

A1 in Northumberland: Morpeth to Ellingham

Scheme Number: TR010041

6.8 Environmental Statement – Appendix 9.11 Biodiversity No Net Loss Assessment Report

Part B

APFP Regulation 5(2)(a)

Planning Act 2008

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

June 2020

Infrastructure Planning

Planning Act 2008

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

**The A1 in Northumberland: Morpeth to Ellingham
Development Consent Order 20[xx]**

Environmental Statement - Appendix

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1 INTRODUCTION

1.1 BIODIVERSITY NET GAIN

- 1.1.1. Biodiversity net gain (BNG) is the end result of a process applied to a development so that overall, there is a positive outcome for biodiversity. The process itself follows the mitigation hierarchy, which sets out to firstly avoid, secondly minimise and thirdly restore / rehabilitate losses of biodiversity on a site. Only as a last resort, are residual losses compensated for using biodiversity offsets, which are distinguished from other forms of mitigation in that they are off-site and require measurable conservation outcomes.
- 1.1.2. To demonstrate that BNG is applied appropriately so as to generate long-term gains for nature, the good practice principles established by the Business and Offset Programme (**Ref. 1**) can be used. These principles have been established in the context of UK development by the Construction Industry Research and Information Association (CIRIA), the Chartered Institute for Ecology and Environmental Management (CIEEM) and the Institute of Environmental Management and Assessment (IEMA) (refer to **Appendix A** of this report). The BNG process for the A1 in Northumberland: Alnwick to Ellingham (Part B) adheres to these principles.

1.2 PROJECT CONTEXT

- 1.2.1. Part B aims to increase capacity along an approximately 8 km section of the existing A1 between Alnwick and Ellingham, in Northumberland. Part B includes widening the existing A1 from single carriageway to a dual carriageway. Part B also includes improving the existing junction at Charlton Mires with a new grade-separated junction and a new Heckley Fence Accommodation Overbridge. Part B aims to increase capacity, enhance resilience, improve safety and improve journey times along the route. Details of the Part B location are provided on the **Location Plan** of this Environmental Statement (ES) (**Application Document Reference: TR010041/APP/2.1**).
- 1.2.2. Part B comprises dualling the existing A1 single carriageway; a new southbound carriageway would be constructed to the east of the existing A1, and the existing A1 would act as a new northbound carriageway. A number of private means of access would need to be stopped up and replaced with new access routes including new roads for East and West Linkhall, and from the B6347 and Rock South Farm. To facilitate the construction of Part B, a length of an extra high voltage cable, utility pipes and telecommunication cables would need to be diverted. Additionally, a construction compound would be constructed within the Lionheart Enterprise Park adjacent to the Applicant's Gritting Depot, and a Main Compound constructed by Thirston. Part B also includes new drainage features, new and extended culverts, and temporary and permanent public rights of way diversions, together with new and/or improved ancillary features.

1.3 SCOPE OF REPORT

- 1.3.1. This report details the method and results of a BNG assessment undertaken using the Defra metric, to:
- a. Establish the total number of baseline biodiversity units (BU) and linear units (LU) within the footprint of Part B.
 - b. Establish the total number of BU and LU which would be retained, reinstated or created under the proposed **Figure 7.10: Landscape Mitigation Plan, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**).
 - c. Determine whether Part B would result in a net loss, no net loss or a net gain for biodiversity, broken down by Habitats of Principal Importance (HPI) and other non-HPI habitats.
- 1.3.2. Part B has sought to achieve no net loss of biodiversity in respect of construction of Part B, where possible aspiring for BNG. For the purpose of this report, the outcomes of the BNG assessment for HPis and all other habitat types have been reported separately to evaluate whether Part B achieves these goals.
- 1.3.3. This BNG report does not cover requirements of Part B arising from potential impacts on protected species and designated sites. This information is provided within **Chapter 9: Biodiversity, Volume 3** of this ES (**Application Document Reference: TR010041/APP/6.3**) and its associated appendices (**Appendices 9.1 to 9.10** of this ES).

1.4 BIODIVERSITY NET GAIN POLICY

HIGHWAYS ENGLAND

- 1.4.1. The Applicant manages England's strategic road network which covers an area of 25,000 ha including around 8,500 miles of road. The road network contains a range of protected habitats including species rich grasslands, woodlands and wetlands. It supports and affects a number of rare and protected flora and fauna, including peregrine falcon, dormouse, rare orchids and other wild plants. In 2015, The Applicant published their biodiversity plan, which aims to ensure that the strategic road network positively supports the health of England's wildlife.
- 1.4.2. The BNG approach can help avoid, minimise and, as a last resort, compensate for residual adverse impacts on biodiversity arising from a development. The Government's Road Investment Strategy (RIS) (**Ref. 2**) states that by 2020, The Applicant must deliver a reduction in the net loss of biodiversity on its estate and reach no net loss of biodiversity by 2025. By 2040 The Applicant must deliver a net gain in biodiversity, which is reflected within their biodiversity plan (**Ref. 3**).
- 1.4.3. Highways England's RIS Delivery Plan 2016-2017 (**Ref. 4**) states "*Highways England will achieve a reduction in the net loss of biodiversity by end of the first Road Period (2020) on an ongoing annual basis*" (page 24); and "*be fully transparent about our performance in relation to biodiversity and will produce a report*" (page 26).

- 1.4.4. Highways England produced a Chief Highways Engineer (CHE) memorandum (**Ref. 5**) which guides the standardised reporting of biodiversity information on The Applicants projects. The CHE Memo does not follow the full Defra metric and is only for internal reporting by The Applicant. An assessment in accordance with the CHE memo is included in **Appendix C**.

NATIONAL POLICY STATEMENT FOR NATIONAL NETWORKS

- 1.4.5. The National Policy Statement for National Networks (NPS NN) (**Ref. 6**) paragraph 5.23 states that:

“The applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests.”

- 1.4.6. Maintaining no net loss of biodiversity as a result of Part B is consistent with the policy aims of Paragraph 5.25 of the NPS NN, which states:

“As a general principle, and subject to the specific policies below, development should avoid significant harm to biodiversity and geological conservation interests, including through mitigation and consideration of reasonable alternatives. The applicant may also wish to make use of biodiversity offsetting in devising compensation proposals to counteract any impacts on biodiversity which cannot be avoided or mitigated. Where significant harm cannot be avoided or mitigated, as a last resort, appropriate compensation measures should be sought.”

- 1.4.7. This sets out that any loss should be compensated for to achieve no net loss or net gain by replacing habitats, exploring the potential for enhancing them, and managing retained features.

NATIONAL PLANNING POLICY FRAMEWORK

- 1.4.8. The revised National Planning Policy Framework (**Ref. 7**) refers to biodiversity and environmental net gains in the following paragraphs:

Transport Infrastructure

- i. Paragraph 102. *“Transport issues should be considered from the earliest stages of plan-making and development proposals, so that: d) the environmental impacts of traffic and transport infrastructure can be identified assessed and taken into account – including appropriate opportunities for avoiding and mitigating any adverse effects, and for net environmental gains.”*

Planning Decisions

- i. Paragraph 118 *“Planning decisions and planning policy should a) encourage multiple benefits from both urban and rural land ... and taking opportunities to achieve net environmental gains - such as developments that would enable new habitat creation.”*
- ii. Paragraph 170 *“Planning policies and decisions should contribute to and enhance the natural and local environment by: ... d) minimising impacts on and providing net gains*

for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures”

iii. Paragraph 174 *“To protect and enhance biodiversity and geodiversity plans should b) 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.”*

iv. Paragraph 175 *“When determining planning applications, local planning authorities should apply the following principles: a) if significant harm to biodiversity resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts) adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused; ... and d) ... opportunities to incorporate biodiversity improvements in and around developments, especially where this can secure measurable net gains for biodiversity.”*

- 1.4.9. In addition, on 14 March 2019, Her Majesty’s Treasury confirmed that following consultation, the government will use the forthcoming Environment Bill to mandate BNG for development in England, ensuring that the delivery of much-needed infrastructure and housing is not at the expense of vital biodiversity. Additionally, the 25 Year Environment Plan (**Ref. 8**) states the UK Government intention to *“seek to embed a ‘net environmental gain’ principle for development to deliver environmental improvements”*.

LOCAL BIODIVERSITY ACTION PLAN

- 1.4.10. In this case, the public authority mentioned in the Natural Environment and Rural Communities Act (2006) Section 40 (1) is deemed to be the local planning authority (Northumberland County Council) within which Part B would reside.
- 1.4.11. Within the Northumberland Biodiversity Action Plan (**Ref. 9**) a list of HPI are recorded as priority habitats. These priority habitats are then referred in the following local plans.
- 1.4.12. The Northumberland Local Plan Core Strategy (**Ref. 10**) was withdrawn in April 2017 in favour of the Northumberland Local Plan (in draft) (**Ref. 11**) but states that:
- Section 3.18. *There should be “no net loss of biodiversity, with the creation of new priority habitats and green infrastructure”; and that*
- Section 8.22. *“Moving from a net loss of biodiversity to achieving net gains for nature is central to sustainable development and that contributing to conserving and enhancing the natural environment is a core planning principle”*.
- 1.4.13. Within the draft Northumberland Local Plan, net gains for biodiversity and priority habitats are mentioned as follows:
- Policy STP 3 states that a development should adhere to principles that *“Contribute to net gains for biodiversity and establish a coherent and resilient ecological network”*;

Section 10.9. *“Moving from a net loss of biodiversity to achieving net gains is central to sustainable development and that contributing to conserving and enhancing the natural environment is a core planning principle”;*

Policy ENV 2 (1) states that *“Development proposals affecting biodiversity and geodiversity will minimise their impact and net gains for biodiversity will be secured by: a) Avoiding significant harm through location and / or design. Where significant harm cannot be avoided, applicants will be required to demonstrate that adverse impacts will be adequately mitigated or, as a last resort compensated for; b) Securing net biodiversity gains and / or wider ecological enhancements through new development”;*

Policy ENV 2 (4) states that *“The conservation, restoration, enhancement, creation and / or (where appropriate) the re-creation of priority habitats” will follow an ecosystem approach; and*

Policy MIN 1 states that *“The conservation and enhancement of nature conservation and geological sites, including internationally, nationally and locally designated sites, priority habitats and protected and priority species – applicants will be required to demonstrate that their proposal will deliver a net gain for biodiversity where possible through the creation of priority habitats and by contributing to the creation of a coherent and resilient ecological network and that there will be no unacceptable adverse effects on national or international nature conservation designations or irreplaceable habitats”.*

2 METHODOLOGY

2.1 OVERVIEW

- 2.1.1. WSP has produced a six-step process for carrying out a BNG assessment of a scheme (refer to **Appendix B** of this report for the full six step process). The work set out in this report is covered by step two (Initial Biodiversity Assessment) with the relevant sections provided below:
- a. Survey baseline habitats and their condition.** Ideally, a habitat condition assessment is undertaken during Phase 1 habitat survey. If primary Phase 1 habitat data is not available, condition assessment can be undertaken retrospectively through interpretation of Phase 1 target notes, publicly available aerial photography or by employing assumptions.
 - b. Identify irreplaceable habitat.** Following Defra guidance, irreplaceable habitats within the Order Limits must be identified and excluded from the biodiversity unit calculations.
 - c. Calculate baseline biodiversity units using the Defra biodiversity metric.** This calculation includes all habitats within the Order Limits prior to development and is informed by Phase 1 Habitat data and results of the condition assessment.
 - d. Calculate post-development biodiversity units using the Defra biodiversity metric.** This calculation accounts for all of the proposed habitats (including retained habitats and habitats lost or created as a result of the development) within the Order Limits post-development. The calculation is informed by Part B design and proposed ecological mitigation, as illustrated in **Figure 7.10: Landscape Mitigation Plan, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**). The assessment is based upon the target state (type, size and condition) of habitats being created.
 - e. Produce a 'Biodiversity Assessment' report.** The report sets out the BNG process in the context of Part B and includes the method and results of initial baseline and post-development biodiversity unit calculations.

