A83 Rest and Be Thankful

LTS EIAR VOLUME 4, APPENDIX 4.1 - BIODIVERSITY NET GAIN / NATURAL CAPITAL ASSESSMENT

Transport Scotland

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A4-1. Introduction

A4-1.1.1. In support of the A83 Rest and Be Thankful Long-Term Solution (LTS), hereafter referred to as the 'Proposed Scheme', the AtkinsRéalis WSP Joint Venture (AWJV) have developed a combined Biodiversity Net Gain (BNG) and Natural Capital assessment to contribute to the Environmental Impact Assessment (EIA) Report.

A4-1.2. Key concepts

A4-1.2.1. The National Planning Framework 4 (NPF4) and the Scottish Government Draft Planning Guidance: Biodiversity mention that "*in order for biodiversity to be 'enhanced' it will need to be demonstrated that it will be in an overall better state than before intervention, and that this will be sustained in the future."* The NPF4 policy requirement for enhancement of biodiversity is additional to existing habitat and species protections and is intended to reinforce the mitigation hierarchy.

A4-1.2.2. Meanwhile, Natural Capital is defined by NatureScot as the elements of nature (e.g. habitats and ecosystems) which "*provide social, environmental and economic benefits to humans*". A Natural Capital approach looks to support the effective management of natural assets by accounting for the value they generate to people, society and businesses via 'ecosystem services'.

A4-1.3. Proposed Scheme

A4-1.3.1. The Proposed Scheme includes a permanent solution to address the landslide and debris flow risk to the A83. Alongside this, interventions to the Old Military Road (OMR), which operates as the local diversion of the trunk road network when the A83 is closed, are required to improve the suitability of the OMR for traffic while the LTS is being constructed. Further information is presented in Volume 2, Chapter 4 – The Proposed Scheme.

A4-1.3.2. The LTS and Improvements to the OMR would be constructed over a period of five years. The OMR construction period, being one year and from the point

where the OMR is operational, the A83 would be closed to facilitate the construction of the LTS over a period of three to four years. Once the LTS is operational, the OMR would be closed for public use and the Proposed Scheme would be complete.

A4-1.4. Legislation, policy and guidance

A4-1.4.1. The Proposed Scheme has various policy drivers concerning biodiversity enhancement and Natural Capital. These drivers comprise specific requirements under NPF4 and the strategic 'environment' objective for the Proposed Scheme.

A4-1.4.2. The Planning (Scotland) Act 2019 requires the NPF4 to protect biodiversity from development, reverse biodiversity loss, deliver beneficial effects from development and strengthen nature networks. NPF4 thus has various cross-cutting requirements relating to biodiversity and Natural Capital.

A4-1.4.3. The Proposed Scheme objective for the environment is "Protect the environment, including the benefits local communities and visitors obtain from the natural environment, by enhancing Natural Capital assets and ecosystem service provision through delivery of sustainable transport infrastructure."

A4-1.4.4. The policy drivers for biodiversity enhancement and Natural Capital are summarised in Table A4-1.1-1 below.

Table A4-1.1-1 –Biodiversity and Natural Capital policy requirements

Biodiversity	Natural Capital
NPF4 Policy 3a: "[All] *Development proposals will contribute to the enhancement of biodiversity, including where relevant, restoring degraded habitats and building and strengthening nature networks and the connections between them.*"	NPF4 Policy 3d: "*Any potential adverse impacts, including cumulative impacts, of development proposals on biodiversity, nature networks and the natural environment will be minimised through careful planning and design. This will take into account the need to*

Biodiversity	Natural Capital
NPF4 Policy 3b: "*the proposal will conserve, restore and enhance biodiversity, including nature networks so they are in a demonstrably better state than without intervention. This will include future management. To inform this, best practice assessment methods should be used. Proposals within these categories will demonstrate how they have met all of the following criteria… significant biodiversity enhancements are provided*." NPF4 Policy 3d: "*Any potential adverse impacts, including cumulative impacts, of development proposals on biodiversity, nature networks and the natural environment will be minimised through careful planning and design. This will take into account the need to reverse biodiversity loss, safeguard the ecosystem services that the natural environment provides, and build resilience by enhancing nature networks and maximising the potential for restoration*."	*reverse biodiversity loss, safeguard the ecosystem services that the natural environment provides, and build resilience by enhancing nature networks and maximising the potential for restoration*." Further NPF4 Policy 3b requirement for 'development proposals for national or major development, or for development that requires an Environmental Impact Assessment,' is that "*local community benefits of the biodiversity and/or nature networks have been considered*."

A4-1.4.5. The Scottish Government's supplementary Biodiversity: draft planning guidance confirms that, "*NPF4 does not specify or require a particular assessment approach or methodology to be used*" and "*assessment may be qualitative or quantitative (for example through use of a metric).*"

A4-1.4.6. To provide assurance in meeting the NPF4 biodiversity requirements, a metric-based approach has been followed to assess the Proposed Scheme: specifically, a BNG approach using the Statutory Biodiversity Metric (as adopted in England) (herein referred to as 'the Metric'). It should be clarified

that BNG has no statutory requirement in Scotland. This contrasts with the mandating of this approach in England under secondary legislation arising from the Environment Act. However, the Metric provides a way of measuring and accounting for biodiversity losses and gains resulting from development and/or land management change. The Metric is deemed to provide the most appropriate best practice method in the absence of a Scottish-specific biodiversity accounting tool, to help demonstrate that biodiversity enhancement is predicted. This approach was discussed and agreed with the A83 Environmental Steering Group (ESG).

A4-1.4.7. To provide assurance in meeting the NPF4 Natural Capital requirements, a Natural Capital assessment has been used to assess the Proposed Scheme: specifically, the use of a metric called the Nature Assessment Tool for Urban and Rural Environments (short: NATURE Tool) (details in Section A4-3.1). The NATURE Tool provides a Natural Capital score for a range of ecosystem services and for the project overall and compares the baseline to the post-development scenario.

A4-1.5. Consenting approach

A4-1.5.1. This report aims to demonstrate the compliance of the Proposed Scheme with the biodiversity and Natural Capital policy requirements described in the previous section. Through the iterative assessment process during the design development, a requirement to provide additional habitat creation and enhancements was identified to ensure that NPF4 requirements and the Proposed Scheme's environmental objective would be achieved. This appendix also includes a BNG and Natural Capital Assessment of the proposals for this additional habitat creation and enhancement.

A4-1.6. Approach to BNG and Natural Capital delivery

A4-1.6.1. To deliver on the various BNG and Natural Capital policy requirements stated in the previous section, two approaches have been followed. The first of these is habitat creation and enhancement of retained habitats on-site within the Proposed Scheme's Improvements to the OMR and LTS land take areas, the

design for which has been prepared in collaboration with the Landscape design team. Secondly, enhancement sites have been identified in proximity to the Proposed Scheme. Sites were identified through consultation with Forestry and Land Scotland (FLS) as one of the main landowners in the area local to the Proposed Scheme. Proposals for each enhancement site were developed in consultation with FLS to achieve both biodiversity and Natural Capital enhancements.

A4-1.6.2. These enhancement sites have been included within the Proposed Scheme Boundary. Volume 3, Figures 4.10 - OMR Improvements Enhancement sites Baseline Terrestrial and Watercourse Habitat Plan and Volume 3, 4.12 LTS Enhancement sites Baseline Terrestrial and Watercourse Habitat Plan present the location of the four identified enhancement sites.

A4-1.6.3. A description of the ecological baseline for each of the enhancement sites is provided in Volume 4, Appendix 11.16 Enhancement Site Survey Report for terrestrial habitats, and Volume 4, Appendix 11.6 Aquatic Receptor Report for watercourses.

A4-2. Biodiversity Net Gain Assessment

A4-2.1. Assessment methodology

A4-2.1.1. BNG is an approach that aims to leave the natural environment in a measurably better state than beforehand. In the absence of a specific Scottish metric or tool at the time of reporting, the Statutory Biodiversity Metric has been used to undertake the BNG assessment to inform the EIA. This approach was discussed and agreed with members of the ESG. The version of the Statutory Biodiversity Metric used for the assessment was downloaded for use in August 2024.

A4-2.1.2. Whilst the Metric was developed for use in England, it includes all the habitats present within the Proposed Scheme and is in line with Policy 3 of NPF4, which refers to the use of "*best practice assessment methods*" to assess whether a proposal can meet the criteria of conserving, restoring and enhancing biodiversity in the absence of a single accepted methodology for doing so. It is therefore considered to be the most appropriate tool to use for the BNG assessment in a Scottish context at this time. In completing the BNG assessment, consideration has been given to Scottish specifics in terms of habitat importance based on those habitats listed on the Scottish Biodiversity List. Any deviation from the Metric model were transparently outlined and justified.

A4-2.1.3. The output from the Metric has been used to evidence how significant biodiversity enhancements are provided, in addition to any proposed mitigation. The use of the Metric allows this to be done in a measured and quantifiable way.

A4-2.1.4. This BNG assessment quantifies the baseline biodiversity value (using habitat type and condition as a proxy and measured in biodiversity units) and calculates the predicted habitat units (HU) for the post development and considers the Proposed Scheme Boundary.

A4-2.1.5. For the purposes of the BNG assessment the Proposed Scheme Boundary encompasses the Improvements to the OMR, LTS and the enhancement sites, but does not include the wider areas of habitats recorded within the 250 metre (m) survey buffer to the Proposed Scheme, (as described in Volume 4, Appendix 11.4 Designated Sites and Terrestrial Habitat Report). The enhancement sites data are entered into the offsite tabs of the Metric (i.e. are excluded from the on-site baseline) as these locations have purely been included in the Proposed Scheme for habitat creation and enhancement purposes and will not be affected by any construction works.

A4-2.1.6. The Proposed Scheme Boundary also includes two locations that are receptor sites to be used as necessary for ecological mitigation and an earth bund, but as there is no habitat change proposed to these receptor sites and earth bund, these have been excluded from the BNG assessment. These locations are shown on Volume 3, Figure 4.8 – Proposed Scheme Baseline Terrestrial and Watercourse Habitat Plan, labelled as Receptor Sites 1 and 2.

A4-2.1.7. The Beinn an Lochain Site of Special Scientific Interest (SSSI) is located within the Proposed Scheme Boundary. The area of the SSSI that overlaps with the Proposed Scheme is also excluded from the BNG assessment. Impact assessment, proposed mitigation and compensation measures to account for the localised loss of this area of SSSI is detailed in Volume 2, Chapter 11 Biodiversity.

A4-2.1.8. Watercourses and a 15m buffer to the watercourse footprint have also been excluded from the terrestrial BNG assessment.

A4-2.2. Terrestrial habitats

A4-2.2.1. The terrestrial habitat baseline HUs have been calculated using the following data sources:

- UK Habitat Classification (UKHab) and Habitat Condition Assessment (HCA) collected in June 2021, and July and August 2022 for the LTS/ Improvements to the OMR and April and June 2024 for the enhancement sites. Methods for data collection and quality assurance are detailed in full

in Volume 4, Appendix 11.4 Designated Sites and Terrestrial Habitat Report).

- Drone footage of the Improvements to the OMR and LTS and the four enhancement sites was obtained in May 2024, and a review of this imagery against the baseline data was undertaken to provide greater accuracy of habitat distribution.

A4-2.3. Watercourse habitats

A4-2.3.1. The assessment of post-development creation and/or enhancement of WBUs has been based upon the following criteria:

- All watercourses within permanent land take areas of the Proposed Scheme are to be 'lost' i.e. open water 'lost' and culvert 'created'.
- Subject to specific design elements associated with the Proposed Scheme, watercourses within temporary land take areas will either be retained in the same condition, will reduce in condition (represented within the metric as loss then creation in reduced condition), or will increase in condition (represented within the metric as enhancement).

A4-2.3.2. Watercourses (rivers, streams and ditches) are assessed as linear habitats under the Metric, reported separately from core terrestrial (area-based) habitats.

A4-2.3.3. On-site baseline linear Watercourse Biodiversity Units (WBUs) were calculated using a combined desk study and site survey approach. Using GIS, Ordnance Survey mapping was used to calculate the baseline lengths of the watercourses (rivers and streams) within the Proposed Scheme boundary, including where the Proposed Scheme boundary falls within the 10m riparian corridor of watercourses. No ditches were recorded within the desk study for the equivalent area (the Proposed Scheme boundaries and within 5m of this boundary).

A4-2.3.4. Lengths of watercourse within the Proposed Scheme were delineated into sections of consistent hydro-morphological and riparian character. These are

referred to as BNG reaches within this assessment and are shown on Volume 3, Figure 4.14 LTS Enhancement Sites BNG Watercourse Reach Plan.

A4-2.3.5. To determine the baseline WBUs, four key quality components were assessed and inputted into the Metric (along with length of watercourse within the Proposed Scheme). These are:

- distinctiveness (determined by watercourse type)
- strategic significance
- river condition (determined from field-based Modular River Physical Habitat (MoRPh) survey)
- watercourse and riparian encroachment

A4-2.4. Watercourse type, distinctiveness and condition

A4-2.4.1. Watercourse type (i.e. Priority River Habitat, Other Rivers and Streams, Ditches, Canals or Culverts) was identified initially through a desk-based assessment of Ordnance Survey maps, satellite imagery, priority river habitat definitions and historical maps. River distinctiveness is automatically generated in the Metric based on the type of watercourse. Watercourse type, assigned during desk study, was verified based on site visit.

A4-2.4.2. Watercourse condition was assessed using the MoRPh survey methodology that is required to conduct a River Condition Assessment as stated in the Metric. MoRPh surveys were conducted across more than 20% of the watercourses within the Proposed Scheme (as defined by the Metric) in January and June 2024. MoRPh surveys were conducted by an accredited MoRPh Pro surveyor. Results were uploaded to the Cartographer platform and the River Type desk-based assessment conducted in order to complete the River Condition Assessment.

A4-2.4.3. No ditches were identified in the Proposed Scheme boundary and therefore the ditch condition assessment was not undertaken.

A4-2.4.4. No condition assessment is required for culverts as they are automatically assigned a ‘low’ condition by the Metric.

A4-2.5. Watercourse and riparian encroachment

A4-2.5.1. Watercourse and riparian zone encroachment are features or interventions within the watercourse and riparian zones that reduce the quantity, quality or ecological function of the habitat, including infrastructure and management practice such as agriculture.

A4-2.5.2. These are included within the baseline and post development elements of the Metric and influence the overall WBUs attributable to each watercourse. The riparian zone is defined as a 10m zone from top of the riverbank (for watercourses other than ditches). This area would naturally be periodically flooded and directly influences the hydrological, geomorphological and biological functions and processes within the river channel.

A4-2.5.3. Encroachment is considered as 'No encroachment', 'Minor' or 'Major' depending on how far artificial development has encroached towards the river within the riparian zone on both banks or within and along the river channel. Encroachment is not recorded for culverts, instead it is automatically assigned the 'N/A' option within the calculation tool which assigns set multipliers.

A4-2.6. Post data collection QA

A4-2.6.1. Project design drawings were converted from Computer-Aided Design (CAD) software to an ArcGIS environment. ArcGIS was then used to calculate the area of each habitat type within the Proposed Scheme and was further grouped by condition to give the overall area (hectares, ha) or length (kilometres, km) (for watercourses) of each habitat type of each condition level.

A4-2.7. Calculating Biodiversity Units using Statutory Biodiversity Metric

A4-2.7.1. The Metric uses several measures to quantify baseline biodiversity value for each habitat type within a development site boundary. These measures indicate the habitats' intrinsic value (i.e., its distinctiveness), its condition and its area (in hectares) or length (for watercourses, in kilometres). In addition, the strategic significance of the location of any habitats within the development site boundary and the enhancement sites is taken into account by applying a spatial multiplier.

A4-2.7.2. Strategic significance has been assigned following the methods sets out through the Metric, following a review of local strategies and plans. The following sources of information were reviewed:

- The river basin management plan for Scotland 2021-2027
- LLTNP Trees and Woodland Strategy
- National Park Partnership Plan
- The Rest and Be Thankful Woodland Creation Plan
- Sitelink
- Defra's Magic Map Application
- Native Woodland Survey of Scotland
- Scotland's Forestry Strategy
- The UK Forestry Standard
- UK Woodland Assurance Standard

A4-2.7.3. As the Proposed Scheme is located within the Loch Lomond and The Trossachs National Park (LLTNP), strategic significance has been assessed as high for all habitats.

A4-2.7.4. A habitat's distinctiveness score is derived from the habitat type's biodiversity value, reflecting the rarity of the plant community, its value to fauna, and its ecosystem function. This score is pre-assigned and is pre-populated in the Metric based on terrestrial habitat/river type.

A4-2.7.5. Post-development biodiversity units are calculated the same way but with the addition of risk multipliers that take into account the difficulty and time it takes to create new habitat or enhance existing habitat. These temporal and risk related multipliers are set within the Metric and cannot be changed.

A4-2.7.6. In order to calculate the overall net change in HU, the baseline units are subtracted from the post-development units. Whilst the Metric identifies the habitat type 'purple moor-grass and rush pastures' as being of 'Very High Distinctiveness', in Scotland this habitat type is fairly common and widespread. As a result of degradation, this habitat does not always closely match the

species' compositions and structure as described in UKHab. To better reflect the value of this habitat within a Scottish context, for the onsite baseline, this widespread habitat has been inputted into the Metric as upland acid grassland (as presented in the baseline and post development tables A4-1.2-1 and A4-1.2-3 respectively), which is valued at medium distinctiveness; this measure will ensure that the baseline value is not unreasonably inflated.

A4-2.7.7. For the enhancement sites, habitat recorded as 'purple moor-grass and rush pastures', a precautionary approach is taken, and this habitat type is entered into the metric as such. For Sites 3a and 3b, these habitats are located along river corridors, where the habitat is wetter and more aligned to the UKHab definition of this habitat type and supported greater baseline species diversity. For Site 1 the ground water here is heavily influenced by the presence of Sitka woodland, it is considered the removal of this, would allow for enhancement of this habitat type with greater species diversity. For Site 2, while purple moor-grass and rush pasture is present, changes to this habitat are not predicted, so it is simply recorded as retained habitat. In Site 2 woodland creation is one of the main targets, with creation of upland birchwood - type being the aim for much of this site. As a reflection of the challenges associated with creating upland birchwood in good condition, this has been entered into the Metric as other broadleaved woodland.

