M5 Junction 10 Improvements Scheme

Environmental Statement

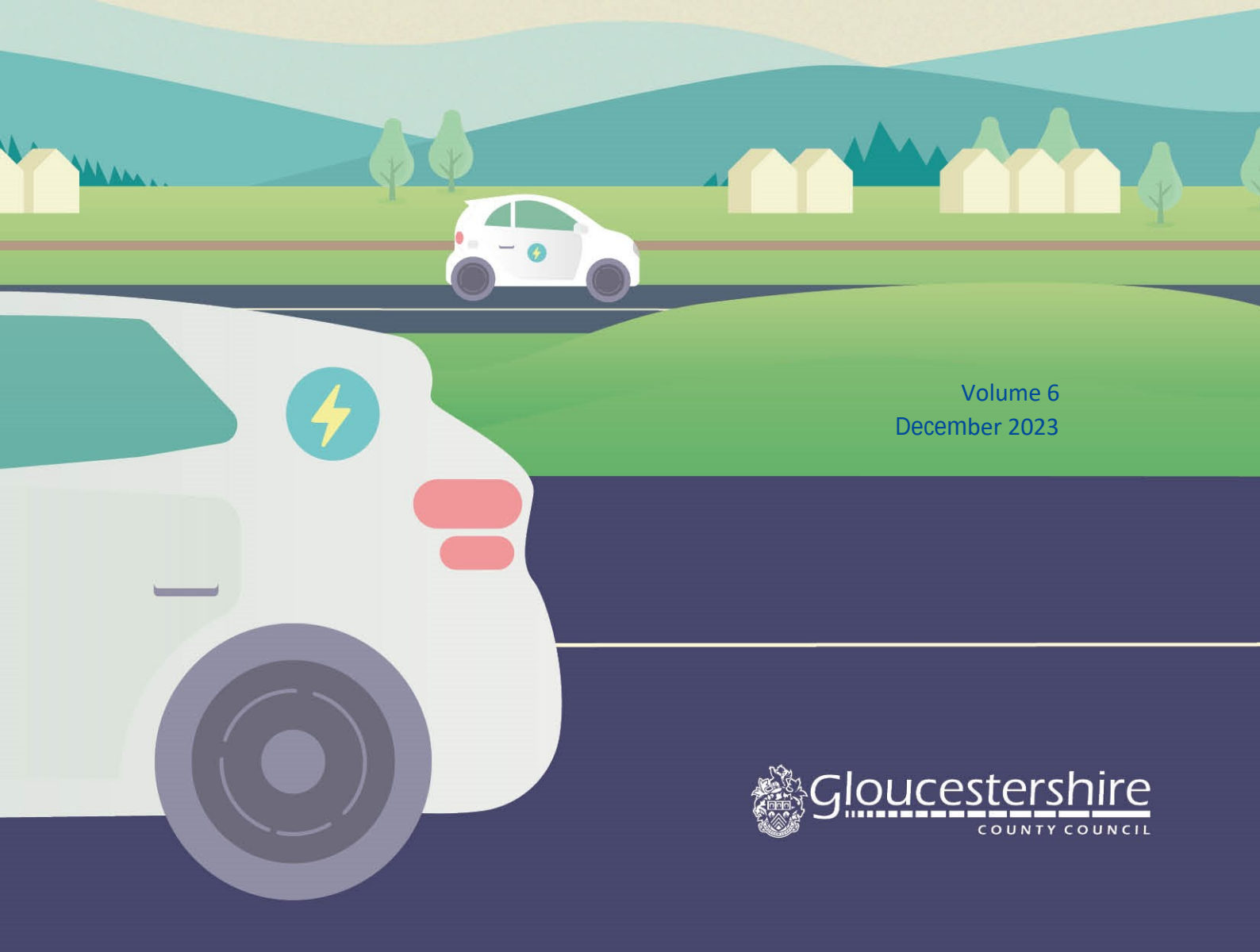
Appendix 7.18 Biodiversity Net Gain

TR010063 - APP 6.15

Regulation 5 (2) (a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009



Volume 6

December 2023

Gloucestershire COUNTY COUNCIL

THIS PAGE IS LEFT INTENTIONALLY BLANK

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

M5 Junction 10 Improvements Scheme

Development Consent Order 202[x]

6.15 Environmental Statement:

APPENDIX 7.18 BIODIVERSITY NET GAIN

Regulation Number:	Regulation 5(2)(a)
Planning Inspectorate Scheme Reference	TR010063
Application Document Reference	TR010063/APP/6.15
Author:	M5 Junction 10 Improvements Scheme Project Team

Version	Date	Status of Version
Rev 0	December 2023	DCO Application

Contents

Chapter		Page
1	**Introduction**	**6**
1.1	Terms of Reference	6
1.2	Legislation and Policy	6
1.3	Structure of the Report	10
2	**Methodology**	**12**
2.2	Approach to BNG	12
2.3	Desk study	13
2.4	Field survey	14
2.5	Calculating Terrestrial Habitat Units/Hedgerow Units using Biodiversity Metric 3.0	17
2.6	Calculating Baseline River Biodiversity Units using Biodiversity Metric 3.0	18
2.7	On-site post-development habitats	20
2.8	Assumptions and limitations	20
3	**On-site baseline conditions**	**23**
3.1	Desk study – Strategic significance – Terrestrial Habitats/Hedgerows	23
3.2	Terrestrial habitats	23
3.3	Hedgerows	27
3.4	Rivers and streams	29
4	**Scheme design**	**34**
4.2	Post-works terrestrial habitats	34
4.3	Post-works hedgerows	39
4.4	Rivers and streams	42
5	**BNG Metric results**	**46**
5.2	Terrestrial habitats	46
5.3	Hedgerows	49
5.4	Trading Summary (terrestrial habitats/hedgerows)	51
5.5	Rivers and streams	51
5.6	Ditches	55
6	**Scheme implementation and construction**	**56**
7	**BNG management and monitoring plan**	**57**
8	**BNG assessment – summary**	**60**
Appendix A.	**Schedule of figures included in this application document**	**62**
Appendix B.	**BNG Good Practice Principles for Development**	**98**
Appendix C.	**River Chelt Indicator Values and Enhancement**	**99**

Tables

Table 2-1 – Translation of UKHab categories to 'Habitats types' as listed in the metric 15
Table 3-1 – Overview of baseline habitats and biodiversity units generated 24
Table 3-2 – Overview of hedgerows and hedgerow units generated 28
Table 3-3 – River Condition Scores for the River Chelt and Leigh Brook 29
Table 3-4 – On-site Baseline River Biodiversity Units for Rivers and Streams 31
Table 3-5 – On-site Baseline River Biodiversity Units for Ditches 33
Table 4-1 – Translation of landscape design planting types to BNG metric categories 36
Table 4-2 – Translation of landscape design hedgerow types into metric (hedge creation) types 40
Table 4-3 – Hedgerow enhancement – summary and justifications 41
Table 4-4 – Rivers and Streams enhancement summary 43
Table 5-1 – Summary of On-site Habitat Creation Results 47
Table 5-2 – Summary of On-site Hedgerow Enhancement Results 49
Table 5-3 – Summary of On-site Hedgerow Creation Results 50
Table 5-4 – Rivers and Streams Module Biodiversity Net Gain post-works 53
Table 5-5 – Ditches Module Biodiversity Net Gain post-works 55
Table 7-1 – Summary of habitat creation and target conditions, with the 'time to target condition' periods 57
Table 7-2 – Summary of habitat (hedgerow) enhancement and target conditions, with the 'time to target condition' periods 59
Table 7-3 – Summary of river types, target conditions, with the 'time to target condition' periods 59
Table 8-1 – Summary of headline results from metric within the Order limits 60

Figures

Figure 2-1 – Illustration to depict the data source and biodiversity calculations for Biodiversity Metric 3.0 18

1 Introduction

1.1 Terms of Reference

1.1.1 This report has been produced as an appendix to Chapter 7 - Biodiversity (application document TR010063 – APP 6.5) to provide an account of the Biodiversity Net Gain (BNG) assessment undertaken to date for the M5 Junction 10 Improvements Scheme (the Scheme). The assessment presented in this report is based on the preliminary design for the Scheme (as presented at Design Fix 3 (DF3)).

1.1.2 Initially, a BNG feasibility assessment was undertaken in early 2022. This was an interim, high-level assessment to facilitate ongoing discussions around the development of habitat mitigation and enhancement options. It was based on an earlier iteration of the design (DF2), and used existing Phase 1 habitat survey data gathered predominantly in 2019, converted to the UK Habitat (UKHab) classification system to calculate the baseline biodiversity units. A number of other assumptions and limitations were also made which can be found in the full feasibility report[1]. The current assessment of the preliminary (DF3) design is based on field data which in most cases was gathered in 2021 and 2022 at an appropriate time of year.

1.1.3 BNG is an approach which aims to leave the natural environment in a measurably better state than beforehand. The Natural England Biodiversity Metric 3.0[2] (hereafter referred to as 'the metric') provides a way of measuring and accounting for biodiversity losses and gains resulting from development and/or land management change. Biodiversity Metric 3.1, an update to the previously published biodiversity metric 3.0, was published in April 2022. However, for this Scheme, given that metric 3.0 was used to undertake the initial BNG feasibility assessment at the start of 2022, version 3.0 will continue to be used, and has been used to undertake the calculations. This is in line with advice from Natural England[3].

1.1.4 As per the methodology set out by Natural England for the assessment of BNG, assessments are made separately for three different typologies which are rivers, streams and ditches; terrestrial habitats (habitats); and hedgerows. Therefore, for a project such as this Scheme, where all of these three typologies are present, the BNG assessment will cover these three different elements to produce three BNG net change values. It is not possible to present an averaged figure by combining the three typologies, or trade between the different percentage change values for each typology either. Each element needs to be viewed and interpreted separately.

1.2 Legislation and Policy

1.2.1 Relevant extracts from legislation, national and local policy and guidance are included in the sections below.

The Environment Act 2021

1.2.2 The Environment Act 2021 became law in November 2021. Part 6 of the Act makes provision for BNG, which will apply to applications under the Town and Country Planning Act 1990 and Nationally Significant Infrastructure Projects (NSIPs). The Act requires

[1] Atkins (March 2022) Technical Note. Biodiversity Net Gain (BNG). Distributed internally and to GCC in March 2022 with accompanying metric spreadsheets
[2] All parts of metric 3.0 have been archived and are available for download here: http://nepubprod.appspot.com/publication/5850908674228224 [accessed 18/10/22]
[3] Natural England Joint Publication JP039 (April 2022) Biodiversity Metric 3.1 Frequently Asked Questions accessed here: http://publications.naturalengland.org.uk/publication/6049804846366720

developments to deliver a minimum of 10% BNG. It requires that habitat is secured for at least 30 years via planning conditions or conservation covenants, and appropriate management and monitoring through the production of a Habitat Management and Monitoring Plan (HMMP). Habitat can be delivered on-site, off-site or via statutory biodiversity credits.

1.2.3 It is anticipated that BNG will become mandatory at the end of 2023 for applications under the Town and Country Planning Act 1990, and in November 2025 for Nationally Significant Infrastructure Projects. The Scheme has an objective of establishing BNG.

National Policy Statement for National Networks (NPS NN, 2014)[45]

1.2.4 The NPS NN sets out the need for, and Government's policies to deliver, development of NSIPs on the national road and rail networks in England. It provides planning guidance and is the basis for the examination by the Examining Authority and decisions by the Secretary of State.

1.2.5 Paragraphs 5.20 – 5.38 of NPS NN, 2014 specifically relate to ecology and biodiversity conservation.

1.2.6 Paragraph 5.23 requires that the Applicant should show the extent to which the project has 'taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests.'

1.2.7 Paragraph 5.36 states that 'Applicants should include appropriate mitigation measures as an integral part of their proposed development, including where and how that will be secured. In particular, the Applicant should demonstrate that:

- During construction, they will seek to ensure that activities will be confined to the minimum areas required for the works.
- During construction and operation, best practice will be followed to ensure that risk of disturbance or damage to species or habitats is minimised (including as a consequence of transport access arrangements.
- Habitats will, where practicable, be restored after construction works have finished.
- Developments will be designed and landscaped to provide green corridors and minimise habitat fragmentation where reasonable.
- Opportunities will be taken to enhance existing habitats and, where practicable, to create new habitats of value within the site landscaping proposals, for example through techniques such as the 'greening' of existing network crossing points, the use of green bridges and the habitat improvement of the network verge.'

National Planning Policy Framework (NPPF, 2021)

1.2.8 Paragraph 174 states that 'planning policies and decisions should contribute to and enhance the natural and local environment by:

- Protecting sites of biodiversity value.
- Minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures.'

1.2.9 Paragraph 179 builds on this by stating that plans should protect and enhance biodiversity through the identification, mapping and safeguarding of 'components of local wildlife-rich habitats and wider ecological networks, including the hierarchy of international, national

[4] Department for Transport (December 2014) National Policy Statement for National Networks.
[5] A ministerial statement on 22 July 2021 by Grant Shapps (Secretary of State for Transport) indicates that the NPS NN will be reviewed, with a proposed completion date of no later than Spring 2023.

and locally designated sites of importance for biodiversity; wildlife corridors that connect them; and areas identified by national and local partnerships for habitat management, enhancement, restoration, and creation'. Furthermore, plans should 'promote the conservation, restoration and enhancement of priority habitats, ecological networks and the protection and recovery of priority species; and identify and pursue opportunities for securing measurable net gains for biodiversity.'

Joint Core Strategy (JCS) 2011-2031[6]

1.2.10 Policy SD9: Biodiversity and Geodiversity outlines the stance that the biodiversity resource of the JCS area will be protected and enhanced through conserving and enhancing biodiversity and geodiversity on internationally, nationally and locally designated sites, as well as encouraging new development to contribute positively to biodiversity and geodiversity whilst linking with wider networks of green infrastructure.

1.2.11 The Strategy states that it provides an opportunity to deliver some of the objectives and complement the work programme of the Gloucestershire Local Nature Partnership (GLNP). It refers to the Gloucestershire Nature Map, which sets out spatial priorities for ecological conservation and enhancement across the county. A key part of this is the identification of a number of Strategic Nature Areas (SNAs), which are the key landscape-scale blocks of land where characteristic habitats that typify the county can be expanded and linked to support wildlife. SD9 encourages habitat creation and restoration within these SNAs and associated Nature Improvement Areas (NIAs).

Gloucestershire's Local Transport Plan (LTP) 2020–2041[7]

1.2.12 LTP PD0.2 – Local Environmental Protection states that 'Gloucestershire County Council (GCC) will work with District Councils and other partners; to minimise the impact of transport on landscapes, townscapes, heritage assets and the wider historic environment; to protect and enhance the water environment, air quality, soils and agricultural resources; to reduce the risk of flooding and the levels of noise pollution; to achieve BNG and conserve geodiversity and the historic environment, from traffic or improvements on the highway network.' GCC will do this by implementing the following policy proposals:

- Protect and avoid harm to geodiversity and biodiversity associated with transport infrastructure in addition to taking opportunities to enhance the natural environment wherever practicable.
- Comply with Gloucestershire Highways Biodiversity Guidance or subsequent guidance and the Green Infrastructure Pledge.
- Maximise the opportunities for transport interventions to contribute towards major new initiatives, including Nature Recovery Networks and large scale woodland creation and other similar measures that would help achieve BNG targets.
- Support Natural England's work on the Green Transport Corridors and Green Infrastructure Agreements, as well as their recommendations of the Linear Infrastructure Network, ensuring that within or adjacent to the rail network and Major Road Network, green infrastructure can deliver biodiversity gains, ecological connectivity and ecosystem services.

[6] Gloucester City, Cheltenham Borough and Tewkesbury Borough (Adopted December 2017) Joint Core Strategy 2011 – 2031.
[7] Gloucestershire County Council (2020) Gloucestershire's Local Transport Plan 2020 – 2041.

Tewkesbury Borough Plan 2011 – 2031[8]

1.2.13 The Tewkesbury Borough Plan refers to the JCS as providing the overarching policies in respect of biodiversity, but adds a number of non-strategic, local level policies, as outlined below.

1.2.14 Policy NAT1 Biodiversity, Geodiversity and Important Natural Features states that 'development proposals that will conserve, restore and enhance, biodiversity will be permitted.' It goes on to make the following point:

- 'Proposals will, where applicable, be required to deliver a BNG across local and landscape scales, including designing wildlife into development proposals, the connection of sites and large-scale habitat restoration, enhancement and habitat re-creation. Locally defined ecological networks identified in the Local Nature Recovery Strategy will be the primary focus for landscape scale net gain delivery.'

Cheltenham Plan Adopted July 2020[9]

1.2.15 The Cheltenham Plan refers to the JCS as providing the overarching policies in respect of biodiversity with particular reference to Policy SD9 of the JCS.

Gloucestershire Highways and Biodiversity Guidance (2022)[10]

1.2.16 The guidance recommends early consideration of biodiversity impacts, as this reduces the risk of future delays, and also allows opportunities for wildlife to be developed. It identifies the value of highway habitats, which can sometimes support remnants of ancient features, for example old meadows and species-rich hedgerows, provide refuges for some species, links to wider ecological networks within the landscape, and provide buffers if situated adjacent to designated sites of nature conservation value.

1.2.17 It identifies the main biodiversity impacts of highways including: habitat loss and fragmentation, the presence of a physical barrier, pollution, hydrological and soil changes, changes in the numbers of predators and/or prey, disturbance, introduction of non-native invasive species and inappropriate management.

1.2.18 The guidance identifies that good design, landscaping, green bridges and wildlife underpasses can mitigate some of these impacts and, as a last resort, offsite compensatory measures. Practical management advice for a variety of newly created and existing habitats is given, as well as suggested mitigation and enhancement measures for biodiversity. These recommendations in particular have been taken into consideration during the development of mitigation for this Scheme.

Gloucestershire Local Nature Partnership (GLNP)

1.2.19 The GLNP came into being in response to the Government's 2011 Natural Environment White Paper[11]. GCC is a key member of the partnership, along with GWT. The GLNP incorporated the Gloucestershire Biodiversity Action Plan (BAP)[12] and adopted the Gloucestershire Nature Map with a focus on priority habitats and species, which have now been incorporated into DEFRA's Nature Improvement Areas and create joined up and resilient ecological networks at a landscape scale.

[8] Tewkesbury Borough Council (Adopted June 2022) Tewkesbury Borough Plan 2011 – 2031.
[9] Cheltenham Borough Council (Adopted July 20202006)) Cheltenham Borough Local Plan
[10] Gloucestershire County Council (May 2022, version 3.2) Gloucestershire Highways and Biodiversity Guidance.
[11] HM Government (2011) The Natural Choice: Securing the Value of Nature.
[12] Gloucestershire Biodiversity Partnership (2000) Gloucestershire Biodiversity Action Plan. The Gloucestershire BAP was launched on 5 April 2000. It contains a series of Habitat Action Plans and Species Action Plans. From 2007 there was a review of the Gloucestershire BAP, which moved Gloucestershire towards a more spatially-based biodiversity delivery framework and resulted in the compilation of the Gloucestershire Nature Map in 2008.

1.2.20 In line with the launch of the Government's 25 Year Environment Plan, the GLNP, led by the Gloucestershire Wildlife Trust, is in the process of transforming the Gloucestershire Nature Map into the Gloucestershire Nature Recovery Network[13]. This will take the form of a spatial GIS-based master plan for nature restoration covering the entire county, which will complement the natural capital mapping being undertaken by the GLNP and build upon the Gloucestershire Nature Map (which identifies SNAs).

1.2.21 The GLNP work within their Growing Natural Success 2021 – 2024 strategy. Over this period, the GLNP are committed to building on its achievements since 2012, Five areas have been identified as key strategic themes, including:

- Nature's recovery.
- Climate resilience.
- Green growth.
- Naturally healthy.
- People at the heart of nature.

Gloucestershire Tree Strategy (Gloucestershire Local Nature Partnership, 2020)[14]

1.2.22 The vision of the strategy is a thriving network of sustainably managed trees and woodlands covering at least 20% of the county by 2030, delivering resilience and connectivity for people, wildlife and the economy.

1.3 Structure of the Report

1.3.1 This BNG report is structured into the following sections:

- Section 2 details the methodology followed for all parts of the BNG assessment (terrestrial habitat, hedgerows, rivers, streams and ditches).
- Section 3 describes the baseline conditions for terrestrial habitat, hedgerows and rivers, streams and ditches.
- Section 4 outlines the Scheme design focusing on the post-works habitat creation and enhancement for terrestrial habitats, hedgerows, and rivers, streams and ditches.
- Section 5 presents the overall BNG assessment calculations (taken from the metric calculator[15]) for terrestrial habitats, hedgerows, and rivers, streams and ditches with regard to the units generated and the trading rules.
- Sections 6 and 7 discuss the implementation and delivery mechanisms for BNG for the Scheme.
- Section 8 summarises the BNG assessment outcomes.
- Appendix A contains the figures.
- Appendix B contains a summary of the BNG Good Practice Principles for Development.

[13] Further information at www.gloucestershirenature.org.uk
[14] Gloucestershire Local Nature Partnership (September 2020) Gloucestershire Tree Strategy.
[15] The 'metric calculator' is a macro enabled excel spreadsheet with pre-set, non-editable cells and cells where data is entered (from a range of information gathered on the habitats within the development footprint, and off-site where applicable). The key data from the metric calculator has been replicated within this report and it is not necessary to view the metric calculator itself to follow the BNG assessment process and/or understand the BNG results. However a copy of the completed metric calculator can be made available on request.

- Appendix C provides the River Chelt indicator values from the MoRPh surveys.

2 Methodology

2.1.1 The term 'Order limits' used throughout this document refers to the definitive development boundary of the Scheme. The Scheme contains areas needed for the operation and construction of the Scheme. The Order limits include land required for the permanent footprint of the Scheme and the temporary[16] footprint of the Scheme. The BNG assessment does not differentiate between these and is based on all habitats within the Order limits.

2.2 Approach to BNG

Natural England's Metric

2.2.1 As per the methodology set out in Biodiversity metric 3.0[17] assessments are made separately for rivers, streams and ditches; terrestrial habitats (habitats); and hedgerows.

2.2.2 The metric is made up of the following documents which have been used for the current assessment

- Biodiversity metric 3.0: Auditing and accounting for biodiversity – User Guide[18].
- Biodiversity metric 3.0: Auditing and accounting for biodiversity – Technical Supplement[19].
- Biodiversity metric 3.0: Auditing and accounting for biodiversity – Calculation tool. This is the metric calculator which is a macro enabled excel spreadsheet downloaded from Natural England's website[17]).
- Biodiversity metric 3.0: Auditing and accounting for biodiversity – Habitats condition assessment sheets (these are the condition assessment sheets in excel format, taken from the Technical Supplement[19]).

Other guidance

2.2.3 BNG is a newly emerging concept and there are key guidance documents that have been utilised in addition to the metric tool in order to carry out this assessment. A list of key guidance documents used to date is listed below:

- Biodiversity Net Gain Report and Audit Templates. Version 1[20].
- Biodiversity net gain. Good practice principles for development[21].

[16] The metric only considers losses to be temporary when the original baseline habitat will be recreated in the same or better condition within 2 years from the date of the impact occurring. This requires the habitat creation/restoration to be complete, not just that seed has been sown or whips planted. This means that the temporary loss option is only available for habitats that can be restored to target condition (by recreation or enhancement) within 2 years. Where the loss is for a period greater than 2 years (such as the current Scheme), even when the same habitat is restored in the same location, the metric advises that this should be recorded as a loss of baseline habitat and creation of the replacement habitat.
[17] All parts of Natural England's 3.0 metric are archived at http://publications.naturalengland.org.uk/publication/5850908674228224 [Accessed August 2022]
[18] S, Panks A, N, White., A Newsome., J, Potter., M, Heydon., E, Mayhew., M, Alvarez., T, Russell., SJ, Scott., M, Heaver., SH, Scott., J, Treweek., B, Butcher & D, Stone. 2021. Biodiversity metric 3.0: Auditing and accounting for biodiversity – User Guide. Natural England.
[19] S, Panks A, N, White., A Newsome., J, Potter., M, Heydon., E, Mayhew., M, Alvarez., T, Russell., SJ, Scott., M, Heaver., SH, Scott., J, Treweek., B, Butcher & D, Stone. 2020. Biodiversity metric 3.0: Auditing and accounting for biodiversity – Technical Supplement. Natural England.
[20] Biodiversity Net Gain Report and Audit Templates. Version 1 (July 2021) Chartered Institute of Ecology and Environmental Management (CIEEM), Winchester, UK.
[21] BNG Good Practice Principals: A practical guide. Baker, J. Hoskins, R, Butterworth, T (CIRIA 2019).

- British Standard (BS) 8683 - Process for designing and implementing Biodiversity Net Gain[22].

2.3 Desk study

2.3.1 A desk study has been carried out as part of the Ecological Impact Assessment with the objective of gathering information on the ecological receptors which may or may not be impacted by the Scheme. This desk study is reported in Chapter 7 - Biodiversity (application document TR010063 – APP 6.5) and the accompanying Technical Appendix reports (Appendices 7.1 to 7.18 (application document TR010063 – APP 6.15)).

2.3.2 A desk study focused on assigning a strategic significance[23] to the habitats on-site (which is a requirement of the BNG assessment) was carried out using the following resources:

- MAGIC website[24] for information on statutory designated sites, ancient woodland and areas of existing priority habitat in proximity to the Scheme.
- Gloucestershire Centre for Environmental Records (GCER) for details of non-statutory sites in proximity to the Scheme.
- Gloucestershire's Natural Capital mapping[25] to identify any local ecological networks.
- Gloucestershire's Local Transport Plan 2020–2041[26] to highlight green infrastructure aims associated with the local road network.
- Gloucestershire's Biodiversity Action Plan[27] to identify relevant habitat action plans and/or species actions plans associated with relevant habitats.
- Gloucestershire Highways Biodiversity Guidance (2019)[28] to identify 'priority/important' habitats for Gloucestershire Highways.
- Severn River Basin Management Plan[29] to determine strategic significance of watercourses within the Order limits.
- Information on National Character Areas[30] to highlight habitats that are listed as important and needing safeguarding.
- Information about the Cotswold Area of Outstanding Natural Beauty (AONB)[31] for context on the natural range of habitats in the area.

