Nenthead Site 101

Ecology Surveys and Assessment

The Coal Authority

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P1	October 2018	Vegetation Survey results added	17/10.2018	Tim Benson	Project Manager
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Table of Contents

Tables

1. Introduction

1.1 Overview of the project

The Department for Environment, Food and Rural Affairs (Defra) set up the “Water and Abandoned Metal Mines” (WAMM) Programme in 2010 to begin to tackle pollution from the hundreds of metal mines across the country. The programme is being delivered as a partnership between Defra, the Coal Authority and the Environment Agency.

Inputs of metals into the River Nent cause average concentrations of cadmium, lead, and zinc to exceed Environmental Quality Standards, so the River Nent fails to achieve good status for fish and invertebrates. The Northumbria River Basin Management Plan (RBMP), published in 2015, includes steps for addressing pollution from abandoned mines and managing the impacts to 2027. The WAMM programme has ranked the River Nent as the lowest quality in the Northumbria RBMP, and one of the lowest quality rivers in England, with respect to mine water related pollution. The pollution from the River Nent contributes to pollution in the River South Tyne up to 40km downstream. Due to these impacts, the Nent Catchment has been a priority for investigation, assessment and targeted improvement measures.

AECOM has been appointed by the Coal Authority to undertake the feasibility and outline design for a mine water treatment scheme (MWTS) at the Caplecleugh Level Adit, which is one of the point source contributors to the failure of the River Nent under the RBMP. The aim is to reduce the metal loading (principally lead, zinc and cadmium) within the mine water discharge from the Caplecleugh Adit by between 70% and 90%, providing betterment to the River Nent, whilst adhering to the conditions required for any consents, licences and permits.

1.2 Proposed Development

The proposed development would divert mine water flowing from the Caplecleugh Level Adit, near the Nenthead Mines car park, to a mine water treatment scheme at Site 101 (Figure 1). The treatment scheme would remove heavy metals from the water before discharging the treated water in to the River Nent. At the location of the adit, works would be carried out to construct a collection chamber and transfer pipework.

1.3 Scope of the Report

This report relates to an area of land referred to as Site 101 (the site), which is located near Nenthead, Alston, Cumbria. The surveys that have been undertaken were commissioned to inform of any ecological constraints to development of a mine water treatment scheme at the site. The initial survey was a preliminary ecological assessment (PEA) that included a desk study and an extended Phase 1 Habitat survey to identify ecological features within the site. Following this several surveys were undertaken in 2018;

- pond assessment for use by amphibians;
- analysis of water samples taken from the waterbodies for presence of great crested newt DNA;
- an upland bird survey;
- a water vole survey of the ditches and the River Nent; and
- a more detailed vegetation survey of the grassland and heath areas.

Following a change in the site boundary to include further land, several further surveys were carried out in 2019:

- updated Phase 1 Habitat Survey;
- a reptile survey;
- bat roost potential assessment of adits;
- further pond assessments and eDNA samples; and
- further otter and water vole surveys of the drains, ditches and River Nent.

It also identified whether there were any other sensitive ecological features that could be affected by any proposed development.

This information will allow for an evaluation of the ecological significance of the site along with the requirement for any further surveys to inform the detailed design.

1.4 Site Description

The site is located southeast of Nenthead village (site central grid reference: NY 787 433) (see Figure 1) and comprises acid grassland, heathland, open and vegetated mine spoil heaps, wetland and ditches. There is a small reservoir adjacent to the site and several ponds within 20m of the proposed site footprint. The wider landscape includes further moorland habitat, the River Nent and disused mine workings.

1.5 Updates to the report following further surveys in 2019

In 2018, the surveys were carried out based on a redline boundary to the east and north of the reservoir (P5, Figure 2a). In 2019, the area within the scheme redline boundary increased to the east, north, south and west of the reservoir, encompassing increased areas of habitat, including being more local to the River Nent (see Figure 2b).

The land within the enlarged site was subject to a Phase 1 Habitat Survey, a reptile survey (given the greater area of potential habitat that could be impacted), further otter and water vole surveys (including along the River Nent) and assessments of four further ponds, including water samples to determine presence of great crested newt DNA.

In addition, a clearer and more detailed design of the route of the pipeline, works required at the adit (to divert the water) and where outflow would be for the treated water became available. The adit and other local features were assessed for bat roost potential.

It should be noted that there are no in-channel works or impacts to the banks of the River Nent. The design is for the outfall of the treated water to be into an existing drain, which then flows in to the Nent local to the adit location towards the west of the scheme. In addition, there will be no impact on Capelcleugh Adit itself, where the water is being diverted from (all works are external to the adit). However, there may be a requirement for a headwall in the reservoir (P5) to allow diversion of a watercourse around the proposed treatment works.

2. Legislation and Planning

2.1 Wildlife Legislation

The following legislation relates to species and habitats that could potentially occur within the site:

- The Conservation of Habitats and Species and Planning (Various Amendments) (England & Wales) Regulations 2018 (Habitats Regulations);
- The Wildlife and Countryside Act 1981 (as amended);
- The Countryside and Rights of Way (CRoW) Act 2000;
- Natural Environment and Rural Communities (NERC) Act 2006;
- The Protection of Badgers Act 1992;
- Wild Mammals (Protection) Act 1996; and
-

2.2 Planning

Consideration has also been given to relevant national, regional and local planning policy and strategy documents.

2.2.1 National Planning Policy Framework (NPPF)

An updated and revised National Planning Policy Framework (NPPF) was published on 24th July 2018 and it sets out the Government's planning policies for England and how these are expected to be applied.

Promoting a strong theme of sustainable development, the Framework aims to strengthen local decision making and reinforce the importance of up-to-date plans. Core aims of the NPPF include:

- The Presumption in favour of Sustainable Development;
- Delivering Sustainable Development – Building a strong competitive economy and ensuring the vitality of town centres;
- Promoting sustainable transport;
- Meeting the challenge of climate change, flooding and coastal change;
- Conserving and enhancing the natural environment; and
- Conserving and enhancing the historic environment.

The NPPF states the commitment of the UK Government to minimising impacts on biodiversity and providing net gains in biodiversity where possible, contributing to the Government's commitment to halt the overall decline in biodiversity. It specifies the obligations that the Local Authorities and the UK Government have regarding statutory designated sites and protected species under UK and international legislation and how this it to be delivered in the planning system. Protected or notable habitats and species can be a material consideration in planning decisions and may therefore make some sites unsuitable for particular types of development, or if development is permitted, mitigation measures may be required to avoid or minimise impacts on certain habitats and species, or where impact is unavoidable, compensation may be required.

2.2.2 Eden District Council Core Strategy (adopted March 2010)

The Eden District Council Core Strategy (2010) contains relevant environmental policies, and 'CS16 Principles for the Natural Environment' is particularly relevant to the proposed development. CS16 states that:

- *"The relationship between the development and the natural environment will be managed to minimise the risk of environmental damage.*
- *"Encouragement will be given to the creation of opportunities for species to spread out and create niches elsewhere to reduce any negative impacts of development and to allow species to migrate because of climate change.*
- *The re-creation and restoration of traditional habitats will be encouraged and existing wildlife and habitats such as hedges, ponds, woodlands, ancient woodlands, wetlands and species rich grasslands will be protected and enhanced.*
- *Where possible, developments will be expected to include suitable measures to contribute positively to overall biodiversity in the District or to mitigate harm caused by the development.*
- *Promote improvements in accessibility to the natural environment for all people regardless of disability, age, gender or ethnicity.*
- *Development should reflect and where possible enhance local landscape character."*

2.3 Biodiversity

The NERC Act 2006 Section 41 (S41) lists habitats and species which are of principal importance for the conservation of biodiversity in England. The habitats and species included on the S41 list are identified as conservation priorities under the UK Post-2010 Biodiversity Framework, which replaced the UK Biodiversity Action Plan (UK BAP).

The Cumbria Biodiversity Action Plan (BAP) was published in 2001, by the Cumbria Biodiversity Partnership and aims to raise public awareness and understanding of the natural environment and hopes to encourage local people and politicians to take a closer look interest in biodiversity to act to help vulnerable wildlife and threatened habitats.

Twenty-one species and 18 habitats have been identified in the Cumbria BAP for priority action and targets set for recovery, and include bats, water vole *Arvicola amphibius*, song thrush *Turdus philomelos*, hay meadows and blanket bogs.

The above legislation and planning have been considered when undertaking this assessment using the methods described in Section 3, when identifying potential constraints to the proposed development and when making recommendations for further survey, design options and mitigation, as outlined in Section 5. Compliance with legislation may require the attainment of relevant protected species licences prior to the implementation of the proposed development.

3. Methodology

3.1 Desk-Study

A stratified approach is usually taken when defining the desk study area, based on the likely zone of influence of the proposed development on different ecological receptors and on an understanding of the maximum distances typically considered by statutory consultees (2km for statutory site designations and 1km for local, non-statutory designations together with protected and notable habitats and species).

A desk study was undertaken as part of The Coal Authority's mine water treatment scheme proposed works local to Nenthead and was carried out in January 2017. This considered a 3km search area from a location close to the site (centre point NY782435) and the data collected is relevant to this project, as it is only a year and a half old and more than adequately covers a 1km radius around the site for non-statutory sites and protected/notable species. In addition, an updated check was carried out in June 2018 for statutory designated sites within a 2.5km radius from centre point NY787434.

The desk study was carried out using the data sources detailed in Table 1. Protected and otherwise notable habitats and species include those listed under Schedules 1, 5 and 8 of the Wildlife and Countryside Act 1981 (as amended); Schedules 2 and 5 of the Habitats Regulations, species and habitats of principal importance for nature conservation in England listed under section 41 (s41) of the NERC Act and other species that are Nationally Rare, Nationally Scarce or listed in national or local Red Data Lists and Biodiversity Action Plans.

Table 1: Desk study data sources

Data source	Accessed	Data Obtained
Multi-Agency Geographic Information for the Countryside (MAGIC) website.	July 2019	• International statutory designations within 2 km. • Other statutory designations within 2 km. • Ancient woodlands and notable habitats within 2 km. • Information on habitats and habitat connections (based on aerial photography) relevant to interpretation of planning policy and assessment of potential protected and notable species constraints.
Cumbria Biodiversity Data Centre.	19th January 2017	• Non-statutory designations within 1km. • Protected and notable species records within 1km.

3.2 Existing Survey Information

Previous survey work has been carried out as part of the wider scoping for other related projects in the area. Whilst not directly relevant to this site, there are completed surveys that were carried out in the general locality, which have been utilised as part of this assessment. In addition, various botanical surveys have been carried out on the site between 1999 and 2017, which have particularly focussed on the areas of the site with species associated with Calaminarian communities and these areas also considered in this assessment.

A separate PEA report was completed for the car park area to the west of the site in April 2018. This was for a different project (bank stabilisation of the River Nent) but the details of that area remain relevant to the mine water treatment scheme and findings are included in this updated report.

3.3 Extended Phase 1 Habitat Survey

An initial extended Phase 1 Habitat Survey of the original site was completed on 7th June 2018 (see Figure 2a (and Figure 5 for redline)). A survey of the land included in the enlarged site was carried out on 23rd May 2019 (see Figure 2b for redline area).

The aim of the surveys was to identify the type and extent of habitats present within and adjacent to the site and to identify the potential for these habitats to support protected or otherwise notable species. The survey was conducted according to the standard Phase 1 habitat survey methodology (Joint Nature Conservation Committee 2010[1]) and with adherence to standard guidelines[2] and was extended to include targeted searches for signs of protected species such as bats, amphibians, reptiles, and badger (*Meles meles*). The survey also included a search for invasive species listed under schedule 9 of the Wildlife and Countryside Act, such as Japanese knotweed (*Reynoutria japonica*) and giant hogweed (*Heracleum mantegazzianum*).

Target notes (TN) were made to provide supplementary information on species composition, features of interest, topography, location of habitats and evidence of management. Botanical nomenclature follows Stace (2019[3]).

3.4 Pond assessment for Great Crested Newts

Four ponds and the reservoir were recorded on/near to the site during the first (2018) survey; a further four ponds were then identified when the size of the site increased. A Habitat Suitability Assessment and analysis of water samples for presence of great crested newt DNA of the ponds and reservoir were completed.

3.4.1 Habitat Suitability Index

Habitat suitability is determined by using the Habitat Suitability Index (HSI), which is calculated using ten habitat variables ('suitability indices') which are known to affect the survival of great crested newt. These are:

- Geographical location (i.e. with respect to the range of great crested newt);
- Pond area;
- Permanence of water (estimated number of years a waterbody is likely to dry out in spring, per decade);
- Water quality;
- Percentage shade of waterbody margin;
- Presence of waterfowl;
- Occurrence of fish;
- Pond density;
- Connectivity and quantity of suitable terrestrial habitat; and
- Macrophyte (aquatic plant) coverage.

Each habitat variable is assessed by experienced surveyors in the field. The ten suitability indices are combined to derive the final HSI score for the pond. The HSI, expressed as a value between 0.01 and 1.0, is then categorised as shown in Table 2.

Table 2 HSI score and suitability of the aquatic habitat for great crested newt[4]

HSI Score	Suitability of the aquatic habitat for Great Crested Newt
0.01 – 0.49	'Poor'
0.50 – 0.59	'Below average'

[1] Joint Nature Conservation Committee, (2010), Handbook for Phase 1 Habitat survey – a technique for environmental audit, ISBN 0 86139 636 7.
[2] Chartered Institute of Ecology and Environmental Management (April 2013) *Guidelines for Preliminary Ecological Appraisal* (GPEA) Professional Guidance Series (CIEEM: http://www.cieem.net/)
[3] Stace, C.A. (2019) The New Flora of the British Isles. Cambridge University Press.
[4] Taken from: Oldman, R. S., Keeble, J., Swan, M. J. S., and Jeffcote, M. (2000). *Evaluating the Suitability of Habitat for the Great crested newt (*Triturus cristatus*)* Herpetological Journal 10 (4), 143-155.

HSI Score	Suitability of the aquatic habitat for Great Crested Newt
0.60 - 0.69	'Average'
0.70 – 0.79	'Good'
0.80 – 1.00	'Excellent'

It is generally considered unsuitable to apply the HSI tool when assessing ditches. Ditches can form long networks, thus determining the area of a ditch is not always possible. Some sections of a ditch may be more suitable for great crested newts than other sections (which for example may be dry). Ditches within 500 metres of the Proposed Scheme that were accessible during the survey period were visually assessed for their potential to support great crested newts by experienced AECOM ecologists and professional judgement was used to determine whether further survey to determine great crested newt presence/absence was required.

3.4.2 Presence/Absence Surveys – eDNA Survey Techniques

Environmental DNA that has been released from an organism in the form of faeces, saliva, urine, skin cells or carcasses is found within the environment. In aquatic environments (e.g. lake, pond& ditch), the eDNA is diluted and distributed in the water where it can persist for 7-21 days, depending on environmental conditions. The procedure for sampling a waterbody involves collecting 20 water samples from a pond or ditch, combining these samples into a single composite sample which is then sent to an approved laboratory for analysis according to Biggs *et a*l. (2014[5]). Water samples must be collected between mid-April and end-June to capture the peak breeding season.

Results are returned as either positive (great crested newt present), negative (great crested newt not detected) or inconclusive.

If a positive result for great crested newt is returned through the eDNA survey, six further survey visits, using traditional survey methods, are required to provide an estimation of the population size class (see below). Population size class estimates are used to inform a great crested mitigation licence and help determine the levels of mitigation required.

On 26th June 2018, water samples were collected from Ponds 2, 3, 4 and 5 (reservoir), shown on Figure 2b, and sent to an approved laboratory (SureScreen Scientifics) for testing. On 1st and 23rd May 2019 water samples were collected from Ponds 6, 7 and 9 (see Figure 2b). Ponds 1 and 8 (see Figure 2b) were dry at the time of sampling and sent to an approved laboratory (ADAS) for testing.

For each pond/ditch, 20 water samples were taken from different areas around the pond/ditch considered suitable to support great crested newts, using sterile kits provided by SureScreen Scientifics (2018) and ADAS (2019), and taking care to not collect sediment from the bottom. All sampling was carried out from the banks and the water was not entered, as this may risk DNA from elsewhere being transferred between waterbodies (e.g. from the ecologist's boots). All water samples were transferred into a whirl pack and mixed thoroughly. Once mixed, a pipette was used to transfer 15ml of the water sample into a tube of ethanol to preserve the eDNA, filling the tube up to 50ml. The tube was fastened, labelled and shaken. This process was completed until six tubes had been prepared for each waterbody. Following the survey all the tubes were safely packed and sent to the laboratory for testing.

In the laboratory, the six sample tubes from each waterbody are pooled together, and then tested 12 times to ensure an accurate result is obtained. For great crested newt presence to be confirmed, one or more of the 12 tests is required to be returned positive. If all results are returned negative, then it can be concluded that great crested newts have not used the waterbody in the preceding two-week period. The accuracy of this method compares favourably with surveys undertaken using standard methods.

[5] Biggs J, Ewald N, Valentini A, Gaboriaud C, Griffiths RA, Foster J, Wilkinson J, Arnett A, Williams P and Dunn F (2014). Analytical and methodological development for improved surveillance of the Great Crested Newt. Defra Project WC1067. Freshwater Habitats Trust: Oxford

3.5 Upland Wader Survey

Breeding bird surveys were conducted on three occasions in June and July 2018 in relation to the original redline area. The primary aim of the surveys was to determine the distribution and abundance of breeding waders within and adjacent to the original site boundary and so the primary method of survey was based upon Brown & Shepherd (1993)[6].

During each visit, all bird observations were recorded on maps using standard British Trust for Ornithology (BTO) notation for species, behaviour and evidence of breeding. The surveys involved walking across the entire site on a transect route, ensuring that all areas within the site were approached to within 100 metres. The survey conditions are present in Table 3 below.

Birds were classified as **Non-breeding, Possible, Probable and Confirmed** breeding depending on activity recorded. A summary of each breeding type is provided in Table 4 as described in Gibbons et al. (1993).

In addition to breeding waders, birds of notable conservation concern were noted in the below species lists:

- Annex 1 of the EC Birds Directive
- Schedule 1 of the Wildlife and Countryside Act 1981
- Red-listed birds of Conservation Concern[7]

Table 3: Breeding Bird Survey Conditions

Date	Start time	Weather Conditions	Visibility
07th June 2018	08.40	No cloud cover, dry, sunny 16°C, slight breeze	Excellent
26th June 2018	08.30	No cloud cover, dry, sunny 20°C, no wind	Excellent
20th July 2018	08.30	95% cloud cover, dry, 14°C, slight breeze	Good

All surveys were undertaken in suitable weather conditions. Surveys were completed at a slightly earlier time of day than those suggested by Brown & Shepherd (1993) to account for other notable species such as short-eared owl and black grouse.

Table 4: Breeding Classification Descriptions[8]

Breeding Classification	Activity Recorded
Non-breeding	Passage flight only
	Non-breeding males
Possible breeding	Singing male
	Bird in suitable nesting habitat
Probable breeding	Pair in suitable nesting habitat
	Permanent territory behaviour
	Visiting probable nest site
	Agitated behaviour
	Nest building or excavating nest hole
Confirmed breeding	Distraction display or injury feigning

[6] A. F. Brown & K. B. Shepherd (1993) A method for censusing upland breeding waders, Bird Study, 40:3, 189-195, DOI: 10.1080/00063659309477182
[7] M. A. Aebischer et al. (2015) Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108, 708-746
[8] Table 2 adapted from Breeding Status Codes: Gibbons et al. (1993) the new atlas of breeding birds in Britain and Ireland: 1988-1991. T. & A. D. Poyser

Breeding Classification	Activity Recorded
	Used nest or eggshells found from this season
	Recently fledged or downy young
	Adult carrying faecal sac or food for young
	Nest containing eggs
	Nest with young seen or heard

3.6 Water Vole Survey

A water vole survey was undertaken along the main ditch on site and 50 metres upstream and downstream beyond the site boundary on 7th June and 20th July 2018. This was repeated on 1st May and 1st July 2019 for the main ditch, other smaller ditches and for the River Nent. These surveys were completed in accordance with the standard methodology[9][10][11].

