



The
Wildlife
Trusts

HS2 Double Jeopardy

How the UK's largest infrastructure project undervalued nature and overvalued its compensation measures

An evidence review of HS2 Ltd's
'No Net Loss' by The Wildlife Trusts

February 2023

Contents

Preface	iii
Summary of audit findings	iv
Conclusion and recommendations	v
Background	vi
Route	vi
HS2 and The Wildlife Trusts	vi
Review of HS2 High Speed 2 No Net Loss Phases 1 and 2a – review by Cheshire Wildlife Trust on behalf of The Wildlife Trusts	1



WOODLAND © ANDY BARTLETT

FIELD TREE © PAUL HARRIS/2020VISION

POND © JON HAWKINS

HEDGEROW © CHRIS COMERSALL/2020VISION

Preface

In January 2020, The Wildlife Trusts published a report, *What's the Damage? Why HS2 will cost nature too much*. At that point, it was the most comprehensive assessment of the environmental impact of the HS2 rail project on the natural world and revealed the broad range of impacts across all phases of HS2's construction on protected wildlife sites, species and landscape restoration projects. It showed how the design and route of HS2 put ancient woodlands and many other highly valuable wild places at risk and was the first time that the public, politicians and Government departments had been alerted to the full scale of environmental implications – and the extent of damage it would leave in its wake.

Despite the risk revealed to the natural world by the current design of HS2, little has changed and the route at present remains much the same. HS2, however, is still very much in its delivery stages, and opportunities to address some of the damage to the natural world remain. To strengthen the case for action, The Wildlife Trusts have produced a new evidence report, presented here, which studies the accuracy of HS2 Ltd's (the company responsible for delivering HS2) own nature data and reveals serious flaws in HS2 Ltd's approach to assessing biodiversity impacts. It is now clear that HS2 Ltd has hugely undervalued the nature that's being destroyed by construction along the route – and overvalued its nature compensation measures. This combination of bias and error in HS2 Ltd's approach puts nature in double jeopardy. The evidence is damning.

HS2 Ltd promises that nature will not lose out when landscapes and important habitats are destroyed to make way for construction of the high-speed rail line. Ensuring there's enough good quality nature compensation relies on accurate baseline assessments of the value of wildlife habitats along the route. For example, are the grasslands rich in wildflowers? Are the woodlands made up of native tree species such as oak and ash?

HS2 Ltd's datasets have been both difficult to access and decipher, but Cheshire Wildlife Trust has used all available information to conduct a year-long audit – the results of

which challenge HS2 Ltd's official nature loss statistics, reveal outdated and inaccurate calculation methods, and expose a lack of transparency.

As a flagship project, HS2 Ltd needs to radically overhaul the way it calculates nature loss. It is deeply disappointing that as the UK's biggest infrastructure programme, it has not committed to create a net gain for nature along the entire route. While it has committed to delivering Biodiversity Net Gain for Phase 2b, unlike most other developments in the pipeline, HS2 Ltd will be under no legal obligation to do this, or to deliver at a minimum of 10% biodiversity net gain across the whole development.

It needs to do much better, and to be held to account by the UK Government for its current failings.

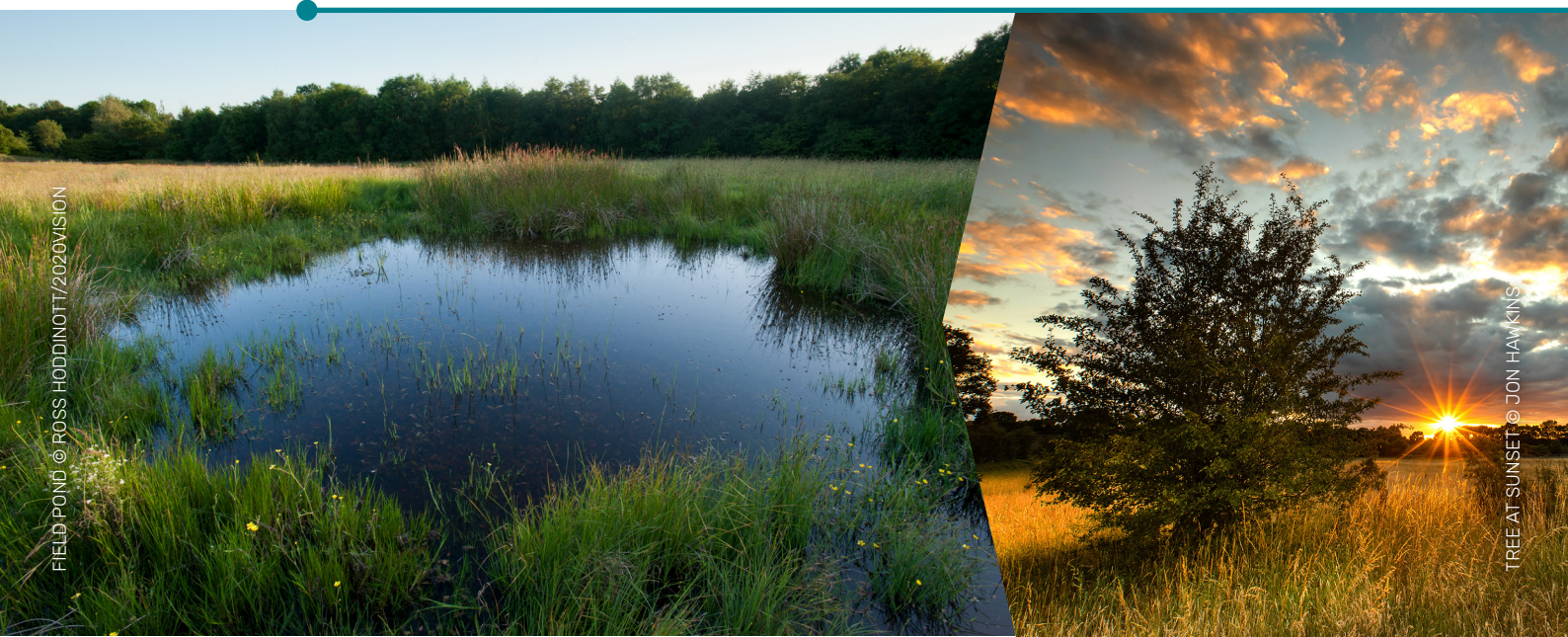
This vast infrastructure project is taking a wrecking-ball to wildlife and communities are in despair at losing the wild places – the woods, meadows and wetlands that they love – they will never get these back. So HS2 Ltd must repair nature in a way that's commensurate with the damage being caused and provide far more nature compensation than it is currently offering because it has seriously underestimated the impacts to biodiversity.

10% Biodiversity Net Gain is surely the absolute bare minimum that HS2 Ltd should offer after all the damage and heartbreak it has caused.

We are in a nature and climate emergency and Wildlife Trusts along the route are witnessing the destruction that the scheme is inflicting on the natural world and wild places. How HS2 Ltd values and restores the natural environment will have a lasting impact on us all.

Craig Bennett

Chief Executive, The Wildlife Trusts
February 2023



Summary of audit findings

In September 2021, The Wildlife Trusts commissioned Cheshire Wildlife Trust to investigate the accuracy of HS2 Ltd's nature data, which measures impacts on biodiversity caused by the construction of the line, and to use these findings to assess whether HS2 Ltd is likely to fulfil its No Net Loss of biodiversity objectives. To deliver No Net Loss, the HS2 high speed rail scheme would have to balance damage to biodiversity caused by its construction with at least equivalent gains for nature. Any damage to irreplaceable ancient woodland is not part of No Net Loss calculations and compensated for separately.

The high-speed line is being built in phases; HS2 Ltd has an aspiration to go beyond its commitment to No Net Loss of biodiversity on Phase 1 currently under construction, and on Phase 2a, being prepared for construction. It says it will create a net gain for biodiversity for non-irreplaceable habitats along the forthcoming Phase 2b of the route; Biodiversity Net Gain means the natural environment should be left in a measurably better state than it was beforehand.

Taking a conservative approach to its assessment, Cheshire Wildlife Trust found alarming errors, indicative of a large-scale problem, and which call into question the adequacy of all HS2 Ltd's nature restoration, and compensation plans.

Using HS2 Ltd's own data where available and additional information to show the type and quality of each habitat, Cheshire Wildlife Trust interrogated HS2 Ltd's mapping and assessment of existing nature along the route and found a catalogue of errors.

To replicate HS2 Ltd's approach as closely as possible, Cheshire Wildlife Trust recalculated the impacts to biodiversity caused by the construction of Phases 1 and 2a of the scheme using HS2 Ltd's own No Net Loss biodiversity units (NNL units). HS2 Ltd's No Net Loss biodiversity units measure the value of different habitats according to their size and how nature-rich they are. For the post-construction assessment (i.e., assessment of nature once the scheme is built) the only amendments were to correct obvious mistakes made by HS2 Ltd.

In addition to the catalogue of errors when assessing the pre-existing nature, this audit found that HS2 Ltd's metric (its 'accounting tool' for assessing impacts on nature) is untested, out of date and fundamentally flawed.

The Wildlife Trusts calculated the difference between the existing biodiversity value (as identified by Cheshire Wildlife Trust using HS2's NNL biodiversity units and metric) and the biodiversity value HS2 Ltd has said will be present after construction. In terms of HS2 Ltd's NNL units, our analysis revealed:

HS2 Ltd is underestimating the value of the nature that will be damaged or destroyed during the route's construction and overestimating the impact of the nature compensation it is putting in place (post construction).

For example, within HS2 Ltd's pre-construction footprint, many habitats such as field trees, ponds, watercourses and hedgerows are misrepresented, undervalued or in some cases not accounted for at all. This means that HS2 Ltd needs to provide far more nature compensation than it thinks is necessary, due to its serious underestimation on the impacts to nature.

Much of HS2 Ltd's data is hard to access. This, combined with HS2 Ltd's own inadequate methodology means Cheshire Wildlife Trust's figures in this report are almost certainly an underestimate and are indicative of the scale of the issues, rather than definitive. They are a warning of the likely errors and inaccuracies built into HS2 Ltd's current approach.

Comparing the assessments carried out by HS2 Ltd with those carried out by Cheshire Wildlife Trust, it is clear that HS2 Ltd's calculations result in some glaringly inaccurate values for the loss of biodiversity resulting from both Phase 1 and Phase 2a. In summary, a comparison of No Net Loss calculations is as follows:

For Phase 1

(2021 scheme), Cheshire Wildlife Trust's assessment indicates a minimum net loss of **4,367 NNL units** (**17.36%** loss of the pre-construction biodiversity value in NNL Units). This compares to a net loss of **555 NNL units** (**2.60%** loss of the pre-construction biodiversity value in NNL units), as calculated by HS2 Ltd.

For Phase 2a

Cheshire Wildlife Trust's assessment indicates a minimum net loss of **4,891 NNL units** (**42.80%** loss of the pre-construction biodiversity value in NNL Units). This compares to a net loss of **1,342 NNL units** (**17.01%** loss of the pre-construction biodiversity value in NNL units), as calculated by HS2 Ltd.

Across Phase 1(2021 scheme): 7.9 times more biodiversity loss than that calculated by HS2 Ltd

Across Phase 2a: 3.6 times more biodiversity loss than that calculated by HS2 Ltd

Consequently, as things stand, HS2 Ltd will not compensate sufficiently for the damage likely to be caused by Phases 1 and 2a of the scheme, and if it uses the same methods, it will not come close to delivering a Net Gain for Biodiversity for Phase 2b. In essence it is not able to account credibly for the impact of HS2 on biodiversity.

Issues include:

Significant mapping errors and poor digitisation. Numerous field trees, ponds, other waterbodies and watercourses (ditches and drains) are unaccounted for in the baseline mapping and are therefore excluded from the assessments.

Watercourses: As a result of HS2 Ltd's flawed No Net Loss metric, there's no differentiation between rivers, streams or ditches with running water. Any damage caused during the construction of the scheme is essentially unaccounted for and HS2 Ltd is only accounting for the overall loss in length, rather than the nature value of a specific river or stream.

Woodland: HS2 Ltd's No Net Loss metric overvalues the woodland that the company will create to compensate for the loss of existing species-rich woods by at least half, and overvalues grassland it plans to create to compensate

for the loss of existing species-rich grassland by at least a third, compared to the current industry standard.

Hedgerows: Many hedgerows have been significantly undervalued in baseline calculations, and overvalued in the post-construction assessments, particularly compared to the current industry standard.

CONCLUSION

The HS2 No Net Loss metric is neither evidence-based nor was subject to wider consultation. Due to a fundamental lack of transparency, it has taken four years for the extent of the issues to be finally recognised. HS2 Ltd has published its No Net Loss figures years in advance of releasing the supporting datasets and has therefore denied the opportunity for proper review and independent scrutiny.

The HS2 No Net Loss figures released in 2017, 2019 and 2021 are wholly unreliable. They are based on poor quality data riddled with inaccuracies and rely on an untested assessment methodology that has been subject to little independent scrutiny and no independent quality assurance. The way in which HS2 Ltd is publishing and communicating its No Net Loss percentage figures is highly misleading.

RECOMMENDATIONS

We recommend that:

- 1 HS2 Ltd should re-map existing habitats along Phases 1 and 2a, correcting mapping errors, applying the correct nature values to habitats, and ensuring no habitats are excluded.
- 2 HS2 Ltd should recalculate the total impacts to nature, by using an up to date and proven methodology, such as one directly comparable to the government's current Biodiversity Metric 3.1. If changes to the methodology are made these should be transparent and evidence based. It is critical that HS2 Ltd ensure all data is made publicly available at the point the figures are released to facilitate transparency and enable independent scrutiny.
- 3 The Westminster Government should respond swiftly to our findings, while there is still time to change the scheme's design and delivery to limit the adverse impacts and enhance biodiversity in a way that is commensurate with the scale of the damage i.e., by achieving a minimum 10% biodiversity net gain for replaceable habitats for each phase of the scheme.
- 4 HS2 Ltd should immediately pause all construction and enabling works and halt the passage of the Phase 2b Hybrid Bill while these latest audit findings are assessed by the Government.

For full details read the accompanying report below: Review of High Speed 2 No Net Loss Phases 1 and 2a Report by Cheshire Wildlife Trust on behalf of The Wildlife Trusts. Based on evidence gathered through an investigation by the Evidence and Planning team at Cheshire Wildlife Trust.

