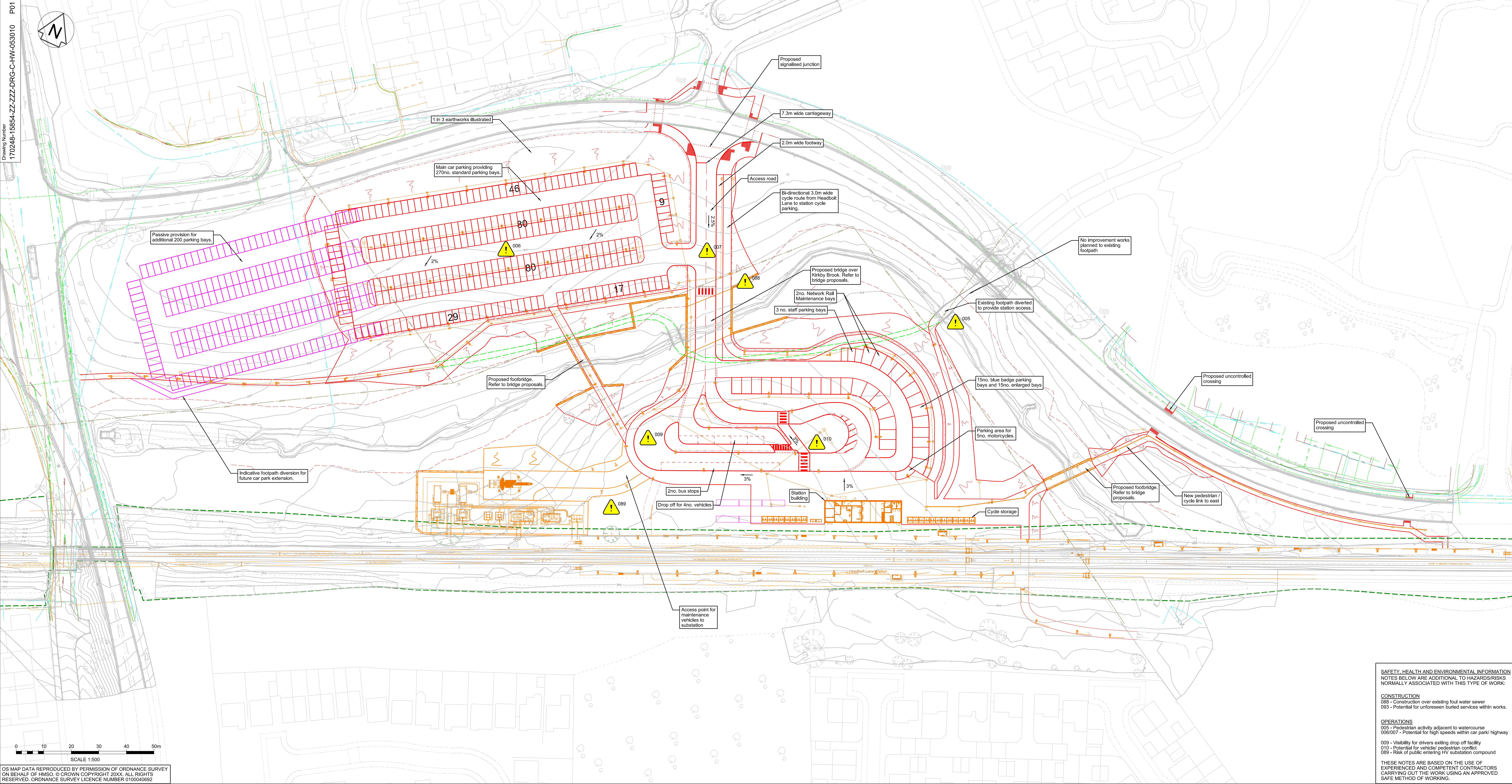




Legend/Notes

- Do not scale from this drawing.
- All dimensions are in millimetres unless shown otherwise.
- For drainage details refer to drawing 170248-15854-ZZZ-DRG-C-DR-003001.
- For further car park details refer to Form 001 document reference 170248-ARU-REP-ECV-000005.
- For platform details refer to Form 001 document reference 170248-ARU-REP-ECV-000004.
- For lineside infrastructure details refer to Form 001 document 170248-ARU-REP-ECV-000006.
- Proposed incoming utilities routes, sizing etc. to be confirmed following MEP IDC.

Key:

- Proposed Highway and Car Park
- Proposed Fencing / Guardrailing
- Passive Provision for Future Car Park Extension
- Other Proposed Works
- Network Rail Boundary

Key (Utilities):

- Existing BT Network
- Existing Surface Water Sewer
- Existing Foul Sewer
- Existing Potable Water
- Existing LV Electric
- Existing HV Electric
- Existing Virgin Media
- Existing Low Pressure Gas

P01	20/01/21	First Revision				GC	RS	---
Rev	Date	Description of Revisions	Drawn	Chkd	Aspr	Status	Drawn	Aspr
Suitable for Co-ordination						S1		

Authorised: --- Signed: --- Date: ---

Contractor(s): Ove Arup & Partners

Location/Level	No Specific Location	Sub-type	General Arrangement
Type	CAD Drawing	Discipline	Highways
Volume/System	No Specific Volume or System	Project	
Phasing	Proposed	Grip Stage	4

Headbolt Lane

Contract No.
170248

Contract Title
Headbolt Lane

Drawing Title
Headbolt Lane New Station
Car Park and Access
Proposed Layout

Designed		Signed		Date	
Drawn	G.COURTNEY	Signed	GC	Date	20/01/21
Checked	R.SCRIVENER	Signed	RS	Date	20/01/21
Approved	--	Signed		Date	

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

NOTES BELOW ARE ADDITIONAL TO HAZARDS/RISKS NORMALLY ASSOCIATED WITH THIS TYPE OF WORK:

CONSTRUCTION

088 - Construction over existing foul water sewer
093 - Potential for unforeseen buried services within works.

OPERATIONS

005 - Pedestrian activity adjacent to watercourse
006/007 - Potential for high speeds within car park/ highway

009 - Visibility for drivers exiting drop off facility
010 - Potential for vehicle/ pedestrian conflict
089 - Risk of public entering HV substation compound

THESE NOTES ARE BASED ON THE USE OF EXPERIENCED AND COMPETENT CONTRACTORS CARRYING OUT THE WORK USING AN APPROVED SAFE METHOD OF WORKING.

Scales (1:1000) ELR & Mileage WKL2 28.1232 to 29.0913

Alternative Reference 170248-ARU-DRG-ECV-000008

Drawing Number 170248-15854-ZZZ-DRG-C-HW-053010

Sheet 1 of 1

Revision 1

P01

Appendix A
Preliminary Ecological
Appraisal, NGL, 2020

Headbolt Lane, Kirkby

Preliminary Ecological Appraisal Report



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July 2020

Project No/Title:

Title: **Headbolt Lane/ Buckingham**
Preliminary Ecological Appraisal Report

Client: **Buckingham**

Date: July 2020

Status	Date	Prepared by	Reviewed by	Approved by
V1	27/07/2020	Rowena Tylden-Pattenson Assistant Ecologist	Neil Lee-Gallon Principal Ecologist	Neil Lee-Gallon Principal Ecologist

NLG Ecology Ltd has prepared this report for the sole use of the client, showing reasonable skill and care, for the intended purposes as stated in the agreement under which this work was completed. The report may not be relied upon by any other party without the agreement of the client and NLG Ecology Ltd. No other warranty, expressed or implied, is made as to the professional advice included in this report.

Data supplied by the client or from other sources have been used - it has been assumed that the information is correct. No responsibility can be accepted by NLG for inaccuracies in the data supplied by any other party. The conclusions and recommendations in this report are based on the assumption that all relevant information has been supplied by those bodies from whom it was requested.

Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work. This work has been undertaken in accordance with the quality management system of NLG Ecology Ltd. No part of this report may be copied or duplicated without the express permission of NLG Ecology Ltd and the party for whom it was prepared.

SUMMARY

NLG Ecology Ltd (NLG) was commissioned by Buckingham Group to undertake a Preliminary Ecological Appraisal of a site subject to works pertaining to the construction of a new station proposal and located at Headbolt Lane. The survey area is centred at OS Grid Reference SJ 41325 99798, with its nearest postcode being L33 1WD; the site location, along with any recorded habitats and features of ecological interest are shown on Figure 1, Appendix 1 and in Photographs 1 to 21 in Appendix 3.

The appraisal was required to inform proposals to construct a new station at Headbolt Lane, and associated engineering works at Kirkby Station and the adjacent track. In general, and facilitated by the Preliminary Ecological Appraisal report, for all rail projects that may affect any plants and/or animals, biodiversity risks and opportunities must be identified and managed in accordance with the 'Biodiversity Mitigation Hierarchy'. This comprises sequential steps to avoid, minimise, rehabilitate/restore and offset any negative impacts on biodiversity, aiming ultimately to achieve a net gain in biodiversity.

The Preliminary Ecological Appraisal of the site has comprised of an open-source and record search to 2km radius, an Extended Phase 1 Habitat Survey in accordance with Joint Nature Conservation Committee (JNCC) guidelines (2010) and an evaluation of the key ecological constraints to the project. The data collected have been used to form a baseline for the site and to inform any necessary recommendations for further surveys, mitigation and enhancement measures. In addition, Defra's Biodiversity Metric v2.0 Toolkit has been used to assess the baseline biodiversity of the survey area, the comparative ecological value of the various features recorded and the level of habitat loss to the project.

The appraisal, including the Extended Phase 1 Habitat Survey completed on 13th and 14th July 2020, has been undertaken by Rowena Tylden-Pattenson (Assistant Ecologist at NLG, Graduate CIEEM member).

The site baseline habitat size is 10.18ha, including buffer zones around the proposed site boundaries, including compound areas, with baseline habitat units calculated as 53.99. The post-works habitat units (post-habitat creation) have been calculated as 15.14, with losses of 38.86 biodiversity units (approximate overall losses of 71.98%) due to the works. To achieve a biodiversity net-gain of 10%, off-site mitigation is considered necessary, with the creation of approximately 44.25 biodiversity units.

Recommendations are made with respect to bats, amphibians, nesting birds, rabbit, fox, badger, riparian mammals, reptiles, invasive species, and small mammals. All recommendations are located in Section 4.4. Post-works suggestions for habitat creation are outlined in Section 4.5.

The data contained within this report are considered to be valid for a period of 18 months from the date of the last survey on site (i.e. until 14/01/2022).

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1 INTRODUCTION

1.1 Background

- 1.1.1 NLG Ecology Ltd (NLG) was commissioned by Buckingham Group to undertake a Preliminary Ecological Appraisal of a site subject to works pertaining to the construction of a new station proposal and located at Headbolt Lane. The survey area is centred at OS Grid Reference SJ 41325 99798, with its nearest postcode being L33 1WD; the site location, along with any recorded habitats and features of ecological interest are shown on Figure 1, Appendix 1 and in Photographs 1 to 21 in Appendix 3.
- 1.1.2 The appraisal was required to inform proposals to construct a new station at Headbolt Lane, and associated engineering works at Kirkby Station and the adjacent track. In general, and facilitated by the Preliminary Ecological Appraisal report, for all rail projects that may affect any plants and/or animals, biodiversity risks and opportunities must be identified and managed in accordance with the 'Biodiversity Mitigation Hierarchy'. This comprises sequential steps to avoid, minimise, rehabilitate/restore and offset any negative impacts on biodiversity, aiming ultimately to achieve a net gain in biodiversity.
- 1.1.3 The Preliminary Ecological Appraisal has mainly comprised of an open-source desk study to 2km radius, an Extended Phase 1 Habitat Survey and an evaluation of the key ecological constraints to the project. In order to identify ecological opportunities and constraints in respect of the proposals, this report collates the data gathered and seeks to fulfil the following objectives:
- To establish an ecological baseline for the site;
 - To assess the potential for, or to confirm actual presence of, protected and notable species;
 - To make recommendations for further appraisal and ecological survey where required; and
 - To make recommendations for habitat retention and enhancement, so as to ensure opportunities for biodiversity gain are considered in line with the Network Rail Biodiversity Calculator where applicable, along with national and local planning policy and strategies for nature conservation (e.g. the UK Post-2010 Biodiversity Framework, the NERC Act 2006 (Section 41) and the National Planning Policy Framework 2018).
- 1.1.4 The appraisal, including the Extended Phase 1 Habitat Survey completed on 13th and 14th July 2020, has been undertaken by Rowena Tylden-Pattenson (Assistant Ecologist at NLG, Graduate CIEEM member).

1.2 Relevant Legislation

- 1.2.1 Legislation that is applicable to the site is listed below, which covers the UK and Wales only. For a more definitive statement of law it is recommend that the full legislative acts are sighted.