The survey involved walking along the watercourses and looking at the potential for use and evidence of presence of water voles. Evidence of water voles includes the species themselves, bankside burrows, latrines, feeding signs and footprints.

No limitations to the survey were encountered and the full length of the watercourse that was planned to be surveyed was able to be surveyed. Weather conditions were good.

3.7 Otter Survey

Otter surveys were carried out in concert with the above water vole surveys along the watercourses. In addition, further wider areas were searched for sign of otter and in response to previous sightings and records. These surveys were completed in accordance with the standard methodology[12][13].

The survey involved walking along the watercourses and wider area and looking at the potential for use and evidence of presence of otter. Evidence of otter includes the species themselves, natal holts, holts and potential holt sites, couches, spraints, anal jelly, tracks/footprints and slides.

3.8 Detailed Vegetation Survey

The vegetation was surveyed to National Vegetation Classification (NVC) methodology on 6th September 2018 by an experienced AECOM surveyor on the smaller, original survey area (see Figure 2a and Figure 5 for redline). Homogenous vegetation stands were classified according to the NVC as given in the relevant original NVC volumes[14]. Reference was also made to the NVC review and other guidance[15],[16] in which some additional vegetation types not covered by the original NVC volumes are described. Sample quadrat data were taken as necessary using standard methods (2x2m quadrats were used in the vegetation encountered). Vegetation was assigned to a sub-community where possible. Since NVC communities often occur in patches too small to map amongst more extensive communities, or in complexes which cannot be feasibly mapped within reasonable timescales, NVC polygons were described as mosaics as necessary.

[9] Dean et al. (2016). The Water Vole Mitigation Handbook (Mammal Society Mitigation Guidance Series). Eds Fiona Mathews and Paul Chanin. Mammal Society London.
[10] Strachan, R. et al. (2011). Water Vole Conservation Handbook; 3rd Edition. Wildlife Conservation Research Unit, Abingdon.
[11] Common Standards Monitoring Guidance for Mammals; JNCC; August 2004.
[12] Chanin, P. (2003a). Ecology of the European Otter. Conserving Natura 2000 Rivers Ecology Series No. 10. English Nature, Peterborough
[13] Chanin, P. (2003b). Monitoring the Otter Lutra lutra. Conserving Natura 2000 Rivers Monitoring Series No.10. English Nature, Peterborough.
[14] Rodwell, J.S. (Ed.) (1991). *British Plant Communities. Volume 2 – Mires and heaths*. Cambridge University Press, Cambridge.
Rodwell, J.S. (Ed.) (1992). *British Plant Communities. Volume 3 – Grasslands and montane communities*. Cambridge University Press, Cambridge.
[15] Averis, A., Averis, A.B.G., Birks, J., Horsfield, D., Thompson, D. & Yeo, M. (2004). *An Illustrated Guide to British Upland Vegetation.* Joint Nature Conservation Committee, Peterborough.
[16] Rodwell, J.S., Dring, J.C., Averis, A.B.G., Proctor, M.C.F., Malloch, A.J.C., Schaminée, J.N.J., & Dargie, T.C.D. (2000). *Review of coverage of the National Vegetation Classification*. JNCC Report No. 302, Joint Nature Conservation Committee, Peterborough.

Within each quadrat all species were recorded with an estimate of percentage cover/abundance using the Domin scale (1 = few individuals; 2 = some individuals; 3 = many individuals; 4 = 4% - 10%; 5 = 11% - 25%; 6 = 26% - 33%; 7 = 34% - 50%; 8 = 51% -75%; 9 = 76% - 90%; 10 = 91% - 100%). Subsequent areas of the same vegetation within a site do not require five additional quadrats but should be sampled for consistency and at least one quadrat recorded and, based on size, possibly more at the discretion of the surveyor.

The quadrat data was analysed initially using TWINSPAN (Two Way INdicator SPecies ANalyis) Hill (1979)[17]. The version utilised was that in the Community Analysis Package Version 2.13 (2002) Pisces Conservation Ltd, Lymington.

TWINSPAN is designed to produce ordered two-way tables by identifying differential species. In TWINSPAN, the samples are classified and then the species are classified using the sample classification as a starting point. The starting point of TWINSPAN is to firstly produce a crude dichotomy of the samples by ordination of the data and dividing the ordination in the middle. Differential species (i.e. ones that are preferential to one side or other of the ordination) are identified and then the ordination is improved. Finally, a third ordination is undertaken based on the most highly differential species. The dichotomy is produced from the results of the second ordination but the third ordination allows a further succinct characterisation if required.

The identified groups of quadrats from the TWINSPAN analysis were then tabulated and a constancy value for each species calculated for each defined group of quadrats, as follows:

- Scale: I = 1% - 20%. II = 21% - 40%. III = 41% - 60%. IV = 61% - 80%. V = 81% -100.

The tables produced were then used to assign the vegetation types to one of the published plant community types through use of the keys provided in the published volumes and by visual comparison of the collected data with the published data. In addition, use was made of TABLEFIT (Hill 2015[18]), which assesses the similarity between single vegetation samples or sets of samples and the species constancy tables which characterise the NVC communities and sub-communities.

The location of each quadrat was recorded by taking a GPS coordinate and then mapped (see Figure 4).

Botanical nomenclature follows the fourth edition of Stace 2019[19].

3.9 Reptile Survey

The heathland and upland grassland habitats are suitable for reptiles such as adders *Vipera berus* to be present, although there were no records for the species in the local or wider area. In addition, the watercourses and wetland (ponds) areas, could offer habitat for grass snake *Natrix helvetica*. The mine workings and spoil heaps would also offer basking potential and there were some small rocky outcrops that could be also used by reptiles for basking. There is dry stone walling that could also be suitable for common lizard *Zootoca vivipara* for basking and cover. In 2018, it was considered that given the limited extent of habitat within the site and the large amount of suitable habitat in the wider area that a specific reptile survey was not required and habitat manipulation to discourage reptiles for the works area prior to works starting would be sufficient to ensure no harm to any reptiles that might be present.

However, given the increase in area within the redline boundary in 2019 and the larger area of suitable habitat this included, a reptile survey was carried out. Two hundred and forty refugia were placed out across the site. The enlarged site is around 22 ha; however bare spoil, buildings and tracks were unsuitable for reptile survey and it was estimated that around 15 ha was potentially suitable making a density of 16 refugia per hectare (see Appendix H has the locations of the refugia that were put out on site).

Reptile surveys were carried out as per the guidelines (Froglife 1999[20]; Gent and Gibson, 2003[21]; Sewell et al., 2013[22]) across the wider redline area. In each habitat area, a combination of corrugated iron and roofing felt

[17] Hill, M.O. (1979) TWINSPAN - A FORTRAN Programme for Arranging Multivariate Data in an Ordered Two-Way Table by Classification of the Individuals and Attributes. Ecology and Systematics. Cornell University, Ithaca, New York 14850, U.S.A.
[18] Hill, M.O. (2015). TABLEFIT version 2.0 for identification of vegetation types. Wallingford: Centre for Ecology and Hydrology.
[19] Stace, C. (2019). *New Flora of the British Isles*. Cambridge University Press, Cambridge.
[20] Froglife. 1999. Froglife Advice Sheet 10: Reptile Survey: An introduction to planning, conducting and interpreting surveys for snake and lizard conservation. Froglife, Halesworth.
[21] Gent, T. & Gibson, S. 2003. Herpetofauna Workers' Manual. Joint Nature Conservation Committee, Peterborough.
[22] Sewell, D.; Griffiths, D.; Beebee, T.J.; Foster, J. & Wilkinson, J.W. 2013. Survey protocols for the British herpetofauna. Version 1.0

refugia were placed out in areas identified as suitable habitat. In non-linear habitats, refugia were placed at a density of at least 10/ha in suitable habitat. In linear habitats refugia were placed at a frequency of at least one every 10m in suitable habitat.

All refugia were number marked using spray paint and their location accurately recorded to an accuracy of <5m where terrain/vegetation allowed, to allow later translation to GIS. The locations were recorded using a GPS device.

Once placed out the artificial refugia were left to settle for 14 days prior to conducting the first check.

Each site containing refugia was checked for reptiles on the required number of occasions (all sites a minimum of seven visits, upgraded to twenty visits if reptiles are recorded). Binoculars were used to check for reptiles between refugia, as well as careful checks by lifting each refugium.

Each refugium check was conducted during the following conditions:

- Time: conducted between 07:00 and 18:00;
- Air temperature: 10°C - 20°C;
- Wind: Still to moderate (equivalent to Beaufort 4; 13 - 17mph); and
- Rain: No or light rain only at time of survey. Surveys between periods of heavy rain (when all other conditions are suitable) are also acceptable.

During each check the surveyor recorded details of all reptiles encountered during the survey, including refuge number, species, number, life stage (adult, sub-adult, juvenile) and, when possible, sex.

All records of reptiles were provided with GPS-derived grid co-ordinates. Where topography and vegetation structure may have reduced the accuracy of records below an accuracy of <5m, this information was noted.

Following placement of the refugia on 28th April 2019 and allowing for a 14-day bedding in period, seven visits were carried out during May and early July 2019.

3.10 Bat roost potential assessment

An initial, ground level inspection of any adits within the site was carried out in-line with the bat survey guidelines (Collins, 2016[23]). The inspection was carried out by a licensed bat ecologist on the 18th April 2019.

3.11 Limitations and Assumptions

Information obtained during a desk study is dependent upon people and organisations having made and submitted records for the area of interest. The absence of records for a species does not therefore necessarily mean that such species does not occur in the study area.

It should be noted that the upland wader and National Vegetation Classification surveys were only completed in relation to the smaller, original redline boundary in 2018. In terms of the wader survey it was considered that the results for the 2018 survey reflected the use of the general area by the birds recorded, given that data for the immediate wider area was included in the survey; and therefore, further survey would not significantly alter the assessment of the site in terms of bird use. For the more detailed vegetation survey, the key habitats classified within the original redline were essentially the same as those found in the wider area (specifically acid grassland and areas of rush with occasional patches of heath) and further survey of the wider areas would not change the findings such that the habitats in the wider area could be mapped as per the original survey (this was ground-truthed during the 2019 Phase 1 update survey).

The upland wader survey missed a May survey, due to timing of the commission; this is not ideal in terms of breeding; however, given the cold spring and late season in 2018, it is not considered that this is a significant limitation and it is likely that any breeding taking place on site would have been captured.

The more detailed vegetation survey was carried out in September 2018, which is not considered limiting for upland communities; however, Calaminarian communities are best surveyed in the spring but due to timing of the commission, this was not possible. However, this is not considered a significant issue, as the areas and extent of

[23] Collins, J. (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). Bat Conservation Trust, London

this habitat was identified during the initial Phase 1 survey, although the detailed boundaries of the community within the site have not been mapped at this point.

It should be noted that the Phase 1 Habitat map and detailed botanical survey map (Figures 2a and 2b and Figure 4) are indicative habitat boundaries and these have not been surveyed-in accurately in terms of GIS, particularly given the mosaic nature of the site where actual boundaries are difficult to delineate.

4. Results

4.1 Desk Study

The results for the wider search carried in January 2017 and July 2019 for statutory and non-statutory sites are included in Appendix A. The desk study results for protected and notable species received from Cumbria Biodiversity Data Centre were too numerous to include as raw data therefore only the relevant species have been identified and considered within the body of the report (a full record set can be issued on request).

4.1.1 Statutory Designations

The Tyne and Nent Special Area of Conservation (SAC) is within 1.2 km to the southwest and around 2.7 km to the northwest. The North Pennine Moors Special Area of Conservation (SAC) and Special Protection Area (SPA) is approximately 1.2 km to the north-northeast of the site. Haggs Bank SSSI is approximately 2.7 km northwest of the site. Allendale Moors SSSI is approximately 1.4 km to the north- northeast of the site. Smallcleugh Mine SSSI is adjacent to the south of the site and Whitesike Mine and Flinty Fell SSSI is around 1.2 km to the southwest of the site.

4.1.2 Non-statutory Designations

Table 5 details the non-statutory nature conservations identified by the desk study. The designations are listed in order of increasing distance from the site boundary.

It should be noted that the site is part of Nenthead Mine Local Geological Site.

Table 5 Sites with non-statutory designations for nature conservation

Designation	Reason(s) for Designation	Relationship to the Site boundary
Flinty Fell County Wildlife Site	Notable habitat (Blanket Bog, Calaminarian grassland)	1.1 km to the southwest of the site
River Nent County Wildlife Site	Notable habitat (Riverine/riparian)	1.2 km to the northwest of the site.
Special Roadside Verge (C1Y (1)).	Notable habitat (road verge).	1.2 km to the northwest of the site.
Special Roadside Verge (C17 (2)).	Notable habitat (road verge).	1.6 km to the northwest of the site.

4.1.3 Protected and Otherwise Notable Species

Table 6 provides a summary of potentially relevant species identified through the desk study. The table summarises the conservation status of each species and provides commentary on the likelihood of presence.

Where species are identified in Table 6 as likely or possible within the site or immediate wider area, depending on the potential for effects from the proposed development, they could be material to determination of a planning application and could represent a legal constraint. Where they are flagged as a potential constraint, further surveys are likely to be required to determine presence/ population size so the impacts from the proposed development can be assessed to the satisfaction of the Planning Authority. Requirements for further surveys are identified in Section 5 of this report.

Table 6 Protected and notable species relevant or potentially relevant to the proposed development

Species	Legally Protected Species	Species of Principal Importance	Other Notable Species	Present on Site	Present/Potentially Present in Wider Zone of Influence	Supporting Comments
Bats	✓	✓	-	?	✓	The desk study returned 21 bat records within 1 km of the site. Species included Pipistrelle species (*Pipistrellus*), Daubenton's (*Myotis daubentonii*), natterer's (*Myotis nattereri*) and whiskered/brandt's (*Myotis mystacinus/brandtii*). Roosts are known in Nenthead itself, at Capleclough adit (0.6 km west of the site at adit - NY78104347) & Rampgill Burn adit (0.1 km north - NY787435).
Breeding birds	✓	✓	-	?	?	The desk study revealed the presence of, amongst others, Oystercatcher (*Haematopus ostralegus*), Lapwing (*Vanellus vanellus*) and ringed plover (*Charadrius hiaticula*) within 1km of the site.
Sand Martin (*Riparia riparia*)	✓	X	-	✓	?	This species was not recorded within the desk study itself, but colony of sand martins is known to utilise the river bank local to the west of the site for nesting.
Red Squirrel (*Sciurus vulgaris*)	✓	✓	-	?	?	The desk study revealed various records of this species within 1 km of the site boundary. The nearest was in the woodland to the northwest (NY78144357)
Water Vole (*Arvicola amphibius*)	✓	✓	-	?	?	The desk study revealed various records of this species within 1 km of the site boundary. This included Galligill Burn and Hardedge. There were no records for water vole on or near the site.
Alpine pennycress (*Noccaea caerulescens*)	-	✓	-	✓	✓	The desk study noted that this species is local to the site recorded south of Capleclough adit (Nenthead Mine car park – NY780435).

Key to symbols: ✓ = yes, X = no, ? = possibly, see Supporting Comments for further rationale.

Species present on site are those for which recent direct observation or field signs confirmed presence. Species which are possibly present are those for which there is potentially suitable habitat based on the results of the desk study records.

Legally protected species are those listed under Schedules 1,5 and 8 of the Wildlife and Countryside Act 1981 (as amended) and Schedules 2 and 4 of the Conservation of Habitat & Species Regulations 2010 (as amended).

Species of Primary Importance are those listed under Section 41 of the NERC Act. Planning Authorities have a legal duty under Section 40 of the same Act to consider such species when determining planning applications.

Other notable species include native species of conservation concern listed in the LBAP (except species that are also of Principal Importance), those that are Nationally Rare, Scarce or Red Data List and non-native controlled weed species listed under Schedule 9 of the Wildlife and Countryside Act 1981 (as amended).

4.1.4 Previous survey work

In 2015 a Phase 1 Habitat Survey[24] was carried out by AECOM of a field and a stretch of the River Nent northwest of the Horse and Wagon Caravan Park, adjacent to the A689 around 2 km to the northwest of the site. Potential constraints were listed as breeding birds, otter, water vole and white clawed crayfish.

In 2015, a white clawed crayfish and water vole survey[25] was carried out along a stretch of the River Nent between Nenthall Bridge and to the northwest of the Horse and Wagon Caravan Park, again around 2 km to the northwest of the site. No evidence of water vole or white clawed crayfish was found on this stretch of the Nent.

[24] AECOM (2015), 47072599. Nentberry Haggs Phase 1 Habitat Survey. Coal Authority.
[25] AECOM (2015), 47072599. Nentsberry Haggs White clawed crayfish and water vole survey. Coal Authority.

In 2016 a further aquatic survey[26] was carried out along a similar stretch of the River Nent to the white clawed crayfish survey in 2015. The surveys involved River Corridor Surveys (RCS), aquatic macroinvertebrate, otter and water vole surveys, throughout a 1 km stretch of the river between National Grid Reference (NGR) NY 76375 45074 and NGR NY 75880 45767. The results suggested a moderate-to-good quality throughout the stretch surveyed (2 km downstream of the site) and the conservation value was recorded as moderate to high. No evidence of water vole was seen. Evidence of otter was recorded along the stretch with fresh otter spraints being found and possible refuge locations recorded.

Whilst the above surveys are not directly relevant to the site, they give an idea of the species found locally along and within the river downstream of the site.

Various botanical surveys have been carried out on site between 1997 and 2017. These focussed on the mining areas to the south and west of the site (within the redline) and to the north and west outside of the redline boundary. The following description is taken from the OREsome Botanical surveys report found at www.northpennines.org.uk/:

The extensive areas of metalliferous ground support large populations of spring sandwort (Minuartia verna), with occasional alpine pennycress (Noccaea caerulescens), moonwort (Botrychium lunaria), mountain pansy (Viola lutea), pale thread-moss (Bryum pallens), dense fringe-moss (Racomitrium ericoides) and the metallophyte form of green-tufted stubble-moss (Weissia controversa var. densifolia). Wetter areas support large populations of another metallophyte, pyrenean scurvy-grass (Cochlearia pyrenaica), as well as a rich variety of bryophytes. All these are associated with lead mines, and the diversity, condition and extent of the calaminarian communities here make this an important site for conservation.

The lichen interest here is also considerable, and is to be found on stone, metal structures, and on the ground. Terricolous communities form a biotic crust over bare soil that protects it from erosion and allows small bryophytes and plants to establish, and this itself includes species of conservation interest such as Baeomyces placophyllus, Diploschistes muscorum, Leptogium teretiusculum, Micarea cinerea, M. leprosula and M. lignaria, Protpannaria pezizoides and Vezdaea aestivalis. Most important in this community are the lichenicolous fungi Taeniolella rolfii, nationally rare and in Britain known only from five sites all close to Nenthead, and Epilichen scabrosus, which has much of its British population in the North Pennines and is declining rapidly.

Clearly, the site, including the car park area to the west, and the immediately surrounding areas contain important plant and lichen communities.

4.2 Extended Phase 1 Habitat Survey

In summary, as recorded in both 2018 and 2019 surveys, the area of interest comprises calaminarian grassland, acid grassland, heathland, wet flushes and bog, mine spoil mounds (both vegetated and un-vegetated), the River Nent and wet ditches. The location of the site is shown in Figure 1. The original Phase 1 Habitat Map is included as Figure 2a (to show the area surveyed) and the updated Phase 1 Habitat Map with the increased area within the redline boundary is shown in Figure 2b. Details of target notes (TN) are found in Appendix B and site photographs are found in Appendix C.