[22] . British Standard (BS) 8683 - Process for designing and implementing Biodiversity Net Gain (August 2021).
[23] The term 'strategic significance' is used in BNG to account for whether or not the habitat is sited in an area identified, typically in a relevant local strategy or plan, as being of strategic significance for nature.
[24] Defra. c2019. Magic Map Application. [Online]. [Accessed August 2022]. Available from: https://magic.defra.gov.uk/MagicMap.aspx
[25] Gloucestershire's Natural Capital mapping, available from: https://naturalcapital.gcerdata.com/ [Accessed August 2022]
[26] Gloucestershire County Council (2020) Gloucestershire's Local Transport Plan2020 – 2041 Available from: https://www.gloucestershire.gov.uk/transport/gloucestershires-local-transport-plan-2020-2041/gloucestershire-ltp-2020-2041/ [Accessed November 2022]
[27] Gloucestershire Local Nature Partnership's Biodiversity Action Plan (BAP). Available from: https://www.gloucestershirenature.org.uk/ [Accessed November 2022]
[28] Gloucestershire County Council (December 2019) Gloucestershire Highways Biodiversity Guidance. Available from: https://www.gloucestershire.gov.uk/highways/plans-policies-procedures-manuals/biodiversity-and-highways/ [Accessed November 2022]
[29] Severn River Basin Management Plan. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/718336/Severn_RBD_Part_1_river_basin_management_plan.pdf [Accessed: September 2022].
[30] NCA Profile:106 Severn and Avon Vales - NE336. Available from: https://www.gov.uk/government/publications/countryside-stewardship-statement-of-priorities-severn-and-avon-vales-nca106 [Accessed November 2022]
[31] https://www.cotswoldsaonb.org.uk/ [Accessed August 2022]

2.4 Field survey

2.4.1 Protected species surveys have been carried out as part of the Ecological Impact Assessment for the scheme and the findings are presented in Chapter 7 - Biodiversity (application document TR010063 – APP 6.5) and the accompanying Technical Appendix reports (Appendices 7.1 to 7.18 (application document TR010063 – APP 6.15)).The information is not repeated here, however, any individual species needs in relation to habitat requirements and the ecological functionality of that habitat across the Scheme have been designed into the landscape proposals, which have fed into the BNG assessment.

UKHab survey (terrestrial habitats)

2.4.2 Habitats within the Order limits were recorded using the UKHab Classification system[32]. UKHab is a comprehensive and hierarchical habitat classification system for the UK that has been developed to benefit from recent changes in habitat categorisation, recording and analysis, and is suitable for digitally recording in the field using GIS. It is fully compatible with other major existing classifications, including Priority Habitat types and Habitats Directive Annex I habitat types and has been chosen as the classification system for the majority of terrestrial area habitat types used in the metric.

2.4.3 UKHab is comprised of two main parts, a Primary Habitat system and a list of secondary codes (which are used to provide extra detail on the environment, management or origin of the mapped habitat feature). The Primary Habitat system is hierarchical with five levels as follows:

- Level 1 - major ecosystem i.e. terrestrial, freshwater, coastal.
- Level 2 - nine ecosystem types (grassland, woodland, heathland and shrub etc).
- Level 3 - 20 broad habitat types such as neutral grassland or dense scrub.
- Level 4 - 80 habitats including Priority Habitats.
- Level 5 - 104 habitat types including 69 Habitat Directive Annex I habitats and further splitting of Level 4 habitats.

2.4.4 The guidance for UKHab surveys[32] recommends that all habitats are recorded to at least Level 3 of the UKHab hierarchy. However, wherever possible, surveys should aim to record to at least Level 4 of the UKHab hierarchy so that habitats of ecological importance, e.g. priority habitats, can be identified. The metric typically uses Level 4 UKHab categories (and there are also some UKHab categories that are not directly transferred into the metric). Therefore, some post-survey alignment and translation of the data was carried out to ensure the correct and most appropriate levels and typologies were included. This is summarised in Table 2-1 below.

2.4.5 Survey data was collected in the field by suitably experienced ecologists with Level 4 Field Identification Skills Certificate (FISC) or above. Surveyors used iPads with pre-loaded master mapping data and a computer software package (ArcGIS Collector), which enables condition assessment data to be collected for each target habitat parcel using pre-set drop-down menus.

2.4.6 Survey dates are presented in Technical Appendix 7.1 – Phase 1 Habitat Survey (application document TR10063-APP 6.15). UKHab surveys were carried out at the recommended time of year, which is April through to September[32].

[32] Butcher, B., Carey, P., Edmonds, R., Norton, L. and Treweek, J. (2020) The UK Habitat Classification User Manual Version 1.1 at https://ukhab.org. UKHab is the classification system that Biodiversity Metric 3.0 predominantly uses for area-based habitats.

2.4.7 Post-processing checks of the data were carried out by the lead field surveyor and all raw data then underwent a quality assurance check by a suitably experienced ecologist trained in UKHab and BNG assessment.

Table 2-1 – Translation of UKHab categories to 'Habitats types' as listed in the metric

UKHab Category (from field surveys)	Metric Habitat Type Used	Justification
c1 – arable and horticulture	Cereal crops	Same distinctiveness as horticulture and non-cereal crop habitat types.
h3 – dense scrub	Mixed scrub	Most scrub habitats within the Order limits are mixed scrub. Same distinctiveness as hawthorn scrub and bramble scrub habitat types.
u1b5 – buildings	Developed land, sealed surface	'Buildings' not an option in the metric, translates to developed land; sealed surface.
g3c5 – Arrhenatherum neutral grassland g3c6 – Lolium-Cynosurus neutral grassland, g3c7 – Deschampsia neutral grassland	Other neutral grassland	These level 5 habitat types are not contained within the metric, so the Level 4 habitat type (Other neutral grassland) was used.
w1h5 – other woodland; mixed; mainly broadleaved	Other woodland: mixed	This level 5 habitat type is not contained within the metric, so the Level 4 habitat type (Other woodland; mixed) was used.

UKHab survey (hedgerows)

2.4.8 Targeted hedgerow surveys were undertaken between June and August 2019, in June 2021, and in May and June 2022. The survey methodology followed the guidelines provided in the Hedgerow Survey Handbook[33]. Table 8-2 in the metric user guide was then used to assign the hedgerow to the correct hedgerow type and a condition score has been assigned to each hedgerow according to the criteria described within Part 1b of the Technical Supplement[34].

2.4.9 Survey data was collected in the field by suitably experienced ecologists with Level 4 FISC or above. Surveyors used iPads with pre-loaded master mapping data and a computer software package (ArcGIS Collector), which enables condition assessment data to be collected using pre-set drop-down menus.

2.4.10 Survey dates are presented in Technical Appendix 7.2 – Hedgerow Survey (application document TR010063 – APP 6.15).

2.4.11 Post-processing checks of the data were carried out by the lead field surveyor and all raw data then underwent a quality assurance check by a suitably experienced ecologist trained in UKHab and BNG assessment.

[33] DEFRA (2007) Hedgerow Survey Handbook. A standard procedure for local surveys in the UK. DEFRA, London
[34] Box 8-2 of Natural England's user guide defines the criteria for each of the 13 hedgerow type options listed in the metric.

2.4.12 Hedgerows within the Order limits were surveyed and mapped as linear features as per the metric guidance[17]. Area habitats adjacent to hedgerows were mapped to the centre line of the hedgerow[35].

Watercourse walkover surveys

2.4.13 All watercourses within the Order limits were subject to watercourse walkover surveys in 2019 by competent freshwater ecologists. The aim of the walkover survey was to assist in identifying important ecological features and typology, i.e. whether a watercourse would be defined as a ditch or river/stream under the metric guidance.

2.4.14 Wherever possible, survey locations were aligned to key points of interaction with the Scheme (e.g. crossing points) where there is greatest potential for effects.

2.4.15 During the survey, habitat characteristics were recorded following habitat descriptors outlined in River Habitat Survey (RHS) methodology[36], as listed below:

- Substrates (e.g. sand/silt, gravel, pebble, cobble, boulders).
- Vegetation type (e.g. submerged fine leaved, submerged broad leaved, marginal reeds).
- Flow type (e.g. smooth, rippled, unbroken waves).
- Approximate channel dimensions and water depths.
- Presence and extent of channel and bank re-sectioning.
- Presence of any existing crossing structures, weirs or outfalls.

Modular river survey (MoRPh)

2.4.16 Baseline condition of watercourses identified as rivers or streams were surveyed using the Modular River Physical survey (MoRPh[37]) method as directed by the Natural England Biodiversity Metric guidance[38,39]. The River Chelt and Leigh Brook were broken down to discrete reaches for the purpose of MoRPh survey siting and metric reporting, taking account of both existing and proposed Scheme interactions as well as changes in river typology.

2.4.17 MoRPh surveys were conducted in June and July 2022 by an accredited MoRPh surveyor. The MoRPh method is a quantitative visual geomorphological assessment of a river and riparian zone, that records a list of features which are marked as the following based on their extent across the survey sub-reach:

- Extensive (>33%)
- Present (5% - 33%)
- Trace (<5%)

[35] The metric guidance (User guide, page 22) accepts that this will result in a slight overestimation of the area and resulting biodiversity units generated by habitats adjacent to hedgerows.
[36] Environment Agency (2003). River Habitat Survey in Britain and Ireland. Field Survey Guidance Manual: 2003 Version.
[37] https://modularriversurvey.org/wp-content/uploads/MoRPh-Manual-ver-12.pdf
[38] S, Panks A, N, White., A Newsome., J, Potter., M, Heydon., E, Mayhew., M, Alvarez., T, Russell., SJ, Scott., M, Heaver., SH, Scott., J, Treweek., B, Butcher & D, Stone. 2021. Biodiversity metric 3.0: Auditing and accounting for biodiversity – User Guide. Natural England.

[39] S, Panks A, N, White., A Newsome., J, Potter., M, Heydon., E, Mayhew., M, Alvarez., T, Russell., SJ, Scott., M, Heaver., SH, Scott., J, Treweek., B, Butcher & D, Stone. 2020. Biodiversity metric 3.0: Auditing and accounting for biodiversity – Technical Supplement. Natural England.

- Absent

2.4.18 Such features include elements such as channel form, in-channel habitats (e.g. riffles and pools), bed substrates and bank material, as well as flow types. Broad aquatic ecological plant community structure and characteristics of the bankside and riparian zone are also recorded.

2.4.19 MoRPh surveys were typically undertaken at or adjacent to Scheme interactions, in particular at Scheme crossings. Three MoRPh surveys were conducted on the River Chelt, with one MoRPh survey undertaken on the Leigh Brook (survey locations are presented in Table 3-3 – R). A minimum of 20% of the river length was covered within the Order limits. Each sub-reach survey was 50 m in length and comprised of five contiguous MoRPh modules of 10 m.

Ditch condition assessment

2.4.20 Baseline condition of watercourses identified as ditches[40] were surveyed using the Ditch Condition Assessment as directed by the guidance.

2.4.21 The Ditch Condition Assessment considers the following criteria in assigning condition:

- The ditch is of good water quality, with clear water (low turbidity) indicating no obvious signs of pollution.
- A range of emergent, submerged and floating leaved plants are present. As a guide < 10 species of emergent, floating or submerged plants in a 20 m ditch length.
- There is less than 10 % cover of filamentous algae and/or duckweed (these are signs of eutrophication).
- A fringe of marginal vegetation is present along more than 75 % of the ditch.
- Physical damage is evident along less than 5 % of the ditch, such as excessive poaching, damage from machinery use or storage, or any other damaging management activities.
- Sufficient water levels are maintained; as a guide a minimum summer depth of approximately 50 cm in minor ditches and 1 m in main drains.
- Less than 10 % of the ditch is heavily shaded.
- There is absence of non-native plant and animal species[41].

2.5 Calculating Terrestrial Habitat Units/Hedgerow Units using Biodiversity Metric 3.0

2.5.1 Biodiversity Metric 3.0 uses a number of measures to quantify baseline biodiversity value for each terrestrial habitat type within a development site boundary. These measures include the habitats' intrinsic value (i.e. its distinctiveness), its condition and its area/length (in hectares/km respectively). In addition, the strategic significance of the location of any terrestrial habitats within the development site boundary is taken into account by applying a spatial multiplier.

[40] Ditches are defined as - 'Artificially created, linear water-conveyancing features that are less than 5 m wide and likely to retain water for more than 4 months of the year. Their hydraulic function is primarily for land drainage, and although partially or fully connected to a river system, they would not have been present without human intervention'.
[41] Any species included on the Water Framework Directive UKTAG GC High Impact Species List should be absent. This list can be accessed here: http://www.wfduk.org/sites/default/files/UKTAG%20classification%20of%20alien%20species%20working%20paper%20v8.pdf

2.5.2 A habitat's distinctiveness score is derived from its intrinsic biodiversity value, reflecting the rarity of the plant community, the time it takes to reach maturity, its value to fauna, and its ecosystem function. This score is pre-assigned and is pre-populated in the metric.

2.5.3 The calculation for baseline habitat/hedgerow units for any terrestrial habitat parcel and/or hedgerow length is outlined in Figure 2-1 below.

2.5.4 Post development terrestrial habitat/hedgerow units are calculated the same way but with the addition of risk multipliers that take into account the difficulty and time it takes to create new habitat/hedgerows or enhance existing habitat/hedgerows, see Figure 2-1. These temporal and risk related multipliers are set by Natural England within the metric and cannot be changed (full details are provided in the Technical Supplement of Biodiversity Metric 3.0[19]). No off-site habitat and/or hedgerow creation or enhancement is proposed for the Scheme.

2.5.5 In order to calculate the overall net change in terrestrial habitat/hedgerow units (this is not applicable to Rivers and Streams, and ditches), the baseline units are subtracted from the post development units, as detailed in Figure 2-1 below.

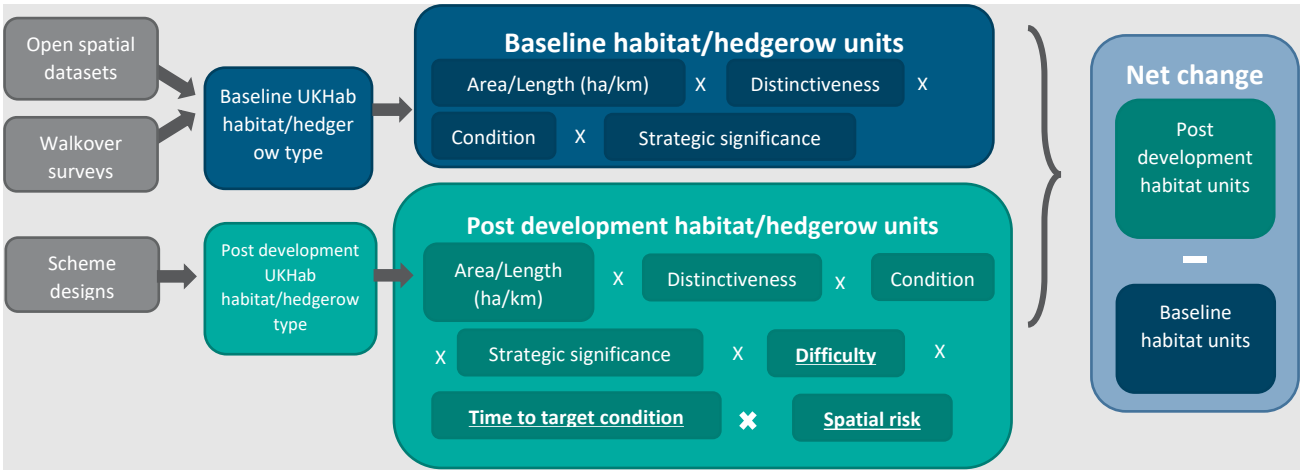


Figure 2-1 – Illustration to depict the data source and biodiversity calculations for Biodiversity Metric 3.0

2.6 Calculating Baseline River Biodiversity Units using Biodiversity Metric 3.0

2.6.1 The Biodiversity Metric 3.0 includes a Rivers and Streams Module[42]. As for terrestrial habitats, the Rivers and Streams Module requires an assessment of baseline River Biodiversity Units (RBU) and post-works RBUs in order to assess overall change in biodiversity units.

2.6.2 To determine the baseline RBUs, four key components are assessed and inputted to the Natural England Biodiversity Metric 3.0 Calculation Tool (along with length of River and Streams and ditches within the Order limits). These are:

- River distinctiveness.

[42] Details of the Rivers and Streams metric approach are provided in the Biodiversity Metric 3.0 User Guide. S, Panks A, N, White., A Newsome., J, Potter., M, Heydon., E, Mayhew., M, Alvarez., T, Russell., SJ, Scott., M, Heaver., SH, Scott., J, Treweek., B, Butcher & D, Stone. 2021. Biodiversity metric 3.0: Auditing and accounting for biodiversity – User Guide. Natural England.

- Strategic significance.
- Watercourse and riparian encroachment.
- River condition.

2.6.3 The distinctiveness score is based on the type of river habitat present, and its value based on its rarity. In the Rivers and Streams Module of the metric, rivers can be classed as 'very high', 'high', 'medium' or 'low' which result in weightings used to calculate RBUs.

2.6.4 It should be noted that where watercourses are crossed by culverts, they are considered a different river type (Culvert) within the metric and afforded a 'Low' habitat distinctiveness. Culverts are automatically assigned a condition of Poor.

2.6.5 Strategic significance is dependent on whether the watercourse has identified actions within River Basin Management Plans (i.e. is a delineated Water Framework Directive (WFD) reportable water body), Catchment Plans and/or Local Plans.

2.6.6 Encroachment scores refer to the extent of encroachment of a development (a) in the watercourse and (b) in the riparian zone (10 m from the top of the riverbank). Encroachment in the watercourse is classified as 'no encroachment', 'minor' or 'major' whereas in the riparian zone encroachment is classed as 'no encroachment', 'minor', 'moderate' or 'major'. These scores result in weightings which are used to calculate the number of RBUs.

2.6.7 River condition is determined by MoRPh surveys (as described in Section 2.4.16). Data collected during surveys were uploaded to the MoRPh cartographer workspace[43]. Cartographer calculates 32 indicators of river condition for each MoRPh sub-reach which are scaled according to river type (determined through the desk study component of the RCA), to produce the final river condition score for each sub-reach. Details of the desk study process are available in the guide to assessing river condition[44]. The final River Chelt and Leigh Brook River condition scores that were input into the Natural England Biodiversity Metric 3.0 are listed in Table 3-3, with indicator scores for each sub-reach presented in Appendix C. The final river condition score produced in the assessment, either 'Good', 'Fairly Good', 'Moderate', 'Fairly Poor' or 'Poor', results in weightings which are used to calculate the number of RBUs.

2.6.8 Further details on the methods for determining river distinctiveness, encroachment, strategic significance and river condition are detailed in the Biodiversity Metric 3.0 guidance[45].

2.6.9 RBUs are linear units and cannot be combined with the area units calculated for terrestrial habitats. A net gain in RBUs would not automatically correlate to an overall net gain for the project as there may be a net loss in terrestrial habitat and/or hedgerow units. Therefore, each of the different module components of the metric need to be considered in parallel and reported separately.

2.6.10 This is also true for rivers/streams and ditches, as they have different distinctiveness. As per the Trading Rules under the Biodiversity Metric 3.0 guidance, RBUs cannot be traded across River Types of different distinctiveness. As such, rivers/streams and ditches have been assessed separately.

[43] https://cartographer.io/
[44] Gurnell, A.M., England, J., Scott, S.J. and Shuker, L.J. (2020) A guide to assessing river condition. Part of the Rivers and Streams Component of the Biodiversity Net Gain Metric. Beta test version: March 2020.
[45] S, Panks A, N, White., A Newsome., J, Potter., M, Heydon., E, Mayhew., M, Alvarez., T, Russell., SJ, Scott., M, Heaver., SH, Scott., J, Treweek., B, Butcher & D, Stone. 2021. Biodiversity metric 3.0: Auditing and accounting for biodiversity – User Guide. Natural England.)

2.7 On-site post-development habitats

2.7.1 The landscape plans (shown in the Environmental Masterplan, application reference TR010063 – APP 2.13) have been used to inform the post development habitat creation. Areas of proposed habitat creation, including built development, were converted from Computer-Aided Design (CAD) software to a Geographic Information System (GIS) environment.

2.7.2 Target condition scores (detailed in Section 4) for the proposed post development habitats have been assigned based on the realistic likelihood of achieving the target condition. This is based on professional opinion which is supported by the habitat condition assessment criteria for each metric habitat type provided in the Technical Supplement[19].

2.8 Assumptions and limitations

2.8.1 Access was not permitted to some areas within the Order limits, which precluded a walkover of these areas. Areas that could not be accessed during the UKHab field survey are shown in Figure 7-1A of Technical Appendix 7.1 (application document TR010063-APP 6.15). Aerial imagery (available in Google Earth Pro (version 7.3.3)) was reviewed to estimate the habitat types in the areas that were not surveyed. Assumptions were made, based on aerial imagery and the experience of the surveyors from adjacent habitats within the Order limits, to assign a condition to each habitat parcel.

2.8.2 The Order limits extend approximately 2 km north and 2 km south of the Scheme alignment, along the M5. The only works proposed in these areas are the installation of signs in discrete locations, which will require vegetation clearance of up to approximately 20 m^2 plus some minor trimming back of vegetation up to a distance of 180 m in front of the sign to ensure visibility. These signage locations can be micro sited to avoid/minimise ecological impacts. These small-scale works are consistent with routine highway maintenance works and would not have any bearing on the impact assessment for the Scheme. Taking into consideration the risks that surveyors are exposed to when surveying motorway verges, a desk study and field surveys of these areas was, therefore, not considered necessary to inform the ES. Pre-construction surveys of the discrete signage locations and working with the contractor to micro site locations, where appropriate, to avoid or minimise ecological impacts will be undertaken and is considered to be proportionate. For the purposes of the BNG assessment, these areas have been included in the assessment, and aerial imagery (available in Google Earth Pro (version 7.3.3)) was reviewed to estimate the habitat types present. Assumptions were made, based on aerial imagery and the experience of the surveyors from adjacent habitats within the Order limits, to assign a condition to each habitat parcel. These areas are considered to be 'retained' within the BNG assessment, given the very small scale works proposed here.

2.8.3 The absence of field survey data from the 'no access' areas, and the M5 verges 2 km north and 2 km south of the Scheme alignment equates to approximately 15.8% of the Order limits. However the habitats present within these areas are common and present elsewhere within the Order limits where they have been fully surveyed. These areas were also often adjacent to surveyed habitat considered likely to be of the same or similar type/condition and therefore the experience of surveyors was relied upon when assigning the condition, and a precautionary approach was taken where necessary. In summary, it is not considered that the areas of assumed data pose a significant constraint to the BNG assessment.

2.8.4 An assumption has been made that all hedgerows that lie within the temporary working area of the Scheme will be retained and protected from damage throughout construction. Further detail can be found in the Register of Environmental Actions and Commitments (REAC) (application document TR010063 – APP 7.4). In a number of locations, the Order

limits are aligned with hedgerow field boundaries. However, in some instances, the mapped hedgerow length and the Order limits did not exactly match, resulting in some stretches of hedgerow mapped just outside of the Order limits. This would have resulted in these hedgerow stretches being excluded from the BNG assessment, resulting in an underestimate of retained hedgerow length. Therefore, in order to include the full extent of these retained hedgerows a buffer of 5 m was applied to the Order limits (for the purpose of the BNG assessment only) and all hedgerows in the temporary working areas which were present within this buffer were counted as retained and included in the 'Length retained' retention category of the metric calculator. This has resulted in a very slight overestimate of retained hedgerow length.

2.8.5 An assumption has been made that all areas that lie within the temporary working area of the Scheme will be reinstated to the same habitat type and condition as prior to the works occurring and returned to the landowner.

2.8.6 Not all watercourses were visited during the walkover surveys. This was partly due to access restrictions and partly due to developing Scheme design following the walkover survey, which brought additional watercourses into the study area. All rivers and streams within the study area were visited and of the ditches, only Drains 9, 11, 14, 21, 22 and MW4 were not visited. Through review of aerial photographs, the ditches which were not visited were determined to be of similar character and condition to the other agricultural and roadside drainage features within the Order limits.

2.8.7 On both the River Chelt and Leigh Brook within the Order limits, limited access and visibility constrained MoRPh surveys at the following locations:

- Upstream of the existing River Chelt Crossing (SO 90128 24770 - SO 90043 24791).
- Upstream, downstream and at the point of the proposed Link Road Bridge on the River Chelt (SO 90618 24617 - SO 90843 24588).
- Leigh Brook upstream (SO 90801 25981 - SO 90920 25908) and downstream of the Leigh Brook Culvert (SO 90687 26076 - SO 90658 26189).

2.8.8 Consequently, the sub-reaches of the River Chelt and Leigh Brook described above have either not been visited or MoRPh surveyed. As such, river condition has been applied to unvisited sub-reaches of both the River Chelt and Leigh Brook, by using river condition from representative reaches on each watercourse, habitat characteristics, watercourse typology, review of aerial imagery and professional judgement.

2.8.9 In Biodiversity metric 3.0, it is not possible to record a reduction in condition for Rivers and Streams. This is recorded as a loss of watercourse, and creation of watercourse in poorer condition e.g., where a new viaduct crosses a watercourse that reduces condition but no length of watercourse is lost. This results in an over-estimation of RBUs that are lost as a result of reduction in condition, due to the application of multipliers associated with time to target condition and difficulty in creating habitat. As part of this BNG assessment, an additional scenario has, therefore, also been undertaken for context, that does not include any losses of watercourse where there is a reduction in condition. Hence, a removal of the multipliers that would result in an over-estimation of RBUs lost. The percentage gain in RBUs has been calculated by creating pre-works, post-works and post-enhancement baselines, where the enhancements have been applied to the post-works baseline. The percentage difference in RBUs between the pre-works baseline and post-enhancement baseline is then calculated to deliver the likely change in RBUs as a result of the Scheme. This is particularly relevant for this assessment given the guidance that 'losses' of very high distinctiveness habitat (of terrestrial habitats and/or rivers and streams specifically) also cannot adequately be accounted for in the metric, with bespoke mitigation required. The River Chelt is considered to be a river habitat of very high

distinctiveness and whilst there will be some localised reduction in condition due to new revetment and bridge abutments in the riparian habitat (which the calculation considers as river loss then creation), none of the river will be physically lost to the Scheme.

3 On-site baseline conditions

3.1 Desk study – Strategic significance – Terrestrial Habitats/Hedgerows

3.1.1 There are no designated sites, non-statutory designated sites or ancient woodland parcels within the Order limits.

3.1.2 All woodland within the Order limits was assessed to be of high strategic significance, on the basis that:

- It is listed as in need of safeguarding within the relevant National Character Area Profile (106 (Severn and Avon Vales))[30].
- A number of blocks of woodland are identified as core woodland habitat in the nature recovery network on Gloucestershire's Natural Capital mapping[25].
- A habitat action plan for woodland is included in the Gloucestershire Biodiversity Action Plan, and woodland is identified as a key habitat for a number of species with species action plans[27].
- Woodland is identified as a priority/important habitat within the Gloucestershire Highways and Biodiversity Guidance[28].

3.1.3 All hedgerows within the Order limits were assessed to be of high strategic significance on the basis that:

- Hedgerows and field boundaries in general are listed as important and in need of safeguarding, both for biodiversity and heritage within the relevant National Character Area Profile (106 (Severn and Avon Vales)[30]).
- There is a habitat action plan covering species rich and/or ancient hedgerows, and this habitat type (whether species rich or species poor) supports species for which species action plans exist[27].
- Hedgerows are listed as a priority/important habitat in the Gloucestershire Highways and Biodiversity Guidance[28].

3.1.4 The remaining baseline terrestrial habitats within the Order limits were assessed to be of low strategic significance.