- ***The Conservation of Habitats and Species Regulations 2017*** (the 'Habitats Regulations'): These Regulations consolidate and update the Conservation (Natural Habitats, &c.) Regulations 1994 ("the 1994 Regulations"). The Habitats Regulations, which are made under section 2(2) of the European Communities Act 1972, are the principal means by which Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the "Habitats Directive") is transposed for England and Wales and territorial seas.
- ***The Wildlife and Countryside Act 1981 (as amended)*** gives general protection measures for wildlife and special measures for species included on Schedules of the Act. Schedule 1 lists birds that are afforded special protection, Schedules 4-6 protects various wild animal species from injury, killing or disturbance, and Schedule 8 confers protection to certain plant species. The statutory designation of Sites of Special Scientific Interest (SSSI) is the main site protection measure in the UK established under the WCA
- ***The Countryside and Rights of Way Act (CROW Act) 2000*** amended the Wildlife and Countryside Act 1981 to also make it an offence to intentionally or recklessly damage, destroy or obstruct a place that a species, listed on Schedules of the Wildlife and Countryside Act, uses for shelter or protection. The repealed Section 74 of the CROW Act listed habitats and species important to biological diversity in England, in accordance with the 1992 UN Convention on Biodiversity (Habitats and Species Action Plans under The UK Biodiversity Action Plan is the means by which the government complied with its duty under Section 74).
- ***Section 41 of the Natural Environment and Rural Communities Act (2006)*** replaces Section 74 of the Countryside and Rights of Way Act, 2000 and refers to the list of organisms and habitats of principal importance published under the repealed Section 74 of the CROW Act 2000. The Secretary of State must take such steps to further the conservation of the living organisms and types of habitat included in the list and promote the taking by others of such steps.
- ***Hedgerow Regulations (1997)*** restrict the removal or part removal of hedgerows which are over 20m in length. Removal includes digging, replanting elsewhere or destroying a hedgerow.
- ***The National Planning Policy Framework (NPPF) (Department of Housing Communities and Local Government, 2019)***: sets out the UK Government's planning policies for England and provides guidance on how these policies are expected to be applied. The NPPF includes a chapter on biodiversity, Chapter 15 – Conserving and Enhancing the Natural Environment. In addition to being concerned with the protection of statutorily designated sites, the Chapter outlines ways in which the planning system is required to contribute to and enhance the natural and local environment and sets out guidance for local authorities in respect of the consideration of biodiversity and green infrastructure. The NPPF is a material planning consideration.
- ***The 'UK Post-2010 Biodiversity Framework'***: succeeded the UK Biodiversity Action Plan (UKBAP) in July 2012. The post-2010 framework is underpinned by the biodiversity and environment strategies of the four countries of the UK and sets out their common purpose and shared priorities. The UKBAP list of priority species remains as a reference source and has been used to help draw up statutory lists of priorities.
- ***Biodiversity 2020***: is a strategy for England's wildlife and ecosystem services'. Published in 2011, it is the most recent biodiversity strategy for England, and has as its mission to halt overall biodiversity loss, support healthy well-functioning ecosystems, and establish coherent ecological networks, with more and better places for nature for the benefit of wildlife and people.

- **Bats.** Receive full protection under the Wildlife and Countryside Act 1981 (as amended). They are also protected under the Conservation of Habitats and Species Regulations 2017. The legislation makes it an offence to intentionally kill, injure or take a wild bat uses for shelter or protection whether present or not, and to intentionally disturb any wild bat while it is occupying a structure or place that it uses for shelter or protection.
- **The Protection of Badgers Act (1992)** relates to protecting badgers from activities that result in disturbing or interfering with a badger's sett.
- **Nesting Birds.** Under the Wildlife and Countryside Act 1982 (as amended) all wild birds, their nests and eggs are protected by law and it is an offence to intentionally kill, injure and wild bird, to intentionally take, damage or destroy the nest of any wild bird while it is in use or being built, and to intentionally take or destroy the egg of any wild bird.
- **Great Crested Newt** is a European Protected Species (EPS), receiving full protection under the 1981 Wildlife and Countryside Act (as amended), the 2017 Conservation and Species Regulations and the Countryside and Rights of Way Act (CROW) 2000.
- **Reptiles.** All UK reptile species are protected under the Wildlife and Countryside Act 1981 (as amended), making it illegal to intentionally kill or injure a common reptile. Rare reptiles (smooth snake and sand lizard) are also protected under the Conservation of Habitats and Species Regulations 2010. This makes it an offence to deliberately injure, kill, capture or disturb a rare reptile, or to damage or obstruct any place used by the species for shelter or protection.
- **Hedgehogs** are protected in England under Schedule 6 of the Wildlife and Countryside Act (1981) and are also listed under Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006). This lists English species that were formerly identified as requiring action under the UK Biodiversity Action Plans and which continue to be regarded as conservation priorities under many Local Biodiversity Action Plans (LBAP) and the current UK Post-2010 Biodiversity Framework.
- **Otter** are protected under the Conservation of Habitats and Species Regulations 2017 and the Wildlife and Countryside Act 1981 (as amended). This makes it an offence to: intentionally or recklessly disturb an individual while it is occupying a structure or place which it uses for shelter or protection (S9:4b) and to intentionally or recklessly obstruct access to any structure or place used for shelter or protection by an individual (S9:4c). It is also an offence to deliberately capture, injure or kill an otter or to impair their ability to survive or reproduce.
- **Rabbit (and fox).** The Wild Mammals Protection Act (1996) makes it an offence to crush or asphyxiate any wild mammal. This may apply during site clearance works, particularly where burrowing mammals such as rabbit and fox are present, as such animals could be crushed or asphyxiated in their burrows by heavy machinery.
- **Water Vole** are protected under Schedule 5 of the Wildlife and Countryside Act (1981 as amended), which makes it an offence to: intentionally capture, kill or injure water voles, damage, destroy or block access to their places of shelter or protection (on purpose or by not taking enough care) or to disturb them in a place of shelter or protection (on purpose or by not taking enough care).

2 METHODOLOGY

2.1 Project and Survey Scope

2.1.1 A brief description of the works, as proposed within the document “Multidisciplinary Survey Requirements for AiP” (Iss. 1.0, 06/03/2020), is as follows:

- Construction of a substation for Kirkby station;
- Northern platform and walkway of Kirkby station to be demolished or modified;
- Second track to be built from Kirkby station to proposed Headbolt Lane station;
- Construction of supply bulk point, substation for Headbolt Lane, two platform station, walkway and associated non-rail transport infrastructure at proposed Headbolt Lane site; and
- Repositioning of Knowsley Freight Terminal

2.1.2 The aim of the Preliminary Ecological Appraisal, including the desk study, is to inform the scheme in recording the ecological baseline for the site and/or identifying key features. Where possible, the ecological value of the features present on site is assessed in accordance with guidelines issued by the Chartered Institute of Ecology and Environmental Management (CIEEM 2016), although the values are usually provisional upon data obtained from further survey effort where required.

2.2 Desk Study

2.2.1 A desk study provides background information on the ecological context of a site and complements data collected in the field. The search area extended up to 2km and incorporated the following resources:

- Defra’s Multi-Agency Geographic Information for the Countryside (MAGIC) www.magic.gov.uk was searched for European and National Statutory designated sites, including Special Protected Areas (SPAs), Special Areas of Conservation (SACs), Sites of Special Scientific Interest (SSSI) and Local Nature Reserves (LNRs). The site was also searched for records of nearby granted European Protected Species (EPS) mitigation licences;
- MAGIC also provided a basis for highlighting the location of nearby UK BAP (Biodiversity Action Plan – now covered by the UK Post-2010 Biodiversity Framework) priority habitats;
- The National Biodiversity Network (NBN) Atlas (<https://records.nbnatlas.org>) was consulted with reference to relevant and notable species records on, or within 1km of, the site; and
- Aerial imagery from Google Maps (www.google.co.uk/maps), and Ordnance Survey mapping from Bing (<https://www.bing.com/maps/>), was reviewed to help determine terrestrial and hydrological connectivity with the wider landscape. This particularly related to the presence of ponds within 250m of the proposal site. Where potential water bodies are identified, further ground investigation of their presence and suitability for great crested newt (*Triturus cristatus*) is recommended.

2.3 Extended Phase 1 Habitat Survey

- 2.3.1 The Phase 1 Habitat Survey broadly followed the standard methodology as detailed in the JNCC (2010) *Handbook for Phase 1 Habitat Survey - A technique for environmental audit*, and further developed in Guidance for Baseline Ecological Assessment (Institute of Environmental Assessment, 1995). This involved mapping and describing the broad habitats and compiling a general plant species list to reflect the floristic assemblage of each habitat type. All botanical names follow the nomenclature of Stace (2010).
- 2.3.2 Target notes (TN) were used to illustrate key features of interest (i.e. over mature trees / dead standing wood) or to draw attention to areas considered too small to map or for the purpose of highlighting the location of an invasive plant species.
- 2.3.3 The survey was 'extended' in accordance with the Institute of Environmental Assessment, (1995) to assess faunal potential through, and adjacent to, the survey area. The level of scoping does not necessarily constitute full survey effort, although reasonable effort is made to provide informed conclusions for the potential requirement of further survey.

2.4 Biodiversity Calculations – DEFRA 2.0

- 2.4.1 Biodiversity calculations were undertaken via the "Biodiversity Metric 2.0 Calculation Tool Beta Test - December 2019 Update" tool.
- 1.1.1 Habitat areas were calculated from the Phase 1 Habitat Plan (Figure 1), using polygon size, per habitat parcel calculated, with MapInfo Pro V17, utilising habitat notes gathered from site survey data and satellite imagery.
- 2.4.2 Condition assessments were undertaken utilising the Biodiversity metric 2.0 Technical supplement – JP029 (BETA).

2.5 Constraints

- 2.5.1 Some areas of dense scrub were impenetrable and therefore could not be fully surveyed for evidence of badgers.
- 2.5.2 Whilst desk study records can help to inform and complement survey effort, they should not be treated as a comprehensive list of species present within the search area. Many species are under-recorded and a lack of records can reflect a lack of survey effort in certain areas rather than confirming absence of a species.

3 FINDINGS

3.1 Desk Study

Designations and Notable Habitats

- 3.1.1 Headbolt Lane is located north of Kirkby, Knowsley, Merseyside. The surrounding habitats are suburban, with rural agricultural lands in close proximity. Simonswood Dell runs underneath the railway track to the west of the proposed station location.
- 3.1.2 Habitats recorded by MAGIC as within 2km of the site include deciduous woodland, which is considered to be of 'priority' conservation status in accordance with the UK Post-2010 Biodiversity Framework.
- 3.1.3 Connectivity from the proposed development is moderate, with linear features present in the form of a small brook connecting to Simonswood Dell, the railway track and open grassland connecting to the wider rural landscape.

Protected, Notable and Invasive Species Records

- 3.1.4 No EPS mitigation licence records were returned within 1km. Three EPS mitigation licence records for common pipistrelle (*Pipistrellus pipistrellus*) were returned within 2km of the site: EPSM2013-5715 1.56km away; 2017-30556-EPS-MIT 1.58km away and 2015-7259-EPS-MIT 1.67km away.
- 3.1.5 The NBN Atlas was used to search for records of protected or notable species within 2km from the past 10 years. These records are summarised as follows:
- Mammals: Four hedgehog (*Erinaceus europaeus*), four brown hare (*Lepus europaeus*), four water vole (*Arvicola amphibious*), four common pipistrelle (*Pipistrellus pipistrellus*) nine red squirrel (*Sciurus vulgaris*) and two red fox (*Vulpes vulpes*).
 - Birds (Schedule 1 birds within the Wildlife and Countryside Act 1981, as amended): seven fieldfare (*Turdus pilaris*), one peregrine (*Falco peregrinus*) and 15 redwing (*Turdus iliacus*). 116 bird species were recorded within 2km of the site.
 - Plants: Two bluebell (*Hyacinthoides non-scripta*).
 - Key invasive plant species: ten records of Himalayan balsam (*Impatiens glandulifera*), and three records of Japanese knotweed (*Fallopia japonica*).
- 3.1.6 During the search, no reptile or amphibian records were returned.

3.2 Extended Phase 1 Habitat Survey

- 3.2.1 The habitat survey findings are illustrated on Figure 1 (Appendix 1) and are described further below, with target notes (TN) tabulated in Appendix 2 and cross referenced within the text below. Photographic plates are presented in Appendix 3. The survey area is approximately 42,923m² in size and was accessed from Headbolt Lane, Kirkby Station, and Millbrook Bridge access gate. The boundary of the planning application site at Headbolt Lane is approximately 57,029m², and the length of track and adjacent cess to also be affected is approximately 34,558m².

Habitats

Grassland communities

Tall ruderal

- 3.2.2 Tall ruderal grassland (TN3, photograph 3) with ragwort (*Jacobaea vulgaris*), red campion (*Silene dioica*), immature silver birch (*Betula pendula*), immature oak (*Quercus sp.*), nettle (*Urtica dioica*), Himalayan balsam (*Impatiens glandulifera*), rosebay willowherb (*Chamaenerion angustifolium*), cow parsley (*Anthriscus sylvestris*), hogweed (*Heracleum spondylium*) and rapeseed (*Brassica napus*).

Semi-improved neutral grassland

- 3.2.3 Semi-improved neutral grassland (TN4, photographs 5 and 6), with lesser stitchwort (*Stellaria graminea*), great willowherb (*Epilobium hirsutum*), ragwort, sorrel (*Rumex acetosa*), thistle (*Cirsium arvense*), nettle, yarrow (*Achillea millefolium*), sweet vernal grass (*Anthoxanthum odoratum*), cocksfoot (*Dactylis glomerata*), ribwort plantain (*Plantago lanceolata*), dandelion (*Taraxacum sp.*), hogweed (*Heracleum spondylium*), creeping buttercup (*Ranunculus repens*), cleavers (*Galium aparine*), bindweed (*Convolvulus arvensis*), dock (*Rumex sp.*), rosebay willowherb, white dead-nettle (*Lamium album*), hawkbit (*Leontodon sp.*), borage (*Borago officinalis*) and garlic mustard (*Alliaria petiolata*), with two ash (*Fraxinus excelsior*) trees.
- 3.2.4 Small cluster of immature trees (TN5, photograph 6) within semi-improved neutral grassland, including sycamore (*Acer pseudoplatanus*), beech (*Fagus sylvatica*) and elm (*Ulmus procera*), with an understorey of Yorkshire fog (*Holcus lanatus*), meadow cranesbill (*Geranium pratense*), nettle, ragwort, ribwort plantain, mallow (*Malva sylvestris*), herb Robert (*Geranium robertianum*) and hawkbit.
- 3.2.5 Unmown areas of semi-improved neutral grassland (TN7, photograph 6), with hawkbit, sweet vernal grass, sorrel, white clover, Yorkshire fog, thistle, dock, ribwort plantain, creeping buttercup, ragwort, weld (*Reseda luteola*), yarrow, bird's foot trefoil (*Lotus corniculatus*) and selfheal (*Prunella vulgaris*).
- 3.2.6 Semi-improved neutral grassland sloping down to embankment (TN11, photograph 9). Species include garlic mustard, thistle, feverfew (*Tanacetum parthenium*), rosebay willowherb, dock, sweet vernal grass, chickweed (*Stellaria media*), horsetail (*Equisetum sp.*), poppy (*Papaver somniferum*), great willowherb, bramble (*Rubus fruticosus*), ribwort plantain, hawkbit, common vetch (*Vicia sativa*), bindweed, red fescue (*Festuca rubra*), pineappleweed (*Matricaria discoidea*) and creeping buttercup.

