commuting along the eastern security fence of the Site.

Large Mammal survey

3.67 The results of the large mammal survey work are shown in figure 6, section 4 of this report.

3.68 No evidence of red squirrel activity was recorded during the survey. The suitability of habitats within the Site remain as described in Chapter 11 (BSG Ecology 2018)

3.69 A single relatively fresh otter spraint was located below the footbridge which crosses the Pow Beck as part of the Coast-to-Coast footpath. The spraint appeared to contain a combination of both small fish and amphibian bone fragments. No other evidence of otter activity was found.

3.70 The suitability of habitats within the Site for use by otter remain as described in Chapter 11 (BSG Ecology 2018).

3.71 Four recent badger footprints were found in the soft sands at the edge of the small gill which flows below the St Bees railway line, in the northeast corner of Main Band Colliery. The footprints were isolated, suggesting water levels may had risen since the badger was present, and any additional prints had been washed away. This location was monitored for 43 consecutive days from 11 May 2021, and no further evidence of badger was recorded. The camera detecting activity by birds and occasional roe deer *Capreolus capreolus* commuting only during the monitoring period.

3.72 The suitability of habitats within the Site for use by badger remain as described in Chapter 11 (BSG Ecology 2018)

3.73 No evidence of water vole activity was recorded during the survey, and the suitability of habitats for this species within the Site remain as described in Chapter 11 (BSG Ecology 2018).

3.74 No evidence of brown hare activity was recorded during the survey, and the suitability of habitats for this species within the Site remain as described in Chapter 11 (BSG Ecology 2018).

Great crested newt

3.75 All eDNA samples collected for ponds 1 to 8 in May 2021 returned negative results, suggesting that great crested newt is likely to be absent from all ponds surveyed.

3.76 The suitability of habitats within the Site for use by great crested newt remains as described within Chapter 11 (BSG Ecology 2018).

Reptiles

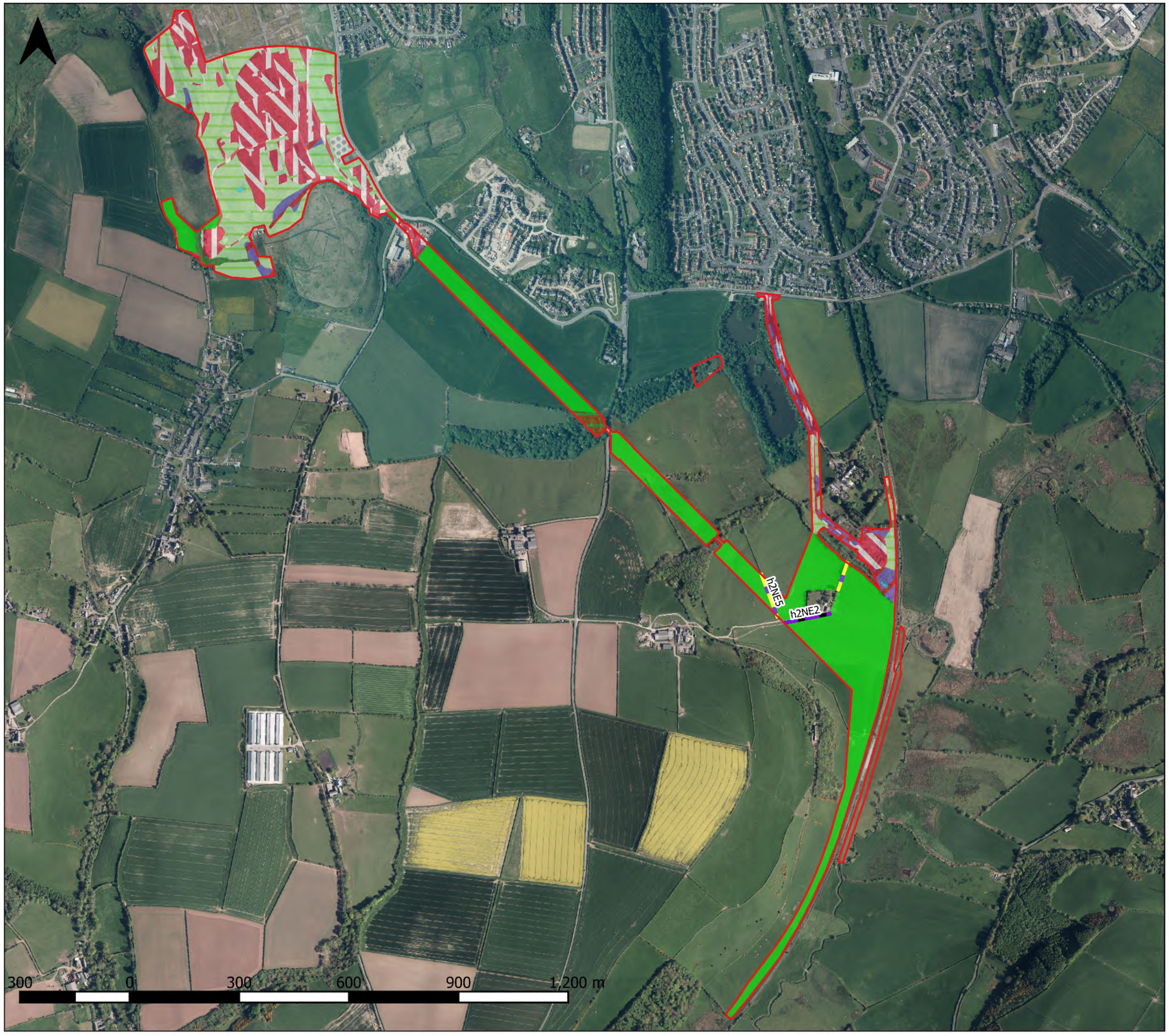
3.77 The results of the 2019 reptile survey of the Main Mine Site and 2021 survey of Main Band Colliery are shown in Figures 7 and 8 respectively.

