ECOLOGY ADDENDUM JULY 2014

NORTH GAWBER

HARWORTH ESTATES

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Field Investigations and Data

Where field investigations have been carried out these have been restricted to a level of detail required to achieving the stated objectives of the work. Where any data supplied by the client or from other sources have been used it has been assumed that the information is correct. No responsibility can be accepted by AES - Ltd for inaccuracies in the data supplied by any other party.

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NORTH GAWBER - ECOLOGY ADDENDUM JULY 2014

CHAPTER 1: UPDATES AND CLARIFICATION ON PREVIOUS REPORTS

1.0 UPDATE TO POLICY / LEGISLATION

Since the onset of the ecological surveys / assessments in 2004 / 2005 there have been a number of changes in policy, legislation and other documents relating to habitats and species. For the purpose of clarity all legislation / policy is outlined below:

THE EC HABITATS DIRECTIVE (92/43/EEC)

1.1 This Directive draws together previous European conservation legislation and conventions, such as the Bern Convention, 1982. The Directive aims to give Europe-wide protection to certain rare and threatened habitats on land and at sea. It builds on legislation already established under the Birds Directive of 1979, and aims to establish a series of protected sites known as The Natura 2000 series. These sites are intended to protect the unique and special wildlife of Europe and to preserve it for future generations. In Britain these Natura 2000 sites include those areas designated as Special Areas of Conservation ("SACs") and Special Protection Areas ("SPAs").

1.2 The Habitats Directive is implemented in the UK through: The Conservation (Natural Habitats &c.) Regulations 1994. On the 1st of April 2010 The Conservation of Habitats and Species Regulations 2010 replaced The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) in England and Wales. The Conservation of Habitats and Species Regulations 2010 (which are the principal means by which the Habitats Directive is transposed in England and Wales) update the legislation and consolidate the many amendments which have been made to the regulations since they were first made in 1994.

THE WILDLIFE AND COUNTRYSIDE ACT, 1981 (AS AMENDED)

1.3 This is the primary legislation for nature conservation in England and Wales. It confers varying degrees of protection on selected species according to their conservation status, ranging from making it an offence to take a species from the wild

for profit, to full protection of a species and its habitat. Species are added or removed from the legislation from time to time, as their conservation status changes. The Act also gives guidance and instruction on statutory sites, such as sites of Special Scientific Interest ("SSSIs"). Licences exempting specific works can be granted by Natural England (NE). Such licences are only granted once a full assessment has been made and an appropriate, sustainable mitigation package devised.

THE COUNTRYSIDE AND RIGHTS OF WAY ACT, 2000

1.4 As well as providing measures to improve countryside access for walkers, ramblers and horse riders, this Act also strengthens the protection of species and designated sites made in the Wildlife and Countryside Act. This Act also encourages the promotion of nature conservation and biodiversity issues.

THE PROTECTION OF BADGERS ACT, 1992

1.5 Allied to the Wildlife and Countryside Act, 1981 are subsidiary Acts such as the Protection of Badgers Act, 1992. Badgers are protected under the Protection of Badgers Act, 1992 ("PBA"), which consolidated and added to previous legislation. According to the PBA it is an offence to wilfully kill, injure or maim a badger. Badger setts are also protected from interference unless such activities are licensed. Any mitigation packages devised for badgers found on development sites must be agreed by Natural England and all mitigation activities must be fully licensed.

NATIONAL PLANNING POLICY

National Planning Policy Framework (March 2012)

1.6 The NPPF includes policies that are relevant to ecology, these are highlighted below. The Government published the NPPF on 27 March 2012. This sets out new guidance for local authorities, focusing on helping to produce planning policies that are clear and easier to understand. There is emphasis in the NPPF on the need for economic growth through designing planning policies which are in favour of development but this would not be achieved in isolation from social and environmental development. Section 11 sets out the requirements for conserving and enhancing the natural environment. Land previously used for development (brownfield sites) should be

favoured as long as they are not considered to be of high environmental value. Of particular note is paragraph 152 of the Plan-Making Section which states, *"Local planning authorities should seek opportunities to achieve each of the economic, social and environmental dimensions of sustainable development, and net gains across all three. Significant adverse impacts on any of these dimensions should be avoided and, wherever possible, alternative options which reduce or eliminate such impacts should be pursued. Where adverse impacts are unavoidable, measures to mitigate the impact should be considered. Where adequate mitigation measures are not possible, compensatory measures may be appropriate"*. The NPPF provides guidance for local planning authorities on the content of their Local Plans, but is also a material consideration in determining planning applications. The NPPF has replaced a number of former planning policy guidance documents, including Planning Policy Statement 9: Biological and Geological Conservation. However, the government circular 06/05: Biodiversity and Geological Conservation - Statutory Obligations and their Impact within the Planning System, which accompanied PPS9, remain valid.

THE UK BIODIVERSITY ACTION PLAN (UKBAP)

1.7 In 1993, the UK government consulted over three hundred organisations throughout the UK and held a two day seminar to debate the key issues raised at the Convention of Biological Diversity. The product of this was the launch of Biodiversity: the UK Action Plan in 1994 which outlined the UK Biodiversity Action Plan for dealing with biodiversity conservation in response to the Rio Convention. The UK Biodiversity Steering Group was created in 1994 and published Biodiversity: the UK Steering Group Report – meeting the Rio challenge. This established the framework and criteria for identifying species (1250 in number) and habitat types of conservation concern. From this list, action plans for 391 species and 45 broad habitat types have been drafted. As well as having national priorities and targets, action was also taken at a local level. The Steering Group drew up a set of guidelines that were discussed with the Local Authority Association and the Local Government Board. Today there are 162 Local Biodiversity Action Plans ("LBAPs") in England, Scotland and Wales and LBAPs are currently being set up in Northern Ireland.

BARNSLEY BIODIVERSITY ACTION PLAN (LBAP)

1.8 The LBAP sets out a framework for nature conservation and comprises a number of documents. This framework includes priority species/habitats and sets targets which would guide work to maintain and enhance their conservation status. The LBAP contains lists of plants and animals and habitats of conservation concern in the county as a whole and in its associated districts.

1.9 SUMMARY OF LEGISLATION / DOCUMENTS RELATING TO ECOLOGY:

- The Wildlife and Countryside Act 1981, as amended;
- The EC Habitats Directive (Directive 92/43/EEC) as translated into UK law by the Conservation (Natural Habitats etc.) Regulations 1994; (see below);
- The European Communities Council Directive on the Conservation of Wild Birds (Birds Directive) 79/409/EEC;
- The Conservation of Habitats and Species Regulations (2010);
- The Protection of Badgers Act (1992);
- Countryside and Rights of Way Act 2000;
- UK Biodiversity Action Plan (UKBAP);
- Barnsley Biodiversity Action Plan (LBAP);
- The Great Crested Newt Mitigation Guidelines, Version August 2001; and
- Water Vole Conservation Handbook 3rd Edition (2011).

DATA SEARCHES

1.10 Data searches were undertaken for the site and a 2km radius around the site with South Yorkshire Bat Group in August 2013 and with Barnsley Records Centre (Sheffield City Ecology Unit).

1.11 A total of 92 records of bats were returned from South Yorkshire Bat Group, recorded between the year 2000 and April 2013. (Data available on request). The nearest record was 1.31 km to the south-west of the approximate centre of the site (grid ref: SE330097) the species was not recorded.

1.12 The nearest known roost to the site was a Leisler's maternity roost located approximately 2.5km south southwest of the site in Gawber, the record was from 2003 and has not been reported since. There was one other record of a Leisler's nursery roost to the south southeast of the site again from 2003. There were records

of three Daubenton's roosts (c.80 bats) approximately 3.26, 3.30 and 3.43km south east from the site – these records were the most recent records of roost sites and were from 2011 and 2012. A pipistrelle roost was recorded in 2002 approximately 3.78km away from the site in a south easterly direction and one further unidentified bat roost was recorded in 2010 approximately 2.85km east southeast of site. There were no records of roosts of other species. There were field records of common pipistrelle, soprano pipistrelle, noctule, Leisler's and Daubenton's bats.

1.13 The 2014 records search returned in excess of a 1000 records for the 2km search radii. Of those records returned 34 related to amphibian species, 97 were for lower plants, 14 were for birds and the remainder were for invertebrate species. Where appropriate these are referred to with the invertebrate report.

1.14 The full species list / record search is available upon request, if required.

REPTILES – ADDITIONAL INFORMATION REQUIRED

1.15 The information detailing the surveys were detailed in the 2009 protected species reports, see Table below and attached.

CONFIRMATION OF ECOLOGIST'S QUALIFICATION / EXPERIENCE

1.16 This was discussed at our meeting of the the 23rd of June 2014. Rachel Richards M.Sc. (15 years experience as a consultant botanist); Chris Madine B.Sc. (Hons) five years experience. Paul White B.Sc., Simon Middleton B.Sc., Ruth Hadden, M.Sc., - Bat Consultant since 1996, Class Survey Licence WML CL20 (Bat Survey Level 4). Registration number: CLS0 2762. Licensed to handle bats and enter known roosts since 1986. Class Survey Licence WML CL15 (Volunteer Bat Roost Visitor Level 1). Charlotte Mercer M.Sc. (15 years' experience as an ecological consultant), Gary Tudor M.Phil, MIEEM, CBiol MSB (20 years' experience as an ecological consultant.