Mown grassland

- 3.2.7 Mown amenity grassland (TN1, photograph 1) with Lombardy poplars (*Populus nigra 'Italica'*), one with a broken knot hole (photograph 2) with low bat roosting potential.
- 3.2.8 Mown amenity grassland (TN6, photograph 6) with white clover (*Trifolium repens*), ragwort, ribwort plantain, dandelion, Yorkshire fog, creeping buttercup, black medick (*Medicago lupulina*) and shining cranesbill (*Geranium lucidum*).
- 3.2.9 Mown amenity grassland (TN12, photograph 9), with infrequent thistle, ribwort plantain, Yorkshire fog, garlic mustard, feverfew, horsetail, white clover, greater plantain (*Plantago major*) and areas of bare ground.

Dense scrub

- 3.2.10 Dense scrub dominated by bramble (TN9), with Himalayan balsam, nettle and sweet vernal grasses at edges. A flytipped shed underneath an English elm may provide cover for reptiles or amphibians.
- 3.2.11 Very dense scrub along the railway boundary (TN10, photograph 8). Species include hawthorn (*Crataegus monogyna*), cherry (*Prunus* sp.), elder (*Sambucus nigra*), ash, field rose (*Rosa arvensis*) and oak, with an understory of bird's foot trefoil, bindweed, bramble, nettle, creeping buttercup, cocksfoot, rosebay willowherb, raspberry (*Rubus idaeus*), hogweed, ragwort, and dock.
- 3.2.12 Railway embankment scrub vegetation east of Kirkby station (TN15, photographs 11 and 12), with species including oak, goat willow (*Salix caprea*), sycamore, silver birch, elder, common lime (*Tilia x europaea*), Lombardy poplar, field maple (*Acer campestre*), cherry, privet (*Ligustrum vulgare*), field rose, hawthorn, gooseberry (*Ribes uva-crispa*), cotoneaster (*Cotoneaster horizontalis*) and Leyland cypress (*Cupressus x leylandii*). Behind the northern platform, trees include laburnum (*Laburnum anagyroides*), sycamore, elder and laurel (*Laurus nobilis*). Ground flora includes horsetail, bramble, ragwort, cocksfoot, red fescue, rosebay willowherb, bindweed, nettle, cleavers, old man's beard (*Clematis vitalba*), bracken (*Pteridium aquilinum*), thistle, hawkbit, ivy (*Hedera helix*), yellow flag iris (*Iris pseudacorus*), goldenrod (*Solidago virgaurea*), raspberry, yarrow, variegated yellow archangel (*Lamium galeobdolon* subsp. *argenteum*), foxglove (*Digitalis purpurea*), common vetch, buddleja (*Buddleja davidii*), groundsel (*Senecio vulgaris*) and herb Robert.
- 3.2.13 Railway embankment scrub vegetation opposite the Merseyrail Kirkby station platform (TN14), includes bramble, hawthorn, cleavers, rosebay willowherb, buddleja, elder, ragwort, bracken, nettle, raspberry, dogwood (*Cornus sanguinea*) and ash. The platform is a mixture of planted and seeded species, including hart's tongue fern (*Asplenium scolopendrium*), ribwort plantain, nettle, ivy, sycamore, hawthorn, dogwood, laurel, field rose, horsetail, St John's wort (*Hypericum perforatum*), dandelion and cotoneaster.
- 3.2.14 Along the railway embankment from Millbrook Bridge (TN16), species include ash, sycamore, hawthorn, oak, osier (*Salix viminalis*), ivy, cherry species, elder, field rose, Himalayan balsam, ragwort, rosebay willowherb, bracken, bramble, horsetail, nettle, greater willowherb and common toadflax (*Linaria vulgaris*), the last found above County Road Bridge WKL2 55.
- 3.2.15 Railway embankment species adjacent to Headbolt Lane (TN17) include goat willow, bracken, tormentil (*Potentilla erecta*), yarrow, hawkbit, bindweed, sage (*Salvia officinalis*), common vetch, cherry species, apple species (*Malus* sp.), and wood forget-me-not (*Myosotis sylvatica*). A large mammal run was observed partway down the track on the southern embankment (photograph 13).

Bare ground

- 3.2.16 An area of bare ground (TN13, photograph 10), with buddleja, bramble, dock, rosebay willowherb, hop (*Humulus lupulus*) and Japanese knotweed (*Fallopia japonica*) present at security fence alongside track. Trees include field rose, sycamore, silver birch, hawthorn and cherry.

Running water

- 3.2.17 Very slow flowing stream (TN2, photograph 3) emerging from two culverts under the rail track, with a depth of 50cm and a width of 1.5m. Some glossy film was observed on the water's surface, and large pieces of litter were observed on the bed. Bankside vegetation included rosebay willowherb, Himalayan balsam, thistle, nettle, horsetail, cleavers, bindweed, Yorkshire fog, bramble, cow parsley and common reed (*Phragmites australis*), with immature oak.
- 3.2.18 A generally slow-flowing stream (TN8, photograph 7), at a width of 1m or more, and a depth of 30cm. Some shallower sections have a faster current. The bed is silty, and banks varying between a height of 20cm to 1m, and heavily vegetated. Some undercutting of river banks from current present at points, but no mammal or crayfish holes visible. Bankside vegetation includes Himalayan balsam, rosebay willowherb, ragwort, thistle, nettle, common reed, yarrow, sorrel, cocksfoot and creeping buttercup, with areas of bare ground.

Invasive plant communities

- 3.2.19 Himalayan balsam was identified along the banks of the stream running through Headbolt Lane (TN2, TN8). Japanese knotweed was identified near Kirkby station (TN13, photograph 10), in an area of bare ground proposed to be developed for a new substation.

Faunal Species

- 3.2.20 The survey has identified potential or confirmed presence for the following protected species.

Breeding Birds

- 3.2.21 Opportunities for nesting birds are prevalent throughout the vegetation within the survey area, including railway embankments and bridges, where trees, scrub and tall ruderal vegetation are present. The dense bramble scrub within the proposed development is of notable value for nesting long tailed tit (*Aegithalos caudatus*), blackbird (*Turdus merula*) and dunnoek (*Prunella modularis*).
- 3.2.22 Old bird nests (photograph 17) from prior to the 2020 nesting season were observed underneath the steel crossbeams of a metal footbridge adjacent to Glovers Brow Bridge (SJ 40249 99256).

Badger, rabbit or fox

- 3.2.23 A cluster of shallow mammal holes were identified along the railway embankment at SJ 41369 99759 (photograph 14). Two mammal pathways, likely used by foxes or domestic cat, was identified the opposite side of the railway track at SJ 41275 99709 (photograph 13) and at SJ 40753 99478 through thick scrub vegetation. As the vegetation along the railway embankment and in some area of the proposed development at Headbolt Lane is dense, it is possible that other evidence of badger, rabbit or fox including mammal holes may have been missed. Therefore as a precaution, recommendations for badger, rabbit and fox are included within the Conclusion and Recommendations section, below.

Amphibians

- 3.2.24 No ponds have been recorded within 250m of the proposed development. Suitable terrestrial habitat for great crested newt was recorded throughout the survey area; in particular, along the railway embankments and within areas of dense tall ruderal vegetation and scrub within the Headbolt Lane survey area. A flytipped shed (TN9) may provide cover for amphibians near the railway embankment.

Reptiles

- 3.2.25 The scrub habitats near the brook hold potential for reptiles (TN3, photograph 4). The slope from the road has a south-westerly facing aspect, with optimal foraging potential due to the density and structure of the scrub. Basking opportunity is present in the more open adjacent habitats of shorter vegetation.
- 3.2.26 A flytipped shed (TN9) may provide cover for reptiles near the railway embankment.

Bats

Proposed Headbolt Lane station site and railway embankments

- 3.2.27 The area within the proposed Headbolt Lane station site offers suitable and ecologically well-connected habitat for foraging and commuting bat species.
- 3.2.28 A Preliminary Ground Level Roost Assessment was carried out for the trees within the survey area, in accordance with best practice guidance (Collins, 2016). This included any trees along the railway embankments where track works are proposed.
- 3.2.29 A mature Lombardy poplar is present adjacent to Headbolt Lane at SJ 41536 99849. The tree has a knot hole approximately 2.5m high, facing east (photograph 2). The extent of the knot hole could not be fully observed during the preliminary ground-level roost appraisal. Due to the potential of the features to support roosting bats and the suitable surrounding habitat, the tree has been assessed to hold a **moderate** bat roosting potential.
- 3.2.30 All other trees within the Headbolt Lane station site were assessed as offering **negligible** potential for roosting bats based on their age and/or a lack of suitable roosting features.
- 3.2.31 Along the railway embankments, multiple trees have ivy growth along the length of the trunks. The ivy conceals a number of trunks from being directly observed and due to the maturity of some trees along the embankments it is considered likely to conceal potential bat roosting features. Due to the maturity of some trees along the railway embankments and highly suitable foraging habitat for foraging bat species, all mature trees have collectively been assessed to hold a **low** bat roosting potential.

County Road Bridge A502 UB WKL2 55

- 3.2.32 County Road Bridge is a reinforced steel and stone structure (photograph 18), with no signs of weathering or colonisation by plant species. There are no gaps or cracks present that could provide potential spaces for roosting bats. No evidence of bat use, in the form of droppings, prey remains, staining on crevices by fur oils or urine, or bats themselves were identified across the bridge.
- 3.2.33 Therefore County Road Bridge was assessed as having **negligible** potential for roosting bats due to a lack of evidence of bat use and the absence of any suitable roosting features.

Millbrook Bridge UB WKL2 56

- 3.2.34 Millbrook Bridge is a stone structure with some vegetation growth present on the elevations and underside.

- 3.2.35 Gaps are present above the arch ring (photograph 19), on the north-west elevation, under the river arch on the western side (photograph 21) and under the arch of the bridge deck (photograph 20); the depth of these gaps are unknown, and therefore may provide suitable roosting opportunities for bats. It is possible that the presence of ivy growing across the wing walls and above the arch rings may have obscured potential bat roosting features; however, the presence of this vegetation is likely to lessen the likelihood of bats roosting in this particular locations due to the decrease in available space and the overly cluttered nature of the vegetation which is thought to obstruct a direct flight path. No evidence of bat use, in the form of droppings, prey remains, staining on crevices by fur oils or urine, or bats themselves were identified across the bridge.
- 3.2.36 Millbrook Bridge was assessed as having **low** potential for roosting bats due to a lack of evidence of bat use, and the presence of only minor superficial roosting features.

Glovers Brow Bridge OB WKL2 57

- 3.2.37 Glovers Brow Bridge is a solid concrete and sandstone construction, with a section of metal plating underneath the arch. Gaps are present between the concrete arch and metal plating (photograph 16) that may provide suitable roosting opportunities for bats, although cobwebs present suggest that these spaces have not been used recently. Some small pockmarks and cracks were present in the eastern sandstone elevation (photograph 15). No evidence of bat use, in the form of droppings, prey remains, staining on crevices by fur oils or urine, or bats themselves were identified across the bridge.
- 3.2.38 Glovers Brow Bridge was assessed as having **low** potential for roosting bats due to a lack of evidence of bat use, and the presence of only minor superficial roosting features.

Riparian mammals

- 3.2.39 The brook running through the proposed site for Headbolt Lane Station appears sub-optimal for otter as the watercourse appears too shallow and narrow.
- 3.2.40 No evidence of water vole was recorded during the survey; however the banks of the brook were densely vegetated, preventing the completion of a thorough inspection. Therefore, it is possible burrows may have been missed.

Other

- 3.2.41 The scrub habitats on site offer refuge opportunities to small mammals, such as hedgehogs.

3.3 Biodiversity Value of Habitats within Development Site

- 3.3.1 Land within the proposed development site supports semi natural habitats comprising a mosaic of semi-improved neutral grassland, tall ruderal, dense scrub, running water, mown grassland and bare ground amounting to approximately 101,800m² in area. The habitats within the footprint of the development range from poor to moderate condition and of low to high habitat distinctiveness with low ecological connectivity to the wider area and of medium strategic significance in Knowsley.
- 3.3.2 Approximately 39,400m² of habitat within the development footprint will be retained post-construction works. Approximately 62,400m² of habitat within the development footprint will be lost on a permanent basis. To compensate for the temporary and permanent habitat loss opportunities for habitat creation are to be undertaken on completion of the works.

3.3.3 When assessed through the DEFRA Biodiversity Metric habitat loss to the development equates to a total loss of 38.86 biodiversity Units.

3.3.4 Table 1 below details the habitat types and areas that will be impacted by the proposed development.

Table 1: Habitats within proposed development

Habitat type	Description, species and TN Habitat Condition & Distinctiveness	Estimated Area of habitat / distance of linear feature	
		Hectares (ha) / Metres (m)	% of development area
Tall ruderal	Tall ruderal with ragwort, rosebay willowherb, Himalayan balsam and immature trees. The habitat is considered to be in poor condition and of high distinctiveness.	0.24ha 2400m ²	2.79
Dense scrub	Areas of dense or very dense scrub characterized by bramble, with Himalayan balsam, nettle, thistle, woody species and ungrazed tall herb edges. The habitat is considered to be in poor condition and of medium distinctiveness.	3.41ha 34100m ²	39.64
Urban amenity grassland	Areas of mown grassland, with stress-tolerant species. The habitat is considered to be in moderate condition and of low distinctiveness.	2.21ha 22100m ²	25.69
Lowland mixed deciduous woodland	A small area of deciduous trees, all of similar ages, with a developed ground flora. The habitat is considered to be in moderate condition and of high distinctiveness.	0.02ha 200m ²	0.23
Semi-improved neutral grassland	Mixed grassland species, including wildflowers but excluding sedges, with some immature trees and undesirable species such as ragwort, hogweed and bramble. The habitat is considered to be in moderate condition and of medium distinctiveness.	2.72ha 27200m ²	31.62
Planted shrub	Not included in biodiversity metric due to small size.	0.0004ha 4m ²	0.00
Bare ground	Not included in biodiversity metric due to small size.	0.0014ha 14m ²	0.02

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 Habitats

- 4.1.1 The habitats recorded on site within the footprint of the development proposal are relatively common and widespread and support commonly occurring botanical species. However within the context of the urban environment they are of relatively high ecological value in the local context. When assessed under the criteria of the DEFRA Biodiversity Metric 2.0 the mosaic of semi-improved neutral grassland, tall ruderal, scrub, mown grassland, bare ground and running water habitats that will be lost to the development range from poor to moderate condition and from low to high habitat distinctiveness. These habitats will provide valuable places of refuge, shelter and foraging opportunities for common amphibian and reptile species, small mammals and birds. Any trees should be retained and incorporated into the landscaping design if possible; any necessary de-vegetation should be undertaken in accordance with the advice given for nesting birds, common amphibian species and small mammals. It is generally recommended that the amount of de-vegetation is restricted to the minimum required to facilitate the proposals and that any bounding vegetation or habitats remain protected and unaffected by the works.