Background

METRIC

HS2 Ltd has developed its own distinct, and modified 'accounting tool' for nature, based on a 2012 Defra pilot metric. HS2 Ltd has been very clear that it is not using these calculations to inform the provision or the appropriateness of compensatory habitat. The like for like or better rule of the current up-to-date government metric is not being applied. The result is that, for example, many complex and well-developed semi-natural woodland ecosystems will be replaced with simplistic homogenous habitats of little value to wildlife.

In 2016 Natural England reported *'In light of the wide-ranging issues that using the HS2 NNL metric as an accounting tool has presented, it is recommended that for Phase 2 of the scheme a metric is applied for biodiversity offsetting purposes, i.e., a tool to inform compensation provision. It is considered that this would be beneficial for the natural environment, for reporting purposes and for HS2 Ltd.'*

The HS2 No Net Loss calculations demonstrate that HS2 Ltd has not taken on board these particular recommendations from Natural England and the No Net Loss metric is still not being used to inform the type of compensation required.

HS2 Ltd also works under a different set of environmental rules, which means unlike most other forthcoming developments, it will not have to deliver at least 10% Biodiversity Net Gain only No Net Loss of biodiversity.

ROUTE

HS2 is England's biggest infrastructure project in modern times. Stretching from London to Manchester, it is being delivered in three phases:

1. Phase 1 (London to Birmingham)

From London to a junction with the West Coast Main Line near Lichfield with a branch to Birmingham. Construction on the line began in 2020 and tunnelling for the first phase began under the Chiltern hills just outside London in 2021. Full construction of the line is now underway.

2. Phase 2a (Birmingham to Crewe)

From Lichfield to another junction with the West Coast Main Line at Crewe, has achieved royal assent, allowing it to begin enabling works including links to highways, compounds, and utilities; full construction is expected to begin in summer 2024.

3. Phase 2b western leg (Crewe to Manchester)

A Hybrid Bill is seeking Parliamentary approval for Phase 2b from Crewe to Manchester, with a link to the West Coast Main Line at Crewe for trains to join the existing network and continue to Scotland and from the West Midlands to East Midlands Parkway where HS2 joins the conventional rail Midland Main Line.

The Phase 2b Eastern Leg to Leeds and the Golborne Link has been cancelled.

HS2 AND THE WILDLIFE TRUSTS

The Wildlife Trusts support the need for better and more sustainable public transport, but nature, which is a vital ally in the fight against the climate crisis, must not pay the price.

For more than a decade The Wildlife Trusts have highlighted the impacts on nature of the HS2 route, the scheme's design and the UK Government's approach to its delivery

In 2014, The Wildlife Trusts set out a 'Greener Vision' offering ideas for large-scale nature restoration along the proposed route.

In January 2020, The Wildlife Trusts' report: [*What's the Damage? Why HS2 will cost nature too much*](#) highlighted the impacts for wildlife and wild places, increased habitat fragmentation and the possibility of local area extinction of endangered species. The report's findings were supported by National Trust, RSPB and Woodland Trust.

HS2 states it is "the UK's flagship transport levelling up project". 'Levelling up' needs to ensure nature, with all the wellbeing benefits it brings to communities living close to the route, does not lose out.

In 2022 Cheshire Wildlife Trust, as the leading local environmental NGO in the area impacted by HS2 Phase 2b, submitted its petition to the High Speed Rail (Crewe-Manchester) Bill. Amongst other objections it cited "a reprehensible lack of transparency regarding how HS2 Ltd has assessed the likely impacts to the natural environment".

Four Wildlife Trusts – Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust, The Wildlife Trust for Birmingham and the Black Country, Cheshire Wildlife Trust, and Herts and Middlesex Wildlife Trust – manage nature reserves that have been directly impacted by construction or compulsory purchase by HS2 Ltd. Eleven Wildlife Trusts are based in counties affected by the planned route.

Phase 1 (London to West Midlands)

- London Wildlife Trust
- Herts and Middlesex Wildlife Trust
- Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust
- The Wildlife Trust for Bedfordshire, Cambridgeshire and Northamptonshire
- Warwickshire Wildlife Trust
- Staffordshire Wildlife Trust
- The Wildlife Trust for Birmingham and the Black Country

Phase 2a (West Midlands to Crewe)

- Staffordshire Wildlife Trust
- Cheshire Wildlife Trust
- Warwickshire Wildlife Trust

Phase 2b western leg (Crewe to Manchester)

- The Wildlife Trust for Lancashire, Manchester and North Merseyside
- Cheshire Wildlife Trust.
- Warwickshire Wildlife Trust

HS2 East Core Network

- Nottinghamshire Wildlife Trust and Leicestershire and Rutland Wildlife Trust are based in counties which might be impacted by HS2 East Core Network. *(Integrated Rail Plan for the North and Midlands, Department for Transport, pg 76)*





The
Wildlife
Trusts

Review of High Speed 2 No Net Loss Phases 1 and 2a

A report by **Cheshire Wildlife Trust**
on behalf of The Wildlife Trusts

February 2023

Contents

Executive summary	3
Context	4
Methodology	5
Overview	5
Calculating the Percentage Reduction in NNL Units	5
HS2 Biodiversity Unit Calculation for Area-based Habitats and Hedgerows	5
HS2 Biodiversity Unit Calculation for Watercourses	5
Pre-construction NNL Unit Assessment	5
Post-Construction NNL Unit Assessment	6
Limitations	6
Results	7
Pre-construction	7
Pre-construction Baseline Phase 1 (2017 and 2021 Schemes)	7
Pre-construction Baseline Phase 2a (2019)	7
Post-construction	7
Post-construction Phase 1 (2017 and 2021 Schemes)	8
Post-construction Phase 2a	8
Habitat Losses and Gains	9
Phase 1 (2017 scheme)	10
Phase 1 (2021 scheme)	10
Phase 2a (2019 scheme)	10
Discussion of Key Issues (Area-based Habitats)	11
Pre-construction	11
Digitising and Mapping Errors	11
Evaluating Existing Habitats	11
Post-construction	12
Summary of No Net Loss Calculations	12
Analysis of the Implications of using the HS2 NNL Approach Compared to Current Industry Standards	13
Overview	13
Strategic Significance	13
Using a Metric to Inform Habitat Compensation (Like for Like or Better)	13
Supplementary Assessment 1 - Sensitivity Analysis of Habitat Creation	14
Overview	14
Results	15
Phase 1 Woodland	16
Phase 2a Woodland	16
Phase 1 Grassland	16
Phase 2a Grassland	16
Summary of Habitat Creation Sensitivity Analysis	16
Supplementary Assessment 2 - Linear Habitats	17
Hedgerows and Lines of Trees	17
Hedgerows and Lines of Trees Summary	18
Hedgerows and Lines of Trees Recommendations	18
Watercourses	18
Watercourses Recommendations	18
Conclusion	19
Sensitivity Analysis	19
Linear Habitats	19
Summary	19
Recommendations	20
<u>Appendices</u>	
Appendix 1 - Methodology	21
Appendix 2 - Datasets	22
HS2 GIS Files used for Phase 1 Calculations	22
HS2 GIS Files used for Phase 2a Calculations	22
Appendix 3 - Habitat Distinctiveness	23
Appendix 4 - Post-Construction Risk Multipliers	28
Appendix 5 - Route-wide summary of areas and NNL biodiversity units	30

Executive summary

This review of the High Speed 2 (HS2) No Net Loss (NNL) interim figures has highlighted that both the underpinning habitat data and No Net Loss calculation methodology are fundamentally flawed. This has led to two key failures:

1. Undervaluation of the existing biodiversity value of HS2's construction footprint.
2. Overvaluation of the scheme's biodiversity value post-construction.

When we examined the pre-construction assessments for HS2 Phases 1 and 2a we found the HS2 data used to evaluate biodiversity had a high number of mapping errors and inconsistencies. Furthermore, many habitats such as field trees, ponds, watercourses, and hedgerows are misrepresented, undervalued or sometimes not accounted for at all. This has led to a serious underestimation of the preconstruction biodiversity value¹.

For habitats other than watercourses and hedgerows we believe the undervaluation of the baseline pre-construction biodiversity value is at least 3,773 NNL units for Phase 1 (2021). This is a 16.21% difference from HS2 Ltd.'s reported figure. For Phase 2a (2019) the undervaluation is at least 3,541 NNL units, a 36.67% difference from HS2 Ltd.'s figure. The undervaluation could be greater than this if the process was repeated applying current industry standards. We did not calculate the overall figures for linear habitats (hedgerows and watercourses).

The post-construction biodiversity value has been calculated using the HS2 No Net Loss metric, an untested methodology based upon an adapted version of a now redundant 2012 pilot biodiversity metric. This means the impacts cannot be compared to biodiversity losses and gains from projects that adhere to current industry standards.

When compared to the government's current Biodiversity Metric 3.1, we found numerous errors in HS2 Ltd's post-construction calculations. Of most concern was a substantial overvaluation of watercourses, woodland, and grasslands, which HS2 Ltd will create to compensate for the loss of existing species rich woods and grassland habitats. We also found the HS2 metric is disproportionately weighted in favour of new hedgerow creation and provides an inaccurate assessment of the overall impacts to the hedgerow network.

We conclude that the HS2 No Net Loss figures released in 2017, in 2019 and in 2021 are wholly unreliable. These are based upon poor quality data riddled with inaccuracies and rely on an untested assessment methodology that is subject to little independent scrutiny and no independent quality assurance². The way in which HS2 Ltd. is publishing and communicating its No Net Loss percentage figures is highly misleading.

Context

Biodiversity net gain (BNG) is an approach to development, and/or land management, that aims to leave the natural environment in a measurably better state than it was beforehand. This approach cannot be used for habitats such as ancient woodland which are deemed to be irreplaceable.

In its Environmental Sustainability Progress report 2022 HS2 Ltd. committed to achieving a 10% net gain in biodiversity on Phase 2b to Manchester and stated its aspiration to go beyond their previous commitment to No Net Loss on Phase One and Phase 2a.

Although not likely to be a legal requirement for large scale infrastructure projects until 2025 (and for other developments in 2023) HS2's net gain objective is a welcome goal and represents a positive shift in biodiversity policy from originally seeking to achieve No Net Loss (NNL)³ of biodiversity for replaceable habitats at a route-wide level. HS2's biodiversity objective emerged from national and international policies including, but not limited to, the England Biodiversity 2020 Strategy, the 25 Year Plan for the Environment (2018), the National Planning Policy Framework 2012⁴, 2018, 2021 and the UK's implementation of the International Convention on Biological Diversity.

In 2017 HS2 Ltd. reported that undertaking calculations for the No Net Loss objective *'has been a major undertaking and is by far the most complex example of any such calculation utilising a biodiversity metric (including those used to define compensation requirements) to be undertaken in the UK'*. In 2017 it released figures and revised methodology for calculating No Net Loss for Phase 1 of the scheme and in 2019 the equivalent figures were released for Phase 2a. Since then, there have been updates to the reported Phase 1 figures in 2020, 2021 and 2022. The most recent 2022 update reported:

'Linear habitats, hedgerows and watercourses, are both showing overall gains in biodiversity units of 10.23% and 7.77% respectively, a significant improvement on both the 2017 baseline and the previous updates. This indicates that it is possible to achieve a net gain position on linear habitats on large infrastructure projects. Area-based habitats are reported at -2.93%. This represents an improvement from the 2017 baseline report which was -7.14% but a worsening from the Q1 2021 figure of -2.6%.'

As a member of the Ecology Review Group for HS2 The Wildlife Trusts have repeatedly asked for access to HS2's No Net Loss data (in the form of a GIS⁵ geodatabase), highlighting that the scale and complexity of the calculations required transparency so that HS2's figures could be independently reviewed.

Four years after release of the Phase 1 2017 progress report (in November 2021), the 2017 No Net Loss data was made available via the Ecology Review Group. This dataset included the baseline No Net Loss habitat assessments from which subsequent calculations of percentage losses or gains are undertaken.

In September 2021, The Wildlife Trusts commissioned the Cheshire Wildlife Trust (CWT) to review the No Net Loss calculations for Phases 1 and 2a of the scheme. Using the available HS2 datasets in addition to habitat information held by The Wildlife Trusts, national datasets and aerial imagery, CWT independently mapped and evaluated the area-based habitats⁶ and calculated the number of HS2 'NNL units' in the footprint of HS2 Phases 1 and 2a.

At the time of writing this study represents the only independent full-scale reappraisal of progress towards the HS2 No Net Loss objective.

Methodology

OVERVIEW

HS2 Ltd. use its No Net Loss metric as an 'accounting tool' to compare the losses and gains in biodiversity units⁷ as a result of the scheme. This contrasts with the government's Biodiversity Metric 3.1 (Defra metric) which is intended to inform⁸ decisions on planning, design, and the provision of biodiversity compensation. The HS2 No Net Loss methodology is based upon an adapted⁹ version of the pilot Biodiversity Metric dating back to 2012.

The No Net Loss calculations assess the likely impacts to habitats, hedgerows, and watercourses. These are reported separately as area-based (habitat) units, hedgerow units and watercourse units.

This study reassesses the losses and gains for HS2 determined area-based units (referred to as NNL units in this report) as a consequence of HS2 Phase 1 (published by HS2 Ltd. in 2017 and 2021) and Phase 2a (published by HS2 Ltd. in 2019). We also reviewed the methodology utilised by HS2 Ltd. for measuring the impacts to hedgerows and watercourses, although we have not reassessed the impacts to these linear habitats.

In order to test the reliability of the HS2 Ltd. calculations we replicated, as far as possible, the pre-construction baseline assessment¹⁰ of biodiversity by mapping area-based habitats and attributing habitat distinctiveness categories¹¹ and condition values¹² according to the criteria used by HS2 Ltd.

The approach¹³ taken by HS2 Ltd. can be summarised as:

- **Pre-construction** – the baseline biodiversity value for area-based units, hedgerow units and watercourse units is calculated by multiplying the habitat distinctiveness value by the habitat condition value.
- **Post construction** – the biodiversity value for area-based units, hedgerow units and watercourse units is calculated by multiplying the habitat distinctiveness value by the habitat condition and two risk factors (i.e., multipliers that account for the difficulty of creating or enhancing different habitat types and the time it takes a created or enhanced habitat to achieve its target condition).

CALCULATING THE PERCENTAGE REDUCTION IN NNL UNITS

The percentage reduction of NNL units as a result of the scheme is calculated by HS2 Ltd. as follows.