3.2 Terrestrial habitats

Priority habitats (terrestrial habitats)

3.2.1 There are two separate areas of road verge within the Order limits (referred to as the A4019 road verge and Stanboro Lane verge) which fall within the definition of a lowland meadow[46] [47] [48]. Lowland meadow is listed as a Priority Habitat as defined in Section 41

[46] Jefferson, R.G., Smith, S.L.N. & MacKintosh, E.J. (2019). Guidelines for the Selection of Biological SSSIs. Part 2: Detailed Guidelines for Habitats and Species Groups. Chapter 3 Lowland Grasslands. Joint Nature Conservation Committee (JNCC), Peterborough. Online: https://data.jncc.gov.uk/data/cf50f420-1b38-4253-89f8-1cb7ba010f27/SSSI-Guidelines-3-LowlandGrasslands-2019.pdf
[47] Maddock, A. (ed) (2008) UK BAP Priority Habitat Descriptions - Lowland Meadows. Online: https://data.jncc.gov.uk/data/f0553254-1d47-474a-98e5-37fa163a28b5/UKBAP-BAPHabitats-29-Lowland-Meadows.pdf
[48] No author information (JNCC). Online: https://data.jncc.gov.uk/data/b0b5e833-7300-4234-8ae5-bdbf326e854c/habitat-types-lowland-grassland.pdf#:~:text=Lowland%20semi-natural%20grassland%20in%20the%20UK%20includes%20a,or%20heavily%20leached%20soils%20in%20the%20upland%20fringes. Accessed: 10/08/2022

of the Natural Environment and Rural Communities (NERC) Act 2006 (as amended) as it is 'highly threatened, internationally scarce and requires conservation action'.

3.2.2 The metric assigns this habitat type a 'Very high' distinctiveness category in the calculator tool and provides suggested actions to address the habitat losses which involves a bespoke compensation strategy.

3.2.3 It has been possible through re-design of part of the Scheme to avoid any impact to the Stanboro Lane verge, however the A4019 road verge will be entirely lost.

3.2.4 A bespoke compensation strategy (referred to as the Road Verge Compensation Strategy) will be required for the loss of this area of lowland meadow and will include, in part, the widespread creation, and long-term management, of species-rich grassland across the scheme. The Road Verge Compensation Strategy is not contained within this report (it will be produced during detailed design). However, the principles of the strategy have been agreed with Natural England and are aligned with the habitat creation proposals. Further detail is included in paragraphs 4.2.4 – 4.2.6.

Remaining terrestrial habitats

3.2.5 The predominant habitats within the Scheme Order limits are woodland, grassland, scrub and large areas of arable cropland. Urban habitats (buildings, roads,) which are referred to as 'Developed land; sealed surface' in the metric are also widespread. Figure 7-18A: Habitat Baseline Plan in Appendix A provides an overview of the habitat types and distribution.

3.2.6 Quality of habitat was measured by undertaking a habitat condition assessment using criteria outlined in the metric. Full condition assessment data (and supporting botanical species data) is available on request.

3.2.7 Table 3-1 below provides an overview of the combined habitat data[49] which have been used to populate the metric spreadsheet (A-1 On-site habitat baseline tab). A summary of the key data is provided, along with the total baseline habitat units generated.

Table 3-1 – Overview of baseline habitats and biodiversity units generated

Metric Broad Habitat-Habitat Type	Distinctiveness	Condition	Strategic Significance	Area (ha)	Total Baseline Habitat Units	Notes
Grassland - Lowland meadow	Very High	Moderate	Low	0.17	1.12	Two habitat parcels. A range of indicator species present and a varied sward height. Not all criteria met to reach 'Good' condition. NB: 0.07ha of this habitat is retained.
Woodland – wet woodland	High	Poor	High	0.03	0.21	One habitat parcel present. Dominant species willow, alder and ash. Himalayan balsam present. Nutrient runoff from

[49] Where individual habitat parcels are of the same type (i.e. same UKHab code) and condition (i.e. good, moderate or poor) they are combined within the metric into one row.

Metric Broad Habitat-Habitat Type	Distinctiveness	Condition	Strategic Significance	Area (ha)	Total Baseline Habitat Units	Notes
						adjacent field was evident. NB: all of this habitat is retained.
Woodland - mixed	Medium	Moderate	High	9.31	85.65	Found in 29 habitat parcels. Dominant species ash, beech, sycamore and Scots pine.
Woodland – other broadleaved	Medium	Moderate	High	5.6	51.52	Found in 40 habitat parcels. Dominant species ash, elm, sycamore and hawthorn.
Grassland – other neutral grassland	Medium	Good	Low	0.17	2.04	Found in 1 habitat parcel. Dominant species barren brome, common vetch, meadow buttercup, false oat grass, field forget me not, bristly oxtongue, hogweed, cut leaved cranesbill. The sward was varied and limited scrub/bare ground and no invasive non-native species (INNS).
	Medium	Moderate	Low	20.35	162.80	Found in 119 habitat parcels. Dominant species varied and in most parcels the sward was varied with bare ground less than 5% and grassland indicator species evident.
	Medium	Poor	Low	4.37	17.48	Found in 62 habitat parcels. Dominant species varied. Over half of the parcels had more than 5% of undesirable species/physical damage/scrub and 25 parcels did not closely match a specific grassland habitat type with indicator species

Metric Broad Habitat-Habitat Type	Distinctiveness	Condition	Strategic Significance	Area (ha)	Total Baseline Habitat Units	Notes
						clearly visible.
Grassland – modified grassland	Low	Moderate	Low	16.23	64.92	Found in 48 habitat parcels. Dominant species perennial rye grass, white clover and creeping thistle
	Low	Poor	Low	0.63	1.26	Found in 23 habitat parcels. Dominant species perennial rye grass and white clover.
Heathland & Shrub – Hawthorn scrub	Medium	Moderate	Low	0.18	1.44	Found in 2 habitat parcels. Dominant species hawthorn, holly, dog rose and wild cherry with a range of age classes and clearings.
Heathland & Shrub – Bramble scrub	Medium	Poor	Low	0.51	2.04	Found in 6 habitat parcels. Dominant species bramble and elder and in all parcels there was a lack of age ranges and no clearings/rides.
Heathland & Shrub – Mixed scrub	Medium	Good	Low	0.14	1.68	Found in 1 habitat parcel. More than 3 woody species and a range of age classes, well-developed edge and clearings and no invasive/undesirable species.
	Medium	Moderate	Low	9.49	75.92	Found in 38 habitat parcels. Dominant species hawthorn, ash, dog rose and wild cherry with a range of age classes and a well-developed edge.
	Medium	Poor	Low	2.28	9.12	Found in 25 habitat parcels. Dominant species hawthorn, holly, dog rose and wild cherry with a range of age classes and clearings.

Metric Broad Habitat-Habitat Type	Distinctiveness	Condition	Strategic Significance	Area (ha)	Total Baseline Habitat Units	Notes
Cropland – cereal crops	Low	Poor	Low	89.69	179.38	74 habitat parcels
Urban – Developed land; sealed surface	Very low	N/A	Low	40.55	0.00	970 habitat parcels including buildings, roads and developed land.
				Total habitat units:	656.58	
				Total habitat units (very high distinctiveness habitats):	1.12	
				Total habitat units (high distinctiveness habitats):	0.21	
				Total habitat units (medium distinctiveness habitats):	409.69	
				Total habitat units (low distinctiveness habitats):	245.56	

Trading summary (terrestrial habitats)

3.2.8 The metric sets out a number of principles and rules that should be followed when undertaking BNG assessments. Rule 3 states: 'Trading down' must be avoided. Losses of habitat are to be compensated for on a "like for like" or "like for better" basis. New or restored habitats should aim to achieve a higher distinctiveness and/or condition than those lost.

3.2.9 The area of lowland meadow (a 'very high distinctiveness' habitat in the metric) will have a bespoke compensation strategy.

3.2.10 For high distinctiveness habitats, to avoid trading down Natural England recommends that habitat creation aims to create an equivalent number of units of the same habitat type. The Scheme baseline includes 0.21 biodiversity units of high distinctiveness habitat (wet woodland). However, this habitat will be retained and is not, therefore, discussed further.

3.2.11 For medium distinctiveness habitats, to avoid trading down Natural England recommends that habitat creation aims to create an equivalent number of units of the same broad habitat type. For example, bramble scrub can be replaced with mixed scrub without risking trading down. The Scheme baseline includes 409.69 biodiversity units of medium distinctiveness habitats (woodland: mixed, woodland: broadleaved, scrub, other neutral grassland, hawthorn scrub, bramble scrub and mixed scrub).

3.2.12 For low distinctiveness habitat, to avoid trading down the guidance within the metric recommends that habitat creation aims to create an equivalent number of units for habitats of the same distinctiveness or better. There is no requirement for this to come from the same broad habitat type. The Scheme baseline includes 245.56 biodiversity units of low distinctiveness habitats (modified grassland and cropland).

3.3 Hedgerows

3.3.1 A mixture of hedgerow types were present within the Order limits (the metric lists 13 hedgerow types). Table 3-2 provides an overview of the metric hedgerow types, condition scores, and total baseline hedgerow units generated for the Order limits. The Baseline Habitats Plan Figure 7-18A in Appendix A shows the location of all hedgerows within the Order limits.

Priority habitats (hedgerows)

3.3.2 Most of the hedgerows present within the Order limits meet the priority habitat criteria for hedgerows[50] (i.e. 80% or more cover of at least one woody UK native species).

3.3.3 There is 0.46 km of 'Very High' distinctiveness hedgerow (native species rich hedgerow with trees – associated with a bank or ditch) within the Order limits. It has been possible to retain 0.42 km of this hedgerow type, however 0.04 km will be lost as there are small sections of hedgerow present within the immediate footprint of the new junction. These will, however, be replaced 'like for like' by the Scheme. Further details are provided in Section 4.

Table 3-2 – Overview of hedgerows and hedgerow units generated

Metric Hedgerow Type	Distinctiveness	Condition	Strategic Significance	Length/km	Total Hedgerow Units
Native species rich hedgerow with trees – with bank or ditch	Very high	Moderate	High	0.46	8.46
Native species rich hedgerow with trees	High	Good	High	0.19	3.93
	High	Moderate	High	0.86	11.87
Native hedgerow with trees – associated with bank or ditch	High	Moderate	High	1.5	20.70
Native species rich hedgerow	Medium	Moderate	High	0.18	1.66
Native hedgerow – associated with bank or ditch	Medium	Good	High	0.48	6.62
	Medium	Moderate	High	0.28	2.58
Native hedgerow with trees	Medium	Good	High	0.86	11.87
	Medium	Moderate	High	2.49	22.91
	Medium	Poor	High	0.82	3.77
Line of Trees (Ecologically Valuable) - with Bank or Ditch	Medium	Moderate	High	0.18	1.66
Native hedgerow	Low	Good	High	1.06	7.31
	Low	Moderate	High	6.25	28.75
	Low	Poor	High	0.46	1.06
Line of trees	Low	Moderate	High	0.16	0.74

[50] Maddock, A. (ed) (2008). UK Biodiversity Action Plan Priority Habitat Descriptions – Hedgerows. Online: https://data.jncc.gov.uk/data/ca179c55-3e9d-4e95-abd9-4edb2347c3b6/UKBAP-BAPHabitats-17-Hedgerows.pdf

Metric Hedgerow Type	Distinctiveness	Condition	Strategic Significance	Length/km	Total Hedgerow Units
	Low	Poor	High	1.83	4.21
Hedge Ornamental Non Native	Very Low	Moderate	High	0.07	0.16
				Total hedgerow units:	138.25

Note, numbers reported are as shown in the metric. It is noted that the total hedgerow units presented here add up to 138.26. However, there is an element of rounding up/down in the metric which results in a slight discrepancy between the sum of the hedgerow units presented here and the metric output.

3.4 Rivers and streams

River condition assessment

3.4.1 The River Condition Assessment identified all sub-reaches on the River Chelt as River Type F (straight-sinuous planform with a gravel-pebble channel bed).

3.4.2 The Leigh Brook was identified as a River Type H (straight-sinuous planform with a sand channel bed).

3.4.3 Detailed outputs of the River Condition Assessment are presented in Appendix C.

3.4.4 The River Condition Scores for each sub-reach is presented in Table 3-3.

Table 3-3 – River Condition Scores for the River Chelt and Leigh Brook

Watercourse Name	Sub-reach Survey Code	River Type	Preliminary Condition Score	Overall Condition Class
River Chelt	WCID09_MRS_LR	River Type F	0.6	Moderate
River Chelt	WCID10_MRS_J10_US	River Type F	-0.54	Fairly Poor
River Chelt	WCID10_MRS_J10_DS	River Type F	-0.28	Fairly Poor
Leigh Brook	WCID02_MRS	River Type H	0.43	Fairly Poor

Rivers and streams on-site baseline units

3.4.5 The length, distinctiveness, condition, encroachment and strategic significance of the on-site Rivers and Streams were input to the metric[51].

3.4.6 Major encroachment has been applied to all reaches of the River Chelt and Leigh Brook, due to agricultural management of the riparian zone, as agricultural management reduces the quality/quantity and use of available habitat that performs a specific ecological function for riparian or aquatic specialist species.

3.4.7 The River Chelt has been identified as Priority Habitat, as it supports six of the criterion B species under the UK BAP Priority Habitat Descriptions[52], which is described in the ES. As described in Section 2.7, river condition scores have been applied to those reaches that could not be MoRPh surveyed.

3.4.8 No off-site reaches have been assessed as part of this BNG assessment.

3.4.9 On-site baseline RBUs for Rivers and Streams are presented in Table 3-4.

[51] Any river or stream that is culverted and present within the Order limits has a River Type of 'Culvert' and is automatically assigned a condition of 'Poor'.
[52] Maddock, A. (ed) (2011). *UK Biodiversity Action Plan Priority Habitat Descriptions – Rivers*. Online: https://data.jncc.gov.uk/data/01d6ab5b-6805-4c4c-8d84-16bfebe95d31/UKBAP-BAPHabitats-45-Rivers-2011.pdf

Table 3-4 – On-site Baseline River Biodiversity Units for Rivers and Streams

Watercourse/Structure	Location	Length (within the Order limits) km	River Type (Distinctiveness)	Strategic Significance	Condition	Extent of Watercourse Encroachment	Extent of Riparian Encroachment	Baseline RBUs
River Chelt	At the West Cheltenham Link Road SO 90745 24596 - SO 90617 24616	0.295	Priority Habitat (Very High)	Within River Basin Management Plan (High)	Moderate	Major	Major	4.07
River Chelt	Immediately upstream from the River Chelt Culvert SO 90129 24772 - SO 90038 24801	0.1	Priority Habitat (Very High)	Within River Basin Management Plan (High)	Fairly Poor	Major	Major	1.04
River Chelt Culvert	SO 90038 24801 - SO 90005 24829	0.05	Culvert (Low)	Within River Basin Management Plan (High)	Poor	N/A Culvert	Major	0.09
River Chelt	Immediately downstream from the River Chelt Culvert SO 90005 24829 - SO 89928 24874	0.1	Priority Habitat (Very High)	Within River Basin Management Plan (High)	Fairly Poor	Major	Major	0.52
Leigh Brook	Upstream of the Leigh Brook Culvert SO 90920 25907 – SO 90779 225993	0.05	Other Rivers and Streams (Low)	Low potential/action not identified in any plan (Low)	Fairly Poor	Major	Major	0.34
Leigh Brook Culvert	SO 90777 25998 - SO 90748 26042	0.054	Culvert (Low)	Low potential/action not identified in any plan (Low)	Poor	N/A Culvert	Major	0.08
Leigh Brook	Downstream of the Leigh	0.229	Other Rivers and	Low	Fairly Poor	Major	Major	1.55

	Brook Culvert SO 90748 26042 – SO 90659 26191		Streams (Low)	potential/action not identified in any plan (Low)				
							Total	**7.67**

Note, numbers reported are as shown in the metric. It is noted that the total RBUs presented here add up to 7.69. However, there is an element of rounding up/down in the metric which results in a slight discrepancy between the sum of the RBUs presented here and the metric output.

.

Ditches on-site baseline units

3.4.10 The ditch condition assessment was undertaken for 14 ditches within the Order limits (as presented in Figure 7-18C), results of which are presented in Table 3-5.

3.4.11 All eight criteria (as described in Section 2.4.21) must be passed in order to achieve the condition assessment class of 'good'. If a ditch passes six/seven of the eight criteria, it achieves a condition of 'moderate'. Any ditch that passes five or less of the eight criteria has a condition class of 'poor'.

3.4.12 All ditches had a condition of 'Poor'. Detailed ditch condition assessment outcomes and photographs are presented in Appendix C.

Table 3-5 – On-site Baseline River Biodiversity Units for Ditches

Watercourse Name	Length (within the Order limits) (km)	Overall Condition Score	Overall Condition Class	Baseline RBUs
MW4	0.057	1	Poor	0.23
MW4 (Culvert)	0.057	N/A	Poor	0.09
MW3	0.07	1	Poor	0.28
Drain 7	0.015	1	Poor	0.06
Drain 8	0.568	1	Poor	2.27
Drain 9	0.234	1	Poor	0.94
Drain 10	1.231	1	Poor	4.92
Drain 10 (A4019 culvert)	0.075	N/A	Poor	0.11
Drain 11	0.223	1	Poor	0.89
Drain 12	0.418	1	Poor	1.67
Drain 14	0.407	1	Poor	1.63
Drain 14 (B4634 culvert)	0.023	N/A	Poor	0.03
Drain 15	0.268	1	Poor	1.07
Drain 15 (B4634 culvert)	0.016	N/A	Poor	0.02
Drain 16	0.38	1	Poor	1.52
Drain 20	0.025	1	Poor	0.10
Drain 21	0.286	1	Poor	1.14
Drain 22	0.466	1	Poor	1.86
Drain 22 (Piffs Elm culvert)	0.40	N/A	Poor	0.60
			Total	**19.45**

Note, numbers reported are as shown in the metric. It is noted that the total RBUs presented here add up to 19.43. However, there is an element of rounding up/down in the metric which results in a slight discrepancy between the sum of the RBUs presented here and the metric output.

4 Scheme design

4.1.1 The Scheme design has been developed with due regard to the BNG Good Practice Guidelines (see Appendix B) and specifically the trading rules for terrestrial habitats, rivers/streams and ditches as outlined in the baseline section.

4.1.2 Local and national biodiversity strategies have been reviewed and habitat creation has been focused on helping deliver these targets, where appropriate.

4.1.3 Habitats have been retained wherever possible.

4.1.4 The on-site post development habitat creation (and enhancement in the case of hedgerows) is shown in the Post-works Habitat Plans (Figures 7-18E (terrestrial habitats), 7.18F (hedgerows) and 7.18G (Rivers and Streams and ditches) in Appendix A).

4.1.5 All areas of habitat enhancement and creation are within the Order limits of the Scheme and there is no off-site habitat creation or enhancement proposed.

4.1.6 The planting specifications, management prescriptions and monitoring requirements of all newly created (and enhanced) habitats will be detailed within an Environmental Management Plan (EMP). A '1st Iteration' of the EMP has been prepared for the Scheme (application document TR010063 – APP 7.3) and in addition a REAC has been produced (application document TR010029 – APP 7.4) which forms part of the 1st iteration of the EMP. Further details are provided in Section 6. The Scheme will deliver a range of additional biodiversity enhancements (such as new bat and wildlife underpasses) which have not been discussed in this report but full details are provided in the Biodiversity chapter of the Environmental Statement (Chapter 7, application document TR010063 – APP 6.5).

4.2 Post-works terrestrial habitats

4.2.1 All areas within the temporary working area of the Scheme will be returned after construction to their pre-works baseline habitat type and condition. Much of this habitat is cropland and therefore very easy to reinstate.

4.2.2 Where land (outside of that required for the new junction and Link Road) is being permanently modified, the post-development habitat types are of a high value and include new blocks of woodland, high-quality road verge, and a flood storage area supporting a mosaic of habitats. New attenuation basins and ditches will also be sown with wet grassland and marginal planting. Further information on the road verges and flood storage area are provided below.

4.2.3 The time to target condition for all newly created habitat is discussed in section 5 and Section 7.

Flood storage area

4.2.4 An area of farmland to the south east of the motorway junction (referred to as the flood storage area) will be transformed into an area supporting wetland habitats surrounded by woodland, scrub and species-rich grassland, whilst also fulfilling its role as a flood storage area. The area will incorporate a permanently wet area, plus ephemeral wet grassland pools. A channel will link the outfall of the attenuation basin to the Piffs Elm culvert which will regularly refresh the permanent waterbody to avoid stagnation. Depressions have been designed to include variations in bed topography, with shallow bank slopes to create drawdown zones and marginal shelves. The approach will be to lightly seed the ephemeral areas with wetland grass species and suitable marginal plants, allowing a degree of natural regeneration. Scrub and woodland planting will be designed to

complement the wetland areas, and these areas together with the adjacent species-rich grassland will collectively create a habitat mosaic suitable for a range of species. The area will be monitored before a management plan is produced to suit the developing conditions and habitats. A maintenance and management regime will be secured with GCC.

Road verge compensation strategy

4.2.5 Species-rich road verge will be created within the Order limits, to compensate for the loss of lowland meadow priority habitat along the A4019 (very high distinctiveness habitat requiring a bespoke compensation strategy).

4.2.6 The Road Verge Compensation Strategy will include details about the creation and long-term management of the species-rich grassland. It will be produced during detailed design, in accordance with the broad principles listed below, which have been agreed with Natural England.

4.2.7 This habitat has been assigned a target condition of 'Good', which is ambitious for this habitat type (Grassland- other neutral grassland). However, it is realistic and achievable for the Scheme for the following reasons (which are set out within the REAC (application document TR010029 – APP 7.4)):

- The species rich grass areas will have low nutrient / minimal topsoil, to promote wildflower growth[53].
- The approach to habitat creation will be to match the species composition and community to that which will be lost by utilising either collected seed and/or green hay sourced from an appropriate local donor site (potentially through the Glorious Cotswold Grasslands initiative run by the Cotswold AONB). Consideration will be given to habitat translocation, noting that the success of any translocation relies on habitat being translocated very rapidly to a pre-prepared receptor area. This option therefore may not align with the construction programme.
- The areas of species-rich road verge (once created) will receive annual maintenance at an appropriate time of year (late July to end of September) and all arisings will be collected and taken off site. This is in line with Gloucestershire Highways and Biodiversity Guidance[28].
- The strategy will be designed and agreed with Natural England and all parties will be signed up to the targets and objectives necessary to achieve 'good' condition (further detail provided in Section 7).
- The areas will be monitored and management will be reviewed and adapted as required to ensure the target condition is reached.

Translation of landscape design

4.2.8 The post-development habitat types were translated from landscape 'types' into metric habitat types (predominantly based on UKHab habitat classifications) by an Atkins ecologist, as shown in Table 4.1 and a target condition assigned based on the likely achievable condition. Justification for the target condition is provided for each habitat type.

[53] This is in line with Gloucestershire County Councils 'Highways and Biodiversity Guidance' (May 2022, version 3.2) and National Highway's 'Low Nutrient Grasslands policy' (Major Projects Delivery Services (October 2020), Low Nutrient Grasslands (version number MPI-85-102020).

Table 4-1 – Translation of landscape design planting types to BNG metric categories

Landscape Design Code / Type	Metric 'Broad' habitat	Metric 'Proposed habitat'	Target Condition	Justification
LE 1.2: Grassland with bulbs	Grassland	Modified grassland	Moderate	As this is typically an aesthetic grassland dominated by grass species, it is unlikely to achieve the non-negotiable criteria of 6-8 species per m^2 to achieve a 'good' condition. The target condition for this habitat type is moderate.
LE 6.2: Banks and ditches – wet grassland	Grassland	Modified grassland	Moderate	As above. Furthermore, management is likely to be infrequent and therefore criteria 2 (varied sward) and/or 3 (>20% scrub) are unlikely to be achieved. The target condition for this habitat type is moderate.
LE 6.4: Wet grassland with marginal planting	Grassland	Other neutral grassland	Moderate	These areas are likely to have infrequent management and are therefore unlikely to meet all 5 condition assessment criteria for other neutral grassland required to achieve 'good' (e.g. <5% scrub). The target condition for this habitat type is moderate.
LE 1.3: Species Rich Grassland	Grassland	Other neutral grassland	Good	These areas will be created and managed as part of the scheme's 'Road Verge Compensation

Landscape Design Code / Type	Metric 'Broad' habitat	Metric 'Proposed habitat'	Target Condition	Justification
				Strategy'. The target condition for this habitat type is good.
LE2.1: Woodland	Woodland and forest	Other woodland; broadleaved	Moderate	Woodland planting typically including a variety of predominantly native tree and shrub species. The target condition for this habitat type is moderate. Unlikely to reach 'good' condition as trees will be planted and management will not involve coppicing.
LE 2.2: Woodland edge	Woodland and forest	Other woodland; broadleaved	Moderate	As above.
LE 2.4: Linear belts of Shrubs and Trees	Heathland and shrub	Mixed scrub	Moderate	Typically native scrub mix comprising species such as hazel, hawthorn, dogwood, holly and blackthorn, interspersed with larger tree species such as oak and sweet chestnut. The target condition for this habitat type is moderate. Good condition may not be achieved as a result of adjacent agricultural land uses reducing the opportunity for well-developed scrub edges.
LE 2.5: Shrubs with intermittent trees	Heathland and shrub	Mixed scrub	Moderate	As above.
LE 2.6: Shrub	Heathland and shrub	Mixed scrub	Moderate	As above.
LE 2.8: Scrub	Heathland and shrub	Mixed scrub	Moderate	As above.

Landscape Design Code / Type	Metric 'Broad' habitat	Metric 'Proposed habitat'	Target Condition	Justification
LE 3.1: Amenity tree and shrub planting	Urban	Introduced shrub	Poor	Fixed at poor. Not possible to achieve a higher condition.
LE 5.1: Individual tree	Urban	Urban tree	Moderate	The target condition for this habitat type is moderate.
LE 6.1: Waterbodies and associated plants	Lakes	Non-priority ponds	Moderate	The target condition for this habitat type is moderate. Good condition may not be achieved as a result of adjacent agricultural land uses and artificial water level controls.

Strategic significance

4.2.9 All proposed woodland was assessed to be of high strategic significance, on the basis that:

- It is listed as in need of safeguarding within the relevant National Character Area Profile (106 (Severn and Avon Vales))[30].
- A number of blocks of woodland are identified as core woodland habitat in the nature recovery network on Gloucestershire's Natural Capital mapping[25].
- A habitat action plan for woodland is included in the Gloucestershire Biodiversity Action Plan, and woodland is identified as a key habitat for a number of species with species action plans[27].
- Woodland is identified as a priority/important habitat within the Gloucestershire Highways and Biodiversity Guidance[28].

4.2.10 Furthermore, proposed individual/scattered trees were assessed to be of high strategic significance on the basis that:

- Urban trees are key to achieving green infrastructure aims in the Gloucestershire Highways and Biodiversity Guidance[28] and the Gloucestershire local Transport Plan 2020 – 2041[26].
- Much of the Scheme is identified as a tree opportunities area on Gloucestershire's Natural Capital mapping[25].
- They would contribute to Gloucestershire's tree planting strategy[54].