4.2 Invasive Species

- 4.2.1 The survey has confirmed the presence of a small and localised stand of Japanese knotweed on site. To prevent further spread the works will be carried out in accordance with a site specific Japanese knotweed management plan to include strict biosecurity measures to prevent the spread of this highly invasive plant along the railway embankments and other locations.
- 4.2.2 Site operatives should be made aware of the presence of Himalayan Balsam within the proposed working area; an identification guide has been included in Appendix 4. Control measures will be required prior to the works to prevent the spread of this species. Control of this species entails manual hand pulling or strimming (below the first node) of any Himalayan balsam plants within any work areas. This management should be undertaken outside the seeding period (July to October, inclusive), accompanied by the burying or composting (in a designated, contained area) of plant fragments; arisings must not be removed from site. Biosecurity measures would be integral to the plan, including cleaning of plant, tools and footwear used within any contaminated areas.

4.3 Water Pollution Control Measures

- 4.3.1 All works will be conducted in line with Network Rail Environment Contract Requirements (NR/SP/ENV/015) and all industry standard best practice. This will avoid the risk of polluting the watercourse through chemical contamination or substrate run off.
- Any chemicals (if required) will be stored in designated places and banded to prevent leakages.
 - Spill kits will be on site to deal with any leakage of fuel, wet concrete or chemicals.
 - Vehicles will be inspected regularly to identify leaks, fuelling will be carried out off site.
 - On completion of the works, the working area will be reinstated on a like-for-like basis.

4.4 Protected Species

- 4.4.1 The survey has confirmed the potential or actual presence of nesting birds, bats, small mammals, reptiles, riparian mammals and amphibian species on site. The following is therefore recommended in respect of these species:

Nesting Birds

- 4.4.2 Nesting opportunities for a range of common bird species exist across the site, including within the proposed development area in grassland, tall ruderal, scrub, under bridges and within trees.
- 4.4.3 It is recommended that all devegetation works are undertaken outside the main nesting bird season (March to August inclusive), and maintained occasionally to deter any uptake prior to the commencement of works. If this timing is not possible and dense scrub or mature trees need to be removed during the main nesting bird season, checks of the affected areas will need to be undertaken by an ecologist no more than 48 hours prior to removal/management. If any active nests are identified, a buffer of at least 5m in all directions would be required, to protect the nest from disturbance until any chicks have fledged.

Bats

- 4.4.4 Trees on site were assessed to hold bat roosting potential. If trees holding a **moderate** bat roosting potential are to be impacted, roost locations should be assessed via aerial inspection and/or with an endoscope by a suitably qualified ecologist to confirm the assessment of bat roosting potential and to check for bat occupation. If bat roosting potential is confirmed to be moderate or higher, further survey effort in the form of bat emergence surveys (at least one dusk and one dawn emergence survey) would be required to determine if the roosting features are being utilised by bats, in-line with best practice guidelines (Collins, 2016). Should bats be confirmed to be present at this stage, a Natural England mitigation licence would be required for any trees with confirmed bat roosts, to be removed to facilitate the works.
- 4.4.5 Trees holding a **low** bat roosting potential can be de-vegetated adhering to the ecological precautionary working method statement in regards roosting bats, located below;

Preliminary Working Methods Statement for Trees with Low Bat Roosting Potential

- The soft felling will be carried out under the supervision of a bat licensed ecologist;
- Ideally carry out work on trees in autumn and spring (i.e. September to October and March to April), as this is when bats are least likely to be present;
- When preparing to cut a tree, look for evidence of bat occupancy – behind ivy stems; obvious holes, cavities and splits; dark staining on a tree below a hole; staining around a hole; maze of tiny scratch marks around the hole; noise coming from a hole; droppings within a hole;
- Bats may be behind partially detached ivy with stems in excess of 50mm, such features must be searched for evidence of bat occupancy before removal;
- Bats may be anywhere inside a hole, try to cut as far above a hole as possible. If in doubt if it is a roost, do not cut and seek ecological advice from the on-site ecologist;

- Bats may be inside cracks held open by the weight of a branch, which will close when the branch is taken off. Search such splits for bats before removing large limbs;
- Where possible, ring bark and leave up to 15m standing dead wood (trunk), with due regard to Health and Safety issues;
- If bats are found: if the roost(s) is still intact and bats are not injured, works will temporarily cease until the ecologist has assessed the situation and establish the most appropriate way forward. If necessary, Natural England will be consulted and a mitigation licence will be applied for. If the bat(s) is injured, the bat will be taken into care by a local bat group/bat carer – works should only recommence once the ecologist has said that it is safe and legal to do so;
- If the timber is felled, the roost is not exposed and the bats are not injured, the ecologist will temporarily seal and isolate the roost and contact Natural England if necessary before re-locating the roost to a nearby suitable location and allowing the bats to disperse of their own accord when ready to do so;
- If the roost has been exposed, and a bat(s) has been injured, the bat(s) will be placed into a secure box or bag by the ecologist, who will then contact the local bat group/carers for advice and assistance. Bats must not be handled without gloves or by non-licensed personnel; and
- In all cases where bats are found to occupy a tree, the ecologist will keep a log of all decisions made and any mitigation undertaken on site.

Badgers, foxes and rabbits

- 4.4.6 Whilst no evidence of badger, rabbit or fox was recorded during the survey, small areas were not accessible during the survey due to the presence of dense scrub vegetation; it is therefore possible that mammal holes and/or evidence are present within.
- 4.4.7 As a precaution, if any holes suspected to be badger sett entrances are unexpectedly discovered during any future works, work in that area must cease and an ecologist must be contacted for advice on how to proceed, a site visit may be required to assess the hole(s). Badger sett entrances are typically in the shape of a capital 'D' with the flat side down, measuring on average 25-35cm in width and maintaining a wide tunnel within. Fresh spoil is often present outside regularly used entrances.
- 4.4.8 With regards to rabbit and fox, these species are protected under the Wild Mammals Protection Act (1996) from asphyxiation and crushing. It is recommended that if any mammal holes are identified then these holes should be avoided – this includes trampling, obstruction, machinery and temporary storage of materials. If avoidance is not possible, an ecologist should be contacted so that the species to which the hole belongs to can be identified. This information will then be used to provide further advice (a site visit may be required to assess the hole(s)).

Reptiles

- 4.4.9 The site is considered suitable for commonly occurring reptile species. It is recommended that during de-vegetation works, should a suspected reptile be observed on site that works cease and that a 10m exclusion zone be demarcated around the reptile and that the reptile be left to disperse on its own accord. A competent ecologist should also be notified immediately. The ecologist will then attend site, assess the situation and establish any required mitigation measures.

Riparian mammals

- 4.4.10 The small watercourse on the site has been considered to offer negligible potential for riparian mammals. However, there may be more suitable habitat within the wider surrounding area. Therefore, as a precaution, if an otter or water vole is sighted at any point, works should cease in that area until the animal(s) has dispersed of its own accord. In addition, as a precaution throughout the proposed works, the watercourse should remain open to wildlife passage; i.e. in-channel scaffolding or machinery, if required, should not fully block access for wildlife to pass through. No overnight lighting should be used.

Common Amphibian Species

- 4.4.11 It is highly likely that common frog and common toad will be present on site and utilising the semi natural habitats for shelter and foraging. To avoid any impacts upon common amphibian species devegetation works should be completed ideally to avoid nesting bird season but also to avoid amphibian hibernation season (November to February).

Other

- 4.4.12 The scrub habitats present on site offer refuge opportunities to small mammals such as hedgehog.
- 4.4.13 Any dense scrub on site, if removal is required, should be carefully cut back in stages by hand in accordance with previous recommendations, taking care to look for hedgehogs in particular. If any hedgehogs are found, these should be safely relocated to a nearby, suitably dense/ well-vegetated area or brash pile that will remain undisturbed by the works.
- 4.4.14 If there is any doubt over translocating the hedgehog to a different part of the site, or if the hedgehog appears to be harmed or underweight, an ecologist will take the hedgehog into care and will contact a local wildlife hospital for advice.
- 4.4.15 As part of the site's landscaping, enhancement opportunities for wildlife could be considered, including: the installation of bird boxes on nearby mature trees; the planting of pollen rich species of benefit to insects; the planting of a small number of fruit trees; and the addition of shrubs to provide a variable vegetative structure.
- 4.4.16 Provision of artificial or natural hedgehog boxes could also be considered for quiet undisturbed areas on site with ground covering vegetation, preferably against a wall or fence. For example, three or four logs may be arranged to leave an appropriately sized hole for a hedgehog to nest in, and covered with masses of twigs and leaves. Retaining wood piles attracts invertebrates and fungi, providing a good local food source for hedgehogs and other species, and possible nesting sites (materials from site works could be used for this purpose).

4.5 Suggested Ecological Enhancement

- 4.5.1 In line with Defra's 'Biodiversity Metric v2.0 Toolkit' and Network Rail's commitment to the 'Mitigation Hierarchy', which comprises sequential steps to avoid, minimise, rehabilitate/restore and offset any negative impacts on biodiversity, calculations of the project's baseline biodiversity units before the works have been made – see relevant pages in the separate document, titled 'Biodiversity Metric 2.0 Calculation Tool Headbolt Lane July 2020'. Calculations were made using the 'Beta Test - December 2019 Update' version of the Biodiversity Metric 2.0 Calculation Tool.
- 4.5.2 The site baseline habitat size is 10.18ha, including buffer zones around the proposed site boundaries.

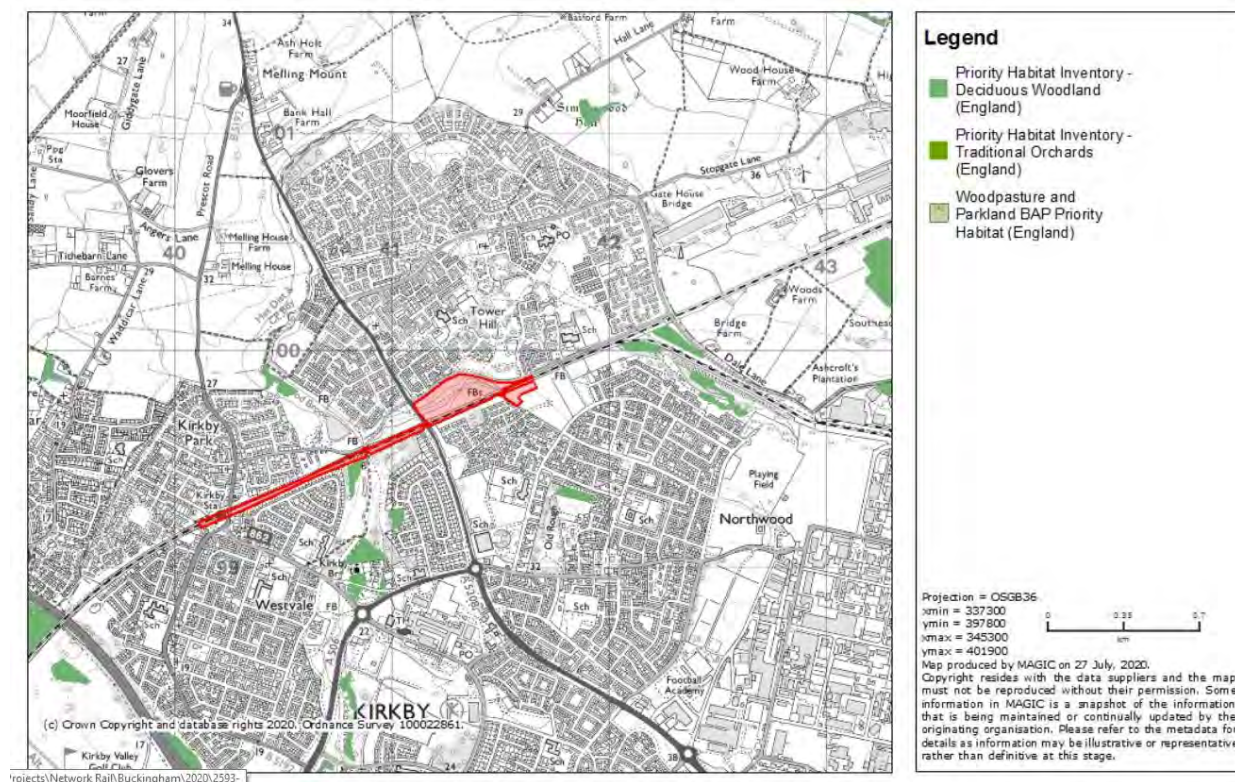
- 4.5.3 The post-works habitat units have been calculated as 53.99, with **losses** of 38.86 biodiversity units (approximate overall **losses** of 71.98%) due to the works. To achieve a biodiversity net-**gain** of 10%, **off-site mitigation is considered necessary**, with the creation of 44.25 biodiversity units.
- 4.5.4 Should any changes to the proposed works be required, the habitat calculations should be updated to reflect the updated habitat losses on site, once specific habitat and biodiversity losses can fully ascertained.
- 4.5.5 It should be noted that calculations that support this report have been carried out with the December 2019 BETA biodiversity calculator, the most recent release at the time of this report. All further updated calculation should take place with this version to ensure comparability to the calculations above. Future versions of the calculator may yield differing results.
- 4.5.6 The railway embankments offer value to wildlife, as they act as a habitat corridor for wildlife foraging and commuting in the wider landscape. Therefore, it is suggested that de-vegetation within the proposed working area is kept to a minimum and that any vegetation removed is reinstated, and enhanced, where possible.
- 4.5.7 Dependent upon an on-site habitat management plan that would ensure the quality and diversity of habitats generated post-works, off-site mitigation is anticipated required for the site to achieve a net-gain in biodiversity.
- 4.5.8 It is recommended that any wood or brash arising from the proposed de-vegetation should be used to create habitat piles in nearby suitable undisturbed locations along the railway embankments/rail corridor or within the compound area where appropriate. This may provide suitable habitat for sheltering and hibernating hedgehogs and provide refuge to other small mammals. The habitat piles should be created by lining up logs or brash horizontally (each layer in alternating directions) in layered, compact piles. Soil and any stones can also be added. Large diameter pieces of wood are the most valuable. The location of the habitat piles should be where feasible but also in areas which are unlikely to be disturbed and remain ecologically well-connected to other habitats.
- 4.5.9 To best achieve a net gain in biodiversity, the following interventions should be implemented on site:
- Any vegetation cleared will be allowed to naturally re-colonise; opening up small areas of vegetation will increase opportunities for successional plants to take hold; and
 - Any areas of scrub and tall ruderal cleared will be allowed to naturally re-colonise. Removal of small areas will diversify the structure of the scrub with open areas, providing disturbance features and an opportunity for other successional plants to grow.
 - A landscape plan should be developed to include habitat creation post development of the area subject to temporary construction impacts