HS2 Biodiversity Unit Calculation for Area-based Habitats and Hedgerows

For area-based habitats and hedgerows HS2's assessment of No Net Loss is calculated as the percentage reduction between:

- The pre-construction baseline biodiversity value of the scheme's footprint, and;
- The predicted post-construction biodiversity value¹⁴ of the scheme once delivery risk and time to target condition have been accounted for.

HS2 Biodiversity Unit Calculation for Watercourses

For watercourses, HS2 Ltd.'s assessment No Net Loss is calculated as the percentage reduction between:

- The pre-construction baseline biodiversity value of the scheme's footprint, and;
- The predicted post-construction biodiversity value of the scheme.

Notably the HS2 metric:

- Allocates the same habitat distinctiveness value pre- and post-construction for all hedgerows and watercourses (i.e., all allocated a distinctiveness value of 1).
- Does not apply risk multipliers¹⁶ for watercourses (i.e., risk multipliers are set at 1 in the calculations).

PRE-CONSTRUCTION NNL UNIT ASSESSMENT

The methodology the Trust used is based upon that published by HS2 in its No Net Loss reports¹⁷ (2017, 2019). Further details can be found in Appendix 1 and details of datasets used can be found in Appendix 2.

Habitat parcels originally mapped by HS2 Ltd. were re-mapped or verified by CWT in GIS using supporting datasets, aerial imagery and base OS maps.

The allocation of habitat distinctiveness categories to each habitat parcel was undertaken using a set of hierarchical criteria including, but not limited to:

1. Designated site data¹⁸.
2. Priority Habitat Inventory¹⁹.
3. Phase 1 habitat survey information.
4. Local datasets.
5. Aerial imagery.

Details of how habitat distinctiveness, a measure of habitat quality, was assigned are set out in Appendix 3 (tables 12 and 13). Where the differences between habitat distinctiveness categories (i.e., a measure of habitat quality

and habitat type) were unclear, professional judgement was used to allocate habitat parcels to a specific category. For example, broadleaved semi-natural woodland was allocated a high distinctiveness category, but if the type of woodland could not be determined then a medium distinctiveness category was used.

To attribute habitat condition value, we followed the same methodology employed by HS2 Ltd which is based upon the condition criteria set out in the Farm Environment Plan^{20,21} with further details in table 13 in Appendix 3. Statutory and non-statutory designated sites (SSSIs and LWSs) were allocated a condition value of 3 (good). For all low distinctiveness habitats, we followed the HS2 methodology by allocating a condition value of 1 (poor).

To improve the accuracy of the assessment, we deviated from the HS2 methodology by:

- Including individual field trees²² where/when these have been mapped by HS2. Figures are also provided²³ that exclude field trees so that a direct comparison with HS2's figures can be made (HS2 Ltd does not include field trees in its No Net Loss assessment).
- Mapping the position of arable margins rather than applying a standard 1m buffer (as HS2 Ltd has done) and mapping road verges more precisely than HS2's assessment.
- Mapping and assessing entire ponds²⁴ where these are partially intersected by the scheme, in contrast to the HS2 assessment which does not account for the area of an impacted pond which lies outside the construction boundary.
- Using the Open Mosaic on Previously Developed Land²⁵ and Wood Pasture/Parkland Priority Habitat Inventories to inform the assessment.
- Accounting for the underlying habitats where scattered scrub²⁶ was present and valuing its condition accordingly. In contrast HS2 Ltd used an inconsistent approach and did not always account for the value of underlying habitat.
- Excluding non-parkland habitats with scattered trees (e.g., field trees in improved grassland or arable fields) from the parkland/scattered trees categories and evaluating them separately. In contrast, HS2 Ltd mapped some scattered trees as medium distinctiveness parkland.

POST-CONSTRUCTION>NNL UNIT ASSESSMENT

To replicate HS2 Ltd's approach we used HS2 post-construction No Net Loss metric data (detailed in Appendix 2) to assess post-construction area-based habitat units with the following minor amendments:

- Exclusion of buildings and built areas from the calculations (to ensure consistency with the pre-construction assessments).
- Amended risk multipliers only where these did not correspond to those published²⁷ by HS2 Ltd or where there were no published risk multipliers²⁸ (unless justification was provided).

Risk multipliers were applied according to the HS2 methodology set out in tables 14 and 15 Appendix 4.

LIMITATIONS

Some datasets that HS2 Ltd had access to were not available to CWT. Some datasets, such as pond survey data was incomplete or in a format that was not easily used.

Like HS2 Ltd, we attributed moderate condition (2) for unvisited habitats in the absence of other information and we assumed poor²⁹ condition (1) for all low distinctiveness habitats. We acknowledge that attributing habitat condition in the absence of detailed information, or where information is inaccurate, is difficult and we used our professional judgement to do this.

In some areas, where previously intensively managed land allocated to the scheme has been taken out of production, the biodiversity value has increased since the assessments were undertaken³⁰. This increase in value in recent years has not been captured in our calculations.

For all these reasons our results should be viewed as a possible undervaluation of the pre-construction baseline biodiversity value.

Results

PRE-CONSTRUCTION

The total number of NNL biodiversity units for the land in the construction footprint of HS2 (calculated using the size of each habitat parcel and its quality) are **26,285** for the Phase 1 baseline 2017, **25,162** for the revised Phase 1 2021 construction footprint and **11,428** for the Phase 2a construction footprint.

Table 1 provides an overview of the differences between the pre-construction habitat baseline of Phase 1 (2017), Phase 1 (2021) and Phase 2a.

Table 2 provides an overview of the NNL biodiversity unit value of field trees in the pre-construction baseline for Phase 1 (2017), Phase 1 (2021) and Phase 2a.

Source (scheme iteration)	HS2	CWT	Net Difference in NNL Units	Percentage difference pre-construction ³¹
Phase 1 2017	22,059	26,285	+4226	17.48%
Phase 1 2021 Q1	21,389	25,162	+3773	16.21%
Phase 2a 2019	7,887	11,428	+3541	36.67%

Table 1 Route-wide difference between pre-construction NNL biodiversity units calculated by CWT and HS2. Field trees included.

Source (scheme iteration)	No of trees mapped by HS2	Area of Trees (ha) ³²	NNL Units ³³
Phase 1 2017 ³⁴	2,851	104.35	834.77 ³⁵
Phase 1 2021 Q1 ³⁶	2,810	102.85	822.77 ³⁷
Phase 2a ³⁸	2,651	97.03	776.21 ³⁹

Table 2 NNL Biodiversity Units arising from field trees

Pre-construction Baseline Phase 1 (2017 and 2021 Schemes)

Re-mapping the No Net Loss baseline habitats across Phase 1 has demonstrated that HS2 underestimated the existing biodiversity value by **4,226 NNL units** within the 2017 scheme. Re-mapping the 2021 scheme has revealed that HS2 underestimated the existing biodiversity value by **3,773 NNL units**.

These figures include field trees that were surveyed by HS2 Ltd. in 2013, however our observations indicate it is unlikely that these surveys identified all individual field trees present within the scheme. As a result, the discrepancy between CWT and HS2 pre-construction NNL units could be even greater than we have identified. This means that in reality HS2 Ltd. is likely to have undervalued the existing pre-construction habitats to an even greater degree than we have shown above.

Pre-construction Baseline Phase 2a (2019)

Re-mapping the No Net Loss baseline habitats across Phase 2a (2019) has demonstrated that HS2 underestimated the existing biodiversity value by **3,541 NNL units** within the scheme.

These figures also include field trees that were surveyed

by HS2 Ltd. between 2015 and 2018, again however our observations indicate it is unlikely these surveys identified all individual field trees present within the scheme. As a result, the discrepancy between CWT and HS2 pre-construction NNL units could be even greater than we have identified, meaning HS2 Ltd. is likely to have undervalued the existing pre-construction habitats to an even greater degree than we have shown above.

POST-CONSTRUCTION

To replicate HS2 Ltd's approach, we recalculated the No Net Loss figures post construction using HS2 Ltd's own metric. The only amendments we have made to the post-construction figures are to correct obvious mistakes made by HS2⁴⁰. Because of HS2 Ltd's out of date methodology these figures are likely to be an overestimate, and if calculations were repeated using an up to date and appropriate metric, the post-construction biodiversity unit value of the scheme is likely to be significantly lower and consequently the overall losses of biodiversity will be greater than those calculated by HS2 Ltd. This is explored further in the discussion section of this report.

Table 3 provides an overview of NNL units generated pre- and post-construction. Identified field trees are included in this analysis. For completeness we have repeated the exercise excluding field trees and included the results in table 16 Appendix 5.

Pre-construction					Post-construction			Summary			
Source (scheme iteration)	Area (ha)		NNL Biodiversity Units		Area (ha)	NNL Biodiversity Units		Reduction in number of area based NNL Biodiversity Units (%)		Overall net change in area based NNL Biodiversity Units	
	HS2	CWT	HS2	CWT		HS2	HS2	CWT	HS2	CWT	HS2
Phase 1 2017	6,775	6,787	22,059	26,285	6,777	20,484	20,102 ^{41,42}	-7.14	-23.52	-1,575	-6,183
Phase 1 2021 Q1	6,409	6,600	21,389	25,162	6,418 ⁴³	20,834	20,795 ⁴⁴	-2.60	-17.36	-555	-4,367
Phase 2a	2,979	2,977	7,887	11,428	2,973	6,545	6,537 ⁴⁵	-17.01	-42.80	-1,342	-4,891

Table 3 Route-wide summary of areas and NNL area-based biodiversity units generated pre- and post-construction. Field trees included.

Post-construction Phase 1 (2017 and 2021 Schemes)

Using the No Net Loss methodology we calculated a residual loss of -6,183 NNL units across the Phase 1 2017 scheme compared to a -1,575 loss calculated by HS2 Ltd. **Our assessment shows a -23.52% loss of NNL units compared to a -7.14% loss reported by HS2 Ltd; however, this is likely to be an underestimate due to the out of date methodology.**

Across the Phase 1 2021 scheme we calculated a residual loss of -4,367 NNL units compared to a -555 loss calculated by HS2 Ltd. **Our assessment shows a -17.36% loss of NNL units compared to a -2.60% loss reported by HS2 Ltd, however this is likely to be an underestimate due to the out of date methodology.**

These figures are not comparable with the losses and gains calculated for other developments using the Defra Biodiversity Metric 3.1 as the methodology utilised is very different. This is discussed further on page 13.

Post-construction Phase 2a

Using the No Net Loss methodology we calculated a residual loss of -4,891 NNL units across the Phase 2a scheme compared to a -1,342 loss calculated by HS2 Ltd. **Our assessment shows a -42.80% loss of NNL units compared to a -17.01% loss reported by HS2 Ltd, however this is likely to be an underestimate due to the out of date methodology.**

These figures are not comparable with the losses and gains calculated for other developments using the Defra Biodiversity Metric 3.1 as the methodology utilised is very different. This is discussed further on page 13.

HABITAT LOSSES AND GAINS

Table 4, Table 5 and Table 6 provide a breakdown of the residual losses of broad habitat types as a result of the HS2 scheme.

Broad habitat category	Pre-construction NNL units generated		Post-construction NNL units generated		Net Change NNL units	
	HS2	CWT	HS2	CWT	HS2	CWT
Woodland, scrub and field trees	4964.85	7458.77	4059.83	4044.94	-905.02	-3413.83
Grassland	9297.26	11623.33	11147.02	10,825.28	1849.76	-798.05
Other Habitat	7796.91	7202.48	5276.81	5231.47	-2520.10	-1971.01
Total	22059.02	26,284.58	20483.66	20,101.69 ^{46,47}	-1575.36	-6,182.89

Table 4 Net Change in NNL units by Broad Habitat (Phase 1 2017)

Broad habitat category	Pre-construction NNL units generated		Post-construction NNL units generated		Net Change NNL units	
	HS2	CWT	HS2	CWT	HS2	CWT
Woodland, scrub and field trees	4563.62	6997.20	4198.90	N/A data unreleased	-364.72	N/A data unreleased ⁴⁸
Grassland	9016.681	11497.29	11130.33	N/A data unreleased	2113.65	N/A data unreleased ⁴⁹
Other Habitat	7809.147	6667.03	5504.50	N/A data unreleased	-2304.65	N/A data unreleased ⁵⁰
Total	21389.45	25,161.52	20833.73	20,795.16 ⁵¹	-555.72	-4,366.36

Table 5 Net Change in NNL units by Broad Habitat (Phase 1 2021 Q1). The 2021 habitat breakdown data has not been reported by HS2 Ltd. as yet, therefore the figures were calculated using GIS data provided by HS2 Ltd.

Broad habitat category	Pre-construction NNL units generated		Post-construction NNL units generated		Net Change NNL units	
	HS2	CWT	HS2	CWT	HS2	CWT
Woodland, scrub and field trees	1317.10	2096.81	642.04	642.04	-675.06	-1454.77
Grassland	3660.78	6703.61	2986.27	2978.48	-674.51	-3725.13
Other Habitat	2908.73	2628.28	2916.53	2916.53	7.80	288.25
Total	7,886.61	11,428.70	6,544.84	6,537.05 ⁵²	-1,341.77	-4,891.65

Table 6 Net Change in NNL units by Broad Habitat (Phase 2a 2019).

Phase 1 (2017 scheme)

As shown in Table 4, throughout Phase 1 (2017 scheme) the majority of losses are from 'woodland, scrub and field trees' (-3413.83 NNL units) followed by the 'other habitats' broad habitat type (-1971.01). The 2017 Phase 1 scheme shows a net loss in NNL units of -798.05 across grassland broad habitats.

A detailed breakdown of broad habitats by distinctiveness value (included in Appendix 5 table 17) demonstrates there are net gains of woodland and scrub of medium distinctiveness (272.24 NNL units) but an overall net loss of high distinctiveness woodland NNL units (-3,717.48).

Net gains in high distinctiveness grassland habitats are reported across the 2017 Phase 1 scheme (1935.14 NNL units), compared to overall net losses of medium distinctiveness grassland (-1708.90 NNL units) and low distinctiveness grassland (-1,024.29 NNL units).

Across the 'other habitats' category there are net losses of high (-795.73 NNL units) and low (-1838.92 NNL units) distinctiveness habitats, compared to an overall net gain in medium distinctiveness habitats (663.63 NNL units).