IRREPLACEABLE HABITAT

- 2.1.2. Following national good practice guidance (**Ref. 12; Appendix A** of this report), irreplaceable habitats are excluded from baseline and post-development biodiversity unit calculations. BNG or no net loss cannot be achieved for Part B as a whole if there is negative impact on an irreplaceable habitat. In these situations, any compensation offered to address impacts on irreplaceable habitats should be agreed directly with the relevant statutory nature conservation agency (Natural England).
- 2.1.3. The footprint of Part B was overlaid with Natural England's Ancient Woodland Inventory dataset to identify presence of irreplaceable habitat. No direct impacts to irreplaceable habitats were identified. Irreplaceable habitat is therefore not considered further within this report.

HABITATS OF PRINCIPAL IMPORTANCE

- 2.1.4. Of the habitats found within the Order Limits and proposed, as illustrated in **Figure 7.10: Landscape Mitigation Plan, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**), some are defined as HPIs. The following table (**Table 2-1**) identifies HPI recorded during baseline survey and included within post-development mitigation as illustrated in **Figure 7.10: Landscape Mitigation Plan, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**).

Table 2-1 – JNCC Phase 1 Habitat Types and their Associated HPI Description

JNCC Phase 1 Habitat Type	Habitat of principal importance
A1.1.1 Broadleaved woodland – semi-natural	Lowland mixed deciduous woodland
A1.3.1 Mixed woodland – semi-natural*	
J2.3.1 Hedgerow with trees – native species rich (intact)	Hedgerows

*this habitat type was reported as A1.3.2 and as of HPI quality from the Phase 1 surveys. The habitat was assumed to be A1.3.1 for the BNG assessment on account that plantation woodland would not qualify as HPI.

LINEAR HABITATS

- 2.1.5. Defra recognise that hedgerows are a very important feature in terms of biodiversity value: “*Their contribution, by area, to biodiversity in the landscape is far greater than even the most biodiversity rich habitats*” (**Ref. 13**). Hedgerows are considered in terms of LU rather than BU.

2.2 BASELINE BIODIVERSITY UNIT CALCULATION

EXTENT AND SOURCES OF BASELINE HABITAT DATA

- 2.2.1. The baseline assessment was based upon the extended Phase 1 Habitat survey undertaken in 2019 (refer to **Appendix 9.1: Habitats and Designated Sites** of this ES). The survey followed Joint Nature Conservation Committee (JNCC) (**Ref. 14**) and CIEEM (**Ref. 15**) best practice guidance. Habitat condition assessment data was gathered concurrently during the survey. The Defra guidance requires habitat condition to be assessed using the system presented in Natural England's Farm Environment Plan (FEP) manual (**Ref. 16**). Where there were gaps in primary habitat condition assessment data, for example because of limited access to land, professional judgement was applied to retrospectively assess habitat condition.
- 2.2.1. This BNG assessment uses the following industry recognised best practice methodologies:

- a. **CIEEM, IEMA & CIRIA (Ref. 12)**. Biodiversity Net Gain: Good Practice Principles for Development (**Appendix A** of this report);
- b. **DEFRA (Ref. 13)**. Biodiversity Offsetting Pilots: Technical Paper- the Metric for the Biodiversity Offsetting Pilots in England;
- c. **Natural England (Ref. 16)**. Higher Stewardship, FEP Manual, 3rd Edition; and
- d. **BRE (Ref. 17)**. Appendix C of the Building Research Establishment's (BRE) Guidance Note 36: BREEAM, Civil Engineering Environmental Quality Assessment and Award Scheme (CEEQUAL) and Home Quality Mark (HQM) Ecology Calculation Methodology – Route 2.

- 2.2.2. The areas of temporary and permanent loss of land to Part B are shown on **Figure 4.1: Boundary Plan: Part B, Volume 1** of this ES (**Application Document Reference: TR010041/APP/6.1**) (i.e. the Order Limits). This land represents the limit within which the contractor shall be able to operate and clear as required for construction operations. Since the detailed design of these operations has yet to be determined it is assumed that all habitats within these boundaries would be cleared except where clearly described as being retained. The Development Consent Order (DCO) boundary was not used as it included areas of land over which easements have been negotiated which would result in no clearance, creation or enhancements of habitat.
- 2.2.3. The extent of retained habitats is detailed within **Figure 7.10: Landscape Mitigation Plan, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**). These habitats are proposed to be retained for ecological and landscape mitigation purposes with no further enhancements.
- 2.2.4. The extent of losses described in this report represent a conservative estimate that can be further reduced at the detailed design stage.
- 2.2.5. The BNG calculation covered all habitats (linear and area-based) within the Order Limits (refer to **Figure 9.3: Phase 1 Habitat Survey, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**)). The area of running water has been reported to ensure full coverage is achieved, however, no BU have been generated as it has been accounted for as LU. The following Phase 1 Habitat typologies present within the Order Limits which, in the context of BNG, are not considered 'habitats' include:
- a. Buildings
 - b. Hardstanding
 - c. Fence
 - d. Wall
 - e. Dry ditch
 - f. Boundary removed
 - g. Earth bank

- 2.2.6. These habitat typologies are excluded from BNG calculations. However, the total areas of buildings and hardstanding are reported in results tables so that the total area of the Order Limits is reported in baseline and post-development calculations.
- 2.2.7. For area-based habitats, hectares are reported to two decimal places. For linear habitats, length is reported to one decimal place.
- 2.2.8. The Phase 1 Habitat survey was undertaken following Joint Nature Conservation Committee (**Ref. 14**) survey methodology and is reported in full within **Appendix 9.1: Habitats and Designated Sites** of this ES.

DEFRA BIODIVERSITY UNIT CALCULATION

- 2.2.9. A baseline biodiversity calculation was completed for all areas of permanent and temporary land take within the Order Limits. Habitat area or length, distinctiveness and condition were used to calculate baseline BU and LU, providing a measure of the biodiversity within the Order Limits before development. This calculation is in accordance with Defra's technical paper, guidance for developers and guidance for offset providers (**Ref. 13, 18, 19**).

DISTINCTIVENESS

- 2.2.10. Habitat distinctiveness is defined as a collective measure of biodiversity and includes parameters such as the number and variety of species found within the habitat (richness and diversity), how rare the species are, and how many species the habitat supports that are not common elsewhere.
- 2.2.11. To determine habitat distinctiveness, Phase 1 Habitat types were transposed into the standard habitat distinctiveness typology and bands issued by Defra (the Defra habitat type). For some habitat types, multiple distinctiveness bands can apply, depending on the quality of the habitat. Decisions on which distinctiveness band to assign were based on criteria listed in Appendix C of the BRE's Guidance Note 36: BREEAM, CEEQUAL and HQM Ecology Calculation Methodology – Route 2 (**Ref. 17**).
- 2.2.12. Where no directly comparable habitat type was available to match the vegetation recorded by Phase 1 Habitat survey (e.g. tall ruderal vegetation), the closest approximation was selected.
- 2.2.13. The Defra distinctiveness bands and associated scores are described in **Table 2-2**.

Table 2-2 – Habitat Distinctiveness Bands and Scores

Distinctiveness Band	Distinctiveness Score	Habitat Types Includes
High	6	HPIs (Ref. 14). This excludes ancient woodland that are considered irreplaceable.
Medium	4	Other semi-natural habitats that do not fall within the scope of HPI definitions, i.e. all other areas of woodland other grassland (e.g. species poor semi-improved), other uncultivated field margins, road verge and railway embankments (excluding those that are intensively managed).
Low	2	Improved grassland, arable fields (excluding any uncultivated margins), domestic gardens, regularly disturbed bare ground (e.g. quarry floor, landfill sites etc.), verges associated with transport corridors.

2.2.14. All hedgerows are assumed to be of High distinctiveness because the vast majority of hedgerows would meet HPI criteria. For this reason, distinctiveness is not included as part of the linear unit calculation. This follows the approach set out by Defra.

CONDITION

2.2.15. Condition, in the context of BNG, is defined as the quality of a particular habitat. For example, a habitat is in poor condition if it fails to support the rare or notable species for which it is valued, or if it is degraded as a result of pollution, erosion, invasive species or other factors.

2.2.16. The Defra metric requires habitat condition to be assessed using the system presented in Natural England's FEP manual (Ref. 16).

2.2.17. Habitat condition scores were assigned based on the criteria in **Table 2-3**.

Table 2-3 – Habitat Condition Bands and Scores

Condition Band	Condition Score	Criteria for Assigning Condition
Good	3	Any habitat which passes all FEP criteria.
Moderate	2	Any habitat which fails one FEP criterion.
Poor	1	Any habitat which fails two or more FEP criteria.

DERIVING THE TOTAL NUMBER OF BASELINE BIODIVERSITY UNITS

- 2.2.18. Following the scoring of all habitat parcels for habitat distinctiveness and condition, the total number of baseline BU was calculated for each area-based habitat using the following formula:

$$\text{Distinctiveness} \times \text{Condition} \times \text{Area (ha)} = \text{BASELINE BIODIVERSITY UNITS}$$

- 2.2.19. The scores generated by each individual habitat parcel were then summed to provide the total number of BU generated by the baseline habitat parcels. It is important to set out the BU for the individual habitats so that these can be compared with the post-development BU for the same habitat type.

- 2.2.20. The number of baseline LU present should be calculated for hedgerows as follows:

$$\text{Length of linear habitats lost (m)} \times \text{Condition} = \text{BASELINE LINEAR UNITS}$$

- 2.2.21. For the baseline BNG calculation, running water is expressed simply as a length in metres.

2.3 POST-DEVELOPMENT BIODIVERSITY UNIT CALCULATION

- 2.3.1. The post-development biodiversity value was quantified using **Figure 7.10: Landscape Mitigation Plan, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**). This approach quantifies the biodiversity units expected post-development after habitat retention, reinstatement and creation. Reinstated habitats have been considered separately to those being created to differentiate habitats that are to be replaced from the same habitat type present before construction of Part B. A created habitat is defined as one where a change in habitat type is proposed.

- 2.3.2. BU and LU resulting from **Figure 7.10: Landscape Mitigation Plan, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**), are referred to as post-development BU and LU.

LINEAR HABITATS

- 2.3.3. Linear habitats have been kept separate from units calculated for area-based habitats; this mirrors the approach for baseline unit calculations. The risk factors described below are only applicable to the area-based habitat calculation. They are not included in the calculation for linear habitats. This is because the risks associated with creating linear habitats are considered to be taken into account within the condition multiplier used to calculate the baseline LU.

- 2.3.4. Post-development LU are expressed as the length (m) created for new species rich hedgerow or new species rich hedgerow with trees:

$$\text{Length (m)} = \text{POST-DEVELOPMENT LINEAR UNITS}$$

- 2.3.5. For the post-development BNG calculation, running water is expressed simply as a length in metres.