A4-2.8. Limitations and Assumptions

A4-2.8.1. As the Improvements to the OMR are anticipated to take approximately one year to complete and the LTS Scheme is anticipated to take three to four years to complete, it has been assumed that no vegetated habitats would be reinstated or created within the Proposed Scheme until after this time, with the exception of the urban categories pertaining to the Proposed Scheme.

A4-2.8.2. Difficulty and time to target condition (TTTC) values have been assigned as per the values given in the Metric with an additional one year added to all post-development vegetated habitats for the Improvements to the OMR and four years for the LTS to reflect the worst-case scenario. This applies specifically to onsite areas. With respect to the enhancement sites, Sites 1 and 3a, works will

be undertaken following the completion of the Improvements to the OMR, so a one year delay has been applied to them in the Metric. With respect to Sites 2 and 3b a four year delay has been applied as the enhancement works to these sites will commence following completion of the LTS. Earlier implementation of the management changes to the enhancement sites will be explored as the project progresses and will require further coordination between Transport Scotland and FLS.

A4-2.8.3. Watercourse enhancements within the enhancement sites are driven by riparian habitat improvements that will take time to establish. Therefore, on a precautionary basis, a manual adjustment has been made to account for the establishment of these riparian habitats and more complex riparian habitat vegetation structure (i.e. wooded features that improve watercourse condition). This approach creates a delay that comprises a combination of the 15 years post enhancement scenario plus the additional one year construction delay for Site 1 and 3a, and a four year construction delay for Site 3b in watercourse enhancement, aligning with the values for woodland creation given in the Metric.

A4-2.8.4. Extremely minor edits were made to the scheme boundary during finalisation of the EIAR (totalling less than 0.25 ha collectively across the Proposed Scheme), but these have not been taken into account in area calculations provided in this Appendix. This is not considered to create any significant limitations on this assessment.

A4-2.8.5. Minor edits were also made to the enhancement site boundaries for Sites 1 and 3b. For Site 1 the changes were below 0.001ha so the HU achieved from these small areas is negligible and therefore this does not affect the BNG and Natural Capital calculations. For Site 3b the change in site boundary results in an increase in the mixed scrub area from 0.4ha to 0.48ha. However, there is no change to this area post development as it is being retained and no change to condition, therefore there is no change to the total net unit change, and this does not affect the BNG and Natural Capital calculations.

A4-2.8.6. For Site 2, the post development habitat calculations and Volume 3, Figure 4.13 - LTS Enhancement sites Post Development Terrestrial and Watercourse Habitat Plan reflect the proposed woodland planting for this Site. However, this Figure is an indicative representation of the extent for which woodland would be planted across Site 2, rather than the exact location of all woodland; finer details will be provided within the habitat management plans as the project progresses.

A4-2.8.7. Habitats were mapped in the field using professional judgement and informed by aerial imagery. Habitat areas are measured within GIS, which creates a high degree of precision. However, boundaries between habitats are sometimes observed as gradual changes in habitat type, so despite the level of precision in area calculations there is always a slight element of approximation involved in calculations. Area calculations are based on areas in hectares being rounded to two decimal places before being entered into metric. Therefore, there may be a difference of 0.01 hectares (ha) between the Proposed Scheme or enhancement site area and total baseline habitat area based on rounding up or down of values. Additionally, areas smaller than 0.01ha appear as 0.00ha in the Metric. The HU achieved from these small areas is negligible and therefore this does not affect the BNG calculations.

A4-2.8.8. In some locations within the enhancement sites, land access was limited due to reasons of health and safety or was limited due to landowner restrictions. In these locations, UKHab classification has been assigned based upon a review of the nearest publicly accessible area and assumptions on the likely habitat types and their condition has been based on the condition of adjacent land of similar composition, characteristics and land management which had been accessible, in combinations with a review of available online mapping resources, historical survey data, and recent drone footage.

A4-2.8.9. A precautionary approach to the baseline HCA has been taken for habitats within the enhancement sites for which no field data were available, using the condition that was recorded in adjacent parcels of the same habitat type, as follows:

- purple moor-grass and rush pastures and fens are assumed to be in moderate condition
- upland birchwood is assumed to be in poor condition due to the presence of grazing animals as observed in other plots of the same habitat type
- other coniferous woodland (non-native conifer plantation) is assumed to be in poor condition

A4-2.8.10. Given that not every individual watercourse was subject to survey (see Volume 4, Appendix 11.6 Aquatic Receptor Report for watercourses), there is a risk that the condition of certain watercourse extents has been misclassified during the assessment. However, MoRPh survey effort exceeded the 20% coverage requirement dictated by the MoRPh method, and survey effort is therefore not considered a significant limitation in the context of the overall assessment.

A4-2.8.11. Outline designs have been produced for the enhancement areas, in consultation with FLS. This provides indicative locations for habitat enhancements and creation. As the project progresses, detailed habitat management plans will be produced for each site, and during the development of these there may be some adjustments to the plans. It is however considered that the indicative plans provide a sufficiently accurate level of detail at this stage of the project to inform the BNG assessment and level of predicted change in biodiversity that can be achieved through these sites.

A4-2.8.12. The enhancement site habitat management proposals will be developed further at the detailed design stage of the project in agreement with FLS. For example, detailed aspects such as deer management, including the location of deer fencing, will be refined in the detailed habitat management plans which will be developed as the project progresses. Due to the presence of invasive non-native species (INNS) within the Proposed Scheme an appropriate INNS management plan will be developed by the appointed contractor.

A4-2.8.13. A phasing approach is beyond the scope of the enhancement sites proposal at this stage. A precautionary approach has been taken to the calculations, which means the TTTC takes account of potential delays between habitat losses and

habitat creation. The appointed enhancement sites contractor, would be responsible of proposing a phased approach, if required.

A4-2.8.14. As discussed in Volume 4, Appendix 11.2 Biodiversity Legislation, Planning Policy and Guidance, any woodland removal would follow the Scottish Government's Control of Woodland Removal Policy. Woodland planting and management proposals undertaken in line with the UK Forestry Standard, the Loch Lomond and Trossachs National Park (LLTNP) National Park Partnership Plan (NPPP), LLTNP Trees and Woodland Strategy, the UKWAS and the Forestry Commission's Creating New Native Woodlands guidance.

A4-2.8.15. The Carbon and Peatland map indicates that there is an area of Class 1 peat within Site 2; in advance of any finalisation of enhancement plans peat probing is proposed to be undertaken in these areas to identify any areas of deeper peat. This would include existing vegetation analysis, visual evidence of disturbed ground to augment the probe data, and topography at the location in assessing whether deep deposits are likely.

A4-2.8.16. The proposed planting within the BNG / Natural Capital areas will develop based upon these results taking account of areas of deep peat and seeking to avoid impacts to these areas where possible. This will be an iterative process and will be informed through discussions with Forestry and Land Scotland and will be reflected in updates to the BNG / Natural Capital Assessment and the Outline Peat Management Plan as the project progresses through Specimen and Detailed Design.

A4-2.9. BNG Results

Proposed Scheme Baseline

A4-2.9.1. A summary of the habitat baseline within the Proposed Scheme is shown in Table A4-1.2-1 below; baseline habitats are shown in Volume 3, Figures 4.8 – Proposed Scheme Baseline Terrestrial and Watercourse Habitat Plan. Areas and percentages are rounded to two decimal points in the below table; a 15m buffer to the watercourses and the area occupied by the watercourses has been removed from the habitat area calculations, as per Volume 3, Figure 9.3-

Landscape and Ecological Mitigation. Full details within respect to the habitats present can be found within Volume 4, Appendix 11.4 Designated Sites and Terrestrial Habitats Report. Note there are no terrestrial linear habitats present within the Proposed Scheme.

A4-2.9.2. A4-1.2-1 list all habitats within the Proposed Scheme, this is therefore a more detailed list of habitats than that provided within Volume 2, Chapter 11 Biodiversity and Volume 4, Appendix 11.4 Designated Sites and Terrestrial Habitat Report as these focus only on habitats of local nature conservation value or higher. The approach with respect to purple moor grass and rush pasture also differs, however in the case of Volume 2, Chapter 11 Biodiversity and Volume 4, Appendix 11.4 Designated Sites and Terrestrial Habitat Report this is taken into account through the valuation assigned to that habitat type.

A4-2.9.3. The baseline condition of watercourses within the Proposed Scheme is summarised within Annex A.

Table A4-1.2-2 Summary of terrestrial habitat baseline within the Proposed Scheme

UKHab Level 4 Primary Habitat Type	Habitat Condition	Area within Survey Area (ha/km)	Percentage cover of habitat %	Habitat Units (HU)
c1b - Temporary grass and clover leys	N/A	0.02	0.07	0.05
f2c - Upland flushes, fens and swamp	Good	1.91	6.53	52.72
g1b - Upland acid grassland (of which 7.82ha is f2b - Purple moor grass and rush pastures)	Good	8.59	10.61	118.54
g1b - Upland acid grassland (of which 2.36ha is f2b - Purple moor grass and rush pastures)	Moderate	2.36	8.07	21.71

UKHab Level 4 Primary Habitat Type	Habitat Condition	Area within Survey Area (ha/km)	Percentage cover of habitat %	Habitat Units (HU)
g1b - Upland acid grassland	Poor	0.25	0.85	1.15
g1c - Bracken	N/A	7.19	24.58	16.54
g2b - Upland calcareous grassland	Good	0.19	0.65	4.14
g3c - Other neutral grassland	Good	1.99	6.78	27.46
g3c - Other neutral grassland	Moderate	0.72	2.48	6.62
g3c - Other neutral grassland	Poor	0.1	0.34	0.46
h1b - Upland heathland	Good	0.13	0.44	2.69
h1b - Upland heathland	Moderate	0.33	1.13	4.55
h1b - Upland heathland	Poor	0.02	0.05	0.14
h3d - Bramble scrub	N/A	0.01	0.02	0.05
h3h - Mixed scrub	Good	0.03	0.11	0.41
h3j - Willow scrub	Poor	0.02	0.06	0.09
u1b - Developed land; sealed surface	N/A	3.99	13.63	0.00
u1c - Artificial unvegetated, unsealed surface	N/A	0.26	0.89	0.00
u1e - Built linear features	N/A	0.19	0.64	0.00
w2c - Other coniferous woodland	Poor	0.93	3.17	2.14
w1e - Upland birchwood	Poor	0.05	0.17	0.35
/	/	/	Total HU	259.81

Watercourse baseline

A4-2.9.4. Fifty-four watercourses are present within the Proposed Scheme. See Volume 3, Figure 11.6 - Aquatic Ecology Screening Area and Volume 4, Appendix 11.6 - Aquatic Receptor Report for a detailed baseline of all aquatic receptors within the Proposed Scheme.

A4-2.9.5. Most watercourses within the Proposed Scheme have been categorised as 'Other Rivers and Streams' watercourse type with two exceptions. Discrete culvert lengths under the existing OMR and A83 which have been classified as 'Culvert', and the extent of the River Croe downstream of its eastern bifurcation, as well High Glen Croe Tributary are classed as priority river habitat on account of supporting *Baetis niger* – a JNCC Criterion Level A species under the priority habitat definition for rivers.

A4-2.9.6. A total of 29 MoRPh surveys were undertaken to inform the baseline watercourse condition of the Proposed Scheme. MoRPh survey locations and methodology are detailed in Volume 4, Appendix 11.6 - Aquatic Receptor Report and shown on Volume 3, Figure 11.6 - Aquatic Ecology Screening Area and Survey Results.

A4-2.9.7. A summary of the watercourse baseline for the Proposed Scheme is provided in A4-1.2-2 below.

Table A4-1.2-3 Watercourse baseline extent and condition

Watercourse Type	Condition	Length (km)	Percentage length of watercourse (%)	Watercourse Units
Culvert	Poor	0.57	11	0.89
Other Rivers and Streams	Fairly Poor	0.66	13	5.11

Watercourse Type	Condition	Length (km)	Percentage length of watercourse (%)	Watercourse Units
Other Rivers and Streams	Moderate	3.86	75	39.95
Other Rivers and Streams	Fairly Good	0.07	1	0.87
Total	N/A	5.15	100	46.81

Proposed Scheme Post Development

A4-2.9.8. A summary of the habitats predicted to be created onsite post development within the Proposed Scheme is shown in

A4-2.9.9. Table A4-1.2-4. The majority of habitat loss will be of purple moor grass and rush pasture, upland flushes, bracken and fens and swamps, with losses of less than 1ha to other coniferous woodland, upland birchwood, upland heathland, willow scrub, mixed scrub and bramble scrub, temporary grass and clover leys and upland calcareous grassland. Gains in habitat extent as shown within the Landscape Mitigation Plan (LTS Landscape Mitigation Drawing A83AAB-AWJ-ELS-LTS_GEN=DR-LE-000005 to 000014) in addition to an additional 0.77ha of the Proposed Scheme infrastructure (man-made urban habitat categories) will comprise of upland acid grassland, other neutral grassland, other inland rock and scree, green roof and rural tree.

A4-2.9.10. Due to rounding up within the Metric, the total area of the post development appears to be 0.05ha smaller than that for the baseline; where an area of habitat totals less than 0.001ha, these are not included in the below table. The post development habitats are shown on Volume 3, Figure 9.3 - Landscape and Ecological Mitigation. The category of Broadleaved woodland/scrub within Volume 3, Figure 9.3 - Landscape and Ecological Mitigation is categorised as Individual tree - Rural tree within the Metric.

Table A4-1.2-4 Summary of habitats post development: Proposed Scheme

UKHab Level 4 Primary Habitat Type	Habitat Condition	Area within Survey Area (ha)	Percentage cover of habitat %	Habitat Units (HU)
f2c - Upland flushes, fens and swamps	Good	0.67	0.23	1.93
g1b - Upland acid grassland (of which 0.26ha was f2b - Purple moor grass and rush pastures)	Good	10.03	34.24	70.48
g1b - Upland acid grassland (of which 0.57ha was f2b - Purple moor grass and rush pastures)	Moderate	0.57	1.94	5.25
g1b - Upland acid grassland	Poor	0.02	0.07	0.09
g1c - Bracken	N/A	0.08	0.26	0.21
g3c - Other neutral grassland	Good	9.77	33.4	87.28
g3c - Other neutral grassland	Moderate	0.07	0.25	0.65
h1b - Upland heathland	Moderate	0.08	0.26	0.97
s1a - Other inland rock and scree	Moderate	2.28	7.78	4.42
u1110 - Other green roof	Poor	1.29	4.41	2.48
u1b - Developed land; sealed surface	N/A	3.79	12.97	0
u1c - Artificial unvegetated, unsealed surface	N/A	1.35	4.6	0
u1e - Built linear features	N/A	0.07	0.24	0
w2c - Other coniferous woodland	Poor	0.04	0.42	0.09

UKHab Level 4 Primary Habitat Type	Habitat Condition	Area within Survey Area (ha)	Percentage cover of habitat %	Habitat Units (HU)
w2e – Upland birchwood	Poor	0.01	0.003	0.07
Rural tree- Individual tree (Note trees sit within the wider baseline habitat, so this area does not form part of the overall % of habitat to avoid double counting)	Moderate	1.42	N/A	4.21
/	/	/	Total HU	178.12

Watercourse post-development

A4-2.9.11. A summary of the watercourse types and conditions created onsite post development within the proposed scheme is shown in A4-1.2-4.

Table A4-1.2-5 – Summary of Improvements to the Proposed Scheme on-site retained, lost, enhanced, and created watercourses.

Watercourse type	Condition	Length (km)	Percentage length of watercourse (%)	Watercourse Units
Culvert	Poor	1.38	2	1.21
Other Rivers and Streams	Poor	0.36	7	0.51
Other Rivers and Streams	Fairly Poor	1.02	20	3.27

Watercourse type	Condition	Length (km)	Percentage length of watercourse (%)	Watercourse Units
Other Rivers and Streams	Moderate	1.72	33	17.82
Other Rivers and Streams	Fairly Good	0.68	13	10.11
Total	N/A	5.16	100	32.92

Summary of Biodiversity Change and Discussion

A4-2.9.12. A summary table of the baseline and predicted post development HU for the Proposed Development is provided in A4-1.2-5.

Table A4-1.2-6 Summary of habitats post development: Proposed Scheme

Baseline Habitat Units	Predicted Post Development Habitat Units	Change in Habitat Units	% Change
259.81	178.12	-81.69	-31.44

Enhancement Sites

A4-2.9.13. This section sets out details with respect to the four proposed enhancement sites. Brief details are provided on the proposed habitat enhancements and creation. Further details with respect to the habitats present in the enhancement sites are provided in Volume 4, Appendix 11.16 Enhancement Site Survey Report, along with details on the proposals.

Site 1

A4-2.9.14. A summary of the BNG assessment for Site 1 is shown in Table A4-1.2-7; baseline habitats are shown in Volume 3, Volume 3, Figure 4.10 - OMR Improvements Enhancement sites Baseline Terrestrial and Watercourse Habitat Plan and proposed enhancements are shown in Volume 3, Figure 4.11 - OMR Improvements Enhancement sites Post Development Terrestrial and Watercourse Habitat Plan. This details how many HU can be gained through the proposed enhancements.

A4-2.9.15. For Site 1 it is proposed that all Sitka spruce plantation including young regenerating Sitka spruce, and any dense Sitka spruce needle litter, arisings and brash that could limit broadleaved woodland creation, is removed whilst minimising soil disturbance. Bracken and small areas of scrub will also be removed. In the locations where the plantation is removed, an open mosaic of planted broadleaved woodland would be created, across the felled footprint, covering approximately 3ha, in moderate condition. Conifer plantation woodland

extraction and management of new woodland will be refined in the detailed habitat management plans, which will be developed with FLS as the project progresses.

A4-2.9.16. For the mosaic of purple moor-grass rush pasture and fens, the presumption is that enhancement of the habitat condition would be achievable through the removal of Sitka spruce, which is likely to result in local changes to the water table. Additionally, the removal of regenerating Sitka saplings and young trees, stumps, needles and brash (where this is feasible whilst minimising soil disturbance) would permit the regeneration of the wetland habitats with a reduction in shade and smothering by needle litter and brash. Together the recommended changes are predicted to enhance the overall condition of the purple moor-grass and rush pastures and fens from moderate to good.