INVERTEBRATES

1.17 Initial surveys for invertebrate species involved the recording of notable species such as dingy skipper (*Erynnis tages*) which were reported as present in the site in 2005 and in 2009. We were advised by The Local Planning Authority (BMBC) in June of 2013 that a third party entomologist had collected data from the site and it was likely that this data could be made available to Harworth Estates / AES – LTD. A request was made to the third party entomologist for the data and this was declined, but we

were informed that the data would be made available to us through Barnsley Records Centre (BRC). A request for a data search of the site and the surrounding area was made to BRC in July 2013 and the data was provided. The BRC data reports presence / absence data which are limited in its uses. At the request of BMBC and in attempt to gain quantitative data surveys were commissioned with a local entomologist in July 2014 and his preliminary report is attached. The report is preliminary at this stage due to the survey season extending into September 2014, although the preliminary assessment provides sufficient information to allow determination of the planning application.

ORCHIDS

1.18 The question of the orchids and their rarity and in fact their identification has been discussed in detail with Trevor Mayne, Conservation Officer, Barnsley Council. The orchids identified in the site are not rare in fact they are relatively common throughout the UK. However, the issue is the large numbers in which they occur within the site. This was discussed with English Nature in 2009 when the issue of translocation was brought up by them. We agreed that we would relocate the orchids into a suitable area within the site prior to the onset and during the development, hence the proposal is to translocate orchids in the site in accordance with a programme to be drafted by AES – LTD and agreed as a condition by the LPA.

MOSSES LIVERWORTS AND LICHENS

1.19 Surveys for lower plant species have been undertaken by Ptyxis, report attached. In summary the report states that there were a number of lower plant species present in the site of conservation interest but no species and / or groups of protected species were recorded.

PROTECTED SPECIES

1.20 The table below gives a summary for the surveys undertaken to date for which reports have been produced and published. The EIA outline relates to the ecology document which accompanied the 2009 planning application.

SURVEY TYPE	DATE UNDERTAKEN	REPORTED IN
Badger	2005 / 2009	EIA outline, protected species report
Water vole	2005 / 2009 / 2013	EIA outline, protected species report and 2013 update
Bats	2009 / 2013	EIA outline, protected species report / 2013 update bat report
Breeding bird surveys	2005 / 2009	EIA outline, protected species report
Amphibian surveys (great crested newt)	2005 / 2009	EIA Outline, Protected species report 2009
Reptiles	2009	Protected species report 2009

INVERTEBRATES (as above)

1.22 The comment within our previous report "due to human disturbance" was discussed in a meeting with BMBC. This comment related specifically to disturbance within the ephemeral pond within the site. The pond, when it contained water, was used by local children and their dogs for paddling / playing in! The disturbance related mainly to our survey equipment which was removed and thrown away during the course of the survey periods.

COMMON ORCHIDS

1.23 An evaluation has not been undertaken as a part of a Phase 1 Habitat Survey, species were identified, an estimate was made as to the number present and their approximate distribution is given on the habitat plan. Due to the extensive earthworks required to enable the site to be brought forward for housing development, it is proposed to translocate the orchids to land on the eastern part of the site (shown as Area C on the Ecological Mitigation Plan at Appendix 2). This will involve collecting up the orchids and replanting them within this area which will remain undisturbed by development.

NON – NATIVE SPECIES

1.24 AES LTD's understanding is that the only non-native species present on the site is Bracken (*Pteridium aquilinum*), this will be removed as the soil strip progresses. In areas where this species occurs and soil stripping is not required then if needed an appropriate herbicide will be used to control this species.

CHAPTER 2: COMMENTS ON UPDATE REPORTS & RECOMMENDATIONS:

2.1 The entomology report provided by Andy Godfrey provides summary details of the results obtained during the late summer months of 2014. The data produced from those surveys takes into account *pre-existing data* obtained from BRC and the surveyors local knowledge of the site. For completeness, the survey period will extend into September 2014 and the final report will be made available then.

2.2 The report summarises the survey results and indicates potential and 'ideal mitigation' based on the summary findings. It must be considered that the Entomological Survey Report provided at Appendix 1 has been undertaken in isolation to the proposed development and its corresponding masterplan. Accordingly further analysis is provided in this chapter to assess which mitigation recommendations are appropriate and can feasibly be taken forward in the context of the earthworks, site preparation and drainage works which are required to make the site suitable for development. Reference is also made to the Ecological Mitigation Plan provided at Appendix 2.

ACID HEATHLAND/DWARF SHRUB HEATH

2.3 Due to the proposed earthworks which are necessary to provide a suitable development platform and the engineering proposals for the diversion of the drainage ditch, translocation of dwarf shrubs is the only feasible option. Accordingly, it is proposed that the area of land between the diverted public footpath and the drainage ditch is utilised for the recreation of acid heathland/dwarf shrubs (See Area A on the Ecological Mitigation Plan at Appendix 2). The drainage ditch will be clay lined to retain water and therefore won't wash out the natural ground acidity in this area thereby ensuring that a suitable environment exists for the dwarf shrub to flourish.

UNIMPROVED DRY GRASSLAND

2.4 The upper platform areas to the north of the site adjacent to the football pitches are proposed to be utilised for the retention of unimproved dry grassland (See Area B on the Ecological Mitigation Plan at Appendix 2). This is on the basis that this part of the

site will be unaffected by the development proposals. However it should be noted that this would leave a very barren area overlooking the housing. It is recommended that trees and shrubs are planted to help maintain privacy levels and prevent public access.

ORCHIDS

2.5 It is proposed that the orchid rich areas to the east of the site under the electricity pylons (See Area C on the Ecological Mitigation Plan at Appendix 2) are retained and Harworth Estates will seek to minimise disturbance in this area during earthworks and site preparation. However there may need to be an element of translocation.

GENERAL MITIGATION MEASURES

1. Harworth Estates will avoid the use of fertilisers, insecticides and pesticides on the grassland areas.

2. Whilst capping is required for residential gardens, the areas shown on the Ecological Mitigation Plan will be constructed using locally translocated materials.

3. It is proposed to leave the upper platform areas to the north of site as rough grassland with scrub/tree encroachment removed and the area retained as an open undisturbed area.

4. Due to the extensive earthworks required there is unlikely to be scope for any disturbed areas to be retained within the site.

5. Due to the extensive earthworks required there is little scope to maintain the existing micro-topography on site. Bunds to the north of the site will however be retained.

6. Harworth Estates will seek to control invading scrub where required.

7. Locally harvested seed will be used where feasible and practical and where cost effective to do so.

8. There are no mature native broadleaved trees present on site which can be incorporated into the development. As identified by the habitat assessment

the existing woodland is secondary. However new trees will be planted as part of the detailed landscaping proposals to be brought forward at reserved matters stage.

9. Non-native trees and shrub species will be removed from the site upon commencement of the earthworks.

10. Lighting proposals will be brought forward at the reserved matters stage and regard had to keeping artificial lighting to a minimum to minimise impacts on nocturnal animals.

11. The potential for green roofs will be assessed at the reserved matters stage.

12. It is proposed to adapt the attenuation pond to provide a variety of shapes and structural forms and to include reeds to support biodiversity, provided that the primary function of the pond to attenuate surface water is maintained.

APPENDIX 1:

ENTOMOLOGY REPORT

BRYOPHYTE, LICHENS AND MOSSES REPORT

NORTH GAWBER – PRELIMINARY ENTOMOLOGICAL SUMMARY

DRAFT REPORT TO APPLIED ECOLOGICAL SERVICES LTD

AUGUST 2014

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NORTH GAWBER – PRELIMINARY ENTOMOLOGICAL SUMMARY

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NORTH GAWBER – PRELIMINARY ENTOMOLOGICAL SUMMARY

SUMMARY

Applied Ecological Services (AES) Ltd requested an entomological survey of the site of the former North Gawber coalmine in Barnsley, South Yorkshire. Coalmining was abandoned in 1987 and the site has partially re-vegetated. The site is now a mosaic of broad-leaved woodland and plantation, woody scrub, unimproved neutral grassland and marshy grassland, acid heathland, tall ruderal and ephemeral vegetation and frequent bare ground. There is evidence that the pioneer invertebrate interest has increased in recent years. Housing development has been granted on the site. This report forms a preliminary assessment ahead of the main report and is based on a visual assessment of the site during survey work and on examination of the existing invertebrate records for the site and surrounding area.

The existing records include (a) taxa on nearby sites not likely to be affected by the works (River Dearne at Dearne Hall Road, Wilthorpe Marsh), (b) mis-identifications, (c) former uncommon species which have increased in abundance and range, and (d) species which have been recorded from Mapplewell Tip which appears to be the local name for the North Gawber ex coal-mine site and which may continue to occur there. The site has been discussed in relation to Barnsley BAP and Yorkshire BAP species.