Phase 1 (2021 scheme)

It is not possible to calculate the losses and gains for individual habitats across the 2021 Phase 1 scheme (Table 5) as the data is yet to be released by HS2 Ltd.

Phase 2a (2019 scheme)

As shown in Table 6, there are overall losses of woodland, scrub and field trees broad habitats (-1,452.77 NNL units) and overall losses of grassland broad habitats (-3725.13 NNL units). The 'other habitats' overall show gains across the scheme (288.25 NNL units).

A detailed breakdown of broad habitats by distinctiveness value (included in Appendix 5 table 18) demonstrates losses of high (-322.91 NNL units) and medium (-1138.06 NNL units) distinctiveness woodland and scrub, alongside gains in low distinctiveness woodland (6.20 NNL units).

Net gains in high distinctiveness grassland (422.28 NNL units) and losses in medium (-3863.74 NNL units) and low (-283.67 NNL units) distinctiveness grassland habitats are reported across the Phase 2a scheme.

Across the 'other habitats' category there are net gains of high (+346.89 NNL units) and medium (+542.98 NNL units) distinctiveness habitats, compared to net losses in low distinctiveness habitats (-601.62 NNL units).

These figures are not comparable with the losses and gains calculated for other developments using the government's Biodiversity Metric 3.1 as the methodology utilised is very different. This is discussed further on page 13.

Discussion of Key Issues (Area-based Habitats)

PRE-CONSTRUCTION

The habitat mapping and evaluation of habitat distinctiveness and condition undertaken by HS2 Ltd. was not of a quality we would expect from a large infrastructure project. We were particularly concerned with what appears to be a high number of digitising errors, suggesting the internal QA process at HS2 Ltd. is not effective. Also of significant concern were the apparent assumptions made by HS2 Ltd. when attributing habitat distinctiveness and condition values to habitat parcels.

Digitising and Mapping Errors

We identified a significant number of simple digitisation errors which we have largely corrected during our re-mapping exercise. These include, but are not limited to:

- Significant geometry errors in the scheme boundaries and habitat polygons.
- Poor quality digitisation leading to gaps, overlaps and slivers.
- Different No Net Loss boundaries with different areas.
- Pre and post construction area discrepancies.
- Inconsistencies between the area figures in the data provided by HS2 Ltd. and those published in its reports.
- Inconsistencies between the baseline area we calculated, and the baseline area calculated by HS2 Ltd.

Evaluating Existing Habitats

We also identified a significant number of issues with the way HS2 Ltd. allocated habitat distinctiveness⁵³ and condition values to individual habitat parcels. These include, but are not limited to:

- Areas identified as priority habitat on the Priority Habitat Inventory were frequently recorded as low or medium distinctiveness habitats.
- Significant areas of grassland were recorded as poor-semi-improved grasslands, including areas identified on the Priority Habitat Inventory and in locally designated wildlife sites.
- Open mosaic habitats on previously developed land were mapped according to their individual component habitats by HS2 Ltd. but numerous areas on the Priority Habitat Inventory were missed by HS2 Ltd and mapped as a single habitat.
- Significant areas of woodland identified on the Priority Habitat Inventory and in locally designated wildlife sites were allocated a medium distinctiveness and moderate condition score.
- Road verges were predominantly mapped as poor semi-improved grassland or amenity grassland, regardless of context.
- Ancient woodland mitigation was sometimes incorrectly identified and excluded from the baseline calculations.
- Areas that were compulsory purchased by HS2 Ltd. and subsequently left to re-naturalise are valued according to their previous distinctiveness and condition rather than using up to date habitat data.

- Significant numbers of field trees were excluded unless these were part of another habitat such as parkland.
- Trees in hedgerows are not accounted for by HS2 Ltd.
- Ponds located partially within the scheme are not fully accounted for, only the area within the scheme boundary was incorporated into the assessment.
- Numerous ponds, other waterbodies and watercourses (ditches and drains) are unaccounted for in the baseline mapping and are therefore excluded from the assessments.
- Habitat distinctiveness is not accounted for in the assessment of linear habitats.

The multiple and significant issues outlined above have resulted in an inaccurate No Net Loss baseline which underestimates the pre-construction biodiversity value of each of the HS2 schemes where data has been released.

We believe HS2 Ltd. has underestimated the pre-construction baseline of Phase 1 (2017 scheme) by at least 4,226 NNL units (17.48%).

We believe HS2 Ltd. has underestimated the pre-construction baseline of Phase 1 (2021 scheme) by at least 3,773 NNL units (16.21%).

We believe HS2 Ltd. has underestimated the pre-construction baseline of Phase 2a (2019 scheme) by at least 3,541 NNL units (36.67%).

Tables 17 and 18 of Appendix 5 highlights that the main differences are a result of:

- CWT identifying significantly more areas of high distinctiveness woodland and scrub in the Phase 1 footprint (2017 scheme); 399.78 ha compared to 230.32 ha identified by HS2 Ltd. In contrast, in Phase 2a we identified less high distinctiveness woodland and scrub than HS2 (68.37 ha compared to 80.14 ha).
- CWT identifying significantly more areas of medium distinctiveness grassland than HS2 in Phase 1 2017 (1,066.92 ha compared to 745.68 ha) and Phase 2a (548.73 ha compared to 260.90 ha).
- CWT identifying significantly more areas of 'other' high distinctiveness habitats in Phase 1 (2017 scheme); 94.34 ha compared to 21 ha identified by HS2 Ltd.

These results are based upon the No Net Loss methodology which attributes pre-construction habitat values differently to the Biodiversity Metric 3.1 methodology, therefore comparisons between the two should not be drawn. However, **it is clear that significantly undervaluing the existing biodiversity gives a false representation of what is required to meet the HS2 No Net Loss objective.**

POST-CONSTRUCTION

We did not amend the post-construction NNL unit values other than to correct obvious errors. This was limited to habitats where we observed that risk multipliers had been applied by HS2 Ltd. that were different to those published⁵⁴ and where no justification was provided for this difference. We did remove habitat distinctiveness and condition values attributed to buildings and built areas⁵⁵ so that the pre- and post-construction methodology was aligned. This was not done by HS2 Ltd., resulting in inconsistencies between pre- and post-construction methodology.

Despite questioning the feasibility⁵⁶ of creating certain habitats in particular locations, we did not amend the post-construction values for these habitat creation parcels unless there were unexplained changes to the HS2 Ltd. published risk multipliers as detailed above.

The following is a summary of the issues with the post-construction HS2 NNL data sets:

- HS2 Ltd. did not consistently use its published risk multipliers for all the post-construction calculations.
- HS2 Ltd. applied habitat distinctiveness and condition values inconsistently for habitats pre- and post-construction.

The HS2 NNL metric risk multipliers applied to mitigation habitats over-valued newly created habitats compared to current standards (this is discussed further on page 13) When we did correct errors in the application of risk multipliers or the distinctiveness values attributed to built-up areas, we found the post-construction calculations for both Phases 1 and 2a over-value post-construction biodiversity. This amounts to 382 NNL units in Phase 1 (2017 scheme), 39 NNL units in Phase 1 (2021 scheme) and 7.84 NNL units in Phase 2a.

On page 13 we analyse the implications of using the HS2 No Net Loss metric to measure losses and gains of biodiversity and particularly its potential to overvalue ecological compensation habitat. We explore why the post-construction NNL unit changes do not represent

the actual changes in biodiversity when measured by modern standards.

SUMMARY OF NO NET LOSS CALCULATIONS

The combination of significant mapping errors, poor digitisation misidentifying habitats and attributing incorrect values to habitats post-construction has led to a wide gap between the reported No Net Loss figures and what is likely to be a more accurate representation of No Net Loss provided by CWT.

Across Phase 1 (2017 scheme) we report a minimum -6,183 loss in NNL units (-23.52%) compared to a -1,575 loss (-7.14%) reported by HS2 Ltd. For Phase 1 (2021 scheme) our figures show a minimum -4,367 loss in NNL units (-17.36%) compared to -555 loss (-2.60%) reported by HS2 Ltd. For Phase 2a we report a minimum -4,891 loss in NNL units (-42.80%) compared to a -1,342 loss (-17.01%) reported by HS2 Ltd.

For Phase 1 (2021 scheme) these figures represent 7.9 times more biodiversity loss than that calculated by HS2 Ltd. For Phase 2a (2019 scheme) the figures represent 3.6 times more biodiversity loss than that calculated by HS2 Ltd. The figures we report are nevertheless considered to be significant underestimations due to the shortcomings of the outdated No Net Loss metric (discussed on page 13).

We observed that net losses of high distinctiveness woodland are not being compensated for by the creation of the same distinctiveness habitat, resulting in a residual loss of -3,413.83 NNL units across the 2017 Phase 1 scheme (no equivalent data is available for the 2021 scheme). On Phase 2a there is a residual loss of -322.91 high distinctiveness woodland NNL units and a residual loss of -1,138.06 medium distinctiveness woodland NNL units.

It is clear that progress towards the No Net Loss objective for area-based habitats is less advanced than HS2 Ltd. claim, with established woodland ecosystems most affected by the scheme.

Analysis of the Implications of using the HS2 No Net Loss Approach Compared to Current Industry Standards

OVERVIEW

In 2016 Natural England was asked by the government to report on differences between the High Speed 2 (HS2) No Net Loss (NNL) metric and the government's Biodiversity Offsetting pilot metric (2012). The 2016 report⁵⁷ concluded *'that the changes made by HS2 Ltd. to the Defra pilot metric have had more than a trivial impact on the calculation of NNL.'*

Since the 2016 review, HS2 Ltd has made further changes to its metric and assessment of No Net Loss to try and address some of the concerns flagged by Natural England. Updates in 2017 were mainly in relation to the removal of irreplaceable ancient woodland habitat and ancient woodland mitigation areas from the metric calculations. As far as we are aware, to date there have been no further updates for Phases 1 and 2a since 2017, despite the subsequent revisions of the government's pilot Biodiversity Metric culminating (to date) in the publication of the Biodiversity Metric version 3.1 in 2022.

There are several differences between the HS2 Ltd's No Net Loss metric and the government's current biodiversity metric (version 3.1). Four of these differences are particularly significant, meaning the two approaches are not comparable:

- The spatial location of a habitat in the landscape (strategic significance) is not accounted for by HS2 Ltd, which contrasts with the approach in Biodiversity Metric 3.1.
- The HS2 No Net Loss approach allows the loss of high distinctiveness habitat NNL units to be compensated for by the creation of different broad habitat types or by habitats of a lower distinctiveness (i.e. the No Net Loss approach does not inform the type of compensation required).
- Risk multiplier values and utilisation⁵⁸ are different in the two approaches.
- There is no recognition of habitat distinctiveness for linear habitats in the HS2 approach.

The first three differences are largely due to the early adaptations HS2 Ltd. made to the government's 2012 pilot Biodiversity Metric. The strategic significance value assessment was brought into the Defra Biodiversity Metric in 2019 to account for spatial location in the landscape. A habitat trading rule (known as like for like or better) was also introduced into the Defra Biodiversity Metric in 2019 meaning that the government's Biodiversity Metric does inform the type of compensation required.

These differences mean that the biodiversity units calculated using the HS2 No Net Loss metric (and therefore percentage losses and gains) are profoundly different and essentially incomparable to those calculated for other developments using the Defra Biodiversity Metric and current industry standards.

STRATEGIC SIGNIFICANCE

Since 2019 developments using the Defra Biodiversity Metric have accounted for the strategic significance of habitats by recognising that where habitats are located geographically contributes to their biodiversity unit value. The HS2 No Net Loss metric does not recognise strategic significance, meaning that habitat types are valued the same irrespective of where these sit in the landscape.

This key difference is a major source of concern for The Wildlife Trusts, particularly because in many locations the HS2 route significantly increases habitat fragmentation, thereby reducing ecological connectivity throughout the wider landscape. Negative impacts to ecological connectivity, through modern changes in land use, have already profoundly impacted the ability of many species to forage and successfully reproduce. Ensuring that HS2 Ltd. accounts for further habitat fragmentation is crucial.

By not incorporating a mechanism to account for strategic significance, the HS2 No Net Loss metric is highly likely to have led to a significant undervaluation of habitats in the pre-construction baseline.

USING A METRIC TO INFORM HABITAT COMPENSATION (LIKE FOR LIKE OR BETTER)

HS2 Ltd. has been very clear that its metric is intended only as an accounting tool and that it is not using the calculations to inform the provision of the appropriateness of compensatory habitat. This means that losses of medium and high distinctiveness habitats may be compensated for by the creation of lower distinctiveness habitats.

The results from Phase 1 have demonstrated that high distinctiveness broad-leaved semi-natural woodland is disproportionately affected and is not being fully compensated for with the provision of the same habitat, or a habitat of a higher value. The like for like or better rule of the current government metric is not being applied. The result of this is that many complex and well-developed semi-natural woodland ecosystems will be replaced with simplistic homogenous habitats throughout the scheme.

In 2016⁵⁹ Natural England reported *'In light of the wide-ranging issues that using the HS2 NNL metric as an accounting tool has presented, it is recommended that **for Phase 2 of the scheme a metric is applied for biodiversity offsetting purposes, i.e., a tool to inform compensation provision.** It is considered that this would be beneficial for the natural environment, for reporting purposes and for HS2 Ltd.'*

The HS2 No Net Loss calculations demonstrate that HS2 Ltd. have not taken on board these recommendations from Natural England and the No Net Loss metric is still not being used to inform compensation.

Supplementary Assessment 1 — Sensitivity Analysis of Habitat Creation

OVERVIEW

The HS2 No Net Loss metric was adapted from the Defra pilot metric which was first published in 2012. The results of these pilots, in addition to ongoing industry-led research and wide consultation enabled the government to further refine its biodiversity metric, with updated versions published in 2019, 2021 and 2022. These updated versions incorporate numerous iterative refinements from the pilot version including, but not limited to, changes to habitat distinctiveness values and the difficulty risk multipliers.

To examine the effect of implementing the risk multipliers and the habitat distinctiveness values used in the published versions of the Defra Biodiversity Metric 3.1, we have undertaken a sensitivity analysis⁶⁰ for woodland and grassland habitat creation (ecology-led). We acknowledge this is not the same as using the published Biodiversity Metric 3.1 to calculate losses and gains of these habitats and we also acknowledge that this sensitivity analysis does not apply to non-ecological habitat creation.