A4-2.9.17. The removal of the Sitka plantation and regenerating Sitka woodland would remove shading of the upland heathland habitats and in combination with the installation of deer fencing (where feasible and necessary) would permit the recovery of previously suppressed heather and bilberry. In time this would result in a greater diversity of heather age class and overall percent coverage of dwarf shrubs. It is predicted that an increase in the condition of the upland heathland from moderate to good would occur.

A4-2.9.18. Additional natural regeneration of native woodland would be feasible at Site 1 in the presence of deer fencing and suitable management and would be included within any management plans that are developed. However, it would only be possible to make a modest estimate of extent and condition that might be achieved, and the success of such regeneration management might not be achieved within the same timelines as described within the Metric. Therefore, native woodland regeneration has not been included with the BNG calculations.

Table A4-1.2-7 Summary of Site 1 BNG Assessment

Habitat type	Baseline Condition	Habitat Area (ha)	Baseline Habitat Units	Proposed Condition	Predicted Post Enhancement Habitat Units
Purple moor grass and rush pastures	Moderate	2.73	50.23	Good	54.92
Purple moor grass and rush pastures	Good	0.37	10.21	Retained as is; Good	10.21
Upland heathland	Moderate	1.07	14.77	Good	17.11
Other coniferous woodland	Poor	3.06	7.04	N/A	N/A
Broadleaved woodland	N/A	3.06	n/a	Moderate	15.92
Fens (upland and lowland)	Moderate	0.68	12.51	Good	13.81
Scrub	Poor	0.01	0.05	Retained as is; Poor	0.05
Bracken	N/A	0.02	0.05	Retained as is: N/A	0.05
Total (Habitat Units)	N/A	N/A	94.85	N/A	112.07 (+17.21)

Site 1: Watercourse baseline

A4-2.9.19. Site 1 includes 0.7km of watercourse habitat (A83_LF_050_000) in fairly good condition, on account of its natural planform, riverbed and riverbank. Moderate levels of grazing from livestock and poor / non-native bank top vegetation cover limit the condition of the watercourse.

Table A4-1.2-8- Summary of Site 1 watercourse baseline

Watercourse	Watercourse type	Baseline length (Km)	Baseline WBUs
A83_LF_050_000	Other Rivers and Streams	0.67	8.67

Site 1: Watercourse post-development

A4-2.9.20. Given the natural planform of the watercourse, aquatic habitat enhancements are restricted to land use change within the riparian corridor (up to 10m from bank top) to improve bank top vegetation cover and richness. As the proposed terrestrial habitat interventions would be undertaken up to and including the bank top, these would also provide aquatic habitat enhancements. Together these enhancements would increase the overall condition of the aquatic habitats within Site 1. Enhancement measures are translated within the Metric to a reduction in riparian encroachment (from major to no encroachment) and an increase of one condition class (from fairly good to good).

A4-2.9.21. An indicative example of how assumed changes translate to MoRPh indicators for watercourses pre- and post- enhancement (that underpin assumed condition change within watercourses) is provided in Annex A.

A4-2.9.22. The proposed interventions are also likely to result in limited uplifts for ecosystem services and Natural Capital, therefore contributing to the respective Proposed Scheme objectives.

Table A4-1.2-9- Summary of Site 1 post development watercourse units

Watercourse	Watercourse type	Enhanced length (km)	Post enhancement WBUs
A83_LF_050_000	Other Rivers and Streams	0.67	12.43

Site 2

A4-2.9.23. A summary of the BNG assessment for Site 2 is shown in A4-1.2-9 below; baseline habitats are shown in Volume 3, Figure 4.12 - LTS Enhancement sites Baseline Terrestrial and Watercourse Habitat Plan and proposed enhancements are shown on Volume 3, Figure 4.13 - LTS Enhancement sites Post Development Terrestrial and Watercourse Habitat Plan. This details how many Habitat Units can be gained through the proposed enhancements.

A4-2.9.24. To improve the condition of all habitats within Site 2, the removal of INNS would be targeted to include Sitka spruce, cotoneaster and New Zealand willowherb. Bracken dominance would also be reduced via targeted strimming.

A4-2.9.25. Planting of a broadleaved woodland mix to replace the majority of the areas of acid grassland/ bracken mosaics is proposed for Site 2. The woodland creation would target upland birch woodland, as the woodland in the surrounding area indicates that this is the natural climax community here, which is likely to have been suppressed by grazing. The presence of woodland ground flora demonstrates that a woodland seedbank is still present, and suggests that soil conditions are favourable, and thus increases the likelihood of successful woodland creation. In total approximately 43.42ha of woodland would be created, in good condition.

A4-2.9.26. Additional natural regeneration of native woodland would be feasible at Site 2, as described for Site 1, in the presence of deer fencing and suitable management and would be included within any management plans that are developed. However, it would only be possible to make a modest estimate of extent and condition that might be achieved, and the success of such regeneration management might not be achieved within the same timelines as

described within the Metric. Therefore, native woodland regeneration has not been included with the BNG calculations for Site 2.

A4-2.9.27. Areas of upland acid grassland in good condition would be retained, with small areas of upland acid grassland in moderate condition enhanced to good condition, to create open glades and to provide habitats for invertebrates and reptiles. The enhancement measures would result in an additional 7.37ha of upland acid grassland in good condition.

A4-2.9.28. Upland birchwood would be enhanced via supplementary woodland planting, and removal of INNS resulting in 3.12ha in moderate condition.

A4-2.9.29. The areas of upland heath and purple moor-grass rush pasture and upland heathland would all be retained. It is considered likely that a change in condition could be achieved if fencing to reduce deer browsing pressure could be installed, but at the time of reporting this has not been agreed, so no change to condition is presumed at this time.

Table A4-1.2-10– Summary of BNG Assessment for Site 2

Habitat type	Baseline Condition	Habitat Area (ha)	Baseline Habitat Units	Proposed Change	Predicted Post Enhancement Habitat Units
Upland acid grassland	Moderate	30.97	284.92	4.07ha grassland enhanced to good condition 0.4ha grassland enhanced to good condition broadleaved woodland 26.5ha grassland enhanced to good condition other broadleaved woodland	49.56 4.80 317.83
Upland acid grassland	Poor	10.9	50.15	3.53ha enhanced to good condition grassland 7.37ha enhanced to good condition broadleaved woodland	32.74 62.74

Habitat type	Baseline Condition	Habitat Area (ha)	Baseline Habitat Units	Proposed Change	Predicted Post Enhancement Habitat Units
Purple moor grass and rush pastures	Good	4.99	137.72	Retained as is; Good	137.72
Purple moor grass and rush pastures	Moderate	2.33	42.87	Retained as is; Moderate	42.87
Bracken	N/A	9.15	21.05	Other broadleaved woodland – created in Good condition	42.78
Upland heathland	Good	4.55	94.19	Retained as is; Good	94.19
Upland birchwood	Poor	3.12	21.53	Enhance condition to moderate	28.85
Total (Habitat Units)	N/A	N/A	652.42	N/A	815.97 (+163.56)

A4-2.9.30. No aquatic habitats have been assessed for this Site.

Site 3a

A4-2.9.31. A summary of the BNG assessment for Site 3a is shown in A4-1.2-10; baseline habitats are shown in Volume 3, Figure 4.10 - OMR Improvements Enhancement sites Baseline Terrestrial and Watercourse Habitat Plan and proposed enhancements are shown on Volume 3, Figure 4.11 - OMR Improvements Enhancement sites Post Development Terrestrial and Watercourse Habitat Plan. This details how many Habitat Units can be gained through the proposed enhancements.

A4-2.9.32. The proposed interventions for Site 3a include the retention of the great majority of the very high distinctiveness habitats: Purple moor grass and rush pastures and Fens (upland and lowland).

A4-2.9.33. These would be enhanced by a reduction in sheep grazing pressure within grassland areas to permit a more varied sward structure to develop, and removal of excessive thatch in purple moor-grass rush pastures in targeted areas. The enhancement measures would be undertaken to improve habitat condition of both grassland and wetland habitats to good condition.

A4-2.9.34. Within the remaining riparian margins of these habitats, low density tree planting would be undertaken sensitively in suitable areas to create a mosaic which includes up to 10% of the area to be occupied by planted broadleaved woodland along the riverbank. In combination with the removal of all non-native Sitka spruce plantation woodland and any regenerating Sitka spruce, to be replaced with planting of a broadleaved woodland mix, this would result in the creation of approximately 0.07 ha of broadleaved woodland.

A4-2.9.35. Fencing or other measures may be necessary to protect newly developing woodland from deer and sheep grazing.

A4-2.9.36. Removal of any INNS such as rhododendron shall also be undertaken within this Site.

Table A4-1.2-11 Summary of Site 3a BNG Assessment

Habitat type	Baseline Condition	Habitat Area (ha)	Baseline Habitat Units	Proposed Condition	Predicted Post Enhancement Habitat Units
Purple moor grass and rush pastures	Moderate	2.39	43.98	Good	48.08
Purple moor grass and rush pastures	Good	0.12	3.31	Retained as is; Good	3.31
Fens (upland and lowland)	Good	0.23	6.35	Retained as is; Good	6.35
Other neutral grassland	Good	0.63	8.69	Retained as is; Good	8.69
Other coniferous woodland	Poor	0.07	0.16	Moderate	0.36
Individual Rural Tree	N/A	N/A	N/A	Moderate	1.10
Total (Habitat Units)	N/A	N/A	62.49	N/A	67.89 (+5.41)

Site 3a: Watercourse baseline

A4-2.9.37. The watercourse habitat has been assessed as being in fairly good condition. The watercourse displays a semi sinuous planform with a high degree of

morphological feature diversity. However, bank top/ face vegetation cover and richness are low and modified riparian land use (plantation and agriculture) limits the condition.

Table A4-1.2-12 - Summary of Site 3a watercourse baseline

Watercourse	Watercourse type	Baseline length (Km)	Baseline WBUs
High Glen Croe	Priority Habitat	1	17.25

Site 3a: Watercourse post-development

A4-2.9.38. Given the natural planform of the watercourse, aquatic habitat enhancements are restricted to land use change within the riparian corridor to improve bank top vegetation cover and richness. Proposed terrestrial habitat interventions would be undertaken up to and including the bank top.

A4-2.9.39. Under the existing baseline, negative watercourse MoRPh indicators are predominantly associated with reduced riparian habitat complexity and an absence of wooded features normally associated with broadleaved tree cover, which is a legacy of agricultural (including forestry plantation) land use. INNS also contribute to negative watercourse MoRPh indicators. Collectively, the proposed enhancement measures (riparian planting, exclusion fencing, where feasible, reduced grazing pressure and removal of INNS), will therefore also improve the condition of the High Glen Croe Tributary within Site 3a, where such measures fall within the 10m riparian corridor. Enhancement measures are translated within the metric to a reduction in riparian encroachment (from major to no encroachment) and an increase of one condition class (from fairly good to good).

A4-2.9.40. An indicative example of assumed changes in watercourse MoRPh indicators pre- and post- enhancement (that underpin assumed condition change within watercourses) is provided in Annex A.

Table A4-1.2-13- Summary of Site 3a post development watercourse units

Watercourse	Watercourse type	Enhanced length (km)	Post enhancement WBUs
High Glen Croe	Priority Habitat	1	24.74

Site 3b

A4-2.9.41. A summary of the BNG assessment for Site 3b is shown in A4-1.2-13 below; baseline habitats are shown in Volume 3, Figure 4.12 - LTS Enhancement sites Baseline Terrestrial and Watercourse Habitat Plan and proposed enhancements are shown on Volume 3, Figure 4.13 - LTS Enhancement sites Post Development Terrestrial and Watercourse Habitat Plan. This details how many Habitat Units can be gained through the proposed enhancements.

A4-2.9.42. The very high and high distinctiveness habitats within Site 3b would be retained. The following enhancement measures would be undertaken with the aim to improve habitat condition for grassland and wetland habitats: a reduction in grazing pressure within grassland areas to permit a more varied sward structure to develop, and removal of excessive thatch in purple moor-grass rush pastures to be undertaken in targeted areas.

A4-2.9.43. Within the riparian margins of these habitats low density tree planting would be undertaken sensitively in suitable areas to create a mosaic which includes broadleaved woodland and scattered trees along the riverbank.

A4-2.9.44. For those areas of mixed scrub, upland heathland and upland birchwood recorded as being in poor condition, the following enhancement measures are proposed with the aim of improving their structure and species' compositions: reduction of grazing pressure via deer fencing and/or tree protection measures; removal of INNS; thinning of scrub; bracken control; and supplementary planting of suitable native tree, shrub and heath species where necessary.

A4-2.9.45. Fencing or other measures may be necessary to protect newly developing woodland and areas of existing woodland, heathland and scrub that are to be enhanced from deer and sheep grazing.

A4-2.9.46. Removal of any INNS such as Sitka and rhododendron and control of bracken shall also be undertaken within additional areas of this Site where necessary to prevent spread into areas targeted for management.

A4-2.9.47. Specifics of habitat enhancement and creation measures will be refined in the detailed habitat management plans which will be developed with FLS as the project progresses.

Table A4-1.2-14 – Summary of BNG Assessment for Site 3b

Habitat type	Baseline Condition	Habitat Area (ha)	Baseline Habitat Units	Proposed Condition	Predicted Post Enhancement Habitat Units
Artificial unvegetated, unsealed surface	N/A	0.05	0	N/A	0
Bracken	N/A	0.63	1.45	Other woodland; broadleaved in Moderate condition	2.95
Developed land; sealed surface	N/A	0.13	0	N/A	0
Fens (upland and lowland)	Good	0.03	0.82	Retained as is; Good	0.82

Habitat type	Baseline Condition	Habitat Area (ha)	Baseline Habitat Units	Proposed Condition	Predicted Post Enhancement Habitat Units
Fens (upland and lowland)	Moderate	0.16	2.94	Good	3.22
Lowland meadows	Poor	0.03	0.28	Good	0.46
Mixed scrub	Good	0.48	6.62	Retained as is; Good	6.62
Mixed scrub	Poor	1.69	7.77	Good	13.42
Other neutral grassland	Good	1.14	15.73	Retained as is; Good	15.73
Other neutral grassland	Moderate	0.09	0.83	Good	1.08
Other coniferous woodland	Poor	1.84	4.23	Other woodland; broadleaved in Moderate condition	8.6
Other woodland; broadleaved	Moderate	0.27	2.48	Retained as is; Moderate	2.48
Other woodland; broadleaved	Poor	0.96	4.42	Retained as is; Poor	4.42

Habitat type	Baseline Condition	Habitat Area (ha)	Baseline Habitat Units	Proposed Condition	Predicted Post Enhancement Habitat Units
Other woodland; mixed	Moderate	0.22	2.024	Retained as is; Moderate	2.02
Purple moor grass and rush pastures	Good	0.35	9.66	Retained as is; Good	9.66
Purple moor grass and rush pastures	Moderate	0.39	7.18	Good	7.78
Upland birchwoods	Poor	2.27	15.66	Enhanced to Moderate	21.00
Upland heathland	Poor	0.13	0.90	Moderate	1.15
Individual Rural Tree	N/A (not present in baseline)	0.12	N/A	Moderate	0.36
Total (Habitat Units)	N/A	N/A	83.01	n/a	101.78 (+18.78)

Site 3b: Watercourse baseline

A4-2.9.48. Site 3b includes 2.7km of watercourse habitat in fairly good condition and 1.04km of watercourse habitat in moderate condition. Differences in artificial bank top ground cover are the main reason the watercourse displays different condition classes throughout Site 3b. Where plantation woodland or

footpaths/roads are present within the riparian corridor, condition of the watercourse is generally restricted to moderate.

Table A4-1.2-15- Summary of Site 3b watercourse baseline

Watercourse	Watercourse type	Baseline length (Km)	Baseline WBUs
River Croe	Priority Habitat	3.74	69.82

Site 3b: Watercourse post-development

Table A4-1.2-16- Summary of Site 3b post development enhanced watercourse length

Watercourse	Watercourse type	Enhanced length (km)	Post enhancement WBUs
River Croe	Priority Habitat	2.87	84.24

Table A4-1.2-17– Summary of Site 3b post development retained watercourse length

Watercourse	Watercourse type	Retained length (km)	Retained WBUs
River Croe	Priority Habitat	0.87	18.6

A4-2.9.49. Under the existing baseline, negative watercourse MoRPh indicators are predominantly associated with reduced riparian habitat complexity, an absence of wooded features normally associated with broadleaved tree cover, which is a legacy of agricultural (including forestry plantation) land use and artificial bank top land use. INNS also contribute to negative watercourse MoRPh indicators at various reaches throughout Site 3b. Collectively, the proposed enhancement measures (riparian planting, exclusion fencing, where feasible and removal of INNS), would improve the condition of the River Croe within Site 3a, where such measures fall within the 10m riparian corridor. Enhancement measures are translated within the metric to a reduction in riparian encroachment (from

major to no encroachment) and an increase of one condition class (from fairly good to good).

A4-2.9.50. An indicative example of assumed changes in watercourse MoRPh indicators pre- and post- enhancement (that underpin assumed condition change within watercourses) is provided in Annex A.

A4-3. Natural Capital Assessment

A4-3.1. Assessment methodology

A4-3.1.1. The NATURE Tool was selected for the Natural Capital Assessment (NCA). The NATURE Tool allows the assessment of up to 17 ecosystem services, plus physical and mental health benefits, through a scoring system, indicating both the direction and magnitude of project impacts. These scores are aggregated based on policy priorities resulting in an overall Natural Capital Score for the project.

A4-3.1.2. The development of the NATURE Tool was led by WSP and the Ecosystems Knowledge Network, in collaboration with Northumbria University, and first released in July 2021. The tool has been co-developed together with more than 30 organisations involved in the built environment industry. Furthermore, the NATURE tool is aligned with Defra's Enabling a Natural Capital Approach (ENCA) guidance, recognised as a recommended tool within the Ecosystems Knowledge Network tool assessor, which is listed within ENCA's featured tools. Additionally, the approach taken by the NATURE Tool broadly aligns with the HM Treasury Greenbook and ENCA-supported 4-step approach to Natural Capital in policy and project appraisal: helping to understand the environmental baseline, how assets are affected in terms of habitat losses, the implications to welfare as a function of ecosystem service delivery, and finally to consider uncertainties when comparing Natural Capital scores.