3.78 Table 18 below, provides a summary of the results of the of the 2019 reptile survey of the Main Mine Site

	Date of visit																																									
	12.07.19						17.07.19						01.08.19						08.08.19						15.08.19						21.08.19						29.08.19					
Tile No.	Cm Liz (Ml)	Cm Liz (fm)	Cm Liz (Jue)	Sl Wm (Ml)	Sl Wm (fm)	Sl Wm (Jue)	Cm Liz (Ml)	Cm Liz (fm)	Cm Liz (Jue)	Sl Wm (Ml)	Sl Wm (fm)	Sl Wm (Jue)	Cm Liz (Ml)	Cm Liz (fm)	Cm Liz (Jue)	Sl Wm (Ml)	Sl Wm (fm)	Sl Wm (Jue)	Cm Liz (Ml)	Cm Liz (fm)	Cm Liz (Jue)	Sl Wm (Ml)	Sl Wm (fm)	Sl Wm (Jue)	Cm Liz (Ml)	Cm Liz (fm)	Cm Liz (Jue)	Sl Wm (Ml)	Sl Wm (fm)	Sl Wm (Jue)	Cm Liz (Ml)	Cm Liz (fm)	Cm Liz (Jue)	Sl Wm (Ml)	Sl Wm (fm)	Sl Wm (Jue)	Cm Liz (Ml)	Cm Liz (fm)	Cm Liz (Jue)	Sl Wm (Ml)	Sl Wm (fm)	Sl Wm (Jue)
3																												1														1
25																																1										
26																																1										
50																																1										
62				1																																	1					
63																1								1																		
64					1																																					
66																	1												1						1							
68					1		1																																			
69																										1	1															
70																									1							1										
71								1																	2																	
74																													1		1	1										
75																	1							1																		
76																							1		1																	
79																																1										
80																														1					1							
86																											1															
87																										1																
92																										2																
95																										1																
Total	0	0	0	1	2	0	1	1	0	0	0	0	0	0	0	1	2	0	0	0	0	0	1	2	4	5	2	1	2	1	1	6	0	0	2	0	1	0	0	0	0	1

3.79 Reptile survey of Main Band Colliery in 2021 recorded a single adult common lizard. This individual was recorded basking on top of a tile in the southeast corner of the site, adjacent to the St Bees Railway. No other reptile species were recorded during the survey.

4 Figures



Legend

- Red Line Boundary
- Native Hedgerow (h2NE5)
- Native Hedgerow with trees (h2NE4)
- Native Species Rich Hedgerow (h2NE2)
- Developed land; sealed surface
- Lowland mixed deciduous woodland
- Mixed scrub
- Modified grassland
- Open Mosaic Habitats on Previously Developed Land
- Other inland rock and scree
- Other neutral grassland
- Other woodland; broadleaved
- Reservoirs
- Temporary lakes, ponds and pools

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Figure 1: Baseline habitat plan

DATE: 06.08.21 | CHECKED: NB | SCALE: 1:10,000
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Document path

Legend

- Site boundary
- W. = Wheateer
- B. = Blackbird
- GO = Goldfinch
- WH = Whitethroat
- SC = Stonechat
- SW = Sedge Warbler
- MP = Meadow Pipit
- S. = Skylark
- ST - Song thursh
- LI - Linnet

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Figure 2: Breeding bird survey 2021

DATE: 03.08.2021 CHECKED: NB SCALE: 1:4000

DRAWN: JT APPROVED: NB STATUS: FINAL

Document path

Legend

- Site boundary
- B. = Blackbird
- CC = Chiffchaff
- PH = Pheasant
- MG - Magpie
- R. = Robin
- WH - Whitethroat

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Figure 3: Breeding bird survey 2021

DATE: 03.08.2021 CHECKED: NB SCALE: 1:4000

DRAWN: JT APPROVED: NB STATUS: FINAL

Document path

Legend

- Site boundary
- BF = Bullfinch
- ST = Song thrush
- SG = Starling
- SW = Sedge warbler
- BT = Blue tit
- WH - Whitethroat
- B. - Blackbird
- R. - Robin
- CC = Chiff chaff
- BC = Blackcap
- GO = Goldfinch
- JD = Jackdaw
- WP = Wood pigeon
- GT = Great tit
- GS = Greater spotted woodpecker

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Figure 4: Breeding bird survey 2021

DATE: 03.08.2021 CHECKED: NB SCALE: 1:4000

DRAWN: JT APPROVED: NB STATUS: FINAL

Document path

Legend

- Site boundary
- ST = Song thrush
- BF = Bull finch
- WW = Willow warbler
- R. = Robin
- WH = White throat
- B. = Blackbird
- CC = Chiff chaff
- WR = Wren
- BT = Blue tit

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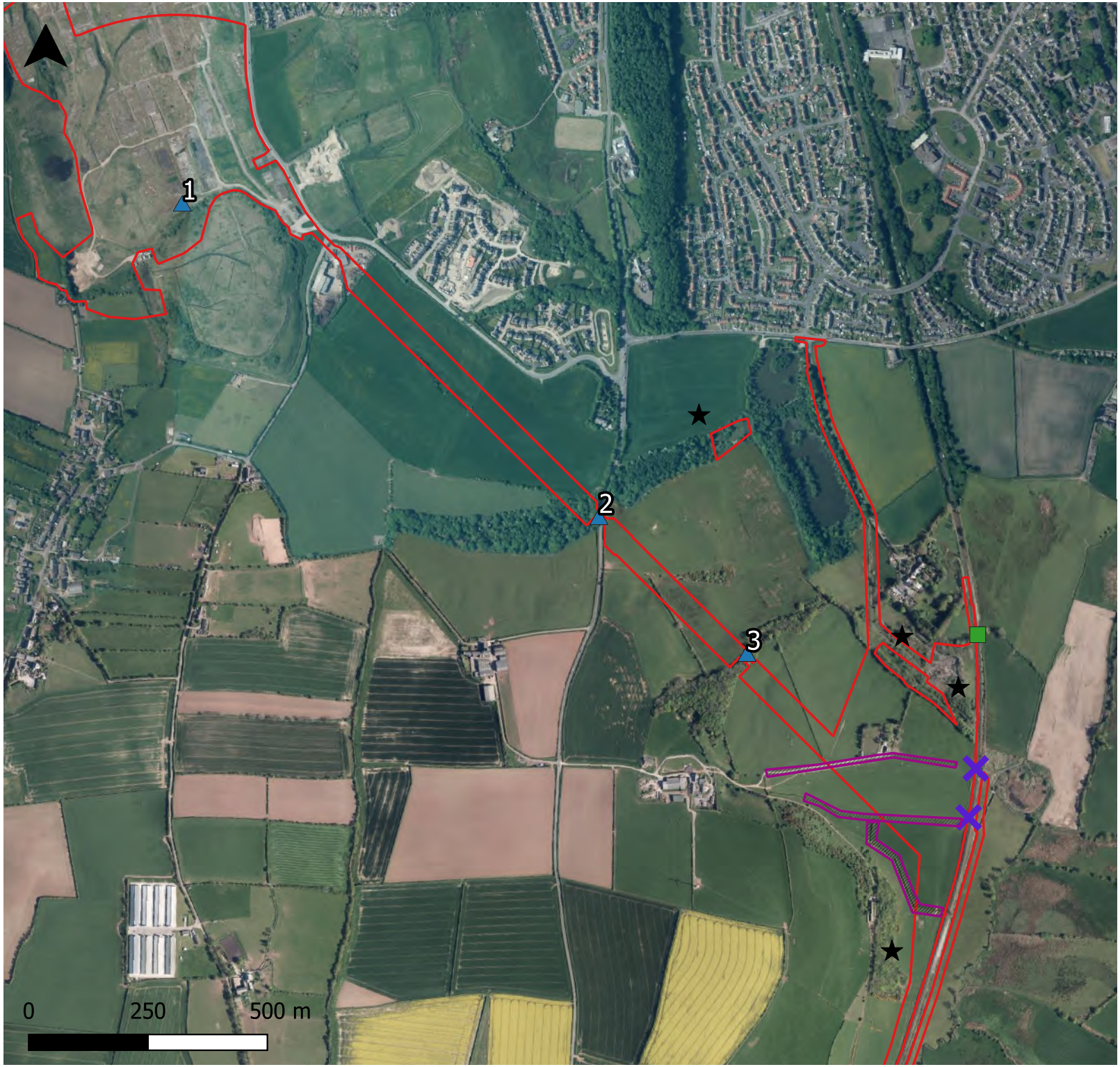
Figure 5: Breeding bird survey 2021