Habitats created with the primary purpose of providing ecological mitigation/compensation include ecological mitigation pond creation (K 1.4), woodland habitat creation (K 2.1), wetland habitat creation (K 2.2) and grassland habitat creation (K 2.3).

For this study we looked at woodland habitat creation (K 2.1) and grassland habitat creation (K 2.3) where there are differences associated with:

- The difficulty risk attributed to habitat creation.
- The distinctiveness value for grassland habitat creation.
- The time taken for a habitat to reach its target condition⁶¹.

These differences are set out in Table 7 below:

Ecological mitigation habitat ⁶²	HS2 metric			Defra Biodiversity Metric version 3.1		
	Habitat distinctiveness	Difficulty risk multiplier	Time to target condition multiplier	Habitat distinctiveness	Difficulty risk multiplier	Time to target condition multiplier
K2.1 Woodland	High (6)	Medium (0.67)	0.33 (32 years+)	High (6)	High (0.33)	0.32 (30 year+)
K2.3 Grassland	High (6)	Medium (0.67)	0.71 (10 years)	Very high (8)	High (0.33)	0.70 (10 years)

Table 7 Sensitivity Analysis of Woodland and Grassland Habitat Creation.

To illustrate the effect of adopting Defra’s approach we used the areas of ecological habitat creation taken from the 2017 No Net Loss reports Phase 1 (2017) and Phase 2a (2019) and recalculated the units using habitat distinctiveness values and difficulty risk multipliers from the published versions of the Defra Biodiversity Metric (as set out in Table 7 above).

RESULTS

Habitat Creation	Distinctiveness	Condition	Difficulty	Time	Area (ha)	Woodland Units ⁶⁴	Grassland Units ⁶⁵
K2.1 Woodland (HS2)	6	2	0.67	0.33	165.80	439.90	-
K2.1 Woodland (Defra 3.1)	6	2	0.33	0.32	165.80	210.10	-
K2.3 Grassland (HS2)	6	2	0.67	0.71	401.90	-	2294.21
K2.3 Grassland (Defra 3.1)	8	2	0.33	0.70	401.90	-	1485.42
Reduced contribution to post-construction calculation compared to HS2 approach per habitat						-229.80	-808.79
Total reduced contribution to post-construction calculation compared to HS2 approach (combined woodland/grassland habitat creation)						-1038.59	

Table 8 Effect of applying Defra's difficulty multipliers and distinctiveness values for the creation of K2.1 Woodland habitat creation and K2.3 Grassland habitat creation to HS2's No Net Loss post-construction assessment. Phase One (2017 data⁶⁵).

Habitat Creation	Distinctiveness	Condition	Difficulty	Time	Area (ha)	Woodland Units ⁶⁷	Grassland Units ⁶⁸
K2.1 Woodland (HS2)	6	2	0.67	0.33	157.21	417.11	-
K2.1 Woodland (Defra 3.1)	6	2	0.33	0.32	157.21	199.22	-
K2.3 Grassland (HS2)	6	2	0.67	0.71	202.75	-	1157.37
K2.3 Grassland (Defra 3.1)	8	2	0.33	0.70	202.75	-	749.36
Reduced contribution to post-construction calculation compared to HS2 approach per habitat						-217.89	-408.01
Total reduced contribution to post-construction calculation compared to HS2 approach (combined woodland/grassland habitat creation)						-625.90	

Table 9 Effect of applying Defra's difficulty multipliers and distinctiveness values for the creation of K2.1 Woodland habitat creation and K2.3 Grassland habitat creation to HS2's No Net Loss post-construction assessment. Phase 2a (2019 data⁶⁶).

Phase 1 Woodland

The HS2 No Net Loss assessment⁶⁹ shows that 439.9 HS2 NNL biodiversity units are delivered through the creation of 165.8 ha of high distinctiveness woodland (habitat of principal importance). However, when applying the Defra Biodiversity Metric 3.1 risk multipliers, the same area of woodland creation would only deliver 210.10 biodiversity units, a difference of -229.8 biodiversity units.

Phase 2a Woodland

The HS2 No Net Loss assessment⁷⁰ shows that 417.11 HS2 NNL biodiversity units are delivered through the creation of 157.2 ha of high distinctiveness woodland (habitat of principal importance). However, when applying the Defra Biodiversity Metric 3.1 risk multipliers, the same area of woodland creation would only deliver 199.22 biodiversity units, a difference of -217.89 biodiversity units.

This simple analysis demonstrates the biodiversity value of ecological woodland habitat creation (K2.1, distinctiveness 6) reduces by more than half when the published Defra Biodiversity Metric 3.1 difficulty risk multipliers are applied.

Phase 1 Grassland

The HS2 No Net Loss metric assessment⁷¹ shows that 2294.21 HS2 NNL biodiversity units are delivered through the creation of 401.90 ha of high distinctiveness grassland. However, when applying the Defra Biodiversity Metric 3.1 risk multipliers and habitat distinctiveness values, the same area of grassland creation would only deliver 1485 units, a difference of -808.79 biodiversity units.

Phase 2a Grassland

The HS2 No Net Loss metric assessment⁷² shows that 1157.37 HS2 NNL biodiversity units are delivered through the creation of 202.75 ha of high distinctiveness grassland. However, when applying the Defra Biodiversity Metric 3.1 risk multipliers and habitat distinctiveness values, the same area of grassland creation would only deliver 749 units, a difference of -408.01 biodiversity units.

This simple analysis demonstrates the biodiversity value of the ecological grassland habitat creation (K2.3) reduces by more than a third when the published⁷³ Defra Biodiversity Metric difficulty risk multipliers and habitat distinctiveness values are applied.

SUMMARY OF HABITAT CREATION SENSITIVITY ANALYSIS

Our findings highlight a significant disparity between the number of units delivered by the HS2 No Net Loss metric and the Defra Biodiversity Metric 3.1 for ecological compensation habitats. We have found that the HS2 No Net Loss metric overvalues woodland which HS2 will create to compensate for the loss of existing species rich woods by at least half and overvalues ecological compensation grassland which HS2 will create to compensate the loss of existing species rich grassland by at least a third, compared to the current industry standard.

Supplementary Assessment 2 – Linear Habitats

HEDGEROWS AND LINES OF TREES

This assessment looks at how the HS2 No Net Loss metric evaluates existing and newly created hedgerows and compared this to the approach taken in the government's Biodiversity Metric 3.1 where there are differences associated with:

- The difficulty risk attributed to habitat creation.
- The distinctiveness value.
- The time taken for a habitat to reach its target condition.

These differences are set out in Table 10 below:

Hedgerow category	HS2 No Net Loss metric			Defra Biodiversity Metric 3.1		
	Habitat distinctiveness	Time to target condition multiplier (good)	Difficulty risk multiplier	Habitat distinctiveness	Time to target condition multiplier (good)	Difficulty risk multiplier
Native species-rich hedgerow with trees associated with bank or ditch	N/A	N/A	N/A	8	0.49 (20 yr)	1 (Low)
Native species-rich hedgerow with trees	N/A	0.71 (10 yr)	1 (Low)	6	0.49 (20 yr)	1 (Low)
Native species-rich hedgerow associated with bank or ditch	N/A	N/A	N/A	6	0.652 (12 yr)	1 (Low)
Native hedgerow with trees associated with bank or ditch	N/A	N/A	N/A	6	0.49 (20 yr)	1 (Low)
Native species-rich hedgerow ⁷⁴	N/A	0.71 (10 yr)	1 (Low)	4	0.652 (12 yr)	1 (Low)
Native hedgerow associated with bank or ditch	N/A	N/A	N/A	4	0.652 (12 yr)	1 (Low)
Native hedgerow with trees	N/A	0.71 (10 yr)	1 (Low)	4	0.49 (20 yr)	1 (Low)
Line of trees (Ecologically valuable)	N/A	N/A	N/A	4	0.32 (30 yr +)	1 (Low)
Line of trees (Ecologically valuable) with bank or ditch	N/A	N/A	N/A	4	0.32 (30 yr +)	1 (Low)
Native hedgerow	N/A	0.71 ⁷⁵ (10 yr)	1 (Low)	2	0.652 (12 yr)	1 (Low)
Line of trees	N/A	N/A	N/A	2	0.32 (30 yr +)	1 (Low)
Line of trees associated with bank or ditch	N/A	N/A	N/A	2	0.32 (30 yr +)	1 (Low)
Hedge ornamental non-native	N/A	N/A	N/A	1	N/A	1 (Low)

Table 10 Sensitivity Analysis of Hedgerow and Lines of Trees Creation.

For both approaches, the value of an existing hedgerow (pre-construction baseline) is calculated by multiplying length⁷⁶ by the distinctiveness value and multiplying again by condition value. For new hedgerows created post-construction, additional risk multipliers⁷⁷ are used to account for the difficulty of creation and the time taken to reach target condition.

In contrast to the government's Biodiversity Metric 3.1, the HS2 No Net Loss metric does not differentiate the distinctiveness value⁷⁸ for different types of hedgerows, meaning the value of an existing hedgerow is calculated using condition alone⁷⁹.

Under the HS2 No Net Loss approach new hedgerow creation has been attributed a good condition value (3), but pre-construction hedgerows have predominantly been attributed a moderate condition value (2).

The HS2 No Net Loss metric utilises a time to target condition of 10 years for hedgerow creation⁸⁰, whereas the Biodiversity Metric 3.1 utilises a time to target condition of 12 years for the equivalent hedgerow type.

The perverse consequence of using the HS2 No Net Loss metric means that many existing, well established mature native species-rich hedgerows⁸¹ have been valued lower⁸² than the new hedgerows due to be created by HS2 Ltd.

While we have not carried out a full sensitivity analysis on these differences, our observations lead us to believe there may be thousands of native species-rich hedgerows (often incorporating mature trees) within the footprint of HS2 Phases 1 and 2a which are not fully accounted for in the No Net Loss metric.

Hedgerows and Lines of Trees Summary

We have found that the methodology utilised by HS2 Ltd. (which is adapted from the now redundant government pilot metric) is too simplistic to capture the value of existing hedgerows (pre-construction baseline). We believe many hedgerows have been significantly undervalued in the baseline and overvalued in the post-construction assessments, particularly when the HS2 No Net Loss metric is compared to the government's Biodiversity Metric 3.1⁸³.

Unlike the government's Biodiversity metric 3.1, the HS2 No Net Loss metric outputs are disproportionately weighted in favour of new hedgerow creation and provide an inaccurate assessment of the overall impacts to the hedgerow network.

Hedgerows and Lines of Trees Recommendations

We concur with the recommendations of Natural England in 2016⁸⁴ that 'the distinctives of hedgerows pre- and post-construction should be assessed in line with current practice' (i.e., in line with the government's biodiversity metric).

It is recommended that hedgerow condition is assessed using the 'hedgerow condition assessment criteria' in line with the government's biodiversity metric, rather than using the outdated methodologies from the pilot metric or the FEP⁸⁵ (2010).

It is recommended that the time to target condition for native species-rich hedgerow creation in good condition is amended to 12 years in line with the government's biodiversity metric.

Where on-the-ground surveys of all hedgerows are impractical, we recommend that HS2 Ltd. capture available information from aerial imagery and maps and use it to inform hedgerow metrics, acknowledging that a simplified precautionary approach⁸⁶ is required because many attributes cannot be assessed from aerial imagery.

WATERCOURSES

Similar to hedgerows, the HS2 No Net Loss metric does not utilise habitat distinctiveness for watercourses meaning there is no differentiation between habitats such as rivers, streams or ditches with running water. The vast majority of watercourses within the footprint of the scheme have not been surveyed by HS2 Ltd. and have therefore been attributed a condition value of moderate (2) unless other information is available⁸⁷.

New watercourses (proposed to be created/reinstated) have been attributed the same condition value as existing watercourses (pre-construction baseline). The perverse consequences of not applying risk factors (difficulty or time to target condition) to watercourses is that any damage caused during the construction of the scheme is essentially unaccounted for in the metric. Instead, HS2 Ltd. is only accounting for the overall loss in length, which again is inconsistent with the Government's biodiversity metric and current practice.

Watercourses Recommendations

The distinctiveness of existing and new watercourses (pre- and post-construction) should be assessed in line with current practice (i.e. in line with the government's biodiversity metric).

The criteria used for condition assessment must be published and should be aligned with those of the government's Biodiversity Metric 3.1.

Post-construction risk multipliers must be utilised to account for the difficulty of creation/restoration and the time to target condition. The risk multipliers should be those used in the government's Biodiversity Metric 3.1.

Conclusion

Our review of the HS2 No Net Loss interim figures has highlighted that both the underpinning habitat data and No Net Loss methodology are fundamentally flawed. HS2's habitat mapping has a significant number of errors and there are major inconsistencies in the way data has been used to inform the calculations.

This has led to an under-valuation of area-based habitats in the HS2 pre-construction footprint of at least 4,226 NNL units (17.48%) in Phase 1 (2017), 3,773 NNL units (16.21%) in Phase 1 (2021) and 3,541 NNL units (36.67%) in Phase 2a (2019).

Particularly concerning is the inherent mischaracterisation or omission of certain habitats from baseline calculations, especially watercourses, hedgerows, field trees and ponds.

The HS2 No Net Loss metric is an adaptation of the government's 2012 pilot Biodiversity Metric and although some amendments were made to it following concerns raised by Natural England in 2016, it is evident that these have only been partially addressed in the current version of the HS2 No Net Loss metric. Nevertheless, we used the HS2 No Net Loss metric and demonstrated that HS2's calculations are inaccurate. **For Phase 1 (2021 scheme) No Net Loss calculations show at least a -17.36% loss of NNL units, whereas HS2 reported a -2.60% loss. For Phase 2a (2019 scheme) No Net Loss calculations show at least a -42.80% loss of NNL units, whereas HS2 reported a -17.01% loss. If the percentages were recalculated using Biodiversity Net Gain Units instead of outdated NNL units we think the actual percentage losses could be significantly higher.**

SENSITIVITY ANALYSIS

Natural England recommended in its review of the HS2 No Net Loss metric that when a published metric is adapted '*sensitivity analyses are conducted to evaluate the implications of any changes and the findings are published alongside the new metric's methodology*'.

Hs2 Ltd. has not published any sensitivity analyses of its No Net Loss metric. For this reason, it is not possible to understand the full implications of using an untested, adapted version of the pilot metric compared to using a version of the government's Biodiversity Metric 3.1. However, our own sensitivity analysis on ecology-led compensatory woodland and ecology-led compensatory grassland demonstrates a significant disparity between the HS2 No Net Loss approach and the approach in the government's Biodiversity Metric 3.1.