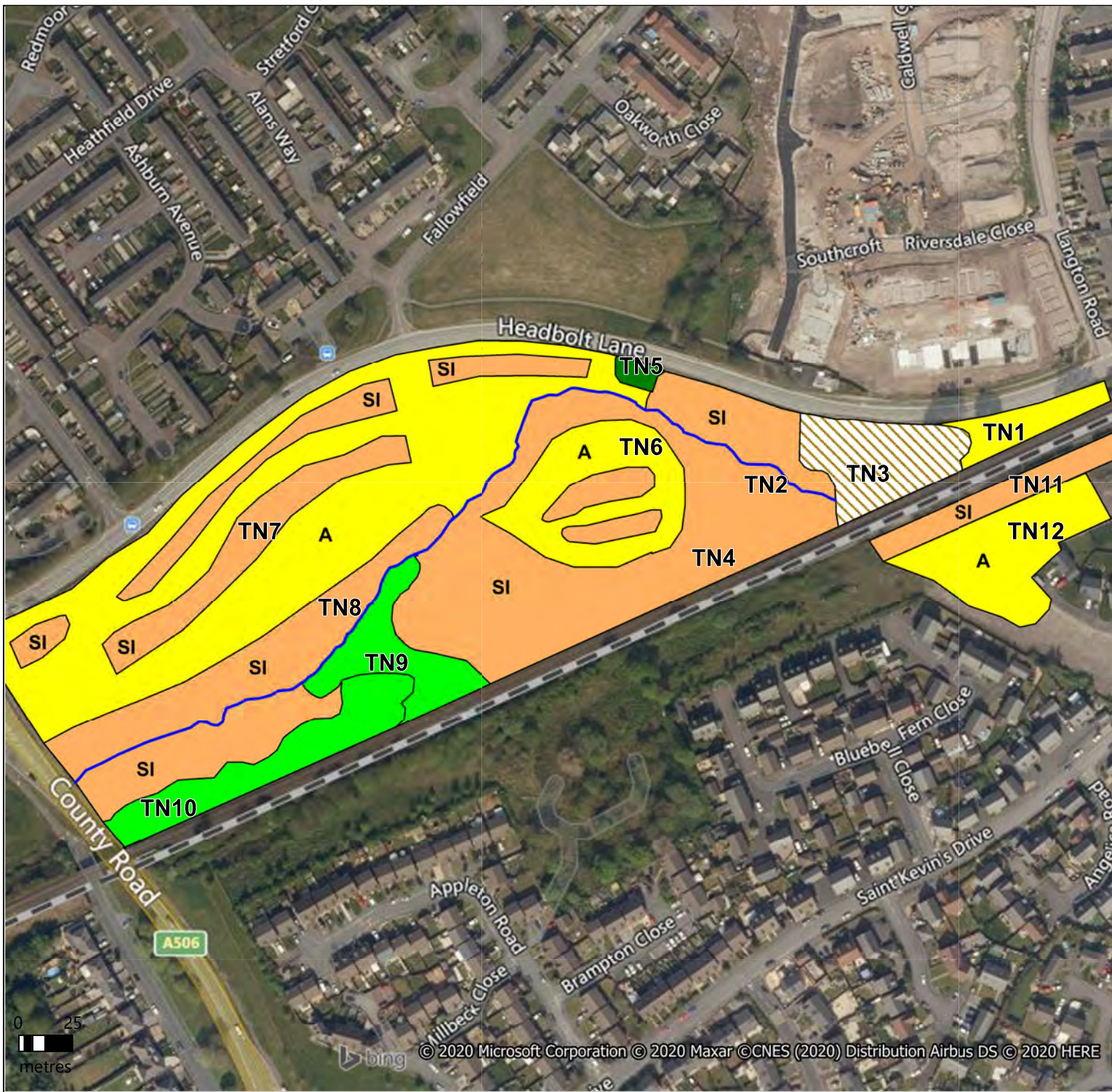
5 REFERENCES

- Bing Maps (<https://www.bing.com/maps>)
- CIEEM (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition. Chartered Institute of Ecology and Environmental Management, Winchester
- CIEEM (2013). Guidelines for Preliminary Ecological Appraisal. Chartered Institute of Ecology and Environmental Management, Winchester.
- CIEEM (2017). Guidelines for Preliminary Ecological Appraisal, 2nd edition. Chartered Institute of Ecology and Environmental Management, Winchester.
- Collins, J, (ed.) (2016). *Bat Survey for Professional Ecologists: Good Practice Guidelines (3rd Edition)*, Bat Conservation Trust, London.
- Google Maps (<https://www.google.co.uk/maps?hl=en&tab=wl>)
- Joint Nature Conservation Committee (2010) Handbook for Phase 1 habitat survey - a technique for environmental audit, ISBN 0 86139 636 8.
- MAGIC Maps (<http://magic.defra.gov.uk/MagicMap.aspx>)
- Mitchell-Jones, A.J. (2004). Bat Mitigation Guidelines. English Nature, Peterborough.
- Network Rail (2018). Level 2 Business Process: Environment and Social Minimum Requirements – Design and Construction (NR/L2/ENV/015). Network Rail, London.
- Stace, C. (2010). New Flora of the British Isles (3rd Ed). Cambridge University Press.
- The National Biodiversity Network Atlas (<https://nbnatlas.org/>)

APPENDIX 1: FIGURES

Figure 1: Location of proposed Headbolt Lane station and engineering works, showing extent of survey area (red highlight) and local BAP deciduous woodland habitats (green polygons). Map screenshot from MAGIC maps (accessed on 27/07/2020).





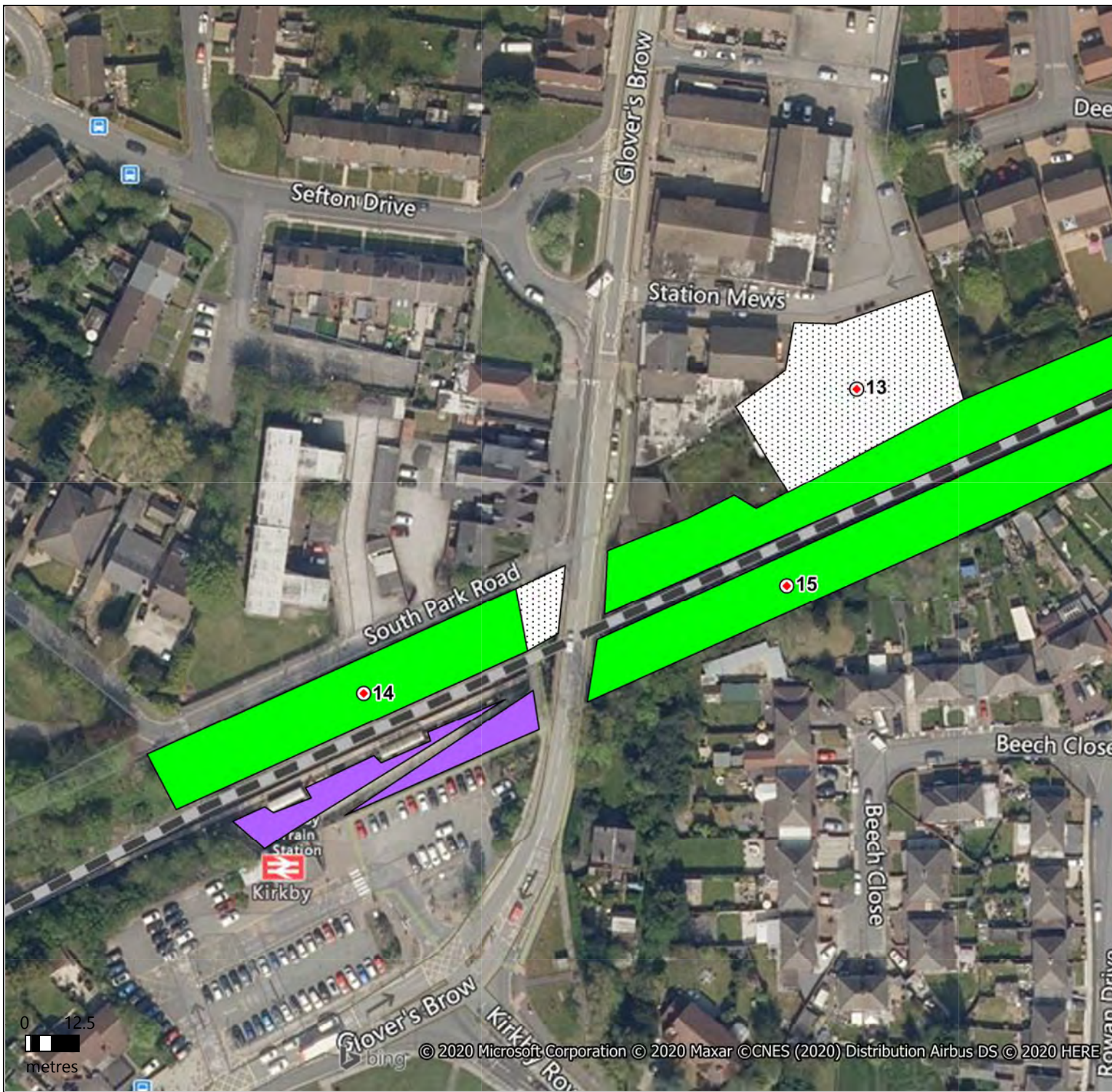
Key

- Cluster of trees
- Dense scrub
- Semi improved neutral grassland
- Tall ruderal
- Stream
- Amenity grassland

Headbolt Lane Phase 1 Habitat Plan

Figure 1

00	22/07/2020	LK	RT	NLG
Rev	Date	Drawn	Checked	Approved
		Scale at A4 1:2500 Contains ordnance survey data © Crown copyright and database right 2020		



Key

- Dense scrub
- Planted shrub
- Bare ground
- Target note



nlg ecology ltd

Headbolt Lane Phase 1 Habitat Plan

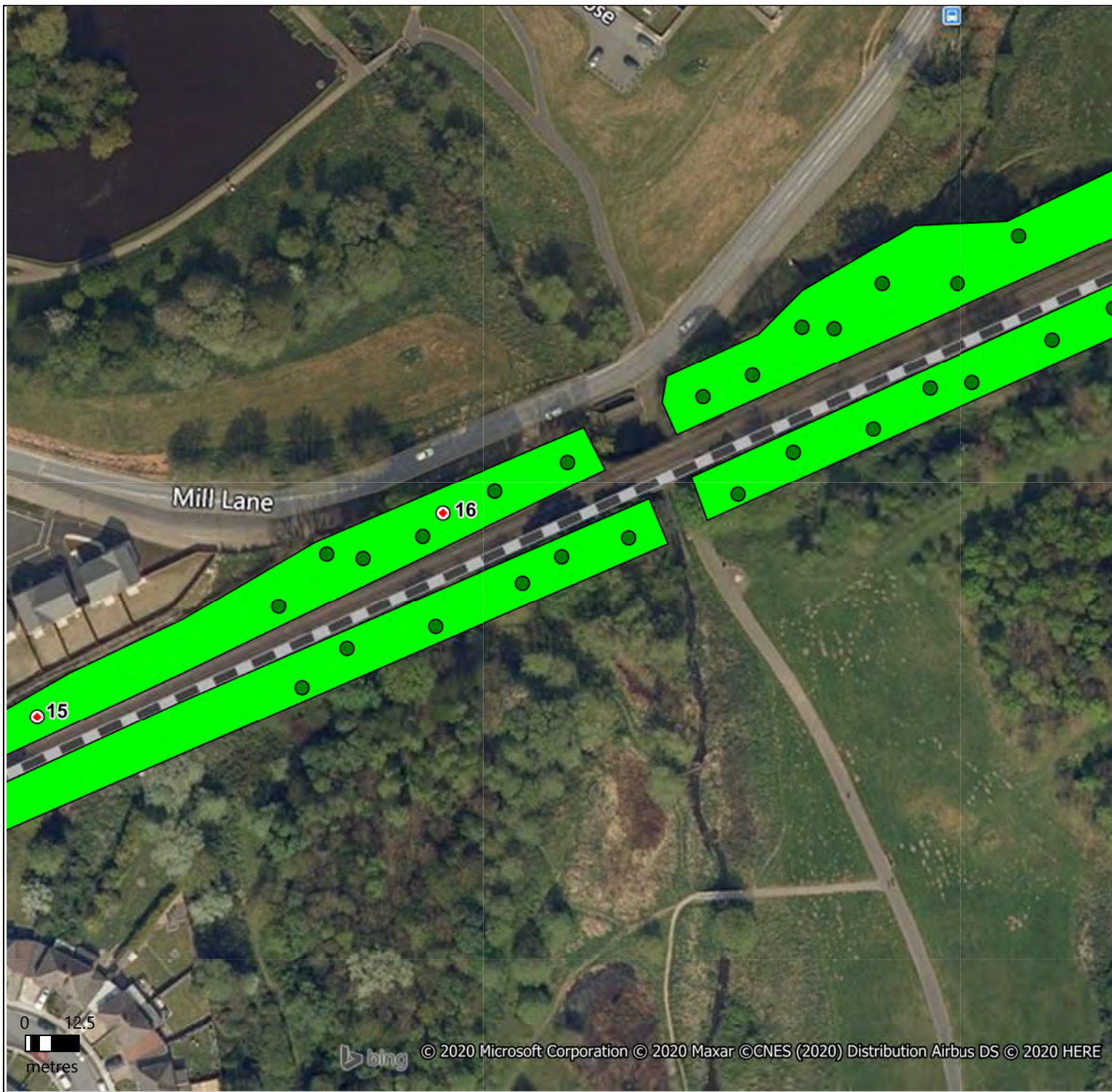
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Rev	Date	Drawn	Checked	Approved