DATE: 03.08.2021 CHECKED: NB SCALE: 1:4750

DRAWN: JT APPROVED: NB STATUS: FINAL

Document path



Legend

Site Boundary

Bat hedgerow survey locations

Static bat detector

Trail camera

Otter spraint

Roe deer

Badger footprint

Locations are approximate

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Figure 6: Mammal survey 2021

DATE: 03.08.21 CHECKED: NB SCALE: 1:1,100

DRAWN: GC APPROVED: NB STATUS: FINAL

Legend

Site Boundary

Reptile tile locations

Common lizard record

Slow worm record

Locations are approximate

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Figure 7: Reptile Survey Main Mine Site 2019

DATE: 03.08.21 CHECKED: NB SCALE: 1:3,000

DRAWN: GC APPROVED: NB STATUS: FINAL

Legend

Site Boundary

Reptile tile locations

Common lizard record

Locations are approximate

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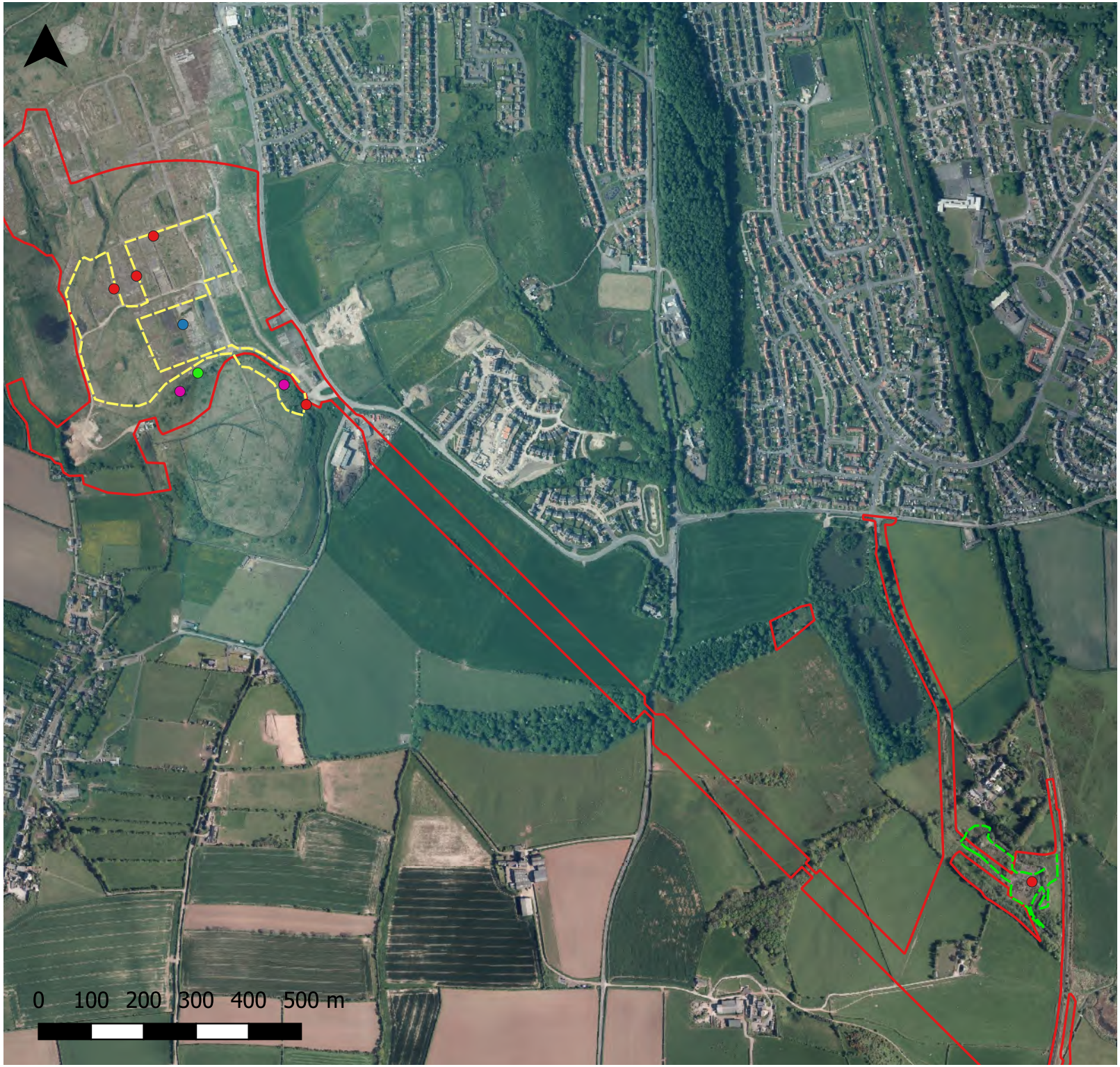
Figure 8: Reptile Survey Main Band Colliery 2021

DATE: 03.08.21 CHECKED: NB SCALE: 1:1,500

DRAWN: GC APPROVED: NB STATUS: FINAL

Sources: BSG Ecology survey data



Legend

- Site boundary
- Butterfly transect route
  Site B: the Mainband Colliery Site
- Butterfly transect route
  Site A: the former Marchon chemical works and the northern margins of a closed landfill

Notable Species:

- Grayling
- *Grypus equiseti*
- *Megalonotus dilatatus*
- *Ocypus nitens*

Locations are approximate

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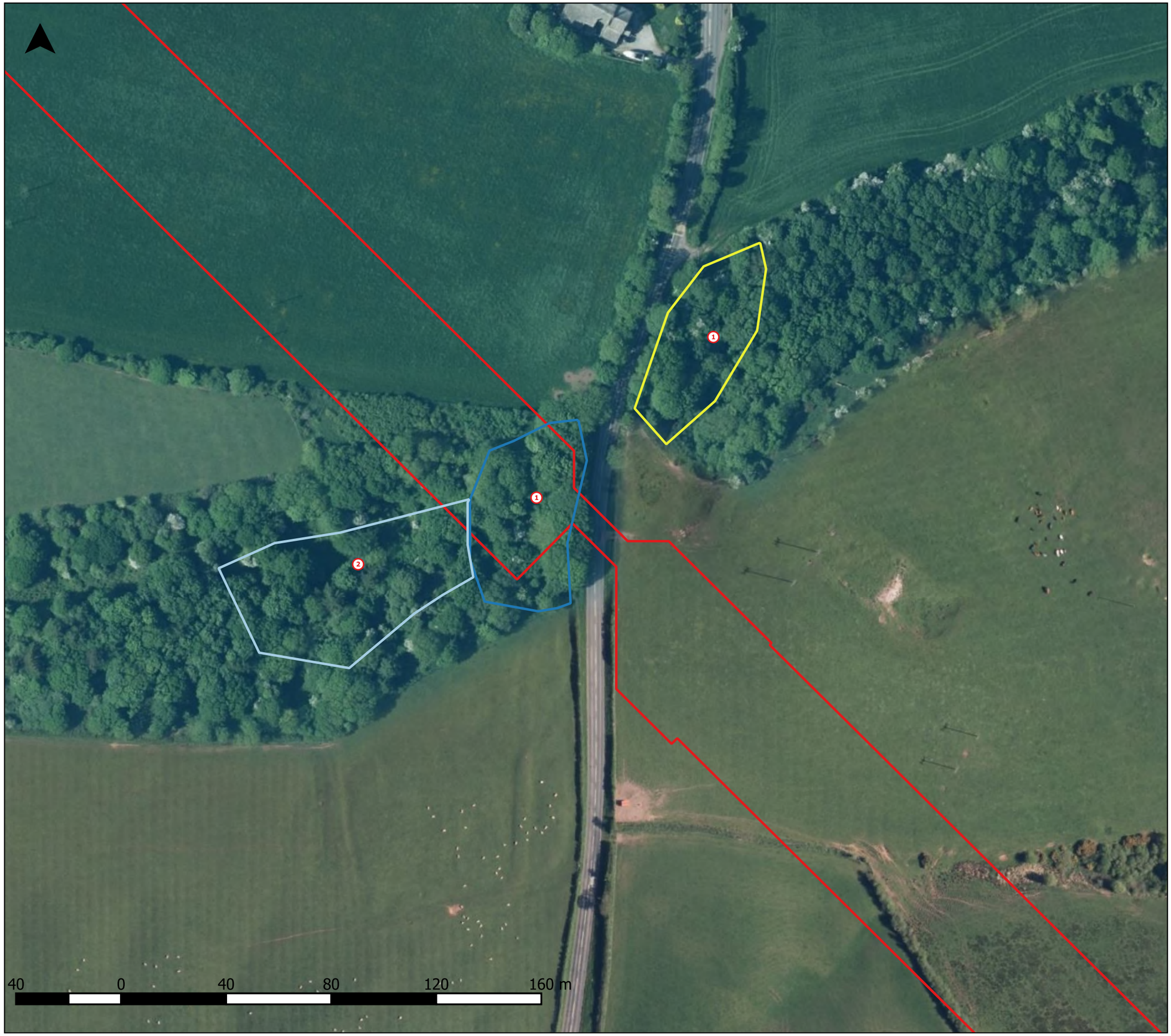
Figure 9: Survey Area and Butterfly Transect

DATE: 03.08.21 CHECKED: NB SCALE: 1:10,000

DRAWN: GC APPROVED: NB STATUS: FINAL



Legend

- Site boundary
- Target notes 1-2
- Natural gill not quarried
- Former quarry area on fill material
- Benhow wood cattle grazed bank

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Figure 10a: Phase 2 botanical suvey target notes

DATE: 05.08.2021 CHECKED: NB SCALE: 1:1750

DRAWN: JT APPROVED: NB STATUS: FINAL

Sources: BSG Ecology survey data

Document path

Legend

- Site boundary
- Target note 1-2
- A = Area affected by tipping of fill material
- Flatter area with open canopy
- Upper part of wood dominated by bluebell

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Figure 10b: Phase 2 botanical survey target notes

DATE: 05.08.2021 CHECKED: NB SCALE: 1:1750

DRAWN: JT APPROVED: NB STATUS: FINAL

Sources: BSG Ecology survey data

Document path

Legend

- Site boundary
- Target note 1-5
- Dry grassland off access track
- Lichen rich sparse grassland with a few long heather
- Lagoons and ditch
- Marshy damp grassland
- Lichen rich sparse dry grassland
- Shelter belt

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Figure 10c: Phase 2 botanical survey target notes

DATE: 05.08.2021 CHECKED: NB SCALE: 1:1750

DRAWN: JT APPROVED: NB STATUS: FINAL

Document path

5 References

Chapter 11 (Ecology) – Planning application 4/17/9007, September 2018 – BSG Ecology

Froglife (1999). Froglife Advice Sheet 10: Reptile Survey - An introduction to planning, conducting and interpreting surveys for snake and lizard conservation.

Herptofauna Groups of Britain and Ireland (1998). Evaluating local mitigation/translocation programmes: Maintaining best practice and lawful standards. HGBI advisory notes for Amphibian and Reptile Groups (ARGs). HGBI. c/o Froglife, Halesworth. Unpubl.

Asher, J., Warren, M., Fx, R., Harding, P., Jeffcote, G. and Jeffcote, S. (2001). *The Millennium Atlas of Butterflies in Britain and Ireland*. Oxford University Press, Oxford.

BRIG (ed. Ant Maddock) (2008, updated Dec 2011). UK Biodiversity Action Plan; Priority Habitat Descriptions.

British Bugs website (undated). Available at: https://www.britishbugs.org.uk/heteroptera/Lygaeidae/megalonotus_dilatatus.html (Accessed 01 August 2021).

Butterfly Conservation website (undated) *UK Butterfly Monitoring Scheme*. Available at: http://www.ukbms.org/Methods.aspx (Accessed 01 August 2021).

Butterfly Conservation (2013) *Grayling species factsheet*. Available at: https://butterfly-conservation.org/sites/default/files/1grayling-species-factsheet.pdf (Accessed 01 August 2021).

Drake, C. M., Lott, D. A., Alexander, K. N. A. and Webb, J. (2007). *Surveying terrestrial and freshwater invertebrates for conservation evaluation. Natural England Research Report NERR005*. Natural England , Worcester.