We have found that the HS2 No Net Loss metric overvalues ecological compensation woodland by at least a half and overvalues ecological compensation grassland by at least a third compared to the current industry standard metric.

Furthermore, we have found that losses of high distinctiveness woodland are being compensated for by lower distinctiveness habitats and the No Net Loss metric outcomes

are not being used to inform the type of compensation required. This approach is different to the habitat trading rules embedded into government's Biodiversity Metric 3.1

LINEAR HABITATS

We observed that compared to the approach taken in the government's Biodiversity Metric 3.1, hedgerows and watercourses are significantly overvalued in the HS2 No Net Loss post-construction calculations⁸⁸.

With regards to watercourses, we are very concerned that the HS2 No Net Loss metric only accounts for differences in length at the pre- and post-construction stage. As we have highlighted, the HS2 No Net Loss metric does not account for damage occurring as a result of construction. Neither does it take into account any risk factors⁸⁹ when watercourses are altered or reinstated.

SUMMARY

The HS2 No Net Loss metric is neither evidence-based nor was it consulted upon. This is in stark contrast to the government's Biodiversity Metric 3.1 which, over a period of at least 10 years, has been developed with the professional input of a wide range of practitioners and stakeholders. The Defra Biodiversity Metric represents current best practice and is an industry standard evidence-based tool.

For these reasons it is important that a distinction is drawn between HS2 No Net Loss outcomes and outcomes for other contemporary developments where the government's Biodiversity Metric 3.1 has been used.

Due to a fundamental lack of transparency, it has taken four years for the extent of the issues to finally be recognised. Publishing the No Net Loss figures years in advance of releasing the supporting datasets has denied the opportunity for proper review and independent scrutiny. This lack of transparency is contradictory to HS2's core values⁹⁰ of fairness, transparency and consistency.

In conclusion the HS2 No Net Loss figures released in 2017, 2019 and 2021 are wholly unreliable. These are based upon poor quality data riddled with inaccuracies and rely on an untested assessment methodology that is subject to little independent scrutiny and no independent quality assurance⁹¹. The way in which HS2 Ltd. is publishing and communicating its No Net Loss percentage figures is highly misleading.

We recommend that the whole assessment should be repeated using a methodology that is directly comparable to the government's Biodiversity Metric 3.1. If changes to the methodology are made these should be 'transparent and evidence based' as highlighted by Natural England in its 2016 review⁹².

Finally, we hope that the flawed, untested methodology used to assess HS2's impacts on biodiversity does not set a precedent for other large-scale infrastructure projects.

Recommendations

- We recommend HS2 Ltd. re-map and re-assess the pre-construction area-based and linear habitats for Phases 1 and 2a, correcting mapping errors, ensuring no habitats are excluded and attributing appropriate distinctiveness and condition values.
- We also recommend that the losses and gains in biodiversity are assessed using a quality assured version⁹³ of the most up-to-date Biodiversity Metric (currently version 3.1), not an adapted version of a metric that is approximately 10 years out of date.
- In any updated assessment HS2 Ltd. must use the government's Biodiversity Metric habitat trading rules as a guide to help inform the levels of compensatory habitat.
- It is critical that HS2 Ltd. ensure all data is made publicly available at the point the figures are released to facilitate transparency and enable independent scrutiny.

Our research has shown the figures for No Net Loss presented by HS2 Ltd. are fundamentally flawed. The entire No Net Loss process is far removed from the scheme's core values⁹⁴ of acting fairly, transparently and consistently. We are calling on the Government to respond swiftly to our findings, while there is still time to change the scheme's design and delivery.

Appendix 1 — Methodology

The methodology we used for our calculations followed those published by HS2 Ltd., however additional explanatory details are provided below:

- Historical aerial imagery dated as closely as possible to the original survey of each phase of HS2 were utilised for comparisons.
- Priority Habitats (Habitats of Principal Importance) were checked against aerial photography before assigning a distinctiveness value of high (6).
- Coastal and floodplain grazing marsh was assigned a distinctiveness value of high (6) but given a condition value of poor (1) unless HS2 Ltd. had undertaken a condition assessment (according to the guidance published in FEP⁹⁵).
- Low (2) distinctiveness habitats were assigned a poor (1) condition value.
- Ponds were assigned a distinctiveness and condition value using HS2 No Net Loss data⁹⁶, or (where HS2 Ltd. data was not available) using protected species data to determine distinctiveness and HS2 guidance for condition scoring⁹⁷.
- In order to avoid bisecting ponds where these straddled or touched the scheme boundary these were split out from the dataset and any ponds within or bisecting the GIS boundary were retained then added back into the dataset. Any large waterbodies that were over 2 ha (defined as a lake by the Freshwater Habitats Trust) were treated the same as other habitat polygons and cropped to the boundary to avoid skewing the area.
- Habitats with a high (6) or medium (4) distinctiveness value that were located within a Local Wildlife Site were assigned good (3) condition. Potential Wildlife Sites were identified but did not receive a higher condition value.
- Ancient woodland, ancient woodland mitigation areas and watercourses were assigned a biodiversity value of Null (0) and excluded from the area based NNL unit calculations.

Appendix 2 — Datasets

HS2 GIS FILES USED FOR PHASE 1 CALCULATIONS

Boundaries:

- HS2_LD_ConsolidatedLandBoundary_Ply_AP05

Habitat data:

- ENV_HSTWO_NNL_PreConstruction_Ply (2017)
- ENV_HSTWO_NNL_PreConstruction_Ln (2017)
- ENV_HSTWO_NNL_PostConstruction_Ply (2017)
- ENV_HSTWO_NNL_PostConstruction_Ln (2017)
- ENV_HSTWO_NNL_PreConstruction_Ply (2021 Q1)
- ENV_HSTWO_NNL_PreConstruction_Ln (2021 Q1)
- ENV_HSTWO_NNL_PostConstruction_Ply (2021 Q1)
- ENV_HSTWO_NNL_PostConstruction_Ln (2021 Q1)
- ENV_ARP_C250_Phase1Habitats_Pt_ES (November 2013)
- ENV_ARP_C250_AmphibiansPondSurvey_GCN_Pt_ES
- ENV_ARP_C250_Pond_Survey_Pt_ES
- ENV_ARP_C250_Amphibians_GCNWaterbodies50m_Ply_ES

HS2 GIS FILES USED FOR PHASE 2A CALCULATIONS

Boundaries:

- HS2_LD_ConsolidatedLandBoundary_Ply_HB01 (Oct 2017)
- CON_CN_ConsolidatedConstructionBoundary_Ply_CT05_HB01 (Oct 2017)
- CON_CN_ConsolidatedConstructionBoundary_AdditionalPlanting_Ply_CT05_HB01 (Oct 2017)

Habitat data:

- ENV_ARP_2PT02_NNL_PreConstruction_Ply (Q4 2018)
- ENV_ARP_2PT02_NNL_PreConstruction_Ln (Q4 2018)
- ENV_ARP_2PT02_NNL_PostConstruction_Ply (Q4 2018)
- ENV_ARP_2PT02_NNL_PostConstruction_Ln (Q4 2018)
- ENV_HSTWO_EC_Phase1Habitats_Pt_AP02 (Environmental Topics 2019)
- ENV_ARP_C861_EC_AmphibiansPondSurvey_GCN_Pt_AP01 (Environmental Topics 2018)
- ENV_ARP_C861_EC_WaterVole_Survey_Extent_Ply_AP01 (Environmental Topics 2018)
- ENV_ARP_C861_EC_Otter_Location_Pt_AP01 (Environmental Topics 2018)

Dataset	Habitat	Source
Ancient Woodland (England) - Natural England	Ancient Woodland	https://data.gov.uk/dataset/9461f463-c363-4309-ae77-fdcd7e9df7d3/ancient-woodland-england
Priority Habitat Inventory (England) - Natural England	Coastal and floodplain grazing marsh Good quality semi-improved grassland Lowland meadows Purple moor grass and rush pastures Woodland / Deciduous	https://data.gov.uk/dataset/4b6ddab7-6c0f-4407-946e-d6499f19fcde/priority-habitat-inventory-england
Open Mosaic Habitat (Draft) - Natural England	Open Mosaic Habitats / Brownfield	https://data.gov.uk/dataset/8509c11a-de20-42e8-9ce4-b47e0ba47481/open-mosaic-habitat-draft
Wood Pasture and Parkland (England) - Natural England	Parkland	https://data.gov.uk/dataset/bac6feb6-8222-4665-8abe-8774829ea623/wood-pasture-and-parkland-england
Traditional Orchards HAP (provisional) (England) - Natural England	Traditional Orchard	https://data.gov.uk/dataset/1c8d4150-0126-4bf2-b697-a93a07007510/traditional-orchards-hap-provisional-england
National Forest Inventory Woodland England - Forestry Commission	Woodland / Broadleaved	https://data.gov.uk/dataset/ae33371a-e4da-4178-a1df-350ccfcc6cee/national-forest-inventory-woodland-england-2015

Table 11 National datasets used by CWT

Appendix 3 — Habitat Distinctiveness

Distinctiveness	Habitat types included	Weighting
High	Habitats of principal importance i.e., those which meet the criteria qualify as habitats of principal importance.	6
Medium	Semi-natural habitats that do not fall within the scope of habitats of principal importance definitions, including: <ul style="list-style-type: none"> All areas of woodland and semi-natural grassland that do not qualify as a habitat of principal importance e.g., non-native coniferous plantation or species poor semi-improved grassland), Uncultivated field margins. Road verge and railway embankments (excluding those that are intensively managed). 	4
Low	Habitats including: <ul style="list-style-type: none"> Improved grassland. Arable fields (excluding any uncultivated margins). Built up areas. Domestic gardens, Regularly disturbed bare ground (e.g., quarry floor, landfill sites etc.). Intensively managed verges associated with transport corridors. 	2

Table 12 Habitat types and their respective distinctiveness and weighting.

CWT Habitat	UK Habitat Classification equivalent	Phase One (HS2) Habitat equivalent	CWT		HS2	
			Distinctiveness	Condition	Distinctiveness	Condition ⁹⁸
Ancient Woodland	Irreplaceable	Irreplaceable	0	0	0	0
Arable	Cropland – cereal crops	J1.1 Cultivated/disturbed land – arable	2	1	2	1
Arable – uncultivated field margins	Cropland – arable field margins	J1.1 Cultivated/disturbed land – arable (uncultivated field margin)	4	2	4	2
Bare ground	Urban – vacant/derelict land/bare ground	J4 Bare ground	2	1	2	1
Bracken – continuous	Grassland – Bracken	C1.1 Bracken – continuous	2	1	2	1
Ephemeral/short perennial	Sparsely vegetated land – ruderal/ephemeral	J1.3 Cultivated/disturbed ground – ephemeral/short perennial (based on species)	2	1	4/2	2/1
Fen	Wetland – Fens (upland and lowland)	E3 Fen (Priority habitat)	6	2	6	2
Grassland/Acid Semi-improved (non-priority)	Grassland – other lowland acid grassland	B1.2 Acid grassland – Semi-improved	6	2	6	2
Grassland/Amenity	Grassland – Modified Grassland	J1.2 Cultivated/disturbed ground – amenity grassland	2	1	2	1
Grassland/Calcareous	Grassland – Lowland Calcareous grassland	B3.1 Calcareous grassland unimproved	6	2	6	2
Grassland/Coastal and floodplain grazing marsh	Grassland – Floodplain Wetland Mosaic	B5 Marshy grassland (priority habitat)	6	1	6	2

Cont.

CWT Habitat	UK Habitat Classification equivalent	Phase One (HS2) Habitat equivalent	CWT		HS2	
			Distinctiveness	Condition	Distinctiveness	Condition
Grassland/Good quality semi-improved	Grassland – Lowland meadows	B2.2 Neutral grassland – Semi-improved (priority habitat)	6	2	6	2
Grassland/Improved	Grassland – Modified grassland	B4 Improved grassland	2	1	2	1
Grassland/Lowland meadows	Grassland – Lowland meadow	B2.1 Neutral grassland – Unimproved	6	2	6	2
Grassland/Lowland Calcareous	Grassland – – Lowland Calcareous grassland	B3.1 Calcareous grassland unimproved/semi-improved good quality	6	2	6	2
Grassland/Marshy (non-priority)	Grassland - Other neutral grassland (Marshy)	B5 Marshy grassland	4	2	4	2
Grassland/Neutral semi-improved (non-priority)	Grassland – other neutral grassland	B2.2 Neutral grassland – Semi-improved	4	2	4	2
Grassland/Neutral unimproved	Grassland – Lowland meadow	B2.1 Neutral grassland – Unimproved	6	2	6	2
Grassland/Poor semi-improved	Grassland – other neutral grassland (Species Poor)	B6 Poor semi-improved grassland	4	2	4	2/1
Hardstanding/Buildings	Urban – developed land; sealed surface	J3.6 Buildings	0	0	0	0
Horticulture	Cropland – Horticulture	J1.4 Cultivated/disturbed ground – introduced shrub	2	1	2	1
Introduced shrub	Urban – Introduced shrub	J1.4 Cultivated/disturbed ground – introduced shrub	2	1	2	1
Lowland fens	Wetland – Fens (lowland)	E3 Fen	6	2	6	2
Lowland heathland	Heathland and shrub – Lowland heathland	D1 Dry dwarf shrub heath	6	2	6	2
Marginal Vegetation (non-priority)	**Various** Habitat type feature is within	F2.1 Marginal and inundation – marginal vegetation	4	2	4	2
Open Mosaic Habitats on previously developed ground	Urban – Open Mosaic Habitats on Previously Developed Land	J1.3 Cultivated/disturbed ground – ephemeral/short perennial (on open mosaic priority habitat)	6	2	6	2
Other habitat/allotment	Urban – Allotment	J.5 Other habitat	2	1	2	1
Other habitat/disturbed ground	Sparsely vegetated land – Ruderal/Ephemeral	J1.3 Cultivated/disturbed ground – ephemeral/short perennial (non-priority)	2	1	4/2	2/1

Cont.