A4-3.1.3. NATURE Tool version 1.2 BETA has been used for this assessment which was the latest NATURE Tool version at the time of the analysis. The full NATURE Tool scope has been applied meaning the impact across 17 ecosystem services plus physical and mental health benefits has been indicated.

A4-3.1.4. The same habitat data that informs the BNG assessments (see Section A4-2.9) also inform the NATURE Tool assessments. However, the NATURE Tool only utilises habitat area data which means that rivers were considered as area rather than lines. Also, the NATURE Tool has its own habitat classification

system and UK Habitats were translated into the NATURE Tool habitat classification system which aligns well with UKHab.

A4-3.1.1. The NATURE Tool is flexible in terms of data requirements and can work with basic and advanced data. For this assessment, an advanced assessment has been conducted meaning that advanced indicators and data were utilised as far as possible (see assumptions and limitations sections) to inform the assessment, providing the greatest level or accuracy.

A4-3.1.2. The NATURE Tool is flexible in terms of data requirements and can work with basic and advanced data. For this assessment, an advanced assessment has been conducted meaning that advanced indicators and data were utilised as far as possible (see assumptions and limitations section) to inform the assessment, providing the greatest level or accuracy.

A4-3.1.3. Examples for advanced indicators include the slope steepness where a steeper slope indicates higher demand for erosion protection or a flood management opportunity model that indicates areas within (proximity to) watercourses and surface water flood zones where habitats that mitigate flood risk would be particularly effective. The full list of NATURE Tool indicators and which ecosystem services/benefits they inform is given in Annex B.

Plate A4-1.1 - A chart with a list of different types of indicators, ecosystem services and benefits used in the NATURE Tool

Indicator	Biodiversity	Mental Health	Physical Health	Aesthetic Values	Education & Knowledge	Interaction with Nature	Recreation	Sense of Place	Air Quality Regulation	Carbon Storage	Cooling & Shading	Erosion Protection	Flood Regulation	Water Quality Regulation	Pest Control	Pollination	Food & Fish - Commercial	Food & Fish - Community	Water Availability	Wood Production
Community Food & Fishing		■	■															■		
Commercial Food & Fishing																	■			
Woodland Management																				■
Nature Designations		■	■	■	■	■		■												
Education		■			■															
Population Density & Visitors		■	■	■	■	■	■	■	■		■									
Water Status for Sub-Catchment														■						
Grazing & Mowing										■										
Air Quality Management Area			■						■											
Flood Risk & Watercourse			■										■							
Annual Winter Rainfall												■								
Slope Steepness												■								
Photovoltaic									■											

A4-3.1.4. This assessment is a projection, meaning the project has not been implemented yet. For a projection, the NATURE Tool applies a risk factor acknowledging that an intended habitat creation or reinstatement (after construction) may fail, depending on the difficulty of the habitat creation. This habitat creation risk is acknowledged in the scoring system.

A4-3.1.5. The NATURE Tool also accounts for the fact that habitats usually need to mature until they reach their full potential to deliver maximum ecosystem service benefits. This means that, for the same habitat area and type, a newly created habitat tends to score lower than an existing (retained) habitat as the

latter is assumed to have already reached its full Natural Capital potential and optimal maturity for maximum ecosystem services delivery.

A4-3.1.6. The Natural Capital outputs have been presented using the NATURE Tool's summary results table, which includes two main indicators relevant for this assessment:

- Score Change: The score change indicates the impact of the project on the score for each service/benefit. The score change is calculated by subtracting the 'Baseline Score' from the 'Project Score' (considering the post-development state of the site but also takes the Natural Capital performance during the construction phase into account).
- Change score: This is the main indicator for measuring project success in terms of Natural Capital impact. For each assessed ecosystem service and benefit, the Change Score indicates the percentage change against the baseline. A Change Score of +30%, for example, indicates that the service provision would be 30% higher than it would have been if the baseline state of the site remained in place. If the Change Score is greater than +100%, it will simply be displayed as >100%. A positive Change Score generally indicates a positive impact on Natural Capital. The higher the Change Score, the greater the indicative ecosystem service/benefit. The Change Score is calculated by dividing the Score Change' by the 'Baseline Score'.

A4-3.1.7. Annex B provides a full glossary of more terms used in NATURE Tool, including the ecosystem services' definitions. Please refer to the NATURE Tool User Guide for more technical detail on how the NATURE Tool model works and how scores and values are calculated.

A4-3.1.8. The assessment for the Proposed Scheme, which includes the improvements to the OMR and the LTS, would have different timeframes (construction time and completion time), therefore habitats would have different TTTC. In contrast to the Metric, the NATURE Tool does not allow enter different TTTC; hence, two assessments were prepared for the Proposed Scheme, and both are presented in Section A4-3.5.

A4-3.1.9. Please note that some manual NATURE Tool model adjustments were made to optimise the assessment, namely:

- Woodland management: In the standard NATURE Tool 1.2 model, woodland management only has an impact on Wood Production scores but not on other ecosystem services. Arguably, felling woodland would reduce the provision of other ecosystem services such as carbon storage. A manual NATURE Tool model adjustment was applied so that after 50 years (assumed year of felling rotation), the average carbon storage score between year 1 and 50 has been used from year 51 onwards, reflecting the average score during a felling rotation. This is to reflect that, on average, less carbon is stored in a woodland in felling rotation compared to a woodland that would not be felled regularly. Whilst many commercial woodlands are felled after 30-40 years, 50 years has been used as a precautionary assumption to not under-estimate baseline ecosystem services provision.
- Habitat enhancements: In the standard NATURE Tool 1.2 model, habitat enhancements are not considered. When a habitat change occurs, the model always assumes that the baseline habitat is removed first and then a new habitat is created. This assumption leads to under-valuation when habitats are enhanced, e.g. when woodland is planted on top of grassland without first removing the grassland. The current model therefore effectively penalizes habitat enhancements. The model was therefore manually adjusted so that where the baseline habitat score in a given year is higher than the score of the newly created habitat, the baseline score still applies. Once the post-intervention habitat scores higher, that score applies. Where more than one baseline habitat was enhanced, the area-weighted baseline scores were used. Where the maximum post-intervention habitat score is lower than the (average) baseline habitat score in a given year, the applied score in a given year is capped at the post-intervention maximum. These adjustments better reflect the transition from one habitat to another where habitats are enhanced. This adjustment was not applied for all habitats. Where coniferous woodland is enhanced to broadleaved woodland, it

needs to be felled first. Hence, the standard model of baseline habitat removal and creation of new habitat was still applied.

A4-3.2. Policy Priorities Definition

A4-3.2.1. In the NATURE Tool, policy priorities determine how ecosystem services and benefits are weighted when aggregated to an overall Natural Capital score. To reflect the main objectives of the Proposed Scheme and the main policies applied nationally and locally, the policy priorities of the NATURE Tool have been tailored to the specific site context of the Proposed Scheme and the enhancement sites as far as possible using desk-based information. The policy priorities were categorised between High (H), Medium (M), and Low (L) and translate into aggregation weights as 3, 2 and 1 respectively. Annex C presents the summary of the ecosystem services prioritisation developed for the assessment for the Proposed Scheme and the enhancement sites.

A4-3.2.2. The following documents were consulted to define the relevance of each ecosystem service for the Proposed Scheme:

- NPF4
- National Transport Strategy 2
- Strategic Transport Projects Review 2 (STPR2)
- Initial appraisal: Case for Change - Argyll and Bute - STPR2
- Argyll and Bute Council Biodiversity Duty Action Plan
- National Park Partnership Plan
- A83 Rest and Be Thankful Story Map

A4-3.2.3. In the case of the enhancement sites, the ecosystems services priorities needed a further review. The ecosystem services priorities for each site were consulted with FLS and re-categorised accordingly.

A4-3.3. Assumptions

A4-3.3.1. The following assumptions were made for the assessments of the Improvements to the OMR, LTS and the enhancement sites:

- Table A4-1.3-1 below, shows the different timeframes used in the assessments. Information was extracted from Volume 2, Chapter 04 – The Proposed Scheme.

Table A4-1.3-1 Improvements to the OMR, LTS and enhancement sites timeframes used in the Natural Capital assessment

Timescale	Improvements to the OMR	LTS	Enhancement sites
Construction time	1	4	0 (less than a year)
Completion year	2027	2033	Site 1 and 3a: 2027 Site 2 and 3b: 2033
Project lifetime	120 years	120 years	100 years (the enhancement sites are assumed to be manage as the post-development proposals in perpetuity)

- For the Proposed Scheme, default values were used for habitat ages; therefore, all the habitats were assumed to have reached maturity for the baseline.
- The NATURE Tool by default assumes that baseline habitats have fully matured and achieved their ecosystem service potential. However, if habitat age data is available, it should be adjusted in the tool to better reflect the actual delivery of ecosystem services. For the enhancement sites, aside from woodland, all the other habitats were assumed to have reached maturity for the baseline condition. Woodland age was adjusted based on woodland planting age information provided by FLS as follows:
  - Site 1: 34 years
  - Site 2: 50 years
  - Site 3a: 64 years
  - Site 3b: 65 years

- For all the assessments, following the NATURE Tool guidance, a 50m buffer was applied to all linear access datasets to define the 'Public footpath access' areas. The following datasets were reviewed in order to classify the accessibility of the sites:
  - Loch Lomond and the Trossachs NP Core Paths (Jacobs, 2022)
  - Loch Lomond and the Trossachs NP Core Paths Corridor (Jacobs, 2022)
  - Sustrans reclassified routes (Jacobs, 2022)
  - Sustrans removed routes (Jacobs, 2022)
  - Hillwalking Routes (Jacobs, 2022)
  - Forest Recreation Routes (Jacobs, 2022)
  - National Cycle Network (Sustrans, 2022)
  - Argyll and Bute Core Paths (Argyll and Bute Council, 2022)
  - Core Paths Scotland (Jacobs, 2022)
  - Scotland's Great Trails (Scottish National Heritage, 2022)
- For the Proposed Scheme, all other areas that were not assessed as 'Public footpath access' were considered as 'Restricted access' as a proxy for right to roam.
- For the enhancement sites, all other areas that were not assessed as 'Public footpath access' were considered as 'No access'.
- For the enhancement sites post-development, Sites 2, 3a and 3b would not have any changes regarding accessibility, therefore, the same data as the baseline data was used. Only Site 1 incorporates a new footpath, and the accessibility was changed accordingly.
- For all the assessments, all areas of coniferous woodland were assumed to be 'primarily managed for wood production,' whereas areas of broadleaved woodland were assumed not to be managed for wood production.
- For all the assessments, local population density was assessed to be <5 persons per hectare.
- For the Proposed Scheme, external visitors were assumed to be 'low' (equivalent to an area with a population density of 20 - 39 persons per hectare).

- For the enhancement sites, external visitors were assumed to be ‘low’ (equivalent to an area with a population density of 20 – 39 persons per hectare) for Site 1, accounting for enhanced visitation as a result of the ‘Rest and Be Thankful’ viewpoint located nearby and the implementation of a new footpath. For Sites 2, 3a and 3b, external visitors are assumed to be insignificant.
- For all the assessments, the water quality was assigned as ‘Moderate overall class (Water Framework Directive class)’ based on SEPA’s Water Classification Hub.
- For all the assessments, default values for grass habitat areas relevant to carbon storage have been used due to lack of information. The default classification in the NATURE Tool is ‘Non-degraded Grassland’.
- For the Proposed Scheme, educational visits were considered non applicable.
- For all the assessments, default values for educational visits were used for the assessments due to lack of information.
- For all the assessments, the whole glen was stated to have 10+ days of winter rain over 10mm based on the Met Office data.

A4-3.4. Limitations

- The Metric accounts for the linear water features (e.g. other rivers and streams) in km, while the NATURE Tool considers them areas (ha). Therefore, there is a difference in some habitats' total area.
- The habitat area used in the Metric and the NATURE Tool rounded numbers differently. While the data input in the Metric used two decimals, the input data in the NATURE Tool used four decimals.
- Site 3a and 3b post development proposals are to have 10% of the habitat area (purple moor grass and rush pastures, upland flushes, fens and swamps, and other neutral grassland)) planted with scattered broadleaved trees. To account for this addition in the NATURE Tool, 10% was subtracted from the total area of these habitats and attributed to “other woodland, broadleaved”. In contrast, the Metric (used for the BNG

assessment) allows for the area of “individual rural trees” and understorey area without double counting issues, and no area subtraction was needed. Hence, there is a difference in the total area of the mentioned habitats.

- Volume 3, Figure 9.3 - Landscape and Ecological Mitigation include scattered woodland/scrub across different areas of the Proposed Scheme. In the NATURE Tool assessment these areas were classified as “other woodland, broadleaved”, given that there would be only a 5m distance between the trees. However, the Metric considered these as “individual rural trees” to account for the retained understorey grassland habitats. Therefore, there is a discrepancy between the classification of these areas in the two assessments.
- The NATURE Tool acknowledges the inherent complexity and residual uncertainty of Natural Capital approaches; therefore, the tool outcomes are indicative and are based mainly on published evidence and expert knowledge. The tool provides an additional evidence source to inform decisions. Therefore, within the study the results have be sense-checked and interpreted to provide consistency.
- As discussed in Section A4-2.8, extremely minor edits were made to the Proposed Scheme boundary during finalisation of the EIAR (totalling less than 0.25 ha collectively across the Proposed Scheme), but these have not been taken into account in area calculations provided in the BNG and Natural Capital assessments. Also, minor edits were made to the enhancement site boundaries for Sites 1 and 3b but these were not consider to have implications for the BNG or the Natural Capital calculations.

A4-3.5. Natural Capital Results

A4-3.5.1. The following section presents the Natural Capital Assessments for Improvements to the OMR, LTS and the enhancement sites.

Improvements to the OMR

A4-3.5.2. The improvement to the OMR presents a slight increase of “developed land, sealed surface” (from 1.72ha to 1.97ha) and a reduction in “artificial

unvegetated, unsealed surface" (from 0.19ha to 0.07ha). In terms of habitats, the main changes are the increase of "other neutral grassland" (4.89ha) and the implementation of "other broadleaved woodland" (0.08ha). It also proposes the removal of "bramble scrub", "mixed scrub", "upland calcareous grassland" and "temporary grass and clover leys".

A4-3.5.3. A summary of the results from the natural capital (NATURE Tool) analysis is shown in Plate A4-1.2. The improvements to the OMR result in a minimal increase in the Natural Capital Score of +1, which represents a +2% score change. The overall Cultural & Health ecosystem services present gains of +6%. However, the Regulating & Supporting and the Provisioning ecosystem services get losses of -3% and -5%.

A4-3.5.4. In terms of Cultural & Health ecosystem services, all the ecosystem services show gains. The most significant increase is in recreation (+21%). The rest of the Cultural & Health ecosystems services had minimal gains from 3% to 8%. The Cultural & Health gains are mainly due to the implementation of "other neutral grassland", which has a better or equal performance in all the cultural & health ecosystem services compared to the baseline habitats that have been removed. Also, the Improvements to the OMR area have some level of accessibility due to the OMR and other footpaths that cross the area, which would not be changed in the post-development. However, accessibility is an important factor within the Cultural & Health ecosystem services to allow people to enjoy the post-development enhancements.

A4-3.5.5. Regulating & Supporting ecosystem services have adverse outcomes for most ecosystem services. The main loss is in carbon storage (-33%), which resulted from "upland flushes, fens & swamps" reduction, which has a significantly better carbon storage performance than the other baseline or post-development habitats. Only pollination (+12%) and pest control (+8%) present positive outcomes due to the implementation of "neutral grassland".

A4-3.5.6. The Provisioning ecosystem services presents a deficit in water availability (-5%). No changes are expected regarding community and commercial food and

fishing provisioning and wood production, which are currently not detected in the area.

Plate A4-1.2– Dashboard from the NATURE Tool showing results for the Improvements to the OMR

NATURE TOOL
Version 1.1.1 BETA
United Kingdom

SUMMARY RESULTS FOR ADVANCED CHANGE ASSESSMENT - PROJECTION

A83 LTS

OMR Section

Priorities Defined By 0 | Assessment By AtkinsRealis & WSP

NATURAL CAPITAL

Services & Benefits	Baseline Units/ Score	Project Units/ Score	Unit/ Score Change	Change Score	Confidence Rating	Policy Priority
Natural Capital Score	35	35	+1	+2%		
Cultural & Health	53	56	+3	+6%		
Mental Health	43	46	+3	+7%		M
Physical Health	25	27	+2	+7%		M
Aesthetic Values	81	84	+4	+4%		H
Education & Knowledge	60	61	+2	+3%		M
Interaction with Nature	64	65	+2	+3%		M
Recreation	22	27	+5	+21%		H
Sense of Place	69	75	+6	+8%		H
Regulating & Supporting	25	24	-1	-3%		
Air Quality Regulation	2	2	0	0%		M
Carbon Storage	4	3	-1	-33%		H
Cooling & Shading	4	3	-1	-23%		L
Erosion Protection	56	56	-1	-1%		H
Flood Regulation	26	23	-3	-10%		M
Water Quality Regulation	26	23	-3	-13%		H
Pest Control	38	41	+3	+8%		L
Pollination	33	37	+4	+12%		M
Provisioning	8	8	-0	-5%		
Food & Fish | Commercial	0	0	0	0%		L
Food & Fish | Community	0	0	0	0%		L
Water Availability	40	38	-2	-5%		L
Wood Production	0	0	0	0%		M

LTS

A4-3.5.7. The LTS post-development presents an increase of “artificial unvegetated, unsealed surface” (1.35ha) and the implementation of a green roof (1.29ha). The “developed land, sealed surface” area would reduce (from 2.27ha to 1.83ha) considering that the green roof is covering a large area of the A83. In terms of habitats, the LTS implements or increases “inland rock outcrop and scree habitats” (2.28ha), “other neutral grassland” (4.31ha), and “other broadleaved woodland” (1.34ha). It also proposes the removal of “scrub”, “upland calcareous grassland” and “upland flushes, fens & swamps”. Finally, it plans a significant reduction in “bracken” (from 6.20ha to 0.06ha) and “other coniferous woodland” (from 0.93ha to 0.04ha).