Scale at A4
1:1250

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Key

- Tree
- Dense scrub
- Target note

Headbolt Lane
Phase 1 Habitat Plan

Figure 1.2

00	26/07/2020	LK	RT	NLG
Rev	Date	Drawn	Checked	Approved
 Scale at A4 1:1250		Contains ordnance survey data © Crown copyright and database right 2020		



Key

- Tree
- Dense scrub
- Target note

Headbolt Lane Phase 1 Habitat Plan

Figure 1.3

00	26/07/2020	LK	RT	NLG
Rev	Date	Drawn	Checked	Approved
Scale at A4 1:1250		Contains ordnance survey data © Crown copyright and database right 2020		



Key

Dense scrub

Semi improved neutral grassland

Headbolt Lane Phase 1 Habitat Plan

Figure 1.4

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Rev	Date	Drawn	Checked	Approved
Scale at A4 1:1750		Contains ordnance survey data © Crown copyright and database right 2020		

APPENDIX 2: TARGET NOTES

Target note (TN)	Description
1	Mown amenity grassland with Lombardy poplars (<i>Populus nigra 'Italica'</i>), one with a broken knot hole with low bat roosting potential.
2	Very slow flowing stream emerging from two culverts under the rail track, with a depth of 50cm and a width of 1.5m. Some glossy film was observed on the water's surface, and large pieces of litter were observed on the bed. Bankside vegetation included rosebay willowherb (<i>Chamaenerion angustifolium</i>), Himalayan balsam (<i>Impatiens glandulifera</i>), thistle (<i>Cirsium arvense</i>), nettle (<i>Urtica dioica</i>), horsetail (<i>Equisetum</i> sp.), cleavers (<i>Galium aparine</i>), bindweed (<i>Convolvulus arvensis</i>), Yorkshire fog (<i>Holcus lanatus</i>), bramble (<i>Rubus fruticosus</i>), cow parsley (<i>Anthriscus sylvestris</i>) and common reed (<i>Phragmites australis</i>), with immature oak (<i>Quercus robur</i>).
3	Tall ruderal grassland with ragwort (<i>Jacobaea vulgaris</i>), red campion (<i>Silene dioica</i>), immature silver birch (<i>Betula pendula</i>), immature oak, nettle, Himalayan balsam, rosebay willowherb, cow parsley, hogweed (<i>Heracleum spondylium</i>) and rapeseed (<i>Brassica napus</i>).
4	Semi-improved neutral grassland, with lesser stitchwort (<i>Stellaria graminea</i>), great willowherb (<i>Epilobium hirsutum</i>), ragwort, sorrel (<i>Rumex acetosa</i>), thistle, nettle, yarrow (<i>Achillea millefolium</i>), sweet vernal grass (<i>Anthoxanthum odoratum</i>), cocksfoot (<i>Dactylis glomerata</i>), ribwort plantain (<i>Plantago lanceolata</i>), dandelion (<i>Taraxacum</i> sp.), hogweed (<i>Heracleum spondylium</i>), creeping buttercup (<i>Ranunculus repens</i>), cleavers, dock (<i>Rumex</i> sp.), rosebay willowherb, white dead-nettle (<i>Lamium album</i>), hawkbit (<i>Leontodon</i> sp.), bindweed, borage (<i>Borago officinalis</i>) and garlic mustard (<i>Alliaria petiolata</i>), with two ash (<i>Fraxinus excelsior</i>) trees.
5	Small cluster of immature trees within semi-improved neutral grassland, including sycamore (<i>Acer pseudoplatanus</i>), beech (<i>Fagus sylvatica</i>) and elm (<i>Ulmus procera</i>), with an understorey of Yorkshire fog, meadow cranesbill (<i>Geranium pratense</i>), nettle, ragwort, ribwort plantain, mallow (<i>Malva sylvestris</i>), herb Robert (<i>Geranium robertianum</i>) and hawkbit.
6	Mown amenity grassland with white clover (<i>Trifolium repens</i>), ragwort, ribwort plantain, dandelion, Yorkshire fog, creeping buttercup, black medick (<i>Medicago lupulina</i>) and shining cranesbill (<i>Geranium lucidum</i>).
7	Unmown areas of semi-improved neutral grassland, with hawkbit, sweet vernal grass, sorrel, white clover, Yorkshire fog, thistle, dock, ribwort plantain, creeping buttercup, ragwort, weld (<i>Reseda luteola</i>), yarrow, bird's foot trefoil (<i>Lotus corniculatus</i>) and selfheal (<i>Prunella vulgaris</i>).
8	A generally slow-flowing stream, at a width of 1m or more, and a depth of 30cm. Some shallower sections have a faster current. The bed is silty, and banks varying between a height of 20cm to 1m, and heavily vegetated. Some undercutting of river banks from current present at points, but no mammal or crayfish holes visible. Bankside vegetation includes Himalayan balsam, rosebay willowherb, ragwort, thistle, nettle, common reed, yarrow, sorrel, cocksfoot (<i>Dactylis glomerata</i>) and creeping buttercup, with areas of bare ground.
9	Dense scrub dominated by bramble, with Himalayan balsam, nettle and sweet vernal grasses at edges. A flytipped shed underneath an English elm may provide cover for reptiles or amphibians.
10	Very dense scrub along the railway boundary. Species include hawthorn (<i>Crataegus monogyna</i>), cherry (<i>Prunus</i> sp.), elder (<i>Sambucus nigra</i>), ash, field rose (<i>Rosa arvensis</i>) and oak, with an understorey of bird's foot trefoil, bindweed, bramble, nettle, creeping buttercup, cocksfoot, rosebay willowherb, raspberry (<i>Rubus idaeus</i>), hogweed, ragwort, and dock.
11	Semi-improved neutral grassland sloping down to embankment. Species include garlic mustard, thistle, feverfew (<i>Tanacetum parthenium</i>), rosebay willowherb, dock, sweet vernal grass, chickweed (<i>Stellaria media</i>), horsetail, poppy (<i>Papaver somniferum</i>), great willowherb, bramble, ribwort plantain, hawkbit, common vetch (<i>Vicia sativa</i>), bindweed, red fescue (<i>Festuca rubra</i>), pineappleweed (<i>Matricaria discoidea</i>) and creeping buttercup.
12	Mown amenity grassland, with infrequent thistle, ribwort plantain, Yorkshire fog, garlic mustard, feverfew, horsetail, white clover, greater plantain (<i>Plantago major</i>) and areas of bare ground.
13	An area of bare ground, with buddleja (<i>Buddleja davidii</i>), bramble, dock, rosebay willowherb, hop (<i>Humulus lupulus</i>) and Japanese knotweed (<i>Fallopia japonica</i>) present at security fence alongside track. Trees include field rose, sycamore, silver birch, hawthorn and cherry.
14	Railway embankment scrub vegetation opposite the Merseyrail Kirkby station platform, includes bramble, hawthorn, cleavers, rosebay willowherb, buddleja, elder, ragwort, bracken, nettle, raspberry, dogwood (<i>Cornus sanguinea</i>) and ash. The platform is a mixture of planted and seeded species, including hart's tongue fern (<i>Asplenium scolopendrium</i>), ribwort plantain, nettle, ivy, sycamore, hawthorn, dogwood,

	laurel, field rose, horsetail, St John's wort (<i>Hypericum perforatum</i>), dandelion and cotoneaster.
15	Railway embankment scrub vegetation east of Kirkby station, with species including oak, goat willow (<i>Salix caprea</i>), sycamore, silver birch, elder, common lime (<i>Tilia x europaea</i>), Lombardy poplar, field maple (<i>Acer campestre</i>), cherry, privet (<i>Ligustrum vulgare</i>), field rose, hawthorn, gooseberry (<i>Ribes uva-crispa</i>), cotoneaster (<i>Cotoneaster horizontalis</i>) and Leyland cypress (<i>Cupressus x leylandii</i>). Behind the northern platform, trees include laburnum (<i>Laburnum anagyroides</i>), sycamore, elder and laurel (<i>Laurus nobilis</i>). Ground flora includes horsetail, bramble, ragwort, cocksfoot, red fescue, rosebay willowherb, bindweed, nettle, cleavers, old man's beard (<i>Clematis vitalba</i>), bracken (<i>Pteridium aquilinum</i>), thistle, hawkbit, ivy (<i>Hedera helix</i>), yellow flag iris (<i>Iris pseudacorus</i>), goldenrod (<i>Solidago virgaurea</i>), raspberry, yarrow, variegated yellow archangel (<i>Lamium galeobdolon</i> subsp. <i>argentatum</i>), foxglove (<i>Digitalis purpurea</i>), common vetch, buddleija, groundsel (<i>Senecio vulgaris</i>) and herb Robert.
16	Along the railway embankment from Millbrook Bridge, species include ash, sycamore, hawthorn, oak, osier (<i>Salix viminalis</i>), ivy, cherry species, elder, field rose, Himalayan balsam, ragwort, rosebay willowherb, bracken, bramble, horsetail, nettle, greater willowherb and common toadflax (<i>Linaria vulgaris</i>), the last found above County Road Bridge WKL2 55.
17	Railway embankment species adjacent to Headbolt Lane include goat willow, bracken, tormentil (<i>Potentilla erecta</i>), yarrow, hawkbit, bindweed, sage (<i>Salvia officinalis</i>), common vetch, cherry species, apple species (<i>Malus</i> sp.), and wood forget-me-not (<i>Myosotis sylvatica</i>). A large mammal run was observed partway down the track on the southern embankment.

APPENDIX 3: PHOTOGRAPHIC PLATES

Photograph 1. Mature Lombardy poplar trees (TN1); tree with knot hole seen to left hand side.



Photograph 2. Knot hole in Lombardy poplar with medium bat roosting potential (TN1).



Photograph 3. Slow-flowing culverted stream (TN2) running through the proposed Headbolt Lane station site.



Photograph 4. Tall ruderal (TN3) with potential for reptiles.



Photograph 5. Semi-improved neutral grassland (TN4) looking west.



Photograph 6. Mosaic of semi-neutral grassland (left side, TN4), small cluster of immature trees (background left side, TN5), mown amenity grassland (foreground, TN6) and unmown grassland (right side, TN7).



Photograph 7. Undercutting of stream banks (TN8).



Photograph 8. Thick bramble scrub outside of railway embankment (TN10).



Photograph 9. Scrub and semi-improved neutral grassland sloping down to culvert under railway embankment (TN11). Mown grassland (TN12) present to far right.



Photograph 10. Japanese knotweed present on bare ground for proposed substation (TN13).



Photograph 11. Northern platform of Kirkby (TN15), with bankside vegetation opposite including Japanese knotweed at base of bare ground for substation (TN13).



Photograph 12. Embankment vegetation (TN15).



Photograph 13. Mammal path (TN17) at SJ 41275 99709.



Photograph 14. Shallow mammal holes (TN17) at SJ 41369 99759.



Photograph 15. Glovers Brow Bridge (eastern elevation) with crack to left and pockmark to right highlighted (red circles).



Photograph 16. Metal plate underneath Glovers Brow Bridge with low bat potential.



Photograph 17. Old bird nest present underneath Glovers Brow footbridge.



Photograph 18. County Road Bridge with no bat potential.



Photograph 19. Millbrook Bridge with gap present above arch ring.



Photograph 20. Gap in arch of Millbrook Bridge near northern elevation, above footpath.



Photograph 21. Cracks and pockmarks in Millbrook Bridge over stream.



APPENDIX 4: HIMALAYAN BALSAM IDENTIFICATION GUIDE

This plant is listed under Schedule 9 of the Wildlife and Countryside Act 1981 (as amended). It is an offence to plant or otherwise cause spread in the wild.

	Seedling in moss Seedlings begin to appear in March (depending on weather and climate) The first 'leaves' are nearly-round, pale green and un-toothed with a nick at the end
	Real, toothed leaves begin to come through and may have reddish mid-ribs

	Immature plant Leaves are slender with finely serrated edges. They are opposite or in whorls along the stem and may have a reddish mid-rib
	Flowers begin to show in June/July and range in colour from pink to white. Stems are round, hollow and range in colour from red (early in year) to pink (summer). Stems can be up to 10cm thick, although usually 3cm. Adult plants can grow up to 2m tall.

	Flowers are trumpet shaped with wide petals and sweetly scented. Flowers are present from June to October.
	Seed pods can form from July to October. Seed pods are droplet shaped and 'explode' when touched. Seeds themselves range from white (unripe) to brown (ripe)
	Winter 'hay' like remains It may be difficult to identify in winter although you can look for 'hay' like remains from last year's growth Old stems are hollow and light. Often areas of high infestation are left bare following annual die-off.

Images used in this identification sheet were adapted from <http://dinns.sketchfiles.co.uk/en/invasive-species/on-the-dee/himalayan-balsam.aspx> [http://wildflowerfinder.org.uk/Flowers/B/Balsam\(Himalayan\)/Balsam\(Himalayan\).htm](http://wildflowerfinder.org.uk/Flowers/B/Balsam(Himalayan)/Balsam(Himalayan).htm) and nonnativespecies.org/

Rabbits: management options for preventing damage

The European rabbit *Oryctolagus cuniculus* has once again established itself as the major vertebrate pest of British agriculture, causing economic losses estimated to be in excess of £100 million annually. The total winter population is estimated to be at 35% to 40% of the pre-myxomatosis level (circa 1952) and is increasing by about 2% annually. This is due primarily to the reduced effect of myxomatosis, resulting from increased levels of genetic resistance. Given the problems associated with rabbits, this increase in numbers is likely to be accompanied by a corresponding rise in the amount of serious crop damage reported. It is essential, therefore, that effective control strategies are available to ensure that crops vulnerable to rabbit damage are adequately protected. This will serve to benefit landowners and occupiers who have a statutory responsibility to manage rabbit infestations on their land and to prevent them causing damage to neighbouring properties.