4.2.11 In addition, the proposed ponds (LE 6.1: waterbodies and associated plants/ponds (non-priority habitat)), banks and ditches (LE 6.2: Banks and ditches sown with wet grassland/Grassland - modified grassland) and wet grassland areas (LE 6.4: Wet

[54] Gloucestershire Local Nature Partnership (September 2020) Gloucestershire Tree Strategy

grassland with marginal planting/Grassland – other neutral grassland) were assessed to be of high strategic significance on the basis that:

- Floodplain grassland is noted as a key part of the relevant National Character Area Profile (106 (Severn and Avon Vales))[30].
- Much of the area within the Order limits is identified as a wetland opportunity area on Gloucestershire's Natural Capital mapping[25].
- A habitat action plan exists for lowland wet grassland within the Gloucestershire Biodiversity Action Plan[27].
- Waterbodies are key elements of the green infrastructure aims within the Gloucestershire local Transport Plan 2020 – 2041[26].

4.2.12 The remaining proposed habitats within the Order limits were assessed to be of low strategic significance.

4.3 Post-works hedgerows

Very High Distinctiveness Hedgerow

4.3.1 The loss of the 0.04km of 'Very High' distinctiveness hedgerow (native species rich hedgerow with trees – associated with a bank or ditch) will be compensated through the creation of 0.06km of hedgerow of the same distinctiveness level on a like for like basis. This section of new hedgerow is associated with a new ditch and will have a minimum of five woody species within each 30m section. See Figure 7-18F for the location of this new Very High distinctiveness hedgerow. The time to target condition for all newly created hedgerow is discussed in section 5 and Section 7.

4.3.2 As a result of this compensation no breach of trading rules for Very High distinctiveness hedgerows has occurred.

Remaining Hedgerows

4.3.3 The Scheme will result in the loss of 9.15 km of hedgerow. New hedgerows will be created throughout the Scheme (totalling 11.35 km), in particular along the Link Road and A4019. In addition, a number of hedgerows to the north of the A4019 will be enhanced (1.21 km in total).

4.3.4 The Scheme design includes species rich hedgerows (i.e. hedgerow replacement with a minimum of five woody species within each 30 m section of new hedge) for all lengths of new hedgerows planted by the Scheme. A translation of the landscape hedgerow type to the hedgerow type selected in the metric (post-development) is provided in Table 4-2 below, with a justification of the condition score selected.

Table 4-2 – Translation of landscape design hedgerow types into metric (hedge creation) types

Landscape Hedgerow Type	Metric Habitat Type	Habitat Condition	Justification (and further explanatory notes)
LE4.2 Native species hedges (trimmed)	Native Species Rich Hedgerow	Moderate	The hedgerows will be planted with at least five woody species per 30 m section/s with species such as: field maple, dogwood, hazel, hawthorn, spindle, beech, holly, privet, crab apple, blackthorn, buckthorn and guelder-rose. The target condition for this habitat type is moderate. Good condition may not be achieved as a result of adjacent agricultural land uses which may result in ground disturbance, nutrient enrichment, undesirable species or damage.
LE4.3 Native species hedgerows (untrimmed)	Native Species Rich Hedgerow	Moderate	As above
LE4.4 Native hedgerows with trees	Native Species Rich Hedgerow with trees	Moderate	The hedgerows will be planted with at least five woody species per 30 m section/s with species such as: field maple, dogwood, hazel, hawthorn, spindle, beech, holly, privet, crab apple, blackthorn, buckthorn and guelder-rose. And trees such as: field maple, silver birch, hornbeam and pedunculate oak. The target condition for this habitat type is moderate. Good condition may not be achieved as a result of adjacent agricultural land uses which may result in ground disturbance, nutrient enrichment, undesirable species or damage. The condition criteria for maturity of trees may also not be met.
LE4.4 Native hedgerows with trees	Native Species Rich Hedgerow with trees, associated with a bank or ditch	Moderate	As above, with the additional parameter of a new ditch adjacent to the hedgerow.

4.3.5 The proposed hedgerow enhancements included in the Scheme are focused on increasing the diversity of tree and shrub species present within the hedgerows / line of trees[55]. This will be achieved through the use of new planting which will be suitably managed (see Sections 6 and 7). Table 4-3 provides the details of the hedgerow to be enhanced with a justification of the post works condition / hedgerow type selected.

[55] The Scheme is delivering additional enhancements to the hedgerow network to benefit the local Hazel Dormouse population however only enhancements which are sufficient to increase either the hedgerow type and/or condition have been included in the BNG assessment and presented in Table 4-3.

4.3.6 The time to target condition for all enhanced hedgerow is discussed in section 5 and Section 7.

Table 4-3 – Hedgerow enhancement – summary and justifications

Hedgerow ID	Current Metric Hedgerow Type	Current Hedgerow Condition	Post-works Metric Hedgerow Type	Post-works Metric Hedgerow Condition	Justification
H48 (9)	Native Hedgerow with trees	Moderate	Native Species Rich Hedgerow with trees	Moderate	Post-intervention there will be at least five native woody species (new planting) meeting the criteria for species rich hedgerow. Condition scores however remain the same due to surrounding land use issues and presence of ash die back.
H199/H199a (63)	Native hedgerow	Moderate	Native Species Rich Hedgerow	Moderate	Post-intervention there will be at least five native woody species (new planting) meeting the criteria for species rich hedgerow. Condition scores however remain the same due to surrounding land use issues.
H200 (62)	Native hedgerow	Moderate	Native Species Rich Hedgerow	Moderate	As above
H201 (92)	Native hedgerow	Moderate	Native Species Rich Hedgerow	Moderate	As above
HT18 (42)	Line of trees	Poor	Same	Moderate	New understory planting will fill gaps and help meet criteria 2. The line of trees will still be dominated by non-native poplars however three criteria will be passed resulting in an enhanced condition of moderate.

Strategic significance

4.3.7 Hedgerows proposed as part of the landscape scheme (created and enhanced) were assessed to be of high strategic significance on the basis that:

- Hedgerows and field boundaries in general are listed as important and in need of safeguarding, both for biodiversity and heritage within the relevant National Character Area Profile (106 (Severn and Avon Vales))[30].

- There is a habitat action plan covering species rich and/or ancient hedgerows, and this habitat type (whether species rich or species poor) supports species for which species action plans exist[27].
- Hedgerows are listed as a priority/important habitat in the Gloucestershire Highways and Biodiversity Guidance[28].

4.4 Rivers and streams

4.4.1 A desktop exercise was conducted to estimate how the Scheme would impact the baseline indicator scores produced from the River Condition Assessment, details of which are presented in Appendix C.

4.4.2 The Scheme will result in the loss of approximately 0.02 km of the Leigh Brook, due to the extension of the Leigh Brook culvert.

4.4.3 Approximately 0.021 km of the River Chelt will reduce in River Condition Score, and consequently River Condition Class, as a result of the Link Road crossing. At this stage, details of bank protection required beneath the deck of the bridge are not known. A precautionary approach has been taken to assume that the bank protection will equal the length of the bridge deck (0.021 km), composed of hard bank protection, e.g. rip-rap.

4.4.4 As described in Section 4.1.1, the Scheme Design incorporates enhancements to the River Chelt and Leigh Brook, which are summarised in Table 4-4.

Table 4-4 – Rivers and Streams enhancement summary

Watercourse Name	Watercourse Location	Length (within the Order limits) km	Pre-works Condition	Post-works Condition	Enhancement Summary
River Chelt	Upstream and downstream of the Link Road Crossing	0.274	Moderate	Fairly Good	• Riparian zone – the riparian habitat will no longer be managed for agriculture and will be restored to reflect a more natural habitat, facilitated through woodland creation[56] and planting of wet grassland species. This will also reduce encroachment from 'Major' to 'Moderate', as there will still be some management present within the riparian zone. • Bank reprofiling – the River Chelt is incised at this location, therefore, banks will be re-profiled with the aim to create more natural two-stage channel and facilitate establishment of marginal features (such as berms/benches) and to reconnect it with its floodplain. • Marginal planting – planting of native aquatic vegetation such as emergent linear leaved and broadleaved species. • Woody features – any trees that have been felled as part of the Scheme will be placed on/in the banks and within the channel to create woody deflectors. This will create refuge for fish species as well as contributing to variability in flow types. Any deflector installations will be as naturalised wherever possible, e.g. tied into the banks with no securing wires/posts showing. • Creation of in-channel geomorphological features – coarse substrates (such as gravel/pebble and cobble, already present within the channel) will be introduced into the channel to facilitate the establishment of riffles, with woody features
	Upstream of the River Chelt Culvert	0.1	Fairly Poor	Moderate	

Watercourse Name	Watercourse Location	Length (within the Order limits) km	Pre-works Condition	Post-works Condition	Enhancement Summary
					previously described creating scour to maintain pool features.
	At the Link Road Crossing	0.21	Moderate	Fairly Poor	Bank protection that is required as part of the Scheme will result in a reduction of local condition through loss of bank-face habitat/vegetation, shading and riparian/watercourse encroachment. Enhancements identified elsewhere on the Chelt may be possible within this reach. However, given current uncertainty of bank protection design, no enhancements have been assumed at this location. This will be updated at detailed design.
Leigh Brook	Downstream of the Leigh Brook Culvert	0.221	Fairly Poor	Moderate	• Riparian zone – the riparian habitat will no longer be managed for agriculture and will be restored to reflect a more natural habitat, facilitated through woodland creation[56] and planting of wet grassland species. A new discharge from an attenuation pond will be an open channel drainage ditch, which will result in increased complexity to the riparian habitat. • Bank reprofiling – banks will be re-profiled with the aim to create more natural two-stage channel and facilitate establishment of marginal features such as berms/benches.

[56] A definition of woodland in the United Kingdom (which is used for forestry statistics) is land under stands of trees with a canopy cover of at least 20% (or having the potential to achieve this), including integral open space. Source: https://www.forestresearch.gov.uk/tools-and-resources/statistics/forestry-statistics/forestry-statistics-2018/sources/woodland-area-and-planting [Accessed: 27.10.22]

Watercourse Name	Watercourse Location	Length (within the Order limits) km	Pre-works Condition	Post-works Condition	Enhancement Summary
					• Marginal planting – planting of native aquatic vegetation such as emergent linear leaved and broadleaved species.

5 BNG Metric results

5.1.1 This section of the report replicates the key outputs from the metric calculator[15]. A copy of the completed metric calculator for terrestrial habitats, hedgerows, and rivers, streams and ditches can be made available on request.

5.2 Terrestrial habitats

5.2.1 The justification for post development habitat choices, distinctiveness and condition selected are provided in Section 4 Scheme Design.

5.2.2 For the terrestrial habitats module of the metric, the Scheme design will result in an increase of habitat units from 656.58 to 732.69, which equates to 11.59% net gain. A breakdown of the habitat units generated by the Scheme is provided in Table 5.1.

5.2.3 An asterisk marks those habitats which form the baseline for areas within the temporary working area where the habitat will be reinstated to the same habitat type and condition as the baseline value (see section 2.8 Assumptions and Limitations).

Table 5-1 – Summary of On-site Habitat Creation Results

Post-development Habitat Type*	Distinctiveness (pre-set)	Target Condition	Area/ha	Strategic Significance	Habitat Enhanced in Advance/ years	Delay in Starting Habitat Enhancement/ years	Final Time to Target Condition (taking into account a 3 year delay for construction)	Habitat Units Delivered
Modified grassland	Low	Moderate	5.16	High (wetland habitat)	0	3	7	18.50
Modified grassland	Low	Moderate	3.56	Low	0	3	7	11.10
Other neutral grassland	Medium	Good	22.46	Low	0	3	13	169.61
Other neutral grassland	Medium	Moderate	5.34	High (wetland habitat)	0	3	8	36.94
Mixed scrub	Medium	Moderate	6.39	Low	0	3	8	44.21
Pond (non priority)	Medium	Moderate	1.01	High	0	3	6	7.50
Introduced shrub	Low	Poor	0.32	Low	0	3	4	0.55
Urban tree	Medium	Moderate	1.04	High	0	3	30	3.29
Woodland: broadleaved	Medium	Moderate	15.98	High	0	3	18	77.42
Developed area	N/A	N/A	30.17	N/A	0	3	3	0.00
Cereal crops*	Low	N/A	33.43	Low	0	3	4	57.98
Modified grassland*	Low	Poor	0.05	Low	0	3	7	0.09

Post-development Habitat Type*	Distinctiveness (pre-set)	Target Condition	Area/ha	Strategic Significance	Habitat Enhanced in Advance/ years	Delay in Starting Habitat Enhancement/ years	Final Time to Target Condition (taking into account a 3 year delay for construction)	Habitat Units Delivered
Modified grassland*	Medium	Moderate	3.58	Low	0	3	7	11.16
Other neutral grassland*	Medium	Poor	0.24	Low	0	3	5	0.80
Other neutral grassland*	Medium	Moderate	5.05	Low	0	3	8	30.38
Woodland: mixed*	Medium	Moderate	0.01	High	0	3	30+	0.03
Bramble scrub*	Medium	Poor	0.06	Low	0	3	4	0.21
Mixed scrub*	Medium	Poor	0.04	Low	0	3	4	0.14
		Total:	132.85				Total:	469.91

Note, numbers reported are as shown in the metric. It is noted that the total area presented here adds up to 133.89 ha. However, there is an element of rounding up/down in the metric which results in a slight discrepancy between the areas presented here and the metric output.

5.3 Hedgerows

5.3.1 The justification for post development habitat choices, distinctiveness and condition selected are provided in Section 4. Scheme Design.

5.3.2 For the hedgerows module of the metric, the Scheme design will result in an in an increase of hedgerow units from 138.25 to 160.32, which equates to 15.96% net gain. A breakdown of the hedgerow units generated by the Scheme is provided in Table 5.2 and 5.3 (the net gain includes enhanced hedgerows and created hedgerows combined).

Hedgerow enhancement results

5.3.3 There are five hedgerows (this includes one line of trees) within the Order limits which will be enhanced. These can be seen on the Proposed Habitats Plan in Figure 7-18D in Appendix A.

Table 5-2 – Summary of On-site Hedgerow Enhancement Results

Baseline Hedgerow Type	Baseline Condition	Post-development Hedgerow Type	Post-development Condition	Length / km	Habitat Enhanced in Advance/ years	Delay in Starting Habitat Enhancement / years (it is assumed no delay will occur)	Hedge Units Delivered
Native Hedgerow with trees	Moderate	Native Species Rich Hedgerow with trees	Moderate	0.43	0	0	5.61
Native hedgerow	Moderate	Native Species Rich Hedgerow	Moderate	0.57	0	0	4.82
Line of trees	Poor	No change – Line of trees	Moderate	0.21	0	0	0.72
			Total length:	1.21		Total units:	11.15

Hedgerow creation

5.3.4 The scheme will create 11.35 km of new species rich hedgerow. The relevant metric data is provided below in Table 5-3 and all created hedgerows can be seen on the Proposed Habitats Plan in Figure 7-18F in Appendix A.

Table 5-3 – Summary of On-site Hedgerow Creation Results

Post-development Hedgerow Type	Distinctiveness (pre-set)	Target Condition	Length/ km	Strategic Significance	Habitat Enhanced in Advance/ years	Delay in Starting Habitat Enhancement/ years	Final Time to Target Condition	Hedge Units Delivered
Native Species Rich Hedgerow with trees, associated with a bank or ditch	Very High	Moderate	0.06	High	0	3	13	0.69
Native Species Rich Hedgerow with trees	High	Moderate	8.77	High	0	3	13	76.16
Native Species Rich Hedgerow	Medium	Moderate	2.52	High	0	3	8	17.43
Total length of hedgerow created:			11.35	Total hedge units delivered:				94.29

5.4 Trading Summary (terrestrial habitats/hedgerows)

Very high/high distinctiveness habitats

5.4.1 The 'Very High' distinctiveness habitats (lowland meadow) cannot be adequately accounted for through the metric and a bespoke compensation strategy (referred to as the Road Verge Compensation Strategy, see paragraphs 4.2.4-4.2.5) will be developed for the loss of this area of lowland meadow and will include, in part, the widespread creation, and long-term management, of species-rich grassland across the scheme.

5.4.2 The Scheme will result in the loss of very high distinctiveness native species rich hedgerow with trees – associated with bank or ditch (0.04 km), and high distinctiveness hedgerow types (native species rich hedgerow with trees and native hedgerow with trees, associated with a bank or ditch) (1.68 km in total), but this is offset by the creation of 0.06 km of very high distinctiveness hedgerow and 8.77 km of new species rich hedgerow with trees (high distinctiveness habitat). Hedgerow enhancements will also result in a move from medium to high distinctiveness type for 0.43 km of hedgerow equating to 5.61 hedgerow units.

Medium distinctiveness habitats

5.4.3 For medium distinctiveness habitats, to avoid trading down it is advised that habitat creation aims to create an equivalent number of units of the same broad habitat type or a higher distinctiveness habitat. For example, bramble scrub can be replaced with mixed scrub without risking trading down. The Scheme results in the loss of areas of a medium distinctiveness habitats including other woodland; broadleaved, other woodland; mixed, mixed scrub and other neutral grassland. The loss of these medium distinctiveness habitats are adequately compensated for by the creation of at least the equivalent number of units of these broad habitat types.

5.4.4 The Scheme will result in the loss of the following medium distinctiveness hedgerow types; native species rich hedgerow (0.01 km), native hedgerow with trees (2.57 km), native hedgerow associated with a bank or ditch (0.31 km) and line of trees (ecologically valuable) with bank or ditch (0.06 km). This loss (2.95 km in total) is offset by the creation of 2.52 km of medium distinctiveness native species rich hedgerow and through 'trading up' by creating new very high/high distinctiveness hedgerow, as described above. Hedgerow enhancements will also result in a move from low to medium distinctiveness type for 0.57 km of hedgerow equating to 4.82 hedgerow units.

Low distinctiveness habitats

5.4.5 For low distinctiveness habitat, to avoid trading down it is advised that habitat creation aims to create an equivalent number of units for habitats of the same distinctiveness or better. There is no requirement for this to come from the same broad habitat type. Units can be used from any higher distinctiveness habitat (medium, high or very high), provided they have not already been counted as part of the trading down for these higher distinctiveness habitats.

5.4.6 No further action is required to offset trading down in low distinctiveness habitats.

5.5 Rivers and streams

5.5.1 For the Rivers and Streams Module of the Metric, the Scheme design will result in an increase of RBUs from **7.67 RBUs** to **10.30 RBUs** for the River Chelt and Leigh Brook combined, which equates to **34.19 % net gain**, as presented in the Metric.

5.5.2 The Scheme design will result in an increase in RBUs for the River Chelt, from **5.63** to **8.02 RBUs**. This will be achieved through enhancing approximately 0.274 km of the River Chelt at the Link Road, and 0.1 km of the River Chelt upstream of the River Chelt Culvert.

5.5.3 For the Leigh Brook, there will be an increase in RBUs from **1.89** to **2.17 RBUs**. This will be achieved through enhancing approximately 0.219 km of the Leigh Brook.

5.5.4 A breakdown of the Rivers and Streams RBUs delivered within the Order limits are presented in Table 5-4.

5.5.5 Given the current limitations of the metric, which assumes River Chelt RBUs are 'lost' to the Link Road bridge deck/abutments and associated bank revetment, then 'created' (as opposed to a baseline reduction in condition), a separate scenario has been undertaken as described in Section 2.8.9, which is likely to be more representative of the actual RBUs lost and generated as part of the Scheme design. The pre-works baseline RBUs are unchanged in this scenario, (**7.67 RBUs**) as presented in Table 3-4, with a post-works baseline of **7.49 RBUs**, where the reduction in condition for 0.021 km of the River Chelt (where the Link Road bridge crosses the River Chelt with associated bank revetment) has been included in the baseline as 'Fairly Poor', rather than it being recorded as a loss (then re-created to capture a reduction in condition). Following enhancements and 'creation' of culverted extent (i.e. Rivers and Streams baseline loss then culvert created under the metric), this will result in an overall delivery of **10.97 RBUs,** which equates to a percentage net gain of **43.02%** (nothing that this value will not be the same as the one generated through the Metric as the percentage change has been calculated outside of it). As this is a bespoke approach, no BNG calculator line entries can be provided that would capture this gain in RBUs. It is included to demonstrate that the reported net gain of 34.19% is likely to be an underestimate of the net gain for Rivers and Streams.

Table 5-4 – Rivers and Streams Module Biodiversity Net Gain post-works

Watercourse / Structure	Baseline Length (within site boundary) (km)	Length Lost (km)	Length Retained (km)	Length Enhanced (km)	Length Created (km)	Baseline Units	Retained Units	Units Lost	Baseline Units Enhanced	Units Generated	Total Post Works Units
River Chelt (at the West Cheltenham Link Road Bridge)	0.295	0.021 (in Moderate condition)	-	0.274	0.021 (in Fairly Poor Condition)	4.07	-	0.29	3.78	2.05	5.83
River Chelt (upstream of the River Chelt Culvert)	0.10	-	-	0.10	-	1.04	-	-	1.04	0.63	1.67
River Chelt Culvert	0.05	-	0.05	-	-	0.09	0.09	-	-	-	0.09
River Chelt (downstream of the River Chelt Culvert)	0.10	-	0.10	-	-	0.52	0.52	-	-	-	0.52
Leigh Brook (upstream of the Leigh Brook Culvert)	0.05	0.01	0.04	-	-	0.34	0.27	0.07	-	-	0.27

Leigh Brook Culvert	0.054	-	0.054	-	0.02	0.08	0.08	-	-	0.03	0.11
Leigh Brook (downstream of the Leigh Brook Culvert)	0.229	0.01	-	0.219	-	1.55	-	0.07	1.48	0.31	1.79
Total (Rivers and Streams)	0.878	0.041	0.244	0.593	0.041	7.67	0.95	0.43	6.30	3.02	10.30 (34.19 %)

Note, numbers reported are as shown in the metric. There is an element of rounding up/down in the metric which results in a slight discrepancy between the total values presented here and the metric output.

5.6 Ditches

5.6.1 The Scheme will result in an increase in RBUs from **19.45** to **23.99 RBUs**, which equates to a **23.38% net gain** in RBUs for Ditches (including baseline and creation of culverts). This will be achieved through replacement of any ditch lost as a result of the Scheme, 'creation' of new culverts (i.e. ditch baseline loss then creation of culvert under the metric), in addition to creation of new ditch as part of the drainage strategy.

5.6.2 As all ditches within the Order limits are of the same condition, they have been summed together within the main body of the BNG assessment, with the metric calculations provided separately, and details of lengths of individual ditches provided in Table 3-5.

5.6.3 Approximately 2.40 km of ditch will be lost as part of the Scheme (which equates to a loss of **9.60 RBUs**), including realignment of existing ditch and placement of new culverts. Approximately 4.793 km of ditch will be created (which equates to a gain of **13.88 RBUs**), and approximately 0.187 km of culvert will be created, which equates to **0.27 RBUs**. Post-works ditches are presented in Figure 7-18F.

5.6.4 A breakdown of the RBUs delivered are presented in Table 5-5.

Table 5-5 – Ditches Module Biodiversity Net Gain post-works

Watercourse / Structure	Baseline Length (within Order Limits) (km)	Length Lost (km)	Length Retained (km)	Length Created (km)	Baseline Units	Retained Units	Units Lost	Units Generated	Total Post Works Units
Ditch	4.65	2.40	2.248	4.793	18.59	8.99	9.60	13.88	22.87
Culvert	0.57	0.00	0.57	0.187	0.85	0.85	0.00	0.27	1.12
Total	**5.22**	**2.40**	**2.818**	**4.98**	**19.45**	**9.84**	**9.60**	**14.15**	**23.99**

6 Scheme implementation and construction

6.1.1 An EMP (1st iteration) has been prepared for the Scheme (application document TR010063 – APP 7.3).

6.1.2 In addition, a REAC has been produced (application document TR010029 – APP 7.4) which forms part of the 1st iteration of the EMP and sets out the mitigation measures that have been committed to within the ES (including the BNG assessment) to manage the effects of the construction and operation of the Scheme to the environment, and how those mitigation commitments will be implemented through the construction of the Scheme and into its operation.

6.1.3 This approach is in accordance with the LA 120[57].

6.1.4 The EMP (2nd iteration) will be prepared by the appointed Principal Contractor (PC) prior to and during the implementation of the Scheme and will reflect the mitigation contained within the REAC. Any remaining items from the REAC which relate to the post construction and operational stage of the Scheme (i.e., the management period for habitats created and/or enhanced as part of the Scheme and described in this report) will be part of the EMP (3rd iteration). The REAC acts in part as a 'bridge' between the three iterations of the EMP through the lifecycle of the Scheme.

6.1.5 The 2nd and 3rd EMP iterations will be prepared and maintained by the appointed PC. The 3rd EMP will cover the remaining period of time required to ensure the full 'time to target condition period' has been met. For the Scheme this is 30+[58] years in total (3 years delay in starting habitat creation, plus 30 years time to target condition for woodland; mixed).

[57] Highways England (2020). Design Manual for Roads and Bridges. LA 120 Environmental Management Plans (formerly IAN 183/14 Environmental Management Plans, IAN 183/16 (W) Environmental Management Plans). Online: a3a99422-41d4-4ca1-bd9e-eb89063c7134 (standardsforhighways.co.uk).

[58] The metric calculation tool increases the 'time to target condition' by the appropriate number of years that the habitat creation is delayed and applies the adjusted multiplier. If the number of years delay, combined with the "standard' time to target condition applied in metric 3.0, exceeds 30 years then the 30+ years multiplier will be applied

7 BNG management and monitoring plan

7.1.1 Details on delivery of long-term management and monitoring for created or enhanced habitats (both terrestrial and aquatic) will be documented in the EMP (2nd and 3rd EMP iterations).

7.1.2 This will include detailed management and maintenance information for years 1 – 5 and broader management aims for the remaining time to target condition period, see Table 7.1 for a summary of the time to target condition period for the scheme.

7.1.3 Objectives will be set that are SMART (i.e., each target set is **Specific** to a feature that can be **Measured** accurately, **Achievable** within the project scope, **Relevant** to the condition assessment criteria and **Time**-bounded) and details on monitoring, including methods, frequency and timing will be included, as well as setting out the reporting procedures and options for remedial works, if needed.

7.1.4 The roles, responsibilities and competency requirements of those involved in implementing the habitat creation and enhancement will be clearly stated and the means by which the delivery of the work will be secured (i.e. financial or legal etc.) will be detailed.

7.1.5 The maximum time for habitat creation proposals to reach target condition is 30 years (for woodland; mixed). However, as there will be a delay in starting habitat creation (a delay of 3 years has been assumed based on the current construction programme information) then this will translate to a total of 30+ years.

7.1.6 An asterisk marks those habitats which form the baseline for areas within the temporary working area where the habitat will be reinstated to the same habitat type and condition as the baseline value (see section 2.8 Assumptions and Limitations).