The North Gawber former coalmine site does support a variety of habitats from pioneer to secondary woodland. The pioneer habitats, especially the unimproved dry grassland, bare and partially ground, ephemeral vegetation and acid heathland are likely to be amongst the more valuable habitats on the site for invertebrates. This is because sunlight and therefore heat can access these habitats and these will help support and promote invertebrate activity. Tall ruderal and scrub edge habitat are likely to be the next most important whilst the ditch and secondary woodland are likely to be less important.

The main recommendations for mitigation include (a) retention and/or translocation of the acid heath (a Barnsley BAP habitat), and (b) retention and management for nature conservation of some areas of the unimproved dry grassland and associated pioneer habitats. The latter includes retaining areas with bird's-foot trefoil for dingy skipper which is a Barnsley BAP species. Several more generic mitigation measures are recommended.

NORTH GAWBER – PRELIMINARY ENTOMOLOGICAL SUMMARY

INTRODUCTION

Applied Ecological Services (AES) Ltd requested an entomological survey of the site of the former North Gawber coalmine in Barnsley, South Yorkshire. Coalmining was abandoned in 1987 and the site has partially re-vegetated. The site is now a mosaic of broad-leaved woodland and plantation, woody scrub, unimproved neutral grassland and marshy grassland, acid heathland, tall ruderal and ephemeral vegetation and frequent bare ground. A discontinuous ditch also cuts across the site. There is evidence that the pioneer invertebrate interest has increased in recent years. Housing development has been granted on the site but it is hoped that mitigation may be possible given the obvious nature conservation value of the site.

METHODS

SAMPLING

Sampling included sweep netting of low-growing vegetation such as grassland and woodland ground and scrub vegetation. This is a standard method for Diptera, phytophagous Coleoptera, Hemiptera and several other groups. A 16 inch diameter sweep net purchased from Marris House Nets and mounted on a 1.5 metre angling pole was used. After a period of about 15 minutes sweep netting, the net was emptied using an aspirator (or pooter) and this was repeated on each visit until a larger proportion of the site was completed. Direct searching on flower heads, under stones, etc and including the field recording of butterflies and other conspicuous invertebrates were undertaken. A portable vacuum was used in the more open areas marked by bare ground or partially vegetated areas and in tussocky vegetation (such as tufted hair grass *Deschampsia cespitosa*).

No streams or ponds were encountered but there is a discontinuous ditch which runs NW-SE on the northern side of the main ride through the lower part of the site and this was sampled using standard pond net (1mm mesh) for three minutes at each sampling point. Material was sieved in the field to remove coarse debris (dead twigs, stones, seeds, etc), washed in the field and the sieved material was placed in sampling pots for later sorting and examination.

IDENTIFICATION

Target groups for terrestrial invertebrates have been identified which are considered by the surveyor to be good habitat indicators. These include Orthoptera (grasshoppers and allies), Odonata (damselflies and dragonflies), shieldbugs and grassbugs, selected Coleoptera (beetles), butterflies, day-flying moths, selected Diptera and selected aculeate Hymenoptera (ants, bees and wasps). These have generally been identified to species.

All vouchers have been identified to species level (where possible). Vouchers of rare or uncommon species have been retained.

RARITY ASSESSMENT

A main aim of the survey was to establish if there are any invertebrate species of high nature conservation interest present on the site. These include UK and local Biodiversity Action Plan species, IUCN, Red Data Book and Nationally Scarce species.

A list of UK BAP invertebrates may be viewed on the UK BAP website at www.ukbap.org.uk. A number of species were added to the UK BAP list following a review in 2006/2007 and these species were added for research only. These are generally widespread but rapidly declining moth and butterfly species which were identified as declining by Butterfly Conservation. These species can be sill frequent and widespread. In general, the same species are listed with little change in the Countryside and Rights of Way Act (2000) and in the National Environment and Rural Communities (NERC) Act 2006.

Rarity statuses such as Red Data Book, Nationally Scarce (previously Notable) and Local have been developed and heavily used by Natural England, the Joint Nature Conservation Committee and associated organisations and are defined in Appendix 3. Since 1995, International Union for Conservation of Nature and Natural Resources (IUCN) categories has been adopted by the Joint Nature Conservation Committee as the new standard for Red Lists in Britain. JNCC aims to work towards assessing the status of all native species against standard criteria based on the internationally accepted guidelines developed by the IUCN (see IUCN, 2001, 2003). Only a few taxonomic groups have been given IUCN codes but these include the water beetles (Foster 2010) and Diptera belonging to the Empidoidea (Falk and Crossley 2005).

REPORTING

The final report will include a full list of species recorded with accurate locations indicated on maps for rare or uncommon species. Details of the ecology, status and ecology of rare species will be provided. Proposals for the protection and habitat management of rare or uncommon species and habitats of particular importance to invertebrates will be provided. The importance of the species in a Barnsley or South Yorkshire context is indicated for existing records and will be done for new records.

RESULTS AND DISCUSSION

REVIEW OF EXISTING INVERTEBRATE RECORDS

AES Ltd supplied 1,108 existing floral and faunal records for North Gawber and the nearby area. Invertebrates make up the bulk of these records and they include one protected species, three UK BAP species, one Endangered beetle, one Indeterminate beetle and seven Notable, Notable A or Nb species. These are summarised in Table 1.

The protected White-clawed crayfish *Austropotamobius pallipes* has been recorded in the River Dearne approximately 1km from the site in October 2012. Since this is upstream of the North Gawber site, it will almost certainly not be affected by the proposed works. Interestingly, the invasive signal crayfish *Pacifastacus leniusculus* were also recorded from the same two sites on the River Dearne in the same month and same year. It is unlikely that the two species can co-exist and it would appear that there is a mis-identification (probably of white-clawed crayfish for signal crayfish). The surveyor is aware that white-clawed crayfish used to occur at this site but signal crayfish were introduced several miles upstream by anglers and the gradual spread of these would almost certainly have led to the demise of white-clawed crayfish in the Dearne.

Dingy skipper *Erynnis tages* is the only UK BAP species in the existing records that isn't Research Only. This species has been recorded from Mapplewell Tip and from old shale tips at Darton. The records for this species for Mapplewell Tip would appear to represent the current site based on the grid references and it has been assumed that all other records for Mapplewell Tip in the data refer to the North Gawber site. Two UK BAP Research Only species appear in the data, namely, small heath *Coenonympha pamphilus* and cinnabar *Tyria*

jacobaeae. Both these species are still common and widespread and do not require mitigation in the surveyor's opinion. It is likely that several UK BAP moths will occur at North Gawber but no moth-trapping appears to have been undertaken on the site.

The Notable six-belted clearwing moth *Scopigera ichneumoniformis* has been recorded from Mapplewell Tip. The caterpillar feeds on bird's-foot trefoil and it often shares its habitat with dingy skipper. The surveyor has recorded it on several former opencast coal sites.

The Red Data Book 1 (RDB1) Endangered rove beetle *Stenus fossulatus* was apparently recorded from Wilthorpe Marsh which is located on the south side of the River Dearne approximately 1-2km from the site. It is unlikely that development at North Gawber would affect Wilthorpe Marsh because it is protected somewhat by the river. *Stenus fossulatus* has only been recorded in Britain from Castle Eden Dene in County Durham and more recently from Cumbria and consequently the Wilthorpe Marsh record is likely to be a mis-identification. The same remarks can be made of the Red Data Book Indeterminate (RDBK) rove beetle *Stenus longitarsis* which has also been recorded from Wilthorpe Marsh and which is mainly known from southern England. Both these species were recorded on 15th May 1988 but the records do not appear in Coldwell (1999) and the collectors and recorders are not provided in the existing data obtained by AES Ltd. UK distribution maps for these species are provided in the report.

The flea beetle *Longitarsis parvulus* has Notable status but has increased its range and abundance in recent years to the extent that it can be regarded as common and widespread. It feeds on flax and has spread with the commercial growing of flax *Linum usitatissimum*.

Four Notable Diptera have been recorded from Wilthorpe Marsh, Low Barugh Ponds and Low Barugh, namely the soldierfly *Stratiomys singularior*, the hoverfly *Neoascia geniculata*, the picture-winged fly *Icterica westermanni* and the snail-killing fly *Psacadina verbekei*. The first two and the latter are associated with wetlands and are likely to be scarce or restricted, if they are present at all, on the North Gawber site. Icterica westermanni feeds on ragworts *Senecio* species, especially hoary ragwort, *S. erucifolius* and appears to be genuinely scarce although it can be a late summer species and can be overlooked.

The spider killing wasp *Priocnemis schioedtei* has Notable B status and has been recorded from Wilthorpe Marsh. This species has been recorded sparingly throughout Britain with purported records for about twenty vice-counties as far north as North-east Yorkshire. There are also two Welsh and five Scottish records. In England, it is typically encountered in broad-leaved woodland where it requires sunny rides, glades and clearings. The fact that it is a woodland species but was recorded from Wilthorpe Marsh suggests the latter records may be mis-identifications. Coldwell (1999) however, suggests that this species may be quite widespread throughout the Barnsley area.