APPLYING RISK FACTORS TO AREA-BASED CALCULATIONS

- 2.3.6. In the post-development calculation, BU are calculated in a similar way to baseline BU. However, in addition to area, condition and distinctiveness of the proposed habitats, the key risks to delivery are taken into account through the incorporation of risk factors.
- 2.3.7. The application of risk factors in the calculation of post-development biodiversity units for reinstated and created habitats is calculated as follows:

Habitat Creation. *When habitats within a scheme boundary are cleared for construction and new habitats created post-development, risk factors are applied to all the potential biodiversity units generated from the newly created habitat. Such that:*

Potential Biodiversity Units =

Target Habitat Area (ha) × Target Distinctiveness × Target Condition

Habitat Creation Biodiversity Units =

Potential Biodiversity Units × (Risk Factors)

- 2.3.8. It is assumed that all habitats (except where explicitly retained) are cleared during the construction stage and then created afresh.
- 2.3.9. The Defra metric sets out three risk factors: distance from scheme (spatial risk); how difficult it is to create any given habitat (delivery risk); and time taken for created or enhanced habitats to reach target condition (temporal risk).

SPATIAL RISK

- 2.3.10. Spatial risk is the risk associated with delivering compensation for the loss of a habitat at a distance from that loss. The further from the site of the loss, the greater the risk.
- 2.3.11. It is assumed that all habitat retention, recreation and creation would be delivered within the Order Limits or within the same ecological network as the loss occurs. Therefore, the spatial risk factor is set as 1 for all habitats and would not be included within the post-development biodiversity unit calculations.

DELIVERY RISK

- 2.3.12. Delivery risk is the risk associated with the difficulty to create or restore any specific habitat. Appendix 1 of Defra's Technical Paper (**Ref. 13**) provides an indicative guide to broad categories of risk for different habitats. For habitat types not listed in Defra's guidance, Appendix C of the BRE Guidance Note 36 was used to determine the appropriate level of delivery risk. This was informed by delivery risk levels assigned to similar habitat types by Defra. **Table 2-4** and **Table 2-5** show the risk factors assigned to each level of delivery risk and type of habitat created or restored within Part B.

Table 2-4 – Defra Delivery Risk Factors

Difficulty of Recreation or Restoration	Delivery Risk Factor
Very High	0.10
High	0.33
Medium	0.67
Low	1

Table 2-5 – Delivery Risk for Reinstated or Created Habitats

JNCC Phase 1 Habitat Type	Difficulty of Creation	Delivery Risk Factor
A1.1.1 Broadleaved woodland – semi-natural	Medium	0.67
A1.1.2 Broadleaved woodland – plantation	Low	1
A1.2.2 Coniferous woodland – plantation	Low	1
A1.3.2 Mixed woodland – plantation	Low	1
A2.1 Scrub – dense / continuous	Low	1
B2.1 Neutral grassland – unimproved	Medium	0.67
B4 Improved grassland	Low	1
B5 Marsh / marshy grassland	Medium	0.67
B6 Poor semi-improved grassland	Low	1
C3.1 Other tall herb and fern – ruderal	Low	1
F2.1 Marginal and inundation – marginal	Low	1
G1.1 Standing water – eutrophic	Low	1
J1.1 Cultivated / disturbed land – arable	Low	1
J1.2 Cultivated / disturbed land – amenity grassland	Low	1
J4 Bare ground	Low	1

TEMPORAL RISK

- 2.3.13. In delivering compensation for loss of habitats, the timing of impact may not coincide with the new habitat reaching the required quality or level of maturity which could result in loss of biodiversity for a period of time. This risk is accounted for by applying a 'temporal risk' multiplier to the biodiversity unit calculations.
- 2.3.14. Defra has no set guidance on the time taken to reach a specific condition for each habitat type. Therefore, this information was taken from Appendix C of the BRE Guidance Note 36 as outlined in **Table 2-6** and **Table 2-7**, informed by professional judgment.
- 2.3.15. For created and reinstated habitats, an additional two years was added to time to target condition to account for the fact the habitats would be lost during the two-year construction stage.

Table 2-6 – Temporal Risk Factors

Years to Target Condition Category	Temporal Risk Factor
Under 1 year	1
1	0.97
2	0.93
3-5	0.83
6-10	0.71
11-15	0.59
16-20	0.50
21-25	0.42
26-30	0.35
32+	0.33

Table 2-7 – Temporal Risk for Reinstated and Created Habitats

JNCC Phase 1 Habitat Type	Time to Target Condition	Temporal Risk Factor
A1.1.1 Broadleaved woodland – semi-natural	32+ years	0.33
A1.1.2 Broadleaved woodland – plantation	21-25 years	0.42
A1.2.2 Coniferous woodland – plantation	21-25 years	0.42
A1.3.2 Mixed woodland – plantation	21-25 years	0.42
A2.1 Scrub – dense / continuous	6-10 years	0.71
B2.1 Neutral grassland – unimproved	6-10 years	0.71
B4 Improved grassland	3-5 years	0.83
B5 Marsh / marshy grassland	6-10 years	0.71
B6 Poor semi-improved grassland	3-5 years	0.83
C3.1 Other tall herb and fern – ruderal	3-5 years	0.83
F2.1 Marginal and inundation – marginal	3-5 years	0.83
G1.1 Standing water – eutrophic	2 years	0.93
J1.1 Cultivated / disturbed land – arable	2 years	0.93
J1.2 Cultivated / disturbed land – amenity grassland	3-5 years	0.83
J4 Bare ground	2 years	0.93

2.4 CALCULATING THE CHANGE IN BIODIVERSITY UNITS AS A RESULT OF PART B

- 2.4.1. The baseline and post-development biodiversity units were calculated using the Defra 2012 metric (excluding irreplaceable habitats and their compensation). The baseline and post-development biodiversity units were compared to assess whether Part B would achieve net gains for biodiversity. This was also completed for HPIs to demonstrate compliance with NERC Act (2006) and the Northumberland Local Plan (**Ref. 11**).

- 2.4.2. The following formula was used to calculate the change in BU following construction of Part B:

$$\text{Change in Biodiversity Units} =$$

$$\text{Post-Development Biodiversity Units (created and retained)} - \text{Baseline Biodiversity Units}$$

- 2.4.3. If this resulting score is negative, there is a loss in biodiversity for area-based habitats. If the score is close to zero (with the post-development BU being within 95%-104% of the baseline BU) there is no net loss of biodiversity for area-based habitats. If there is an increase in the BU of 5% or more the project demonstrates delivery of net gain for biodiversity for area-based habitats. The percentage should be rounded to the nearest whole percentage point (0.5 and above is to be rounded up to 1 and anything below 0.5 should be rounded down). This is in accordance with Appendix C of the BRE Guidance Note 36.
- 2.4.4. The same formula and process applies to calculating the change in LU and length of watercourse. Subsequently, a quantitative BNG or no net loss outcome can only be achieved if BU, LU and watercourse length achieve the same outcome.
- 2.4.5. Quantitative outcomes of the BNG assessment calculations were reported in line with **Table 2-8**, as described in Appendix C of the BRE Guidance Note 36.

Table 2-8 – Quantitative Outcomes of BNG Calculations

Result from the Calculation	Predicted Scheme-Wide Outcome
Less than 95% of the initial value	Net loss for biodiversity
95% - 104%	Biodiversity No Net Loss
105% or more	Biodiversity Net Gain

- 2.4.6. The quantitative outcomes of the calculations are one component of the BNG assessment and associated good practice principles (**Appendix A** of this report). Another component is the collation of qualitative evidence to review adherence to good practice principles (refer to **Section 5-6**).

3 ASSUMPTIONS AND LIMITATIONS

3.1 DATA

3.1.1. Assumptions associated with the Phase 1 Habitat survey are described in **Appendix 9.1: Habitats and Designated Sites** of this ES.

3.2 BASELINE BIODIVERSITY AND LINEAR UNIT CALCULATIONS

3.2.1. The following assumptions were made for the baseline area-based and linear calculations. Assumptions were made using expert opinion and guided by BREEAM GN36 Appendix C (Ref. 17).

DISTINCTIVENESS

3.2.2. The baseline area-based HPIs within the Order Limits and their attributed Phase 1 Habitat types are listed in **Table 3-1** alongside their distinctiveness and condition categories.

Table 3-1 – Baseline HPI and their Associated Baseline Phase 1 Habitat Types

Baseline HPI Type	JNCC Phase 1 Habitat type	Habitat Distinctiveness	Habitat condition
Lowland mixed deciduous woodland	A1.1.1 Broadleaved woodland – semi-natural	High (6)	Moderate (2)
Lowland mixed deciduous woodland	A1.3.1 Mixed woodland – semi-natural	Medium (4)	Moderate (2)

3.2.3. The baseline area-based Phase 1 categories for non-HPI habitat types are listed in **Table 3-2** alongside their distinctiveness and condition categories. Where multiple habitat conditions are presented this is as a result of differing parcels of the same habitat type presenting different habitat conditions.

Table 3-2 – Baseline Non-HPI Area-Based Phase 1 Habitat Types

JNCC Phase 1 Habitat Type	Habitat Distinctiveness	Habitat Condition
A1.1.1 Broadleaved woodland – semi natural	Medium (4)	Good (3) Moderate (2) Poor (1)
A1.1.2 Broadleaved woodland – plantation	Medium (4)	Good (3) Moderate (2)

JNCC Phase 1 Habitat Type	Habitat Distinctiveness	Habitat Condition
		Poor (1)
A1.2.2 Coniferous woodland – plantation	Low (2)	Moderate (2) Poor (1)
A1.3.2 Mixed woodland – plantation	Medium (4)	Moderate (2)
A2.1 Dense/continuous scrub	Medium (4)	Moderate (2) Poor (1)
A3.1 Broadleaved parkland/scattered trees	Medium (4)	Moderate (2)
A3.3 Mixed parkland/scattered trees	Medium (4)	Poor (1)
B4 Improved grassland	Low (2)	Poor (1)
B5 Marshy grassland	Low (2)	Poor (1)
B6 Poor semi-improved grassland	Low (2)	Good (3) Moderate (2) Poor (1)
C3.1 Other tall herb and fern – ruderal	Low (2)	Poor (1)
G1.1 Standing water – eutrophic	Medium (4)	Moderate (2)
G2 Running water	N/A	N/A
Hardstanding	N/A	N/A
J1.1 Cultivated / disturbed land – arable	Low (2)	Poor (1)
J1.2 Cultivated / disturbed land – amenity grassland	Low (2)	Poor (1)
J1.3 Cultivated / disturbed land – ephemeral/short perennial	Low (2)	Poor (1)
J3.6 Built-up areas - buildings	N/A	N/A
J4 Bare ground	Low (2)	Poor (1)

CONDITION

- 3.2.4. Condition assessment data was not complete across all habitats. Where condition data had not been collected in the field, the following assumptions were made:
- a. All Low distinctiveness habitats were allocated a condition score of Poor.
 - b. All Medium and High distinctiveness habitats were allocated a condition score of Moderate.
 - c. All hedgerows are assumed to be in Good condition. The exception to this rule is defunct hedgerows. Defunct hedgerows fail one of the FEP condition assessment criteria.

3.3 POST-DEVELOPMENT BIODIVERSITY AND LINEAR UNIT CALCULATIONS

- 3.3.1. The following assumptions were made for post-development biodiversity unit and linear unit calculations. Assumptions were made using expert opinion and guided by BREEAM GN36 Appendix C (Ref. 17). The Phase 1 Habitat types of habitats present in **Figure 7.10: Landscape Mitigation Plan, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**) are detailed in **Table 3-3** alongside their distinctiveness and target condition categories as well as the associated habitat creation risk multipliers. Under the current Part B design, it is assumed that there would be no enhancement of retained habitats and that all post-development habitats are created following clearance of baseline habitats for development.