Table 7-1 – Summary of habitat creation and target conditions, with the 'time to target condition' periods

Landscape Type	Metric Proposed Habitat Type	Target Condition	Final Time to Target Condition (years) (taking into account a 3 year delay to start habitat creation due to construction)
Individual tree	Urban tree	Moderate	30
Grassland with bulbs	Modified grassland	Moderate	7
Banks and ditches – wet grassland	Modified grassland	Moderate	7
N/A – from existing baseline*	Modified grassland*	Moderate*	7
Species rich grassland	Other neutral grassland	Good	13
Wet grassland with marginal planting	Other neutral grassland	Moderate	8
N/A – from existing baseline*	Other neutral grassland*	Poor*	5

Landscape Type	Metric Proposed Habitat Type	Target Condition	Final Time to Target Condition (years) (taking into account a 3 year delay to start habitat creation due to construction)
N/A – from existing baseline*	Cereal crops*	N/A agricultural*	4
Woodland	Woodland and forest - Other woodland; broadleaved	Moderate	18
Woodland edge	Woodland and forest - Other woodland; broadleaved	Moderate	18
N/A – from existing baseline*	Woodland and forest – Other woodland; mixed*	Moderate*	30+
Linear belts of Shrubs and Trees	Mixed scrub	Moderate	8
Shrubs with intermittent trees	Mixed scrub	Moderate	8
Shrub	Mixed scrub	Moderate	8
Scrub	Mixed scrub	Moderate	8
N/A – from existing baseline*	Bramble scrub*	Poor*	4
N/A – from existing baseline*	Mixed scrub*	Poor*	4
Amenity tree and shrub planting	Urban – introduced shrub	Fixed at poor	4
Waterbodies and associated plants	Lakes - Non-priority ponds	Moderate	6
Native Species Hedgerow (trimmed/untrimmed)	Native Species Rich Hedgerow	Moderate	8
Native Species Rich Hedgerow with trees	Native Species Rich Hedgerow with trees/ Native Species Rich Hedgerow with trees, associated with a bank or ditch	Moderate	13

7.1.7 Proposed hedgerow enhancements are summarised in Table 7.2. Details of the delivery of these enhancements works and any long-term management and monitoring for the enhanced hedgerows will be documented in the EMPs (all iterations). The enhancements will be carried out during the construction period therefore there has been no delay in starting the enhancements applied in the metric, or added to the time to target condition.

Table 7-2 – Summary of habitat (hedgerow) enhancement and target conditions, with the 'time to target condition' periods

Current Baseline Metric Hedgerow Type	Proposed Metric Hedgerow Type	Target Condition	Time to Target Condition (years)
Native Hedgerow	Native Species Rich Hedgerow	Moderate	5
Native Hedgerow with trees	Native Species Rich Hedgerow with trees	Moderate	5
Lines of Trees	No change – Line of Trees	Moderate	20

7.1.8 The target condition and time to target condition for rivers and streams/ditches that will be enhanced/created as part of the Scheme design is presented in Table 7-3.

7.1.9 The reduction in condition on the River Chelt (at the location of the new bridge crossing) has to be recorded as a loss through the metric as per the guidance, then re-created in poorer condition. However, in reality, no rivers and streams habitat will be lost or created. As such, time to target condition for the River Chelt has been presented, only, for the reach of watercourse that will be enhanced.

7.1.10 The baseline condition for ditches has been captured as N/A, as they will be created as part of the drainage strategy, and at present do not exist.

Table 7-3 – Summary of river types, target conditions, with the 'time to target condition' periods

River Type	Baseline River Condition	Target Condition	Time to Target Condition (years)
Priority Habitat (River Chelt)	Moderate	Fairly Good	2
Leigh Brook (Other Rivers and Streams)	Fairly Poor	Moderate	2
Ditches	N/A	Poor	1

8 BNG assessment – summary

8.1.1 In summary, the Scheme has the potential to achieve a net gain for terrestrial habitats, hedgerows, rivers and streams, and ditches within the Order limits, with the potential to achieve in excess of the 10% target for all elements, whilst meeting all trading rules.

8.1.2 A summary of the headline BNG results for the Scheme taken from the metric calculator (Headline Results tab), based on DF3, is provided below.

Table 8-1 – Summary of headline results from metric within the Order limits

	Total Habitat Units	Total Hedgerow Units	Total RBUs for River and Streams	Total RBUs for Ditches
Baseline	656.58	138.25	7.67	19.45
Post-development including retention and creation	732.69	160.32	10.30	23.99
Total net unit change	76.11	22.06	2.62	4.55
Total net percentage change (%)	**11.59%**	**15.96%**	**34.19%**	**23.38%**

8.1.3 For Rivers and Streams, the Scheme has the potential to achieve a net gain on both Rivers and Streams and Ditches, with the potential to achieve in excess of 10% target for both Rivers and Streams (34.19 %) and ditches (23.38 %). As described in paragraph 5.5.4, this is likely to be an underestimation of the net gain for rivers and streams. As the design progresses (i.e., confirmation of the bank protection design on the River Chelt), this BNG assessment will be updated to reflect any changes in RBUs associated with the Scheme.

8.1.4 The retained habitats are based on the DF3 design for the Scheme and minor changes may be required during the detailed design stage. However, any refinement in the habitats to be lost/retained/created by the Scheme will be carried out with due regard to the BNG Good Practice Guidelines and the trading rules.

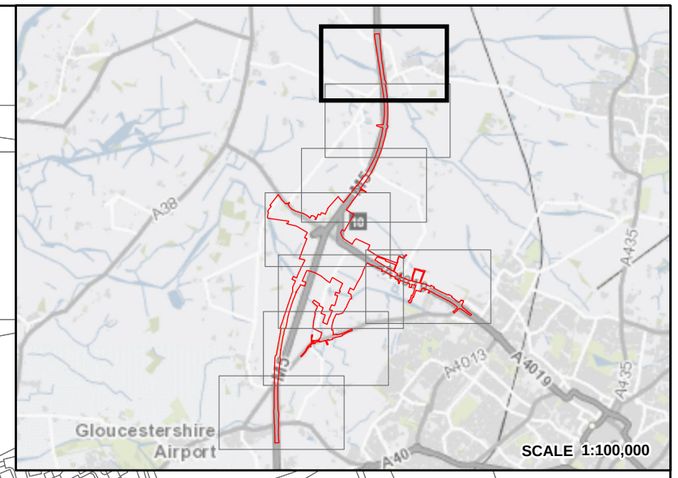
8.1.5 The maximum time for habitat creation proposals to reach target condition is 30+ years, factoring in the delay in starting habitat creation due to construction (a 3 year delay has been assumed). The long-term management and monitoring of created and enhanced habitat will be secured by an EMP which is updated at each phase of the Scheme and will cover the total duration of the 30+ years.

Appendices

Appendix A. Schedule of figures included in this application document

Figure reference	Document title	Sheet	Document number	Revision
7-18A	BNG Assessment - habitat baseline plan terrestrial habitats	1 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000075	0
7-18A	BNG Assessment - habitat baseline plan terrestrial habitats	2 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000075	0
7-18A	BNG Assessment - habitat baseline plan terrestrial habitats	3 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000075	0
7-18A	BNG Assessment - habitat baseline plan terrestrial habitats	4 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000075	0
7-18A	BNG Assessment - habitat baseline plan terrestrial habitats	5 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000075	0
7-18A	BNG Assessment - habitat baseline plan terrestrial habitats	6 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000075	0
7-18A	BNG Assessment - habitat baseline plan terrestrial habitats	7 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000075	0
7-18A	BNG Assessment - habitat baseline plan terrestrial habitats	8 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000075	0
7-18B	BNG Assessment - habitat baseline plan hedgerows	1 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000076	0
7-18B	BNG Assessment - habitat baseline plan hedgerows	2 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000076	0
7-18B	BNG Assessment - habitat baseline plan hedgerows	3 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000076	0
7-18B	BNG Assessment - habitat baseline plan hedgerows	4 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000076	0
7-18B	BNG Assessment - habitat baseline plan hedgerows	5 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000076	0
7-18B	BNG Assessment - habitat baseline plan hedgerows	6 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000076	0
7-18B	BNG Assessment - habitat baseline plan hedgerows	7 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000076	0
7-18B	BNG Assessment - habitat baseline plan hedgerows	8 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000076	0
7-18C	MoRPh and ditch condition assessments	1 of 1	GCCM5J10-ATK-EBD-ZZ-GS-GI-000077	0
7-18D	BNG Assessment - habitat baseline plan rivers, ditches and streams	1 of 1	GCCM5J10-ATK-EBD-ZZ-GS-GI-000078	0
7-18E	BNG Assessment - proposed habitat plan terrestrial habitats	1 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000079	0

Figure reference	Document title	Sheet	Document number	Revision
7-18E	BNG Assessment - proposed habitat plan terrestrial habitats	2 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000079	0
7-18E	BNG Assessment - proposed habitat plan terrestrial habitats	3 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000079	0
7-18E	BNG Assessment - proposed habitat plan terrestrial habitats	4 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000079	0
7-18E	BNG Assessment - proposed habitat plan terrestrial habitats	5 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000079	0
7-18E	BNG Assessment - proposed habitat plan terrestrial habitats	6 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000079	0
7-18E	BNG Assessment - proposed habitat plan terrestrial habitats	7 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000079	0
7-18E	BNG Assessment - proposed habitat plan terrestrial habitats	8 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000079	0
7-18F	BNG Assessment - proposed habitat plan hedgerows	1 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000080	0
7-18F	BNG Assessment - proposed habitat plan hedgerows	2 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000080	0
7-18F	BNG Assessment - proposed habitat plan hedgerows	3 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000080	0
7-18F	BNG Assessment - proposed habitat plan hedgerows	4 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000080	0
7-18F	BNG Assessment - proposed habitat plan hedgerows	5 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000080	0
7-18F	BNG Assessment - proposed habitat plan hedgerows	6 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000080	0
7-18F	BNG Assessment - proposed habitat plan hedgerows	7 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000080	0
7-18F	BNG Assessment - proposed habitat plan hedgerows	8 of 8	GCCM5J10-ATK-EBD-ZZ-GS-GI-000080	0
7-18G	BNG Assessment - proposed habitat plan rivers, ditches and streams	1 of 1	GCCM5J10-ATK-EBD-ZZ-GS-GI-000081	0



Metres
0 100 200

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form.
© Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS

UK HABITATS

- CEREAL CROPS
- LOWLAND MEADOWS
- OTHER NEUTRAL GRASSLAND
- MODIFIED GRASSLAND
- BRAMBLE SCRUB
- HAWTHORN SCRUB
- MIXED SCRUB
- DEVELOPED LAND, SEALED SURFACE
- WET WOODLAND
- OTHER WOODLAND, BROADLEAVED
- OTHER WOODLAND, MIXED
- PONDS (NON-PRIORITY HABITAT)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	07/09/23

Drawing Suitability: PUBLISHED
Status: A1

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

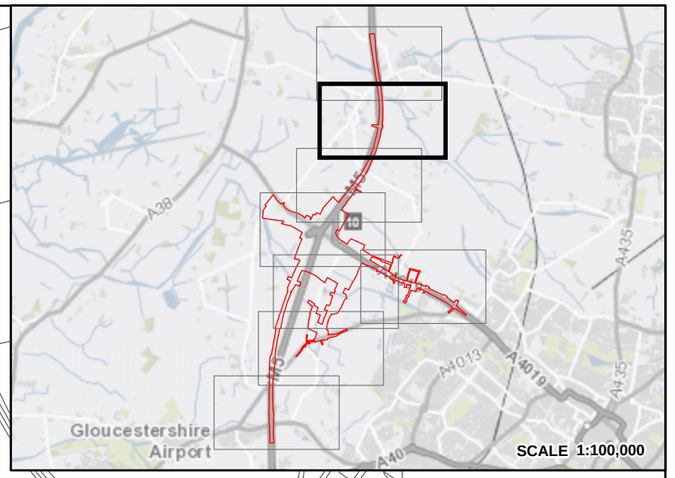
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title:
FIGURE 7-18A
BNG ASSESSMENT - HABITAT BASELINE PLAN
TERRESTRIAL HABITATS

Drawing Number
Project | Originator | Volume
GCCM5J10 - ATK - EBD
ZZ - GS - GI - 000075
Location | Type | Role | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	1 of 8	P01



Metres
0 100 200

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form. © Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS

UK HABITATS

- CEREAL CROPS
- LOWLAND MEADOWS
- OTHER NEUTRAL GRASSLAND
- MODIFIED GRASSLAND
- BRAMBLE SCRUB
- HAWTHORN SCRUB
- MIXED SCRUB
- DEVELOPED LAND, SEALED SURFACE
- WET WOODLAND
- OTHER WOODLAND, BROADLEAVED
- OTHER WOODLAND, MIXED
- PONDS (NON-PRIORITY HABITAT)

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	07/09/23

Drawing Suitability: PUBLISHED

Status: A1

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

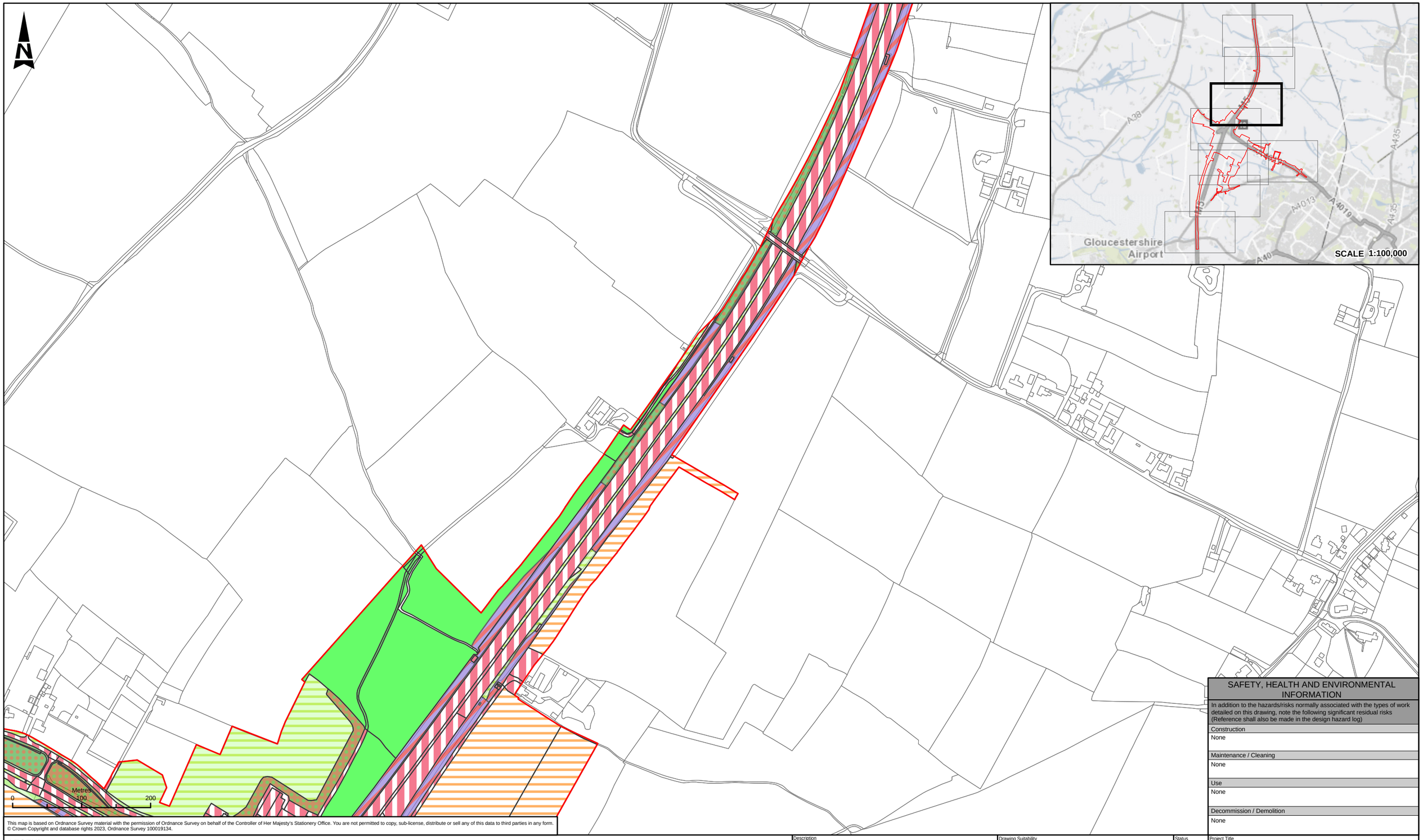
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title: FIGURE 7-18A
BNG ASSESSMENT - HABITAT BASELINE PLAN
TERRESTRIAL HABITATS

Drawing Number
Project | Originator | Volume
GCCM5J10 - ATK - EBD
ZZ - GS - GI - 000075
Location | Type | Role | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	2 of 8	P01



This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form. © Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS

UK HABITATS

- CEREAL CROPS
- LOWLAND MEADOWS
- OTHER NEUTRAL GRASSLAND
- MODIFIED GRASSLAND
- BRAMBLE SCRUB
- HAWTHORN SCRUB
- MIXED SCRUB
- DEVELOPED LAND, SEALED SURFACE
- WET WOODLAND
- OTHER WOODLAND, BROADLEAVED
- OTHER WOODLAND, MIXED
- PONDS (NON-PRIORITY HABITAT)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	07/09/23

Drawing Suitability: PUBLISHED
Status: A1

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

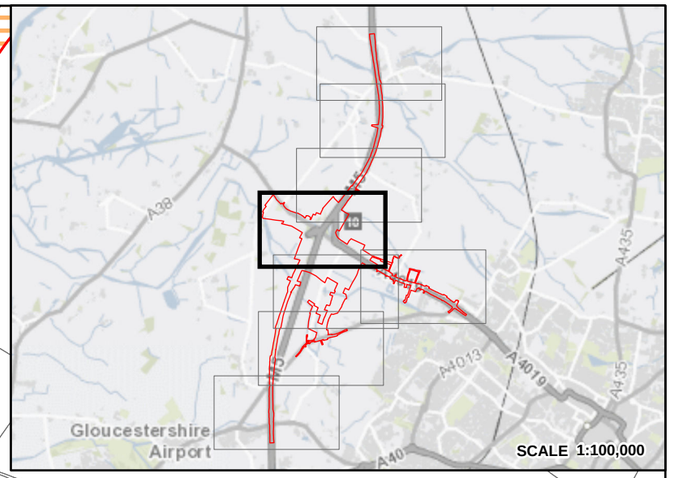
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title:
FIGURE 7-18A
BNG ASSESSMENT - HABITAT BASELINE PLAN
TERRESTRIAL HABITATS

Drawing Number
Project | Originator | Volume
GCCM5J10 - ATK - EBD
Location | Type | Role | Number
ZZ - GS - GI - 000075

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	3 of 8	P01



Metres
0 100 200

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form.
© Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS

UK HABITATS

- CEREAL CROPS
- LOWLAND MEADOWS
- OTHER NEUTRAL GRASSLAND
- MODIFIED GRASSLAND
- BRAMBLE SCRUB
- HAWTHORN SCRUB
- MIXED SCRUB
- DEVELOPED LAND, SEALED SURFACE
- WET WOODLAND
- OTHER WOODLAND, BROADLEAVED
- OTHER WOODLAND, MIXED
- PONDS (NON-PRIORITY HABITAT)

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	07/09/23

Drawing Suitability: PUBLISHED
Status: A1

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

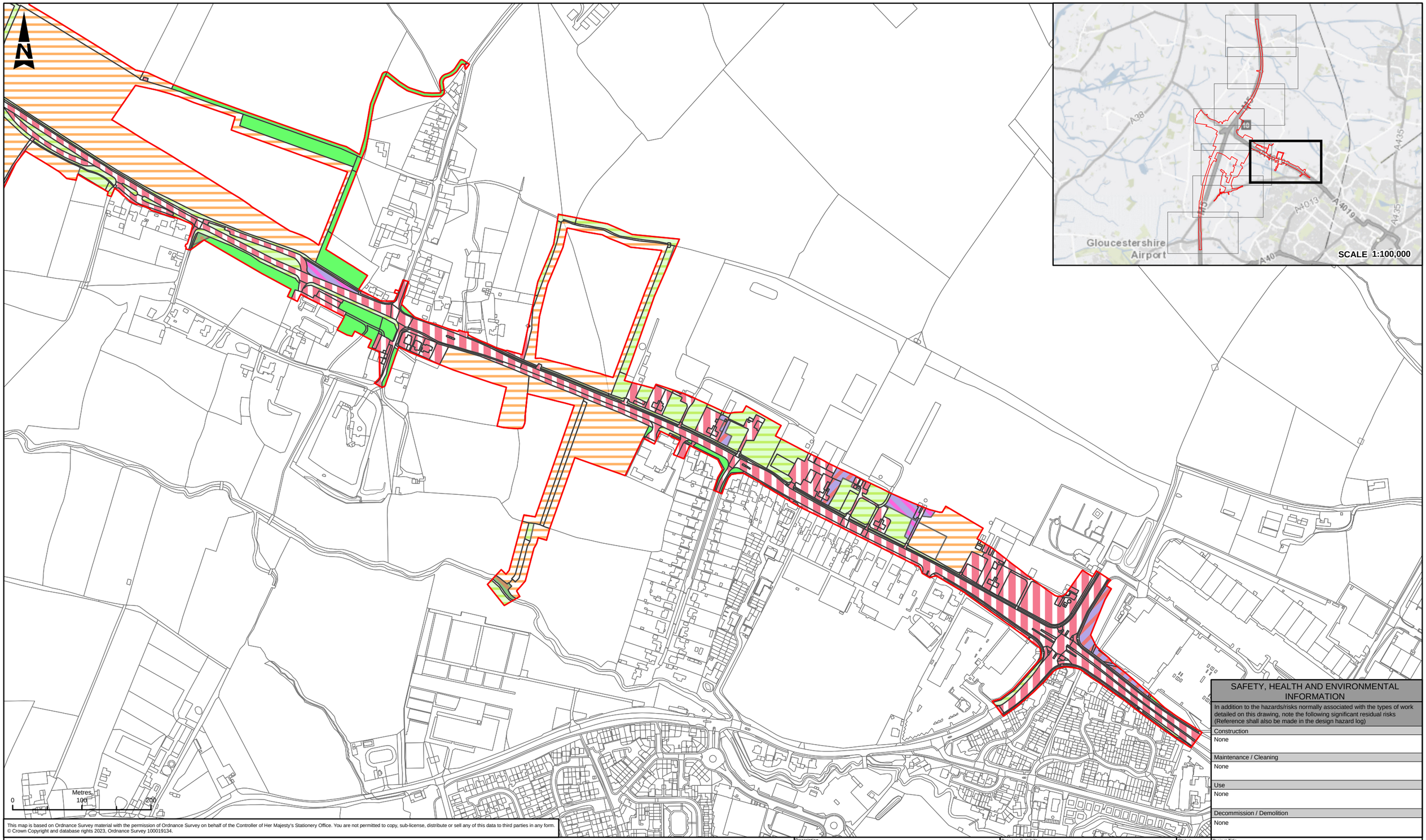
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title:
FIGURE 7-18A
BNG ASSESSMENT - HABITAT BASELINE PLAN
TERRESTRIAL HABITATS

Drawing Number
Project | Originator | Volume
GCCM5J10 - ATK - EBD
Location | Type | Role | Number
ZZ - GS - GI - 000075

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	4 of 8	P01



This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form.
© Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS

UK HABITATS

- CEREAL CROPS
- LOWLAND MEADOWS
- OTHER NEUTRAL GRASSLAND
- MODIFIED GRASSLAND
- BRAMBLE SCRUB
- HAWTHORN SCRUB
- MIXED SCRUB
- DEVELOPED LAND, SEALED SURFACE
- WET WOODLAND
- OTHER WOODLAND, BROADLEAVED
- OTHER WOODLAND, MIXED
- PONDS (NON-PRIORITY HABITAT)

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	07/09/23

Drawing Suitability: PUBLISHED

Status: A1

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

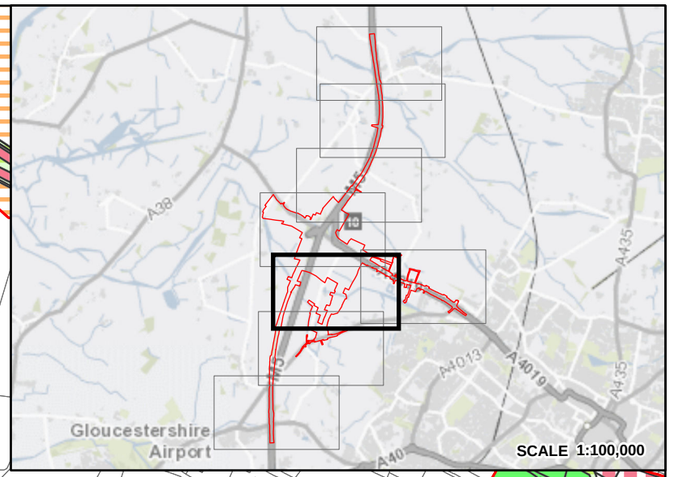
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title: FIGURE 7-18A
BNG ASSESSMENT - HABITAT BASELINE PLAN
TERRESTRIAL HABITATS

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
ZZ - GS - GI - 000075
Location | Type | Role | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	5 of 8	P01



N

0 100 200 Metres

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form. © Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS

UK HABITATS

- CEREAL CROPS
- LOWLAND MEADOWS
- OTHER NEUTRAL GRASSLAND
- MODIFIED GRASSLAND
- BRAMBLE SCRUB
- HAWTHORN SCRUB
- MIXED SCRUB
- DEVELOPED LAND, SEALED SURFACE
- WET WOODLAND
- OTHER WOODLAND, BROADLEAVED
- OTHER WOODLAND, MIXED
- PONDS (NON-PRIORITY HABITAT)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date

Description
PUBLISHED

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
A1	P01	JM	VG	CC	LJ	07/09/23

Drawing Suitability: PUBLISHED

Status: A1

Project Title: M5 Junction 10 Improvements Scheme

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

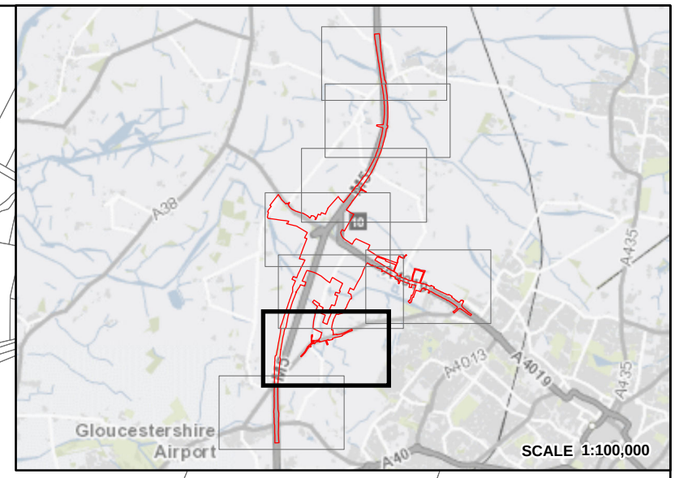
Copyright © Atkins Limited (2023)