The tree bumblebee *Bombus hypnorum* was first recorded in Britain in 1999. It has spread rapidly so that it is now widespread and frequent throughout much of England at least. It has been given the high score of 16 in the invertebrate assemblage assessment software ISIS developed by Natural England which is used for assessing whether designated sites are in favourable or unfavourable condition. A score of 16 is usually associated with the rarer Red Data Book species. Given the frequency and widespread nature of this species, this score may need lowering and the species should not receive a rarity designation.

In summary, the white-clawed crayfish may or may not occur in the River Dearne 1-2km from the site and may/may not have been confused with signal crayfish – I don't believe they co-exist as the data suggest. In any case, the crayfish sites will not be affected by the works. The two Red Data Book rove beetles, *Stenus fossulatus* and *S. longitarsis* are almost certainly mis-identifications and would not be affected at Wilthorpe Marsh. The flax flea beetle Longitarsis parvulus and tree bumblebee have increased in abundance and range in recent years and mitigation is unnecessary for these. The three wetland Diptera recorded from Wilthorpe Marsh are also unlikely to be affected by the development. Dingy skipper, cinnabar and small heath occur or are likely to continue to occur at North Gawber since appropriate habitat is available. The same is true of the Notable six-belted clearwing moth and the picture winged fly *Icterica westermanni*. The status of *Priocnemis schioedtei* is unclear since this is normally regarded as a woodland species yet the local records are from Wilthorpe Marsh which suggests a mis-identification.

SPECIES ASSESSMENT

2014 invertebrate survey

This is ongoing. Small heath was recorded on 26th June 2014 and is a UK BAP Research Only species. The tree bumblebee *Bombus hypnorum* was also recorded on this visit (see below). Dingy skipper was searched for but was not found. However, this species has a short flight period in mid spring which may have been before survey work started on the present survey. Several UK BAP moth species are likely to occur on the site since several common and widespread species were given UK BAP status in the last BAP review because Butterfly Conservation have data which suggests they are declining. However, no moth-trapping is planned but it can be undertaken if requested.

Barnsley BAP species

Three invertebrates are included in the 2008-2012 version of the Barnsley Biodiversity Action Plan. These are the dingy skipper, white-clawed crayfish and glow worm. There are existing records of the former for Mapplewell Tip (= the former North Gawber coal-mine). White-clawed crayfish mat still exist in the River Dearne approximately 1-2km from the site but since this is upstream of the North Gawber site, it is very unlikely to be affected by any proposed works on the latter. The glow worm *Lampyris noctiluca* occurs at only one site (a disused railway line covered with limestone ballast) in the south of the borough but could potentially occur elsewhere in the borough but would require nocturnal surveys to detect it.

Yorkshire BAP species

Yorkshire BAP species have been audited by Selman et al (1999). Most of the species are unlikely to be found in North Gawber since they include species now considered extinct in Yorkshire and others restricted to single sites. There are also few, if any, species listed that are associated with post-industrial sites (dingy skipper is not included). The white-clawed crayfish is included in the audit. None of the species included in the audit are likely to occur at North Gawber.

HABITAT ASSESSMENT

Broad-leaved woodland and plantation

Broad-leaved semi-natural woodland occupies a large block in the centre of the site. There are smaller blocks on the southern and eastern margins of the site. Given that mining only ceased in 1987 and the site was not wooded before, the woodland is clearly secondary and therefore unlikely to support veteran trees although occasional boundary trees might be present (none were noted by the surveyor). Secondary woodland on a pre-industrial site is

usually regarded as a secondary habitat for invertebrates – the main interest or value of such sites is open habitats. The secondary nature of the woodland and absence of long continuity are also likely to result in invertebrate faunas characterised by common and widespread woodland species with a general absence of rare saproxylic species.

Non-native conifers are normally regarded as of low nature conservation value for native invertebrates and the recommendation on sites managed for nature conservation would be to remove these and replace them with native deciduous species. Non-native deciduous tree species such as sycamore Acer pseudoplatanus can be a nuisance, out-competing native broadleaved species and being of limited value to native saproxylic and phytophagous insects. Non-native deciduous tree species provide better habitat than conifers but inferior habitat compared with native broadleaved tree species. On sites managed for nature conservation, they should be removed and replaced by native broadleaved. There are exceptions and these include species closely related to British trees (such as *Quercus*, etc) and non-invasive species such as horse chestnut *Aesculus hippocastanum* which is prone to cavity decay which can be good for native saproxylic insects.

The woodland at North Gawber will be treated as of secondary value in the survey for the reasons given above and will concentrate on the open habitats.

Woody scrub

Woody scrub is frequent throughout the site. This habitat can be valuable for insects but since it normally results in the loss of often valuable open habitat and the appearance of lower value secondary woodland, it can be a negative feature. It is probably best when scattered and irregular with scallops, embayments and 'islands' of scattered scrub, where it is comprised of mixed species and where it is controlled and does not comprise more than 15% or so of the total habitat available. On North Gawber, it is mixed and generally scattered but some thinning might be required if the land was to be retained as a Local nature reserve. The scrub edge between the woodland and pioneer habitats is likely to be most valuable scrub habitat.

Tall ruderal

Tall ruderal vegetation is frequent along the tracks and footpaths, on the margins of the site and amongst the unimproved dry grassland. These generally form valuable nectar sources and foodplants for insects and provide valuable plant architecture on or through which predatory invertebrates such as spiders, damselflies and robber-flies can hunt prey and other invertebrates can find shelter. The ruderal flora is relatively rich on the site and this should be reflected in a relatively rich and diverse insect fauna.

Ditch

A discontinuous stagnant ditch runs NW-SE on the northern side of the main ride through the lower part of the site. Debris has been dumped in the ditch in places. This has been sampled but it is very unlikely that anything of nature conservation value will be recorded from it. Its current low nature conservation value is almost certainly a result of long periods of misuse and neglect but could be improved through positive management.

Unimproved neutral grassland

Open mosaic habitats on previously developed land is a habitat included in the 2008-2012 Barnsley Biodiversity Action Plan. Policies to protect and manage open mosaic habitats including former colliery sites are included in the Barnsley BAP. Unimproved dry grassland

along with bare ground, partially bare ground and ephemeral vegetation comprise much of this habitat on North Gawber. The grassland is plant and flower-rich so providing a wide range of nectar sources and foodplants for insects. This is probably the most valuable habitat for invertebrates on the site and should support a range of rare and uncommon species. These could include species such as dingy skipper and the Notable six-belted clearwing moth which feed on bird's-foot trefoil and the Notable picture-winged fly *Icterica westermanni* which feeds on hoary ragwort and other Senecio species. Several other species might be expected here. One reason for its importance it the increased air temperatures near the ground which allow warmth loving invertebrates to exist and promote invertebrate activity.

Marshy grassland

This habitat forms relatively minor parts of the site according to the Phase 1 Habitat Plan updated in July 2013. There are areas marked by sedges *Carex* sp and tufted hair grass *Deschampsia cespitosa* often with fringing willow *Salix* spp but some of these are small and irregular and are difficult to map. They are likely to support different invertebrate assemblages compared with the other habitats on the site and should support one or two uncommon species.

Acid heathland

Lowland heathland is included as a habitat in the Barnsley Biodiversity Action Plan. There are 19 such sites in the borough of Barnsley according to the last BAP. Sites on former coalfields are presumably being lost as a result of development and this number will decrease over time.

No species of high nature conservation value have yet been linked to the small area of heathland at North Gawber. It is however a scarce habitat in the borough and should be retained and managed positively if possible.

Bare ground (and hardstandings)

Open mosaic habitats on previously developed land is a habitat included in the 2008-2012 Barnsley Biodiversity Action Plan. Policies to protect and manage open mosaic habitats including former colliery sites are included in the Barnsley BAP. Many of the comments made under unimproved dry grassland apply here. Bare and partially bare ground and ephemeral vegetation is likely to be an important habitat on North Gawber. Species such as dingy skipper bask on bare ground and six-belted clearwing may benefit from the enhanced temperatures around the *Lotus* plants on which the larvae feed.

Summary of habitat assessment

The North Gawber site does support a variety of habitats from pioneer to secondary woodland. The pioneer habitats, especially the unimproved dry grassland, bare and partially ground, ephemeral vegetation and acid heathland are likely to be amongst the more valuable habitats on the site for invertebrates. This is because sunlight and therefore heat can access these habitats and these will help support and promote invertebrate activity. Tall ruderal and scrub edge habitat are likely to be the next most important whilst the ditch and secondary woodland are likely to be less important.

MITIGATION

Specific recommendations for the North Gawber site

Retention of the area of acid heathland (or dwarf shrub heath) in the centre of the site is probably unfeasible given that housing has probably been planned for this area. Translocation

of the acid heathland is probably unjustified even though this is a Barnsley habitat since there are still several other albeit, small lowland heathland sites elsewhere in the borough although any on post-industrial land are probably threatened.

Retain areas of unimproved dry grassland (along with bare or partially bare ground) where possible since these are the most insect rich areas on the site. In particular, maintain areas with bird's-foot trefoil for dingy skipper. In general the most flower-rich areas are also likely also to be rich in invertebrates.