Table 3-3 – Proposed Post-Development Habitats Created Including Distinctiveness and Condition Categories

Landscape Element	Landscape Plan Description	JNCC Phase 1 Habitat Type	Habitat Distinctiveness	Habitat Condition	Difficulty to Create	Time to Creation +2 Years
LE 1.1 Amenity grassed areas	Proposed amenity grassland	J1.2 Cultivated / disturbed land - amenity grassland	Low (2)	Moderate (2)	Low (1)	2 years (0.93)
LE 1.3 Species rich (or conservation) grassland	Proposed conservation grassland	B2.1 Neutral grassland - unimproved	High (6)	Moderate (2)	Medium (0.67)	6-10 years (0.71)
LE 2.1 Woodland	Proposed woodland	A1.1.1 Semi-natural woodland - broadleaved	High (6)	Moderate (2)	Medium (0.67)	32+ years (0.33)
LE 2.2 Woodland edge	Proposed woodland	A1.1.1 Semi-natural woodland - broadleaved	High (6)	Moderate (2)	Medium (0.67)	32+ years (0.33)
LE 2.6 Shrubs	Proposed shrubs	A2.1 Scrub – dense / continuous	Medium (4)	Moderate (2)	Low (1)	6-10 years (0.71)
LE 6.1 - Water bodies and associated plants	Marginal planting / wetland	F2.1 Marginal and inundation - marginal	High (6)	Moderate (2)	Low (1)	3-5 years (0.83)

- 3.3.2. Where habitat is temporarily lost during the construction stage, it is assumed that it would be reinstated back to the original habitat type on completion of construction. The exception to this is where **Figure 7.10: Landscape Mitigation Plan, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**) or Part B design identifies creation of a different habitat type.

TARGET DISTINCTIVENESS

- 3.3.3. It is assumed that created habitats would be managed so that they develop into habitats of HPI quality (refer to **Section 3.3**).

TARGET CONDITION

- 3.3.4. For retained habitats and those habitats which are reinstated after works, it is assumed that there would be no change in their baseline condition. For created habitats, target condition assumptions are the same as those described in **paragraph 3.2.4**.

RISK FACTORS

- 3.3.5. The difficulty to create risk factors have been extracted directly from BREEAM GN36 Appendix C (**Ref. 17**) as per best practice guidelines (**Appendix A** of this report).
- 3.3.6. It is assumed that all habitat within the Order Limits would be cleared within the two-year construction stage, unless that habitat is identified as 'retained' in **Figure 7.10: Landscape Mitigation Plan, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**). Since most temporal risk multipliers are based on five-year bands, such lag is not expected to affect the band to which each habitat types is assigned. Should this change then smaller temporal risk multipliers may be applied and a reduction in the biodiversity value of onsite habitat creation would be expected. The time to target habitat condition for each habitat type present within the Order Limits post-development was extracted from BREEAM GN36 Appendix C (**Ref. 17**). Where there were deviations to this these were provided based on professional judgement.
- 3.3.7. It is assumed that all habitat retention, recreation and creation would be delivered within the Order Limits or within the same ecological network as that in which the loss occurs. Therefore, the spatial risk factor is set as 1 for all habitats and was not included within the post-development biodiversity unit calculations.

LIMITATIONS

- 3.3.8. Should any amendments be made to the current Part B design and **Figure 7.10: Landscape Mitigation Plan, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**) the biodiversity unit calculations to determine the biodiversity impacts of Part B would need to be repeated. Specifically, the inclusion of the Order Limits implies that there may be some amendments to **Figure 7.10: Landscape Mitigation Plan, Volume 6** of this ES depending on the final Part B design.
- 3.3.9. The BU and LU calculations do not account for indirect impacts upon habitats outside of the Order Limits that may occur as a result of the proposed works.

4 RESULTS OF THE BASELINE BIODIVERSITY AND LINEAR UNIT CALCULATIONS

4.1 HPI

4.1.1. HPI within the Order Limits comprised a total of 0.69 ha and 7.32 BU of area-based habitats; 20,684 m and 45,486 LU of hedgerows; and 1,059.1 m of watercourses. These are broken down by habitat type in **Table 4-1** to **Table 4-3**.

Table 4-1 – Summary of Baseline BU Calculation: Area-Based HPI

JNCC Phase 1 Habitat Type	Distinctiveness Score	Condition Score	Area (Ha)	Baseline BU
A1.1.1 Broadleaved woodland – semi-natural	High (6)	Moderate (2)	0.45	5.40
A1.3.1 Mixed woodland – semi-natural	Medium (4)	Moderate (2)	0.24	1.92
Total			0.69	7.32

Table 4-2 – Summary of Baseline LU Calculation: Linear-Based HPI

JNCC Phase 1 Habitat Type	Condition Score	Length (m)	LU
J2.1.1 Hedgerow – native species rich (intact)	Good (3)	124.4	373.1
	Moderate (2)	61.2	122.4
J2.1.2 Hedgerow – native species poor (intact)	Good (3)	6,098.3	18,294.9
	Moderate (2)	4,271.1	8,542.1
	Poor (1)	2,716.6	2,716.6
J2.2.1 Hedgerow – native species rich (defunct)	Moderate (2)	151.4	302.8
J2.2.2 Hedgerow – native species poor (defunct)	Poor (1)	1,090.8	1,090.8
J2.3.1 Hedgerow with trees – native species rich (intact)	Good (3)	1,153.0	3,459.0
	Moderate (2)	521.5	1,042.9

JNCC Phase 1 Habitat Type	Condition Score	Length (m)	LU
J2.3.2 Hedgerow with trees – native species poor (intact)	Good (3)	1,821.4	5,464.2
	Moderate (2)	1,403.0	2,806.0
	Poor (1)	1271.6	1,271.6
J2.4	N/A	13,982.6	N/A
J2.5	N/A	2,562.8	N/A
J2.7	N/A	611.4	N/A
Total		37,841.1	45,481.4

Table 4-3 – Summary of Baseline Watercourse Length

JNCC Phase 1 Habitat Type	Length (m)
G2 – Running water	1,059.1
Total	1,059.1

4.2 NON-HPI

- 4.2.1. The total area of non-HPI within the Order Limits is 124.61 ha, with a total of 265.14 BU. These habitats are broken down by type in **Table 4-4**.

Table 4-4 – Summary of Baseline BU Calculation: Area-Based non-HPI

JNCC Phase 1 Habitat Type	Distinctiveness Score	Condition Score	Area (Ha)	Baseline BU
A1.1.1 Broadleaved woodland – semi-natural	Medium (4)	Good (3)	0.22	2.64
		Moderate (2)	0.88	7.04
		Poor (1)	0.00	0.00
A1.1.2 Broadleaved woodland – plantation	Medium (4)	Good (3)	0.01	0.12
		Moderate (2)	4.24	33.92
		Poor (1)	1.17	4.68

JNCC Phase 1 Habitat Type	Distinctiveness Score	Condition Score	Area (Ha)	Baseline BU
A1.2.2 Coniferous woodland – plantation	Low (2)	Moderate (2)	0.01	0.04
		Poor (1)	0.31	0.62
A1.3.2 Mixed woodland – plantation	Medium (4)	Moderate (2)	0.39	3.12
A2.1 Scrub – dense / continuous	Medium (4)	Moderate (2)	0.15	1.20
		Poor (1)	0.00	0.00
A3.1 Parkland / scattered trees – broadleaved	Medium (4)	Moderate (2)	0.01	0.08
A3.3 Parkland / scattered trees – mixed	Medium (4)	Moderate (2)	0.00	0.00
B4 Improved grassland	Low (2)	Poor (1)	34.71	69.42
B5 Marsh / marshy grassland	Low (2)	Poor (1)	0.21	0.42
B6 Poor semi-improved grassland	Low (2)	Good (3)	0.03	0.18
		Moderate (2)	1.42	5.68
		Poor (1)	15.71	31.42
C3.1 Other tall herb and fern – ruderal	Low (2)	Poor (1)	1.02	2.04
G1.1 Standing water - eutrophic	Medium (4)	Moderate (2)	1.17	9.36
Hardstanding	N/A	N/A	15.82	N/A
J1.1 Cultivated / disturbed land – arable	Low (2)	Poor (1)	35.82	71.64
J1.2 Cultivated / disturbed land – amenity grassland	Low (2)	Poor (1)	4.30	8.60
J1.3 Cultivated / disturbed land – ephemeral/short perennial	Low (2)	Poor (1)	2.10	4.20

JNCC Phase 1 Habitat Type	Distinctiveness Score	Condition Score	Area (Ha)	Baseline BU
J3.6 Built-up areas - buildings	N/A	N/A	0.23	N/A
J4 Bare ground	Low (2)	Poor (1)	4.36	8.72
G2 Running water	N/A	N/A	0.32	0.00
Total			124.61	265.14

4.3 SUMMARY

- 4.3.1. A summary of the baseline BUs and LUs and watercourse length generated by HPI and non-HPI is detailed in **Table 4-5**.

Table 4-5 – Summary of Baseline BU Calculation: Retained Area-Based Habitat

Source	Baseline BU	Baseline LU	Baseline Watercourse Length (m)
HPI	7.32	45,486.4	1,059.1
Non-HPI	265.14	N/A	N/A
Total	272.46	45,486.4	1,059.1

5 RESULTS OF POST-DEVELOPMENT BIODIVERSITY AND LINEAR UNIT CALCULATIONS

5.1 OVERVIEW

- 5.1.1. **Section 5** shows the results of the post-development BU and LU calculations for Part B. These results are shown as HPI and Non-HPI habitat, and by post-development prescription (i.e. whether a proposed habitat is retained, reinstated or created).
- 5.1.2. During construction within the Order Limits, habitats would be temporarily and permanently lost to facilitate Part B. The landscape planting measures expected after construction are based on **Figure 7.10: Landscape Mitigation Plan, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**). These habitats have been transcribed into Phase 1 Habitat types for use in post-development BU and LU calculations.
- 5.1.3. **Figure 7.10: Landscape Mitigation Plan, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**) identifies proposed post-development habitats as area-based and linear HPIs and area-based non-HPI.

5.2 RETAINED HABITATS

HPI

- 5.2.1. **Figure 7.10: Landscape Mitigation Plan, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**) includes the retention of baseline area-based HPIs totalling <0.00 ha and 0.00 BU; 3,467.2 m and 10,087.0 LU of Hedgerow HPI.
- 5.2.2. **Table 5-1** and **Table 5-2** show the BU generated by area-based HPIs and Hedgerow HPI which are to be retained from baseline to post-development.

NON-HPI

- 5.2.3. **Figure 7.10: Landscape Mitigation Plan, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**) shows non-HPI area-based habitat types present following construction. These total 12.61 ha and 26.58 BU and 82.83 m of watercourse.
- 5.2.4. **Table 5-3** and **Table 5-4** summarise the watercourse length being retained, and BU generated by area-based non-HPI.