A4-3.5.8. A summary of the results from the natural capital (NATURE Tool) analysis is shown in Plate A4-1.3. The LTS results in a decrease of the Natural Capital Score from 100 to 93, which represents a -7% score change. The overall Cultural & Health ecosystem services present minimal gains of +2%. However, the Regulating & Supporting and the Provisioning ecosystem services get losses of -17% and -26%, respectively.

A4-3.5.9. In terms of Cultural & Health ecosystem services, sense of place (+11%) and aesthetic value (+3%) present gains, mainly due to the implementation or increase of “upland acid grassland”, “other neutral grassland”, “inland rock outcrop & scree habitats”, “other broadleaved woodland” and the green roof. Mental health has a minimal gain (+1%). The rest of the Cultural & Health ecosystems services present losses, except for education & knowledge, where no changes are expected.

A4-3.5.10. Regulating & Supporting ecosystem services have adverse outcomes in all the ecosystem services. The main losses are in flood regulation (-23%), erosion protection (-22%), and pest control (-22%), which are mainly a result of the significant reduction of the “bracken” habitat type.

A4-3.5.1. Provisioning ecosystem services presents a significant deficit in wood production (-97%), due to the reduction of “other coniferous woodland”. Water availability outputs are also negative (-26%), mainly due to the decrease of “bracken”. No

changes are expected regarding community and commercial food and fishing provisioning, which are currently undetected in the area.

Plate A4-1.3– The LTS NATURE Tool results

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Version 1.1.1 BETA
United Kingdom

SUMMARY RESULTS FOR ADVANCED CHANGE ASSESSMENT - PROJECTION

A83 LTS

LTS Section

Priorities Defined By 0 | Assessment By AtkinsRealis & WSP

NATURAL CAPITAL

Services & Benefits	Baseline Units/ Score	Project Units/ Score	Unit/ Score Change	Change Score	Confidence Rating	Policy Priority
Natural Capital Score	100	93	-7	-7%		
Cultural & Health	132	135	+3	+2%		
Mental Health	104	105	+1	+1%		M
Physical Health	64	60	-4	-6%		M
Aesthetic Values	200	205	+6	+3%		H
Education & Knowledge	142	143	+0	0%		M
Interaction with Nature	144	137	-7	-5%		M
Recreation	52	51	-2	-3%		H
Sense of Place	190	211	+21	+11%		H
Regulating & Supporting	86	71	-15	-17%		
Air Quality Regulation	8	7	-1	-13%		M
Carbon Storage	15	15	-1	-4%		H
Cooling & Shading	12	11	-0	-2%		L
Erosion Protection	199	154	-45	-22%		H
Flood Regulation	94	72	-22	-23%		M
Water Quality Regulation	78	69	-9	-11%		H
Pest Control	149	116	-34	-22%		L
Pollination	114	106	-9	-7%		M
Provisioning	29	21	-8	-26%		
Food & Fish | Commercial	0	0	0	0%		L
Food & Fish | Community	0	0	0	0%		L
Water Availability	132	106	-26	-20%		L
Wood Production	6	0	-6	-97%		M

Enhancement Sites

Site 1

A4-3.5.2. Section A4-2.9 describes the baseline and post development habitat changes for Site 1. The main planned habitat changes are the removal of “other coniferous woodland” to implement “other broadleaved woodland”, and the removal of “bracken” to increase the “upland heathland” area. The other baseline habitats, including “mixed scrub”, “upland acid grassland”, “upland heathland”, “purple moor grass and rush pastures”, “upland flushes, fens and swamps” and “other rivers and streams” would be retained or enhanced. The LTS also proposes the implementation of an Active Travel Route next to Site 1.

A4-3.5.3. A summary of the results from the Natural Capital (NATURE Tool) analysis is shown in Plate A4-1.4– Site 1 NATURE Tool results. The enhancement proposal in Site 1 results in an increase in the Natural Capital Score from 35 to 42, which represents a +22% score change. The overall cultural & health ecosystems services would present gains of +48% and the regulating & supporting ecosystem services gets gains of +12%.

A4-3.5.4. In terms of cultural & health ecosystem services, all the ecosystem services present gains. The gains over 100% from a zero-baseline are in education & knowledge and recreation services. Other significant gains are for interaction with nature (+68%), mental health (+53%), aesthetic value (+47%), physical health (+35%) and sense of place (+21%). The cultural & health gains are mainly due to the access improvements with the new Active Travel Route at the north of Site 1. Moreover, the implementation of broadleaved woodland has a better performance in all the mentioned ecosystem services compared to coniferous woodland.

A4-3.5.5. Regulating & supporting ecosystem services also have positive outcomes for the post-development plan, especially for pollination (+44%), carbon storage (+26%), water quality regulation (+19%), cooling and shading (+13%) and erosion protection (+11%). The implementation of broadleaved woodland has a positive impact in all the mentioned ecosystem services. Furthermore, the new broadleaved woodland is not planned to be used for forestry production in the

manner of the existing coniferous plantation and therefore would not have a felling rotation. This means that the woodland can mature further than in the commercially managed coniferous woodland where the level of ecosystem services provision is reduced each time after felling, only slowly building up again when the next rotation matures.

A4-3.5.6. However, the provisioning ecosystem services presents a deficit of -37% which is mainly a consequence of the wood production change. Wood production has the highest deficit amongst all the ecosystem services with -100%. This is a consequence of removing coniferous woodland plantation. In the post development scenario, no wood production is expected in the area. Although this is shown as a negative outcome, avoiding wood production would allow the woodland to develop and provide greater ecosystem services in the long term, which also aligns with the aspirations for the enhancement sites and the positive scores indicated for other ecosystem services.

A4-3.5.7. No changes are expected regarding community and commercial food and fishing provisioning, which currently are not detected in the area.

Plate A4-1.4– Site 1 NATURE Tool results

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United Kingdom

SUMMARY RESULTS FOR ADVANCED CHANGE ASSESSMENT - PROJECTION

A83 Enhancement Site 1-LTS

Priorities Defined By 0 | Assessment By AtkinsRealis & WSP

NATURAL CAPITAL

Services & Benefits	Baseline Units/ Score	Project Units/ Score	Unit/ Score Change	Change Score	Confidence Rating	Policy Priority
Natural Capital Score	35	42	+8	+22%		
Cultural & Health	29	43	+14	+48%		
Mental Health	22	33	+12	+53%		M
Physical Health	16	22	+6	+34%		M
Aesthetic Values	46	67	+21	+47%		H
Education & Knowledge	0	18	+18	>100%		M
Interaction with Nature	27	45	+18	+68%		M
Recreation	0	6	+6	>100%		H
Sense of Place	74	90	+15	+21%		H
Regulating & Supporting	40	45	+5	+12%		
Air Quality Regulation	9	6	-2	-28%		M
Carbon Storage	15	19	+4	+26%		H
Cooling & Shading	8	9	+1	+13%		L
Erosion Protection	79	87	+8	+11%		H
Flood Regulation	64	62	-2	-3%		M
Water Quality Regulation	48	57	+9	+19%		H
Pest Control	44	46	+3	+6%		L
Pollination	31	44	+13	+44%		M
Provisioning	19	12	-7	-37%		
Food & Fish | Commercial	0	0	0	0%		L
Food & Fish | Community	0	0	0	0%		L
Water Availability	50	47	-3	-6%		L
Wood Production	25	0	-25	-100%		L

Site 2

A4-3.5.8. Section A4-2.9 describes the baseline and post development of Site 2. The main habitat changes are the removal of upland acid grassland and bracken, and the addition of broadleaved woodland. The other baseline habitats, including other upland heathland, purple moor grass and rush pastures, and rivers (priority habitat) would be retained or enhanced. Within these habitats along the riparian corridor scattered broadleaved trees would be planted.

A4-3.5.9. A summary of the results from the natural capital (NATURE Tool) analysis is shown in Plate A4-1.5. The enhancement proposal for Site 2 results in an increase in the Natural Capital Score from 249 to 313, which represents a +26% score change. The overall regulating & supporting ecosystem services present gains of +40%. Cultural & health ecosystems services have marginal gains of +6%, while provisioning ecosystem services decrease by -49%.

A4-3.5.10. The ecosystem services with the most gains are carbon storage (>100%), air quality regulation (>100%), cooling and shading (>100%), flood regulation (+69%) and water quality regulation (+59%). There is a slight gain for erosion protection (+16%) and pollination services (+7%) and a negative gain for pest control (-18%). The implementation of broadleaved woodland, to replace upland acid grassland and bracken, has a positive impact in all the mentioned ecosystem services (except for pest control).

A4-3.5.11. Similar to Sites 1 and 3a, the provisioning ecosystem services present a deficit of -49%. Water availability has the highest deficit amongst all the ecosystem services with -49%. This is a consequence of adding trees in the form of broadleaved woodland which utilise more water than bracken or grassland.

A4-3.5.12. In cultural & health ecosystem services, the most gains are for physical health (+41%). Physical health is an indicative aggregated indicator in the NATURE Tool, which is calculated with certain ecosystem services that contribute to physical health. The aggregation accounts for the outputs of aesthetic value, interaction with nature, recreation, air quality regulation, cooling and shading, flood regulation, pollination and food & fishing (community). In this case, the main ecosystem services that contribute to the physical health gains are air

quality regulation (>100%), cooling and shading (>100%) and flood regulation (+69%). Moreover, it is located in a national nature designation site, which is accounted as a bonus multiplier for the physical health score calculation in the tool, which also applies to the other enhancement sites and the Proposed Scheme. There are moderate gains for sense of place (+5%), aesthetic values (+2%) and mental health (+3%). No changes are expected in ecosystem services such as education & knowledge, interaction with nature and recreation.

A4-3.5.13. No changes are expected regarding community and commercial food and fishing provisioning which are currently not detected in the area.

Plate A4-1.5 – Site 2 NATURE Tool results

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SUMMARY RESULTS FOR ADVANCED CHANGE ASSESSMENT - PROJECTION

A83 Enhancement Site 2 - LTS

Priorities Defined By A83 Argyll & Bute | Assessment By AtkinsRealis & WSP

NATURAL CAPITAL

Services & Benefits	Baseline Units/ Score	Project Units/ Score	Unit/ Score Change	Change Score	Confidence Rating	Policy Priority
Natural Capital Score	249	313	+64	+26%		
Cultural & Health	196	207	+11	+6%		
Mental Health	129	133	+4	+3%		L
Physical Health	97	136	+40	+41%		L
Aesthetic Values	123	125	+2	+2%		H
Education & Knowledge	0	0	0	0%		L
Interaction with Nature	180	181	+1	0%		L
Recreation	0	0	0	0%		L
Sense of Place	460	484	+24	+5%		H
Regulating & Supporting	300	421	+121	+40%		
Air Quality Regulation	24	80	+55	>100%		M
Carbon Storage	58	261	+203	>100%		H
Cooling & Shading	12	32	+21	>100%		L
Erosion Protection	621	718	+98	+16%		H
Flood Regulation	377	636	+259	+69%		M
Water Quality Regulation	306	486	+180	+59%		H
Pest Control	516	423	-93	-18%		L
Pollination	404	433	+29	+7%		M
Provisioning	115	58	-57	-49%		
Food & Fish | Commercial	0	0	0	0%		L
Food & Fish | Community	0	0	0	0%		L
Water Availability	459	232	-227	-49%		L
Wood Production	0	0	0	0%		L

Site 3a

A4-3.5.14. Section A4-2.9 describes the baseline and post development of Site 3a. The main planned habitat changes are the removal of “other coniferous woodland” and the addition of “broadleaved woodland”. The other baseline habitats, including “other neutral grassland”, “purple moor grass and rush pastures”, “upland flushes, fens and swamps” and “rivers” are planned to be retained or enhanced. “Scattered broadleaved trees” are planned to be added within these habitats and along the riparian corridor.

A4-3.5.15. A summary of the results from the natural capital (NATURE Tool) analysis is shown in Plate A4-1.6-Site 3a NATURE Tool results. The enhancement proposal for Site 3a results in a minimal increase in the Natural Capital Score from 14 to 15, which represents a +4% score change. The overall regulating & supporting ecosystem services present gains of +5%. However, the provisioning ecosystem services present a deficit of -9%. Cultural & health ecosystems services have marginal gains of 1% for the post-development proposal.

A4-3.5.16. The regulating and supporting ecosystem services with the most gains are carbon storage (+71%), air quality regulation (+36%), cooling and shading (+17%) and flood regulation (9%). The implementation of broadleaved woodland positively impacts in the provision of these ecosystem services because, despite the removal of existing coniferous woodland, the new broadleaved woodland would have a bigger extent (five times more than current tree coverage). Similar to Site 1, the new broadleaved woodland would not be used for forestry production like the old coniferous forest and therefore would not have a felling rotation, which will allow the woodland to mature further than in the commercially managed coniferous woodland.

A4-3.5.17. Similar to Site 1, wood production has the highest deficit with -100%. This is a consequence of removing coniferous woodland plantation in favour of other broadleaved woodland. In the post development, no wood production is expected in the area.

A4-3.5.18. No changes are expected in ecosystem services such as mental health, education & knowledge, interaction with nature, recreation, pest control and community and commercial food and fishing provisioning.

Plate A4-1.6– Site 3a NATURE Tool results

NATURE TOOL
Version 1.1.1 BETA
United Kingdom

SUMMARY RESULTS FOR ADVANCED CHANGE ASSESSMENT - PROJECTION

A83 Enhancement Site 3a

Priorities Defined By 0 | Assessment By AtkinsRealis & WSP

NATURAL CAPITAL

Services & Benefits	Baseline Units/ Score	Project Units/ Score	Unit/ Score Change	Change Score	Confidence Rating	Policy Priority
Natural Capital Score	14	15	+1	+4%		
Cultural & Health	12	12	+0	+1%		
Mental Health	8	8	0	0%		L
Physical Health	5	6	+0	+6%		L
Aesthetic Values	7	7	+0	+1%		H
Education & Knowledge	0	0	0	0%		L
Interaction with Nature	10	10	0	0%		L
Recreation	0	0	0	0%		L
Sense of Place	29	29	+0	+1%		H
Regulating & Supporting	17	17	+1	+5%		
Air Quality Regulation	1	2	+0	+36%		M
Carbon Storage	2	4	+2	+71%		H
Cooling & Shading	1	1	+0	+17%		L
Erosion Protection	33	34	+1	+3%		H
Flood Regulation	24	26	+2	+9%		M
Water Quality Regulation	24	25	+1	+3%		H
Pest Control	22	22	+0	0%		L
Pollination	16	17	+1	+5%		M
Provisioning	8	7	-1	-9%		
Food & Fish | Commercial	0	0	0	0%		L
Food & Fish | Community	0	0	0	0%		L
Water Availability	29	27	-2	-7%		L
Wood Production	1	0	-1	-100%		L

Site 3b

A4-3.5.19. Section A4-2.9 describes the baseline and post development proposals for Site 3b. The main habitat changes proposed are the removal of “coniferous woodland” and “bracken”, and the addition of “broadleaved woodland”. The other baseline habitats, including “other upland heathland”, “purple moor grass and rush pastures”, and “rivers (priority habitat)” would be retained or enhanced. “Scattered broadleaved trees” are proposed to be added within these habitats, along the riparian corridor. This site also contains a small amount of “developed land, sealed surface” and “artificial unvegetated, unsealed surface” which is retained in post-development.

A4-3.5.20. A summary of the results from the natural capital (NATURE Tool) analysis is shown in Plate A4-1.7. The enhancement proposal for Site 3b results in an increase in the Natural Capital Score from 61 to 64, which represent a +6% score change. The overall Regulating & Supporting ecosystem services present gains of +7%, as do cultural & health ecosystems services (+7%). Provisioning ecosystem services decreases by -20%.

A4-3.5.1. The ecosystem service category with the most gains are the Regulating & Supporting services. The proposed habitat changes for the site result in a carbon storage gain of +18%, a pollination service gain of +12%, a cooling and shading service gain of +11%, and a water quality regulation service gain of +10%. There are also slight gains for erosion protection (+6%), flood regulation (+3%) and pest control (+1%). Negative impacts were scored for air quality regulation (-2%).

A4-3.5.2. Similar to Site 1 and 3a, the Provisioning ecosystem services present a deficit, in this case of -20%. There is -100% deficit for wood production related to the removal of the coniferous woodland. Water availability has a slight deficit of -6%. No changes are expected regarding community and commercial food and fishing provisioning which are currently not detected in the area.

A4-3.5.3. In Cultural & Health ecosystem services, the most gains are made for recreation (+11%), followed by education and knowledge (+8%) and sense of place (+7%). Interaction with nature, aesthetic values and physical health all received scores of +5%, while mental health had a gain of +6%. These positive

gains are due to the addition of the broadleaved woodland, which improves many of the ecosystem services relative to coniferous woodland and bracken.

Plate A4-1.7– Site 3b NATURE Tool results

NATURE TOOL
Version 1.1.1 BETA
United Kingdom

SUMMARY RESULTS FOR ADVANCED CHANGE ASSESSMENT - PROJECTION

A83 Enhancement Site 3b - LTS

Priorities Defined By A83 Argyll & Bute | Assessment By AtkinsRealis and WSP

NATURAL CAPITAL

Services & Benefits	Baseline Units/ Score	Project Units/ Score	Unit/ Score Change	Change Score	Confidence Rating	Policy Priority
Natural Capital Score	61	64	+3	+6%		
Cultural & Health	55	59	+4	+7%		
Mental Health	42	45	+3	+6%		L
Physical Health	35	37	+2	+5%		L
Aesthetic Values	41	43	+2	+5%		H
Education & Knowledge	20	21	+2	+8%		L
Interaction with Nature	68	72	+4	+5%		L
Recreation	10	12	+1	+11%		L
Sense of Place	103	111	+7	+7%		H
Regulating & Supporting	71	76	+5	+7%		
Air Quality Regulation	16	16	-0	-2%		M
Carbon Storage	35	41	+6	+18%		H
Cooling & Shading	6	7	+1	+11%		L
Erosion Protection	108	115	+6	+6%		H
Flood Regulation	126	130	+3	+3%		M
Water Quality Regulation	90	99	+9	+10%		H
Pest Control	83	84	+1	+1%		L
Pollination	66	74	+8	+12%		M
Provisioning	22	18	-4	-20%		
Food & Fish | Commercial	0	0	0	0%		L
Food & Fish | Community	0	0	0	0%		L
Water Availability	77	72	-5	-6%		L
Wood Production	13	0	-13	-100%		L

Natural Capital Aggregated Score

A4-3.5.4. Plate A4-1.8 shows the aggregated score for the Proposed Scheme (Improvements to the OMR and the LTS) as well as the enhancement sites. The overall natural capital score total change is +52%. The main gains are in the Regulating & Supporting ecosystem services, with an overall score of +105%. Carbon storage (+1,102%) and air quality regulation (+559%) have the highest increases. Cultural & Health ecosystem services also present gains, with an overall +19%.