Some of the land on the eastern margin under the power-lines is orchid-rich and appears to be favourable to invertebrates as well. There may be constraints to development given the presence of the power-lines. Consideration could be given to retaining and managing some of this area for nature conservation

General Mitigation Measures

A few general recommendations as regards mitigation are provided below. Some recommendations may also be found for Open Mosaic Habitats in the Barnsley Biodiversity Action Plan.

Avoid the use of fertilisers, insecticides and pesticides on the grassland.

Avoid importing top-soil and use the soils that are present on the site. Maintain the calcareous or neutral nature of the soils on the site.

Maintain and/or encourage high botanical species richness. High botanical species richness should equate to high invertebrate species richness.

Disturbed areas are good even if small, because they are often rich in plant species and diversity and this will be reflected in the invertebrates. Consequently, any disturbed areas should be retained.

Control of invading scrub might be required in some areas.

Maintain a varied micro-topography on the site with hollows, banks, uneven ground, ditches, bunds, etc.

Use locally harvested seed where seeding is considered necessary. Purchased seed may include plant species not native to the area and they will not be of local genetic stock.

Incorporate any mature native broadleaved trees into the development where possible.

Remove non-native tree (such as sycamore *Acer pseudoplatanus*) and shrub species since these are likely to be of low value to native invertebrates.

Keep artificial lighting on the new development to a minimum since this can affect nocturnal animals such as moths and bats. Literature and websites that can be used for guidance on this can be quoted if required.

Incorporate green roofs into the design of the buildings

Create new ponds in the wetter parts of the sites.

CONCLUSIONS

A preliminary assessment of the North Gawber former coalmine site for invertebrates is presented. Survey work is ongoing and the results will be presented when survey work finishes in September 2014. The present assessment is based on a visual assessment of the site during survey work and on examination of the existing invertebrate records for the site and surrounding area.

The existing records include (a) taxa on sites not likely to be affected by the works (River Dearne at Dearne Hall Road, Wilthorpe Marsh), (b) mis-identifications, (c) former uncommon species which have increased in abundance and range and (d) species which have been recorded from Mapplewell Tip which appears to be the local name for the North Gawber ex coal-mine site. The site has been discussed in relation to Barnsley BAP and Yorkshire BAP species.

The North Gawber site does support a variety of habitats from pioneer to secondary woodland. The pioneer habitats, especially the unimproved dry grassland, bare and partially ground, ephemeral vegetation and acid heathland are likely to be amongst the more valuable habitats on the site for invertebrates. This is because sunlight and therefore heat can access these habitats and these will help support and promote invertebrate activity. Tall ruderal and scrub edge habitat are likely to be the next most important whilst the ditch and secondary woodland are likely to be less important.

The main recommendations for mitigation include (a) retention and/or translocation of the acid heath (a Barnsley BAP habitat), and (b) retention and management for nature conservation of some areas of the unimproved dry grassland and associated pioneer habitats. The latter includes retaining areas with bird's-foot trefoil for dingy skipper which is a Barnsley BAP species. Several more generic mitigation measures are recommended.

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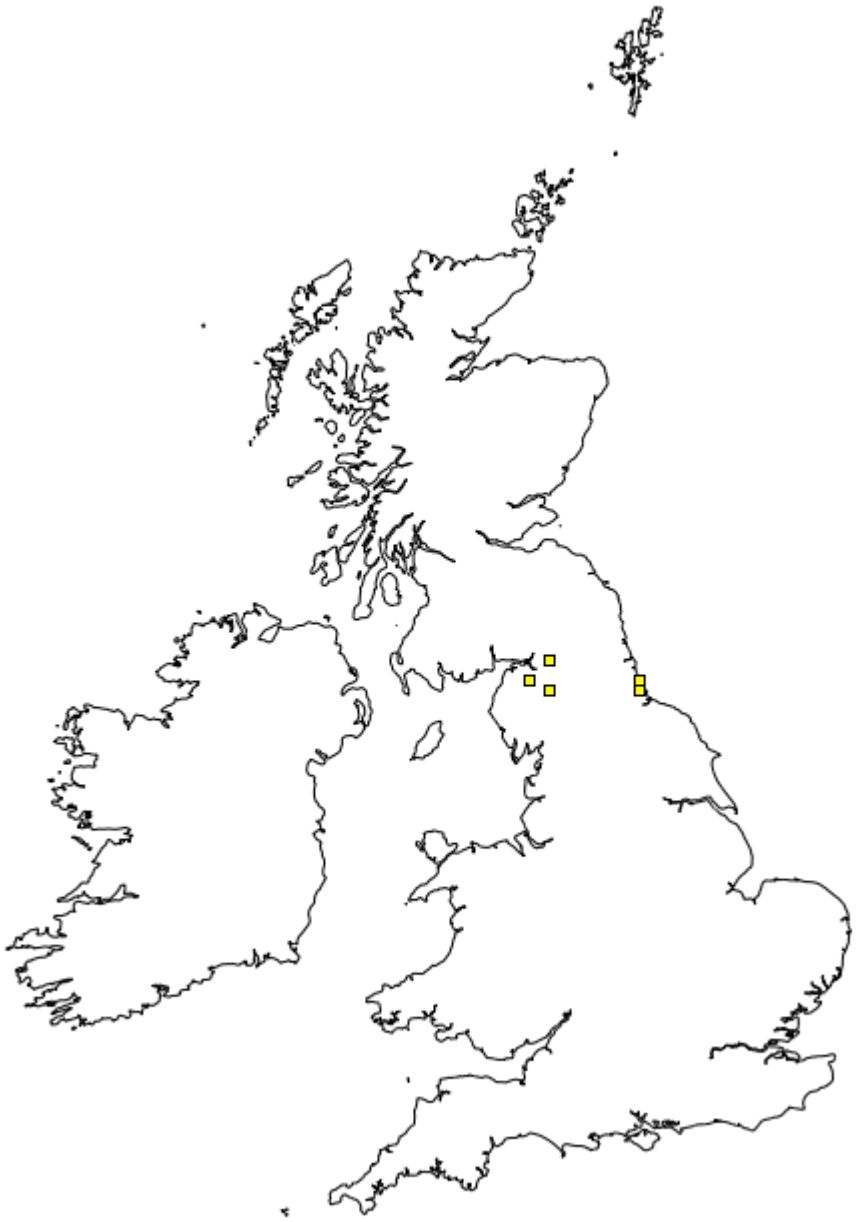
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SPECIES	ORDER	STATUS	WHERE RECORDED
White clawed crayfish *Austropotamobius pallipes*	Crustacea	Protected	River Dearne at Dearne Hall Road, Low Barugh
Dingy skipper *Erynnis tages*	Lepidoptera	UK BAP	Mapplewell Tip & Old Shale tips, Darton
Small heath *Coenonympha pamphilus*	Lepidoptera	UK BAP (Research only)	Mapplewell Tip & Wilthorpe Marsh
Cinnabar *Tyria jacobaeae*	Lepidoptera	UK BAP (Research only)	Mapplewell & Mapplewell Tip
6-belted clearwing *Scopigera ichneumoniformis*	Lepidoptera	Notable	Mapplewell Tip
Stenus fossulatus	Coleoptera	Endangered	Wilthorpe Marsh
Stenus longitarsis	Coleoptera	Indeterminate	Wilthorpe Marsh
Longitarsus parvulus	Coleoptera	Notable A	Darton
Stratiomys singularior	Diptera	Notable	Wilthorpe Marsh
Neoascia geniculata	Diptera	Notable	Low Barugh Ponds
Icterica westermanni	Diptera	Notable	Wilthorpe Marsh
Psacadina verbekei	Diptera	Notable	Wilthorpe Marsh & Low Barugh
Priocnemis schioedtei	Hymenoptera	Nb	Wilthorpe Marsh
Bombus hypnorum	Hymenoptera	New to Britain in 2001.	Mapplewell Tip & 11 Springfields

TABLE 1: INVERTEBRATES OF HIGH NATURE CONSERVATION IMPORTANCE RECORDED FROM NORTH GAWBER AND NEARBY AREA BASED ON EXISTING RECORDS



DISTRIBUTION MAP FOR *STENUS FOSSULATUS* (FROM NBN GATEWAY)



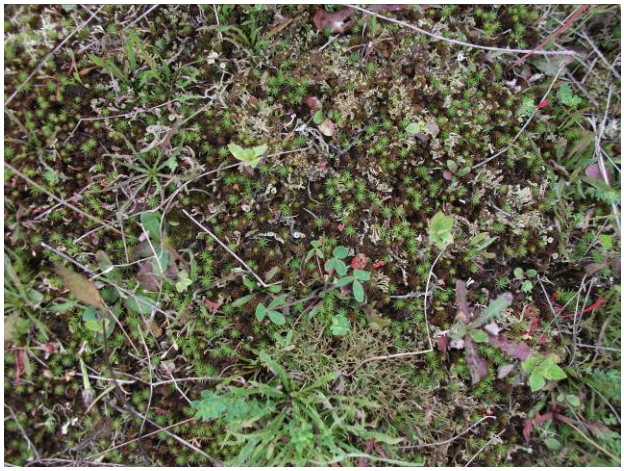
DISTRIBUTION MAP FOR *STENUS LONGITARSIS* (FROM NBN GATEWAY)

APPENDIX 1: INVERTEBRATES RECORDED FROM NORTH GAWBER, BARNSLEY, SOUTH YORKSHIRE IN 2014

[To be completed in the full report]

APPENDIX 2: DETAILS OF THE ECOLOGY, STATUS AND DISTRIBUTION OF THE RARE AND UNCOMMON INVERTEBRATE SPECIES RECORDED FROM NORTH GAWBER, BARNSLEY IN 2014

[To be completed in the full report]



The moss *Polytrichum piliferum* growing amongst the lichens *Cladonia furcata*, *Cladonia ramulosa* and *Cladonia diversa* in sparsely-vegetated acid grassland on colliery spoil

North Gawber

Bryophyte & Lichen survey

2014

Report for

Applied Ecological Services Ltd.