CWT Habitat	UK Habitat Classification equivalent	Phase One (HS2) Habitat equivalent	CWT		HS2	
			Distinctiveness	Condition	Distinctiveness	Condition
Other habitat/ railway embankment	Grassland – other neutral grassland	B6 Poor semi-improved grassland	4	2	4	2/1
Other habitat/ road verge	Grassland – other neutral grassland	B6 Poor semi-improved grassland	4	2	4	2/1
Other habitat/ track	Urban – vacant/ derelict land/bare ground	J4 – Bare ground	2	1	2	1
Other habitat/ vegetated garden	Urban – vegetated garden	J1.2/4 Cultivated/ disturbed ground – amenity grassland/ introduced shrub	2	1	2	1
Parkland/ Scattered trees (non-priority)	Woodland and forest – Wood-pasture and Parkland	A3.1 Parkland/scattered trees – Broad-leaved	4	2	4	2
Purple moor grass and rush pastures	Wetland – Purple moor grass and rush pastures	B5 – Marshy grassland (priority habitat)	6	2	6	2
Quarry	Quarry – hard rock/ soft sand	I2.1 – Quarry (based on habitats present)	2	1	4/2	2/1
Reedbeds (priority habitat)	Wetland – Reedbeds	F1 Swamp	6	2	6	2
Running water	Linear Feature: Rivers and Streams	G2 Running water	0	0	0	0
Scrub – dense continuous	Heathland and shrub – mixed scrub	A2. 1 Scrub – dense/ continuous ⁹⁹	4	2	4	2
Standing Water/ Pond	Lakes – Ponds (Non-Priority Habitat)	G1 – Standing water (non-priority habitat) ¹⁰⁰	4	1/2	4	1/2
Standing Water/ Pond	Lakes – Ponds (Priority Habitat)	G1 – Standing water (priority habitat)	6	1/2	6	1/2
Tall ruderal	Sparsely vegetated land – ruderal/ ephemeral	C3.1 Tall ruderal	2	1	2	1
Traditional Orchard	Grassland – Traditional Orchards	A1.3.2 Mixed woodland – plantation (Traditional orchard priority habitat)	6	2	6	2
Urban trees	Urban – Urban trees	A1.3.2 Mixed woodland – plantation	4	2	4	2
Woodland/ Broadleaved	Woodland and forest – other woodland; broadleaved	A1.1 Broadleaved woodland	4	2	4	2
Woodland/ Broadleaved Plantation (non-priority)	Woodland and forest – other woodland; broadleaved	A1.1.2 Broadleaved woodland – plantation	4	2	4	2
Woodland/ Broadleaved Semi-natural	Woodland and forest – lowland mixed deciduous woodland	A1.1.1 Broadleaved woodland – semi-natural	6	2	6	2

Cont.

CWT Habitat	UK Habitat Classification equivalent	Phase One (HS2) Habitat equivalent	CWT		HS2	
			Distinctiveness	Condition	Distinctiveness	Condition
Woodland/Coniferous (non-priority)	Woodland and forest – other woodland; Scots Pine	A1.2.2 Coniferous woodland – plantation	4	2	4	2
Woodland/Coniferous Plantation (non-priority)	Woodland and forest – other woodland; Scots Pine	A1.2.2 Coniferous woodland – plantation	4	2	4	2
Woodland/Deciduous	Woodland and forest – lowland mixed deciduous woodland	A1.1.1/3 Broadleaved or Mixed woodland – semi-natural (priority habitat)	6	2	6	2
Woodland/Felled	Woodland and forest – felled	A4.1 – Broadleaved woodland – recently felled	4	2	4	2
Woodland/Mixed (non-priority)	Woodland and forest – other woodland; mixed	A1.3.1 Mixed woodland – semi-natural	4	2	4	2
Woodland/Scrub (transition habitat/difficult to distinguish on aerial imagery)	Woodland and forest/Heathland and shrub – mixed scrub	A1.1 Broadleaved woodland/A2.1 Scrub – dense/continuous	4	2	4	2
Woodland/Young trees	Woodland and forest – other woodland; broadleaved	A1.1.2 Broadleaved woodland – plantation	4	2	4	2
Wood Pasture and Parkland	Woodland and forest – Wood-pasture and Parkland	A3.1 Broadleaved parkland/scattered trees (wood pasture parkland priority habitat)	6	2	6	2

Table 13 HS2 and CWT guidelines applied to habitat distinctiveness and condition scores (HS2 No Net Loss methodology).

Appendix 4 — Post-Construction Risk Multipliers

Post Construction – Habitats which are assigned each difficulty rating					
Low (1.00)			Medium (0.67)		High (0.33)
Scrub – dense continuous			Broadleaved woodland – semi-natural		Wet heath
Scrub – scattered			Broadleaved woodland – plantation		Upland flushes,
Improved Grassland			Coniferous woodland – plantation		Swamps
Poor semi-improved grassland			Mixed woodland – semi-natural		Purple moor grass and rush pastures
Tall ruderal			Mixed woodland – plantation		Fens
Standing Water/Pond			Acid grassland – semi-improved		
Arable			Neutral grassland – unimproved		
Amenity Grassland			Neutral grassland – semi-improved		
			Marshy grassland		
			Marginal vegetation		
Post Construction – Compensatory habitats which are assigned a difficulty rating					
Low (1.00)			Medium (0.67)		
Habitat	Distinctiveness	Condition	Habitat	Distinctiveness	Condition
K1.4 – Ecological mitigation	6	2	K1.2 – Balancing pond	4	2
K2.6 – Grassed areas (primary purpose = landscape & visual)	2	1	K2.1 – Woodland habitat creation	6	2
K4.2 – Depot, station, headhouse or portal building	2	1	K2.2 – Wetland habitat creation	6	2
K4.4 – Electricity substation	2	1	K2.3 – Grassland habitat creation	6	2
K5.3 – Engineering earthworks	2	1	K2.4 – Landscape mitigation planting (primary purpose = landscape & visual)	4	2

Table 14 HS2 Post-Construction Difficulty Risk Multipliers

Number of Years	Habitat	Distinctiveness	Condition
0 year (1)	G1 – Standing water	4	1
	G1 – Standing water	4	2
	J1.1 – Cultivated/disturbed land – arable	2	1
	J1.4 – Introduced shrub	2	1
	J3.6 – Buildings	2	1
	J4 – Bare ground	2	1
	K4.2 – Depot, station, headhouse or portal building	2	1
	K4.4 – Electricity substation	2	1
1 year (0.97)	B4 – Improved grassland	2	1
	J1.3 – Cultivated/disturbed land – ephemeral/short perennial	2	1

Cont.

Number of Years	Habitat	Distinctiveness	Condition
2 years (0.93)	C3.1 – Other tall herb and fern – ruderal	2	1
	J1.2 – Cultivated/disturbed land – amenity grassland	2	1
	K2.6 – Grassed areas (primary purpose = landscape & visual)	2	1
5 years (0.84)	A2.2 – Scrub – scattered	2	1
	B6 – Poor semi-improved grassland	4	1
	B6 – Poor semi-improved grassland	4	2
	B6 – Poor semi-improved grassland	6	1
	C1.1 – Bracken – continuous	2	1
	C1.2 – Bracken – scattered	2	1
	F2.2 – Marginal and inundation – inundation vegetation	6	N/A
	J5 – Other habitat	0	1
	K1.2 – Balancing pond	4	1
	K1.4 – Ecological mitigation pond	6	2
	K5.3 – Engineering earthworks	2	1
10 years (0.71)	A1.1.2 – Broadleaved woodland – plantation	4	1
	A1.1.2 – Broadleaved woodland – plantation	4	2
	A1.2.2 – Coniferous woodland – plantation	4	1
	A1.2.2 – Coniferous woodland – plantation	4	2
	A1.3.2 – Mixed woodland – plantation	4	2
	A2.1 – Scrub – dense/continuous	4	2
	B1.2 – Acid grassland – semi-improved	6	1
	B1.2 – Acid grassland – semi-improved	6	2
	B2.1 – Neutral grassland – unimproved	6	1
	B2.1 – Neutral grassland – unimproved	6	2
	B2.2 – Neutral grassland – semi-improved	4	1
	B2.2 – Neutral grassland – semi-improved	4	2
	B2.2 – Neutral grassland – semi-improved	6	1
	B2.2 – Neutral grassland – semi-improved	6	2
	B5 – Marsh/marshy grassland	4	1
	B5 – Marsh/marshy grassland	4	2
	B5 – Marsh/marshy grassland	6	1
	B5 – Marsh/marshy grassland	6	2
10 years (0.71)	K2.2 – Wetland habitat creation	6	2
	K2.3 – Grassland habitat creation	6	2
	K2.4 – Landscape mitigation planting (primary purpose = landscape & visual)	4	2
32 years (0.33)	A1.1.1 – Broadleaved woodland – semi-natural	6	1
	A1.1.1 – Broadleaved woodland – semi-natural	6	2
	A1.3.1 – Mixed woodland – semi-natural	4	2
	A3.1 – Broadleaved parkland/scattered trees	4	1
	A3.1 – Broadleaved parkland/scattered trees	4	2
	K2.1 – Woodland habitat creation	6	2

Table 15 HS2 Ltd. post-construction time to target condition and risk multipliers

Appendix 5 — Route-wide summary of areas and NNL biodiversity units

Source	Pre-construction				Post-construction			Summary			
	Area (ha)		NNL Biodiversity Units		Area (ha)	NNL Biodiversity Units		Reduction in number of area based NNL Biodiversity Units (%)		Overall net change in area based NNL Biodiversity Units	
	HS2	CWT	HS2	CWT		HS2	CWT	HS2	CWT	HS2	CWT
Phase 1 2017 Baseline	6,775	6,787	22,059	25,450	6,777	20,484	20,102 ^{101,102}	-7.14	-21.01	-1,575	-5,348
Phase 1 2021 Q1	6,409	6,600	21,389	24,339	6,418 ¹⁰³	20,834	20,795 ¹⁰⁴	-2.60	-14.56	-555	-3,544
Phase 2a	2,979	2,977	7,887	10,652	2,973	6,545	6,537 ¹⁰⁵	-17.01	-38.63	-1,342	-4,115

Table 16 Route-wide summary of areas and NNL area-based biodiversity units generated pre- and post-construction. Field trees excluded.

Habitat category (distinctiveness weighting)	Pre-Construction (HS2)		Pre-Construction (CWT)		Post-Construction (HS2)		Post-Construction (CWT)		Summary (HS2)		Summary (CWT)	
	Area (ha)	Area-based NNL biodiversity units generated	Area (ha)	Area-based NNL biodiversity units generated	Area (ha)	Area-based NNL biodiversity units generated	Area (ha)	Area-based NNL biodiversity units generated	Net change in area biodiversity (ha)	Net change in area biodiversity units	Net change in area biodiversity (ha) ¹⁰⁶	Net change in area biodiversity units
Woodland & scrub (6)	230.32	3055.47	399.78	4841.53	309.74	1138.94	1124.05	79.42	-1916.53	-90.04	-3,717.48	
Woodland & scrub (4) including field trees	230.73	1847.74	222.69	2617.24	729.57	2889.48	2889.48	498.84	1041.74	506.88	272.24	
Woodland & Scrub (2)	30.82	61.64	0.00	0.00	18.70	31.41	31.41	-12.12	-30.23	18.70	31.41	
Woodland & Scrub (0)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Woodland & Scrub (NULL) ¹⁰⁷	75.87	0.00	68.39	0.00	203.79	0.00	0.00	127.93	0.00	135.40	0.00	
Grassland (6)	71.93	1003.12	69.87	688.68	447.68	2623.82	2623.82	375.76	1620.70	377.81	1935.14	
Grassland (4)	745.68	5826.92	1066.92	8555.76	1049.95	7168.60	6846.86	304.27	1341.68	-16.97	-1,708.9	
Grassland (2)	1233.61	2467.22	1189.45	2378.89	701.56	1354.60	1354.60	-532.05	-1112.62	-487.89	-1024.29	
Grassland (0)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Grassland (NULL) ¹⁰⁸	63.75	0.00	82.49	0.00	8.00	0.00	0.00	-55.75	0.00	-74.49	0.00	
Other habitats (6)	21.09	300.74	94.34	1205.32	52.81	409.59	409.59	31.71	108.85	-41.53	-795.73	
Other habitats (4)	86.26	700.97	40.09	324.23	154.97	987.86	987.86	68.71	286.89	114.88	663.63	
Other habitats (2)	3397.60	6795.20	2836.47	5672.94	2006.92	3879.36	3834.02 ¹⁰⁹	-1390.68	-2915.84	-829.55	-1838.92	
Other habitats (0)	506.75	0.00	659.33	0.00	1084.59	0.00	0.00	577.84	0.00	425.26	0.00	
Other habitats (NULL) ¹¹⁰	80.41	0.00	57.33	0.00	8.23	0.00	0.00	-72.19	0.00	-49.10	0.00	
Totals	6774.81	22059.02	6787.15	26,284.59	6776.51	20483.66	20101.69	1.70	-1575.36	-10.64¹¹¹	-6,182.90	

Table 17 Habitat Polygons: Area based Biodiversity Units for Phase One – directly comparable to HS2 2017 figures