Damage

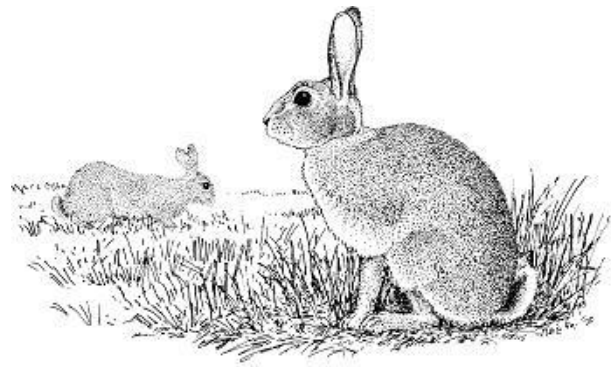
Cereals

It is estimated that farmers are losing about £50 million per annum as a consequence of rabbit damage to cereals. Winter wheat, barley and oats appear to be most vulnerable. Rye and triticale suffer smaller losses and spring barley appears to be the least susceptible to rabbit damage. In terms of annual yield, a loss of 1% per rabbit per hectare (2.5 acres) has been recorded for winter wheat and 0.33% per rabbit per hectare for spring barley.

The effects of grazing on winter cereals are most obvious during the winter, when plant growth is slow, and become less apparent when crops grow more rapidly in the spring.

In fact, by harvest, plants grazed by as many as 20 rabbits per hectare can be the same height as plants that have never been grazed. Yields, however, can be reduced by about 20%.

This clearly illustrates not only the scale of the problem but also the difficulties in accurately assessing the impact of grazing.



Rabbits

Grassland

The effect of rabbit grazing on pasture is less obvious than on cereals. Grazing of newly sown grassland may result in poor establishment or complete failure of the sward. Over-winter grazing of established grassland reduces early grass that is needed in the spring. Yields of crops cut later for silage or hay may also be substantially reduced.

Continuous grazing soon reduces the vigour of species such as Italian ryegrass or meadow fescue.

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Permanent grass on good soils is better able to withstand close defoliation, but grazing by large numbers of rabbits can weaken or kill even persistent leafy ryegrass. Scratching and burrowing can degrade pasture still further by encouraging the establishment of weeds such as nettles, thistles and ragwort. In terms of annual yield, recent studies have indicated the loss to be almost 1% per rabbit per hectare.

Other crops

Rabbit damage has been recorded to a wide range of crops in Britain. Besides cereals and grassland, some of the most important include roots, brassicas and market garden crops, which can all suffer severe damage, both to the growing plants and the marketable end product.

Trees

Rabbits can damage or kill planted nursery stock and young trees of many species. Damage to the bark of large trees can also be serious and semi-mature hedgerows may also be vulnerable. In extreme circumstances, rabbits may prevent natural regeneration in woodlands. Damage ranges from the eating of young seedlings to the destruction of leading shoots, the browsing of branches and removal of bark. The burrowing activities of rabbits can also undermine root systems.

Damage to archaeological sites, monuments and landscapes

Animal burrowing on archaeological sites results in the disturbance and sometimes destruction of artefacts, ecofacts and buried land surfaces. It also leads to the destabilisation of monuments, which in turn can lead to an altering of a monuments profile. Damage by burrowing should be prevented or avoided because our archaeological resource is finite and contains irreplaceable information that is important to the study of the human past.

Management

Rabbit populations can withstand high mortality from natural causes, therefore control efforts must add to, and not merely replace, these causes if direct control is to be effective.

Because of the size of the effort required, and the rabbit's inherent capacity for population increase, complete eradication is impractical.

Instead the aim should be to reduce rabbit numbers to levels at which the damage they cause is economically acceptable. Where access can be gained to burrows, gassing - accompanied by careful habitat management to reduce rabbit harbourage, if necessary - is the most effective method of control. In some situations, other techniques may be appropriate.

The most effective time for control is from November to March, although earlier action may be needed on autumn cereals showing signs of heavy grazing. There are four main reasons for this recommendation:

- Mortality from natural causes will have reduced rabbit numbers to their lowest level by the winter. Up to 90% of young rabbits born during the summer will have died by this time without human intervention.
- Action at this time will reduce the adult breeding population before the next breeding season begins. Each doe killed during this period can mean at least 20 fewer young rabbits born next summer.
- Reduction of numbers during this period will reduce damage to vulnerable autumn sown crops.
- Vegetation is dying back, making access to burrows easier.

More effective results will be achieved if adjoining land is treated at the same time in a co-operative exercise. Rabbits do not respect boundaries, and joint action will remove animals that use burrows on one holding and feed on another. Control over a substantial block of land will also reduce the rate of re-infestation.

The quality and amount of harbourage are major factors that can determine the number of rabbits in a particular area. Habitat management should therefore play an integral part of any successful rabbit control programme. Scrub and ground cover may need to be thinned sufficiently to give access to all burrows; this is essential where gassing is planned. Also, where practicable,

Rabbits: management options for preventing damage

burrow systems should be destroyed following control operations.

Appropriate measures should be taken to minimise damage to other wildlife and habitats. For example, scrub clearance should be avoided during the bird-nesting season.

Legal considerations

Under the Wild Mammals (Protection) Act 1996 it is an offence to intentionally inflict unnecessary suffering, as specified by the Act, on any wild mammal. This legislation may need to be considered where the destruction of occupied warrens and burrow systems is being contemplated.

Under the Animal Welfare Act 2006 a rabbit becomes a Protected Animal once it is caught in a trap or snare, making it an offence to cause unnecessary suffering. Traps and snares should therefore be inspected at least once and preferably twice a day and, wherever possible, be placed where the trapped animal will not be exposed to extremes of weather.

Under Section 12 of the Pests Act 1954, it is an offence to knowingly spread myxomatosis to uninfected rabbits. The Specified Animal Pathogens Order 1998 (S.I. 1998/463) prohibits the introduction into an animal of the live virus causing viral haemorrhagic disease (VHD) of rabbits, except where such introduction is undertaken under the authority of a licence. These prohibitions mean that the deliberate spreading of myxomatosis or VHD cannot be used as a legal method of controlling rabbits.

An Order has been made under Section 1 of the Pests Act 1954 by which England and Wales (except for the City of London, the Isles of Scilly and Skokholm Island) have been designated a Rabbit Clearance Area. In this area, every occupier of land is responsible for the killing or taking of wild rabbits on his land. Where it is not reasonably practical to destroy the rabbits, occupiers must take the necessary steps to prevent them causing damage.

Under section 98 of the Agricultural Act 1947, Defra has the power to serve a Notice under the Agriculture Act 1947, requiring rabbit control to

be carried out; if this is not done, they may arrange for the necessary work to be undertaken at the expense of the occupier, who could also be liable to a fine.

To help manage infestations, the Ground Game Act 1880 gives every occupier of land a limited right to kill and take rabbits and hares concurrently with the right of any other person entitled to do so on the same land. An occupier may use any legal method to kill rabbits and should ensure that they comply with other legislative controls on the methods of killing and taking animals, the most relevant of which are discussed further below.

The occupier may, in writing, authorise other persons to assist him, however only he and one other person authorised by him are entitled to kill using a firearm. The Ground Game Act 1880 exempts an occupier, and persons authorised by him, from the need to hold a game licence when killing or taking rabbits on the occupier's land.

Monuments that are being damaged by burrowing animals may be Scheduled. Any proposals to control rabbits on Scheduled Monuments should be discussed with English Heritage before work starts, to determine whether Scheduled Monument Consent is required.

Control methods: gassing

Gassing is the most effective method of reducing rabbit numbers where burrows are accessible. When correctly used, under the right conditions, gassing can reduce the rabbit population by up to 80%. However, effectiveness decreases in porous soils, when soil moisture is low and also when air temperatures fall below 5 °C. For best results, it is essential to drive rabbits to ground before gassing and to find and treat every entrance to the warren system.

On monuments and archaeological sites the soil used for closing up burrow holes should be brought in from off-site as any further digging on site will further damage the monument and add to its disfigurement. On Scheduled Monuments this should have already been agreed with

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English Heritage as part of the Scheduled Monument Consent.

Selective scrub clearance may be necessary to gain access to burrows. Before embarking on a gassing programme, particular attention should be paid to the possible presence of badger setts, as it is illegal to gas badgers. Care should also be taken to avoid gassing fox earths, as no fumigant is approved for use against foxes. Burrows in or around badger setts and fox earths must not therefore be treated. The impact on other wildlife living in burrows, for example adders, may also need to be considered.

Since the withdrawal of Cymag as a vertebrate control agent, the only commercially available fumigants are formulations that generate phosphine gas on contact with moisture. These are available either in tablet or pellet form.

All fumigants must be approved under the Control of Pesticides Regulations 1986 and must be used according to label instructions.

Gassing should only be undertaken by persons trained in the use of aluminium phosphide, and familiar with the precautionary measures to be observed. Fumigants can be lethal to humans and it is essential that users follow the instructions on safety aspects.

Users should be aware of the need to comply with the Control of Substances Hazardous to Health Regulations 2002 (S.I. 2002/2677), in respect both of its general provisions and those which relate specifically to fumigations. Further guidance is provided in the Health and Safety Executive Agriculture Information Sheet No. 22 Gassing of rabbits and vertebrate pests (see Further information).

Use of phosphine

The only available phosphine generating formulations are Phostoxin and Talunex. Both are extremely toxic to rabbits with inhalation resulting in rapid death.

Phostoxin is formulated as a spherical 3 gram tablet and can be introduced into the burrow system either by hand (protected by suitable gloves) or via an applicator. One tablet should

be inserted into each hole. This should then be sealed with a piece of turf, grass side downwards. Care must be taken not to drop soil onto the tablet.

Talunex consists of 0.6 gram pellets that are injected into the burrow system using a Topex applicator, specifically designed for use with this product. The system has the advantage of minimising operator exposure to the formulation. Treatment of infested areas should be the same as with Phostoxin, with the exception that 4 or 5 pellets should be introduced into each hole.

Follow-up action

The effectiveness of all gassing treatments should be monitored by inspecting treated areas for signs of fresh activity 48 hours after the initial treatment. In many situations, a follow-up treatment of re-opened holes will be necessary. Ideally, the procedure should be repeated until no re-opened burrows are found.

Control methods: fencing

Fencing is a particularly useful management tool where the nature of the rabbit harbourage makes other techniques impractical, or when complete exclusion is the aim. In many situations, fencing can be more cost-effective than control methods that have to be undertaken year after year. Traditionally, permanent wire-netting fences have been used to deny rabbits access to vulnerable areas but more recently, temporary electric fences, either netting or multi-strand wire systems, have become popular methods of crop protection.

When correctly erected and maintained, wire-netting and electric fences can reduce rabbit numbers on protected fields by 85% to 90%, and both have a useful life of about ten years. Electric fencing is cheaper to purchase and erect than wire-netting, but its maintenance costs are higher.

Wire-netting

Netting fences should be constructed of 18 gauge, 31 mm (1 1/4 in) hexagonal mesh. They should be a minimum of 750 mm (2 ft 6 in) high with a further 150 mm (6 in) lapped on the surface of the ground towards the rabbit

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harbourage. Turfs of grass should be placed on the lapped netting at 1 m (about 1 yard) intervals to hold it firmly in place (vegetation should later grow through the mesh to complete this job). The netting should be attached to two 2.65 mm (1/8 in) high tensile spring steel straining wires (one at the bottom of the fence and one at the top) with galvanised fence rings. The straining wires should be supported by wooden stakes 1.8 m (5 ft 11 in) x 80 mm (3 in). The stakes can be placed up to 15 m (48 ft 9 in) apart although ground undulations may dictate closer spacing. End posts 2 m (6 ft 6 in) x 100 mm (4 in) braced by struts 2 m (6 ft 6 in) x 80 mm (3 in) should be placed at the ends of the fence and at bends.

Local site conditions or other considerations may demand a variation to these specifications. For example, particular attention should be paid to the presence of potential weak spots such as uneven ground, dry stone-walls and watercourses. In areas such as young farm woodlands, where it is especially important to prevent invasion by rabbits, the fence specification can be improved by projecting the top 150 mm (6 in) of the fence outwards at 45° towards the harbourage. It is recommended that any proposed changes to the specification are first discussed with one of Natural England's Wildlife Management Advisers (see *Further information*).

Ideally, wire-netting fences should be erected to surround fully the area to be protected. If this is not practical, a strip fence, which extends at least 150 m beyond either end of the problem area, may be used.

The number of gates in a fence should be kept to a minimum because they make maintenance more difficult. They should be hung on supports independent of fence straining posts, as the latter will inevitably move and so affect the hang of the gates. A wooden sill must be dug into the ground to prevent burrowing underneath, and gates should shut against a post. Badger gates should be installed in the netting if the fence crosses any badger tracks or paths.

An advisory leaflet, describing the design and installation of badger gates in rabbit-proof

fencing (TIN026) is available (see under *Further information*).

Regular monthly inspections and maintenance of fences are essential to block burrows dug under the fences and to repair damage caused by farm machinery, fallen tree branches and vegetation. This safeguards the long-term effectiveness of the fence.

Electric fences

There are two types of electric fence in common use: netting and strained-wire. Both have been shown to be as effective as wire-netting fences.

Electric-netting fences are available in a number of commercial designs. Basically, they all consist of a heavy-duty polythene twine mesh in which the horizontal strands are interwoven with electrically conductive stainless steel wire. To prevent shorting, the steel wires are omitted from the bottom strand. They are between 0.5 to 0.75 m (1 ft 8 in to 2 ft 5 in) high and are supplied in 25 m (82 ft) or 50 m (164 ft) rolls in which the fence posts are already fitted. This type of fence is very quick and easy to erect and take down.