A4-3.5.5. In contrast, Provisioning ecosystem services result in a negative output (-208%). This is mainly due to the change of coniferous woodland currently used for wood production into broadleaved woodland. -700% was calculated for wood production. A more negative score than -100% is possible because the percentage change is assessed against the Proposed Scheme baseline, not the baseline of all sites including the enhancement sites together. This is implemented and best practice for assessing BNG which is why the same approach was adopted. A more negative score than -100% is possible because more is lost on the enhancement Sites than is present on the baseline for the Proposed Scheme.

A4-3.5.6. However, all the Proposed Scheme's high priority ecosystem services (i.e. aesthetic value, recreation, sense of place, erosion protection and water quality regulation) result in gains.

A4-3.5.7. It was the intention to achieve at least +10% Natural Capital net gain for the aggregated Natural Capital score as well as all high-priority ecosystem services, which has been achieved (marked with a tick in the last column of Plate A4-1.8). Notably, a net gain for all but one (Wood Production) Medium priority ecosystem services was also achieved.

A4-3.5.8. Also notably, all high priority cultural ecosystem services achieve an on-site net gain. This is relevant because these services are usually realised locally; hence, offsetting somewhere else could be somewhat problematic.

A4-3.5.9. The most-negative High-priority change on-site is for erosion protection. However, this is less concerning given the engineered solutions to reduce landslide risk and also the FLS woodland planting scheme to mitigate the same.

A4-3.5.10. The priorities are based on the Proposed Scheme priorities. However, all High FLS priorities are also High priorities for the Proposed Scheme.

Plate A4-1.8– Aggregated NATURE Tool results

NATURE TOOL
Version 1.2 BETA
United Kingdom

SUMMARY RESULTS FOR ADVANCED CHANGE ASSESSMENT - PROJECTION

A83 LTS Aggregated Results

Assessment By AtkinsRealis & WSP

Services & Benefits	On-Site Baseline	On-Site Unit Change	Offset Unit Change	Total Change From On-Site Baseline	Confidence Rating	Policy Priority	Objectives Met?
Natural Capital Score	134	-6	+75	+52%			✓
Cultural & Health	184	+6	+28	+19%			N/A
Mental Health	148	+4	+18	+15%		M	N/A
Physical Health	89	-2	+47	+50%		M	N/A
Aesthetic Values	280	+9	+26	+12%		H	✓
Education & Knowledge	202	+2	+19	+10%		M	N/A
Interaction with Nature	208	-5	+23	+9%		M	N/A
Recreation	75	+3	+7	+13%		H	✓
Sense of Place	259	+27	+46	+28%		H	✓
Regulating & Supporting	111	-16	+132	+105%			N/A
Air Quality Regulation	9	-1	+53	+559%		M	N/A
Carbon Storage	19	-2	+215	+1102%		H	✓
Cooling & Shading	16	-1	+23	+137%		L	N/A
Erosion Protection	255	-45	+114	+27%		H	✓
Flood Regulation	120	-24	+262	+199%		M	N/A
Water Quality Regulation	104	-12	+199	+180%		H	✓
Pest Control	187	-31	-89	-64%		L	N/A
Pollination	147	-5	+52	+32%		M	N/A
Provisioning	37	-8	-69	-208%			N/A
Food & Fish | Commercial	0	0	0	0%		L	N/A
Food & Fish | Community	0	0	0	0%		L	N/A
Water Availability	172	-28	-237	-154%		L	N/A
Wood Production	6	-6	-38	-700%		M	N/A

A4-4. Discussion and Conclusions

A4-4.1. Terrestrial BNG

A4-4.1.1. Overall, the changes to terrestrial habitat as a result of the Proposed Scheme is predicted to result a 31.44% loss in HU. By undertaking the proposed habitat enhancements and habitat creation within the four enhancement Sites, overall, a significant biodiversity enhancement would be achieved. A 47.44% gain is predicted, based on the current designs. It is therefore anticipated that the Proposed Project can meet the requirements of NPF4 Policy B with regard to terrestrial biodiversity. The initial predictions suggest that the results would go beyond standard policy compliance, and it should be noted that the results are an assessment of predicted outcomes based on the information available and do not themselves constitute a target for the Proposed Scheme to meet. Table A4-1.4-1 provides a summary of the BNG terrestrial assessment.

A4-4.1.2. The proposed enhancement sites include a substantial area totalling 91.45ha. The key habitat to be created is woodland, which aligns with the LLTNP Trees and Woodland Strategy strategic objective of increasing woodland cover and improving woodland condition and of note, Site 2, is located within an area identified as preferred for native woodland creation within the strategy.

A4-4.1.3. It is also noted, however, that within the Metric, despite the substantial gain in HU, the trading rules are not met fully. The trading rules work on the principle of providing habitats to offset losses, based on the same broad habitat type which has been lost and providing habitats of at least the same distinctiveness value or higher.

A4-4.1.4. Within the Proposed Scheme, the key losses for which the trading rules are not satisfied are with respect to wetland-fen (upland and lowland), where 50.78 HU would be lost. This habitat type is valued in the metric as a very high distinctiveness habitat. The majority of this habitat is present within the OMR Improvements. Here the landscaping includes a wet grassland mix, to be

seeded alongside each of the watercourses which run between the A83 and the OMR and within a Sustainable Drainage System (SuDS). This wet grassland mix contains a number of species associated with wetland-fen habitat currently present. However, a precautionary approach has been taken in assigning the post development habitat type in the metric. The area of wet grassland to be created, has been entered as neutral grassland, rather than wetland-fen, as the difficulty in creating this fen is acknowledged and it is considered more likely that wet (neutral) grassland can be achieved.

A4-4.1.5. On review of the UKHab definitions, neutral grassland can include grasslands that are periodically inundated with water or permanently moist. The seed mix to be used, as detailed in Volume 4 Appendix 11.15 (Outline Landscape and Ecological Management & Monitoring Plan), includes species appropriate to the location, which were also recorded during the baseline surveys, including common sorrel, devil's bit scabious and marsh thistle. This means that while the created habitat is assumed to be neutral grassland; in practice a habitat mosaic should form that supports similar features and species to the fen habitat to be lost, so similar ecological niches will be provided.

A4-4.1.6. Given this, whilst the trading rules indicate an overall loss of wetland-fen habitat, it is considered that the proposed wet grassland mix does provide a degree of compensation for this loss, noting that the loss of wetland-fens (upland and lowland), is a unit loss of 50.78 HU from within the Proposed Scheme (and an area loss of 1.84ha), while 9.62ha of wet grassland is proposed which equates to 84.92 HU, so there is a substantial gain in area of a similar form of habitat.

A4-4.1.7. The trading rules are also not satisfied with respect to losses of small areas of upland calcareous grassland and upland heathland. An area of 0.2ha (0.65% of the baseline habitats) of upland calcareous grassland and 0.48 of upland heathland (1.63% of the baseline habitats) will be lost. However, taking account for the small size of these areas affected, combined with the overall substantial increase in HU achieved, and the fact that much of the gain relates to habitats of High distinctiveness, it is considered the Proposed Scheme still provides clear biodiversity enhancements.

Table A4-1.4-1 - Summary Predicted Habitat Units (HUs)

Proposed Scheme Baseline HUs	Proposed Scheme Post Development HUs	Predicted % change - Proposed Scheme only	HUs Achievable through Enhancement Sites	Total combined HUs of Proposed Scheme and Enhancement Sites and Overall HU Percentage change
259.81	178.12	-31.44%	Site 1: +17.21 Site 2: +163.56 Site 3a: +5.41 Site 3b: +18.78 Total +204.95	+123.26 +47.44%

A4-4.2. Aquatic BNG

A4-4.2.1. Overall, the changes to aquatic habitats as a result of the Proposed Scheme are predicted to result a 31.41% loss in WBU. By undertaking the proposed habitat enhancements and habitat creation within the three enhancement sites, a significant biodiversity enhancement will be provided, with a 27.82% gain predicted based on the current designs. It is therefore anticipated that the Proposed Project can meet the requirements of NPF4 Policy B with regard to aquatic biodiversity. The initial predictions suggest that the results would go beyond standard policy compliance, and it should be noted that the results are an assessment of predicted outcomes based on the information available and do not themselves constitute a target for the Proposed Scheme to meet.

A4-4.2.2. Watercourse units are predicted to be gained through riparian habitat enhancements that reflect positively within MoRPh survey and align with terrestrial ecology habitat enhancements. See Annex A for a worked example

how such habitat changes are assumed to increase the condition of watercourses.

Table A4-1.4-2 - Summary Predicted Watercourse Biodiversity Units (WBUs)

Proposed Scheme Baseline WBUs	Proposed Scheme Post Development WBUs	Predicted % change - Proposed Scheme only	WBUs Achievable through Enhancement Sites	Overall Percentage change for Proposed Scheme, plus Enhancement Sites – WBUs
43.36	29.7	-31.5%	Site 1: +3.76 Site 3a: +7.49 Site 3b: +14.43	27.82%

A4-4.3. Natural Capital

A4-4.3.1. The Natural Capital Assessment was done separately for the Improvements to the OMR, the LTS and the four enhancement sites. These scores were then aggregated to present an overall score change for the Proposed Scheme (Table A4-1.4-3). The initial predictions suggest that the results would go beyond basic compliance with the Scheme objective, and also go beyond meeting the policy requirement to safeguard ecosystem services. It should be noted that the results are an assessment of predicted outcomes based on the information available and do not themselves constitute targets for the Proposed Scheme to meet.

A4-4.3.2. Without the enhancement sites, the Proposed Scheme Natural Capital score will result in a 4.5% loss (combining Improvements to the OMR and LTS). However, the enhancement sites will provide numerous Natural Capital gains, which are predicted to allow to achieve the Proposed Scheme objectives. Overall, the Natural Capital score improves by 52% compared to the baseline.

This is largely a function of the habitat improvements proposed for the enhancement sites, in particular, the removal of coniferous woodland and bracken and replacement with broadleaved woodland.

A4-4.3.3. Moreover, for all the priority individual ecosystem services scoped, the Proposed Scheme is predicted to result in gains of over 10%. Boosting the area of broadleaved woodland in the enhancement sites has positive impacts on most of the ecosystem services assessed, particularly those in the Regulating & Supporting category, such as carbon storage, water quality regulation and air quality regulation and flood regulation. Increasing broadleaved woodland also boosted the scores in the Cultural & Health category, particularly physical health, aesthetic values and interaction with nature.

A4-4.3.4. There were negative impacts to the Provisioning ecosystem services due to the loss of wood production as the broadleaved woodland would not be manged for timber; however, this is not a priority ecosystem service for the Proposed Scheme.

Table A4-1.4-3 - Summary of Predicted Natural Capital Scores

Proposed Scheme Baseline Natural Capital score	Proposed Scheme Post Development Natural Capital score	Predicted % change - Proposed Scheme only	Natural Capital score Achievable through the Enhancement Sites	Proposed Scheme and enhancement sites overall Natural Capital score change
134	128	-4.5%	Site 1: +22% Site 2: +26% Site 3a: +4% Site 3b: +6%	+52%

A4-4.4. Conclusion

A4-4.4.1. The Proposed Scheme objective for the environment is “Protect the environment, including the benefits local communities and visitors obtain from the natural environment, by enhancing Natural Capital assets and ecosystem service provision through delivery of sustainable transport infrastructure.”

A4-4.4.2. This report has demonstrated through the BNG and Natural Capital assessments that the landscape mitigation design for the Proposed Scheme along with the additional offsite habitat creation and enhancements would comply with the biodiversity and Natural Capital policy requirements and environment objective (as outlined in Section A4-1.4). Both assessments demonstrated positive gains greater than 10%, meaning that significant benefits can be achieved.

Annexes

Annex A. Pre- and Post- Enhancement Watercourse MoRPh Indicator Scores

Based on proposed enhancements within each identified enhancement site, MoRPh scoring indicators recorded under the existing baseline have been assumed to change for several indicators that underpin overall condition classification.

An example of this approach is provided in Table A4-1.4-4 , for the High Glen Croe Tributary. Based on the enhancements set out for the riparian corridor associated with this watercourse, MoRPh indicators have been artificially adjusted to reflect a likely change in scoring, relative to the existing baseline. In this example, two post-enhancement scenarios are shown:

- 2 years post-enhancement scenario - based on standard time to target condition for watercourses, for movement from Fairly Good to Good Condition within the Metric; and
- 15 years post-enhancement scenario - based on adopting a typical woodland establishment time to target condition within the Metric, aligning with the terrestrial approach and acknowledging that the proposed enhancements of the riparian corridor will take time to establish. At least to the extent that associated MoRPh indicators (for example, bank top and bank face vegetation and riparian structure and tree feature richness) are significantly improved relative to the existing baseline).

The metrics and net change reported within this BNG assessment for watercourses are, on a precautionary basis, predicated on the 15 years post-enhancement scenario. This has been represented as a delay in watercourse enhancement within the Metric, as discussed within the assumptions section of this report.

Condition classification thresholds within the Metric vary by watercourse typology. In this example, High Glen Croe Tributary (River Type F) requires a minimum provisional condition score of 2.3 in order to attain Good condition, which is shown

to be achieved under the 15 years post-enhancement scenario. Full details of indicator definitions, scoring approaches and condition type thresholds are included within A Guide to Assessing River Condition.

Table A4-1.4-4 - Example Pre- and Post- Enhancement MoRPh Indicator Scores (High Glen Croe Tributary MoRPh, MoRPh River Type F)

River Condition Indicator	Code	Baseline	2 Years Post Enhancement	15 Years Post Enhancement
Bank top vegetation structure	B1	3	3	4
Bank top tree feature richness	B2	0	1	4
Bank top water-related features	B3	2	2	2
Bank top NNIPS cover	*B4*	0	0	0
Bank top managed ground cover	*B5*	-1	0	0
Bank face riparian vegetation structure	C1	2	2	3
Bank face tree feature richness	C2	1	1	2
Bank face natural bank profile extent	C3	3	3	3
Bank face natural bank profile richness	C4	4	4	4
Bank face natural bank material richness	C5	2	2	2
Bank face bare sediment extent	C6	4	4	4

River Condition Indicator	Code	Baseline	2 Years Post Enhancement	15 Years Post Enhancement
Bank face artificial bank profile extent	*C7*	0	0	0
Bank face reinforcement extent	*C8*	0	0	0
Bank face reinforcement material severity	*C9*	0	0	0
Bank face NNIPS cover	*C10*	0	0	0
Channel margin aquatic vegetation extent	D1	1	1	1
Channel margin aquatic morphotype richness	D2	1	1	1
Channel margin physical feature extent	D3	3	3	3
Channel margin physical feature richness	D4	3	3	3
Channel margin artificial features	*D5*	0	0	0
Channel aquatic morphotype richness	E1	1	1	1
Channel bed tree features richness	E2	0	2	4
Channel bed hydraulic features richness	E3	2	2	2

River Condition Indicator	Code	Baseline	2 Years Post Enhancement	15 Years Post Enhancement
Channel bed natural features extent	E4	3	3	3
Channel bed natural features richness	E5	2	2	2
Channel bed material richness	E6	2	2	2
Channel bed siltation	*E7*	0	0	0
Channel bed reinforcement extent	*E8*	0	0	0
Channel bed reinforcement severity	*E9*	0	0	0
Channel bed artificial features severity	*E10*	0	0	0
Channel bed NNIPS extent	*E11*	0	0	0
Channel bed filamentous algae extent	*E12*	0	0	0
Average of positive scores	NA	2.05	2.21	2.63
Average of negative scores	NA	-0.08	0.00	0.00
Provisional condition score	NA	1.98	2.21	2.63
Condition Class	NA	FAIRLY GOOD	FAIRLY GOOD	GOOD

Table Note: NNIPS = non-native invasive plant species, positive indicators in green non-italic, negative indicators in red italic. Green shaded cells indicate an assumed score/condition change under the post-enhancement scenario.

Annex B. NATURE Tool Glossary

A.1. Indicator Key (Columns)

A.1.1. Baseline Units/Scores

This indicator provides an indication of the Natural Capital (biodiversity) performance of the site in its baseline state over the assessment period. This is effectively the business-as-usual scenario assuming the site remains unchanged.

The scores for Natural Capital are commonly based on base scores for each habitat type present. The base scores also depend on habitat maturity which is factored in. The base scores indicate the general level of ecosystem service provision by that habitat. The base scores are then adjusted based on multipliers in relation to indicators for ecosystem location and condition. A habitat receives for example a higher Recreation score if the habitat has good access. Please refer to the Detailed Results sheet for more information on how scores are calculated.

For biodiversity, units are commonly calculated with the Metric with results being imported into the NATURE Tool so that results can be displayed alongside Natural Capital.

In a change assessment, the baseline scores (units) are used as baseline against which project impacts are assessed and directly inform the Change Score.

A.1.2. Project Units/Score

This indicator provides an indication of the Natural Capital (biodiversity) performance of the site in its proposed future state. It is based on the scores (units) indicated for the post-development state of the site but also takes the Natural Capital performance during the construction phase into account (where applicable).

The scores for Natural Capital are commonly based on base scores for each habitat type present. The base scores also depend on habitat maturity. The base scores indicate the general level of ecosystem service provision by that habitat. The base scores are then adjusted based on multipliers in relation to indicators for

ecosystem location and condition. A habitat receives for example a higher Recreation score if the habitat has good access. For the project scores, habitat delivery risks are also accounted for which may reduce the score for certain habitats compared to already established habitats of the same type.

The project scores (units) are compared against the baseline to inform the Unit/Score Change and subsequently the Change Score.

A.1.3. Unit/Score Change

The score (unit) change indicates the impact of the project on the score (units) for each service/benefit. The score (unit) change is calculated by subtracting the 'Baseline Units/Score' from the 'Project Units/Score'.