Drawing Title: FIGURE 7-18A
BNG ASSESSMENT - HABITAT BASELINE PLAN
TERRESTRIAL HABITATS

Client: Gloucestershire County Council

Drawing Number
Project | Originator | Volume
GCCM5J10 - ATK - EBD
Location | Type | Role | Number
ZZ - GS - GI - 000075

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	6 of 8	P01



Metres
0 100 200

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form.
© Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS

UK HABITATS

- CEREAL CROPS
- LOWLAND MEADOWS
- OTHER NEUTRAL GRASSLAND
- MODIFIED GRASSLAND
- BRAMBLE SCRUB
- HAWTHORN SCRUB
- MIXED SCRUB
- DEVELOPED LAND, SEALED SURFACE
- WET WOODLAND
- OTHER WOODLAND, BROADLEAVED
- OTHER WOODLAND, MIXED
- PONDS (NON-PRIORITY HABITAT)

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	07/09/23

Drawing Suitability: PUBLISHED

Status: A1

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

Client: Gloucestershire County Council

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

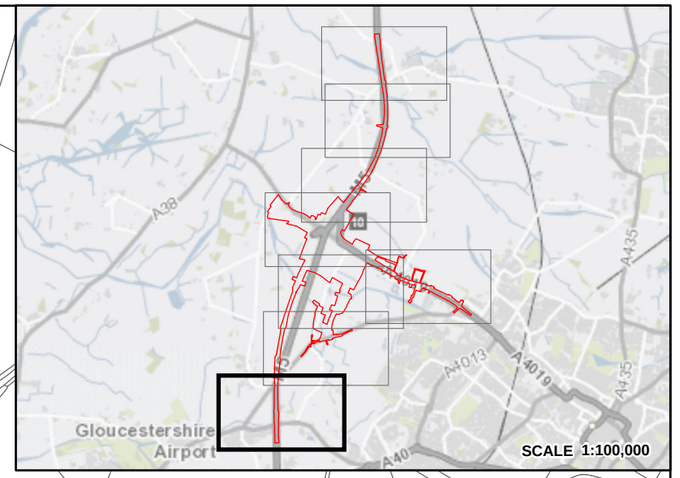
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title:
FIGURE 7-18A
BNG ASSESSMENT - HABITAT BASELINE PLAN
TERRESTRIAL HABITATS

Drawing Number
Project | Originator | Volume
GCCM5J10 - ATK - EBD
ZZ - GS - GI - 000075
Location | Type | Role | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	7 of 8	P01



Metres
0 100 200

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form.
© Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS

UK HABITATS

- CEREAL CROPS
- LOWLAND MEADOWS
- OTHER NEUTRAL GRASSLAND
- MODIFIED GRASSLAND
- BRAMBLE SCRUB
- HAWTHORN SCRUB
- MIXED SCRUB
- DEVELOPED LAND, SEALED SURFACE
- WET WOODLAND
- OTHER WOODLAND, BROADLEAVED
- OTHER WOODLAND, MIXED
- PONDS (NON-PRIORITY HABITAT)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	07/09/23

Drawing Suitability: PUBLISHED — Status: A1

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

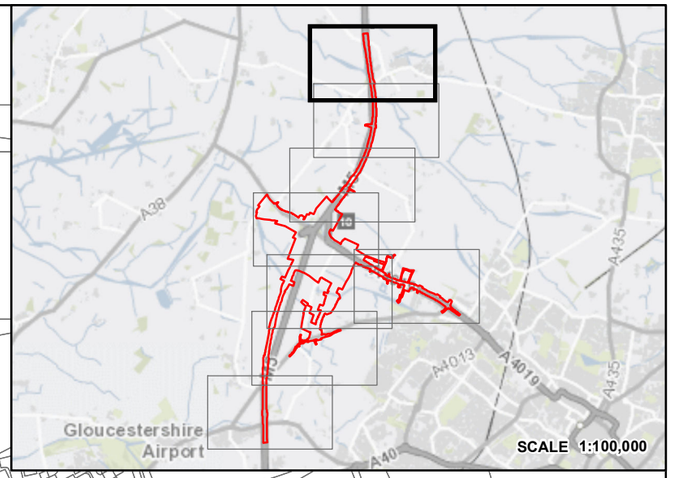
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title: FIGURE 7-18A
BNG ASSESSMENT - HABITAT BASELINE PLAN
TERRESTRIAL HABITATS

Drawing Number: GCCM5J10 - ATK - EBD ZZ - GS - GI - 000075
(Project | Originator | Volume | Location | Type | Role | Number)

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	8 of 8	P01



Metres
0 100 200

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form.
© Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- NATIVE HEDGEROW
- NATIVE HEDGEROW - ASSOCIATED WITH BANK OR DITCH
- NATIVE HEDGEROW WITH TREES
- NATIVE HEDGEROW WITH TREES - ASSOCIATED WITH BANK OR DITCH
- NATIVE SPECIES RICH HEDGEROW
- NATIVE SPECIES RICH HEDGEROW WITH TREES
- NATIVE SPECIES RICH HEDGEROW WITH TREES - ASSOCIATED WITH BANK OR DITCH
- HEDGE ORNAMENTAL NON-NATIVE
- LINE OF TREES
- LINE OF TREES (ECOLOGICALLY VALUABLE) - WITH BANK OR DITCH

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	14/08/23

Drawing Suitability: PUBLISHED
Status: A1

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

Client: Gloucestershire County Council

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

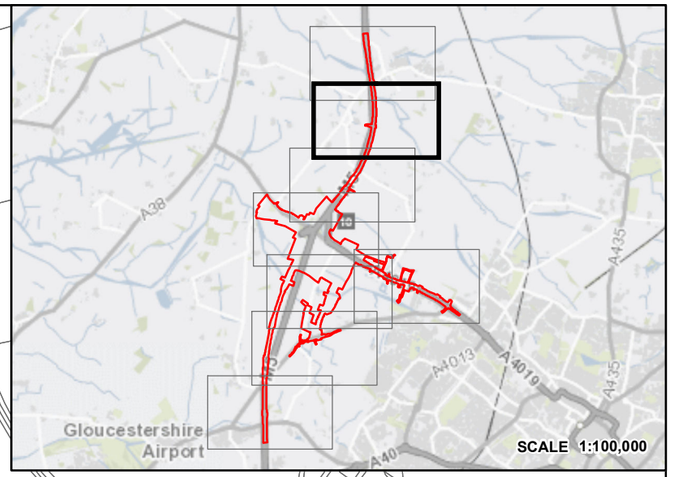
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title: FIGURE 7-18B
BNG ASSESSMENT - HABITAT BASELINE PLAN
HEDGEROWS

Drawing Number: GCCM5J10 - ATK - EBD - ZZ - GS - GI - 000076
(Project | Originator | Volume | Location | Type | Role | Number)

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	1 of 8	P01



N

Metres
0 100 200

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form.
© Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- NATIVE HEDGEROW
- NATIVE HEDGEROW - ASSOCIATED WITH BANK OR DITCH
- NATIVE HEDGEROW WITH TREES
- NATIVE HEDGEROW WITH TREES - ASSOCIATED WITH BANK OR DITCH
- NATIVE SPECIES RICH HEDGEROW
- NATIVE SPECIES RICH HEDGEROW WITH TREES
- NATIVE SPECIES RICH HEDGEROW WITH TREES - ASSOCIATED WITH BANK OR DITCH
- HEDGE ORNAMENTAL NON-NATIVE
- LINE OF TREES
- LINE OF TREES (ECOLOGICALLY VALUABLE) - WITH BANK OR DITCH

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	14/08/23

Drawing Suitability: PUBLISHED
Status: A1

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

Client: Gloucestershire COUNTY COUNCIL

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

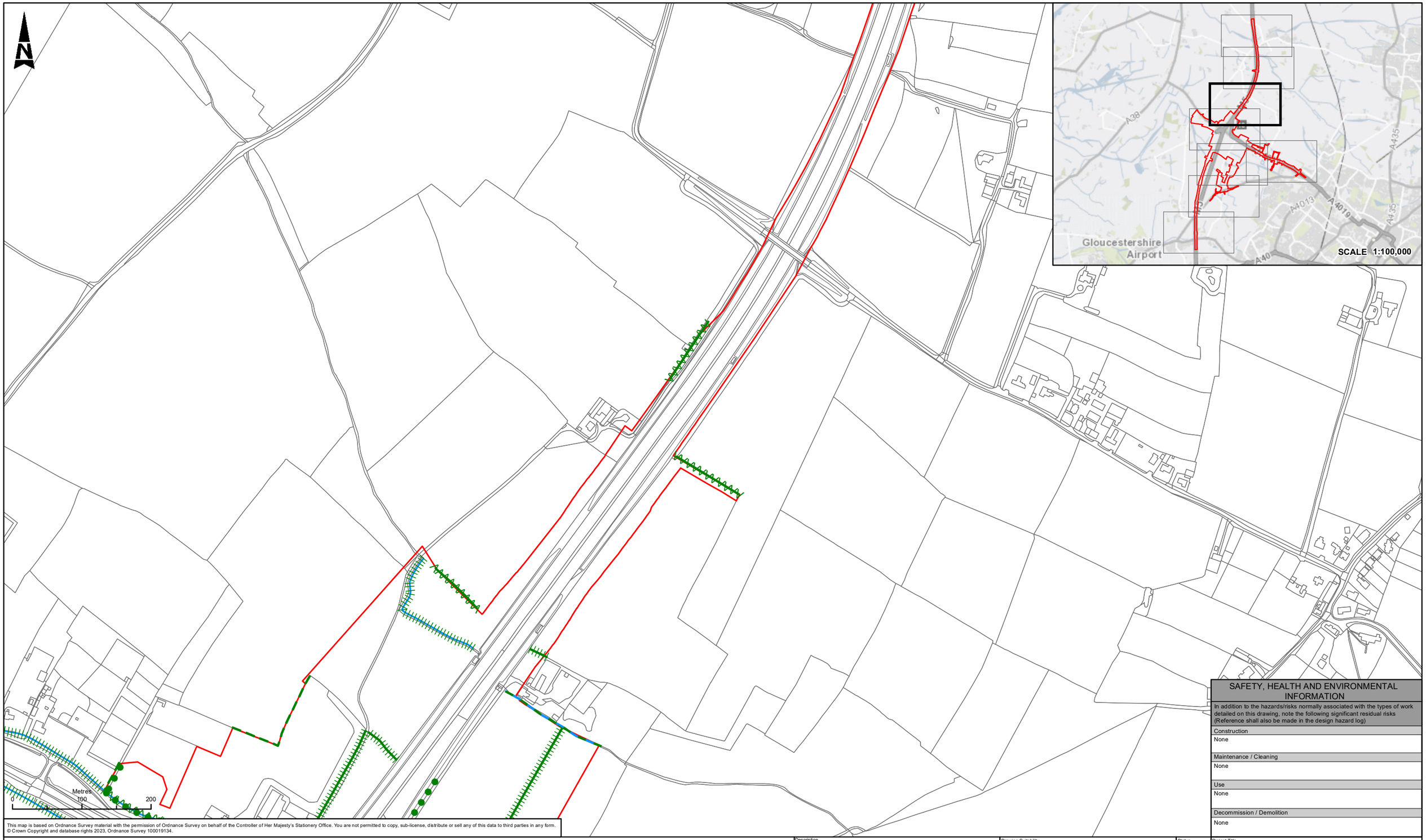
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title:
FIGURE 7-18B
BNG ASSESSMENT - HABITAT BASELINE PLAN
HEDGEROWS

Drawing Number
Project | Originator | Volume
GCCM5J10 - ATK - EBD
ZZ - GS - GI - 000076
Location | Type | Role | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	2 of 8	P01



This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form.
© Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- NATIVE HEDGEROW
- NATIVE HEDGEROW - ASSOCIATED WITH BANK OR DITCH
- NATIVE HEDGEROW WITH TREES
- NATIVE HEDGEROW WITH TREES - ASSOCIATED WITH BANK OR DITCH
- NATIVE SPECIES RICH HEDGEROW
- NATIVE SPECIES RICH HEDGEROW WITH TREES
- NATIVE SPECIES RICH HEDGEROW WITH TREES - ASSOCIATED WITH BANK OR DITCH
- HEDGE ORNAMENTAL NON-NATIVE
- LINE OF TREES
- LINE OF TREES (ECOLOGICALLY VALUABLE) - WITH BANK OR DITCH

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	14/08/23

Drawing Suitability: PUBLISHED

Status: A1

Project Title: M5 Junction 10 Improvements Scheme

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

Client: Gloucestershire County Council

Drawing Title: FIGURE 7-18B
BNG ASSESSMENT - HABITAT BASELINE PLAN
HEDGEROWS

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
ZZ - GS - GI - 000076
Location | Type | Role | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	3 of 8	P01

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

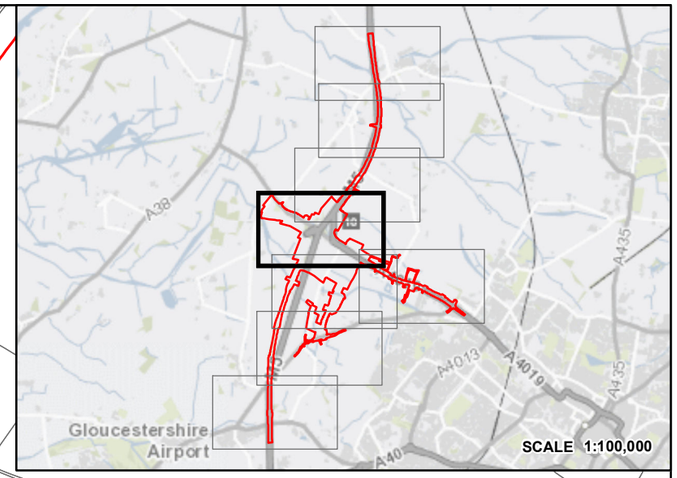
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None



Metres
0 100 200

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form.
© Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- NATIVE HEDGEROW
- NATIVE HEDGEROW - ASSOCIATED WITH BANK OR DITCH
- NATIVE HEDGEROW WITH TREES
- NATIVE HEDGEROW WITH TREES - ASSOCIATED WITH BANK OR DITCH
- NATIVE SPECIES RICH HEDGEROW
- NATIVE SPECIES RICH HEDGEROW WITH TREES
- NATIVE SPECIES RICH HEDGEROW WITH TREES - ASSOCIATED WITH BANK OR DITCH
- HEDGE ORNAMENTAL NON-NATIVE
- LINE OF TREES
- LINE OF TREES (ECOLOGICALLY VALUABLE) - WITH BANK OR DITCH

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	14/08/23

Drawing Suitability: PUBLISHED — Status: A1

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

Client: Gloucestershire County Council

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

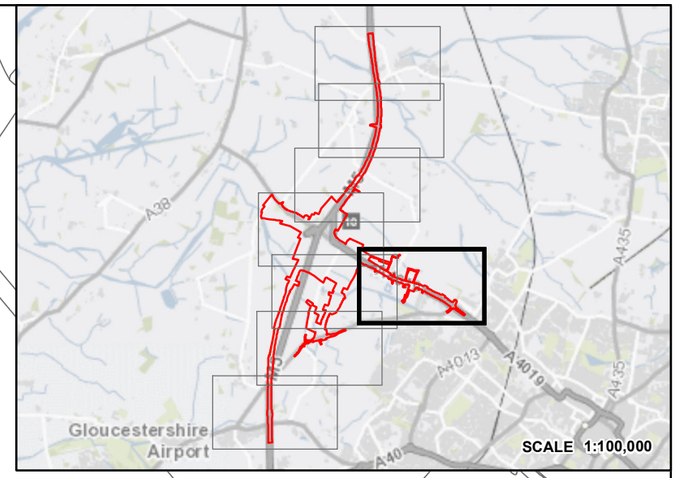
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title: FIGURE 7-18B
BNG ASSESSMENT - HABITAT BASELINE PLAN
HEDGEROWS

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
ZZ - GS - GI - 000076
Location | Type | Role | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	4 of 8	P01



0 Metres 100 200

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form.
© Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- NATIVE HEDGEROW
- NATIVE HEDGEROW - ASSOCIATED WITH BANK OR DITCH
- NATIVE HEDGEROW WITH TREES
- NATIVE HEDGEROW WITH TREES - ASSOCIATED WITH BANK OR DITCH
- NATIVE SPECIES RICH HEDGEROW
- NATIVE SPECIES RICH HEDGEROW WITH TREES
- NATIVE SPECIES RICH HEDGEROW WITH TREES - ASSOCIATED WITH BANK OR DITCH
- HEDGE ORNAMENTAL NON-NATIVE
- LINE OF TREES
- LINE OF TREES (ECOLOGICALLY VALUABLE) - WITH BANK OR DITCH

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	14/08/23

Drawing Suitability: PUBLISHED — Status: A1

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

Client: Gloucestershire COUNTY COUNCIL

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

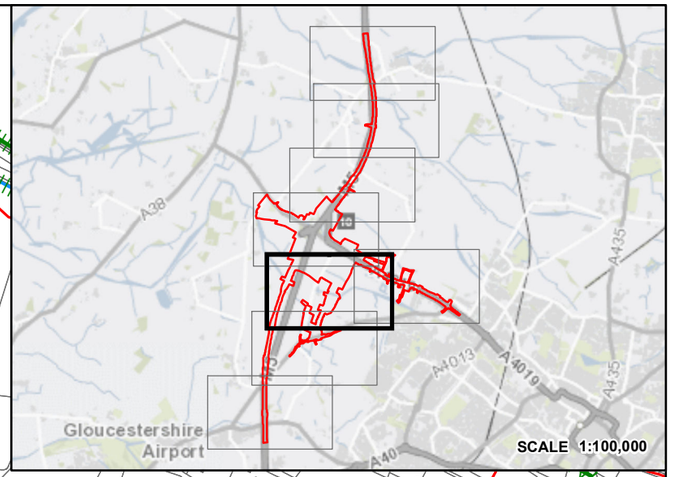
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title:
FIGURE 7-18B
BNG ASSESSMENT - HABITAT BASELINE PLAN
HEDGEROWS

Drawing Number
Project | Originator | Volume
GCCM5J10 - ATK - EBD
ZZ - GS - GI - 000076
Location | Type | Role | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	5 of 8	P01



0 100 200 Metres

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form. © Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- NATIVE HEDGEROW
- NATIVE HEDGEROW - ASSOCIATED WITH BANK OR DITCH
- NATIVE HEDGEROW WITH TREES
- NATIVE HEDGEROW WITH TREES - ASSOCIATED WITH BANK OR DITCH
- NATIVE SPECIES RICH HEDGEROW
- NATIVE SPECIES RICH HEDGEROW WITH TREES
- NATIVE SPECIES RICH HEDGEROW WITH TREES - ASSOCIATED WITH BANK OR DITCH
- HEDGE ORNAMENTAL NON-NATIVE
- LINE OF TREES
- LINE OF TREES (ECOLOGICALLY VALUABLE) - WITH BANK OR DITCH

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	14/08/23

Drawing Suitability: PUBLISHED

Status: A1

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

Client: Gloucestershire County Council

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

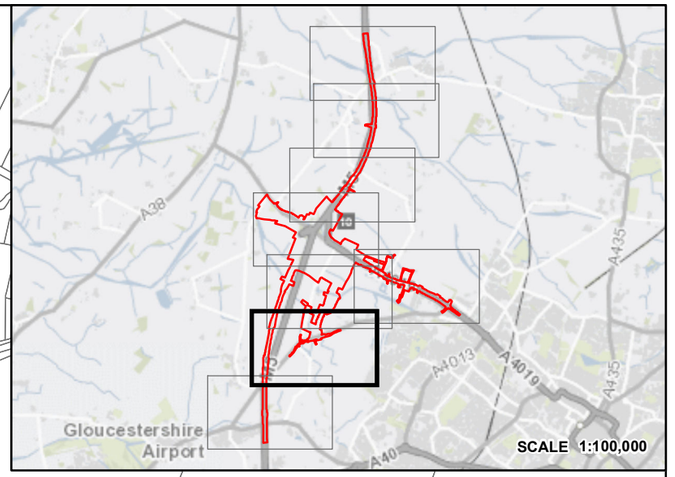
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title: FIGURE 7-18B
BNG ASSESSMENT - HABITAT BASELINE PLAN
HEDGEROWS

Drawing Number: GCCM5J10 - ATK - EBD - ZZ - GS - GI - 000076
(Project | Originator | Volume | Location | Type | Role | Number)

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	6 of 8	P01



Metres
0 100 200

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form.
© Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- NATIVE HEDGEROW
- NATIVE HEDGEROW - ASSOCIATED WITH BANK OR DITCH
- NATIVE HEDGEROW WITH TREES
- NATIVE HEDGEROW WITH TREES - ASSOCIATED WITH BANK OR DITCH
- NATIVE SPECIES RICH HEDGEROW
- NATIVE SPECIES RICH HEDGEROW WITH TREES
- NATIVE SPECIES RICH HEDGEROW WITH TREES - ASSOCIATED WITH BANK OR DITCH
- HEDGE ORNAMENTAL NON-NATIVE
- LINE OF TREES
- LINE OF TREES (ECOLOGICALLY VALUABLE) - WITH BANK OR DITCH

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	14/08/23

Drawing Suitability: PUBLISHED
Status: A1

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

Client: Gloucestershire County Council

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

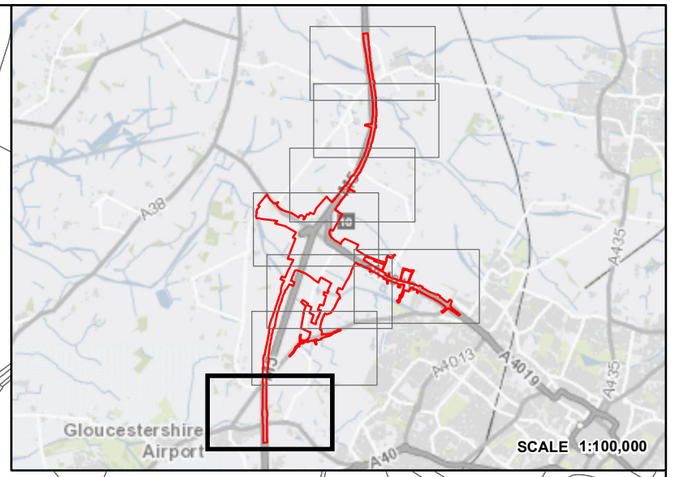
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title: FIGURE 7-18B
BNG ASSESSMENT - HABITAT BASELINE PLAN
HEDGEROWS

Drawing Number
Project | Originator | Volume
GCCM5J10 - ATK - EBD
ZZ - GS - GI - 000076
Location | Type | Role | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	7 of 8	P01



Metres
0
100
200

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form.
© Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- NATIVE HEDGEROW
- NATIVE HEDGEROW - ASSOCIATED WITH BANK OR DITCH
- NATIVE HEDGEROW WITH TREES
- NATIVE HEDGEROW WITH TREES - ASSOCIATED WITH BANK OR DITCH
- NATIVE SPECIES RICH HEDGEROW
- NATIVE SPECIES RICH HEDGEROW WITH TREES
- NATIVE SPECIES RICH HEDGEROW WITH TREES - ASSOCIATED WITH BANK OR DITCH
- HEDGE ORNAMENTAL NON-NATIVE
- LINE OF TREES
- LINE OF TREES (ECOLOGICALLY VALUABLE) - WITH BANK OR DITCH

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	14/08/23

Drawing Suitability: PUBLISHED
Status: A1

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title: FIGURE 7-18B
BNG ASSESSMENT - HABITAT BASELINE PLAN
HEDGEROWS

Drawing Number
Project | Originator | Volume
GCCM5J10 - ATK - EBD
ZZ - GS - GI - 000076
Location | Type | Role | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	8 of 8	P01

DRAIN 3
DRAIN 4
DRAIN 5
DRAIN 6
DRAIN 9
DRAIN 7
DRAIN 8
LEIGH BROOK CULVERT
LEIGH BROOK
DRAIN 10
MW3
RIVER CHELT
DRAIN 22
DRAIN 11
DRAIN 13
DRAIN 12
M5J10 CULVERT
MW4
LINK ROAD BRIDGE CROSSING
UCKINGTON MOAT
UPSTREAM OF M5J10 CULVERT
DRAIN 21
DRAIN 13A
DOWNSTREAM OF BRIDGE CROSSING
UPSTREAM OF BRIDGE CROSSING
MW5
DRAIN 16
DRAIN 14
DRAIN 20
DRAIN 15
DRAIN 17
DRAIN 19

Kilometres
0
1

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form. © Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- WATERCOURSES SUBJECT TO DITCH CONDITION ASSESSMENTS
- MoRPh SURVEY LOCATIONS

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	SD	CC	LJ	14/08/23

Drawing Suitability: PUBLISHED
Status: A1

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title: FIGURE 7-18C MoRPh AND DITCH CONDITION ASSESSMENTS

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

Client: Gloucestershire County Council

Drawing Number: GCCM5J10 - ATK - EBD ZZ - GS - GI - 000077
(Project | Originator | Volume | Location | Type | Role | Number)

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:18,000	5214106	1 of 1	P01

DRAIN 3
DRAIN 4
DRAIN 5
DRAIN 6
DRAIN 9
DRAIN 7
DRAIN 8
LEIGH BROOK CULVERT
LEIGH BROOK
DRAIN 10
MW3
RIVER CHELT
DRAIN 22
DRAIN 11
DRAIN 13
DRAIN 12
M5J10 CULVERT
MW4
LINK ROAD BRIDGE CROSSING
UCKINGTON MOAT
UPSTREAM OF M5J10 CULVERT
DRAIN 21
DRAIN 13A
DOWNSTREAM OF BRIDGE CROSSING
UPSTREAM OF BRIDGE CROSSING
MW5
DRAIN 16
DRAIN 14
DRAIN 20
DRAIN 15
DRAIN 17
DRAIN 19

Kilometres
0
1

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form.
© Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

ORDER LIMITS

WATERCOURSES

PRE-WORKS CONDITION (BASELINE)

MODERATE

POOR

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)
Construction
None
Maintenance / Cleaning
None
Use
None
Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	SD	CC	LJ	14/08/23

Drawing Suitability: PUBLISHED

Status: A1

Project Title: M5 Junction 10 Improvements Scheme

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

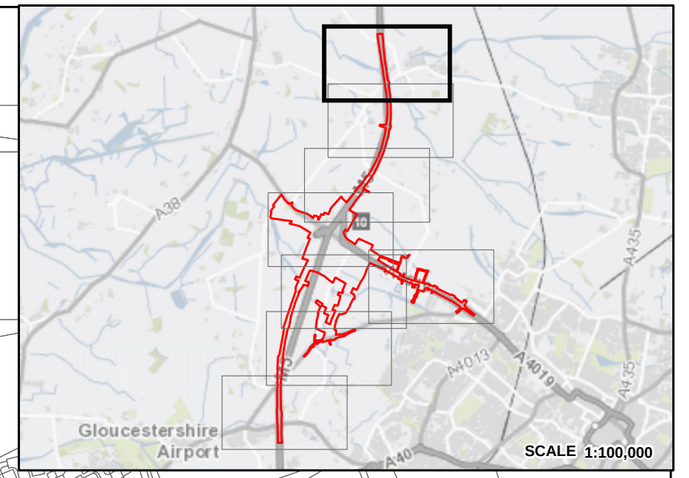
Copyright © Atkins Limited (2023)