Duff, A.G. (2016). *Beetles of Britain & Ireland. Vol 4: Cerambycidae to Curculionidae*. A.G. Duff (Publishing).

Hyman, P.S. and Parsons, M.S. (1992). *A review of the scarce and threatened Coleoptera of Great Britain*. Part 1. UK Nature Conservation: 3. Peterborough: Joint Nature Conservation Committee.

Lott, D.A. & Anderson, R. (2011). *The Staphylinidae (rove beetles) of Britain and Ireland. Oxyporinae, Steninae, Euaesthetinae, Pseudopsinae, Paederinae, Staphylininae. Handbooks for the Identification of British Insects: Royal Entomological Society*. Vol. 12 Part 7 and 8.

UK Butterflies website (undated) Grayling. Available at: https://www.ukbutterflies.co.uk/species.php?species=semele (Accessed 01 August 2021).

Webb, J., Heaver, D., Lott, D., Dean, H.J., van Breda, J., Curson, J., Harvey, M., Gurney, M., Roy, D.B., van Breda, A., Drake, M., Alexander, K.N.A. and Foster, G. (2018). Pantheon - database version 3.7.4 [Online] Available at: http://www.brc.ac.uk/pantheon/ [Accessed 01 August 2021].

6 Appendix 1: Status Definitions, Habitats of Principal Importance (HPI) and Species of Principal Importance (SPIs)

Much invertebrate conservation evaluation hinges on nationally threatened and scarce species. For many invertebrate groups, species rarity has often been gauged by the number of national 10 km grid squares in which they occur. The fewer "spots on a map", the rarer it is. This, however, does not exactly equate with how threatened a species is, since some species may be naturally confined to very few localities but are very abundant where they do occur and under no immediate threat of extinction. The matter of how threatened the "rarest" species are has been addressed in a series of Red Data Books (RDB), such as for insects[3]. Here, the listing as RDB1 (Endangered), RDB2 (Vulnerable) and RDB3 (Rare) is an assessment of how threatened or endangered the species is in Britain, rather than how scarce it is in terms of map spot counting.

Over the last decade the RDB categories are slowly being replaced by IUCN red-list categories (Critically Endangered, Endangered and Vulnerable), which use different criteria to those developed for the RDBs. The process of replacing RDB categories with IUCN ones is however slow, and IUCN categories are not available for all groups. Accordingly, wherever IUCN categories have been allocated in the report, these are also shown in preference, ahead of RDB categories.

IUCN also recognised the value of a Near Threatened category to identify species that need to be kept under review to ensure that they have not become vulnerable to extinction. This category is used for species which have been evaluated against the criteria but do not qualify for a threatened category, although they may be close to qualifying or likely to qualify in the near future.

At the national level, countries are permitted to refine the definitions for the non-threatened categories and to define additional ones of their own, which essentially sit below RDB / IUCN status (i.e. Near Threatened). Thus, less rare but still significant species can be defined as Nationally Scarce (formerly called Nationally Notable), which is often sub-divided into Na (scarce), Nb (less scarce). These sub-categories were originally devised by[4] and are based on 10 km square spot counting for the Great Britain grid system. The Na sub-category represents scarce taxa that are thought to occur in 30 or fewer 10 km squares of the Great Britain grid system. The Nb sub-category represents less scarce taxa that occur in 31 to 100 10 km squares. Taxa in the N- sub-category are those listed as 'Notable', but not always distinguished into sub-category Na or Nb. These species are thought to occur in 16 to 100 10 km squares of the National Grid but are too poorly known for their status to be more precisely estimated.]

IUCN (pre 1994) categories remain relevant to certain taxa if an update has not been forthcoming. These categories are as follows:

- IUCN (pre 1994) Rare - taxa with small populations that are not at present Endangered or Vulnerable, but are at risk. In the UK, this was interpreted as species which exist in fifteen or fewer 10km squares. Superseded by new IUCN categories in 1994, but still applicable to lists that have not been reviewed since 1994.
- IUCN (pre 1994) Vulnerable - taxa believed likely to move into the Endangered category in the near future if the causal factors continue operating. Superseded by new IUCN categories in 1994, but still applicable to lists that have not been reviewed since 1994.

Habitats of Principal Importance (HPI) and Species of Principal Importance (SPIs) for the Conservation of Biodiversity in England are listed in accordance with requirements of Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006. Under Section 40 of the NERC Act (2006) public bodies (including local planning authorities) have a duty to have regard for the conservation of biodiversity when carrying out their functions.

[3] Shirt, D. B (ed) (1987) British Red Data Books: Insects. JNCC.
[4] Ball, S.G. (1986) Terrestrial and freshwater invertebrates with Red Data Book, Notable or habitat indicator status. Invertebrate Site Register internal report number 66. NCC.