A.1.4. Change Score

This is the main indicator for measuring project success in terms of Natural Capital (biodiversity) impact. For each assessed ecosystem service and benefit, the Change Score indicates the percentage change against the baseline. A Change Score of +30%, for example, indicates that the service provision would be 30% higher than it would have been if the baseline state of the site remained in place. If the Change Score is greater than +100%, it will simply be displayed as >100%. A positive Change Score generally indicates a positive impact on Natural Capital (biodiversity). The higher the Change Score, the greater the indicative ecosystem service/benefit. The Change Score is calculated by dividing the 'Unit/Score Change' by the 'Baseline Units/Score'.

A.1.5. Confidence Rating

The Confidence Rating indicates the general confidence in the scores and units calculated. It is mainly provided for transparency and considers general model uncertainties and caveats such as how well the model reflects the complexity of the ecosystem service/benefit and the evidence base informing scores and multipliers.

The fixed Confidence Rating is based on the assumption that the highest habitat detail level and all relevant advanced indicators are utilised. The Confidence Rating can be High (Green), Medium (Yellow), Low (Orange) or Experimental (Red):

 High: Very confident: There is a strong evidence base upon which to base scores across the range of habitats and multipliers used for the respective ecosystem service. Please note that this category is not currently applicable.

 Medium: Reasonably confident: There is some suitable evidence to calibrate the range of scores across habitats and multipliers and/or scoring applied to a limited range of habitats/multipliers for which there is a sound and simple rationale.

 Low: Low confidence: The relationship between the provision of the ecosystem service and habitats is complex. Evidence for scoring/multipliers is partial, although may be stronger for some habitats than others. Evidence gaps have been filled by consulting experts and with a degree of subjectivity, particularly for cultural services.

 Experimental: An experimental approach which applies for aggregated benefit categories such as health benefits and the Natural Capital score. This category reflects the additional uncertainty and caveats attached to aggregated scores.

A.1.6. Policy Priority

This indicator informs how scores are aggregated for the Natural Capital Score, Cultural & Health score, Regulating & Supporting score and Provisioning score, respectively. They are mainly displayed for reference and transparency. By default, policy priorities are based on a literature review where relevant national environmental and planning policies were reviewed for each UK jurisdiction. The policy priority for each service and benefit can either be high, medium or low. This classification should be based on both the frequency of policies related to a service/benefit as well as how strong the wording is formulated.

Policy Priorities translate into aggregation weights as follows:

- High (H) = 3

- Medium (M) = 2
- Low (L) = 1

As a result, an ecosystem services/benefit score with a high policy priority is weighted 3 times as much in the aggregated Natural Capital Score than the same score for a service/benefit with a policy priority weight of 1 (low).

Please note that physical and mental health scores are aggregated scores based on a literature review (see below). That means that certain ecosystem services scores feed into the health scores which feed into the aggregated Natural Capital Score which would result in double-counting. To avoid the double-counting issue, any contribution of ecosystem services scores to the health scores is deducted from the ecosystem services scores when feeding into aggregated scores such as the Natural Capital Score. For more detail refer to the relevant section within the Detailed Results sheet.

A.2. Benefit and Services (Category) Key (Rows)

A.2.1. Natural Capital Score

This is an aggregated headline indicator. It indicates the overall Natural Capital performance of the project and is based on scores for all ecosystem services/benefits as well as the Policy Priorities. This is effectively based on a Multi Criteria Decision Analysis (MCDA) framework and does NOT represent the overall value change in Natural Capital performance. Hence, the indicative Natural Capital Score should be read and interpreted alongside the individual ecosystem services/benefit results (and objectives where applicable).

The aggregated Natural Capital Score is calculated as the average of each ecosystem services/benefits score below, each multiplied by the aggregation weight attached to the respective Policy Priority (see Policy Priority for further detail). The abiotic Photovoltaic Carbon Impact is also considered when applying the Carbon Storage policy priority.

A.2.2. Cultural & Health (Category)

The Cultural & Health score is an aggregated headline indicator. It indicates the overall Culture & Health performance of the project and is based on scores for all ecosystem services/benefits as well as the Policy Priorities within this category. This is effectively based on a Multi Criteria Decision Analysis (MCDA) framework and does NOT represent the overall value change in Culture & Health performance. Hence, the indicative Culture & Health score should be read and interpreted alongside the individual ecosystem services/benefit results within the category (and objectives where applicable).

The aggregated Culture & Health score is calculated as the average of each ecosystem services/benefits score below, each multiplied by the aggregation weight attached to the respective Policy Priority (see Policy Priority for further detail).

A.2.3. Mental Health

The Mental Health score is an indicative aggregated indicator. It effectively aggregates ecosystem services scores based on their indicative contribution to Mental Health. This only indicates the contribution by Natural Capital and not any other engineered assets such as the presence of a hospital.

The Mental Health score is effectively based on a Multi Criteria Decision Analysis (MCDA). A percentage-contribution to Mental Health is allocated to each ecosystem service which adds up to 100% (the Mental Health score). The percentage allocation is based on a literature review exploring the links between ecosystem services and Mental Health. To avoid double-counting when aggregating (the already aggregated) Mental Health score to for example the Natural Capital Score, the percentage allocation is deducted from the ecosystem services again when aggregated to the Natural Capital Score.

A.2.4. Physical Health

The Physical Health score is an indicative aggregated indicator. It effectively aggregates ecosystem services scores based on their indicative contribution to

Physical Health. This only indicates the contribution by Natural Capital and not any other engineered assets such as the presence of a hospital.

The Physical Health score is effectively based on a Multi Criteria Decision Analysis (MCDA). A percentage-contribution to Physical Health is allocated to each ecosystem service which adds up to 100% (the Mental Health score). The percentage allocation is based on a literature review exploring the links between ecosystem services and Physical Health. To avoid double-counting when aggregating (the already aggregated) Physical Health score to for example the Natural Capital Score, the percentage allocation is deducted from the ecosystem services again when aggregated to the Natural Capital Score.

A.2.5. Aesthetic Values

The aesthetic value of nature is highly subjective and therefore difficult to reflect in a habitat-based scoring system which should be acknowledged when interpreting results. Different groups of society have different levels of appreciation for different natural settings and places. However, not valuing aesthetic and other cultural ecosystem services also means that they can be undermined in decision-making. It is important to stress, however, that this is only a broad indication of aesthetic value.

The Aesthetic Values Score only considers nature/habitats and not the aesthetics of constructed features such as buildings or monuments. The score is purely habitat-based and does not consider wider landscape impacts such as the appropriateness of habitats within the landscape setting. Nor does the automatically calculated score consider the preferences of the local community.

The Aesthetic Values Score is based on a habitat base score, as well as the following multipliers:

- Level of accessibility: The multiplier is higher for sites that have better public access as people are more likely to benefit if they can be physically present.
- Nature designations: The multiplier is higher dependent on whether the site has local, national or international nature designations.

- Population density/external visitor numbers: The multiplier is higher in areas with higher population density and/or which are frequently visited which indicates a higher demand/likelihood of exposure.
- Habitat maturity: The score is usually higher for mature habitats that have reached their full ecosystem services potential.
- Delivery risk: For newly created habitats, a delivery risk penalty may apply where failure of creating the intended habitat is likely to reduce ecosystem services.

A.2.6. Education & Knowledge

Alongside more theoretical environmental education in the classroom, frequent interaction with the natural environment can form a key element of acquiring ecological knowledge.

The Education & Knowledge Score only considers informal interaction with/formal educational visits to nature/habitats. It does not consider for example classroom-based ecological education which means that the presence of a school building or education centre would not enhance the score.

The Education & Knowledge Score is based on a habitat base score, as well as the following multipliers:

- Educational use: The multiplier is higher for areas that are specifically designed for educational purposes, areas that are located on primary school grounds and areas regularly visited for organised educational visits.
- Level of accessibility: The multiplier is higher for sites that have better public access as people are more likely to benefit if they can be physically present.
- Nature designations: The multiplier is higher based on whether the site has local, national or international nature designations.
- Population density/external visitor numbers: The multiplier is higher in areas with higher population density and/or frequently visited which indicates a higher demand/likelihood of exposure.

- Habitat maturity: The score is usually higher for mature habitats that have reached their full ecosystem services potential.
- Delivery risk: For newly created habitats, a delivery risk penalty may apply where failure of creating the intended habitat is likely to reduce ecosystem services.

A.2.7. Interaction with Nature

Interaction with nature refers to observing nature such as bird watching; either formally or informally. It also includes random encounters with wildlife and more generally feeling 'connected to nature'. To distinguish interaction with nature from recreation, for example, amenity grassland or a natural sports pitch may provide great recreational opportunities but it is unlikely to provide many opportunities to interact with nature.

The Interaction with Nature Score is purely habitat-based and does not directly consider the presence of species. Nor does it consider species/habitat diversity across a site.

The Interaction with Nature Score is based on a habitat base score, as well as the following multipliers:

- Level of accessibility: The multiplier is higher for sites that have better public access as people are more likely to benefit if they can be physically present.
- Nature designations: The multiplier is higher based on whether the site has local, national or international nature designations.
- Population density/external visitor numbers: The multiplier is higher in areas with higher population density and/or which are frequently visited which indicates a higher demand/likelihood of exposure.
- Habitat maturity: The score is usually higher for mature habitats that have reached their full ecosystem services potential.
- Delivery risk: For newly created habitats, a delivery risk penalty may apply where failure of creating the intended habitat is likely to reduce ecosystem services.

A.2.8. Recreation

The cultural ecosystem service recreation refers to greenspace that enables enjoyment, recovery from stress and the promotion of health. Accessible greenspace provides opportunities for a range of human activities such as walking, cycling, horse riding, climbing and informal relaxation. Recreational activities are known to increase individual wellbeing.

The Recreation Score is based on a habitat base score, as well as the following multipliers:

- Level of accessibility: The multiplier is higher for sites that have better public access as people are more likely to benefit if they can be physically present. The Recreation Score is highly dependent on the level of accessibility and sites without any level of access receive a score of zero.
- Population density/external visitor numbers: The multiplier is higher in areas with higher population density and/or which are frequently visited which indicates a higher demand/likelihood of exposure.
- Habitat maturity: The score is usually higher for mature habitats that have reached their full ecosystem services potential.
- Delivery risk: For newly created habitats, a delivery risk penalty may apply where failure of creating the intended habitat is likely to reduce ecosystem services.

A.2.9. Sense of Place

Sense of place refers to the aspects of a place that make it special and distinctive. This includes historic features, personal reasons, but also natural features such as habitats. The NATURE Tool provides indicative scores for different habitat types.

The Sense of Place Score is purely indicative and only captures a proportion of what gives a space sense of place. Not considered, for example, is how habitats fit into the local setting or interact with other features such as buildings, monuments or the landscape. It also doesn't consider any spiritual or religious meanings of a space to communities.

The Sense of Place Score is based on a habitat base score, as well as the following multipliers:

- Level of accessibility: The multiplier is higher for sites that have better public access as people are more likely to benefit if they can be physically present.
- Nature designations: The multiplier is higher based on whether the site has local, national or international nature designations.
- Population density/external visitor numbers: The multiplier is higher in areas with higher population density and/or which are frequently visited which indicates a higher demand/likelihood of exposure.
- Habitat maturity: The score is usually higher for mature habitats that have reached their full ecosystem services potential.
- Delivery risk: For newly created habitats, a delivery risk penalty may apply where failure of creating the intended habitat is likely to reduce ecosystem services.

A.2.10. Regulating & Supporting (Category)

The Regulating & Supporting score is an aggregated headline indicator. It indicates the overall Regulating & Supporting performance of the project and is based on scores for all ecosystem services/benefits as well as the Policy Priorities within this category. This is effectively based on a Multi Criteria Decision Analysis (MCDA) framework and does NOT represent the overall value change in Regulating & Supporting performance. Hence, the indicative Regulating & Supporting score should be read and interpreted alongside the individual ecosystem services results within the category (and objectives where applicable).

The aggregated Regulating & Supporting score is calculated as the average of each ecosystem services/benefits score below, each multiplied by the aggregation weight attached to the respective Policy Priority (see Policy Priority for further detail).

A.2.11. Air Quality Regulation

Complex vegetation and especially trees usually have a positive effect on the regulation of air quality. This applies particularly to areas where pollution emissions are comparatively high. Trees and other vegetation absorb, through physical deposition as well as chemical reactions, deleterious pollution such as nitrogen dioxide; but also, carbon monoxide, sulphur dioxide, ozone and fine particulates which are responsible for major illnesses such as respiratory ailments, heart disease and cancer.

Please note that good project design is assumed such as not creating a canopy 'roof' over busy roads which could potentially worsen localised air quality.

The Air Quality Regulation Score is based on a habitat base score, as well as the following multipliers:

- Population density/external visitor numbers: The multiplier is higher in areas with higher population density and/or which are frequently visited which indicates a higher demand/likelihood of exposure.
- Air Quality Management Area (AQMA): The multiplier is higher if a site is located in an area with an AQMA which indicates a higher demand for air quality regulation services.
- Habitat maturity: The score is usually higher for mature habitats that have reached their full ecosystem services potential.
- Delivery risk: For newly created habitats, a delivery risk penalty may apply where failure of creating the intended habitat is likely to reduce ecosystem services.

A.2.12. Carbon Storage

Carbon Storage in this context refers to natural carbon storage in vegetation and corresponding soils which makes an important contribution to mitigating climate change and reaching climate/net-zero targets. The photosynthetic activities of trees and other vegetation sequester carbon dioxide from the atmosphere and therefore act as a net carbon sink, especially when carbon is stored in corresponding soils. This score indicates (the project's impact on) average carbon stocks in vegetation

and corresponding soils. It is NOT the carbon sequestration as this would not appropriately account for the carbon loss of deforestation, for example.

In addition to the scores, Carbon Storage is also assessed in biophysical terms (tonnes of carbon dioxide equivalent; t CO_2e) and in monetary values. Please click on the info notes for respective headers for more information.

For woodland, carbon stock (changes) are based on the Woodland Carbon Code (WCC) calculation tool (version 2.1). For other habitats, estimates are based on Natural England's publication Carbon Storage and Sequestration by Habitat 2021. Please note that there is still significant uncertainty particularly around soil carbon stock changes. Please also note that the impact of peatland management/ degradation is not implemented yet. However, the development team is intending to implement that in subsequent versions. Not considered in this assessment are for example non-natural carbon impacts such as from building energy use or traffic (except the impacts of photovoltaic installations - see further below).

The Carbon Storage Score is based on a habitat base score, as well as the following multipliers:

- Grazing & Mowing: The multiplier is slightly higher for non-degraded grassland habitats.
- Habitat maturity: The score is usually higher for mature habitats that have reached their full ecosystem services potential.
- Delivery risk: For newly created habitats, a delivery risk penalty may apply where failure of creating the intended habitat is likely to reduce ecosystem services.

A.2.13. Cooling & Shading

Green vegetation has an influence on the local climate, and particularly so in more urbanised areas. Urban areas are usually warmer than their surroundings. This Urban Heat Island Effect (UHIE) is caused by the built environment retaining heat, which is released during the night, as well as the concentration of waste heat from warming and cooling. The UHIE will increasingly combine with global warming

caused by climate change. Green vegetation and in particular trees have a significant cooling effect on the local climate in cities and towns. The temperature around vegetation is reduced by evapotranspiration. Trees and scrub also provide shading and protection from heat and UV radiation. Therefore, Natural Capital has the potential to play a vital role in helping urban areas to adapt to climate change.

Cooling & Shading only indicates the contribution of natural vegetation. Not considered are for example sunshade sails which also provide shading but are not natural. Also not considered are engineered solutions to reduce waste-heat from buildings, for example.

The Cooling & Shading Score is based on a habitat base score, as well as the following multipliers:

- Level of accessibility: The multiplier is slightly higher for sites that have better public access as people are more likely to benefit from shading.
- Population density/external visitor numbers: The multiplier is higher in areas with higher population density and/or which are frequently visited which indicates a higher demand/likelihood of exposure. For Cooling & Shading, the population density is more significant because it also indicates the level of urbanisation/UHIE.
- Habitat maturity: The score is usually higher for mature habitats that already have reached their full ecosystem services potential.
- Delivery risk: For newly created habitats, a delivery risk penalty may apply where failure of creating the intended habitat is likely to reduce ecosystem services.

A.2.14. Erosion Protection

Soil erosion happens when wind and water results in the loss of nutrients, minerals and organic compounds. Such loss reduces the fertility of soils and is therefore undesirable. Soil erosion also puts pressure on water bodies through increased sediment runoff. Vegetation cover can protect soils from eroding – especially complex vegetation such as woodlands and vegetation that provides good soil

coverage such as grassland habitats. Arable fields where soils are often exposed to water and wind provide lower erosion protection services.

The Erosion Protection Score is based on a habitat base score, as well as the following multipliers:

- Slope steepness: The multiplier is higher for sites with steeper slopes because this makes soil erosion more likely which in turn indicates higher demand for Erosion Protection.
- Rainfall: The multiplier is higher in areas that experience more rainfall as heavy rain can contribute to soil erosion.
- Habitat maturity: The score is usually higher for mature habitats that have reached their full ecosystem services potential.
- Delivery risk: For newly created habitats, a delivery risk penalty may apply where failure of creating the intended habitat is likely to reduce ecosystem services.

A.2.15. Flood Regulation

Flood Regulation refers to the ability of natural habitats to slow down and store water in case of a flooding event. Woodlands, for example, do this by canopy interception, infiltration and water storage in soils.

Please note that the Flood Regulation Score only provides a rough indication of flood regulation. Modelling floods is complex, and this high-level assessment cannot capture the full complexity of flooding events. Not considered, for example, is the reduced level of damage/disruption mitigated flooding events would otherwise cause. Hence, scores are essentially indicative.

The Flood Risk Regulation Score is based on a habitat base score, as well as the following multipliers:

- Flood regulation location: The multiplier is higher in locations that are more likely to be flooded as long as water could run off (flow routes).

- Habitat maturity: The score is usually higher for mature habitats that have reached their full ecosystem services potential.
- Delivery risk: For newly created habitats, a delivery risk penalty may apply where failure of creating the intended habitat is likely to reduce ecosystem services.

A.2.16. Water Quality Regulation

Vegetation can, retain, remove and transform for example nitrate pollution from agricultural habitats or other pollution sources such as from sewage overflows during periods of heavy rainfall. The complexity of vegetation is important because complex vegetation can trap more pollutants when water flows through.