Client: Gloucestershire County Council

Drawing Title: FIGURE 7-18D
BNG ASSESSMENT - HABITAT BASELINE PLAN
RIVERS, DITCHES AND STREAMS

Drawing Number: GCCM5J10 - ATK - EBD - ZZ - GS - GI - 000078
(Project | Originator | Volume | Location | Type | Role | Number)

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:18,000	5214106	1 of 1	P01



Metres
0 100 200

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form. © Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- HABITATS TO BE RETAINED

UK HABITATS

- CEREAL CROPS
- LOWLAND MEADOWS
- OTHER NEUTRAL GRASSLAND
- MODIFIED GRASSLAND
- BRAMBLE SCRUB
- MIXED SCRUB
- PONDS (NON-PRIORITY HABITAT)
- DEVELOPED LAND, SEALED SURFACE
- INTRODUCED SHRUB
- WET WOODLAND
- OTHER WOODLAND, BROADLEAVED
- OTHER WOODLAND, MIXED
- URBAN TREE

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	05/10/23

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Drawing Suitability: PUBLISHED
Status: A1

Project Title: M5 Junction 10 Improvements Scheme

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

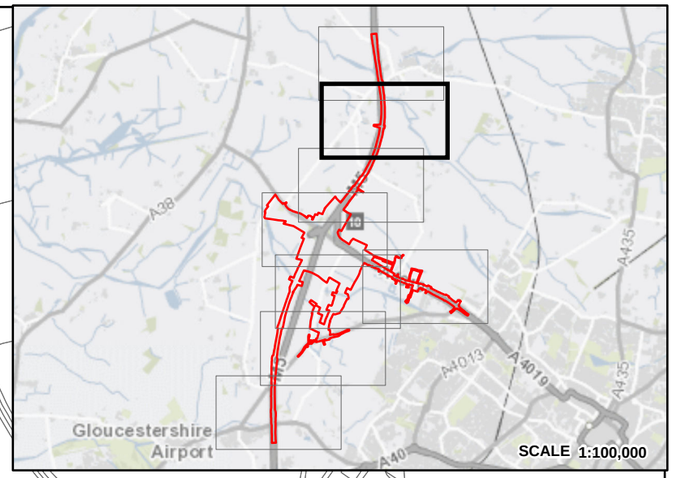
Copyright © Atkins Limited (2023)

Client: Gloucestershire County Council

Drawing Title:
FIGURE 7-18E
BNG ASSESSMENT - PROPOSED HABITAT PLAN
TERRESTRIAL HABITATS

Drawing Number
Project | Originator | Volume
GCCM5J10 - ATK - EBD
ZZ - GS - GI - 000079
Location | Type | Role | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	1 of 8	P01



N

Metres
0 100 200

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form. © Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- HABITATS TO BE RETAINED

UK HABITATS

- CEREAL CROPS
- LOWLAND MEADOWS
- OTHER NEUTRAL GRASSLAND
- MODIFIED GRASSLAND
- BRAMBLE SCRUB
- MIXED SCRUB
- PONDS (NON-PRIORITY HABITAT)
- DEVELOPED LAND, SEALED SURFACE
- INTRODUCED SHRUB
- WET WOODLAND
- OTHER WOODLAND, BROADLEAVED
- OTHER WOODLAND, MIXED
- URBAN TREE

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	05/10/23

Drawing Suitability: PUBLISHED
Status: A1

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

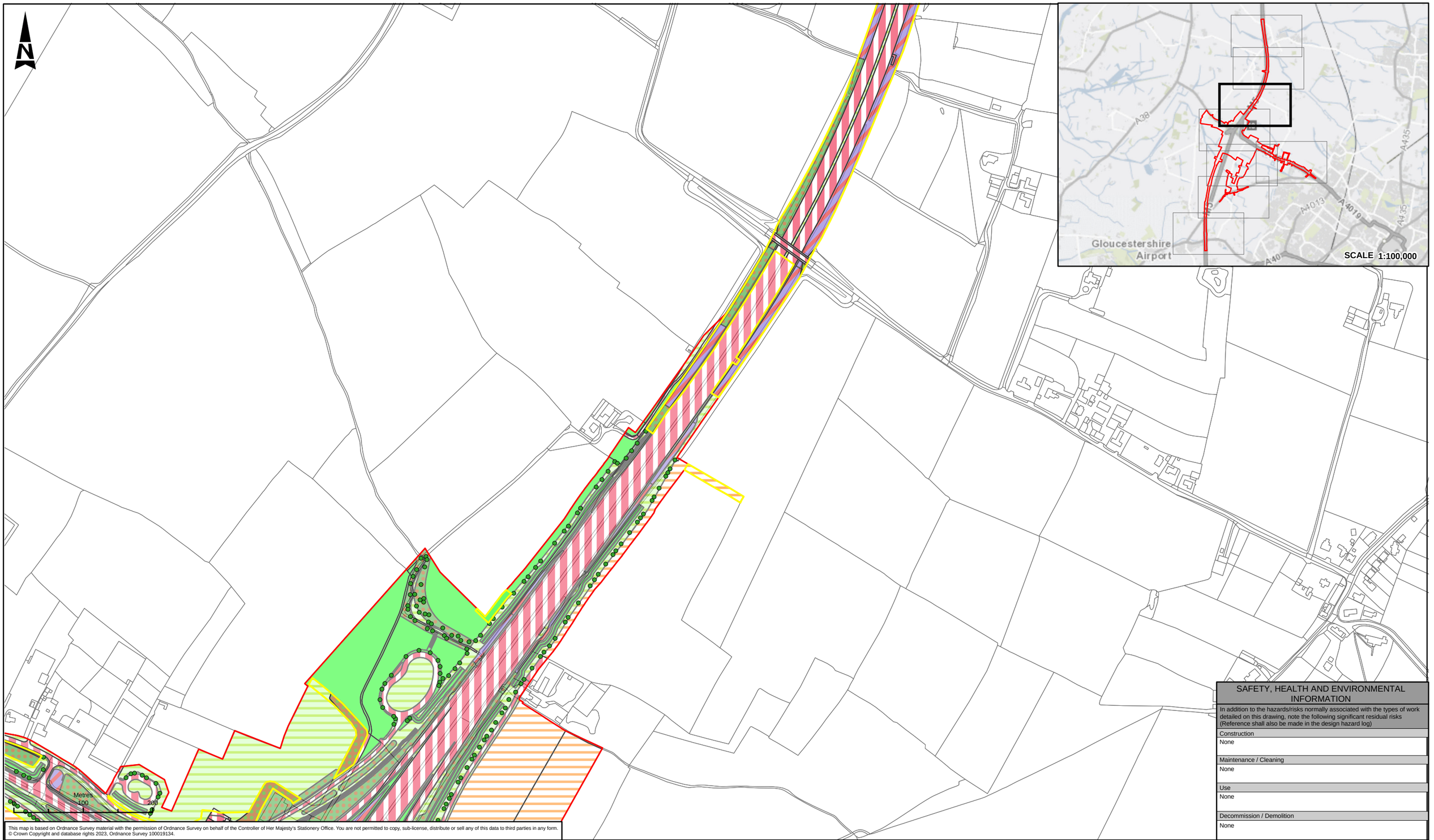
Client: Gloucestershire COUNTY COUNCIL

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title: FIGURE 7-18E
BNG ASSESSMENT - PROPOSED HABITAT PLAN
TERRESTRIAL HABITATS

Drawing Number
Project | Originator | Volume
GCCM5J10 - ATK - EBD
ZZ - GS - GI - 000079
Location | Type | Role | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	2 of 8	P01



This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form. © Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- HABITATS TO BE RETAINED

UK HABITATS

- CEREAL CROPS
- LOWLAND MEADOWS
- OTHER NEUTRAL GRASSLAND
- MODIFIED GRASSLAND
- BRAMBLE SCRUB
- MIXED SCRUB
- PONDS (NON-PRIORITY HABITAT)
- DEVELOPED LAND, SEALED SURFACE
- INTRODUCED SHRUB
- WET WOODLAND
- OTHER WOODLAND, BROADLEAVED
- OTHER WOODLAND, MIXED
- URBAN TREE

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	05/10/23

Drawing Suitability: PUBLISHED — A1

Status

Project Title: M5 Junction 10 Improvements Scheme

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

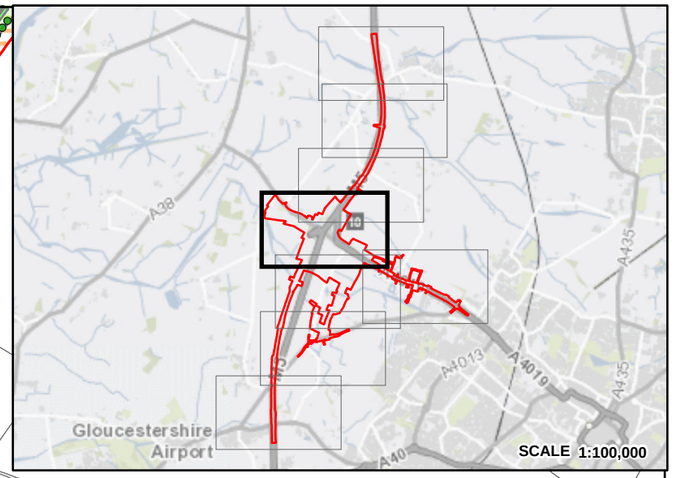
Copyright © Atkins Limited (2023)

Drawing Title: FIGURE 7-18E
BNG ASSESSMENT - PROPOSED HABITAT PLAN
TERRESTRIAL HABITATS

Client: Gloucestershire County Council

Drawing Number: GCCM5J10 - ATK - EBD - ZZ - GS - GI - 000079
(Project | Originator | Volume | Location | Type | Role | Number)

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	3 of 8	P01



RETAINED STANBORO LANE LOWLAND MEADOW

FLOOD STORAGE AREA

Metres
0 100 200

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form.
© Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- HABITATS TO BE RETAINED

UK HABITATS

- CEREAL CROPS
- LOWLAND MEADOWS
- OTHER NEUTRAL GRASSLAND
- MODIFIED GRASSLAND
- BRAMBLE SCRUB
- MIXED SCRUB
- PONDS (NON-PRIORITY HABITAT)
- DEVELOPED LAND, SEALED SURFACE
- INTRODUCED SHRUB
- WET WOODLAND
- OTHER WOODLAND, BROADLEAVED
- OTHER WOODLAND, MIXED
- URBAN TREE

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	05/10/23

Drawing Suitability: PUBLISHED
Status: A1

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

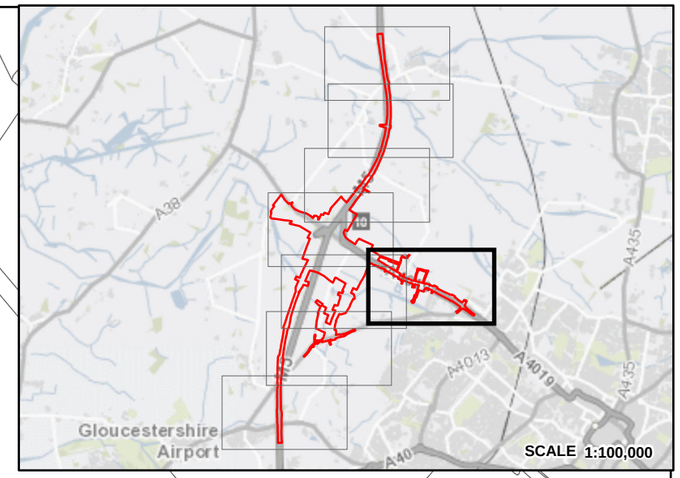
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title:
FIGURE 7-18E
BNG ASSESSMENT - PROPOSED HABITAT PLAN
TERRESTRIAL HABITATS

Drawing Number
Project | Originator | Volume
GCCM5J10 - ATK - EBD
Location | Type | Role | Number
ZZ - GS - GI - 000079

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	4 of 8	P01



N

0 Metres 100 200

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form. © Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- HABITATS TO BE RETAINED

UK HABITATS

- CEREAL CROPS
- LOWLAND MEADOWS
- OTHER NEUTRAL GRASSLAND
- MODIFIED GRASSLAND
- BRAMBLE SCRUB
- MIXED SCRUB
- PONDS (NON-PRIORITY HABITAT)
- DEVELOPED LAND, SEALED SURFACE
- INTRODUCED SHRUB
- WET WOODLAND
- OTHER WOODLAND, BROADLEAVED
- OTHER WOODLAND, MIXED
- URBAN TREE

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	05/10/23

Drawing Suitability: PUBLISHED

Status: A1

ATKINS
Member of the SNC-Lavalin Group

5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH

Tel: 08000 514 514

www.atkinsglobal.com

Copyright © Atkins Limited (2023)

Client: Gloucestershire COUNTY COUNCIL

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

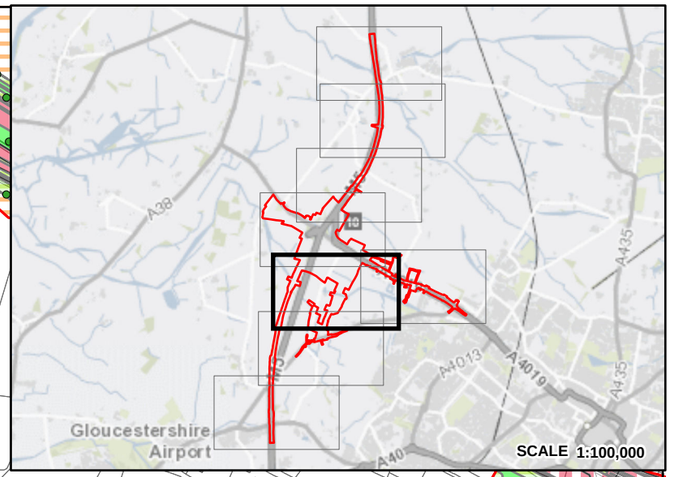
Project Title: M5 Junction 10 Improvements Scheme

Drawing Title: FIGURE 7-18E
BNG ASSESSMENT - PROPOSED HABITAT PLAN
TERRESTRIAL HABITATS

Drawing Number

Project	Originator	Volume	Location	Type	Role	Number
GCCM5J10	ATK	EBD	ZZ	GS	GI	000079

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	5 of 8	P01



0 100 200 Metres

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form.
© Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- HABITATS TO BE RETAINED

UK HABITATS

- CEREAL CROPS
- LOWLAND MEADOWS
- OTHER NEUTRAL GRASSLAND
- MODIFIED GRASSLAND
- BRAMBLE SCRUB
- MIXED SCRUB
- PONDS (NON-PRIORITY HABITAT)
- DEVELOPED LAND, SEALED SURFACE
- INTRODUCED SHRUB
- WET WOODLAND
- OTHER WOODLAND, BROADLEAVED
- OTHER WOODLAND, MIXED
- URBAN TREE

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	05/10/23

Drawing Suitability: PUBLISHED
Status: A1

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

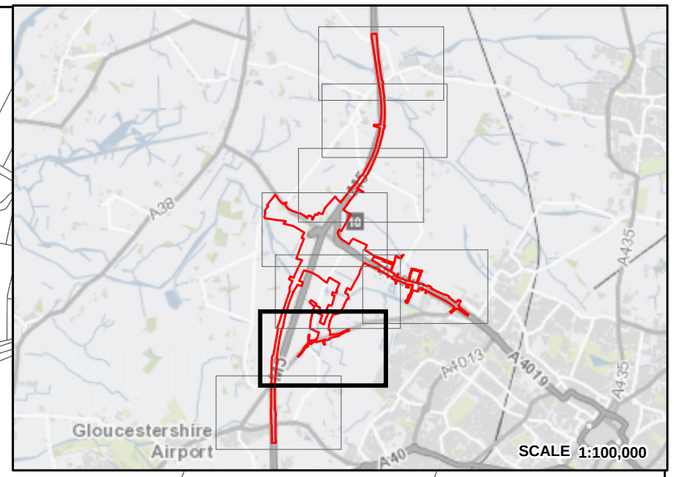
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title: FIGURE 7-18E
BNG ASSESSMENT - PROPOSED HABITAT PLAN
TERRESTRIAL HABITATS

Drawing Number: GCCM5J10 - ATK - EBD - ZZ - GS - GI - 000079
(Project | Originator | Volume | Location | Type | Role | Number)

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	6 of 8	P01



Metres
0 100 200

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form.
© Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- HABITATS TO BE RETAINED

UK HABITATS

- CEREAL CROPS
- LOWLAND MEADOWS
- OTHER NEUTRAL GRASSLAND
- MODIFIED GRASSLAND
- BRAMBLE SCRUB
- MIXED SCRUB
- PONDS (NON-PRIORITY HABITAT)
- DEVELOPED LAND, SEALED SURFACE
- INTRODUCED SHRUB
- WET WOODLAND
- OTHER WOODLAND, BROADLEAVED
- OTHER WOODLAND, MIXED
- URBAN TREE

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	05/10/23

Drawing Suitability: PUBLISHED
Status: A1

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction: None

Maintenance / Cleaning: None

Use: None

Decommission / Demolition: None

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

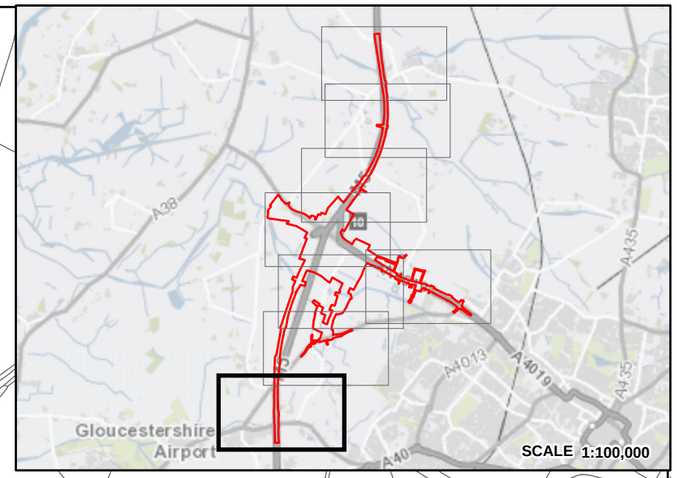
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title: FIGURE 7-18E
BNG ASSESSMENT - PROPOSED HABITAT PLAN
TERRESTRIAL HABITATS

Drawing Number: GCCM5J10 - ATK - EBD - ZZ - GS - GI - 000079
(Project | Originator | Volume | Location | Type | Role | Number)

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	7 of 8	P01



Metres
0 100 200

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form.
© Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- HABITATS TO BE RETAINED

UK HABITATS

- CEREAL CROPS
- LOWLAND MEADOWS
- OTHER NEUTRAL GRASSLAND
- MODIFIED GRASSLAND
- BRAMBLE SCRUB
- MIXED SCRUB
- PONDS (NON-PRIORITY HABITAT)
- DEVELOPED LAND, SEALED SURFACE
- INTRODUCED SHRUB
- WET WOODLAND
- OTHER WOODLAND, BROADLEAVED
- OTHER WOODLAND, MIXED
- URBAN TREE

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	05/10/23

Drawing Suitability: PUBLISHED
Status: A1

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

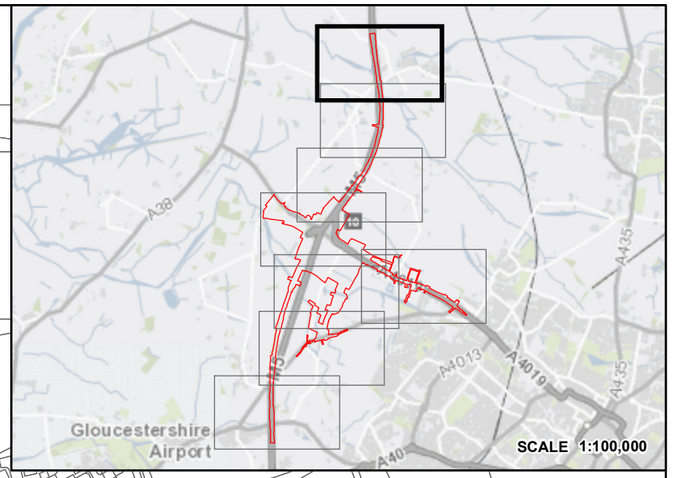
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title: FIGURE 7-18E
BNG ASSESSMENT - PROPOSED HABITAT PLAN
TERRESTRIAL HABITATS

Drawing Number
Project | Originator | Volume
GCCM5J10 - ATK - EBD
ZZ - GS - GI - 000079
Location | Type | Role | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	8 of 8	P01



Metres
0 100 200

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form.
© Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- RETAINED HEDGEROW
- ENHANCED HEDGEROW

HEDGEROW CREATION

- NATIVE SPECIES RICH HEDGEROW
- NATIVE SPECIES RICH HEDGEROW WITH TREES
- NATIVE SPECIES RICH HEDGEROW WITH TREES - ASSOCIATED WITH BANK OR DITCH

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	14/08/23

Drawing Suitability: PUBLISHED
Status: A1

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

Client: Gloucestershire County Council

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

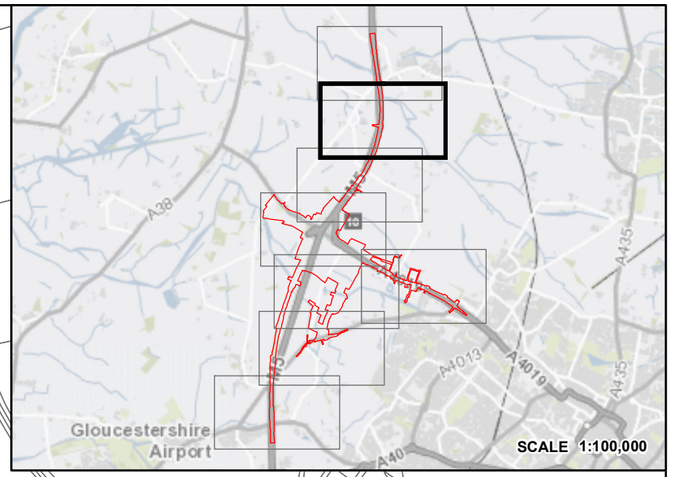
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title: FIGURE 7-18F
BNG ASSESSMENT - PROPOSED HABITAT PLAN
HEDGEROWS

Drawing Number
Project | Originator | Volume
GCCM5J10 - ATK - EBD
ZZ - GS - GI - 000080
Location | Type | Role | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	1 of 8	P01



Metres
0 100 200

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form.
© Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- RETAINED HEDGEROW
- ENHANCED HEDGEROW

HEDGEROW CREATION

- NATIVE SPECIES RICH HEDGEROW
- NATIVE SPECIES RICH HEDGEROW WITH TREES
- NATIVE SPECIES RICH HEDGEROW WITH TREES - ASSOCIATED WITH BANK OR DITCH

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	14/08/23

Drawing Suitability: PUBLISHED
Status: A1

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

Client: Gloucestershire COUNTY COUNCIL

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

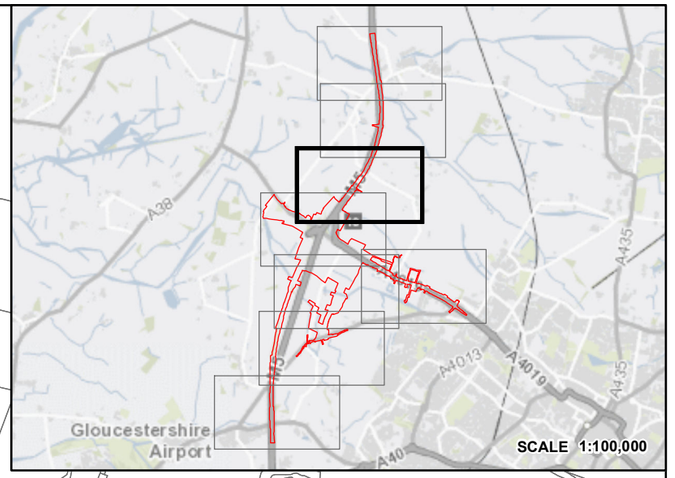
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title:
FIGURE 7-18F
BNG ASSESSMENT - PROPOSED HABITAT PLAN HEDGEROWS

Drawing Number
Project | Originator | Volume
GCCM5J10 - ATK - EBD
ZZ - GS - GI - 000080
Location | Type | Role | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	2 of 8	P01



H48

Metres
0
100
200

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form.
© Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- RETAINED HEDGEROW
- ENHANCED HEDGEROW

HEDGEROW CREATION

- NATIVE SPECIES RICH HEDGEROW
- NATIVE SPECIES RICH HEDGEROW WITH TREES
- NATIVE SPECIES RICH HEDGEROW WITH TREES - ASSOCIATED WITH BANK OR DITCH