The electric strained-wire system consists of seven parallel electrified conducting wires (7-strand, 16 gauge medium tensile mild steel) at heights of 5, 10, 15, 20, 25, 30, and 40 cm (2, 4, 6, 8, 10, 12 and 16 in) above the ground. The lowest wire is earthed and the remaining six are live (a small length of wire should be wound around each of the top six wires to electrically connect them). Adjustable plastic insulators supported on metal stakes hold the wires. The stakes can be placed up to 7 m apart (about 8 yards), although ground undulations may dictate closer spacing. Where the fence line bends, anchor posts replace the normal metal stakes. The whole system is tensioned at a reel post placed at the end of the fence.

Both electric fence types must be powered by an energiser capable of producing an output of at least 1 joule when measured into a 500 ohm resistance. Most mains-operated energisers, and the more powerful battery-powered units, have this capability. Batteries should be

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changed regularly (a fully charged 70 Ah battery will need to be changed every 2 to 3 weeks). A wide range of energisers is available and users are advised to discuss specific requirements with their supplier. To effectively deter rabbits, it is important to maintain a minimum of 2.5 kV throughout the fenceline. A good earthing system is essential to achieve this.

Ideally, as for wire-netting fences, electric fences should be erected to surround fully the area to be protected. If this is not practical a strip fence, which extends at least 150 m beyond either end of the problem area, may be used. Prior to erection, a 450 mm to 600 mm (1 ft 6 in to 2 ft) wide strip should be mown along the fence line or the vegetation killed off using an approved herbicide. This ensures that the conducting wires are kept clear of vegetation that would otherwise short-circuit the system thereby draining power and reducing effectiveness. Initially, fences should be inspected every few days but this can later be extended to 2 to 3 week intervals.

A more detailed advisory leaflet on the use of fencing (TIN023) is available (see *Further information*).

Lethal control methods

Shooting

Shooting is a popular method of rabbit control and is most effective when conducted at night, using a spotlight.

The Ground Game Act 1880 gives an occupier the right to shoot rabbits on his land during the day and to authorise in writing one other person to do so. The person must be a member of the occupier's household or staff or be employed for reward. Under the Pests Act 1954, an occupier may apply to Natural England for authority to use a reasonable number of extra guns, if the owner of the shooting rights will neither permit the occupier to bring on extra guns, nor undertake to destroy the rabbits himself, and it is necessary to use more guns than the occupier has the right to authorise.

Under the Ground Game Act 1880 as amended by the Wildlife and Countryside Act 1981, the following are allowed to shoot at night:

- An owner-occupier with shooting rights.
- A landlord who has reserved his shooting rights.
- A shooting tenant not in occupation who has derived his shooting rights from the owner.
- An occupier or one other person authorised by him provided he has written authority from another person with shooting rights.

The Firearms Act 1968 requires any person possessing, purchasing or acquiring a shotgun to obtain a shotgun certificate from the police. A firearms certificate is required for rifle use.

Single shooting operations are not particularly effective and reduce rabbit numbers by only about 30%. The technique should only be used therefore as an adjunct to more effective control methods or to remove problem individuals that cannot be disposed of by other means. Shooting also tends to target adult males and therefore has a relatively limited effect on the breeding potential of the population the following spring unless considerable time and effort are expended.

Baited cage trapping

This technique involves the live capture of wild rabbits in galvanised wire-mesh cages baited with carrot. The technique can be used throughout the year, but is most effective at catching adult rabbits during the winter. Additional benefits are that the technique does not require access to burrows and non-target species can be released unharmed.

The traps should be set in short open vegetation and checked twice a day, early morning and late afternoon. Captured rabbits must be dispatched humanely. Cage trapping has been shown to reduce numbers by about 65% and is most appropriate for protecting high value crops where manpower is available for frequent checking of traps. A detailed advisory leaflet on the use of cage trapping is available from Natural England (see under *Further information*).

Rabbits: management options for preventing damage

Drop box trapping

Drop boxes are designed to be used in conjunction with wire-mesh netting. A tunnel is either inserted into the fence line at right angles or placed parallel to the netting on the harbourage side of the barrier. Rabbits are caught when they enter the tunnel and fall through a hinged flap into a box that has been buried in the ground. The lid returns to place by means of a counter balance weight fixed to it.

Drop box traps should be visited at least once a day, when set, preferably early in the mornings. Captured rabbits must be despatched humanely. Traps should not be installed where they may be at risk from flooding. Permanently sited traps can be an effective method of capturing rabbits where fences are newly erected and where rabbits are passing through holes in established fences.

Spring trapping

Under the Pests Act 1954 only approved spring traps, designed to catch and kill rabbits humanely, may be used. Those currently approved by the Spring Traps Approval Order 1995 are the Imbra Trap Mark I and Mark II, Juby Trap, Fenn Rabbit Trap Mark I, Fenn Vermin Trap Mark VI (Dual Purpose), Springer No. 6 (Multi Purpose), Victor Conibear 120-2, BMI Magnum 116, and clones of any of these listed spring traps.

Spring traps generally consist of a pair of clamps that are triggered to catch rabbits that step onto a plate mechanism. The traps should be set firmly in position with the treadle plate flush with the floor. The plate should be concealed by covering lightly with soil. To minimise the risk to non-target species, stock and pets should be excluded from the trapping area and the traps must be set only within the overhang of natural or artificial tunnels.

The Protection of Animals Act 1911 requires that all spring traps set for the purpose of catching rabbits (or hares) should be inspected at reasonable intervals and at least once every day between sunrise and sunset.

Snaring

Snares are intended for use to tether animals for subsequent humane despatch. They are made from stranded brass wires that run freely through a small eye made in one end of the wire. The looped end of the wire (100 mm (4 in) diameter), into which the animal places its head, is positioned about 90 mm (3 in), above the ground using a short, notched stick (the 'pricker' or 'teeler'). The free end of the wire is securely tethered by a strong rot-proof cord to a peg, which is driven firmly into the ground. This prevents captured animals from escaping. Snares with a 'stop' or knot about 140 mm (5 in) from the eye can be used. The 'stop' prevents the loop from closing fully, thus ensuring the snare tethers rather than kills the rabbit. Snares should be set on well-used rabbit runs, in short vegetation, close to the harbourage from which rabbits are gaining access to crops. Where rabbits are numerous, the use of well-placed snares can catch animals quickly and efficiently, but results are poor during dry weather and frost.

The Wildlife and Countryside Act 1981 prohibits the use of self-locking snares and requires free-running snares to be inspected daily. All reasonable precautions should be taken to avoid catching non-target animals. Under the Wildlife and Countryside Act 1981 it is illegal to set a snare to catch certain animals, such as badgers and otters. Under the Deer Act 1991 it is an offence to use snares to kill or take deer. It is recommended that they are inspected at dawn and dusk, and that they are not set where livestock are present or if there is a risk to domestic pets.

Ferreting

This involves the introduction of ferrets into the burrow system. The ferrets drive rabbits into nets, which are placed over the burrow entrances or to waiting guns that shoot them as they bolt from tunnel entrances. Ferreting is most successful outside of the breeding season and, having the advantage of capturing more females than males, may serve as a valuable technique for dealing with intransigent populations. However, the method is time consuming and, when used in isolation, is

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unlikely to produce effective control of rabbit infestations.

Damage reduction methods

Tree-guards

Individual tree guards and shelters can be used to protect young trees and shrubs from rabbit browsing and bark stripping where it is impractical or uneconomic to enclose them with fencing. There are many types available including plastic net guards, split plastic tubes, spiral plastic sleeves and welded mesh cylinders. Spiral plastic sleeves are perhaps the least successful because they tend to be displaced by wind or animals. The effectiveness of split plastic sleeves and net guards is greater because they are more robust. To effectively reduce rabbit damage tree guards should be at least 60 cm (2 ft) high.

Repellents

The use of repellents can be expensive, and does not always provide long-term protection from attack by rabbits. Any benefit they can provide is often offset when, as is often the case, repeated applications are necessary. Their use should therefore be restricted to small plantations or to areas that cannot be protected in any other way. Only repellents approved under the Control of Pesticides Regulations 1986 may be used. Users must comply fully with the label instructions.

Further information

In England further advice on dealing with rabbit problems, as well as problems caused by other

mammals and birds can be obtained by contacting Wildlife Management and Licensing at: Natural England, Wildlife Licensing Unit, First Floor, Temple Quay House, 2 The Square, Bristol, BS1 6EB

Tel: 0845 601 4523 (local rate). Email: wildlife@naturalengland.org.uk

A range of leaflets on wildlife topics is available online www.naturalengland.org.uk. In particular see:

- TIN023: *Rabbits: use of fencing to prevent agricultural damage*
- TIN024: *Rabbits: use of cage-trapping to prevent agricultural damage*
- TIN026 : *Badger gates in rabbit-proof fencing*

The Forestry Commission produces a number of publications and these can be obtained from Publication Section, Forest Research Station, Alice Holt Lodge, Wrecclesham, Farnham, Surrey GU10 4LH. Tel: 01420 23337.

The Health and Safety Executive Agriculture Information Sheet No. 22 Gassing of rabbits and vertebrate pests is available via their Infoline (Tel: 08701 545500) or online at www.hse.gov.uk/pubns/ais22.pdf

This leaflet was produced by Natural England and the Central Science Laboratory, now known as the Food and Environmental Research Agency (FERA).

Appendix B
Ground Investigation
Report, Arup, 2020

Buckingham Group Construction Ltd

**170248 Headbolt Lane New
Station GRIP 4**

Ground Investigation Report

170248-ARU-REP-EGE-000001

P01 | 26 January 2021

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 276736-06

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ARUP

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Appendices

Appendix A

Pre-Planning Application Drawings

Appendix B

Dunelm, 2020. Mining Risk Assessment

Appendix C

CCG Ground Investigation Locations

Appendix D

Geotechnical parameters

Appendix E

Geoenvironmental Screening Assessment

Appendix F

Waste Classification

Appendix G
Geotechnical Risk Register

1 Introduction

1.1 Context

Headbolt Lane is an infrastructure project that will extend the Merseyrail network from the existing terminating station at Kirkby to a new station to be constructed at Headbolt Lane.

The project extents (based on the GRIP 3 Option Selection Report) are 29m 57ch to 28m 44ch (29m 1254y to 28.0968y). The engineers line reference (ELR) changes from WJK to WKL2 at the existing head shunt to the east of Kirkby station (~29m 0902y).

The existing rail corridor comprises a single line. The Merseyrail network will be extended east from the existing terminating station at Kirkby, a new turnout will provide access to a new twin-track arrangement with provision for new 3rd rail DC electrification and bi-directional signalling. As part of these works the existing earthwork will be widened and strengthening and / or renewal works will be required to the existing Underbridges 55 and 56 (UB55 and UB56). The existing Northern Rail network will be shortened as a result.

The existing Northern Rail station at Kirkby will be decommissioned and a new station interchange provided at Headbolt Lane. This new station will comprise three platforms, with two platform faces serving Merseyrail and a single platform face serving Northern Rail. Buffer stops will be provided to Merseyrail and Northern Rail to delineate between the two Train Operating Companies. The platforms will be connected by a station access arrangement replicating the operational functionality at the existing Kirkby station.

A new 300 space car park, with passive provision to increase to 500 should demand require, with public transport interchange facilities will be provided at Headbolt Lane.

The scheme has been developed to GRIP stage 3 by Network Rail. Buckingham Group Construction Ltd (BGCL) has been appointed to develop the design to GRIP stage 4, and have appointed Ove Arup and Partners Ltd (Arup) to undertake design services.

Drawings to summarise the anticipated scope of works required for the scheme, prepared to support a recent pre-planning application are presented in Appendix A. It should be noted that GRIP stage 4 design is currently ongoing and as such these may be subject to change as the scheme design develops.

Arup has been commissioned by BGCL to prepare a Ground Investigation Report (GIR) and a Geo-environmental Report to support the GRIP stage 4 design and planning application for the scheme. This report covers both these aspects.

1.2 Objectives

A number of ground related uncertainties were identified in an earlier desk study completed by others [1],[2] and an intrusive ground investigation was recommended.

A ground investigation was designed by Arup to inform GRIP stage 4 design activities and preparation of approval in principle (F001) documents for the scheme.

The purpose of this report is to summarise the findings of this intrusive ground investigation and evaluate the potential impact on the future development by:

- Establishing the general ground profile and ground condition across the site;
- Providing an overview on the groundwater levels below the site;
- Characterising the existing geoenvironmental conditions and providing sufficient information to accompany the planning application to enable conditional planning approval;
- Summarising the existing earthworks within the rail corridor.

The report includes preliminary guidance on the ground-related risks which should be considered within subsequent design and construction phases. Key ground-related risks have also been recorded in the Designers Risk Assessment for the project, with relevant entries presented in Appendix G.

This Ground Investigation Report (GIR) has been prepared in accordance with BS EN 1997 (Eurocode 7 [3]) and NR/L3/CIV/071 [4]. Additionally, it contains the results of geoenvironmental investigations and contamination risk assessment.

The factual data from the ground investigation is provided in the Ground Investigation Factual Report [5].

1.3 Geotechnical category

The scheme has currently been identified to be Geotechnical Category 2 in accordance with BS EN 1997-1:2004, which comprise conventional types of structures, foundations and earthworks design with no exceptional risk or difficult ground or loading conditions.

It is anticipated that a number of design elements within the scheme (primarily bases for ancillary lineside civils structures) will be classed as Category 1 and where appropriate standard Network Rail design details will be used for design.

The Geotechnical Category of the various design elements will be identified in the relevant Form 001.

1.4 Use of report and limitations

This report was prepared by Arup on behalf of BGCL. It takes into account our Client's particular instructions and requirements. This report is not intended for,

and should not be relied on by, any third party and no responsibility is undertaken to any third party in relation to it.

All reasonable skill, care and diligence have been exercised within the timescale available and in accordance with the technical requirements of the brief. Notwithstanding the efforts made by the professional team in preparing the report, it is possible that other ground contamination or ground conditions, as yet undetected, may exist and consequently reliance on this report must be limited accordingly.