Not considered in the score are engineered water quality improvement measures such as chemical water treatment facilities.

The Water Quality Regulation Score is based on a habitat base score, as well as the following multipliers:

- Water status: The multiplier is higher for sites located in areas with generally poorer water quality, indicating a higher demand for the service.
- Habitat maturity: The score is usually higher for mature habitats that have reached their full ecosystem services potential.
- Delivery risk: For newly created habitats, a delivery risk penalty may apply where failure of creating the intended habitat is likely to reduce ecosystem services.

A.2.17. Pest Control

Pest Control describes nature's ability to self-regulate pests which are species that compete with humans for provisioning services such as food. Birds and spiders, for example, prey on pests and therefore naturally control pest populations. Chemical pesticides are a threat to natural pest control because natural enemies of pests are often more susceptible than the pests themselves. This is because pests build up resistance to chemical pesticides whilst their predators are more vulnerable and

also generally smaller in population. Semi-natural habitats tend to have higher Pest Control Scores than improved grassland or arable fields, for example.

Not considered in this score are for example chemical pest treatment or other non-natural measures. Also not considered is the local demand for Pest Control as this would require further context analysis. Arguably, Pest Control is more important in areas with higher volumes of agricultural production, for example.

The Pest Control Score is based on a habitat base score, as well as the following multipliers:

- Habitat maturity: The score is usually higher for mature habitats that have reached their full ecosystem services potential.
- Delivery risk: For newly created habitats, a delivery risk penalty may apply where failure of creating the intended habitat is likely to reduce ecosystem services.

A.2.18. Pollination

Most wild plants and crop species depend on insect pollination. Hence, pollination represents a vital ecosystem service supporting food supply and other ecosystem services such as aesthetic values. Many pollinators in the UK, especially those associated with semi-natural habitats, have become less widespread which may have implications for pollination services. Semi-natural habitats tend to have higher Pollination scores than for example improved grassland.

Not considered in this score is the local demand for Pollination as this would require further context analysis. Arguably, Pollination is more important in areas with higher volumes of agricultural production, for example. Also not considered are for example the presence/establishment of bee hives on a site.

The Pollination Score is based on a habitat base score, as well as the following multipliers:

- Habitat maturity: The score is usually higher for mature habitats that have reached their full ecosystem services potential.

- Delivery risk: For newly created habitats, a delivery risk penalty may apply where failure of creating the intended habitat is likely to reduce ecosystem services.

A.2.19. Provisioning (Category)

The Provisioning score is an aggregated headline indicator. It indicates the overall Provisioning performance of the project and is based on scores for all ecosystem services/benefits as well as the Policy Priorities within this category. This is effectively based on a Multi Criteria Decision Analysis (MCDA) framework and does NOT represent the overall value change in Provisioning performance. Hence, the indicative Provisioning score should be read and interpreted alongside the individual ecosystem services/benefit results within the category (and objectives where applicable).

The aggregated Provisioning score is calculated as the average of each ecosystem services/benefits score below, each multiplied by the aggregation weight attached to the respective Policy Priority (see Policy Priority for further detail).

A.2.20. Food & Fish | Commercial

Commercial food and fish production includes all production/catch that has a commercial purpose – essentially food/fish that is produced/caught to be sold. This is in contrast to community food and fish which is assessed below.

The score only captures grown food but does not include for example pig or poultry farms. This is because arguably such food production is not based on an ecosystem service (apart from the food grown to feed animals which is included in the score). It could also lead to double-counting with grown food that is then fed to livestock.

The Food & Fish - Commercial Score is based on a habitat base score, as well as the following multipliers:

- Commercial food/fishing function: Scores are zero if a habitat is not used for commercial fishing/food production.

- Agricultural Land Classification (ALC) grade: The multiplier for food production is higher for sites with a better ALC grade. The ALC grade indicates the quality of land for agricultural production. Please note that the ALC grade multiplier only applies to habitat types which typically rely on it. Habitat types that are not connected to ALC classification include woodland which may be used to collect mushrooms.
- Water status: The multiplier for fish production is higher for water that has a good status.
- Habitat maturity: The score is usually higher for mature habitats that have reached their full ecosystem services potential.
- Delivery risk: For newly created habitats, a delivery risk penalty may apply where failure of creating the intended habitat is likely to reduce ecosystem services.

A.2.21. Food & Fish | Community

Community food and fish production refers to non-commercial food production such as gathering berries and mushrooms or managing an allotment for private consumption. This service also includes non-commercial angling where the fish caught can be kept.

Not captured within the score is the recreational aspect of, for example, recreational fishing or enjoying gardening in an allotment. The score only indicates the produce, rather than the experience of the process.

The Food & Fish - Community Score is based on a habitat base score, as well as the following multipliers:

- Community food/fishing function: Scores are zero if a habitat is not used for community fishing/food production.
- Water status: The multiplier for fish production is higher for water that has a good status.
- Habitat maturity: The score is usually higher for mature habitats that have reached their full ecosystem services potential.

- Delivery risk: For newly created habitats, a delivery risk penalty may apply where failure of creating the intended habitat is likely to reduce ecosystem services.

A.2.22. Water Availability

The availability of water is, for example, crucial for ensuring affordable and safe drinking water and sanitation. Habitats such as running and standing water contribute directly to water abstraction whilst other habitats such as wetlands and woodlands allow the recharge of groundwater as surface water can impede through soil. This water availability function can be interrupted when surfaces are sealed or compacted, for example.

Water Availability needs to be distinguished from water supply where water is actually abstracted. This has not been included because information is usually difficult to obtain. Also not considered within the score is the local demand for water availability, for example whether water is/will be in shortage in an area.

The Water Availability Score is based on a habitat base score, as well as the following multipliers:

- Habitat maturity: The score is usually higher for mature habitats that have reached their full ecosystem services potential.
- Delivery risk: For newly created habitats, a delivery risk penalty may apply where failure of creating the intended habitat is likely to reduce ecosystem services.

A.2.23. Wood Production

Wood Production includes harvesting of timber and other woodland products such as wood-based biofuels or firewood. Woodland habitats usually receive the highest scores, but orchards, scattered trees and scrub can also provide some level of woodland products.

The Wood Production Score is based on a habitat base score, as well as the following multipliers:

- Woodland management: The multiplier is higher if a woodland is primarily managed for wood/timber production. The score is zero for woodlands that are not managed for wood production.
- Habitat maturity: The score is usually higher for mature habitats that have reached their full ecosystem services potential.
- Delivery risk: For newly created habitats, a delivery risk penalty may apply where failure of creating the intended habitat is likely to reduce ecosystem services.

Annex C. NATURE Tool Ecosystem Services Prioritisation

A.3. Proposed Scheme

Table A4-1.4-5 Proposed Scheme ecosystem services prioritisation

Benefits & Ecosystem Services	Default Priorities for Scotland	Applied policy priority	Justification and references
Mental Health	High	Medium	The Argyll and Bute Council Biodiversity Duty Action Plan, which outlines the council's statutory biodiversity duties, has four overarching outcomes in which biodiversity contributing to health and wellbeing is mentioned. Encouraging the use of the LLTNP to help realise the personal health and wellbeing benefits of connecting with nature and being active in the outdoors comprises Outcome 9 of the NPPP. NPF4 includes health as an important policy and recognises nature's positive impact on it. It is considered as MEDIUM because the project's location is far from the community.

Benefits & Ecosystem Services	Default Priorities for Scotland	Applied policy priority	Justification and references
Physical Health	High	Medium	The Argyll and Bute Council Biodiversity Duty Action Plan, which outlines the council's statutory biodiversity duties, has four overarching outcomes in which biodiversity contributing to health and wellbeing is mentioned. Encouraging the use of the LLTNP to help realise the personal health and wellbeing benefits of connecting with nature and being active in the outdoors comprises Outcome 9 of the NPPP. NPF4 includes health as an important policy and recognises nature's positive impact on it. It is considered as MEDIUM because the project's location is far from the community.
Aesthetic Values	Medium	High	The positive management and enhancement of the internationally renowned landscape of the National Park (NP) are mentioned as part of the three overarching NPPP. Outcomes, which form the basis for the vision of the Local Development Plan (LDP) for the Loch Lomond and Trossachs National Park (LLTNP). The LLTNP NPPP states that ‘we will work to conserve and enhance the special landscape and cultural heritage qualities of the area.’ LLTNP in the NPPP underlines the importance of aesthetic values in the A83 route. ‘Supporting projects that enhance opportunities to enjoy landscapes, particularly along major transport routes and around settlements, including implementing a strategically planned and designed upgrade to the A82 between Tarbet and Inverarnan, and continuing to review landslip management measures on the A83 at The Rest and Be Thankful. Additionally, this service is strongly linked to Sense of place in the context of the NP, which is designated as being of 'HIGH' importance.

Benefits & Ecosystem Services	Default Priorities for Scotland	Applied policy priority	Justification and references
Education & Knowledge	Low	Medium	Promoting understanding and enjoyment of the National Park is one of the four aims of National Parks that the LDP for each Park must contribute. As stated in the LDP, the encouragement and support for recreational and educational opportunities is also a 'core' part of the work done by the NP. The Argyll and Bute Council Biodiversity Duty Action Plan, which outlines the council's statutory biodiversity duties, has four overarching outcomes: biodiversity contributing to education (formal, informal and lifelong learning) is mentioned. Additionally, the site includes SSSI and SPA for Golden Eagles areas, which support the importance of the site in terms of educational value (unique ecology/wildlife).
Interaction with Nature	Medium	Medium	A subsidiary objective of outcome 9 of the NPPP concerning improving health and learning recognises the health benefits of 'connecting with nature' and thus is for the NP to be 'used more' as a place to do this.
Recreation	High	High	Promoting understanding and enjoyment of the NP is one of the four aims of NP that the LDP for each Park must contribute. As stated in the LDP, the encouragement and support for recreational and educational opportunities is also a 'core' part of the work done by the NPA. Visitor experience also comprises one of the core aims of the NPPP, with two outcomes focussed specifically on increasing terrestrial and water-based recreational opportunities. A83 connects to relevant recreational sites (Rest and be thankful, Loch Lomond, etc.)

Benefits & Ecosystem Services	Default Priorities for Scotland	Applied policy priority	Justification and references
Sense of Place	High	High	The conservation of the cultural (and natural) heritage of the National Park is one of the four aims of NP that the LDP to each Park must contribute. Additionally, the LDP states that if there is a conflict between any of the aims, greater weight must be given to this aim. Biodiversity and cultural heritage also constitute priority services, according to the NPA.
Air Quality Regulation	Medium	Medium	The Argyll and Bute Council Biodiversity Duty Action Plan, which outlines the council's statutory biodiversity duties, has four overarching outcomes. Argyll and Bute's sustainable management of natural resources for social and economic prosperity, including clean air, potable water, soil and native flora and fauna, is mentioned. The National transport Strategy (NTS), Strategic Transport Projects Review (STPR2) and STPR2 for Argyll and Bute, mention the improving air quality. STPR2 for and Bute says 'While emissions in Argyll & Bute make up a small proportion (1.8%) of Scotland's total transport emissions, there are opportunities for the region to contribute positively to the country's ambitious statutory targets to tackle the global climate emergency.' The plans do not include nature as part of the emissions mitigation, but the project has the potential to support this outcome. However, A83 is not in air quality management area or urban area, which is where would consider attributing high importance.

Benefits & Ecosystem Services	Default Priorities for Scotland	Applied policy priority	Justification and references
Carbon Storage (Habitats)	Medium	High	Policy 1 NPF4 states that "When considering all development proposals significant weight will be given to the global climate and nature crises." Additionally, "*LDPs must address the global climate emergency and nature crisis by ensuring the spatial strategy will reduce emissions*." Policy 2, climate change mitigation and adaptation of the NPF4 also states: "*Development proposals will be sited and designed to minimise lifecycle greenhouse gas emissions as far as possible.*"
Cooling & Shading	Medium	Low	No mention of this in local policy. Given the rural location, this has been attributed a LOW priority.
Erosion Protection	Low	High	Policy 4 NPF4 states that, "*development proposals will only be supported if they are designed and constructed in a manner that protects soil from damage including from compaction and erosion*." Additionally, the primary driver for the Proposed Scheme is to improve the resilience of the road network against landslips. Transport plans also mention to ensure the transport system adapts to the projected climate change impacts, and to deliver safe and resilient roads. The Argyll and Bute Council Biodiversity Duty Action Plan, which outlines the council's statutory biodiversity duties, has four overarching outcomes, in which the sustainable management of Argyll and Bute's natural resources for social and economic prosperity, including clean air, potable water, soil and native flora and fauna, is mentioned.

Benefits & Ecosystem Services	Default Priorities for Scotland	Applied policy priority	Justification and references
Flood Regulation	High	Medium	According to the A83 Story Map, one of the environmental sensitivities which will help to shape the design proposals will be 'existing and predicted future areas at risk of flooding.' One of the specific actions of Outcome 3 of the NPPP is also to "*work with partners and communities to better adapt to, and mitigate against, the impacts of climate change via initiatives which reduce flooding impacts.*" NPF4 Policy 2 states that "*development proposals which create, expand or enhance opportunities for natural flood risk management, including blue and green infrastructure, will be supported*." Transport plans also mention to ensure the transport system adapts to the projected climate change impacts, and to deliver safe and resilient roads. Check on whether it's a local threat to disruption of the highway and edit importance accordingly. Water environment team considered Flood regulation as a MEDIUM priority: The baseline situation is that a high likelihood flood risk zone has been identified on SEPA flood mapping adjacent to the Croe Water, which widens at various locations downstream, including where it meets the sea loch. The fact that the floodplain gets inundated will alleviate flood risk to receptors downstream. Less flood risk downstream would be beneficial to users of the Old Military Road and other receptors on valley floor downstream, but there may be limited receptors to benefit. The flood risk assessment for the project will seek to avoid the proposed development being flooded or causing flooding elsewhere, it is unlikely to reduce flood risk, although that may be a side-effect if particular engineering solutions are adopted.

Benefits & Ecosystem Services	Default Priorities for Scotland	Applied policy priority	Justification and references
Water Quality Regulation	Medium	High	The Argyll and Bute Council Biodiversity Duty Action Plan, which outlines the council's statutory biodiversity duties, has four overarching outcomes, in which the sustainable management of Argyll and Bute's natural resources for social and economic prosperity, including clean air, potable water, soil and native flora and fauna, is mentioned.
Pest Control	Low	Low	Within local policy reviewed, INNS was only mentioned in the NPPP, which states that the "*NPA will support targeted work on reducing the impact of INNS*" in its Natural Capital outcomes.
Pollination	Medium	Medium	Pollination was not mentioned across any locally-specific policy documents, however, NPF4, the Argyll and Bute Biodiversity Plan, NPPP expose their interest on nature crisis/biodiversity. Pollination is intrinsically linked with biodiversity. It is also linked to food production.
Food & Fish - Commercial	High	Low	Outcome 1 of the NPPP, concerning Natural Capital, states that "we will work with others to deliver multiple benefits from nature including natural flood management, carbon storage, and sustainable timber and food production." This is the only mention of food production within local policy reviewed. Commercial food production is of limited relevance to the glen. The Population & Human Health team agrees it is a LOW priority for the Proposed Scheme.
Food & Fish - Community	Medium	Low	Outcome 1 of the NPPP, concerning Natural Capital, states that "*we will work with others to deliver multiple benefits from nature including natural flood management, carbon storage, and sustainable timber and food production*." This is the only mention of food production within local policy reviewed. The value of the glen to local food production is considered relatively LOW.

Benefits & Ecosystem Services	Default Priorities for Scotland	Applied policy priority	Justification and references
Water Availability	Medium	Low	The Argyll and Bute Council Biodiversity Duty Action Plan, which outlines the council's statutory biodiversity duties, has four overarching outcomes, in which the sustainable management of Argyll and Bute's natural resources for social and economic prosperity, including clean air, potable water, soil and native flora and fauna, is mentioned. Water availability is not mentioned as a priority in the local plans. The site location is far from community areas. The Water environment team considered it to be of LOW priority for the Proposed Scheme: Water availability is likely to be high for surface water receptors. Private water supplies data has been requested but not yet confirmed. Water availability is unlikely to be affected by the Proposed Scheme.
Wood Production	High	Medium	Outcome 1 of the NPPP, concerning Natural Capital, states that "*we will work with others to deliver multiple benefits from nature including natural flood management, carbon storage, and sustainable timber and food production*." However, it is worth noting there is an emphasis on sustainable timber production and that there is a trend towards the removal of conifer plantation within the wider glen for the purposes of habitat restoration and improving slope stabilisation. Most of the valley is owned by family estate (tenant forestry) as well as FLS. The Population & Human Health team considered wood production as MEDIUM priority for the Proposed Scheme: there is wood production next to green route, however, the fact that trees need to be removed with the construction of route does not have a big impact in the wood production because those trees are meant to me removed soon anyway.
Photovoltaic Carbon Avoided	Medium	Low	No solar panels within the Proposed Scheme.

A.4. Enhancement sites

Table A4-1.4-6 Enhancement sites ecosystem services pioritisation

Benefits & Ecosystem Services	FLS Site South of RABT Carpark (Site 1)	FLS Honeymoon Bridge (Site 2)	FLS Riparian Site (Sites 3a and 3b)
Mental Health	Medium	Low	Low
Physical Health	Medium	Low	Low
Aesthetic Values	High	High	High
Education & Knowledge	Medium	Low	Low
Interaction with Nature	Medium	Low	Low
Recreation	High	Low	Low
Sense of Place	High	High	High
Air Quality Regulation	Medium	Medium	Medium
Carbon Storage (Habitats)	High	High	High
Photovoltaic Carbon Avoided	Low	Low	Low
Cooling & Shading	Low	Low	Low
Erosion Protection	High	High	High
Flood Regulation	Medium	Medium	Medium
Water Quality Regulation	High	High	High
Pest Control	Low	Low	Low
Pollination	Medium	Medium	Medium
Food & Fish - Commercial	Low	Low	Low

Benefits & Ecosystem Services	FLS Site South of RABT Carpark (Site 1)	FLS Honeymoon Bridge (Site 2)	FLS Riparian Site (Sites 3a and 3b)
Food & Fish - Community	Low	Low	Low
Water Availability	Low	Low	Low
Wood Production	Low	Low	Low