Table 5-1 – Summary of Post Development BU Calculation: Retained Area-Based HPI

JNCC Phase 1 Habitat Type	Distinctiveness	Condition	Area (Ha)	Post-Development BU
A1.3.1 Mixed woodland – semi-natural	Medium (4)	Moderate (2)	<0.00	0.00
Total Area			0.00	0.00

Table 5-2 – Summary of Post-Development LU Calculation: Retained Hedgerow HPI

JNCC Phase 1 Habitat Type	Length (m)	Post-Development LU
J2.1.2 Hedgerow – species-poor (intact)	3,152.0	9,456.0
J2.2.2 Hedgerow – species-poor (defunct)	157.3	157.3
J2.3.1 Hedgerow – species-rich with trees	0.9	2.7
J2.3.2 Hedgerow – species-poor with trees	157.0	471.0
Total	3,467.2	10,087.0

Table 5-3 – Summary of Post-Development Watercourse Length

JNCC Phase 1 Habitat Type	Length (m)
G2 Running water	82.8
Total	82.8

Table 5-4 – Summary of Post-Development BU Calculation: Retained Area-Based Non-HPI

JNCC Phase 1 Habitat Type	Distinctiveness	Target Condition	Area (Ha)	Post-Development BU
A1.1.1 Broadleaved woodland – semi-natural	Medium (4)	Good (3)	0.00	0.00
		Moderate (2)	0.30	2.40
A1.1.2 Broadleaved woodland – plantation	Medium (4)	Good (3)	0.01	0.12
		Moderate (2)	0.35	2.80
		Poor (1)	0.00	0.00
A1.2.2 Coniferous woodland – plantation	Low (2)	Moderate (2)	0.01	0.04
		Poor (1)	0.14	0.28
A1.3.2 Mixed woodland – plantation	Medium (4)	Moderate (2)	0.06	0.48

JNCC Phase 1 Habitat Type	Distinctiveness	Target Condition	Area (Ha)	Post-Development BU
A2.1 Scrub – dense / continuous	Medium (4)	Moderate (2)	0.07	0.56
A3.1 Parkland / scattered trees – broadleaved	Medium (4)	Moderate (2)	0.01	0.08
A3.3 Parkland / scattered trees – mixed	Medium (4)	Moderate (2)	0.00	0.00
B4 Improved grassland	Low (2)	Poor (1)	4.29	8.58
B5 Marsh / marshy grassland	Low (2)	Poor (1)	0.02	0.04
B6 Poor semi-improved grassland	Low (2)	Good (3)	0.03	0.18
		Moderate (2)	0.02	0.08
		Poor (1)	1.47	2.94
C3.1 Other tall herb and fern – ruderal	Low (2)	Poor (1)	0.00	0.00
Hardstanding	N/A	N/A	1.79	0
J1.1 Cultivated / disturbed land – arable	Low (2)	Poor (1)	3.02	6.04
J1.2 Cultivated / disturbed land – amenity grassland	Low (2)	Poor (1)	0.10	0.20
J3.6 Built-up areas - buildings	N/A	N/A	0.04	0.00
J4 Bare ground	Low (2)	Poor (1)	0.88	1.76
Total Area			12.61	26.58

5.3 REINSTATED HABITATS

HPI

- 5.3.1. **Figure 7.10: Landscape Mitigation Plan, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**) shows the reinstatement of baseline area-based HPIs totalling 0.01 ha and 0.03 BU; 4,629.2 LU of Hedgerow HPI.

- 5.3.2. **Table 5-5** and **Table 5-6** show the BU generated by area-based HPIs and Hedgerow HPI which are to be reinstated post-development.

NON-HPI

- 5.3.3. **Figure 7.10: Landscape Mitigation Plan, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**) shows the reinstatement non-HPI area based habitat types totalling 37.15 ha and 65.97 BU and 365.3 m of watercourse.
- 5.3.4. **Table 5-7** and **Table 5-8** summarise the watercourse length and show the BU generated by area-based non-HPI being reinstated post-development.

Table 5-5 – Summary of Post-Development BU Calculation: Reinstated Area-Based HPI

JNCC Phase 1 Habitat Type	Distinctiveness	Target Condition	Area (Ha)	Difficulty Risk	Temporal Risk	Post-Development BU
A1.3.1 Mixed woodland – semi-natural	Medium (4)	Moderate (2)	0.01	Low (1)	21-25 years (0.42)	0.03
Total Area			0.01			0.03

Table 5-6 – Summary of Post-Development LU Calculation: Reinstated Hedgerow HPI

JNCC Phase 1 Habitat Type	Length (m)	Post-Development LU
J2.1.2 Hedgerow – native species-rich (intact)	2,618	2,618
J2.2.1 Hedgerow – native species-rich (defunct)	30.7	30.7
J2.2.2 Hedgerow – native species-poor (defunct)	845.3	845.3
J2.3.1 Hedgerow with trees – native species-rich (intact)	19.9	19.9
J2.3.2 Hedgerow with trees – native species-poor (intact)	1,115.3	1,115.3
Total	4,629.2	4,629.2

Table 5-7 – Summary of Post-Development Watercourse Length

JNCC Phase 1 Habitat Type	Length (m)
G2 Running water	365.3

Table 5-8 – Summary of Post-Development BU Calculation: Reinstated Area-Based Non-HPI

JNCC Phase 1 Habitat Type	Distinctiveness	Target Condition	Area (Ha)	Difficulty Risk	Temporal Risk	Post Development BU
A1.1.1 Broadleaved woodland – semi-natural	Medium (4)	Moderate (2)	0.06	Medium (0.67)	32+ years (0.33)	0.11
A1.1.2 Broadleaved woodland – plantation	Medium (4)	Moderate (2)	0.09	Low (1)	21-25 years (0.42)	0.30
A1.1.2 Broadleaved woodland – plantation	Medium (4)	Poor (1)	0.00	Low (1)	21-25 years (0.42)	0.00
A1.2.2 Coniferous woodland – plantation	Low (2)	Poor (1)	0.17	Low (1)	21-25 years (0.42)	0.14
A1.3.2 Mixed woodland – plantation	Medium (4)	Moderate (2)	0.03	Low (1)	21-25 years (0.42)	0.09
A2.1 Scrub – dense / continuous	Medium (4)	Moderate (2)	0.08	Low (1)	6-10 years (0.71)	0.45
A3.3 Mixed parkland/scattered trees	Medium (4)	Poor (1)	0.00	Low (1)	21-25 years (0.42)	0.00

JNCC Phase 1 Habitat Type	Distinctiveness	Target Condition	Area (Ha)	Difficulty Risk	Temporal Risk	Post Development BU
B4 Improved grassland	Low (2)	Poor (1)	8.92	Low (1)	3-5 years (0.83)	14.81
B5 Marsh / marshy grassland	Low (2)	Poor (1)	0.05	Medium (0.67)	6-10 years (0.71)	0.05
B6 Poor semi-improved grassland	Low (2)	Poor (1)	2.41	Low (1)	3-5 years (0.83)	4.00
C3.1 Other tall herb and fern – ruderal	Low (2)	Poor (1)	0.01	Low (1)	3-5 years (0.83)	0.02
G1 Standing water - eutrophic	Medium (4)	Moderate (2)	1.17	Low (1)	2 years (0.93)	8.70
Hardstanding	N/A	N/A	3.47	N/A	N/A	0.00
J1.1 Cultivated / disturbed land – arable	Low (2)	Poor (1)	13.83	Low (1)	2 years (0.93)	25.72
J1.2 Cultivated / disturbed land – amenity grassland	Low (2)	Poor (1)	1.42	Low (1)	3-5 years (0.83)	2.36
J1.3 Cultivated / disturbed land – ephemeral/short perennial	Low (2)	Poor (1)	2.10	Low (1)	3-5 years (0.83)	3.49
J3.6 Built-up areas - buildings	N/A	N/A	0.00	N/A	N/A	0.00
J4 Bare ground	Low (2)	Poor (1)	3.08	Low (1)	2 years (0.93)	5.73
G2 Running water	N/A	N/A	0.26	N/A	N/A	0.00

JNCC Phase 1 Habitat Type	Distinctiveness	Target Condition	Area (Ha)	Difficulty Risk	Temporal Risk	Post Development BU
Total Area			37.15			65.97

5.4 CREATED HABITATS

HPI

- 5.4.1. **Figure 7.10: Landscape Mitigation Plan, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**) shows the creation of area-based HPI totalling 10.13 ha and 26.88 BU and 12499.3 m hedgerow HPI which generates 12,499.3 LU. **Table 5-9** and **Table 5-10** show the biodiversity from HPI types within the Order Limits which are being created post-development.

Table 5-9 – Summary of Post-Development BU Calculation: Created Area-Based HPI

JNCC Phase 1 Habitat Type	Distinctiveness	Target Condition	Area (Ha)	Difficulty Risk	Temporal Risk	Post-Development BU
A1.1.1 Broadleaved woodland – semi-natural	High (6)	Moderate (2)	10.13	Medium (0.67)	32+ years (0.33)	26.88
Total Area			10.13			26.88

Table 5-10 – Summary of Post-Development LU Calculation: Created Hedgerow HPI

JNCC Phase 1 Habitat Type	Length (m)	Post-Development LU
J2.3.1 Hedgerow - native species rich with trees (intact)	12,499.3	12,499.3
Total	12,499.3	12,499.3

NON-HPI

- 5.4.2. **Figure 7.10: Landscape Mitigation Plan, Volume 6** of this ES (**Application Document Reference: TR010041/APP/6.6**) shows the creation of a number of area-based non-HPIs which total 35.51 ha and generate 213.33 BU.
- 5.4.3. **Table 5-11** shows the biodiversity from non-HPIs within the Order Limits which are being created post-development.

Table 5-11 – Summary of Post-Development BU Calculation: Created Area-Based

JNCC Phase 1 Habitat Type	Distinctiveness	Target Condition	Area (Ha)	Difficulty Risk	Temporal Risk	Post-Development BU
J1.2 Cultivated / disturbed land – amenity grassland	Low (2)	Moderate (2)	3.07	Low (1)	2 years (0.93)	11.42
B2.1 Neutral grassland - unimproved	High (6)	Moderate (2)	27.82	Medium (0.67)	6-10 years (0.71)	158.81
A2.1 Scrub – dense / continuous	Medium (4)	Moderate (2)	0.68	Low (1)	6-10 years (0.71)	3.86
F2.1 Marginal and inundation - marginal	High (6)	Moderate (2)	3.94	Low (1)	3-5 years (0.83)	39.24
Hardstanding	N/A	N/A	20.48	N/A	N/A	N/A
Total			55.99			213.33

5.5 RESULTS SUMMARY

5.5.1. A summary of the results of the BNG calculations for HPI and non-HPI habitats is provided in **Table 5-12**, along with the percentage change from baseline for each habitat type.

5.5.2. The results show that construction of Part B would result in:

- a. A 15.38% net gain in BU for area-based non-HPI
- b. A 267.54% net gain in BU for area-based HPI
- c. A 40.17% net loss in LU for Hedgerow HPI
- d. A 57.69% net loss in LU for watercourses

Table 5-12 – Summary of BNG Calculation Results

Habitat Type	Baseline	Post-Development	Change	Outcome
Area-based habitats (non-HPI)	265.14 BU	305.92 BU	+40.78	Net Gain (15.38%)
Area-based habitats (HPI)	7.32 BU	26.90 BU	-19.58	Net Gain (-267.54%)
Hedgerow HPI	45,481.4 LU	27,215.6 LU	-18,270.8	Net Loss (-40.17%)
Watercourse	1,059.1	448.2	-610.9	Net Loss (-57.69%)

5.6 BIODIVERSITY NET GAIN PRINCIPLES

5.6.1. The quantitative outcomes of the assessment are a singular element of the BNG assessment and associated good practice principles (**Appendix A** of this report). **Table 5-13** discusses adherence of Part B to each of the BNG good practice principles. Adherence of Part B to these principles is based on the current stage in the BNG process; it does not necessarily rule out further adherence.