4.2.1 Acid Grassland

There were various areas across the site that had acid grassland present (e.g. Photographs 1 and 2), which were interspersed with the other habitats found. There was a large mound to the southeast, which then graded into further grassland areas across the site. Species recorded in the grassland areas included sheep's fescue *Festuca ovina*, red fescue *Festuca rubra*, common bent *Agrostis capillaris*, wavy hair grass *Deschampsia flexuosa*, purple moor grass *Molinia caerulea*, heath bedstraw *Galium saxatile*, heath milkwort *Polygala serpylifolia*, heath woodrush *Luzula multiflora* and the moss *Polytrichum* sp. (forms large tufts is some areas – see Photograph 3).

4.2.2 Calaminarian community

The main area showing a heavy metal influence and therefore providing habitat for the Calaminarian community type was to the west, north-northwest and south-southwest of the site (see Photograph 4), although there were some open areas and representative species on the mound to the southeast (Photograph 1). Species recorded in these areas included spring sandwort *Sabulina verna*, alpine pennycress *Noccaea caerulescens*, mountain pansy

[26] AECOM (2016), 47072599. Nentsberry Haggs, Cumbria: Check Weirs Ecology Survey. Coal Authority.

Viola lutea, pyrenean scurvy grass *Cochleria pyrenaica*, bird's foot trefoil *Lotus corniculatus*, sheep's fescue, mouse-ear hawkweed *Pilosella officinarum* agg. and a rich moss and lichen flora.

4.2.3 Wet grassland/mire

There were areas of damper communities, which varied in terms of species and community type. In some areas it was grassland with species such as heath rush *Juncus squarrosus*, common sedge *Carex nigra*, marsh thistle *Cirsium palustre*, a horsetail *Equisetum* sp. alongside species such as red fescue, sweet vernal grass *Anthoxanthum odoratum*, wavy hair grass, heath milkwort and heath woodrush (Photograph 5); other areas with marshy species present included along the ditches to the centre and south of the site (Photographs 6 and 7) with species such as marsh thistle, star sedge *Carex echinata*, other sedges *Carex* spp., bog stitchwort *Stellaria uliginosa*, soft rush *Juncus effusus*, purple moor grass, floating sweet grass *Glyceria fluitans*, a willowherb *Epilobium* sp., and tufts of *Polytrichum* sp. present; in addition there was a more dominant area of soft rush to the southeast (Photograph 8) and further there were other areas that had bog mosses *Sphagnum* spp. present to the north and centre west (Photograph 9) alongside species such as ling *Calluna vulgaris* and cotton grass *Eriophorum* sp.

4.2.4 Semi-improved neutral grassland

There were several areas of semi-improved neutral grassland towards the west of the site. The eastern bank above the car park to the west of the site was dominated by moss species and grasses such as Yorkshire fog *Holcus lanatus*. Again, to the west and on the banks of the River Nent below the car park was grassland, which had a good moss flora along with species such as sheep's fescue, red fescue, cocksfoot *Dactylis glomerata*, common bent, tufted hair grass *Deschampsia cespitosa*, rosebay willowherb *Chamaenerion angustifolium*, selfheal *Prunella vulgaris*, ling, daisy *Bellis perennis*, soft rush and common mouse ear *Cerastium fontanum*.

There was also sheep and horse grazed fields to the northwest, behind Hilltop Cottages, which had common bent, meadow grasses, red fescue, field woodrush present although these are outside the redline boundary and unaffected by the scheme, they were accessed during pond assessments.

4.2.5 Heathland

There were various areas of heathland dominated communities (e.g. Photograph 10) with ling being the dominant species with occasional cross-leaved heath *Erica tetralix* and other species such as heath rush, heath bedstraw, bilberry *Vaccinium myrtillus*, wavy hair grass, sheep's fescue, heath woodrush and patches of lichen.

4.2.6 Bare ground/sparse vegetation

Given the nature of the area there were various sections with bare ground or just a sparse vegetation present (Photograph 11). These areas were particularly prevalent to the west of the site and around the old mining infrastructure and buildings.

4.2.7 Ponds

There were nine ponds recorded on or local to the site (see Figure 2). Six of the ponds (1, 2, 4, 6, 7 and 9) had aquatic vegetation present such as horsetails, rushes *Juncus* spp. and broadleaved pondweed *Potamogeton natans* (for examples see Photographs 12-14). Pond 3 was devoid of vegetation (see Photograph 15). In addition, there was a disused reservoir (recorded as Pond 5 for the purposes of the report) adjacent to the west and south of the study area, which had some occasional aquatic species but little marginal vegetation except near the outfall where there was a gradation into a marsh community to the southern end with species such as soft rush, a water starwort *Callitriche* sp., cuckoo flower *Cardamine pratensis* and horsetail present.

4.2.8 Running water

There were four main ditches on the site, with one running from the east into the reservoir (see Photograph 7), which had dense vegetation within it and along its length with species such as marsh thistle, sedges and floating sweet grass present (see above also). There were two at the northern end of the reservoir, one running north and the other running southeast from the reservoir. The ditch running southeast had quite rocky substrate and grassland edges with again species such as soft rush found along with New Zealand willowherb *Epilobium brunnescens* and a pearlwort *Sagina* sp. found on some of the stony edges (see Photograph 16). The ditch coming to the reservoir from the north was not open but was covered in places, although a line of rush was noted

in places. There was also a ditch leaving the reservoir to the south, which again was covered in places but also had rush species present.

There were other shallow strips, which formed seemingly wet ground again falling towards the reservoir from the eastern field, were damp grassland and potentially would hold water as drains during wet periods but no obvious ditch was present.

The River Nent runs along the south and southwest boundary of the site. Much of the river is just outside the redline boundary, although a stretch of the river to the west does come into the redline, towards and including the location of the Capelcleugh adit. The river had a stony substrate and was shallow and relatively fast flowing, with very little aquatic vegetation being seen. The side of the river were often very rocky, with sparse vegetation (Photograph 17) and towards the west stretch the northern bank was a wall. Where vegetation existed on the banks (to the west) it tended to be semi-improved acid grassland/heath mosaic.

The River ran through a culvert at the western boundary of the site, which was brick lined (Photograph 18). Local to this area (at the western end), the River Nent previously had a sheer bank, which was a nesting site for sand martin. This embankment was subject to a bank stabilisation project in 2018. The embankment was graded and netted, and gabions were placed on the river edge. A new sand martin 'wall' was put in place as part of the works to encourage them to continue to nest in the area (see Photograph 19).

4.2.9 Woodland

There were several discreet areas of mixed woodland towards the west of the site around the car park area. There was a band of planted trees above the River Nent and to the west of the car park area. Trees included pines and spruce, larch *Larix decidua*, silver birch *Betula pendula*, alder *Alnus glutinosa* and poplar species *Populus* sp. There was grass and moss in the ground flora. They appeared quite young (10-15 years) although there was a lot of lichen on the trees.

To the east of the car park on the top of the bank was predominantly broadleaved species including birch and oak *Quercus* sp, beyond which and to the south became more mixed plantation again.

4.3 Species

4.3.1 Amphibians

There are nine waterbodies on or within 100m of the site. There were opportunities for areas such as rocky substrate, dry stone walls, shrubs and rough grassland that would offer refuge or hibernation features for amphibians, although the site in general was very open. Palmate newts *Lissotriton helveticus* were seen in Pond 7 during the 2019 survey.

There are no desk study records for great crested newts in the locality.

Habitat Suitability Index

A habitat suitability index assessment was completed for the waterbodies recorded on the survey as follows (see Appendix D for the table of full results):

- Pond 1 was poor
- Pond 2 was below average
- Pond 3 was below average
- Pond 4 was average
- Pond 5 (reservoir) was poor
- Pond 6 was Good
- Pond 7 was Excellent
- Pond 8 was no longer a pond (it was dry and full of rush/grasses)
- Pond 9 was Average

Presence/Absence Surveys – eDNA Survey

The water samples taken from Ponds 2-5 (Pond 1 was dry) in spring 2018 and from Ponds 6, 7 and 9 (Pond 8 was no longer a pond) in 2019 all returned probable absence of great crested newts (see Appendix E for results).

4.3.2 Breeding Birds (Upland Wader Survey - 2018)

Overview

The area surveyed (original site and adjacent areas) had relatively good numbers of ground nesting waders encountered over the three visits. There was evidence of probable breeding behaviour from two pairs of curlews *Numenius arquata* and one common sandpiper *Actitis hypoleucos*. Both species were close to, but not on the site, (see Figure 3 for locations of territories). Other birds likely to be nesting in the vicinity included grey wagtail, likely outside the site boundary and red grouse and meadow pipit within the site boundary.

Curlew

On Visit 1, curlews were heard singing and alarm calling in the west field. One curlew was seen flying over the site towards the west outside the site. Curlews were present in good numbers in the vicinity and there was abundant suitable habitat present for the birds in the wider area. There was evidence of breeding behaviour from the frequency of the alarm calling which lasted throughout the duration of the survey. No further curlews were seen or heard during Visits 2 and 3.

The survey suggests a category of probable breeding.

Lapwing

One lapwing was observed flying over the site during Visit 2. This bird was neither calling nor displaying agitated behaviour. There was no evidence of nesting within the site. No lapwings were observed within the site or adjacent to the site during any of the visits.

Oystercatcher

An oystercatcher was feeding along the margin of the reservoir during Visit 1. This bird did not alarm call. During Visit 2 there was two oystercatchers alarm calling in the west field outside the site boundary. No further birds were seen or heard during the final visit. Three birds were encountered across all three visits. Oystercatcher is known to be an early breeding species and may have been unaffected by the suggested late start to the breeding season. This may account for the low numbers of birds, particularly since this habitat is highly suitable for this species

The surveys suggest probable breeding for oystercatcher in the site.

Snipe

No evidence of breeding. There were no sightings of snipe *Gallinago gallinago* within or adjacent to the site across the three visits.

Redshank

No evidence of breeding. There were no sightings of redshank *Tringa tetanus* within or adjacent to the site across the three visits.

Common Sandpiper

During Visit 1, a common sandpiper was observed feeding along the margin of the reservoir and within the rock formed bank of the reservoir. There was no agitated behaviour during this visit. During Visit 2 a common sandpiper was noted in the same location, however during this visit there was continuous and distinct agitated calling ongoing until the survey ended.

The surveys suggest probable breeding for common sandpiper in the site.

Notable Observations

During Visits 1 and 2, a grey wagtail *Motacilla cinerea* was observed feeding in the margin of the reservoir which then flew across the River Nent. There is suitable nesting habitat for grey wagtail in the area which may suggest breeding, albeit outside of the site boundary. Skylarks *Alauda arvensis* were heard within the vicinity during Visit 1. Meadow pipits *Anthus pratensis* were heard during all visits and during Visit 3, a bird was observed carrying food, indicating young nearby. During all three visits red grouse *Lagopus lagopus* were observed; three birds were disturbed when carrying out the survey during Visit 1, two during Visit 2 and seven during Visit 3. The birds disturbed during the final visit were in two groups and included juveniles, indicating that breeding took place on site. Sand martins *Riparia riparia* which are known to nest nearby were observed during all visits; the greatest count was seven birds during Visit 2. A little grebe *Tachybaptus ruficollis* was observed feeding on the reservoir during Visit 3.

There were black headed gulls *Chroicocephalus ridibundus* present during all visits. During Visit 1 there were two black headed gulls on the reservoir and two flying over the site towards the west. On Visit 2 there were five black headed gulls, including one juvenile and two herring gulls *Larus argentatus* on the reservoir. An adult and a juvenile black headed gull were noted flying over the site to the west. During Visit 3, seven juveniles and one adult black headed gull were found dead scattered around the perimeter of the reservoir. There were no other gulls observed during this visit.

Notable flyovers during the surveys include merlin *Falco columbarius*, kestrel *Falco tinnunculus*, Buzzard *(Buteo buteo).*

Table 7 below provides a summary of the surveys.

Table 7: Summary of Sighting and Activity at each Survey Visit

Common Name & BTO Code	Conservation status	Observations			Nesting Pairs
		7th June 2018	26th June 2018	20th July 2018	
Curlew (CU)	Species of Principal Importance (SPI) & Red List[27]	Individuals heard within area east of the reservoir, but not within site boundary – constant alarm calling once field entered Flyover from single bird	Individuals heard within east area but not within site boundary	None	x2 possible
Lapwing (L.)	SPI & Red List	None	Flyover from single bird	None	None
Oystercatcher (OC)	Amber List	Single bird feeding along the margin of the reservoir. No breeding behaviour.	Two birds calling from the west of the site.	None	None
Snipe (SN)	Amber List	None	None	None	None
Redshank (RK)	Amber List	None	None	None	None
Common Sandpiper (CS)	Amber List	Single bird feeding along the margin of the reservoir. No breeding behaviour.	Single bird in the same location as Visit 1 displaying agitated behaviour.	None	x1 possible

4.3.3 Water Vole

The River Nent has potential for use by water vole. In addition, there are ditches on site that may offer habitat to water voles.

The main ditch on site runs from east to west running into the reservoir, which contained shallow water in some sections and was dry in others. The ditch was very narrow and contained a lot of vegetation. No evidence of water vole was seen during the survey and the ditch was considered to have low potential to support water vole.

[27] Aebischer, M. A. et al. (2015) Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108, 708-746

The ditch that exits the reservoir to the north and runs southwest (towards the River Nent) had a combination of a rocky substrate, and shallow bank with grassy vegetation and indicated a low suitability for water voles in the area surveyed. In addition, other ditches checked on site were very shallow and full of vegetation and were not considered particularly suitable for water vole or as potential for otter holts.

No evidence of water vole was recorded during any of the surveys, although there are records from the wider area.

4.3.4 Otter

There was no suitable habitat offering potential for the presence of an otter holt on the site, although there are tunnels and adits that have the potential to be utilised by otter local to the scheme boundary, although again no evidence of otter was seen around the adits/tunnels.

There are records for otter in the wider landscape, although none near the works. In addition, through correspondence with the Environment Agency (EA), details of a record of an otter spraint, along the old flue to the east of the site (NY 79244 42949), was communicated to the Coal Authority (see TN2, Figure 2). The area was visited, which is outside the redline boundary (approximately 250 m from the nearest point), by an ecologist but no spraints or footprints were found. The evidence may have been washed away or become desiccated, suggesting it was just transient use by an otter moving around the area.

4.3.5 National Vegetation Classification Survey (2018)

The original (2018) Phase 1 Habitat Survey (above) identified several habitats on site, which included a Calaminarian community and acid grassland. The key habitats identified for further survey were the areas of acid grassland, heathland and mire. Other habitats such as the stands of soft rush, the ponds/reservoir and areas of running water were not surveyed, these are common in the area and/or of lower conservation value. Whilst of high conservation value, the Calaminarian community was not surveyed; the best time to survey this community is in May, as several of the key and notable species of this community are spring annuals that flower and set seed early and so are not visible later in the year. However, it was considered that enough data was collected during the Phase 1 Survey to confirm this as a Calaminarian community and sufficient on which to base an assessment.

Figure 4 shows an indicative map of the area and habitats surveyed and the location of the quadrats taken. Appendix F is a table of the results for each quadrat recorded. Appendix G gives the Twinspan group results and the best fit NVC communities.

Stands of acid grassland, areas of heathland (*Calluna vulgaris* dominated) and areas of mire (more obvious areas with Sphagnum moss) were noted and 2x2m quadrats were taken where it was considered the vegetation was homogenous. Five quadrats were taken in the grassland and areas with more dominant heather and three quadrats were taken in areas where Sphagnum was more obvious. Only three were taken in the areas that were clearly Sphagnum dominated as it appeared the ‘mire’ community was degrading and was transitional to the more acid grassland/heath communities (see below); other quadrats did contain Sphagnum. The quadrats were taken in the northwest, north and central areas of the site. Whilst the southern areas were walked, no further quadrats were taken as the vegetation appeared to be the same as previously surveyed areas.

Twinspan data analysis and TABLEFIT assessment

Three groups were identified from the TWINSPAN analysis of the data collected as follows. These were tabulated and run through TABLEFIT (percentage ‘fit’ given below to best fit community type) and were then checked with the community descriptions and tables.

Group 1

Appendix G summarises the data from Group 1 (Quadrats 1, 2, 6 & 7) showing the quadrat number, species and their constancy.

The quadrats forming Group 1 had a 60% fit to the U5 acid grassland (*Nardus stricta-Galium saxatile* grassland) with the U5b sub-community being the best fit.

Group 2

Appendix G summarises the data from Group 2 (Quadrats 3, 4, 5, 8, 11 & 13) showing the quadrat number, species and their constancy.

Group 2 was not a good fit with any NVC community type, although TABLEFIT suggested U5b (55% (poor) fit), U6c (*Juncus squarrosus-Festuca ovina* grassland) (53% (poor) fit) and/or M18c (*Erica tetralix-Sphagnum papillosum* raised and blanket mire) (52% (poor) fit). The analysis again suggests an acid grassland community, with the possibility of a mire community, as the group includes sphagnum species, *Polytrichum commune*, *Calluna vulgaris*, *Eriophorum vaginatum*, *Vaccinium myrtillus* and *Empetrum nigrum*.

Group 3

Appendix G summarises the data from Group 3 (Quadrats (9, 10 & 12) showing the quadrat number, species and their constancy.

Group 3 was identified using TABLEFIT as having a 78% fit to the acid grassland U5b sub-community. In addition, the U4d (*Festuca ovina-Agrostis capillaris* grassland) acid grassland sub-community had a 67% fit.

NVC Community Assessment

The Phase 1 Habitat Survey identified the potential for acid grassland, heathland and mire to be present in the areas subject to more detailed vegetation assessment. It appears from the analysis that the site has an affinity to the U5 acid grassland NVC type with potential for M18 mire, but no specific heathland communities were identified. The following is an assessment of the vegetation types originally identified, given both the analysis along with consideration of the keys and community descriptions in the relevant NVC volumes.

Acid Grassland

The acid grassland had a mix of grasses with *Festuca rubra*, *Nardus stricta*, *Festuca ovina* and *Anthoxanthum odoratum* being the constant species and *Nardus stricta* and *Festuca rubra* having the highest cover of these grasses; these are accompanied by other typical acid grassland grasses and herbs (including *Deschampsia flexuosa*, *Galium saxatile* and *Potentilla erecta*). In addition, species typical of acid conditions such as *Juncus squarrosus* and *Calluna vulgaris*, which are constant species in Groups 1 and 2.

The frequency and cover of *Nardus stricta* suggests a community around U5 type with other frequent species of *Festuca ovina*, *Galium saxatile*, *Vaccinium myrtillus* and *Juncus squarrosus* alongside occasional *Calluna vulgaris* for example. However, the ubiquity of *Juncus squarrosus* in the sward suggests the U6 community type. This separation has been noted as a problematic issue in terms of diagnostics and it is sometimes hard to distinguish between the U5 and U6 communities[28]. In addition, over grazing can contribute to increased levels of *Juncus squarrosus* within a U5 community.

In terms of the U5 community, the species composition suggests most affinity with U5b or U5c, with the presence of *Juncus squarrosus* frequent alongside *Rhytidiadelphus squarrosus* and *Luzula multiflora*. The presence of *Cirsium palustre* and the moss *Calliergonella cuspidatum* suggest U5c although a clear sub-community is not apparent.

As mentioned *Festuca rubra* is a constant in the grassland surveyed; often with high relative cover values, which conforms less to the U5/U6 communities. It is not a species considered part of the U6 community and whilst present in U5 communities, it is never considered to be dominant with a low constancy and low cover (I and 1-4 respectively). It is more commonly associated with U4 sub-communities or as a sign of transition into other communities. This may be due to under-recording or a reflection of the mosaic nature of the site; in fact, some of the areas were likely to be transitional towards the Calaminarian areas given the presence of *Linum catharticum, Euphrasia officinalis* agg. and *Thymus praecox*. Although *Thymus praecox* and *Euphrasia officinalis* agg. are also species found in low abundance in U4 communities.

Overall, it is considered that U5 (U5b most likely) was the predominant grassland type across the site although this is likely to be transitional with other community types such as U6, U4 and potentially OV37 (*Festuca ovina-Minuartia verna* community and see below).

[28] Rodwell, J.S. (Ed.) (1992). *British Plant Communities. Volume 3 – Grasslands and montane communities*. Cambridge University Press, Cambridge.