July 2014

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Summary

This report presents the results of a lichen and bryophyte survey of the North Gawber site at Mapplewell near Barnsley. The fieldwork was carried out in July 2014 by Doug McCutcheon (lichens) and John O'Reilly (bryophytes).

The site did not include lichen or bryophyte taxa of national conservation significance and would not be regarded as being of SSSI quality for its lichens and bryophytes. However, in a more local or regional context, the site can be regarded as being among the more diverse sites for lichens and bryophytes in the lowlands of South-west Yorkshire. 62 bryophytes (7 liverworts and 55 mosses) and 60 lichens were found here.

Overall, the lichen communities here were of more conservation interest than the bryophyte communities. In general, the most important habitats for lichens and bryophytes on the site were the areas of sparsely-vegetated acid grassland on colliery spoil.

1 Introduction

1.1 Ptyxis Ecology was commissioned by Applied Ecological Services Ltd. to conduct a comprehensive survey for bryophytes (mosses & liverworts) and lichens in North Gawber, Mapplewell near Barnsley (hereafter referred to as 'the site').

1.2 The site was roughly 20 hectares in size. It was located on the edge of the villages of Mapplewell and Staincross near Barnsley. It lay within VC63 (south-west Yorkshire) and within monads SE3209 and SE3309 for biological recording purposes.

1.3 The site was formerly part of a colliery. Much of the soil on the site was comprised of materials associated with the colliery and soil may also have been imported from outside the site as part of the landscaping. A variety of vegetation types had developed on the site over the past few decades, including extensive areas of young woodland, mesotrophic grassland, open sparsely-vegetated acid grassland, with more limited areas of dwarf shrub heathland and wetland vegetation. Informal paths and tracks were kept open on the site from trampling and motorbikes. Some areas of concrete occurred in the north of the site.

1.4 The survey was commissioned to inform a planning application for the site. An evaluation of the conservation value of the site for bryophytes and lichens was required.

1.5 Nomenclature follows Smith *et al*. (2009) for lichens, Hill *et al*. (2008) for bryophytes and Stace (2010) for vascular plants.

2 Methodology

2.1 Fieldwork

2.1.1 The field survey was carried out on 20th July by Doug McCutcheon (lichens) and John O'Reilly (bryophytes). Both surveyors spent 1 full day on fieldwork each. Lichens and bryophytes were identified in the field where possible, but where there was any doubt, specimens were collected for detailed examination later under the microscope. An additional day was spent on microscope work identifying specimens. The main identification books used were Smith *et al*. (2009) for lichens, Paton (1999) for liverworts and Smith (2004) for mosses.

2.1.2 Each surveyor walked over the whole site, visiting representative samples of each habitat on the site. Particular attention was paid to examples of different or unusual habitats, so that the site list could be as comprehensive as possible. Lists of species were compiled during this walkover and specimens not identified with certainty in the field were collected and stored in separate, clearly labelled bags. At the end of the survey an estimate of the relative abundance of each species on the site was given using the DAFOR scale (Dominant, Abundant, Frequent, Occoasional, Rare). Following the recommendations in Callaghan (2012) the survey was ended once all of the habitats on the site were fairly comprehensively sampled, the surveyors had visited to within no more than 50m of every part of the site and no new taxa were found for 30 minutes despite further searching. We estimate that the survey has probably found at least 95% of the bryophyte and lichen species of the site.

2.1.3 Notes were also made in the field of the main substrates on which the bryophytes and lichens were found. Some photographs were taken (see Appendix D).

2.1.4 Two types of moss (*Weissia* sp and *Bryum* sp.) could not be identified to species level as ripe capsules were needed for identification and these were not present.

2.2 Conservation evaluation

2.2.1 The national conservation status of each species was checked against the lists in Hodgetts (2011), Preston (2006), Preston (2010) and Woods & Coppins (2012). Also, an assessment was made of how many points the site would score using the criteria for selecting biological SSSIs for non-vascular plants (Hodgetts 1992). When doing this assessment the lists of nationally rare and nationally scarce species were in Hodgetts (1992) were updated using the lists from Preston (2006), Preston (2010) and Woods & Coppins (2012).

2.2.2 No comprehensive local bryophyte and/or lichen flora exists which could help with assessing the local/regional status of the individual species. In order to assess this, we counted the number of hectad (10km x 10km squares) records for each species

in the south-west Yorkshire (VC63) area. These records were counted using the distribution maps available from the NBN Gateway website. Records from all date classes were used. Ideally a scale smaller than the hectad scale would be used for an assessment of local rarity, but as lichens and bryophytes are poorly-recorded compared to many other taxonomic groups, it was thought that the hectad scale was the only practical scale to use. In all, 50 hectads had at least 2% of their area within VC63, so species recorded from 5 or fewer hectads may be considered to be locally uncommon.

3 Results

3.1 Overall species-richness

Overall in this survey 62 bryophytes (7 liverworts and 55 mosses) and 60 lichens were recorded. These are listed in appendices A to C.

3.2 Substrates and habitats

Notes on the main substrates which each taxon was growing on are included in the species lists in appendices A to C. The most abundant and characteristic bryophyte and lichen species in the survey on each of the main substrate types are included in the description of the site below.

3.2.1 Soil

This substrate category included a range of habitats including soils with different pH, shade, wetness and vegetation cover.

One of the most extensive habitats on the site was the mesotrophic/neutral grassland. This supported dense vegetation that was either grassy or flowery. The vegetation was often too dense to allow lichens to develop, but the habitat supported some very common bryophytes here and there, including the mosses *Brachythecium rutabulum*, *Calliergonella cuspidata*, *Kindbergia praelonga*, *Rhytidiadelphus squarrosus* and the liverwort *Lophocolea bidentata*.

There were also extensive areas of sparsely vegetated grassland that had developed on stony soil and spoil. Most of these areas were a form of lichen- and bryophyte-rich acid grassland. The most abundant bryophytes in this habitat included the mosses *Campylopus introflexus*, *Ceratodon purpureus* and *Polytrichum piliferum*. The habitat was particularly rich in lichens and supported 13 species of *Cladonia*. The most abundant lichens here included *Cladonia furcata*, *Cladonia chlorophaea*, *Cladonia diversa*, *Cladonia floerkeana*, *Cladonia ramulosa*, *Cladonia squamosa*, *Cladonia subulata* and *Peltigera hymenina*. This species-rich, well-developed lichen community was quite extensive on the site and was the most interesting lichen or bryophyte feature of the site.

Locally, in the sparsely-vegetated lichen- and bryophyte-rich grassland, there were areas where the substrate was more calcareous, supporting vascular plants like common centaury *Centaurium erythraea*. This mosaic of pH conditions is often a feature of sites with colliery spoil. In these areas, there were occasional patches of mosses such as *Cratoneuron filicinum*, *Dicranella varia* and *Fissidens adianthoides* and lichens such as *Collema crispum*.

Young secondary woodland was also an extensive habitat on the site, but the woodland floor was a relatively species-poor habitat for bryophytes and lichens here. There were occasional patches of the mosses *Brachythecium rutabulum*, *Kindbergia praelonga* or *Polytrichum commune*.

3.2.2 Concrete

In the north of the site the remains of concrete floors from buildings formerly occupying the site were still partly intact. Elsewhere (also mainly in the north of the site), there were loose lumps and blocks of concrete. These habitats supported a diverse assemblage of mainly crustose lichens and small acrocarpous mosses. In terms of overall species numbers, the concrete habitats supported slightly more lichen species than the acid soil habitats described above. However, most of the species growing here on concrete were relatively common on concrete elsewhere in urban and lowland areas.

On the loose blocks of concrete the most abundant lichens included *Caloplaca citrina*, *Lecanora albescens*, *Lecanora crenulata*, *Physcia tenella* and *Rinodina oleae*, while the most abundant mosses included *Grimmia pulvinata*, *Schistidium crassipilum* and *Tortula muralis*.

On the concrete floors other species became more abundant, including the lichens *Aspicilia contorta* and *Lecanora muralis* and the mosses *Barbula convoluta* and several *Didymodon* species.