Table 5-13 – Evidence of Project Compliance with BNG Good Practice Principles

Principle	Description	Evidence	Current Outcome
1. Apply the mitigation hierarchy	Do everything possible to first avoid and then minimise impacts on biodiversity. Only as a last resort, and in agreement with external decision-makers where possible, compensate for losses that cannot be avoided. If compensating for losses within the development footprint is not possible or does not generate the most benefits for nature conservation, then offset biodiversity losses by gains elsewhere.	The landscape design for Part B: <ul style="list-style-type: none"> – Avoids impacts to existing biodiversity value by focusing development on habitats of low distinctiveness wherever possible; – Partially compensates for negative impacts by creating new habitats within the Order Limits. 	Partially achieved
2. Avoid losing biodiversity that cannot be offset by gains elsewhere	Avoid impacts on irreplaceable biodiversity – these impacts cannot be offset to achieve No Net Loss or Net Gain.	No irreplaceable habitats are impacted by Part B.	Achieved
3. Be inclusive and equitable	Engage stakeholders early, and involve them in designing, implementing, monitoring and evaluating the approach to Net Gain. Achieve Net Gain in partnership with stakeholders where possible and share the benefits fairly among stakeholders.	Stakeholders have been actively engaged with through consultation workshops as part of the Environmental Impact Assessment process.	Achieved
4. Address risks	Mitigate difficulty, uncertainty and other risks to achieving Net Gain. Apply well-accepted ways to add contingency when calculating biodiversity losses and gains in order to account for any remaining risks, as well as to compensate for the time between the losses occurring and the gains being fully realised.	The BNG assessment used industry recognised risk multipliers from Appendix C of BRE (2018) GN36 – BREEAM, CEEQUAL and HGM Ecology Calculation Methodology – Route 2. Further to this, a 2-year time lag was applied to the post-development temporal risk multiplier to incorporate the time between habitat clearance and creation.	Achieved
5. Make a measurable Net Gain contribution	Achieve a measurable, overall gain for biodiversity and the services ecosystems provide while directly contributing towards nature conservation priorities.	The BNG assessment determined a quantitative: <ul style="list-style-type: none"> – Net loss of hedgerows and watercourses. 	Not achieved
6. Achieve the best outcomes for biodiversity	Achieve the best outcomes for biodiversity by using robust, credible evidence and local knowledge to make clearly justified choices when: <ul style="list-style-type: none"> – Delivering compensation that is ecologically equivalent in type, amount and condition, and that accounts for the location and timing of biodiversity losses; – Compensating for losses of one type of biodiversity by providing a different type that delivers greater benefits for nature conservation; – Achieving Net Gain locally to the development while also contributing towards nature conservation priorities at local, regional and national levels; – Enhancing existing or creating new habitat; – Enhancing ecological connectivity by creating more, bigger, better and joined areas for biodiversity. 	This BNG assessment used the newest data and followed a rigorous method and QA process. For area-based habitats, the majority of habitat types have been compensated for using the ‘like-for-like or better’ approach. However, there is a reduction in hedgerows and watercourses.	Not achieved

Principle	Description	Evidence	Current Outcome
7. Be additional	Achieve nature conservation outcomes that demonstrably exceed existing obligations (i.e. do not deliver something that would occur anyway).	The nature conservation outcomes have not been met because of the net loss in hedgerows and watercourses. Nature conservation outcomes could be met subject to the implementation of the recommendations (refer to Section 6.2). If achieved, these outcomes would be considered additional as they are not covered under other ecological mitigation measures.	Not achieved
8. Create a Net Gain legacy	Ensure Net Gain generates long-term benefits by: <ul style="list-style-type: none"> – Engaging stakeholders and jointly agreeing practical solutions that secure Net Gain in perpetuity; – Planning for adaptive management and securing dedicated funding for long-term management; – Designing Net Gain for biodiversity to be resilient to external factors, especially climate change; – Mitigating risks from other land uses; – Avoiding displacing harmful activities from one location to another; – Supporting local-level management of Net Gain activities. 	The habitats proposed in the post-development mitigation plan and their associated maintenance would be undertaken by The Applicant or an external management body.	Achieved
9. Optimise sustainability	Prioritise BNG and, where possible, optimise the wider environmental benefits for a sustainable society and economy.	Part B has a landscape mitigation plan containing features which have biodiversity value and environmental benefits. However, this mitigation plan does not achieve a BNG for hedgerows and watercourses.	Not achieved
10. Be transparent	Communicate all Net Gain activities in a transparent and timely manner, sharing the learning with all stakeholders.	This report and its associated BNG assessment calculations would be submitted as part of the Environmental Impact Assessment (EIA). Through this process, the results would be shared with the public and therefore any stakeholders.	Achieved

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

- 6.1.1. **Table 5-12** summarises results of the BNG assessment for area-based and linear habitats.
- 6.1.2. Despite achieving a net gain for area-based HPI and non-HPI, under current landscape designs, Part B would result in an overall net loss in biodiversity due to net loss of length of hedgerows and watercourses.
- 6.1.3. The BNG assessment shows that the majority of the good practice principles relating to qualitative criteria would be met. The quantitative biodiversity net loss is the main reason the current design would not achieve a Part B-wide BNG.

6.2 RECOMMENDATIONS AND NEXT STEPS

- 6.2.1. The BNG assessment shows a net gain of biodiversity for area-based HPI and non-HPI habitats, but net loss of hedgerows and watercourses. It is recommended that the landscape design is amended to maximise the retention of linear hedgerow and woodland habitats. Additional linear hedgerow habitats which contribute to the post-development BU and LU value should be included in the design. This could be achieved by creating new hedgerow within the Order Limits. Measures such as increased retention or enhancement of the existing watercourses would compensate for the loss of watercourse and contribute to the achievement of net gain for all habitats.
- 6.2.2. Highways England produced a CHE memorandum (**Ref. 5**) which guides the standardised reporting of biodiversity information on The Applicants projects. The CHE memo is only for internal Highways England reporting. An assessment in accordance with the CHE memo is included in **Appendix C** of this report.

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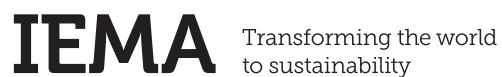
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Appendix A

CIEEM, CIRIA AND IEMA GOOD
PRACTICE PRINCIPLES

Biodiversity Net Gain

Good practice principles for development



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Introduction

Achieving Biodiversity Net Gain

Designing, building, operating and maintaining - each of these stages of a development scheme generates opportunities to help achieve an overall benefit for biodiversity. Realising these opportunities is vital because biodiversity, and the functions it provides, are essential to sustain our society and economy.

Achieving these net gains in biodiversity, where there are wider benefits for society, is more than simply outweighing losses with gains. It requires doing everything possible to avoid losing biodiversity in the first place, as well as involving stakeholders especially as partners. It also requires the gains in biodiversity to be valuable locally, and to make important contributions towards regional and national priorities for nature conservation. In other words, there is a right way to achieve 'Biodiversity Net Gain' that brings about long-lasting and meaningful benefits for our environment, society and economy.

This 'right way' is articulated in standards and guidelines produced by an international community on achieving No Net Loss and Net Gain targets for biodiversity. In the United Kingdom, the government has international and national commitments on biodiversity that include halting the loss of biodiversity and reaching net gains. Development can contribute significantly towards realising these commitments. However, until now there has been no standard for the UK industry on good practice for achieving Biodiversity Net Gain.

Establishing good practice

CIRIA, CIEEM and IEMA have developed the first UK principles on good practice to achieve Biodiversity Net Gain. These principles provide a framework that helps improve the UK's biodiversity by contributing towards strategic priorities to conserve and enhance nature while progressing with sustainable development. They also provide a way for industry to show that projects followed good practice.

It is important that these principles are tested, refined and improved through feedback and review. CIRIA, CIEEM and IEMA will undertake a first review within 12 months.

Supporting guidance

The principles are broad by necessity so that they apply to a wide-ranging industry. This means that their proper interpretation is critical. CIRIA, CIEEM and IEMA are developing guidance that will contain practical advice on implementing the Net Gain principles and definitions of key terms. This guidance will be available in 2017, and a steering group will be overseeing its production and consultation with a variety of stakeholders.

Part of that stakeholder consultation is discussing a credible, proportionate way to audit implementation of Biodiversity Net Gain. While this is in progress, developments claiming to achieve Biodiversity Net Gain must provide evidence that clearly demonstrates they have implemented and adhered to the good practice principles.

Biodiversity Net Gain

Good practice principles for development

Biodiversity Net Gain is development that leaves biodiversity in a better state than before. It is also an approach where developers work with local governments, wildlife groups, land owners and other stakeholders in order to support their priorities for nature conservation. These ten principles set out good practice for achieving Biodiversity Net Gain and must be applied all together, as one approach.

Principle 1. Apply the Mitigation Hierarchy

Do everything possible to first avoid and then minimise impacts on biodiversity. Only as a last resort, and in agreement with external decision-makers where possible, compensate for losses that cannot be avoided. If compensating for losses within the development footprint is not possible or does not generate the most benefits for nature conservation, then offset biodiversity losses by gains elsewhere.

Principle 2. Avoid losing biodiversity that cannot be offset by gains elsewhere

Avoid impacts on irreplaceable biodiversity - these impacts cannot be offset to achieve No Net Loss or Net Gain.

Principle 3. Be inclusive and equitable

Engage stakeholders early, and involve them in designing, implementing, monitoring and evaluating the approach to Net Gain. Achieve Net Gain in partnership with stakeholders where possible, and share the benefits fairly among stakeholders.

Principle 4. Address risks

Mitigate difficulty, uncertainty and other risks to achieving Net Gain. Apply well-accepted ways to add contingency when calculating biodiversity losses and gains in order to account for any remaining risks, as well as to compensate for the time between the losses occurring and the gains being fully realised.

Principle 5. Make a measurable Net Gain contribution

Achieve a measurable, overall gain¹ for biodiversity and the services ecosystems provide while directly contributing towards nature conservation priorities.

¹ Net Gain has been described as a measurable target for development projects where impacts on biodiversity are outweighed by a clear mitigation hierarchy approach to first avoid and then minimise impacts, including through restoration and / or compensation. Adhering to these Net Gain principles (i.e. pursuing all principles together) will help in under-pinning good practice for achieving and sustaining Net Gain.

Principle 6. Achieve the best outcomes for biodiversity

Achieve the best outcomes for biodiversity by using robust, credible evidence and local knowledge to make clearly-justified choices when:

- Delivering compensation that is ecologically equivalent in type, amount and condition, and that accounts for the location and timing of biodiversity losses
 - Compensating for losses of one type of biodiversity by providing a different type that delivers greater benefits for nature conservation
 - Achieving Net Gain locally to the development while also contributing towards nature conservation priorities at local, regional and national levels
 - Enhancing existing or creating new habitat
 - Enhancing ecological connectivity by creating more, bigger, better and joined areas for biodiversity
-

Principle 7. Be additional

Achieve nature conservation outcomes that demonstrably exceed existing obligations (i.e. do not deliver something that would occur anyway).

Principle 8. Create a Net Gain legacy

Ensure Net Gain generates long-term benefits by:

- Engaging stakeholders and jointly agreeing practical solutions that secure Net Gain in perpetuity²
 - Planning for adaptive management and securing dedicated funding for long-term management
 - Designing Net Gain for biodiversity to be resilient to external factors, especially climate change
 - Mitigating risks from other land uses
 - Avoiding displacing harmful activities from one location to another
 - Supporting local-level management of Net Gain activities
-

Principle 9. Optimise sustainability

Prioritise Biodiversity Net Gain and, where possible, optimise the wider environmental benefits for a sustainable society and economy.

Principle 10. Be transparent

Communicate all Net Gain activities in a transparent and timely manner, sharing the learning with all stakeholders.

² Biodiversity compensation should be planned for a sustained Net Gain over the longest possible timeframe. For development in the UK, the expectation is that compensation sites will be secured for at least the lifetime of the development (e.g. often 25-30 years) with the objective of Net Gain management continuing in the future.

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Principal Co-ordinating Author

Julia Baker

Balfour Beatty

Project Team and Contributors

Martina Girvan

Arcadis

Neil Harwood

Arup

Claire Wansbury

Atkins

Sally Hayns

CIEEM

Owen Jenkins

CIRIA

Michael Small (Project Manager)

CIRIA

Nick Blyth

IEMA

Alex Saponja

Interserve

Bob Edmonds

SLR Consulting

The project team consisted of staff representatives from the three partner organisations, together with industry members of each organisation.