Heathland

The areas identified as heather dominated, whilst seemingly obvious given the constancy and cover of *Calluna vulgaris* (heather) were quite patchy across the site and tended to be in a mosaic with the grassland communities and given the constancy again of *Juncus squarrosus*, alongside *Nardus stricta* tends to suggest the U5/U6 acid grassland community, in either transition to heathland (reduction in grazing) or from heathland (increase in grazing). This is reflected in the fact that TABLEFIT did not identify a heathland community.

However, the presence of *Vaccinium myrtillus*, *Deschampsia flexuosa*, *Cladonia impexa* and *Festuca ovina* suggests that these vegetation patches retain affinity to heathland communities such as H12 (*Calluna vulgaris-Vaccinium myrtillus* heath) that can include *Juncus squarrosus* and *Nardus stricta* in varying degrees within the different sub-communities. In addition, H10 (*Calluna vulgaris-Erica cinerea* heath) and specifically the H10b sub-community can contain species such as *Racomitrum lanuginosum* alongside *Juncus squarrosus* and *Vaccinium myrtillus* as seen on the site.

Whilst clearly heather dominated, the range and type of species recorded make these areas difficult to assign a clear community type and forms part of a transitional mosaic of acid grassland/heath communities.

Mire

The areas of sphagnum noted were relatively small and only three quadrats were taken in obvious stands of sphagnum, although sphagnum was present in other heath/grass quadrats. The species of note are *Sphagnum magellanicum* and *Eriophorum vaginatum* as peat forming species; however, the areas were relatively dry and some of the Sphagnum was degrading.

It is likely that the areas of sphagnum on site are transitional to grassland/heath communities and given their restricted size and the limited data collected, it is difficult to place them within a specific mire community. Whilst sphagnum was quite common in patches across the wider site, it is unlikely that it would be mire but rather acid grassland with patches of Sphagnum. Whilst the data is limited, given the presence of *Sphagnum magellanicum* alongside *Eriophorum vaginatum* along with *Calluna vulgaris* and *Rytidiadelphus squarrosus*, it suggests that the small areas identified have affinities to M17 (*Scirpus cespitosus-Eriophorum vaginatum* blanket mire), M18 (as suggested by TABLEFIT) or M19 (*Calluna vulgaris-Eriophorum vaginatum* blanket mire).

Quadrats 4 and 5 (in Group 2) also contained *Sphagnum magellanicum* but these areas had the appearance of heath/grass and on mineral soil, suggesting that the communities here are more aligned with a grassland/heath mosaic containing patches of Sphagnum.

Calaminarian Community

The areas of Calaminarian grassland were not subject to further detailed assessment but enough data was collected previously to identify the habitat. These are essentially open-structured plant communities, which are composed of ruderal/metallophyte species of lichens, bryophytes and vascular plants, such as *Sabulina verna* and *Noccaea caerulescens*.

In terms of NVC, the community is generally regarded as OV37. The more open areas, which did grade into damper areas and into the acid grassland, contained both *Sabulina verna* and *Noccaea caerulescens* along with *Festuca ovina*, *Linum catharticum*, *Pilosella officinarum* agg. and *Lotus corniculatus*, all of which are part of the OV37 community.

Summary

Overall the grassland, mire and heath communities tend to form intergrades and mosaics with no discernible boundaries in most cases. This has made separation into distinct community types difficult, as many species are present across areas that appear homogeneous.

Based on the habitat plan and the data collected it should be considered that the vegetation on the Site is acid grassland in mosaic with patches of varying degrees of heather dominance and Sphagnum presence. The best fit community type for the Site appears to be U5b as the dominant community, but with possible small patches in mosaic of M18, H10b communities.

All the above communities are generally common in the uplands and in the case of U5 almost ubiquitous where grazing has reduced and eliminated heather cover. The small areas of mire with *Eriophorum vaginatum* and

Sphagnum magellanicum is a very small example of the blanket bog community that covers large expanses of the Pennines.

In terms of mapping the site is recorded as acid grassland with a mosaic of heathland and mire represented in patches across the site which is shown on Figure 4.

4.3.6 Reptiles (2019)

No reptiles were recorded during the survey. Table 8 gives a summary the survey visits, including dates and summary weather conditions. Only adult toads were recorded on four occasions.

Survey	Date	Weather/Temps	Notes
1	18/04/2019	Overcast and occasional sunny spells, 6°C overnight and 14°C during the survey	Weather conditions changed from several weeks of cold and unsuitable weather to warmer temperatures a few days before the survey started.
2	1/5/2019	Cloudy with occasional light rain 7°C overnight and 10°C during the survey	No rain during the survey
3	13/05/2019	Sunny and clear 5°C overnight and 13°C during the survey (max of 14°C during the day)	
4	16/05/2019	Sun and cloud 7°C overnight and 12°C during the survey (max of 13°C during the day)	
5	20/05/2019	Sun and cloud 7°C overnight and 11°C during the survey (max of 13°C during the day)	
6	23/05/2019	Sun and cloud; 6°C overnight and 12°C during the survey (max of 13°C during the day)	
7	2/7/2019	Sun and cloud; 8°C overnight and 15°C during the survey (max of 17°C during the day)	Survey day warm with sunny periods. The previous weeks through June the weather had not been ideal for reptile surveys, with either temperatures being too low or there was rain, hence the gap between the 6th and 7th surveys.

4.3.7 Bats

There were no trees offering bat roost potential within the site. No buildings will be impacted by the works and given the nature of the works no further survey works are required

There was a tunnel/culvert leaving to the north of the reservoir; however, this was quite short in length and exposed which would reduce its potential to negligible for use as roosting, particularly for hibernation due to temperature fluctuations and winter weather conditions.

The culvert of the River Nent at the western edge of the site appeared to have a potential for bat use but access to examine the brick culvert was not possible on the day of the survey. However, there will be no impact on or near the culvert and it is not considered further.

Capelcleugh Adit (TN1 and Photograph 20) and a second adit in the woodland to the west were brick lined with gaps and voids, offering potential for roosting bats and was considered to have Moderate potential for a bat roost to be present. Following discussion with representatives of the mine museum it was ascertained that a bat roost is known in the adit within the woodland to the west, in the location of Pond 7, which is monitored by a local bat group. It is unclear whether Capelcleugh Adit has a known roost. The bat group were contacted for further information, but no response has been received to date.

Most of the land within the site comprises grassland and heathland, habitats which are not typically associated with high levels of bat activity where there is no shelter afforded by woodland or hedgerows and generally low value for foraging. However, the reservoir and local watercourses provide foraging areas and commuting routes and bat activity may occur in these areas during peak season. However, given the open nature of the wider area, only low levels of activity would be expected and bats that may be roosting in Nenthead are more likely to use the sheltered habitats along the Nent corridor in the valley.

4.3.8 Other fauna

No evidence of badger activity or setts was observed within or adjacent to the site. There is potential for the site to support foraging activity but no signs were found.

There are records for red squirrel local to and near the site. However, there is no red squirrel habitat on or adjacent to the site but they could be present in the conifer plantation to the southwest and they may utilise other areas of woodland in the wider landscape.

There is potential that hedgehog *Erinaceus europaeus* and brown hare *Lepus lepus* would be found local to the site as there was suitable habitat.

The site itself could support a notable invertebrate fauna, given the heathland and open/bare ground habitat both on and local to the site. In addition, areas of wetland habitat offer further potential for invertebrate diversity.

Fish and aquatic invertebrates will utilise the river and there is anecdotal evidence of use of the reservoir by brown trout. White clawed crayfish are not known in the local or wider area.

5. Summary of potential constraints

5.1 Designated Sites

5.1.1 Tyne and Nent Special Area of Conservation (SAC)

The grassland type for which the SAC is designated relies on periodic inundation with sediments containing high concentrations of metals such as lead, cadmium and zinc to allow the metallophyte flora to out-compete other species. Since these metallophytes rely on metal rich sediments being deposited, it is unclear whether mine water treatment (which only removes dissolved rather than particulate metals) will affect this habitat.

At its nearest, the site is around 1.2 km to the east of the Tyne and Nent SAC (at Whitesike and Flinty Fell SSSI Unit 4), although the watercourses associated with this area flow into the River Nent so no effect in this part of the SAC is foreseen. The next nearest part of the SAC lies approximately 2.7km to the north west (at Nent Haggs SSSI); this lies off-line from the River Nent and no effect on this part of the SAC is foreseen. Blagill SSSI, forming part of the SAC lies 5.2 km downstream to the northwest and receives silts and water from the River Nent and so could be affected by the proposed scheme.

An Appropriate Assessment (Habitats Directive) was completed by the Environment Agency in 2014[20] to assess the potential impacts of several schemes including this site proposed to remediate the severe metal pollution of rivers in the South Tyne catchment. This assessment concluded that "*with the planned mitigation package, including the perturbation of the substrate*", the proposed schemes to decrease metals entering the rivers "*will not adversely affect the integrity of the Tyne & Nent SAC and/or the Tyne & Allen River Gravels SAC*". Furthermore, the HRA stated:

"Natural England's (NE) advice is that the potential impacts of reduced heavy metal concentrations can be mitigated by perturbation of the substrate to bring soils still rich in heavy metals to the surface. Although previous discussions have revolved around different types of management e.g. turf stripping, scrub clearance and addition of metal rich spoil from elsewhere NE has advised that perturbation of substrate would not form part of the ordinary management planned for the sites and can directly address the potential impacts of mine water remediation. To that extent perturbation is legitimate mitigation for the purposes of the Habitats Directive."

Thus, the effects of the proposed scheme have been accounted for in the overall assessment and the agreed mitigation is enough for any effects of this proposed scheme.

5.1.2 North Pennine Moors Special Protection Area

The North Pennine Moors Special Protection Area (SPA) is approximately 1.2 km to the north of the proposed development area. However, no impacts are foreseen on the population status of the bird species for which the SPA is designated due to the fact there will be no impact on the SPA itself and given the distance and overall

small footprint of the works in the context of the wider landscape, the site is unlikely to provide functional habitat for the species for which the SPA is designated.

5.1.3 Haggs Bank SSSI

Haggs Bank SSSI (part of the Tyne and Nent SAC) has been discussed above under Section 5.1.1.

5.1.4 Small Cleugh Mine SSSI

Small Cleugh Mine SSSI is adjacent to the south of the site. However, the SSSI itself is designated for geological reasons, which is outside the scope of this report.

5.1.5 Allendale Moors SSSI

Allendale Moors SSSI (part of the North Pennine Moors SPA) has been discussed above with respect to the bird populations. It lies upstream of and on a different catchment area to the River Nent and the streams that feed it and so no effect on the vegetation for which the SSSI is designated is anticipated from the proposed development.

5.1.6 Whitesike Mine and Flinty Fell SSSI

Whitesike Mine and Flinty Fell SSSI (part of the Tyne and Nent SAC) has been discussed above under Section 5.1.1.

5.2 Habitats

The site was, in general, a mosaic of heath and acid grassland, which also graded into mire to the north and southwest and open/ephemeral metalliferous communities above the reservoir in the north and west; Figure 2b shows indicative habitat boundaries and Figure 4 indicates habitat types under the NVC of certain areas of the site (Figure 2a and Figure 5). Figure 5 shows an indicative development area, although this is outline at the present time and was used in terms of the original (2018) redline.

5.2.1 Acid Grassland

The acid grassland areas appeared to be good quality acid grassland with various indicator species such as heath bedstraw and heath woodrush with acid grass species such as wavy hair grass. The grassland grades into heath, open communities and mire across the site and is considered that the grassland best fits the U5b community.

The current design shows that grassland areas would be lost to the development The U5 grassland type in itself is not a Habitat of Principal Importance (under S41 of the NERC Act); however, whilst not one of the defining grassland types (CG10 & CG11), species rich variants of U5 are included within the habitat definition of the Annex 1(Habitats Directive 1992; The Habitats Regulations 2018 Habitat 6230 Species-rich Nardus grassland, on siliceous substrates in mountain areas (and sub-mountain areas in continental Europe).

The grassland on site is the more typical species -poor U5 and whilst it does contain several of the species associated with the more species rich variant, it does not qualify. In addition, there are extensive areas of similar habitat in the wider landscape and with habitat management or creation as part of a mitigation package any loss of this grassland is not considered to be a significant constraint.

5.2.2 Heath

The heath community was, like the acid grassland, found across the central part of the site to the east of the reservoir, with patches amongst grassland and mire in the north and west. In general, these areas appeared to be good quality heathland dominated by heather along with species such as bilberry. However, the more detailed assessment has shown that the heathland vegetation is more transitional towards the U5 acid grassland type. This is often brought about through grazing pressure, which if too high reduces the ericoid component at the expense of the acid grassland.

These areas may be lost to the development, however, like the grassland, there are extensive areas of similar habitat in the wider landscape and any loss of heather/acid grassland on site is not considered to be a significant constraint.

5.2.3 Mire

There were several small areas of mire community across the site with an area with *Sphagnum* hummocks in the north and to the east of the reservoir towards the south of the main proposed development area. There were also patches of rush dominated ground to the north and south and along ditches across the site. However, some of the *Sphagnum* areas appeared to be drying and may be becoming replaced by acid grass/heath. The closest community type was M18 (a typical blanket bog community), which is a Habitat of Principal Importance type, but the very limited extent and transitional nature of the community on the site suggests that it is not of the quality to be considered priority habitat.

These small areas would be impacted by the proposed development, however, like the heath and grassland and as discussed above these areas would not be considered a significant constraint given the limited extent and extensive areas of similar habitat in the wider landscape.

5.2.4 Calaminarian community

The main areas showing a calaminarian influence were to the west, south and north of the reservoir, particularly towards the old mine workings. These were more of an open ephemeral nature rather than a closed grassland community and highly influenced by the heavy metal content of the spoil form the old mine workings. This is a rare plant community (OV37; Annex 1 Habitat 6130 Calaminarian grasslands of the *Violetalia calaminariae*) and is in part the reason for designation of several of the nature conservation sites local to the proposed development area; whilst the development may impact on the community to a certain extent, most of this habitat lies outside the project footprint; it is recommended that this community along with acid grassland should be the focus of habitat creation/management as part of the scheme.

5.2.5 Ponds

There were nine ponds on or local to the site; none of these would be lost to the development. However, a headwall may need to be constructed on the reservoir (P5) to allow the diversion of a ditch that would be lost to the proposed scheme. The reservoir is thought to support a population of brown trout and the EA have commented that, as the reservoir may be providing spawning and nursery habitat for these fish, the design and construction of the treatment scheme should avoid affecting affect the watercourses feeding the reservoir.

The construction of the headwall would be localised on the bank of the reservoir and there are no proposals to change the quality or quantity of input into the reservoir just the location. This being the case, it is expected that there would be no effect on the fish present or their ability to breed.

5.2.6 Watercourses

There were four ditches across the site either running to or from the reservoir. There was some botanical interest, but this is of only of local importance. At least one of the ditches would need to be diverted, although the habitat would be maintained during and beyond the development (see 5.2.5 above).

The River Nent would not be impacted directly by the works. There are no proposed in-water works or direct impacts to the riverbank. However, the EA consider that potential periods of reduced flows and temperature changes could potentially affect brown trout populations within the River Nent as a result of the treatment process and change in the current discharge location. Thus, this and potential impacts on aquatic species present within the reservoir should also be investigated and assessed and further aquatic surveys of the River Nent are recommended.

5.3 Species

5.3.1 Amphibians

The ponds local to the site may hold breeding populations of amphibians and the walls and disturbed ground offer refuge and hibernating areas. Great crested newts have been confirmed as absent but common species such as frogs, toads and palmate newt present. However, the ponds are not affected by the works and further

wetland areas (a reedbed) would be created as part of the development providing additional habitat for such species.

5.3.2 Breeding birds

The upland wader survey recorded possible breeding of curlew and common sandpiper on site. However, the loss of the areas of the generally small areas of heath, acid grassland and mire to the proposed development within what is a landscape comprising extensive similar habitat, is unlikely to affect the local population of these species; curlew was noted on the main central eastern area of heath and grassland and the sandpiper was recorded local to the reservoir but within the current location for the proposed development.

However, all birds receive protection whilst nesting or attempting to nest under the Wildlife & Countryside Act 1981 (as amended) and so vegetation clearance and soil stripping should, wherever possible, be undertaken between 1st October and end February, i.e. outside of the main bird nesting season.

If works are required to be carried out within the bird nesting season, a nesting bird check of the site would be required prior to works starting. If a nesting bird was recorded within the development footprint, then works would not be able to proceed until the young had fledged.

5.3.3 Riparian Mammals (water vole and otter)

Evidence of water voles and otters has been recorded within 1.5km of the site (site search and previous surveys of the River Nent). However, no evidence of water voles was seen during the surveys undertaken, and it appeared that the substrate would be generally unsuitable and concluded that water voles are not present in the site currently. However, the species is mobile and could colonise from connected habitat along one of the other feeder streams. As such, it is recommended that where sections of ditch or river are lost or disturbed to the proposed scheme, they are checked again prior to commencement.

Otters use the River Nent for movement; spraints and prints have been noted and there are records from the locality. There appeared to be little potential for laying up areas or a holt in the locality of the site, but they may utilise the ditches and reservoir in the site for foraging and/or commuting. Although there is anecdotal evidence that otters utilise the adits on site, no evidence that a holt was present in these locations was found. Works would be undertaken during the day and otters would be moving along the river at night and so provided standard measures are taken to avoid leaving open excavations overnight or provide a means of egress and included in a project Construction Environmental Management Plan (CEMP), no impacts on the local otter population are foreseen.

5.3.4 Reptiles

Given the range of habitats such as heathland and open communities, there is potential that reptiles such as adder and common lizard could be present on site but there are no local records for these species and the survey undertaken did not record any reptiles. If reptiles are present, they would be in small numbers and low density given the amount of suitable habitat within and beyond the site and as such significant populations would not be expected within the site.

However, all common species receive protection from deliberate harm under Schedule 5 of the Wildlife & Countryside Act 1981 (as amended) and the proposals would result in loss of suitable reptile habitat ad reptiles are highly mobile. Thus, standard measures to avoid harming reptiles would be included within a CEMP. This would be simply managing the habitat to be affected to be unsuitable for reptiles and leaving a few days for ay reptiles present to move into wider unaffected habitat outside the site.

5.3.5 Bats

There are no trees or buildings within or immediately adjacent to the site. A tunnel/culvert has been recorded on the northern section of the reservoir and there is also a record of a bat roost local to the site in an adit near to the Capelcleugh adit.

However, it has been assessed that the tunnel/culvert at the reservoir has Negligible potential for bats being short, open both ends and hence very exposed. If bats were to this for roosting such a roost would be a summer transient roost by small numbers of commoner species of bats and as no works are proposed closer than 10 m to the tunnel, no impact on roosting bats, are expected.

Capelcleugh Level Adit has potential for roosting bats and a second adit nearby to the west has a reported known bat roost. However, no works are proposed that would directly affect either adit; works to divert the discharge would all be external and so no impacts on roosting bats are foreseen, and no further survey is required.

The culvert through which the River Nent flows was assessed to have bat roost potential but no works are proposed in or near to the culvert and so even if roosting bats were present, no impact is foreseen, and no further survey is required.

5.3.6 Other fauna

No evidence of badgers was seen on the site and this species would not be impacted by the works. Badgers that may be present in the wider area and which may wander into working areas during construction could come to harm but standard measures for avoidance (e.g. escape ramps for excavations) would be included in a CEMP.

Red squirrels are known locally, but there is no habitat suitable for them in or adjacent to the site and this species would be affected by the scheme.

Hedgehog and brown hare may be found on or local to the site and given required working areas during construction could come to harm, but standard measures for avoidance (e.g. escape ramps for excavations) would be included in a CEMP.

In terms of terrestrial invertebrates, the scheme is unlikely to impact on local populations due to the extent of wider habitat unaffected by the works, the temporary nature of much of the impact and the additional habitat that will be created as part of the scheme.