3.2.3 Rock and stones

Rocks of natural materials and smaller stones supported a different group of lichens. Mostly these were species suited to growing on acid stones and rock including *Lecidella stigmataea*, *Porpidia macrocarpa* and *Rhizocarpon reductum*. Rocks and stones were not a significant habitat on the site for bryophytes.

3.2.4 Trees (epiphytes)

Most of the trees on the site were quite young and supported few if any lichen or bryophyte epiphytes. The woodland along the southern edge of the site had the best-developed epiphytic flora, particularly on young trees of Italian alder *Alnus cordata*, pedunculate oak *Quercus robur* and sycamore *Acer pseudoplatanus*.

The lichen *Xanthoria parietina*, which often does well in nitrogen-rich environments was the only species that occurred frequently. The following lichen epiphytes were occasional: *Lecanora chlarotera*, *Lecanora expallens*, *Lecanora symmicta*, *Melanelixia fuliginosa*, *Parmelia sulcata*, *Physcia adscendens*, *Physcia tenella* and *Xanthoria candelaria*.

Bryophyte epiphytes were even less abundant. Some of the larger tree boles in the south supported a partial covering of *Brachythecium rutabulum* and *Orthotrichum affine.* One hawthorn *Crataegus monogyna* bush deep in the sheltered valley of the stream in the south-east of the site supported the mosses *Hypnum cupressiforme* var. *resupinatum*, *Orthotrichum affine* and *Orthotrichum diaphanum* and the liverwort *Metzgeria furcata*.

3.2.5 Uncommon habitats on the site

Some of the bryophytes and lichens were confined to habitats that were uncommon on the site.

The small areas of dwarf shrub heath in the south of the site supported some patches of the moss *Aulacomnium palustre*. Other bryophytes that were relatively abundant in the heathland included the mosses *Campylopus introflexus*, *Kindbergia praelonga* and *Brachythecium rutabulum* and the liverwort *Lophocolea bidentata*.

The two wetland mosses *Calliergon cordifolium* and *Leptodictyum riparium* were found only in the small area of bulrush *Typha latifolia* swamp in the west of the site.

In the sheltered stream valley in the south-east of the site a few bryophytes were found which were otherwise rare or absent from the remainder of the site. Growing on the bare soil of the steep bank were patches of the moss *Dicranella heteromalla* and occasional patches of the liverwort *Calypogeia arguta*.

Fence posts provided the main habitat on the site for a couple of lichens. *Lecanora conizaeoides* was found on wooden fence posts, while *Lecanora polytropa* was confined to fence posts of acid stone.

4 Evaluation & discussion

4.1 National status

4.1.1 None of the taxa found are protected under the Wildlife & Countryside Act. No nationally rare or nationally scarce taxa were found (Preston 2006, Preston 2010, Woods & Coppins 2012). No RDB taxa were found (Hodgetts 2011, Woods & Coppins 2012).

4.2 SSSI evaluation criteria

4.2.1 The guidelines for selection of SSSIs based on non-vascular plants (Hodgetts 1992) assign scores to legally protected species, nationally rare and scarce species, and to certain indicator species (see Table 1). The various indices of lichen indicator species which are sometimes also used are relevant only to sites with ancient woodland or ancient parkland and are not included in Table 1. The scores for the site are totalled and there are different SSSI quality threshold scores depending on which part of Britain the site is in. North Gawber lies within the zone of Britain where the threshold is set at 200 points.

Table 1: Points assigned to various categories relevant to North Gawber from Hodgetts (1992)

Species category	Points
Legally protected	200
Nationally rare	100
Nationally scarce	50
Strict Atlantic bryophytes	10
Sub-atlantic & western bryophytes	5
Woodland indicator bryophytes	5

4.2.2 Nationally rare and nationally scarce taxa were assessed using the lists in Preston (2006), Preston (2010) and Woods & Coppins (2012). The lists of Atlantic, sub-atlantic and western bryophytes and woodland indicator bryophytes were taken from Hodgetts (1992).

4.2.3 No legally protected, or nationally rare or scarce taxa were found and no strict Atlantic bryophytes were found. Several bryophyte taxa from the sub-atlantic, western and woodland indicator lists were found and are listed in Table 3 below. The total score for the site is well below the threshold of 200.

4.2.4 The total score here of 25 points fell well short of the threshold score for SSSI selection of 200. These SSSI criteria are currently under review. Most emphasis in the current system is placed on nationally rare and scarce taxa. Sites that support

diverse assemblages of taxa, but which do not include many nationally rare or scarce taxa can currently only qualify if they support either:

- a large number of Atlantic, sub-atlantic or western bryophytes,
- a very large number of woodland bryophytes, if the site is in eastern or south-eastern Britain, or
- a number of uncommon lichens which are restricted to ancient woodland or parkland.

Other types of bryophyte or lichen assemblage do not currently qualify unless they earn points from other criteria.

Table 2: Taxa at North Gawber which get a score using the criteria from Hodgetts (1992)

Species	Category	Points
Atrichum undulatum	Woodland moss	5
Calypogeia	Sub-atlantic liverwort	5
Dicranum scoparium	Woodland moss	5
Hypnum cupressiforme var. *resupinatum*	Sub-atlantic moss	5
Orthotrichum affine	Woodland moss	5
TOTAL SCORE		**25**

4.2.5 Although the lichens at North Gawber are probably of more conservation interest than the bryophytes, the lichens earn no points in the current SSSI selection system. Perhaps in the planned reviewed system of SSSI selection based on non-vascular plants, these biases in the system may be addressed and so the site could then score more points. While the site would still be unlikely to reach the SSSI threshold in any new system, the score it gets using the current system probably underestimates the conservation interest of the site.

4.3 Regional & local rarity

4.3.1 There are 50 hectads with at least 2% of their area falling within south-west Yorkshire (VC63). Here we have considered any bryophyte or lichen species recorded from 5 or fewer hectads from these 50 to be locally uncommon, although this system has no official recognition. For each bryophyte and lichen species found at North Gawber, the number of hectads it has been recorded in the 50 VC63 hectads are listed in appendices A, B and C. Species recorded from 10 or fewer hectads in VC63 are listed in Table 3 below.

4.3.2 The figures in brackets in table 3 below are used for some species falling within difficult to identify species complexes. The first number outside the brackets is the number of records for the species in a narrow sense, while the second number in brackets refers to the number of hectad records for the species in a broad sense. In each of these three cases (*Arthonia punctiformis, Cladonia squamosa* and *Xanthoria candelaria*), the true number of hectad records for the species in a narrow sense is

likely to be close to the second number in brackets, so the first number under-estimates how widespread the species are.

Table 3: Bryophytes and lichens which are apparently uncommon in VC63 (South-west Yorkshire)

Species		VC63 hectads
Arthonia punctiformis	Lichen	3(15)
Cladonia crispata	Lichen	8
Cladonia squamosa	Lichen	3(29)
Didymodon nicholsonii	Moss	5
Lecanora carpinea	Lichen	7
Rhizocarpon petraeum	Lichen	8
Xanthoria candelaria	Lichen	7(50)

4.3.3 The other three lichen species listed in table 3 *Cladonia crispata*, *Lecanora carpinea*, *Rhizocarpon petraeum* probably were uncommon locally until recently. These species are among many other lichen species that have recently been recolonising eastern, lowland Britain following improvements in air quality after a long period of industrial pollution (Smith *et al*. 2009). It is possible that some or all of these species will become more widespread locally in the future.

4.3.4 The moss in table 3 *Didymodon nicholsonii*, was recorded mainly from the flood zone of rivers and streams in the past. However, in recent years it has been found many times growing on old tarmac and concrete, often in partly shaded situations. It is likely that it is under-recorded and it may not be genuinely locally uncommon.

4.4 Species-richness and diversity in a local context

4.4.1 The total numbers of bryophytes (62) and lichens (60) recorded for the site are relatively high for a urban fringe, lowland site in South-west Yorkshire. Most lowland sites of equivalent size would be expected to have fewer taxa than this, particularly in the wider agricultural landscape. In particular, the diversity of *Cladonia* species was high. It is the mixture of semi-natural habitats on the site, plus the varied nutrient-poor substrates provided by the colliery spoil that has allowed this diversity of species to develop here.

4.5 Overall conservation evaluation

4.5.1 In summary, the site did not include lichen or bryophyte taxa of national conservation significance and would not be regarded as being of SSSI quality for its lichens and bryophytes. However, in a more local or regional context, the site can be regarded as being among the more diverse sites for lichens and bryophytes in the lowlands of South-west Yorkshire. Overall, the lichen communities here were of more

conservation interest than the bryophyte communities. In general, the most important habitats for lichens and bryophytes on the site were the sparsely-vegetated acid grassland areas on nutrient-poor colliery spoil.