Appendix 2: Invertebrate Species List

Site A			Site B		
Order	**Family**	***Taxon***	**Order**	**Family**	***Taxon***
Aranaeae	Aranaeidae	*Araneus diadematus*	Amphipoda	Crangonyctidae	*Crangonyx pseudogracilis*
Aranaeae	Lycosidae	*Pardosa nigriceps*	Aranaeae	Gnaphosidae	*Zelotes latreillei*
Aranaeae	Thomisidae	*Xysticus cristatus*	Aranaeae	Salticidae	*Euophrys frontalis*
Coleoptera	Apionidae	*Apion frumentarium*	Aranaeae	Tetragnathidae	*Meta mengei*
Coleoptera	Apionidae	*Eutrichapion viciae*	Aranaeae	Tetragnathidae	*Tetragnatha montana*
Coleoptera	Apionidae	*Exapion ulicis*	Aranaeae	Thomisidae	*Xysticus cristatus*
Coleoptera	Apionidae	*Oxystoma subulatum*	Coleoptera	Apionidae	*Perapion hydrolapathi*
Coleoptera	Apionidae	*Protapion assimile*	Coleoptera	Apionidae	*Protapion assimile*
Coleoptera	Apionidae	*Protapion trifolii*	Coleoptera	Apionidae	*Protapion fulvipes*
Coleoptera	Apionidae	*Stenopterapion tenue*	Coleoptera	Byrrhidae	*Cytilus sericeus*
Coleoptera	Cantharidae	*Cantharis cryptica*	Coleoptera	Cantharidae	*Cantharis cryptica*
Coleoptera	Cantharidae	*Cantharis flavilabris*	Coleoptera	Cantharidae	*Cantharis flavilabris*
Coleoptera	Cantharidae	*Cantharis pallida*	Coleoptera	Cantharidae	*Cantharis nigra s.str*
Coleoptera	Cantharidae	*Rhagonycha fulva*	Coleoptera	Cantharidae	*Cantharis pallida*
Coleoptera	Carabidae	*Abax parallelepipedus*	Coleoptera	Cantharidae	*Malthodes guttifer / mysticus*
Coleoptera	Carabidae	*Agonum fuliginosum*	Coleoptera	Cantharidae	*Rhagonycha fulva*
Coleoptera	Carabidae	*Bembidion guttula*	Coleoptera	Cantharidae	*Rhagonycha testacea*
Coleoptera	Carabidae	*Bembidion tetracolum*	Coleoptera	Carabidae	*Amara ovata*
Coleoptera	Carabidae	*Clivina fossor*	Coleoptera	Carabidae	*Carabus nemoralis*
Coleoptera	Carabidae	*Harpalus rubripes*	Coleoptera	Carabidae	*Clivina fossor*
Coleoptera	Carabidae	*Loricera pilicornis*	Coleoptera	Carabidae	*Pterostichus diligens*
Coleoptera	Carabidae	*Nebria salina*	Coleoptera	Carabidae	*Pterostichus nigrita*
Coleoptera	Carabidae	*Notiophilus biguttatus*	Coleoptera	Chrysomelidae	*Altica palustris*
Coleoptera	Carabidae	*Paradromius linearis*	Coleoptera	Chrysomelidae	*Chaetocnema hortensis*
Coleoptera	Carabidae	*Pterostichus strenuus*	Coleoptera	Chrysomelidae	*Chaetocnema picipes*
Coleoptera	Chrysomelidae	*Crepidodera fulvicornis*	Coleoptera	Chrysomelidae	*Crepidodera fulvicornis*
Coleoptera	Chrysomelidae	*Altica species (indet)*	Coleoptera	Chrysomelidae	*Hydrothassa marginella*
Coleoptera	Chrysomelidae	*Longitarsus parvulus*	Coleoptera	Chrysomelidae	*Oulema obscura*
Coleoptera	Chrysomelidae	*Longitarsus species*	Coleoptera	Chrysomelidae	*Phratora vitellinae*
Coleoptera	Chrysomelidae	*Longitarsus suturellus*	Coleoptera	Chrysomelidae	*Phyllotreta tetrastigma*
Coleoptera	Chrysomelidae	*Oulema duftschmidi*	Coleoptera	Chrysomelidae	*Phyllotreta exclamationis*
Coleoptera	Chrysomelidae	*Phratora vitellinae*	Coleoptera	Chrysomelidae	*Psylliodes affinis*
Coleoptera	Chrysomelidae	*Sphaeroderma rubidum*	Coleoptera	Chrysomelidae	*Psylliodes napi*
Coleoptera	Coccinellidae	*Coccinella septempunctata*	Coleoptera	Coccinellidae	*Coccidula rufa*
Coleoptera	Coccinellidae	*Propylea quattuordecimpunctata*	Coleoptera	Coccinellidae	*Coccinella septempunctata*
Coleoptera	Coccinellidae	*Psyllobora vigintiduopunctata*	Coleoptera	Coccinellidae	*Subcoccinella vigintiquatuorpunctata*
Coleoptera	Coccinellidae	*Scymnus redtenbacheri*	Coleoptera	Curculionidae	*Ceutorhynchus obstrictus*
Coleoptera	Cryptophagidae	*Atomaria rubella*	Coleoptera	Curculionidae	*Exomias pellucidus*
Coleoptera	Curculionidae	*Ceutorhynchus obstrictus*	Coleoptera	Curculionidae	*Mecinus pascuorum*
Coleoptera	Curculionidae	*Exomias araneiformis*	Coleoptera	Curculionidae	*Phyllobius pomaceus*
Coleoptera	Curculionidae	*Grypus equiseti*	Coleoptera	Curculionidae	*Rhinoncus pericarpius*
Coleoptera	Curculionidae	*Hypera postica*	Coleoptera	Curculionidae	*Rhynchaenus fagi*
Coleoptera	Curculionidae	*Leiosoma deflexum*	Coleoptera	Dytiscidae	*Agabus bipustulatus*
Coleoptera	Curculionidae	*Mecinus labilis*	Coleoptera	Dytiscidae	*Agabus nebulosus*
Coleoptera	Curculionidae	*Otiorhynchus porcatus*	Coleoptera	Dytiscidae	*Hydroporus palustris*
Coleoptera	Curculionidae	*Otiorhynchus sulcatus*	Coleoptera	Dytiscidae	*Hydroporus planus*
Coleoptera	Curculionidae	*Parathelcus pollinarius*	Coleoptera	Dytiscidae	*Hydroporus tessellatus*