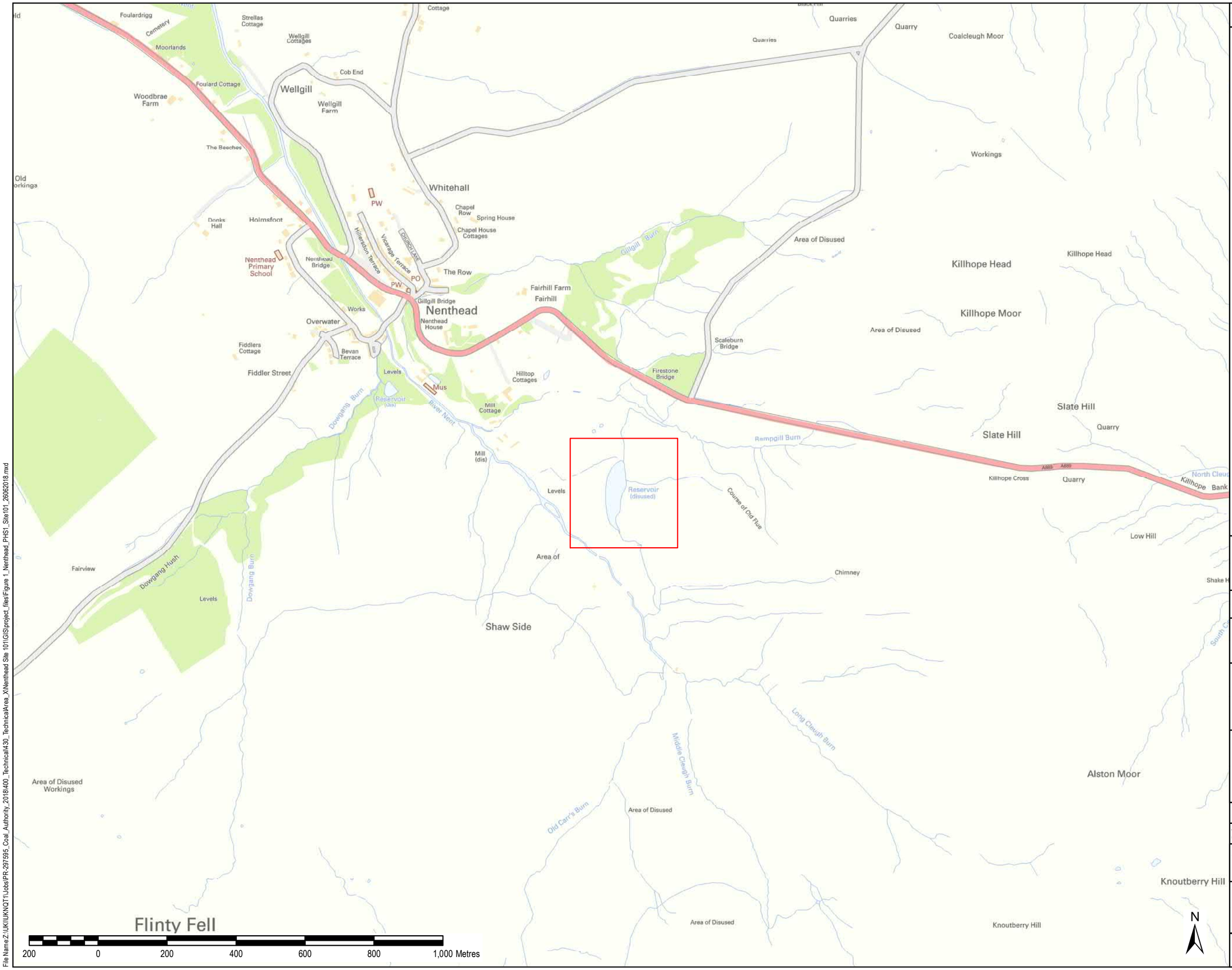
No aquatic surveys have been carried out to date as there are no proposed in-river or works proposed on the river banks. However there has been comment by the EA that the diverted water and subsequent treated water re-entering the river could influence any fish present. In addition, they have suggested that impacts on the reservoir and feeder channels/ditches need to consider the local brown trout population and possible local spawning grounds. There are no records along this stretch of the Nent and surveys undertaken downstream have not recorded the species and no constraints are foreseen for this species.

5.4 Summary

It is assessed that there is potential for the proposed development to have an impact on several ecological receptors, most notably the heathland, acid grassland and mire communities recorded on site but also potentially the local fish population. To reduce the potential impacts of the scheme the following recommendations are made:

- It is recommended that a habitat management plan for the site is developed to ensure the better quality and higher conservation value communities are maintained on and around the site to mitigate any loss of the plant communities. This should focus on the Calaminarian and acid grasslands found on and local to the site;
- Aquatic ecology surveys may be required of the stretch of the River Nent local to the adit where water will be diverted and of the reservoir and the local ditches to assess any potential for affecting brown trout and requirements for mitigation;
- A Construction Environmental Management Plan should be completed, to include ecological receptors identified with appropriate avoidance/ mitigation measures to reduce the risks of impacts on them; and
- If there are any works to be carried out in the bird nesting season, a check for nests should be undertaken by a suitably experienced ecologist and if a nest was found, then a buffer zone would be required around the nest site and works in that area would not be able to proceed until the young have fledged.

Figure 1 Site Location map



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LEGEND

Site location

Purpose of Issue
FINAL

Client
THE COAL AUTHORITY

Project Title
NENTHEAD MINE WATER TREATMENT SCHEME

Drawing Title
SITE 101
LOCATION PLAN

Drawn	Checked	Approved	Date
CAA	MH	-	26/06/2018

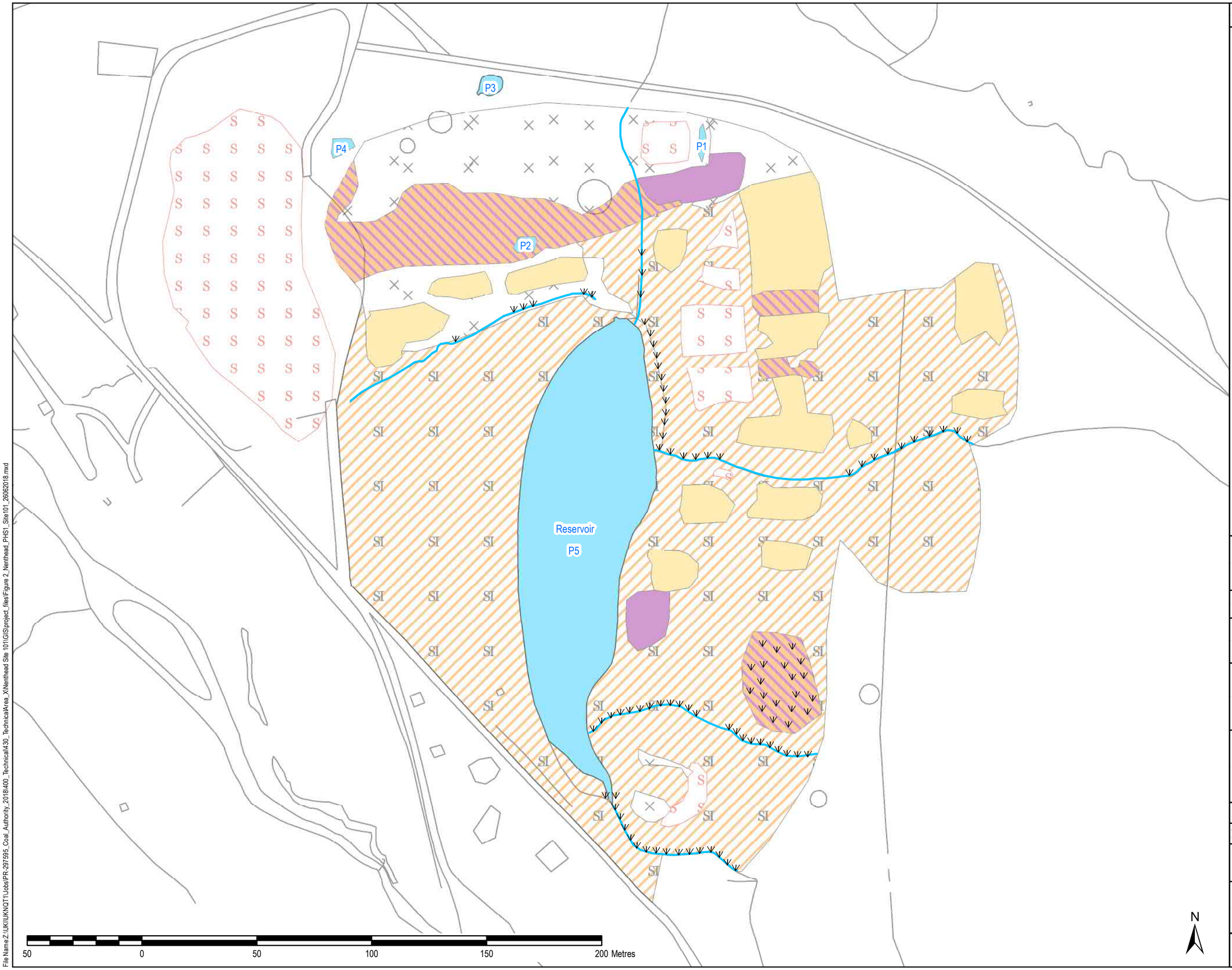
AECOM Internal Project No.	Scale @ A3
60543005	1:10,000

AECOM
12 Regan Way,
Chetwynd Business Park,
Nottingham,
NG9 6RZ
www.aecom.com

Drawing Number
FIGURE 1

Rev
.

Figure 2 Phase 1 Habitat Map



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LEGEND

- Semi-improved acid grassland
- Marsh/marshy grassland
- Acid dry dwarf shrub heath
- Sphagnum bog (remnant)
- Standing water
- Spoil
- Calaminarian grassland
- Running water
- Rush
- Target note

Purpose of Issue
FINAL

Client
THE COAL AUTHORITY

Project Title
NENTHEAD MINE WATER TREATMENT SCHEME

Drawing Title
SITE 101 PHASE 1 HABITAT SURVEY

Drawn	Checked	Approved	Date
CAA	MH	PB	06/07/2018

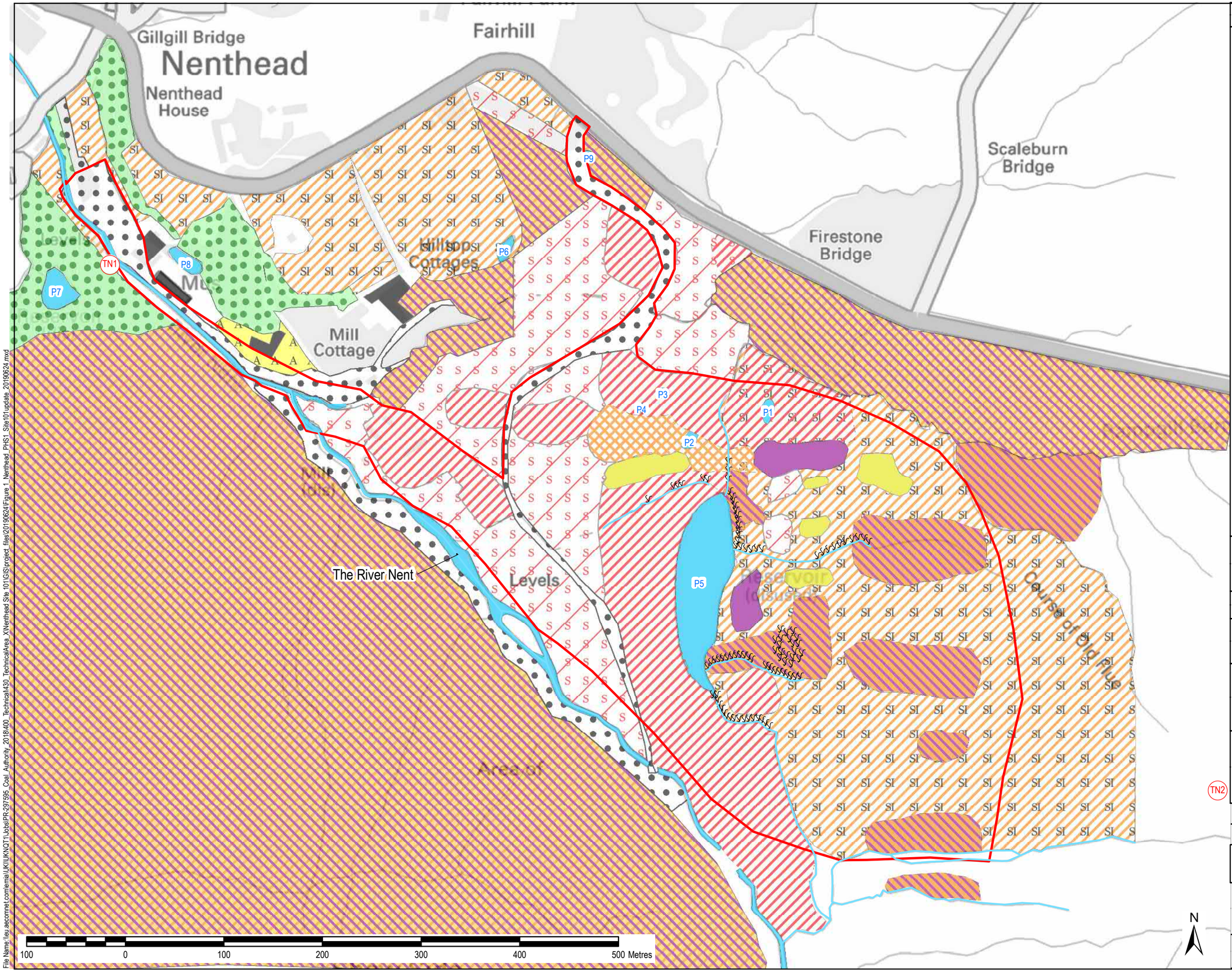
AECOM Internal Project No.	Scale @ A3
60543005	1:1,500

AECOM
12 Regan Way,
Chetwynd Business Park,
Nottingham,
NG9 6RZ
www.aecom.com

Drawing Number
FIGURE 2a

Rev

File Name:Z:\UK\UKNQT1\Jobs\PR-297595_Coal_Authority_2018\400_Technical\430_TechnicalArea_XN\Nenthead Site 101\GIS\project_files\Figure 2_Nenthead_PHS1_Site101_26062018.mxd



THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

- Site boundary
- Mixed woodland
- Acid grassland with calaminarian mosaic
- Semi-improved acid grassland
- Rush dominated
- Bare ground and tracks
- Heath
- Acid grassland, heath and occasional rush mosaic
- Sphagnum
- Water body/watercourse
- Bare spoil/with scattered acid grass/Calaminarian
- Amenity grassland
- Building
- Wet grassland/Acid grassland
- Running water
- Rush
- Target note

Purpose of Issue: FINAL

Client: THE COAL AUTHORITY

Project Title: NENTHEAD MINE WATER TREATMENT SCHEME

Drawing Title: SITE 101 PHASE 1 HABITAT SURVEY UPDATED

Drawn	Checked	Approved	Date
KC	GSB		17/07/2019

AECOM Internal Project No.	Scale @ A3
60596575	1:3,500

AECOM
12 Regan Way,
Chetwynd Business Park,
Nottingham,
NG9 6RZ
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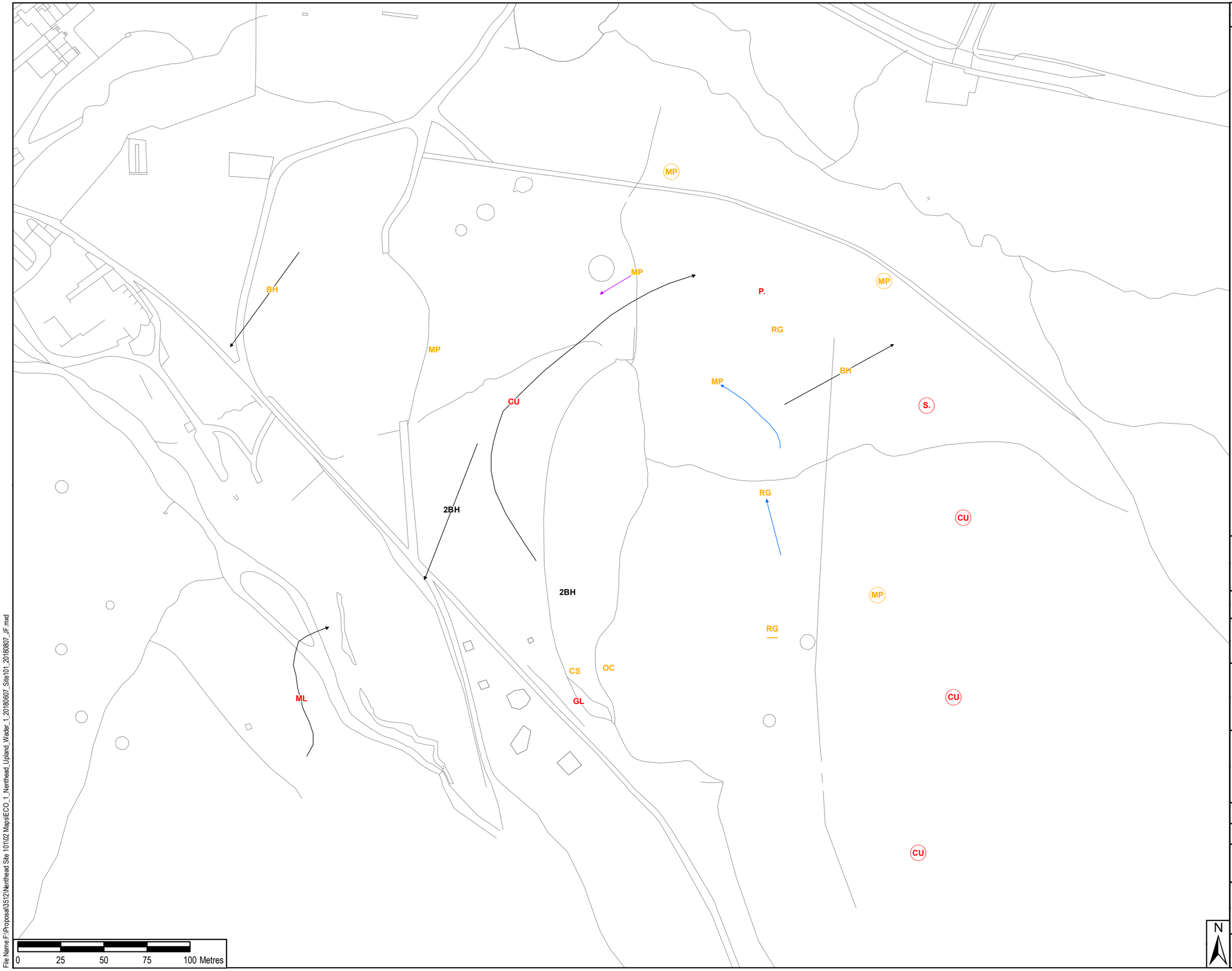
Drawing Number: **FIGURE** 2b

Rev:

File Name:\\eu.aecomnet.com\emia\UK\UKNOT1\Jobs\PR-297595_Coal_Authority_2018\400_Technical\430_Technical\Area_X\Nenthead Site 101\GIS\projject_files\20190624\Figure 1_Nenthead_PHS1_Site101update_20190624.mxd

Figure 3 Upland Wader Survey



File Name:F:\Proposal\3512\Nenthead Site 101\02 Maps\ECO_1_Nenthead_Upland_Wader_1_20180607_Site101_20180807_JF.mxd

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

SPECIES PRESENT:

- BH - BLACK-HEADED GULL
- CS - COMMON SANDPIPER
- CU - CURLEW
- GL - GREY WAGTAIL
- ML - MERLIN
- MP - MEADOW PIPIT
- OC - OYSTERCATCHER
- P. - GREY PARTRIDGE
- RG - RED GROUSE
- S. - SKYLARK

SPECIES CONSERVATION STATUS:

- S. RED LIST
- BH. AMBER LIST
- BL. GREEN LIST

ACTIVITY:

- S. CALLING
- (S.) SINGING
- ONLY SEEN IN FLIGHT
- ON GROUND THEN FLEW OFF
- SEEN FLYING THEN LANDED

Purpose of Issue
FINAL

Client
THE COAL AUTHORITY

Project Title
NENTHEAD MINE WATER TREATMENT SCHEME

Drawing Title
SITE 101
UPLAND WADER SURVEY 1
07-06-2018

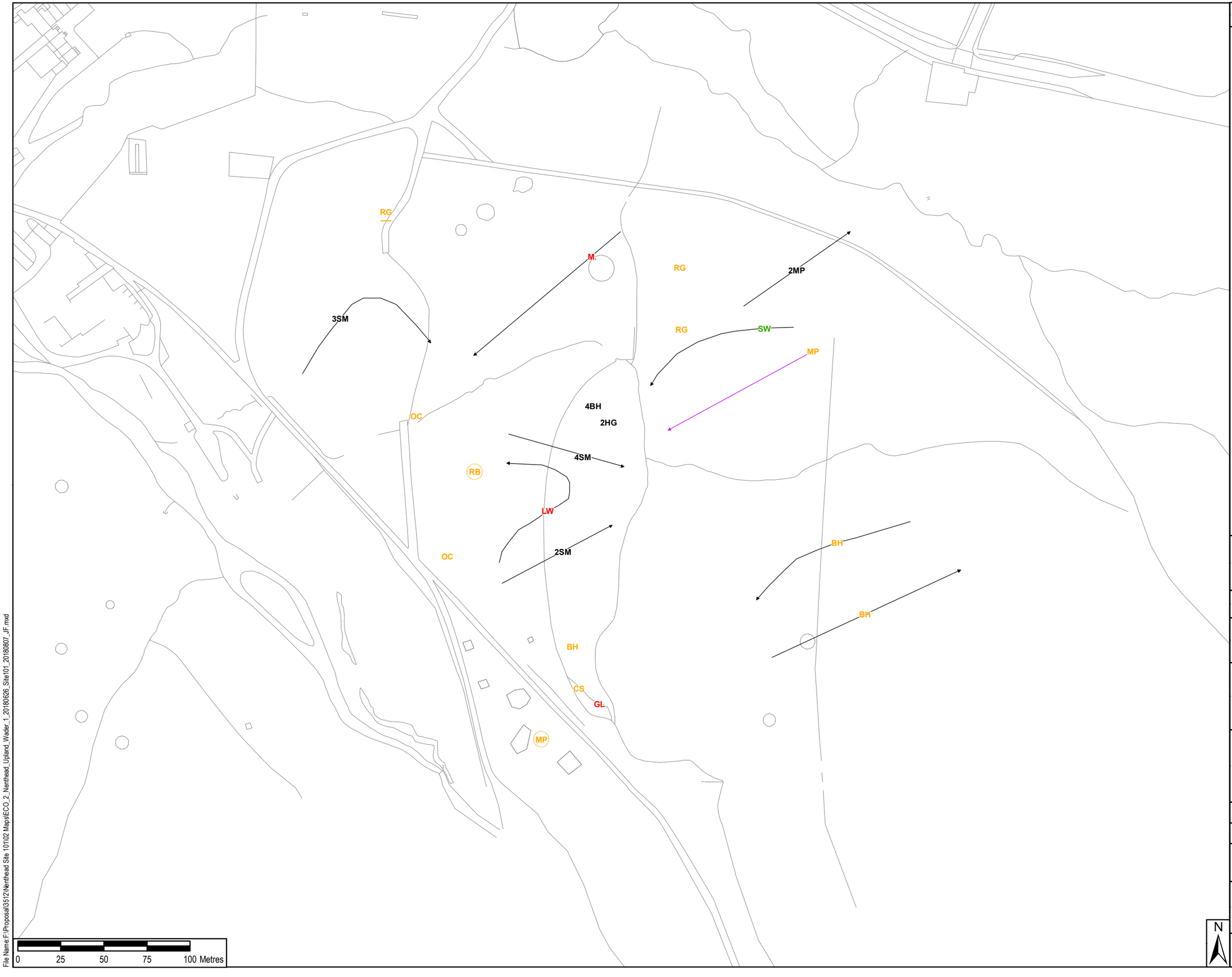
Drawn	Checked	Approved	Date
JF	AR	WON	07/08/2018

AECOM Internal Project No.	Scale @ A3
60543005	1:2,000

AECOM
AECOM House,
179 Moss Lane,
Altrincham,
WA15 8FH
0161 9278319
www.aecom.com

Drawing Number
FIGURE 3a

Rev



THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

SPECIES PRESENT:

- BH - BLACK-HEADED GULL
- CS - COMMON SANDPIPER
- GL - GREY WAGTAIL
- HG - HERRING GULL
- LW - LAPWING
- M. - MISTLE THRUSH
- MP - MEADOW PIPIT
- OC - OYSTERCATCHER
- RB - REED BUNTING
- RG - RED GROUSE
- SM - SAND MARTIN
- SW - SEDGE WARBLER

SPECIES CONSERVATION STATUS:

- S. RED LIST
- BH. AMBER LIST
- BL. GREEN LIST

ACTIVITY:

- S. CALLING
- (S.) SINGING
- ONLY SEEN IN FLIGHT
- ON GROUND THEN FLEW OFF
- SEEN FLYING THEN LANDED

Purpose of Issue
FINAL

Client
THE COAL AUTHORITY

Project Title
NENTHEAD MINE WATER TREATMENT SCHEME

Drawing Title
SITE 101
UPLAND WADER SURVEY 2
26-06-2018

Drawn	Checked	Approved	Date
JF	AR	WON	07/08/2018

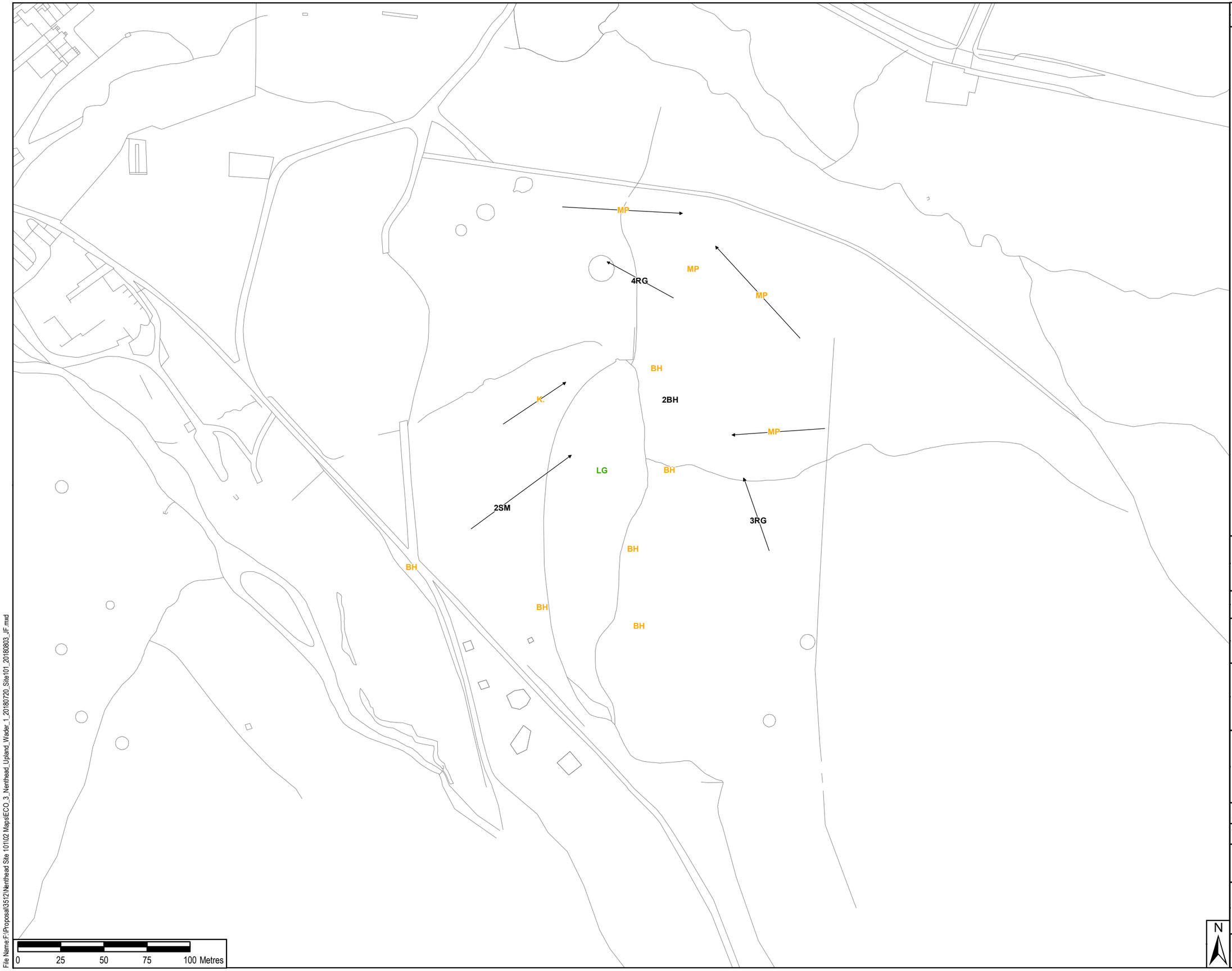
AECOM Internal Project No.	Scale @ A3
60543005	1:2,000

AECOM
AECOM House,
179 Moss Lane,
Altrincham,
WA15 8FH
0161 9278319
www.aecom.com

Drawing Number
FIGURE 3b

Rev

File Name:F:\Proposal\3512\Nenthead Site 101\02 Maps\ECO_2_Nenthead_Upland_Wader_1_20180626_Site101_20180807_JF.mxd



THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

SPECIES PRESENT:

- BH - BLACK-HEADED GULL
- K. - KESTRAL
- LG - LITTLE GREBE
- MP - MEADOW PIPIT
- RG - RED GROUSE
- SM - SAND MARTIN

SPECIES CONSERVATION STATUS:

- S. RED LIST
- BH. AMBER LIST
- BL. GREEN LIST

ACTIVITY:

- S. CALLING
- (S.) SINGING
- ONLY SEEN IN FLIGHT
- ON GROUND THEN FLEW OFF
- SEEN FLYING THEN LANDED

Purpose of Issue
FINAL

Client
THE COAL AUTHORITY

Project Title
NENTHEAD MINE WATER TREATMENT SCHEME

Drawing Title
SITE 101
UPLAND WADER SURVEY 3
20-07-2018

Drawn	Checked	Approved	Date
JF	AR	WON	03/08/2018

AECOM Internal Project No.	Scale @ A3
60543005	1:2,000

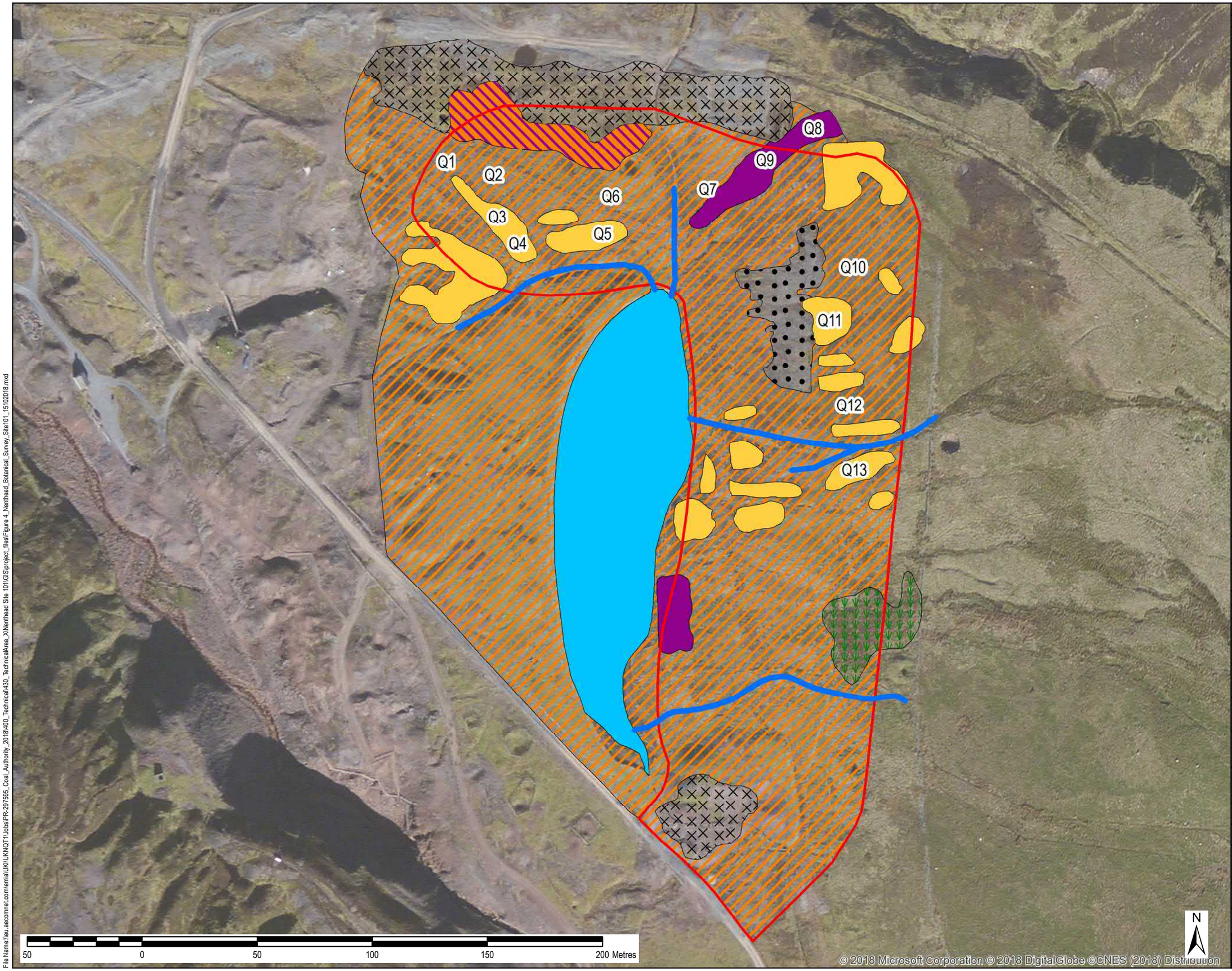
AECOM
AECOM House,
179 Moss Lane,
Altrincham,
WA15 8FH
0161 9278319
www.aecom.com

Drawing Number
FIGURE 3c

Rev

File Name:F:\Proposal\3512\Nenthead Site 101\02 Maps\ECO_3_Nenthead_Upland_Wader_1_20180720_Site101_20180803_JF.mxd

Figure 4 National Vegetation Community (NVC) Survey Map



THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

- Indicative Site Boundary
- Q1 Quadrat Location
- Ditch
- Heather Dominated Areas (With Grass) - Affinity With H10
- Acid Grassland Communities - U5B
- Mire Communities - Affinity With M18
- Bare Ground/Stone
- Calaminarian Communities - OV37
- Marshy/Acid Grassland Communities - U5
- Rush Dominated Area
- Reservoir

Purpose of Issue
FINAL

Client
THE COAL AUTHORITY

Project Title
NENTHEAD MINE WATER TREATMENT SCHEME

Drawing Title
SITE 101 NATIONAL VEGETATION CLASSIFICATION SURVEY

Drawn	Checked	Approved	Date
AG	MH	PB	16/10/2018

AECOM Internal Project No.	Scale @ A3
60543005	1:1,500

AECOM
5th Floor,
2 City Walk,
Leeds,
LS11 9AR
www.aecom.com

Drawing Number
FIGURE 4

Rev
01

File Name:\\eu.aecomnet.com\emia\UKIUKNQT1\Jobs\PR_297595_Coal_Authority_2018\400_Technical\430_TechnicalArea_X\Nenthead Site 101\GIS\project_files\Figure 4_Nenthead_Botanical_Survey_Site101_15102018.mxd

Figure 5 Indicative Development Outline Drawing

ACCESS TRACK FROM A689

REED BED

POND 1

POND 2

POND 3

RESERVOIR (DISUSED)

DRAIN

RIVER NENT

TRACK SHOWN ON OS MAP (PUBLIC BRIDLEWAY)

PROPOSED ACCESS POINT TO SITE

SHAFTS

490

500

510

520

N

NOTES

1. DO NOT SCALE THIS DRAWING. ALL DIMENSIONS MUST BE CHECKED/ VERIFIED ON SITE. IF IN DOUBT ASK.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALISTS DRAWINGS AND SPECIFICATIONS.
3. ALL DIMENSIONS IN MILLIMETRES UNLESS NOTED OTHERWISE. ALL LEVELS IN METRES UNLESS NOTED OTHERWISE.
4. ANY DISCREPANCIES NOTED ON SITE ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.

KEY TO DRAWING STATUS

RED STATUS - DRAWING IS FOR INFORMATION / COMMENT ONLY AND SHOULD NOT BE PRICED OR CONSTRUCTED FROM

AMBER STATUS - DRAWING IS PRELIMINARY / TENDER ONLY AND SHOULD NOT BE CONSTRUCTED FROM

GREEN STATUS - DRAWING HAS BEEN APPROVED FOR CONSTRUCTION

KEY

- SITE BOUNDARY
- ACCESS TRACKS
- OS CONTOUR
- PONDS
- TREATMENT SITE AREA
- REED BEDS
- TRACK
- SCHEDULED ANCIENT MONUMENT

Rev	Date	Details of issue / revision	Drw	Rev
P2	12.04.18	PRELIMINARY ISSUE	KH	P1
P1	29.03.18	PRELIMINARY ISSUE	KH	PT

ISSUES & REVISIONS

The Coal Authority
Engineering
200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG
Tel. 01623 637000

Project Title.
NENTHEAD FEASIBILITY STUDY

Drawing Title.
SITE 101

Scale	1:1500	Drawn	KH
Size	A3	Reviewed	PT

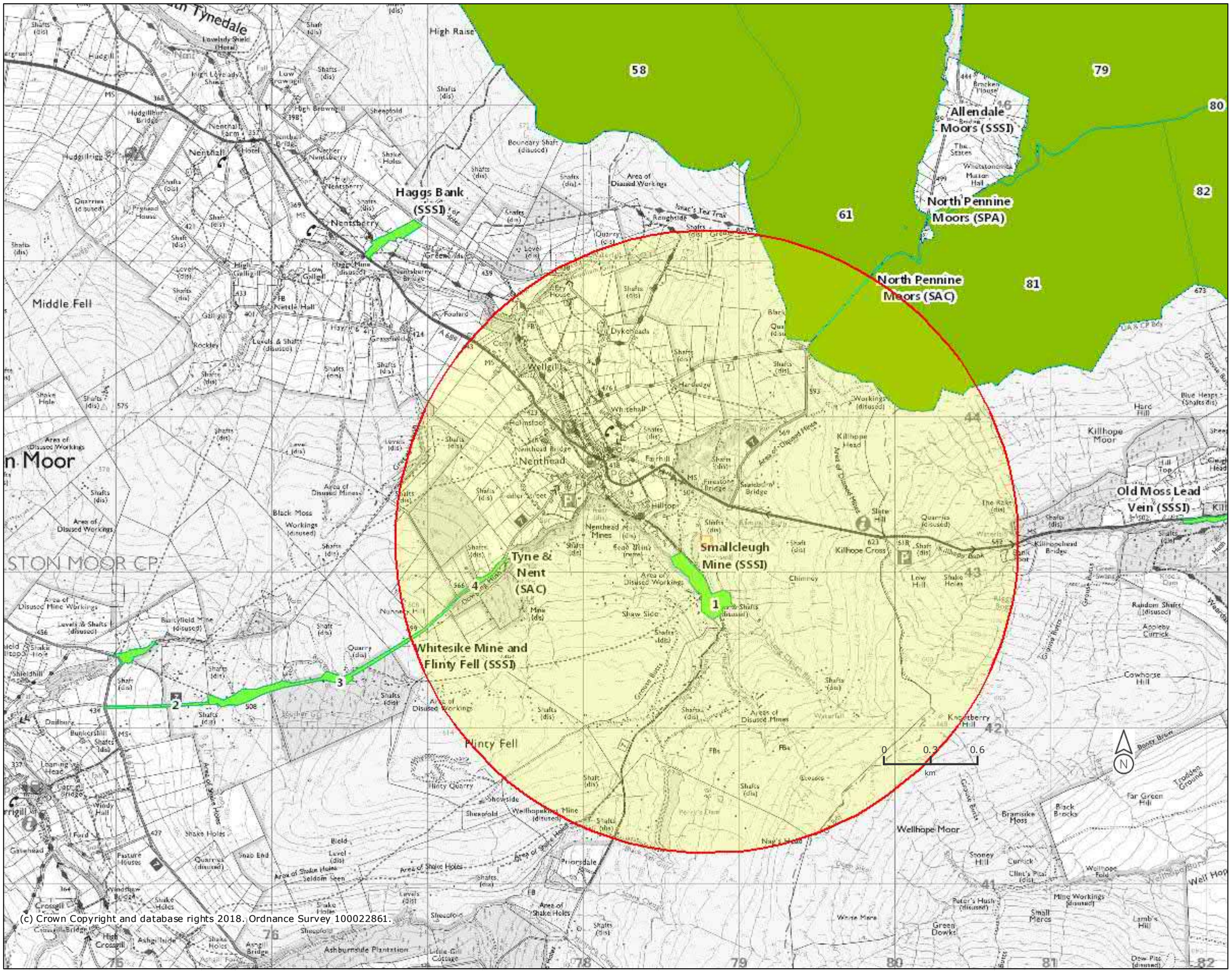
Drawing Status.
PRELIMINARY

Drawing No.
EV000114-010-003

Revision
P2

Appendix A Desk Study: Statutory and Non-Statutory sites

Site 101 Statutory Site Search



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Legend

- Limestone Pavement Orders (England)
- Local Nature Reserves (England)
- National Nature Reserves (England)
- Ramsar Sites (England)
- Proposed Ramsar Sites (England)

Sites of Special Scientific Interest Units (England)

- Favourable Condition
- Unfavourable Recovering
- Unfavourable no change
- Unfavourable Declining
- Part Destroyed
- Destroyed
- Not Assessed

- Sites of Special Scientific Interest (England)
- Special Areas of Conservation (England)
- Possible Special Areas of Conservation (England)
- Special Protection Areas (England)
- Possible Special Protection Areas (England)

Projection = OSGB36
xmin = 373600
ymin = 541200
xmax = 382800
ymax = 545900

0 0.5 1
km

Map produced by MAGIC on 8 June, 2018.