We would like to thank the numerous stakeholders who provided comment on earlier drafts of the principles in the form of online surveys, a consultation workshop and a webinar.

The Biodiversity Net Gain good practice principles were first drafted based on several sources: responses to the UK government's 2013 Green Paper Consultation on Biodiversity Offsetting; experience gained from the national pilot on biodiversity offsetting led by the UK's Department for Environment, Food and Rural Affairs; experience from Network Rail Infrastructure Projects' and from other leading corporations' work on net positive approaches; and also on principles developed for the international community by the Business and Biodiversity Offset Programme.

The draft principles were refined following initial consultation with various stakeholders including government, NGOs, regulators and private and public-sector organisations. The refined version was presented to over 450 professionals during a webinar where the majority supported this approach to Biodiversity Net Gain and the principles. The principles were revised based on feedback received during the webinar, assessed by the project team and the final set are presented in this document. It is envisaged that the principles will be further refined following a period of application, feedback and review.

Supporting guidance

The principles are broad by necessity so that they apply to a wide-ranging industry. This means that their proper interpretation is critical. CIRIA, CIEEM and IEMA are developing guidance that will contain practice advice on implementing the Net Gain principles and definitions of key terms. This guidance will be available in 2017, and a steering group will be overseeing its production and consultation with a variety of stakeholders.

Part of that stakeholder consultation is discussing a credible, proportionate way to audit implementation of Biodiversity Net Gain. While this is in progress, developments claiming to achieve Biodiversity Net Gain must provide evidence that clearly demonstrates they have implemented and adhered to the good practice principles.

How you can get involved

If you would like to be kept informed of progress with our Biodiversity Net Gain practical guidance, please visit www/ciria.org/netgain for further information.

If you are able to sponsor or otherwise contribute towards the cost of developing the Biodiversity Net Gain practical guidance, please contact owen.jenkins@ciria.org

Biodiversity Net Gain

Good practice principles for development



CIRIA is the construction industry research and information association. It is an independent, not-for-profit, member-based research organisation that exists to champion performance improvement in construction. Since 1960, CIRIA has delivered support and guidance to the construction, built environment and infrastructure sectors. CIRIA works with members from all parts of the supply chain to co-ordinate collaborative projects, industry networks and events. Its high quality guidance is delivered to industry through publications, training and other performance improvement activities. www.ciria.org



The **Chartered Institute of Ecology and Environmental Management** (CIEEM) is the leading professional membership body representing and supporting ecologists and natural environment managers in the UK, Ireland and abroad. Our Vision is of a society which values the natural environment and recognises the contribution of professional ecologists and environmental managers to its conservation. We have members drawn from across the employment sectors including local authorities, government agencies, NGOs, environmental consultancy, academia and industry. The diversity of our membership is our greatest strength, enabling us to take an integrated and holistic approach to furthering the management and enhancement of biodiversity and the ecological processes essential to a fully functional biosphere. www.cieem.net



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This initiative has also been supported by Balfour Beatty

Appendix B

WSP BIODIVERSITY NET GAIN
PROCESS



WSP BIODIVERSITY NET GAIN PROCESS

Step 1 – Set the Scope

- i. **Produce a biodiversity net gain (BNG) strategy.** A short memo report setting out client commitments to BNG, scope of the BNG work, and the proposed steps required.
- i. **Workshop 1 or 1-2-1 meetings – strategy meetings.** Early engagement with key stakeholders, likely to include local conservation NGOs, local authorities and government agencies such as Natural England. Early engagement is essential to present, discuss and develop the BNG strategy; including setting the BNG good practice principles into a scheme context and agreeing local priorities for biodiversity.

Step 2 – Initial Biodiversity Assessment

- i. **Survey baseline habitats and their condition.** Ideally, a habitat condition assessment is undertaken during Phase 1 Habitat survey. If Phase 1 Habitat data has been collected prior to initiating the BNG process, condition assessment can be undertaken either a) retrospectively through interpretation of Phase 1 target notes, consultation with surveyors, or employing a number of assumptions; or b) during an additional site visit.
- ii. **Identify irreplaceable habitat.** Following Defra guidance, irreplaceable habitats within the scheme boundary must be identified and excluded from the biodiversity unit calculations. It is important to note that biodiversity net gain or no net loss cannot be achieved for the scheme as a whole if there is a negative impact on an irreplaceable habitat.
- iii. **Calculate baseline biodiversity units using the biodiversity metric.** This calculation includes all habitats (minus irreplaceable habitats) within the scheme boundary prior to development and is informed by Phase 1 Habitat data and results of the condition assessment. The baseline biodiversity unit calculation may be run on a number of scheme options if the scheme is at options appraisal stage.
- iv. **Calculate post-development biodiversity units using the biodiversity metric.** This calculation accounts for all of the proposed habitats (including retained habitat and habitat lost or created as a result of the development) within the scheme boundary post-development. The calculation is informed by scheme design, landscape plans, and proposed ecological mitigation. The assessment is based upon the target state (type, size and condition) of habitats being created.
- v. **Produce an ‘Initial Biodiversity Assessment’ report.** The report sets out the BNG process in the context of the scheme, and includes the method and results of initial baseline and post-development biodiversity unit calculations.



Step 3 – Detailed Scheme Assessment

- i. **Inform options appraisal.** If baseline biodiversity units have been calculated for a number of scheme options, results will be used to inform options appraisal.
- ii. **Inform the mitigation proposals.** Results of biodiversity unit calculations performed under Step 2 are used to inform the extent and habitat type of on-site ecological mitigation and compensation land required for the scheme to meet no net loss or net gain targets.
- iii. **Update biodiversity unit calculations.** Following finalisation of the scheme design and ecological mitigation proposals, the biodiversity units are updated to reflect any changes. Calculations may also be re-run if updated Phase 1 Habitat data becomes available.
- iv. **Estimate the biodiversity compensation required.** The difference between baseline and post-development biodiversity units indicates the number of units required for the scheme to deliver no net loss or net gain for biodiversity. This in turn can be used to identify the extent and habitat type of compensation required. A rough cost estimate for potential compensation can be provided at this stage.
- v. **Workshop 2 – compensation/offset workshop.** Work with stakeholders to gather suggestions to identify candidate compensation sites and providers. These sites could be offset sites, which are compensation sites that are situated outside the project boundary. This workshop also provides an opportunity to update stakeholders on BNG progress.

Step 4 – Assessment of Candidate Offset Sites

- i. **Initial assessment of feasibility.** Any candidate offset sites which are considered not feasible for any reason are scoped out at this stage.
- ii. **Survey candidate offset sites** to identify existing habitat type, extent and condition.
- iii. **Calculate potential biodiversity units** deliverable by each candidate offset. Using the same methods employed for calculating baseline and post-development biodiversity units for the scheme as a whole, calculate baseline and post-development biodiversity units for offset sites to determine potential biodiversity units deliverable.
- iv. **Hold one-to-one meetings with potential offset providers to:**
 - a) Identify suitable locations for candidate offset sites and determine what habitats and species they could support;
 - b) Determine how offsets can contribute to local biodiversity objectives and fit within ecological networks;
 - c) Set out the type of agreement that would be acceptable to offset providers (e.g. long-term agreement for management of the land); and

- d) Collate information to feed in to offset scoring templates and offset summary sheets.
- v. **Score candidate offsets** using the offset scoring template. This takes into account ecological factors, financial factors, and wider benefits and opportunities.
- vi. **Produce offset summary sheets** describing each offset site in its present state and the habitats and species the proposed offsets will support. Details of land ownership, access provisions and proposed management agreements are also included in summary sheets.
- vii. **Panel review of potential offset sites** to include relevant stakeholders. Decisions are made as to which candidate offset sites to take forward.

Step 5 – Completion of Biodiversity Assessment

- i. **Final update of biodiversity unit calculations.** If there have been changes to the scheme design (including environmental mitigation proposals) since calculations were last updated, biodiversity units are updated to reflect any changes.
- ii. **Workshop 3 – final workshop.** A third stakeholder engagement workshop is recommended to update all stakeholders on BNG progress since the last workshop, and inform them of any decisions made.
- iii. **Produce a ‘Full Biodiversity Assessment’ report and associated GIS data.** This will detail the approach and outcomes of Steps 1 to 4, importantly, how the project has met the BNG good practice principles. It will set out candidate offset sites and enable the client to decide which offsets to support and whether to aim for no net loss or net gain.

Step 6 – Delivering Biodiversity Net Gain

- i. **Implement BNG during the construction phase.** This will involve: updating the biodiversity baseline; including BNG within construction documents; training key staff; reducing the time-lag between losses and gains; acting on risks and opportunities; and collecting evidence and data.
- ii. **Set up offsets.** Once offset sites to be delivered have been selected, and fine details of the scope of each offset agreed, legal agreements will be set up with offset providers to manage offsets over a set time frame (generally between 15 and 30 years). Further information on the agreement types can be provided on request.
- iii. **Monitor and report** to ensure the offsets are delivered to the standard required. Monitoring and reporting is undertaken at key points throughout the management agreement (e.g. once every two or three years).

Appendix C

CHIEF HIGHWAYS ENGINEER MEMO

INTRODUCTION

In March 2018, Highways England (HE) published the Chief Highways Engineer Memorandum 422/18, Supporting Transparency Around our Biodiversity Performance (CHE Memorandum 422/18) which supports the consistent reporting of biodiversity units, where project teams are gathering biodiversity data.

Overview of Methods

The CHE Memorandum 422/18 recommends that projects report on biodiversity units using the following method (page 3):

- “1. Report biodiversity units before works by:
 - Recording the areas of habitat plots (in hectares) using standard habitat categories listed within Annex B; and
 - Evaluating and reporting the condition of these habitat plots, using condition assessment stated within Annex B.
- 2. Report biodiversity units after works by:
 - Recording the areas of habitat plots (in hectares) using standard habitat categories listed within Annex B; however
 - Habitat condition will be assigned by The Applicant’s SES Environment Group centrally.”

Annex B of the CHE Memorandum 422/18 stipulates that the calculation of biodiversity units before and after development follows this formula:

Distinctiveness score x Condition score x Area (hectares) = Baseline or Post-Development biodiversity units

The methods for calculating hedgerow LU and reporting lengths of watercourse are the same as the methods detailed within **Section 2** of the main report.

The CHE Memorandum 422/18 does not use the Farm Environment Plan (FEP) methodology for assessing condition and has developed assessment criteria for each habitat type which are listed in full within Annex B of CHE Memorandum 422/18. Since the habitat condition assessment was commissioned prior to the publication of the CHE Memorandum 422/18, it principally followed DEFRA guidance and followed the Natural England's FEP manual. Where there were gaps in primary HCA data, for example from limited access to land, professional judgement was applied to retrospectively assess habitat condition (refer to **Section 2 and 3** of the main report).

RESULTS

Baseline Biodiversity Units

Tables C1 and C2 show the number of baseline biodiversity units, hedgerow LU and watercourse metres within the Order Limits.