Coleoptera	Curculionidae	*Sitona hispidulus*	Coleoptera	Dytiscidae	*Hygrotus inaequalis*
Coleoptera	Curculionidae	*Sitona humeralis*	Coleoptera	Dytiscidae	*Ilybius fuliginosus*
Coleoptera	Curculionidae	*Sitona lineellus*	Coleoptera	Dytiscidae	*Hydroporus species (indet)*
Coleoptera	Elateridae	*Adrastus pallens*	Coleoptera	Elateridae	*Agriotes obscurus*
Coleoptera	Elateridae	*Agriotes obscurus*	Coleoptera	Elateridae	*Hypnoidus riparius*
Coleoptera	Elateridae	*Hypnoidus riparius*	Coleoptera	Gyrinidae	*Gyrinus substriatus*
Coleoptera	Latridiidae	*Cortinicara gibbosa*	Coleoptera	Helophoridae	*Helophorus aequalis*
Coleoptera	Latridiidae	*Enicmus transversus*	Coleoptera	Helophoridae	*Helophorus brevipalpis*
Coleoptera	Leiodidae	*Leiodes rufipennis*	Coleoptera	Helophoridae	*Helophorus species (indet)*
Coleoptera	Nitidulidae	*Epuraea aestiva*	Coleoptera	Hygrobiidae	*Hygrobia hermanni*
Coleoptera	Nitidulidae	*Meligethes aeneus*	Coleoptera	Latridiidae	*Cartodere nodifer*
Coleoptera	Nitidulidae	*Meligethes nigrescens*	Coleoptera	Nitidulidae	*Epuraea aestiva*
Coleoptera	Nitidulidae	*Meligethes planiusculus*	Coleoptera	Nitidulidae	*Meligethes aeneus*
Coleoptera	Scraptiidae	*Anaspis fasciata*	Coleoptera	Oedemeridae	*Oedemera lurida*
Coleoptera	Staphylinidae	*Anotylus rugosus*	Coleoptera	Salpingidae	*Salpingus planirostris*
Coleoptera	Staphylinidae	*Anotylus sculpturatus*	Coleoptera	Scarabaeidae	*Hoplia philanthus*
Coleoptera	Staphylinidae	*Atheta species (indet)*	Coleoptera	Scirtiidae	*Cyphon coarctatus*
Coleoptera	Staphylinidae	*Ocypus brunnipes*	Coleoptera	Scirtiidae	*Microcara testacea*
Coleoptera	Staphylinidae	*Ocypus nitens*	Coleoptera	Scraptiidae	*Anaspis frontalis*
Coleoptera	Staphylinidae	*Philonthus cognatus*	Coleoptera	Scraptiidae	*Anaspis maculata*
Coleoptera	Staphylinidae	*Quedius curtipennis*	Coleoptera	Staphylinidae	*Amischa analis*
Coleoptera	Staphylinidae	*Quedius curtipennis / fuliginosus*	Coleoptera	Staphylinidae	*Anotylus rugosus*
Coleoptera	Staphylinidae	*Quedius fumatus*	Coleoptera	Staphylinidae	*Atheta fungi*
Coleoptera	Staphylinidae	*Quedius schatzmayri*	Coleoptera	Staphylinidae	*Callicerus obscurus*
Coleoptera	Staphylinidae	*Quedius semiobscurus*	Coleoptera	Staphylinidae	*Gabrius appendiculatus*
Coleoptera	Staphylinidae	*Stenus brunnipes*	Coleoptera	Staphylinidae	*Othius punctulatus*
Coleoptera	Staphylinidae	*Stenus clavicornis*	Coleoptera	Staphylinidae	*Quedius curtipennis / fuliginosus*
Coleoptera	Staphylinidae	*Stenus fulvicornis*	Coleoptera	Staphylinidae	*Stenus cicindeloides*
Coleoptera	Staphylinidae	*Stenus similis*	Coleoptera	Staphylinidae	*Stenus clavicornis*
Coleoptera	Staphylinidae	*Tachinus laticollis*	Coleoptera	Staphylinidae	*Stenus juno*
Coleoptera	Staphylinidae	*Tachinus rufipes*	Coleoptera	Staphylinidae	*Stenus providus*
Coleoptera	Staphylinidae	*Tachyporus dispar*	Coleoptera	Staphylinidae	*Stenus tarsalis*
Coleoptera	Staphylinidae	*Tachyporus hypnorum*	Coleoptera	Staphylinidae	*Tachinus rufipes*
Coleoptera	Staphylinidae	*Tachyporus nitidulus*	Coleoptera	Staphylinidae	*Tachyporus hypnorum*
Coleoptera	Staphylinidae	*Tachyporus solutus*	Coleoptera	Staphylinidae	*Tachyporus nitidulus*
Coleoptera	Staphylinidae	*Xantholinus longiventris*	Coleoptera	Tenebrionidae	*Lagria hirta*
Coleoptera	Tenebrionidae	*Lagria hirta*	Dermaptera	Forficulidae	*Forficula auricularia*
Dermaptera	Forficulidae	*Forficula auricularia*	Diptera	Bibionidae	*Dilophus febrilis*
Diptera	Bibionidae	*Bibio marci*	Diptera	Dolichopodidae	*Dolichopus popularis*
Diptera	Calliphoridae	*Lucilia caesar*	Diptera	Rhagionidae	*Rhagio scolopaceus*
Diptera	Dolichopodidae	*Dolichopus popularis*	Diptera	Scathophagidae	*Scathophaga stercoraria*
Diptera	Dolichopodidae	*Dolichopus* species (indet)	Diptera	Stratiomyidae	*Microchrysa flavicornis*
Diptera	Empididae	*Empis tessellata*	Diptera	Syrphidae	*Eristalis arbustorum*
Diptera	Muscidae	*Mesembrina meridiana*	Diptera	Syrphidae	*Eristalis tenax*
Diptera	Rhagionidae	*Rhagio scolopaceus*	Diptera	Syrphidae	*Helophilus pendulus*
Diptera	Scathophagidae	*Scathophaga stercoraria*	Diptera	Syrphidae	*Orthonevra splendens*
Diptera	Stratiomyidae	*Beris vallata*	Diptera	Syrphidae	*Syrphus ribesii*
Diptera	Stratiomyidae	*Chloromyia formosa*	Diptera	Syrphidae	*Tropidia scita*
Diptera	Syrphidae	*Cheilosia bergenstammi*	Diptera	Syrphidae	*Xylota segnis*
Diptera	Syrphidae	*Episyrphus balteatus*	Diptera	Ulididae	*Herina frondescentiae*
Diptera	Syrphidae	*Eristalis arbustorum*	Hemiptera	Anthocoridae	*Anthocoris nemorum*
Diptera	Syrphidae	*Eristalis horticola*	Hemiptera	Aphrophoridae	*Neophilaenus campestris*