Site Check Report Report generated on Fri Jun 08 2018
You selected the location: Centroid Grid Ref: NY787432
The following features have been found in your search area:

Areas of Outstanding Natural Beauty (England)

Reference	25
Name	North Pennines
Date Designated	Jun-88
Hyperlink	http://www.landscapesforlife.org.uk/about-aonbs/visit-aonbs/north-pennines-aonb
Statutory Area in Sq.km	1985.16

Sites of Special Scientific Interest Units (England) - points

Name	SMALLCLEUGH MINE
Reference	1059223
Site Unit Condition	FAVOURABLE
Citation	1010595
Hectares	5.01
Hyperlink	http://designatedsites.naturalengland.org.uk/UnitDetail.aspx?UnitId=1010595

Name	WHITESIKE MINE AND FLINTY FELL
Reference	1059601
Site Unit Condition	FAVOURABLE
Citation	1027650
Hectares	1.56
Hyperlink	http://designatedsites.naturalengland.org.uk/UnitDetail.aspx?UnitId=1027650

Sites of Special Scientific Interest Units (England)

Name	SMALLCLEUGH MINE
Reference	1059223
Site Unit Condition	FAVOURABLE
Citation	1010595
Hectares	5.01
Hyperlink	http://designatedsites.naturalengland.org.uk/UnitDetail.aspx?UnitId=1010595

Name	WHITESIKE MINE AND FLINTY FELL
Reference	1059601
Site Unit Condition	FAVOURABLE
Citation	1027650
Hectares	1.56
Hyperlink	http://designatedsites.naturalengland.org.uk/UnitDetail.aspx?UnitId=1027650

Name	ALLENDALE MOORS
Reference	1060862
Site Unit Condition	UNFAVOURABLE RECOVERING
Citation	1020714
Hectares	289.63
Hyperlink	http://designatedsites.naturalengland.org.uk/UnitDetail.aspx?UnitId=1020714

Name	ALLENDALE MOORS
Reference	1060884
Site Unit Condition	UNFAVOURABLE RECOVERING
Citation	1020724
Hectares	257.47
Hyperlink	http://designatedsites.naturalengland.org.uk/UnitDetail.aspx?UnitId=1020724

Sites of Special Scientific Interest (England) - points

Name	Smallcleugh Mine SSSI
Reference	1004064
Natural England Contact	SIMON STAINER
Natural England Phone Number	0845 600 3078
Hectares	5.01
Citation	1005631
Hyperlink	http://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=s1005631

Sites of Special Scientific Interest (England)

Name	Smallcleugh Mine SSSI
Reference	1004064
Natural England Contact	SIMON STAINER
Natural England Phone Number	0845 600 3078
Hectares	5.01
Citation	1005631
Hyperlink	http://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=s1005631

Name	Allendale Moors SSSI
Reference	1006745
Natural England Contact	CLAIRE FURNESS
Natural England Phone Number	0845 600 3078
Hectares	5289.1
Citation	2000292
Hyperlink	http://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=s2000292

Name	Whitesike Mine and Flinty Fell SSSI
Reference	1007360
Natural England Contact	SIMON STAINER
Natural England Phone Number	0845 600 3078
Hectares	8.15
Citation	2000420
Hyperlink	http://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=s2000420

Special Areas of Conservation (England)

Name	TYNE & NENT
Reference	UK0030293
Hectares	36.73
Hyperlink	http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?eucode=UK0030293

Name	NORTH PENNINE MOORS
Reference	UK0030033
Hectares	103114.37
Hyperlink	http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?eucode=UK0030033

Special Protection Areas (England)

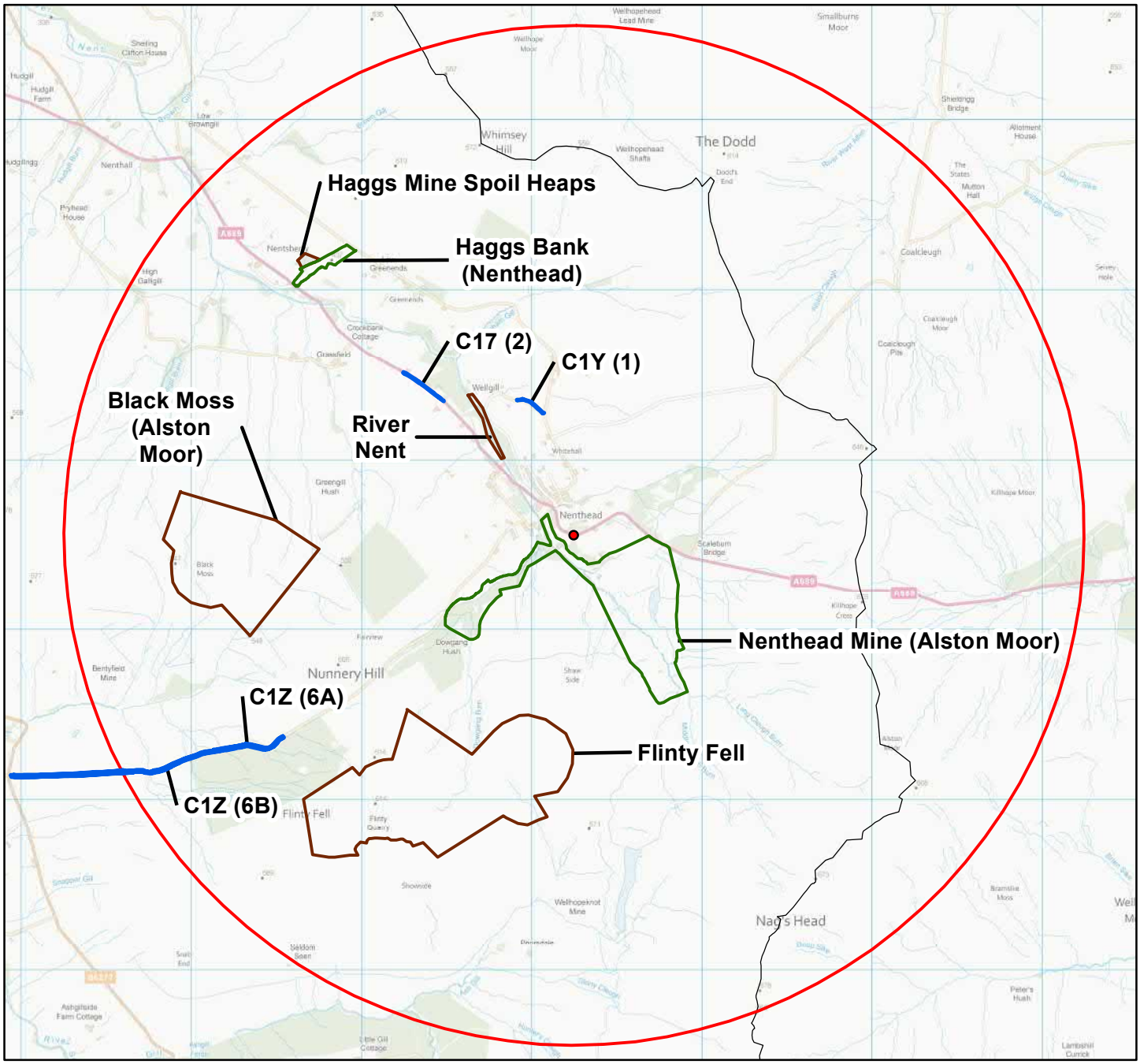
Name	NORTH PENNINE MOORS
Reference	UK9006272
Hectares	147277.28

Cumbria Biodiversity Data Centre (CBDC): Non-Statutory Sites Search

For: Paul Benyon at AECOM Infrastructure & Environment UK Ltd

Centroid: NY 782435
Site Name: Nenthead discharge points
Search Buffer: 3km
Search Date: 13/01/2017

N.B. Sites are displayed only if they exist within the search area



Key

- County Wildlife Sites
- Local Geological Sites
- Special Roadside Verges

0 375 750 1,500 Meters

Any queries in the first instance contact:
Dr Moustafa Eweda
Biological Data Officer
Cumbria Biodiversity Data Centre (CBDC)

T. 01228 618770
E. dataofficer@cbdc.org.uk

Appendix B Target Notes

1. Capelcleugh Adit, with bat roost potential.
2. Location of otter signs noted by Environment Agency

Appendix C Photographs

Photograph 1. Mound to south of site with acid grassland and remnant calaminarian community.

Photograph 2. Acid grassland found across the site interspersed with heath and mire.

Photograph 3. Tufts of Polytrichum moss to the south of the site.

Photograph 4. Calaminarian influence to north of site.

Photograph 5. Marshy/mire grassland.

Photograph 6. Ditch/flush habitats.

Photograph 7. Ditch/flush habitats.

Photograph 8. Area dominated by soft rush.

Photograph 9. Areas of Sphagnum moss (and Polytrichum) in the north and central areas of the site.

Photograph 10. Areas of Heathland.

Photograph 11. Areas of rocky substrate/bare ground.

Photograph 12. Pond 1.

Photograph 13. Pond 2.

Photograph 14. Pond 4.

Photograph 15. Pond 3.

Photograph 16. Ditch running southeast from the north of the reservoir.

Photograph 17. River Nent.

Photograph 18. Culvert of the River Nent.

Photograph 19. Bank stabilisation works to west of site (below car park) with sand martin nesting habitat.

Photograph 20. Capelcleugh Adit (TN1).

Appendix D Habitat Suitability Index results

		Pond 1	
		Results	**Scores**
SI_1	**Location**	B	0.50
SI_2	**Pond area**	35m²	0.07
SI_3	**Pond drying**	Annually	0.10
SI_4	**Water quality**	Moderate	0.67
SI_5	**Shoreline shade**	0%	1.00
SI_6	**Fowl**	Minor	0.67
SI_7	**Fish**	Absent	1.00
SI_8	**Pound count**	6	0.80
SI_9	**Terrestrial habitat**	Moderate	0.67
SI_{10}	**Macrophytes**	60%	0.90
HSI			**0.49**
Pond suitability			**Poor**

		Pond 2	
		Results	**Scores**
SI_1	**Location**	B	0.50
SI_2	**Pond area**	30m²	0.06
SI_3	**Pond drying**	Sometimes	0.50
SI_4	**Water quality**	Moderate	0.67
SI_5	**Shoreline shade**	0%	1.00
SI_6	**Fowl**	Minor	0.67
SI_7	**Fish**	Possible	0.67
SI_8	**Pound count**	6	0.80
SI_9	**Terrestrial habitat**	Moderate	0.67
SI_{10}	**Macrophytes**	80%	1.00
HSI			**0.55**
Pond suitability			**Below Average**

		Pond 3	
		Results	**Scores**
SI_1	**Location**	B	0.50
SI_2	**Pond area**	70m²	0.14
SI_3	**Pond drying**	Sometimes	0.50
SI_4	**Water quality**	Poor	0.33
SI_5	**Shoreline shade**	0%	1.00
SI_6	**Fowl**	Minor	0.67
SI_7	**Fish**	Absent	1.00
SI_8	**Pound count**	6	0.80
SI_9	**Terrestrial habitat**	Moderate	0.67
SI_{10}	**Macrophytes**	0%	0.30
HSI			**0.51**
Pond suitability			**Below Average**

		Pond 4	
		Results	**Scores**
SI_1	**Location**	B	0.50
SI_2	**Pond area**	100m²	0.20
SI_3	**Pond drying**	Sometimes	0.50
SI_4	**Water quality**	Moderate	0.67
SI_5	**Shoreline shade**	0%	1.00
SI_6	**Fowl**	Minor	0.67
SI_7	**Fish**	Possible	0.67
SI_8	**Pound count**	6	0.80
SI_9	**Terrestrial habitat**	Moderate	0.67
SI_{10}	**Macrophytes**	60%	0.90
HSI			**0.61**
Pond suitability			**Average**

		Pond 5	
		Results	**Scores**
SI_1	**Location**	B	0.50
SI_2	**Pond area**	7000m²	0.03
SI_3	**Pond drying**	Never	0.90
SI_4	**Water quality**	Moderate	0.67
SI_5	**Shoreline shade**	0%	1.00
SI_6	**Fowl**	Minor	0.67
SI_7	**Fish**	Possible	0.67
SI_8	**Pound count**	6	0.80
SI_9	**Terrestrial habitat**	Moderate	0.67
SI_{10}	**Macrophytes**	10%	0.40
HSI			**0.50**
Pond suitability			**Poor**

		Pond 6	
		Results	**Scores**
SI_1	**Location**	A	1.00
SI_2	**Pond area**	180m²	0.36
SI_3	**Pond drying**	Rarely	1.00
SI_4	**Water quality**	Moderate	0.67
SI_5	**Shoreline shade**	0%	1.00
SI_6	**Fowl**	Minor	0.67
SI_7	**Fish**	Possible	0.67
SI_8	**Pound count**	7	0.85
SI_9	**Terrestrial habitat**	Moderate	0.67
SI_{10}	**Macrophytes**	60%	0.90
HSI			**0.75**
Pond suitability			**Good**

		Pond 7	
		Results	**Scores**
SI_1	**Location**	A	1.00
SI_2	**Pond area**	800m²	0.98
SI_3	**Pond drying**	Never	0.90
SI_4	**Water quality**	Moderate	0.67
SI_5	**Shoreline shade**	10%	1.00
SI_6	**Fowl**	Minor	0.67
SI_7	**Fish**	Possible	0.67
SI_8	**Pound count**	7	0.85
SI_9	**Terrestrial habitat**	Good	1.00
SI_{10}	**Macrophytes**	15%	0.45
HSI			**0.80**
Pond suitability			**Excellent**

		Pond 9	
		Results	**Scores**
SI_1	**Location**	A	1.00
SI_2	**Pond area**	75m²	0.15
SI_3	**Pond drying**	Sometimes	0.50
SI_4	**Water quality**	Moderate	0.67
SI_5	**Shoreline shade**	0%	1.00
SI_6	**Fowl**	Minor	0.67
SI_7	**Fish**	Absent	1.00
SI_8	**Pound count**	7	0.85
SI_9	**Terrestrial habitat**	Moderate	0.67
SI_{10}	**Macrophytes**	70%	1.00
HSI			**0.67**
Pond suitability			**Average**

Appendix E eDNA Results

SureScreen Scientifics

Folio No: E3511
Report No: 1
Order No: 60571450-21
Client: AECOM INFRASTRUCTURE & ENVIRONMENT
Contact: Jack Muskett
Contact Details: jack.muskett@aecom.com
Date: 10/07/2018

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA IN POND WATER FOR THE DETECTION OF GREAT CRESTED NEWTS

Date sample received at Laboratory: 28/06/2018
Date Reported: 10/07/2018
Matters Affecting Results: None

RESULTS

Lab Sample No.	Site Name	O/S Reference	SIC	DC	IC	Result	Positive Replicates
2480	Nentheap, Pond 3	NY 787 432	Pass	Pass	Pass	Negative	0
2485	Nentheap, Pond 2	NY 787 432	Pass	Pass	Pass	Negative	0
2486	Nentheap, Resevoir	NY 787 432	Pass	Pass	Pass	Negative	0
2489	Nentheap, Pond 4	NY 787 432	Pass	Pass	Pass	Negative	0

SUMMARY

When Great Crested Newts (GCN); Triturus cristatus inhabit a pond, they deposit traces of their DNA in the water as evidence of their presence. By sampling the water, we can analyse these small environmental DNA (eDNA) traces to confirm GCN habitation, or establish GCN absence.

The water samples detailed below were submitted for eDNA analysis to the protocol stated in DEFRA WC1067 (Latest Amendments). Details on the sample submission form were used as the unique sample identity.

RESULTS INTERPRETATION

Lab Sample No.- When a kit is made it is given a unique sample number. When the pond samples have been taken and the kit has been received back in to the laboratory, this sample number is tracked throughout the laboratory.

Site Name- Information on the pond.

O/S Reference – Location/co-ordinates of pond.

SIC- Sample Integrity Check. Refers to quality of packaging, absence of tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to results errors. Inspection upon receipt of sample at the laboratory. To check if the Sample is of adequate integrity when received. Pass or Fail.

DC- Degradation Check. Analysis of the spiked DNA marker to see if there has been degradation of the kit since made in the laboratory to sampling to analysis. Pass or Fail.

IC- Inhibition Check- PCR inhibitors can cause false results. Inhibitors are analysed to check the quality of the result. Every effort is made to clean the sample pre-analysis however some inhibitors cannot be extracted. An unacceptable inhibition check will cause an indeterminate sample and must be sampled again.

Result- NEGATIVE means that GCN eDNA was not detected or is below the threshold detection level and the test result should be considered as no evidence of GCN presence. POSITIVE means that GCN eDNA was found at or above the threshold level and the presence of GCN at this location at the time of sampling or in the recent past is confirmed. Positive or Negative.

Positive Replicates- To generate the results all of the tubes from each pond are combined to produce one eDNA extract. Then twelve separate analyses are undertaken. If one or more of these analyses are positive the pond is declared positive for the presence of GCN. It may be assumed that small fractions of positive analyses suggest low level presence but this cannot currently be used for population studies. In accordance with Natural England protocol, even a score of 1/12 is declared positive.