Table C-1 – Baseline Biodiversity Units (BU) – HPI and Non-HPI

JNCC Phase 1 Habitat Type	Distinctiveness Score	Condition Score	Area (Ha)	Baseline BU
A1.1.1 Broadleaved woodland – semi-natural	High (6)	Moderate (2)	0.45	5.40
A1.1.1 Broadleaved woodland – semi-natural	Medium (4)	Good (3)	0.22	2.64
A1.1.1 Broadleaved woodland – semi-natural	Medium (4)	Moderate (2)	0.88	7.04
A1.1.1 Broadleaved woodland – semi-natural	Medium (4)	Poor (1)	0.00	0.00
A1.1.2 Broadleaved woodland - plantation	Medium (4)	Good (3)	0.01	0.12
A1.1.2 Broadleaved woodland - plantation	Medium (4)	Moderate (2)	4.24	33.92
A1.1.2 Broadleaved woodland - plantation	Medium (4)	Poor (1)	1.17	4.68
A1.2.2 Coniferous woodland - plantation	Low (2)	Moderate (2)	0.01	0.04
A1.2.2 Coniferous woodland - plantation	Low (2)	Poor (1)	0.31	0.62
A1.3.1 Mixed woodland – semi-natural	Medium (4)	Moderate (2)	0.24	1.92
A1.3.2 Mixed woodland – plantation	Medium (4)	Moderate (2)	0.39	3.12
A2.1 Scrub - dense / continuous	Medium (4)	Moderate (2)	0.15	1.20
A2.1 Scrub - dense / continuous	Medium (4)	Poor (1)	0	0
A3.1 Parkland / scattered trees - broadleaved	Medium (4)	Moderate (2)	0.01	0.08
A3.3 Parkland / scattered trees – mixed	Medium (4)	Moderate (2)	0.00	0.00

JNCC Phase 1 Habitat Type	Distinctiveness Score	Condition Score	Area (Ha)	Baseline BU
B4 Improved grassland	Low (2)	Poor (1)	34.71	69.42
B5 Marsh / marshy grassland	Low (2)	Poor (1)	0.21	0.42
B6 Poor semi improved grassland	Low (2)	Good (3)	0.03	0.18
B6 Poor semi improved grassland	Low (2)	Moderate (2)	1.42	5.68
B6 Poor semi improved grassland	Low (2)	Poor (1)	15.71	31.42
C3.1 Other tall herb and fern - ruderal	Low (2)	Poor (1)	1.02	2.04
G1.1 Standing water - eutrophic	Medium (4)	Moderate (2)	1.17	9.36
Hardstanding	N/A	N/A	15.82	0
J1.1 Cultivated / disturbed land - arable	Low (2)	Poor (1)	35.82	71.64
J1.2 Cultivated / disturbed land - amenity grassland	Low (2)	Poor (1)	4.30	8.6
J1.3 Cultivated / disturbed land – ephemeral/short perennial	Low (2)	Poor (1)	2.10	4.20
J3.6 Built-up areas - buildings	N/A	N/A	0.23	0
J4 Bare ground	Low (2)	Poor (1)	4.36	8.72
G2 Running water	N/A	N/A	0.32	0
Total Area			124.61	265.14

Table C-2 – Baseline Hedgerow Linear Units (LU)

JNCC Phase 1 Habitat Type	Condition Score	Length (m)	LU
J2.1.1 Hedgerow - native species rich (intact)	Good (3)	124.4	373.1
J2.1.1 Hedgerow - native species rich (intact)	Moderate (2)	61.2	122.4
J2.1.2 Hedgerow - native species poor (intact)	Good (3)	6,098.3	18,294.9
J2.1.2 Hedgerow - native species poor (intact)	Moderate (2)	4,271.1	8,542.1
J2.1.2 Hedgerow - native species poor (intact)	Poor (1)	2,716.6	2,716.6
J2.2.1 Hedgerow - native species rich (defunct)	Moderate (2)	151.4	302.8
J2.2.2 Hedgerow - native species poor (defunct)	Poor (1)	1,098.8	1,090.8
J2.3.1 Hedgerow with trees- native species rich (intact)	Good (3)	1,153	3,459
J2.3.1 Hedgerow with trees- native species rich (intact) R	Moderate (2)	521.5	1,042.9
J2.3.2 Hedgerow with trees- native species poor (intact)	Good (3)	1,821.4	5,464.2
J2.3.2 Hedgerow with trees- native species poor (intact)	Moderate (2)	1,403	2,806
J2.3.2 Hedgerow with trees- native species poor (intact)	Poor (1)	1,271.6	1,271.6
J2.4 Fence	N/A	13,982.6	0
J2.5 Wall	N/A	2,562.8	0
J2.7 Boundary removed	N/A	611.4	0
Total		37,840.8	45,486.4

Table C-3 – Baseline Length of Watercourse

JNCC Phase 1 Habitat Type	Length (m)
G2 Running water	2,705.6
Total	2,705.6

POST-DEVELOPMENT BIODIVERSITY UNITS

Tables C4, C5 and C6 show the number of post-development biodiversity units, hedgerow LU and watercourse metres within the Order Limits.

Table C-4 – Post-Development Biodiversity Units (BU)

JNCC Phase 1 Habitat Type	Mitigation Action	Distinctiveness Score	Condition Score	Area (Ha)	BU
A1.1.1 Broadleaved woodland – semi-natural	Retain	Medium (4)	Good (3)	0.00	0.00
A1.1.1 Broadleaved woodland – semi-natural	Retain	Medium (4)	Moderate (2)	0.3	2.4
A1.1.2 Broadleaved woodland - plantation	Retain	Medium (4)	Good (3)	0.01	0.12
A1.1.2 Broadleaved woodland - plantation	Retain	Medium (4)	Moderate (2)	0.35	2.80
A1.1.2 Broadleaved woodland - plantation	Retain	Medium (4)	Poor (1)	0.00	0.00
A1.2.2 Coniferous woodland - plantation	Retain	Low (2)	Moderate (2)	0.01	0.04
A1.2.2 Coniferous woodland - plantation	Retain	Low (2)	Poor (1)	0.14	0.28

JNCC Phase 1 Habitat Type	Mitigation Action	Distinctiveness Score	Condition Score	Area (Ha)	BU
A1.3.1 Mixed woodland – semi-natural	Retain	Medium (4)	Moderate (2)	0.00	0.00
A1.3.2 Mixed woodland - plantation	Retain	Medium (4)	Moderate (2)	0.06	0.48
A2.1 Scrub - dense / continuous	Retain	Medium (4)	Moderate (2)	0.07	0.56
A3.1 Parkland / scattered trees - broadleaved	Retain	Medium (4)	Moderate (2)	0.01	0.08
A3.3 Parkland / scattered trees – mixed	Retain	Medium (4)	Moderate (2)	0.00	0.00
B4 Improved grassland	Retain	Low (2)	Poor (1)	4.30	8.60
B5 Marsh / marshy grassland	Retain	Low (2)	Poor (1)	0.02	0.04
B6 Poor semi improved grassland	Retain	Low (2)	Good (3)	0.03	0.18
B6 Poor semi improved grassland	Retain	Low (2)	Moderate (2)	0.02	0.08
B6 Poor semi improved grassland	Retain	Low (2)	Poor (1)	1.47	2.94
Hardstanding	Retain	N/A	N/A	1.79	0
J1.1 Cultivated / disturbed land - arable	Retain	Low (2)	Poor (1)	3.02	6.04
J1.2 Cultivated / disturbed land - amenity grassland	Retain	Low (2)	Poor (1)	0.10	0.20
J3.6 Built-up areas - buildings	Retain	N/A	N/A	0.04	0
J4 Bare ground	Retain	Low (2)	Poor (1)	0.88	1.76
A1.1.1 Broadleaved woodland – semi-natural	Reinstate	Medium (4)	Moderate (2)	0.06	0.72

JNCC Phase 1 Habitat Type	Mitigation Action	Distinctiveness Score	Condition Score	Area (Ha)	BU
A1.1.2 Broadleaved woodland - plantation	Reinstate	Medium (4)	Moderate (2)	0.09	0.72
A1.1.2 Broadleaved woodland - plantation	Reinstate	Medium (4)	Poor (1)	0.00	0.00
A1.2.2 Coniferous woodland - plantation	Reinstate	Low (2)	Poor (1)	0.17	0.34
A1.3.1 Mixed woodland – semi-natural	Reinstate	Medium (4)	Moderate (2)	0.01	0.08
A1.3.2 Mixed woodland - plantation	Reinstate	Medium (4)	Moderate (2)	0.03	0.24
A2.1 Scrub - dense / continuous	Reinstate	Medium (4)	Moderate (2)	0.08	0.64
A3.3 Mixed parkland/scattered trees	Reinstate	Medium (4)	Poor (1)	0.00	0.00
B4 Improved grassland	Reinstate	Low (2)	Poor (1)	8.91	17.82
B5 Marsh / marshy grassland	Reinstate	Low (2)	Poor (1)	0.05	0.10
B6 Poor semi improved grassland	Reinstate	Low (2)	Poor (1)	2.41	4.82
C3.1 Other tall herb and fern – ruderal	Reinstate	Low (2)	Poor (1)	0.01	0.00
G1 Standing water - eutrophic	Reinstate	Medium (4)	Moderate (2)	1.17	9.36
Hardstanding	Reinstate	N/A	N/A	3.47	0
J1.1 Cultivated / disturbed land - arable	Reinstate	Low (2)	Poor (1)	13.83	27.66
J1.2 Cultivated / disturbed land - amenity grassland	Reinstate	Low (2)	Poor (1)	1.42	2.84

JNCC Phase 1 Habitat Type	Mitigation Action	Distinctiveness Score	Condition Score	Area (Ha)	BU
J1.3 Cultivated / disturbed land – ephemeral/short perennial	Reinstate	Low (2)	Poor (1)	2.1	4.2
J3.6 Built-up areas - buildings	Reinstate	N/A	N/A	0	0
J4 Bare ground	Reinstate	Low (2)	Poor (1)	3.08	6.16
G2 Running water	Reinstate	N/A	N/A	0.26	N/A
A1.1.1 Broadleaved woodland – semi-natural	Create	Medium (4)	Moderate (2)	10.13	81.04
A2.1 Scrub – dense / continuous	Create	Medium (4)	Moderate (2)	0.68	5.44
B2.1 Neutral grassland – unimproved	Create	High (6)	Moderate (2)	27.82	333.84
F2.1 Marginal and inundation – marginal	Create	High (6)	Moderate (2)	3.94	47.28
J1.2 Cultivated / disturbed land - amenity grassland	Create	Low (2)	Moderate (2)	3.07	12.28
J2.3.1 Hedgerow – species-rich with trees	Create	N/A	N/A	1.53	N/A
Hardstanding	Create	N/A	N/A	20.48	N/A
Total				117.42	582.18

Table C-5 – Post-Development Hedgerow Linear Units (LU)

JNCC Phase 1 Habitat Type	Mitigation Action	Length (m)	LU

J2.1.2 Hedgerow – species-poor (intact)	Retain	3,152	9,456
J2.2.2 Hedgerow – species-poor (defunct)	Retain	157.3	157.3
J2.3.1 Hedgerow – species-rich with trees	Retain	0.9	2.7
J2.3.2 Hedgerow – species-poor with trees	Retain	157	471
J2.1.2 Hedgerow – native species-rich (intact)	Reinstate	2,617.96	2,617.96
J2.2.1 Hedgerow – native species-rich (defunct)	Reinstate	30.7	30.7
J2.2.2 Hedgerow – native species-poor (defunct)	Reinstate	845.28	845.28
J2.3.1 Hedgerow with trees – native species-rich (intact)	Reinstate	19.92	19.92
J2.3.2 Hedgerow with trees – native species-poor (intact)	Reinstate	1,115.32	1,115.32
J2.1.1 Hedgerow - native species rich (intact)	Create	12,499.3	12,499.3
Total		20,595.68	27,215.48

Table C-6 – Post-Development Length of Watercourse

JNCC Phase 1 Habitat Type	Length (m)
G2 Running water (retained)	121.11
G2 Running water (reinstated)	1,250.2
Total	1,371.31

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