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	14/08/23

Drawing Suitability: **PUBLISHED**
Status: **A1**

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

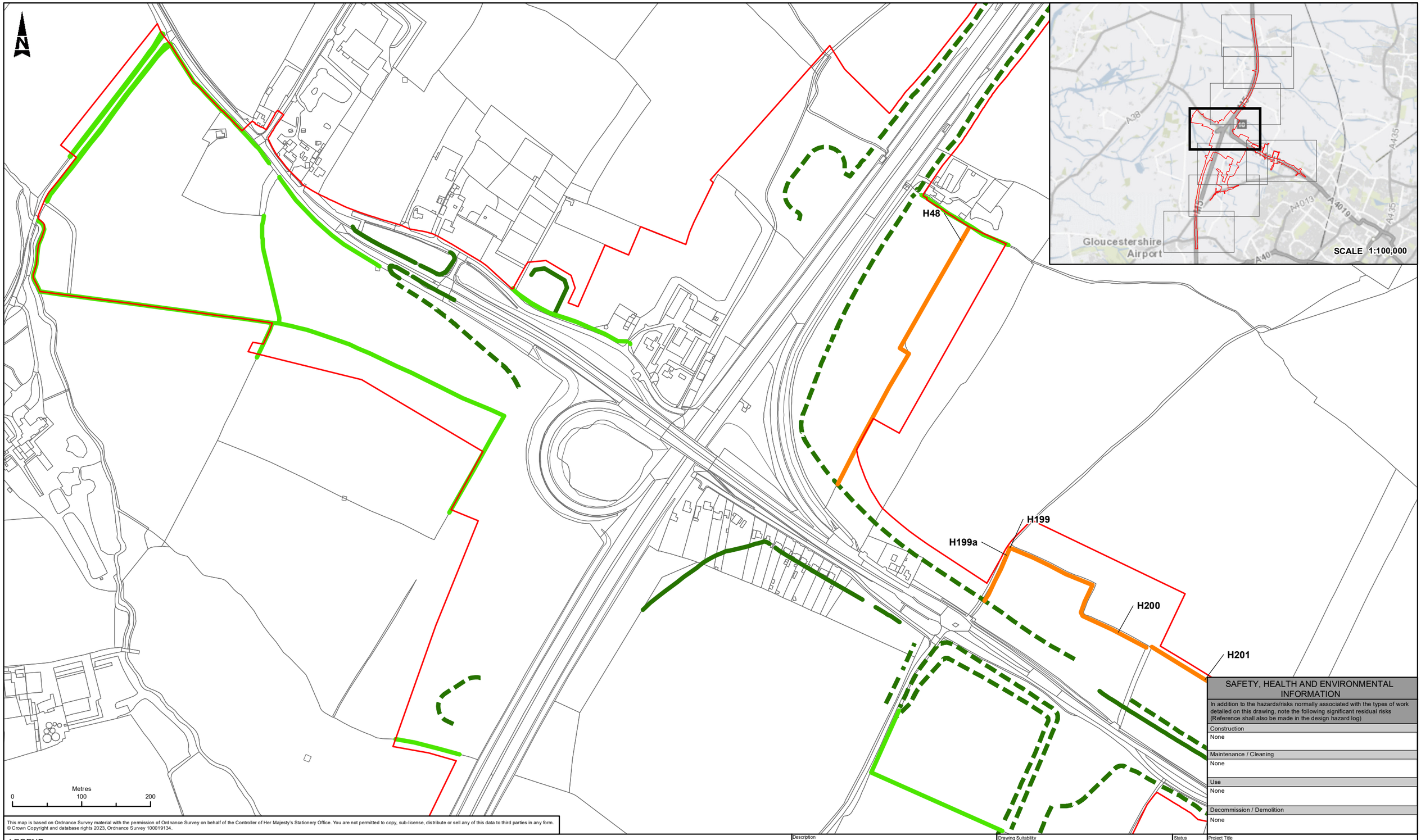
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title: FIGURE 7-18F
BNG ASSESSMENT - PROPOSED HABITAT PLAN
HEDGEROWS

Drawing Number
Project | Originator | Volume
GCCM5J10 - ATK - EBD
ZZ - GS - GI - 000080
Location | Type | Role | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	3 of 8	P01



This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form. © Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- RETAINED HEDGEROW
- ENHANCED HEDGEROW

HEDGEROW CREATION

- NATIVE SPECIES RICH HEDGEROW
- NATIVE SPECIES RICH HEDGEROW WITH TREES
- NATIVE SPECIES RICH HEDGEROW WITH TREES - ASSOCIATED WITH BANK OR DITCH

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	14/08/23

Drawing Suitability: PUBLISHED

Status: A1

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

Client: Gloucestershire County Council

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction: None

Maintenance / Cleaning: None

Use: None

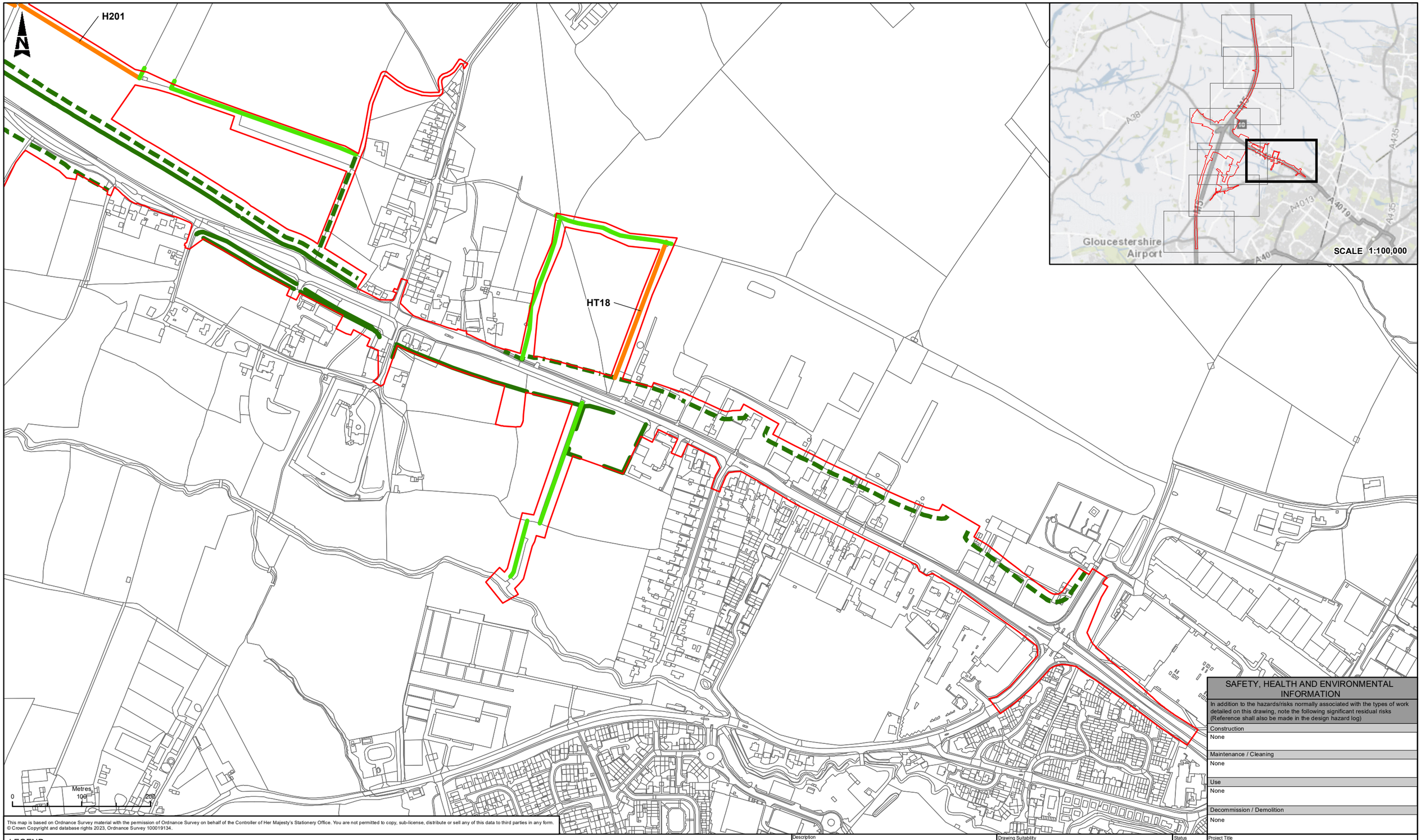
Decommission / Demolition: None

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title: FIGURE 7-18F
BNG ASSESSMENT - PROPOSED HABITAT PLAN
HEDGEROWS

Drawing Number: GCCM5J10 - ATK - EBD - ZZ - GS - GI - 000080
(Project | Originator | Volume | Location | Type | Role | Number)

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	4 of 8	P01



This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form. © Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- RETAINED HEDGEROW
- ENHANCED HEDGEROW

HEDGEROW CREATION

- NATIVE SPECIES RICH HEDGEROW
- NATIVE SPECIES RICH HEDGEROW WITH TREES
- NATIVE SPECIES RICH HEDGEROW WITH TREES - ASSOCIATED WITH BANK OR DITCH

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	14/08/23

Drawing Suitability: PUBLISHED
Status: A1

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

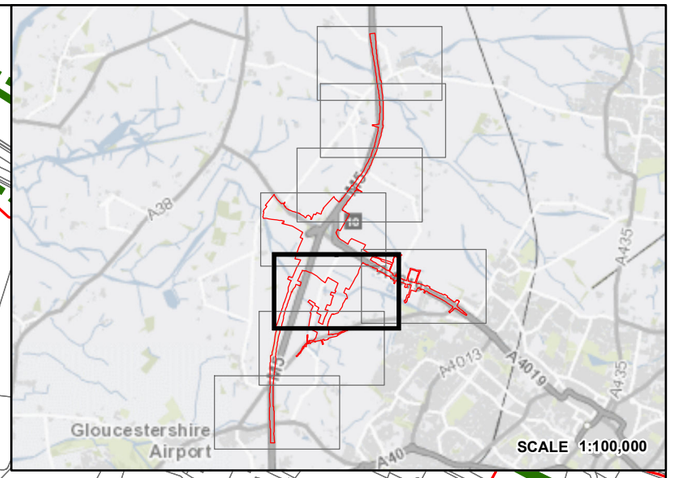
Client: Gloucestershire County Council

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title: FIGURE 7-18F
BNG ASSESSMENT - PROPOSED HABITAT PLAN
HEDGEROWS

Drawing Number
Project | Originator | Volume
GCCM5J10 - ATK - EBD
ZZ - GS - GI - 000080
Location | Type | Role | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	5 of 8	P01



N

0 Metres 100 200

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form.
© Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- RETAINED HEDGEROW
- ENHANCED HEDGEROW

HEDGEROW CREATION

- NATIVE SPECIES RICH HEDGEROW
- NATIVE SPECIES RICH HEDGEROW WITH TREES
- NATIVE SPECIES RICH HEDGEROW WITH TREES - ASSOCIATED WITH BANK OR DITCH

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	14/08/23

Drawing Suitability: **PUBLISHED** | Status: **A1**

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

Client: Gloucestershire County Council

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

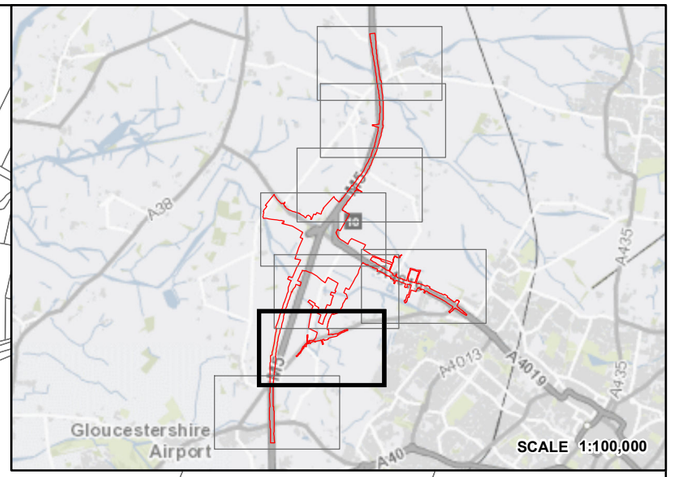
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title:
FIGURE 7-18F
BNG ASSESSMENT - PROPOSED HABITAT PLAN
HEDGEROWS

Drawing Number
Project | Originator | Volume
GCCM5J10 - ATK - EBD
ZZ - GS - GI - 000080
Location | Type | Role | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	6 of 8	P01



Metres
0 100 200

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form.
© Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- RETAINED HEDGEROW
- ENHANCED HEDGEROW

HEDGEROW CREATION

- NATIVE SPECIES RICH HEDGEROW
- NATIVE SPECIES RICH HEDGEROW WITH TREES
- NATIVE SPECIES RICH HEDGEROW WITH TREES - ASSOCIATED WITH BANK OR DITCH

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	14/08/23

Drawing Suitability: **PUBLISHED** | Status: **A1**

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

Client: Gloucestershire County Council

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

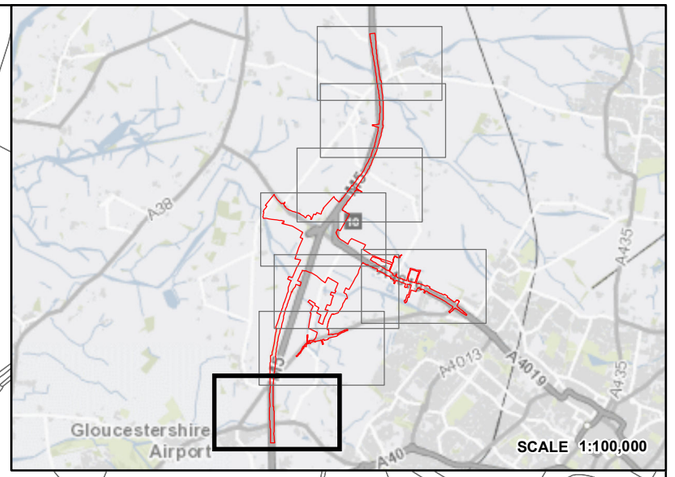
Decommission / Demolition
None

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title: FIGURE 7-18F
BNG ASSESSMENT - PROPOSED HABITAT PLAN HEDGEROWS

Drawing Number: Project | Originator | Volume
GCCM5J10 - ATK - EBD
ZZ - GS - GI - 000080
Location | Type | Role | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	7 of 8	P01



Metres
0
100
200

This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form.
© Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- RETAINED HEDGEROW
- ENHANCED HEDGEROW

HEDGEROW CREATION

- NATIVE SPECIES RICH HEDGEROW
- NATIVE SPECIES RICH HEDGEROW WITH TREES
- NATIVE SPECIES RICH HEDGEROW WITH TREES - ASSOCIATED WITH BANK OR DITCH

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	VG	CC	LJ	14/08/23

Drawing Suitability: **PUBLISHED**

Status: **A1**

Project Title: M5 Junction 10 Improvements Scheme

Drawing Title: FIGURE 7-18F
BNG ASSESSMENT - PROPOSED HABITAT PLAN HEDGEROWS

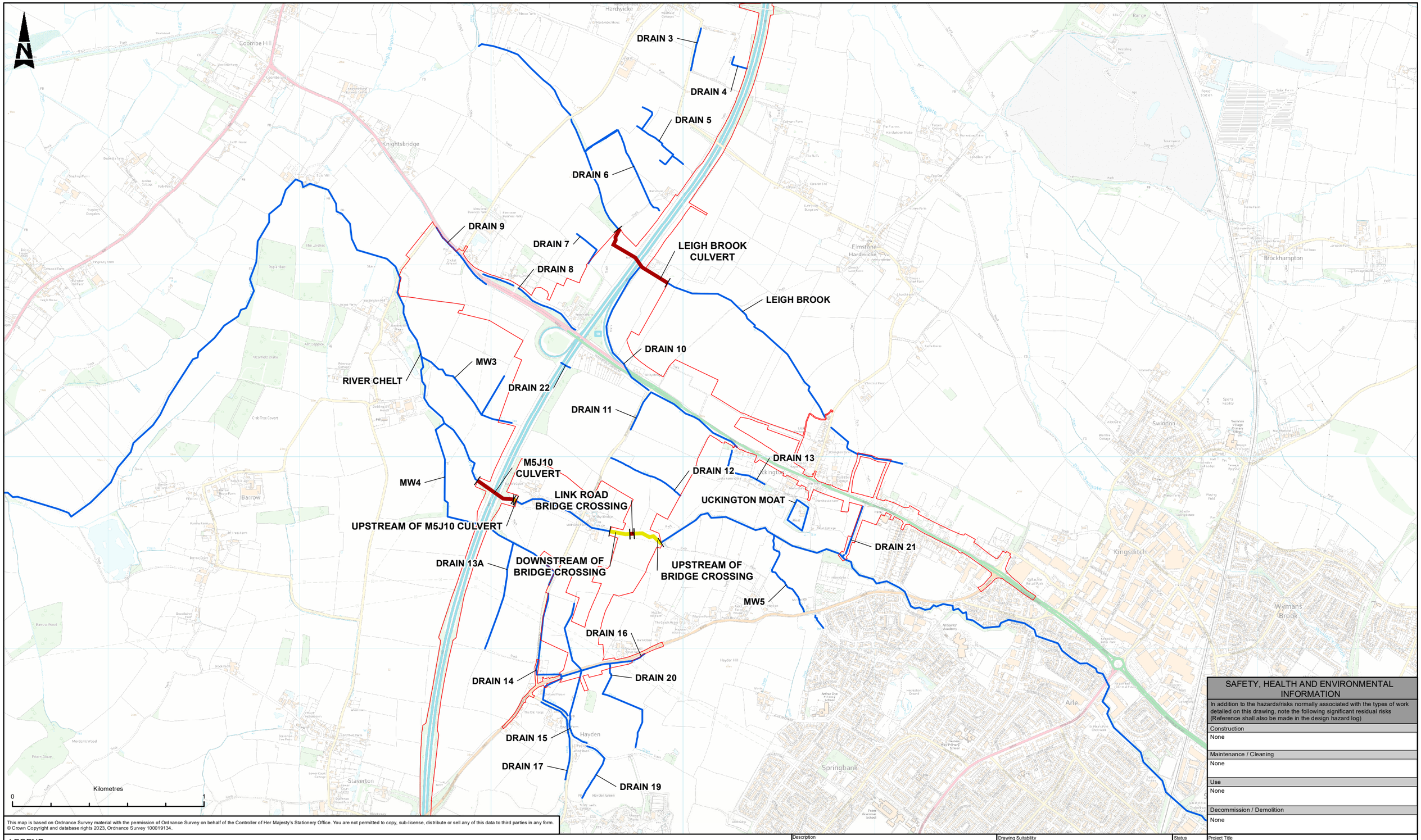
ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

Client: Gloucestershire COUNTY COUNCIL

Drawing Number
Project | Originator | Volume
GCCM5J10 - ATK - EBD
ZZ - GS - GI - 000080
Location | Type | Role | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:5,000	5214106	8 of 8	P01



This map is based on Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. You are not permitted to copy, sub-license, distribute or sell any of this data to third parties in any form. © Crown Copyright and database rights 2023, Ordnance Survey 100019134.

LEGEND

- ORDER LIMITS
- WATERCOURSES

POST-WORKS CONDITION

- FAIRLY GOOD
- MODERATE
- POOR

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)
Construction
None
Maintenance / Cleaning
None
Use
None
Decommission / Demolition
None

Description	Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
PUBLISHED	A1	P01	JM	SD	CC	LJ	09/06/23

Drawing Suitability: **PUBLISHED**

Status: **A1**

Project Title: M5 Junction 10 Improvements Scheme

ATKINS
Member of the SNC-Lavalin Group
5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH
Tel: 08000 514 514
www.atkinsglobal.com

Copyright © Atkins Limited (2023)

Client: Gloucestershire County Council

Drawing Title

FIGURE 7-18G
BNG ASSESSMENT - PROPOSED HABITAT PLAN
RIVERS, DITCHES AND STREAMS

Drawing Number

Project | Originator | Volume
GCCM5J10 - ATK - EBD
ZZ - GS - GI - 000081
Location | Type | Role | Number

Original Size:	Scale	Project Ref:	Sheet:	Rev:
A3	1:18,000	5214106	1 of 1	P01

Appendix B. BNG Good Practice Principles for Development

1. Apply the Mitigation Hierarchy
2. Avoid Losing Biodiversity that cannot be Offset by Gains Elsewhere
3. Be Inclusive and Equitable
4. Address Risks
5. Make a Measurable Net Gain
6. Achieve the Best Outcomes for Biodiversity
7. Be Additional
8. Create a Net Gain Legacy
9. Optimise Sustainability
10. Be Transparent

Appendix C. River Chelt Indicator Values and Enhancement

Table C-1 - River indicator for the River Chelt derived from MoRPh surveys positive indicators are underlined, negative indicators are in italics)

Location	Indicator Code	Indicator Description	Pre-works Baseline	Post-works baseline	Justification
Bank top	B1	Bank top vegetation structure	1	3	Tree planting and less management of riparian zone will allow for natural recolonisation of short/creeping herbs/grass, tall herbs/grasses, shrubs/scrub and saplings/trees.
	B2	Bank top tree feature richness	0	2	Use wood cut down as part of the Scheme to introduce large wood onto the floodplain on both banks
	B3	Bank top water-related features	0	1	Planting of wet grassland within 10 m of the River Chelt
	B4	*Bank top NNIPS cover*	-3	-3	Will likely be removed during some point during the Scheme, but it is unlikely that NNIPS will be removed unless it is part of a catchment wide approach.
	B5	*Bank top managed ground cover*	-3	0	Land within 10 m of the River Chelt will no longer be managed.
Bank face	C1	Bank face riparian vegetation structure	2	2	Remaining 0.27 km of the River Chelt that is not impacted by the Scheme will be unaffected – no hard revetment as part of the Scheme.
	C2	Bank face tree feature richness	1	2	Use wood cut down as part of the Scheme to introduce large wood onto the floodplain on both banks.
	C3	Bank face natural bank profile extent	3	3	No change in this indicator value due to the presence of bank reinforcement under the West Cheltenham Link Road Bridge.
	C4	Bank face natural bank profile richness	3	4	Bank reprofiling will result in more variation in bank face profile richness that will increase the indicator value to 4.
	C5	Bank face natural bank material richness	1	1	No change.
	C6	Bank face bare sediment	1	1	No change.

Location	Indicator Code	Indicator Description	Pre-works Baseline	Post-works baseline	Justification
		extent			
	C7	*Bank face artificial bank profile extent*	0	0	No bank revetment is present within the enhanced reaches.
	C8	*Bank face reinforcement extent*	0	0	No bank revetment is present within the enhanced reaches.
	C9	*Bank face reinforcement material severity*	0	0	No bank revetment is present within the enhanced reaches.
	C10	*Bank face NNIPS cover*	-2	-2	No change.
Channel – water margin	D1	Channel margin aquatic vegetation extent	1	3	Reprofiling to a two-stage channel (berms and benches) will encourage the growth of marginal macrophytes, in particular emergent and amphibious macrophyte species.
	D2	Channel margin aquatic morphotype richness	1	3	As above - emergent linear and broadleaved species and amphibious species.
	D3	Channel margin physical feature extent	3	4	Reprofiling and introduction of harder substrates will allow for generation of berms/benches and side bars and creation of backwater.
	D4	Channel margin physical feature richness	1	3	As above for D3.
	D5	*Channel margin artificial features*	0	0	No change.
Channel bed	E1	Channel aquatic morphotype richness	0	0	Higher flows in this area are likely to constrain the establishment to in-channel macrophyte species.
	E2	Channel bed tree features richness	1	2	Introduction of large wood within the channel will act to increase the indicator value by 1.
	E3	Channel bed hydraulic features richness	1	2	Introduction of large wood and larger substrates to encourage riffles will result in a greater diversity of flow types that include smooth, rippled, upwelling and unbroken standing waves. Marginal backwaters created will

Location	Indicator Code	Indicator Description	Pre-works Baseline	Post-works baseline	Justification
					result in no perceptible flow ad provide fish refuge.
	E4	Channel bed natural features extent	2	3	Increase in pools and riffles throughout the reach will increase the indicator value by 1.
	E5	Channel bed natural features richness	1	1	In-channel feature will not increase, but richness will.
	E6	Channel bed material richness	2	3	Introduction of cobble within the channel to allow for establishment of riffles.
	E7	*Channel bed siltation*	0	0	No change.
	E8	*Channel bed reinforcement extent*	0	0	No change.
	E9	*Channel bed reinforcement severity*	0	0	No change.
	E10	*Channel bed artificial features severity*	0	0	No change.
	E11	*Channel bed NNIPS extent*	0	0	No change.
	E12	*Channel bed filamentous algae extent*	0	0	No change.
River Condition Score			**0.60**	**1.90**	Enhancements as part of the Scheme design will result in an increase in the River Condition Score by 1.3.
River Condition Class			**Moderate**	**Fairly Good**	Enhancements will lead to increasing the River Condition Score above the threshold required to increase the River Condition Class from Moderate to Fairly Good.

Table C-2 - River indicator scores for the Leigh Brook derived from MoRPh surveys (positive indicators are underlined, negative indicators are in italics)

Location	Indicator Code	Indicator Description	Pre-works Baseline	Post-works baseline	Justification
Bank top	B1	Bank top vegetation structure	1	3	Tree planting and less management of riparian zone will allow for natural recolonisation of short/creeping herbs/grass, tall herbs/grasses, shrubs/scrub and saplings/trees.
	B2	Bank top tree feature richness	0	0	No change.
	B3	Bank top water-related features	0	2	Planting of wet grassland within 10 m of the Leigh Brook and an open ditch that conveys flow from an attenuation pond will enhance riparian zone.
	B4	*Bank top NNIPS cover*	0	0	No change.
	B5	*Bank top managed ground cover*	-2	-1	Less land within 10 m of the Leigh Brook will be managed.
Bank face	C1	Bank face riparian vegetation structure	1	1	No change.
	C2	Bank face tree feature richness	1	1	Use wood cut down as part of the Scheme to introduce large wood onto the floodplain on both banks.
	C3	Bank face natural bank profile extent	2	4	Removal of poaching on banks will result in increasing this indicator.
	C4	Bank face natural bank profile richness	2	4	Bank reprofiling will result in more variation in bank face profile richness that will increase the indicator value to 4.
	C5	Bank face natural bank material richness	1	1	No change.
	C6	Bank face bare sediment extent	0	0	No change.
	C7	*Bank face artificial bank profile extent*	0	0	No change.

Location	Indicator Code	Indicator Description	Pre-works Baseline	Post-works baseline	Justification
	C8	*Bank face reinforcement extent*	0	0	No change.
	C9	*Bank face reinforcement material severity*	0	0	No change.
	C10	*Bank face NNIPS cover*	0	0	No change.
Channel – water margin	D1	Channel margin aquatic vegetation extent	1	2	Reprofiling to a two-stage channel (berms and benches) will encourage the growth of marginal macrophytes, in particular emergent and amphibious macrophyte species.
	D2	Channel margin aquatic morphotype richness	1	2	As above - emergent linear and broadleaved species and amphibious species.
	D3	Channel margin physical feature extent	1	3	Reprofiling will allow for generation of berms/benches and side bars and creation of backwater.
	D4	Channel margin physical feature richness	1	2	As above for D3.
	D5	*Channel margin artificial features*	0	0	No change.
Channel bed	E1	Channel aquatic morphotype richness	0	0	Riparian vegetation that causes shading is likely to constrain establishment of in-channel macrophytes.
	E2	Channel bed tree features richness	0	1	Introduction of large wood within the channel will act to increase the indicator value by 1.
	E3	Channel bed hydraulic features richness	0	1	Marginal backwaters created will result in no perceptible flow and provide fish refuge.
	E4	Channel bed natural features extent	0	0	No change.
	E5	Channel bed natural features richness	0	0	No change.

Location	Indicator Code	Indicator Description	Pre-works Baseline	Post-works baseline	Justification
	E6	Channel bed material richness	2	2	No change.
	E7	*Channel bed siltation*	0	0	No change.
	E8	*Channel bed reinforcement extent*	0	0	No change.
	E9	*Channel bed reinforcement severity*	0	0	No change.
	E10	*Channel bed artificial features severity*	0	0	No change.
	E11	*Channel bed NNIPS extent*	0	0	No change.
	E12	*Channel bed filamentous algae extent*	0	0	No change.
River Condition Score			**0.43**	**1.52**	Enhancements as part of the Scheme design will result in an increase in the River Condition Score by 1.09.
River Condition Class			**Fairly Poor**	**Moderate**	Enhancements will lead to increasing the River Condition Score above the threshold required to increase the River Condition Class from Moderate to Fairly Good.

ATKINS
Member of the SNC-Lavalin Group

5th Floor, Block 5
Shire Hall
Bearland
Gloucester
GL1 2TH

Tel: +44 (0) 8000 514 514

© SNCL and Atkins except where stated otherwise