METHODOLOGY

The laboratory testing adheres to strict guidelines laid down in WC1067 Analytical and Methodological Development for Improved Surveillance of The Great Crested Newt, Version 1.1

The analysis is conducted in two phases. The sample first goes through an extraction process where all six tubes are pooled together to acquire as much eDNA as possible. The pooled sample is then tested via real time PCR (also called q-PCR). This process amplifies select part of DNA allowing it to be detected and measured in ‘real time’ as the analytical process develops. qPCR combines PCR amplification and detection into a single step. This eliminates the need to detect products using gel electrophoresis. With qPCR, fluorescent dyes specific to the target sequence are used to label PCR products during thermal cycling. The accumulation of fluorescent signals during the exponential phase of the reaction is measured for fast and objective data analysis. The point at which amplification begins (the Ct value) is an indicator of the quality of the sample. True positive controls, negatives and blanks as well as spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared so they act as additional quality control measures.

The primers used in this process are specific to a part of mitochondrial DNA only found in GCN ensuring no DNA from other species present in the water is amplified. The unique sequence appropriate for GCN analysis is quoted in DEFRA WC 1067 and means there should be no detection of closely related species. We have tested our system exhaustively to ensure this is the case in our laboratory. We can offer eDNA analysis for most other species including other newts.

Analysis of eDNA requires scrupulous attention to detail to prevent risk of contamination. Kits are manufactured by SureScreen Scientifics to strict quality procedures in a separate building and with separate staff, adopting best practice from WC1067 and WC1067 Appendix 5. Kits contain a 'spiked' DNA marker used as a quality control tracer (SureScreen patent pending) to ensure any DNA contained in the sampled water has not deteriorated in transit. Stages of the DNA analysis are also conducted in different buildings at our premises for added

SureScreen Scientifics Ltd also participate in Natural England's proficiency testing scheme and we also carry out inter-laboratory checks on accuracy of results as part of our quality procedures.

Reported by: Sam Humphrey **Approved by:** Derry Hickman

End Of Report

Client: Mark Hampton,
AECOM,
Midpoint,
Alencon Link,
Basingstoke,
Hampshire,
RG21 7PP

ADAS
Spring Lodge
172 Chester Road
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WA6 0AR

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Sample ID: 2019-0018	Condition on Receipt: Good	Volume: Passed
Client Identifier: Pond 6 Marshall pond	Description: pond water samples in preservative	
Date of Receipt: 03/05/2019	Material Tested: eDNA from pond water samples	

Determinant	**Result**	**Method**	**Date of Analysis**
Inhibition Control[†]	2 of 2	Real Time PCR	07/05/2019
Degradation Control[§]	Within Limits	Real Time PCR	07/05/2019
Great Crested Newt*	0 of 12 (GCN negative)	Real Time PCR	07/05/2019
Negative PCR Control (Nuclease Free Water)	0 of 4	Real Time PCR	As above for GCN
Positive PCR Control (GCN DNA 10^{-4} ng/µL)[#]	4 of 4	Real Time PCR	As above for GCN

Report Prepared by:	Dr Helen Rees	Report Issued by:	Dr Ben Maddison
Signed:		Signed:	
Position:	Director: Biotechnology	Position:	MD: Biotechnology
Date of preparation:	08/05/2019	Date of issue:	08/05/2019

eDNA analysis was carried out in accordance with the stipulated methodology found in the Technical Advice Note (WC1067 Appendix 5 Technical Advice Note) published by DEFRA and adopted by Natural England.

** If all PCR controls and extraction blanks give the expected results a sample is considered: negative for great crested newt if all of the replicates are negative; positive for great crested newt if one or more of the replicates are positive.*

[†] Recorded as the number of positive replicate reactions at expected C_t value. If the expected C_t value is not achieved, the sample is considered inhibited and is diluted as per the technical advice note prior to amplification with great crested newt primer and probes.

[§] No degradation is expected within time frame of kit preparation, sample collection and analysis.

[#]Additional positive controls (10^{-1}, 10^{-2}, 10^{-3} ng/µL) are also routinely run, results not shown here.

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Sample ID: 2019-0166	Condition on Receipt: Good	Volume: Passed
Client Identifier: Pond 7 Forest Road	Description: pond water samples in preservative	
Date of Receipt: 03/05/2019	Material Tested: eDNA from pond water samples	

Determinant	**Result**	**Method**	**Date of Analysis**
Inhibition Control[†]	2 of 2	Real Time PCR	07/05/2019
Degradation Control[§]	Within Limits	Real Time PCR	07/05/2019
Great Crested Newt*	0 of 12 (GCN negative)	Real Time PCR	07/05/2019
Negative PCR Control (Nuclease Free Water)	0 of 4	Real Time PCR	As above for GCN
Positive PCR Control (GCN DNA 10^{-4} ng/µL)[#]	4 of 4	Real Time PCR	As above for GCN

Report Prepared by:	Dr Helen Rees	Report Issued by:	Dr Ben Maddison
Signed:		Signed:	
Position:	Director: Biotechnology	Position:	MD: Biotechnology
Date of preparation:	08/05/2019	Date of issue:	08/05/2019

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[§] No degradation is expected within time frame of kit preparation, sample collection and analysis.

[#]Additional positive controls (10^{-1}, 10^{-2}, 10^{-3} ng/µL) are also routinely run, results not shown here.

Appendix 1: Interpretation of results

Sample Condition

Upon sample receipt we score your samples according to quality: good, low sediment, medium sediment, high sediment, white precipitate, and presence of algae.

There are three reasons as to why sediment should be avoided:

1. It is possible for DNA to persist within the sediment for longer than it would if it was floating in the water which could lead to a false positive result i.e. in this case GCN not recently present but present a long time ago
2. In some cases sediment can cause inhibition of the PCR analysis used to detect GCN eDNA within samples which could lead to an indeterminate result.
3. In some cases sediment can interfere with the DNA extraction procedure resulting in poor recovery of the eDNA which in turn can lead to an indeterminate result.

Algae can make the DNA extraction more difficult to perform so if it can be avoided then this is helpful.

Sometimes samples contain a white precipitate which we have found makes the recovery of eDNA very difficult. This precipitate can be present in such high amounts that it interferes with the eDNA extraction process meaning that we cannot recover the degradation control (nor most likely the eDNA itself) at sufficient levels for the control to be within the acceptable limits for the assay, therefore we have to classify these type of samples as indeterminate.

What do my results mean?

A positive result means that great crested newts are present in the water or have been present in the water in the recent past (eDNA degrades over around 7-21 days).

A negative result means that DNA from the great crested newt has not been detected in your sample.

On occasion an inconclusive result will be issued. This occurs where the DNA from the great crested newt has not been detected but the controls have indicated that either: the sample has been degraded and/or the eDNA was not fully extracted (poor recovery); or the PCR inhibited in some way. This may be due to the water chemistry or may be due to the presence of high levels of sediment in samples which can interfere with the DNA extraction process. A re-test could be performed but a fresh sample would need to be obtained. We have successfully performed re-tests on samples which have had high sediment content on the first collection and low sediment content (through improved sample collection) on the re-test. If water chemistry was the cause of the indeterminate then a re-test would most likely also return an inconclusive result.

The results will be recorded as indeterminate if the GCN result is negative and the degradation result is recorded as:

1. evidence of decay - meaning that the degradation control was outside of accepted limits
2. evidence of degradation or residual inhibition - meaning that the degradation control was outside of accepted limits but that this could have been due to inhibitors not being removed sufficiently by the dilution of inhibited samples (according to the technical advice note)

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Sample ID: 2019-0491	Condition on Receipt: Good	Volume: Passed
Client Identifier: Pond 9 Gate Pond	Description: pond water samples in preservative	
Date of Receipt: 26/04/2019	Material Tested: eDNA from pond water samples	

Determinant	**Result**	**Method**	**Date of Analysis**
Inhibition Control[†]	2 of 2	Real Time PCR	29/05/2019
Degradation Control[§]	Within Limits	Real Time PCR	29/05/2019
Great Crested Newt*	0 of 12 (GCN negative)	Real Time PCR	28/05/2019
Negative PCR Control (Nuclease Free Water)	0 of 4	Real Time PCR	As above for GCN
Positive PCR Control (GCN DNA 10^{-4} ng/µL)[#]	4 of 4	Real Time PCR	As above for GCN

Report Prepared by:	Dr Helen Rees	Report Issued by:	Dr Ben Maddison
Signed:		Signed:	
Position:	Director: Biotechnology	Position:	MD: Biotechnology
Date of preparation:	29/05/2019	Date of issue:	29/05/2019

eDNA analysis was carried out in accordance with the stipulated methodology found in the Technical Advice Note (WC1067 Appendix 5 Technical Advice Note) published by DEFRA and adopted by Natural England.

** If all PCR controls and extraction blanks give the expected results a sample is considered: negative for great crested newt if all of the replicates are negative; positive for great crested newt if one or more of the replicates are positive.*

[†] Recorded as the number of positive replicate reactions at expected C_t value. If the expected C_t value is not achieved, the sample is considered inhibited and is diluted as per the technical advice note prior to amplification with great crested newt primer and probes.

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Algae can make the DNA extraction more difficult to perform so if it can be avoided then this is helpful.

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The results will be recorded as indeterminate if the GCN result is negative and the degradation result is recorded as:

1. evidence of decay - meaning that the degradation control was outside of accepted limits
2. evidence of degradation or residual inhibition - meaning that the degradation control was outside of accepted limits but that this could have been due to inhibitors not being removed sufficiently by the dilution of inhibited samples (according to the technical advice note)

Appendix F Vegetation Survey Results Table

	Q1[29]	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13
Juncus squarrosus	4[30]	5	5	5	4	6	5	3	4	3	4	4	3
Calliergonella cuspidatum	5	5	4	4	4		4	3	4	7	5	7	6
Nardus stricta	5	7	5	3	4	6	6	4	4			4	5
Festuca rubra	6	5	3	3	3	4	3		5	4		5	3
Calluna vulgaris	3	4	7	6	7	3	6	6			8		8
Hypnum cupressiforme	8	7	4	7	4	5	6	2	5				7
Festuca ovina	4	4	3			4	4		4			4	3
Polytrichum commune				3	2		6	5	6	6		5	
Rhytidiadelphus squarrosus		4		2		4			4	5		5	
Vaccinium myrtillus		2	4	3		4					4		5
Deschampsia flexuosa			2				2	2	4	6		7	
Anthoxanthum odoratum	3	4				3	4					3	
Pleurozium schreberii	6	5	4		2		4						
Polygala serpylifolia		3	2	2		3	3						
Eriophorum angustifolium	5	3			3		4						
Luzula multiflora	2	2				4						4	
Racomitrum lanuginosum			3		7			2			4		
Cladonia impexa			3	3	4			2					
Sphagnum magellanicum				4	3			6	4				
Galium saxatile	2									6		6	
Cirsium palustre	3					2							
Linum catharticum	3	2											
Holcus lanatus	4	4											
Taraxacum officinale agg.	2	2											
Potentilla erecta		2				2							
Peltigera canina agg.	2	2											
Agrostis canina						4			5				
Empetrum nigrum							4	4					
Eriophorum vaginatum								3	5				
Sphagnum angustifolium								6	5				
Carex viridula	2												
Euphrasia officinalis	2												
Thymus polytrichus	2												
Scapania undulatum	3												
Huperzia solago	2												
Lepidoza reptans					4								
Cynosurus cristatus						2							
Lophoclea bidentata						4							
Festuca pratensis										3			

[29] Quadrat number – these were 2x2m quadrats in each community identified

[30] Within each quadrat all species were recorded with an estimate of percentage cover/abundance using the Domin scale (1 = few individuals; 2 = some individuals; 3 = many individuals; 4 = 4% - 10%; 5 = 11% - 25%; 6 = 26% - 33%; 7 = 34% - 50%; 8 = 51% -75%; 9 = 76% - 90%; 10 = 91% - 100%). Subsequent areas of the same vegetation within a site do not require five additional quadrats but should be sampled for consistency and at least one quadrat recorded and, based on size, possibly more at the discretion of the surveyor.

Appendix G :Twinspan Group Results

Group 1 identified by Twinspan analysis

Species	Quadrat				Constancy
	Q1	Q2	Q6	Q7	
Juncus squarrosus	4	5	6	5	V
Nardus stricta	5	7	6	6	V
Festuca rubra	6	5	4	3	V
Calluna vulgaris	3	4	3	6	V
Hypnum cupressiforme	8	7	5	6	V
Festuca ovina	4	4	4	4	V
Anthoxanthum odoratum	3	4	3	4	V
Calliergonella cuspidatum	5	5		4	IV
Polygala serpylifolia		3	3	3	IV
Pleurozium schreberii	6	5		4	IV
Eriophorum angustifolium	5	3		4	IV
Luzula multiflora	2	2	4		IV
Rhytidiadelphus squarrosus		4	4		III
Vaccinium myrtillus		2	4		III
Cirsium palustre	3		2		III
Linum catharticum	3	2			III
Holcus lanatus	4	4			III
Taraxacum officinale agg.	2	2			III
Potentilla erecta		2	2		III
Peltigera canina agg.	2	2			III
Polytrichum commune				6	II
Deschampsia flexuosa				2	II
Galium saxatile	2				II
Agrostis canina			4		II
Empetrum nigrum				4	II
Carex viridula	2				II
Euphrasia officinalis	2				II
Thymus polytrichus	2				II
Scapania undulatum	3				II
Huperzia solago	2				II
Cynosurus cristatus			2		II
Lophoclea bidentata			4		II

TABLEFIT NVC communities identified: Fair U5b 60%; U5 56%

Group 2 identified by Twinspan analysis

Species	Quadrat						Constancy
	Q5	Q3	Q4	Q11	Q13	Q8	
Calliergonella cuspidatum	4	4	4	5	6	3	V
Juncus squarrosus	4	5	5	4	3	3	V
Calluna vulgaris	7	7	6	8	8	6	V
Nardus stricta	4	5	3		5	4	V
Hypnum cupressiforme	4	4	7		7	2	V
Racomitrum lanuginosum	7	3		4		2	IV
Cladonia impexa	4	3	3			2	IV
Festuca rubra	3	3	3		3		IV
Vaccinium myrtillus		4	3	4	5		IV
Polytrichum commune	2		3			5	III
Sphagnum magellanicum	3		4			6	III
Deschampsia flexuosa		2				2	II
Festuca ovina		3			3		II
Polygala serpylifolia		2	2				II
Pleurozium schreberii	2	4					II
Eriophorum vaginatum						3	I
Sphagnum angustifolium						6	I
Lepidoza reptans	4						I
Rhytidiadelphus squarrosus			2				I
Empetrum nigrum						4	I
Eriophorum angustifolium	3						I

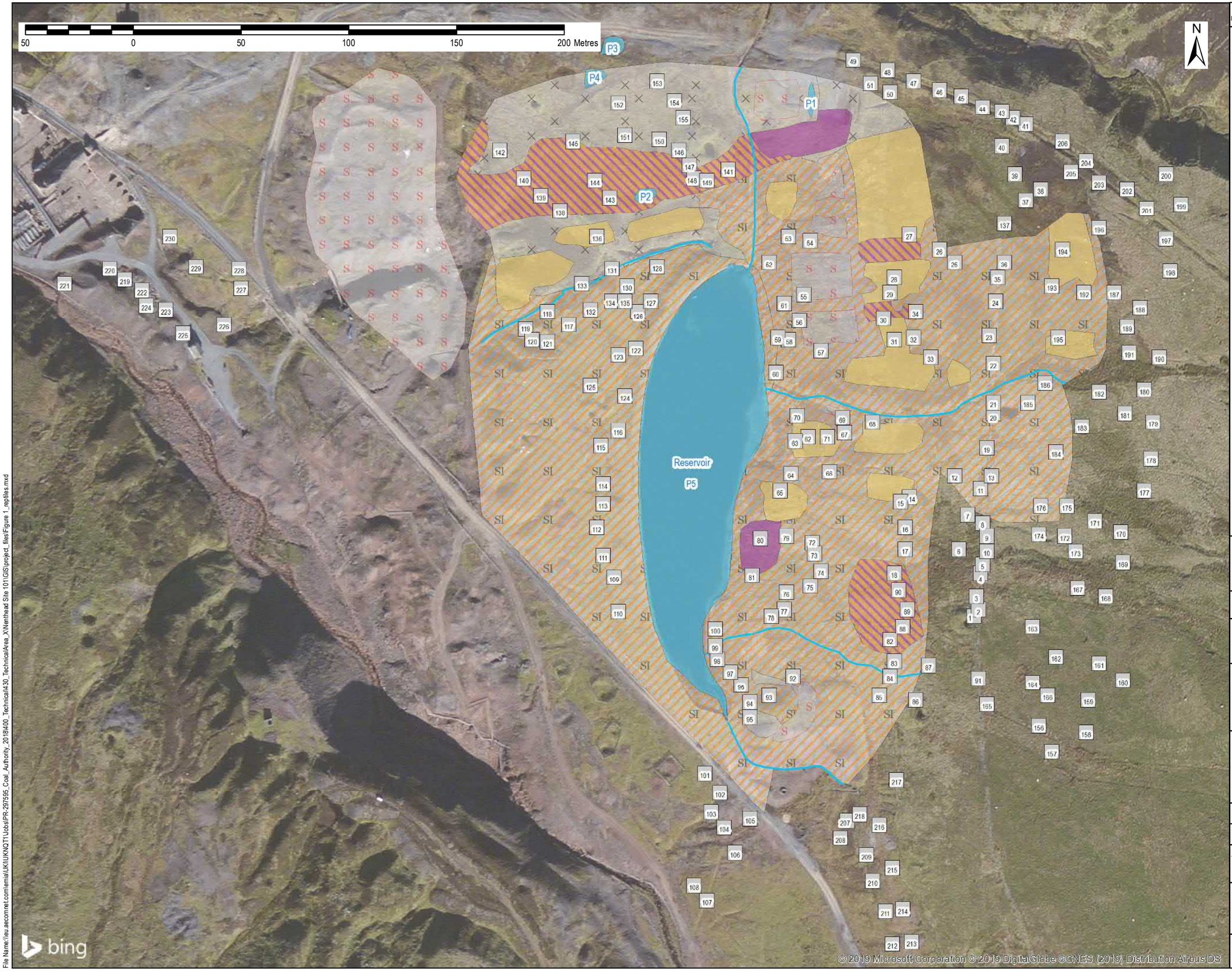
TABLEFIT NVC Communities identified: Poor U5e 55%; U6c 53%; M18c 52%

Group 3 identified by Twinspan analysis

Species	Quadrat			Constancy
	Q9	Q10	Q12	
Calliergonella cuspidatum	4	7	7	V
Polytrichum commune	6	6	5	V
Deschampsia flexuosa	4	6	7	V
Rhytidiadelphus squarrosus	4	5	5	V
Juncus squarrosus	4	3	4	V
Festuca rubra	5	4	5	V
Galium saxatile		6	6	IV
Nardus stricta	4		4	IV
Festuca ovina	4		4	IV
Festuca pratensis		3		II
Sphagnum magellanicum	4			II
Eriophorum vaginatum	5			II
Sphagnum angustifolium	5			II
Agrostis canina	5			II
Hypnum cupressiforme	5			II
Luzula multiflora			4	II
Anthoxanthum odoratum			3	II

TABLEFIT NVC communities identified: Good fit U5b 78%; U5 78%; U4d 67%

Appendix H Reptile Refugia Locations



THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

- Reptile tile

Habitats

- Semi-improved acid grassland
- Marsh/marshy grassland
- Acid dry dwarf shrub heath
- Sphagnum bog (remnant)
- Standing water
- Spoil
- Calaminarian grassland
- Running water

Purpose of Issue
FINAL

Client
THE COAL AUTHORITY

Project Title
NENTHEAD MINE WATER TREATMENT SCHEME

Drawing Title
SITE 101
REPTILE SURVEY

Drawn	Checked	Approved	Date
LCS	GSB	PB	04/04/2019

AECOM Internal Project No.	Scale @ A3
60543005	1:1,600

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AECOM

Drawing Number
FIGURE 1

Rev
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File Name:\\eu.aecomnet.com\emia\UK\UKNOT1\Jobs\PR-297595_Coal_Authority_2018400_Technical\430_Technical\Area_X\Nenthead Site 101\GIS\project_files\Figure 1_reptiles.mxd

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