Diptera	Syrphidae	*Eristalis pertinax*	Hemiptera	Cicadellidae	*Cicadella viridis*
Diptera	Syrphidae	*Eristalis tenax*	Hemiptera	Cicadellidae	*Eupteryx aurata*
Diptera	Syrphidae	*Helophilus pendulus*	Hemiptera	Delphacidae	*Javesella pellucida*
Diptera	Syrphidae	*Sphaerophoria species (indet)*	Hemiptera	Delphacidae	*Stenocranus minutus*
Diptera	Syrphidae	*Melanostoma scalare*	Hemiptera	Lygaeidae	*Chilacis typhae*
Diptera	Syrphidae	*Neoascia podagrica*	Hemiptera	Lygaeidae	*Megalonotus chiragra*
Diptera	Syrphidae	*Sphaerophoria scripta*	Hemiptera	Lygaeidae	*Nysius huttoni*
Diptera	Syrphidae	*Volucella bombylans*	Hemiptera	Lygaeidae	*Scolopostethus affinis*
Diptera	Ulididae	*Herina frondescentiae*	Hemiptera	Miridae	*Capsus ater*
Hemiptera	Aphrophoridae	*Neophilaenus campestris*	Hemiptera	Miridae	*Dicyphus stachydis*
Hemiptera	Aphrophoridae	*Neophilaenus lineatus*	Hemiptera	Miridae	*Stenodema laevigatum*
Hemiptera	Aphrophoridae	*Philaenus spumarius*	Hemiptera	Pentatomidae	*Dolycoris baccarum*
Hemiptera	Ciccadellidae	*Cicadella viridis*	Hemiptera	Pentatomidae	*Palomena prasina*
Hemiptera	Ciccadellidae	*Cicadula quadrinotata*	Hemiptera	Rhopalidae	*Myrmus miriformis*
Hemiptera	Ciccadellidae	*Eupelix cuspidata*	Hygrophila	Lymnaeidae	*Galba truncatula*
Hemiptera	Ciccadellidae	*Macustus grisescens*	Hygrophila	Lymnaeidae	*Lymnaea stagnalis*
Hemiptera	Delphacidae	*Javesella pellucida*	Hymenoptera	Andrenidae	*Andrena haemorrhoa*
Hemiptera	Lygaeidae	*Megalonotus dilatatus*	Hymenoptera	Apidae	*Bombus hypnorum*
Hemiptera	Lygaeidae	*Nysius senecionis*	Hymenoptera	Apidae	*Bombus lapidarius*
Hemiptera	Lygaeidae	*Peritrechus nubilus*	Hymenoptera	Apidae	*Nomada marshamella*
Hemiptera	Lygaeidae	*Scolopostethus thomsoni*	Hymenoptera	Colletidae	*Hylaeus confusus*
Hemiptera	Miridae	*Capsus ater*	Hymenoptera	Crabronidae	*Tachysphex pompiliformis*
Hemiptera	Miridae	*Leptopterna dolabrata*	Hymenoptera	Crabronidae	*Trypoxylon attenuatum*
Hemiptera	Miridae	*Stenodema laevigatum*	Hymenoptera	Formicidae	*Lasius niger*
Hemiptera	Nabidae	*Nabis flavomarginatus*	Hymenoptera	Halictidae	*Halictus tumulorum*
Hemiptera	Nabidae	*Nabis rugosus*	Hymenoptera	Halictidae	*Lasioglossum cupromicans*
Hemiptera	Psyllidae	*Chamaepsylla (Psylla) hartigii*	Hymenoptera	Halictidae	*Lasioglossum leucopus*
Hemiptera	Rhopalidae	*Myrmus miriformis*	Hymenoptera	Megachilidae	*Osmia bicolor*
Hymenoptera	Andrenidae	*Andrena nigroaenea*	Isopoda	Asellidae	*Asellus aquaticus*
Hymenoptera	Andrenidae	*Andrena scotica*	Isopoda	Asellidae	*Asellus meridianus*
Hymenoptera	Andrenidae	*Andrena subopaca*	Julida	Blaniulidae	*Blaniulus guttulatus*
Hymenoptera	Apidae	*Apis mellifera*	Julida	Julidae	*Julus scandinavius*
Hymenoptera	Apidae	*Bombus lapidarius*	Julida	Julidae	*Ophyiulus pilosus*
Hymenoptera	Apidae	*Bombus lucorum*	Lepidoptera	Hesperidae	*Ochlodes sylvanus*
Hymenoptera	Apidae	*Bombus lucorum / terrestris*	Lepidoptera	Nymphalidae	*Aglais io*
Hymenoptera	Apidae	*Bombus pratorum*	Lepidoptera	Nymphalidae	*Aglais urticae*
Hymenoptera	Apidae	*Bombus terrestris*	Lepidoptera	Nymphalidae	*Hipparchia semele*
Hymenoptera	Apidae	*Nomada flava*	Lepidoptera	Nymphalidae	*Maniola jurtina*
Hymenoptera	Apidae	*Nomada marshamella*	Lepidoptera	Nymphalidae	*Thymelicus sylvestris*
Hymenoptera	Colletidae	*Hylaeus confusus*	Lepidoptera	Pieridae	*Pieris brassicae*
Hymenoptera	Colletidae	*Hylaeus hyalinatus*	Lepidoptera	Pieridae	*Pieris napi*
Hymenoptera	Crabronidae	*Trypoxylon attenuatum*	Lepidoptera	Pieridae	*Pieris rapae*
Hymenoptera	Formicidae	*Lasius niger*	Littorinimorpha	Tateidae	*Potamopyrgus antipodarum*
Hymenoptera	Formicidae	*Myrmica lobicornis*	Odonata	Aeshnidae	*Aeschna cyanea*
Hymenoptera	Formicidae	*Myrmica ruginodis*	Orthoptera	Acrididae	*Chorthippus brunneus*
Hymenoptera	Halictidae	*Lasioglossum albipes*	Orthoptera	Acrididae	*Chorthippus parallelus*
Hymenoptera	Halictidae	*Lasioglossum cupromicans*	Orthoptera	Acrididae	*Stenobothrus lineatus*
Hymenoptera	Megachilidae	*Osmia aurulenta*	Orthoptera	Tetrigidae	*Tetrix undulata*
Hymenoptera	Megachilidae	*Osmia bicolor*	Pulmonata	Geomitridae	*Cernuella virgata*
Hymenoptera	Pompilidae	*Anoplius nigerrimus*	Pulmonata	Helicidae	*Cornu aspersum*
Hymenoptera	Tenthredinidae	*Hoplocampa species (indet)*	Pulmonata	Succineidae	*Oxyloma elegans*
Hymenoptera	Vespidae	*Odynerus spinipes*	Pulmonata	Vitrinidae	*Vitrina pellucida*

Isopoda	Oniscidae	*Oniscus asellus*			
Isopoda	Philosciidae	*Philoscia muscorum*			
Isopoda	Porcellionidae	*Porcellio scaber*			
Julida	Julidae	*Ommatoiulus sabulosus*			
Julida	Julidae	*Ophyiulus pilosus*			
Lepidoptera	Crambidae	*Anania hortulata*			
Lepidoptera	Erebidae	*Tyria jacobaeae*			
Lepidoptera	Hesperidae	*Ochlodes sylvanus*			
Lepidoptera	Hesperidae	*Thymelicus sylvestris*			
Lepidoptera	Lycaeinidae	*Polyommatus icarus*			
Lepidoptera	Nymphalidae	*Coenonympha pamphilus*			
Lepidoptera	Nymphalidae	*Hipparchia semele*			
Lepidoptera	Nymphalidae	*Maniola jurtina*			
Lepidoptera	Nymphalidae	*Pyronia tithonus*			
Lepidoptera	Pieridae	*Anthocharis cardamines*			
Lepidoptera	Pieridae	*Pieris brassicae*			
Lepidoptera	Pieridae	*Pieris napi*			
Lepidoptera	Pieridae	*Pieris rapae*			
Lepidoptera	Zygaenidae	*Zygaena filipendulae*			
Lepidoptera	Erebidae	*Tyria jacobaeae*			
Lepidoptera	Zygaenidae	*Zygaena species*			
Mecoptera	Panorpidae	*Panorpa communis*			
Opiliones	Nemostomatidae	*Nemastoma bimaculatum*			
Opiliones	Phalangiidae	*Phalangium opilio*			
Orthoptera	Acrididae	*Chorthippus brunneus*			
Polydesmida	Polydesmidae	*Polydesmus angustus*			
Pulmonata	Arionidae	*Arion species (indet)*			
Pulmonata	Helicidae	*Cepaea hortensis*			
Pulmonata	Helicidae	*Cornu aspersum*			
Pulmonata	Hygromiidae	*Zenobiellina subrufescens*			
Pulmonata	Succineidae	*Oxyloma elegans*			