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Appendix A: List of liverworts recorded at North Gawber in 2014

Scientific name	Substrate	DAFOR	VC63 hectads
Calypogeia arguta	Soil	R	35
Cephalozia bicuspidata	Soil	O	43
Cephaloziella divaricata	Soil	R	19
Lophocolea bidentata	Soil	F	48
Lophocolea heterophylla	Soil	R	50
Lunularia cruciata	Soil	R	47
Metzgeria furcata	Tree bole	R	37

Appendix B: List of mosses recorded at North Gawber in 2014

Scientific name	Substrate	DAFOR	VC63 hectads
Aloina aloides	Concrete	O	15
Amblystegium serpens var. *serpens*	Concrete	O	50
Atrichum undulatum var. *undulatum*	Soil	R	49
Aulacomnium palustre	Soil among heather	R	39
Barbula convoluta var. *convoluta*	Soil & concrete	F	50
Barbula unguiculata	Soil & concrete	O	49
Brachythecium albicans	Acid soil	O	38
Brachythecium rutabulum	Various	F	50
Bryum argenteum	Stony soil & concrete	R	50
Bryum caespiticium s.l.	Soil	O	22
Bryum dichotomum	Stony soil & concrete	R	43
Bryum rubens	Soil	R	43
Bryum sp.	Soil & concrete	O	50
Calliergon cordifolium	Wet soil	R	23
Calliergonella cuspidata	Soil	F	49
Campylopus introflexus	Acid soil	A	46
Ceratodon purpureus	Acid soil	A	50
Cratoneuron filicinum	Calcareous soil	R	32
Dicranella heteromalla	Acid soil	O	49
Dicranella schreberiana	Soil	R	40
Dicranella varia	Calcareous soil	O	39
Dicranoweisia cirrata	Tree bole	R	44
Dicranum scoparium	Acid soil	O	46
Didymodon insulanus	Soil & concrete	O	47
Didymodon nicholsonii	Concrete floors	R	5
Didymodon rigidulus	Concrete floors	R	41
Didymodon vinealis	Concrete floors	R	15
Fissidens adianthoides	Calcareous soil	F	21
Fissidens bryoides var. *bryoides*	Soil	R	47
Fissidens taxifolius var. *taxifolius*	Soil	O	50
Funaria hygrometrica	Soil after fire	R	50
Grimmia pulvinata	Concrete	F	49
Hypnum cupressiforme var. *cupressiforme*	Soil	R	42
Hypnum cupressiforme var. *lacunosum*	Calcareous soil	O	23
Hypnum cupressiforme var. *resupinatum*	Tree bole	R	25
Hypnum jutlandicum	Acid soil	O	44
Kindbergia praelonga	Soil	F	50
Leptodictyum riparium	Wet soil	R	37
Orthodontium lineare	Acid soil	R	48
Orthotrichum affine	Tree branches	O	43
Orthotrichum anomalum	Concrete floors	R	40
Orthotrichum diaphanum	Tree boles	R	47
Pohlia nutans	Acid soil	O	48
Polytrichastrum formosum	Acid soil	R	44
Polytrichum commune var. *commune*	Soil in woodland	O	40
Polytrichum juniperinum	Acid soil	O	40
Polytrichum piliferum	Acid soil	F	42

Pseudocrossidium hornschuchianum	Soil	O	40
Pseudoscleropodium purum	Soil	O	40
Rhynchostegium confertum	Concrete	O	50
Rhytidiadelphus squarrosus	Soil	F	46
Schistidium crassipilum	Concrete	F	35
Syntrichia ruralis var. *ruralis*	Concrete floors	O	32
Tortula muralis	Concrete	F	50
Weissia sp.	Concrete	O	18

Appendix C: List of lichens recorded at North Gawber in 2014

Scientific name	Substrate	DAFOR	VC63 hectads
Acarospora fuscata	Acid rock	R	48
Amandinea punctata	Tree branch	R	29
Arthonia punctifomis	Tree bole	R	3(15)
Aspicilia contorta	Concrete floors	F	24
Caloplaca citrina agg	Concrete	F	50
Caloplaca holocarpa	Concrete	O	50
Candelariella aurella	Concrete floors	O	50
Catillaria lenticularis	Concrete	O	21
Cladonia cervicornis	Soil	R	15
Cladonia chlorophaea	Soil	F	15
Cladonia crispata	Soil	R	8
Cladonia diversa	Soil	F	14
Cladonia floerkeana	Soil	F	37
Cladonia furcata	Soil	A	29
Cladonia polydactyla	Soil	O	29
Cladonia portentosa	Soil	O	23
Cladonia pyxidata	Soil	R	26
Cladonia ramulosa	Soil	F	16
Cladonia rangiformis	soil	O	13
Cladonia squamosa	Soil	F	3(29)
Cladonia subulata	Soil	F	25
Collema crispum	Calcareous soil	O	23
Evernia prunastri	Tree branch	R	34
Lecanora albescens	Concrete	F	48
Lecanora campestris	Concrete	O	37
Lecanora carpinea	Tree branch	R	7
Lecanora chlarotera	Trees	O	27
Lecanora conizaeoides	Fence posts	O	50
Lecanora crenulata	Concrete	F	25
Lecanora dispersa	Concrete	O	50
Lecanora expallens	Tree boles	O	29
Lecanora muralis	Concrete floors	F	50
Lecanora polytropa	Acid stone fence post	R	50
Lecanora symmicta	Tree branches	O	11
Lecidella elaeochroma	Tree boles	F	20
Lecidella stigmatea	Scattered stones	F	49
Melanelixia fuliginosa ssp. glabratula	Tree branches	O	32
Parmotrema perlatum	Tree bole/post top	R	17
Parmelia sulcata	Trees	O	44
Peltigera hymenina	Soil	F	13
Peltigera rufescens	Soil	R	19
Phaeophyscia orbicularis	Concrete	R	49
Physcia adscendens	Trees/concrete	O	46
Physcia tenella	Trees/concrete	A	47
Porpidia macrocarpa	Acid stones	F	24

Porpidia soredizodes	Acid stones	O	36
Porpidia tuberculosa	Acid stones	O	48
Protoblastenia rupestris	Concrete	R	28
Ramalina farinacea	Tree branch	R	31
Rhizocarpon petraeum	Acid stone	R	8
Rhizocarpon reductum	Acid stones	F	40
Rinodina oleae	Concrete	F	47
Sarcogyne regularis	Concrete	O	38
Trapelia coarctata	Moist sandstone	R	48
Verrucaria hochstetteri	Concrete	R	26
Verrucaria muralis	Concrete	F	49
Verrucaria nigrescens	Concrete	O	49
Xanthoria candelaria	Tree branches	O	7(50)
Xanthoria parietina	Rocks/branches	F	50
Xanthoria polycarpa	Branch nodes	R	34

Appendix D: Photographs



Fig 1: The lichen *Cladonia furcata* which was abundant at the site



Fig 2: The moss *Polytrichum piliferum* growing amongst the lichens *Cladonia furcata*, *Cladonia ramulosa* and *Cladonia diversa* in sparsely-vegetated acid grassland on colliery spoil



Fig 3: The mosses *Brachythecium albicans* and *Ceratodon purpureus* growing on sparsely-vegetated acid grassland on colliery spoil



Fig 4: The moss *Campylopus introflexus* which was one of the most abundant mosses on the site



Fig 5: Extensive patches of the moss *Campylopus introflexus* growing in sparsely-vegetated acid grassland and heathland



Fig 6: A patch of the moss *Dicranum scoparium*

APPENDIX 2:

ECOLOGICAL MITIGATION PLAN

AREA - B

AREA SEEDED ON COLLIERY SPOIL WITH NATURAL GRASS SPECIES

APPROXIMATE AREA - 0.924 HA

0 20 40 60
(metres)

LEGEND

AREA - A
TRANSLOCATED / RETAINED COLLIERY SPOIL AND DWARF SHRUBS

APPROXIMATE AREA - 0.709 HA

AREA - B
AREA SEEDED ON COLLIERY SPOIL WITH NATURAL GRASS SPECIES.

APPROX AREA - 0.924 HA

AREA - C
RECEPTOR SITE FOR ORCHIDS

APPROXIMATE AREA - 0.416 HA

AREA - D
ENHANCED ATTENUATION POND

AREA - C

RECEPTOR SITE FOR ORCHIDS

APPROXIMATE AREA - 0.416 HA

CLAY LINED DRAINAGE CHANNEL

AREA - A

TRANSLOCATED / RETAINED COLLIERY SPOIL AND DWARF SHRUBS

APPROXIMATE AREA - 0.709 HA

AREA - D

ENHANCED ATTENUATION POND

SPARKFIELDS
SPARK LANE
MALINCROFT
MAPPLEWELL DRIVE
HAMBLE COURT
CARR GREEN LANE
BEAULIEU CLOSE
CARRON DRIVE
TAY CLOSE
SPEY CL
LEAP
DAM
GREEN LANE

1 RETAINING STRUCTURE
2 EXISTING OVERHEAD POWERLINES
3 PRIMARY ENTRANCE
4 CONSTRUCTION ACCESS

CLIENT: HARWORTH ESTATES
PROJECT: NORTH GAWBER
DRAWING OF: ECOLOGICAL MITIGATION PLAN
DRAWING NO.: 13:4764:SK05
DRAWN BY: AT
SCALE: 1:1000 @ A1
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