Habitat category (distinctiveness weighting)	Pre-Construction (HS2)		Pre-Construction (CWT)		Post-Construction (HS2)		Post-Construction (CWT)		Summary (HS2)		Summary (CWT)	
	Area (ha)	Area- based>NNL biodiversity units generated	Area (ha)	Area- based>NNL biodiversity units generated	Area (ha)	Area- based>NNL biodiversity units generated	Area (ha)	Area- based>NNL biodiversity units generated	Net change in area biodiversity (ha)	Net change in area based>NNL biodiversity units	Net change in area biodiversity (ha) ¹¹²	Net change in area based>NNL biodiversity units
Woodland & scrub (6)	80.14	987.03	68.37	865.13	205.86	542.22	542.22	542.22	125.72	-444.81	137.49	-322.91
Woodland & scrub (4) including field trees	42.25	317.53	56.09	1230.63	23.43	92.57	92.57	92.57	-18.82	-224.96	-32.66	-1138.06
Woodland & Scrub (2)	6.27	12.54	0.52	1.05	4.32	7.25	7.25	7.25	-1.96	-5.29	3.80	6.20
Woodland & Scrub (0)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Woodland & Scrub (NULL) ¹¹³	30.58	0.00	53.43	0.00	95.58	0.00	0.00	0.00	65.00	0.00	42.15	0.00
Grassland (6)	45.86	460.77	65.00	805.81	218.42	1228.09	1228.09	1228.09	172.57	767.32	153.42	422.28
Grassland (4)	260.90	1536.47	548.73	4460.52	130.97	596.78	596.78	596.78	-129.93	-939.69	-417.76	-3863.74
Grassland (2)	831.77	1663.54	718.64	1437.28	623.68	1161.40	1161.40	1153.61 ¹¹⁴	-208.09	-502.13	-94.96	-283.67
Grassland (0)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grassland (NULL) ¹¹⁵	39.16	0.00	56.13	0.00	3.45	0.00	0.00	0.00	-35.71	0.00	-52.68	0.00
Other habitats (6)	5.82	71.90	7.42	101.27	69.46	448.16	448.16	448.16	63.64	376.26	62.04	346.89
Other habitats (4)	9.62	76.57	17.30	139.60	166.14	682.58	682.58	682.58	156.51	606.01	148.84	542.98
Other habitats (2)	1380.13	2760.26	1193.71	2387.41	898.62	1785.79	1785.79	1785.79	-481.51	-974.47	-295.09	-601.62
Other habitats (0)	205.73	0.00	174.93	0.00	409.98	0.00	0.00	0.00	204.25	0.00	235.05	0.00
Other habitats (NULL) ¹¹⁶	40.34	0.00	16.24	0.00	127.76	0.00	0.00	0.00	87.42	0.00	111.52	0.00
Totals	2978.57	7886.61	2976.51	11,428.07	2977.67	6544.84	6537.05	6537.05	-0.91	-1341.76	1.16	-4891.65

Table 18 Habitat Polygons: Area based Biodiversity Units for Phase 2a – directly comparable to HS2 2019 figures

References

- 1 As identified in the No Net Loss of biodiversity data released by HS2 Ltd. in 2017, 2019, 2021
- 2 Independent quality assurance is recommended by Natural England in 'NATURAL ENGLAND, 2016, Review of the High Speed 2 No Net Loss in Biodiversity Metric'.
- 3 The No Net Loss approach seeks to balance the impacts on biodiversity so that the outcome is neutral.
- 4 In 2012 the government's National Planning Policy Framework first stated that sustainable development involved 'moving from a net loss of bio-diversity to achieving net gains for nature'
- 5 Geographical Information Systems
- 6 Excluding linear hedgerows and watercourses
- 7 HS2 No Net Loss (NNL) Biodiversity units are calculated using the size of the habitat and its quality. The government's Defra Biodiversity Units are calculated using the size of the habitat, its quality and location.
- 8 Biodiversity Metric 3.1 User Guide, Natural England 2022
- 9 Adapted in 2012 with further adaptations in 2017 following the 2016 review by Natural England.
- 10 HS2 London-West Midlands. No Net Loss in biodiversity calculation- Methodology and Results (2017 baseline) and HS2 No Net Loss in biodiversity calculation – Methodology and Results 2019
- 11 Habitat distinctiveness is a measure of habitat quality. Habitats that are scarce or declining typically score highly relative to habitats that are more common and widespread. HS2 utilise four categories, high, medium, low and very low distinctiveness. All Habitat of Principal Importance (Priority Habitat) is high distinctiveness, semi-natural habitat is generally medium distinctiveness, significantly modified habitats are low distinctiveness and developed areas are very low distinctiveness. Details in Appendix 3, tables 12 and 13.
- 12 Habitat condition is a score of the biodiversity value of the habitat relative to others of the same type
- 13 HS2 London-West Midlands. No Net Loss in biodiversity calculation- Methodology and Results (2017 baseline) and HS2 No Net Loss in biodiversity calculation – Methodology and Results 2019
- 14 HS2 London-West Midlands. No Net Loss in biodiversity calculation- Methodology and Results (2017 baseline) and HS2 No Net Loss in biodiversity calculation – Methodology and Results 2019
- 15 Risk multipliers were not used
- 16 The reason for not accounting for risk is unclear and no explanation is provided.
- 17 HS2 London-West Midlands. No Net Loss in biodiversity calculation- Methodology and Results (2017 baseline) and HS2 No Net Loss in biodiversity calculation – Methodology and Results 2019
- 18 Appendix 2
- 19 Appendix 2
- 20 FEP underpinned Higher Level Stewardship. The condition values are poor (1), moderate (2), good (3) "At the time of the HS2 metric development the FEP approach was the best available evidence regarding condition and its assessment. However, experts considered the FEP to be outdated and somewhat inappropriate" (Natural England, 2016a)
- 21 In the absence of appropriate FEP criteria for certain habitats we allocated a condition score of moderate (2).
- 22 The unit value of field trees was calculated using the methodology from the government's Biodiversity Metric 3.1. On a precautionary basis trees were allocated a root protection area of 0.0366 ha which corresponds to the RPA for urban trees of medium distinctiveness and moderate condition in Biodiversity Metric 3.1. Trees less than 2.5m from the centre line of hedgerows were excluded and trees in parkland and woodland were excluded.
- 23 Table 16 Appendix 5
- 24 These areas lie outside the HS2's NNL area meaning the total areas mapped by CWT and HS2 differ.
- 25 Open Mosaic on Previously Developed land is a Priority Habitat (Habitat of Principal Importance) associated with high biodiversity value brownfield sites.
- 26 Scattered scrub is a term used in Phase One habitat surveys to describe locally native shrubs (and occasional trees) less than 5m tall that do not have a continuous cover.
- 27 HS2 London-West Midlands. No Net Loss in biodiversity calculation- Methodology and Results (2017 baseline) and HS2 No Net Loss in biodiversity calculation – Methodology and Results 2019
- 28 For K2.6 grassed areas distinctiveness 4 there are no published risk multipliers. We applied a 5-year time to target condition risk multiplier to align this habitat creation with other areas of grassland distinctiveness 4
- 29 This is a significant difference to the Biodiversity Metric 3.1 methodology where low distinctiveness habitats can be allocated a moderate or good condition value.
- 30 On Phase 1 much of the baseline assessment was undertaken in 2013
- 31 Calculated as the difference between two values divided by the average of the two values.
- 32 Root Protection Area as calculated by the Biodiversity Metric 3.1 is the number of trees multiplied by 0.0366 ha (urban trees of medium distinctiveness)
- 33 Unit equivalent calculated as medium (4) distinctiveness urban trees of moderate (2) condition multiplied by Root Protection Area of 0.0366 ha (as set out in Biodiversity Metric 3.1).
- 34 ENV_ARP_C250_Phase1Habitats_Pt_ES
- 35 2013 tree dataset.
- 36 ENV_ARP_C250_Phase1Habitats_Pt_ES
- 37 2013 tree dataset.
- 38 ENV_HSTWO_EC_Phase1Habitats_Pt_AP02
- 39 2019 GIS tree dataset. ENV_HSTWO_EC_Phase1Habitats_Pt_AP02
- 40 Details provided in Discussion section of this report
- 41 Removed 345.07u due to amends time to target condition for grassland distinctiveness 4, woodland distinctiveness 6. Revised value is correct for the published time to target condition risk multipliers.
- 42 Removed buildings valued at 45.34u
- 43 Difference in area due to the inclusion of whole waterbodies that are impacted
- 44 Removed buildings valued at 38.57u
- 45 Removed buildings valued at 7.79u

- 46 Removed 345.07u due to amends time to target condition for grassland distinctiveness 4, woodland distinctiveness 6. Revised value is correct for the published time to target condition risk multipliers.
- 47 Removed buildings valued at 45.34u
- 48 Data has not been made available for scrutiny at the time of writing.
- 49 Data has not been made available for scrutiny at the time of writing.
- 50 Data has not been made available for scrutiny at the time of writing.
- 51 Removed buildings valued at 38.57 u
- 52 Removed buildings and built areas valued at 7.79u
- 53 Habitat distinctiveness is a measure of habitat quality. Habitats that are scarce or declining typically score highly relative to habitats that are more common and widespread. HS2 utilise four categories, high, medium, low and very low distinctiveness. All Habitat of Principal Importance (Priority Habitat) is high distinctiveness, semi-natural habitat is generally medium distinctiveness, significantly modified habitats are low distinctiveness and developed areas are very low distinctiveness. Details in Appendix 3, tables 12 and 13.
- 54 HS2 London-West Midlands. No Net Loss in biodiversity calculation- Methodology and Results (2017 baseline) and HS2 No Net Loss in biodiversity calculation – Methodology and Results 2019
- 55 As the Biodiversity Metric 3.1 (2022)
- 56 For example, the creation of species-rich grassland (high distinctiveness, moderate condition) on land that is currently arable.
- 57 NATURAL ENGLAND, 2016, Review of the High Speed 2 No Net Loss in Biodiversity Metric.
- 58 Risk multipliers are not used for watercourses in the HS2 NNL metric.
- 59 NATURAL ENGLAND, 2016, Review of the High Speed 2 No Net Loss in Biodiversity Metric.
- 60 Natural England undertook similar sensitivity analyses in 2016 to examine HS2's earlier adaptations from the Defra methodology. NATURAL ENGLAND, 2016, Review of the High Speed 2 No Net Loss in Biodiversity Metric.
- 61 The 10-year multiplier in the Biodiversity metric 3.1 is 0.70 which results in lower unit values than the 10-year multiplier of 0.71 in the HS2 metric
- 62 All mitigation/compensation habitats post-construction are targeted at achieving moderate condition.
- 63 ENV_HSTWO_NNL_PostConstruction_Ply 2017
- 64 Distinctiveness x condition x difficulty x time x area = Biodiversity Units
- 65 Distinctiveness x condition x difficulty x time x area = Biodiversity Units
- 66 ENV_ARP_2PT02_NNL_PostConstruction_Ply 2019
- 67 Distinctiveness x condition x difficulty x time x area = Biodiversity Units
- 68 Distinctiveness x condition x difficulty x time x area = Biodiversity Units
- 69 HS2 London-West Midlands. No Net Loss in biodiversity calculation- Methodology and Results (2017 baseline)
- 70 HS2 No Net Loss in biodiversity calculation – Methodology and Results 2019
- 71 HS2 London-West Midlands. No Net Loss in biodiversity calculation- Methodology and Results (2017 baseline)
- 72 HS2 No Net Loss in biodiversity calculation – Methodology and Results 2019
- 73 Defra Biodiversity Metric versions 2.0, 3.0, 3.1
- 74 HS2 hedgerow habitat creation K2.5 is valued as native species rich.
- 75 The 10-year multiplier in the Defra metric is 0.70 which results in lower unit values than the 10-year multiplier in the HS2 metric.
- 76 Metres in HS2 No Net Loss metric, kilometres in Defra metric.
- 77 (x time to target condition x difficulty).
- 78 Distinctiveness value for all hedgerows is set at 1.
- 79 Condition value multiplied by length.
- 80 In areas only used for construction HS2 Ltd. have committed to replacing habitat on a like for like basis which would include species-rich hedgerows with trees. HS2 Ltd. only use the 10-year time to target condition multiplier for hedgerow creation whereas the Defra metric utilises a 20-year time to target condition for these particular hedgerows.
- 81 Including intact native species-rich hedgerows (J.2.1.1, P1 survey code) and hedges with trees native species-rich (J.2.3.1, P1 survey code).
- 82 i.e. Predominantly 2u/metre compared to 2.13 u/metre for new hedgerows post-construction (when risk factors applied).
- 83 Also significantly undervalued compared to earlier versions of the Defra metric including version 2.0 published in 2019.
- 84 NATURAL ENGLAND, 2016, Review of the High Speed 2 No Net Loss in Biodiversity Metric.
- 85 Farm Environment Plan, Higher Level Stewardship. 2010.
- 86 This approach should:
- attribute a very high distinctiveness (8) and condition value of good (3) to all native species-rich hedgerows with trees associated with a ditch or bank (where these can be identified).
 - attribute a high distinctiveness (6) and condition value of moderate (2) to all hedgerows with trees or a ditch/bank.
 - attribute a medium distinctiveness (4) and condition value of good (3) to intact hedgerows.
 - attribute a medium distinctiveness (4) and condition value of moderate (2) to defunct hedgerows.
 - attribute a very low distinctiveness (1) and condition value of poor (1) for non-native ornamental hedgerows (where these can be identified).
- 87 Such as Local Wildlife Site data where condition attributed is 3.
- 88 Also significantly overvalued compared to earlier versions of the government's biodiversity metric including version 2.0 published in 2019
- 89 Risk factors are used to account for time to target condition and difficulty for other habitats.
- 90 Environmental Sustainability Report April 2020 – March 2021
- 91 Independent quality assurance is recommended by

- Natural England in 'NATURAL ENGLAND, 2016, Review of the High Speed 2 No Net Loss in Biodiversity Metric'.
- 92 NATURAL ENGLAND, 2016, Review of the High Speed 2 No Net Loss in Biodiversity Metric.
- 93 Any adaptation to the government's biodiversity metric should be independently quality assured as recommended by Natural England in 'NATURAL ENGLAND, 2016, Review of the High Speed 2 No Net Loss in Biodiversity Metric'.
- 94 HS2 core values 2022: 'Acting fairly, transparently and consistently. That means using the powers we've been given wisely; acknowledging the impact of the HS2 programme; and doing the right thing, even in difficult circumstances.
- 95 FEP – Farm Environment Plan methodology 2010
- 96 Priority habitat ponds (distinctiveness 6) were identified by the presence of Great Crested Newts. In some cases, HS2 assigned ponds as non- priority where there was insufficient or incomplete survey data. For example, where either a) less than 4 survey visits had been undertaken; b) one or more survey visits were undertaken outside the mid-May – mid-June survey window; c) eDNA samples were lost by the courier; d) ponds were not accessed for survey. CWT found some ponds were given a non-priority score despite there being a medium meta-population of Great Crested Newts identified from HS2 data. These ponds were reassigned a distinctiveness 6 value.
- 97 The following criteria were developed by HS2 Ltd.:
- Distinctiveness: Priority ponds (distinctiveness 6) were identified due to the presence of Great Crested Newts, Water vole or White Clawed Crayfish. Non-priority ponds were attributed a medium distinctiveness value.
 - Condition: if a pond was not surveyed it was assigned a condition weighting of moderate 2. Where ponds were surveyed, these were assigned a condition weighting of 2 if these met one of the following criteria. If these met two or more criteria, they were assigned a condition weighting of x 1
 - a) more than 500m from any other water body
 - b) not within semi-natural habitat (i.e., if these are within hard standing, arable, pasture)
 - c) contain non-native (signal) crayfish
 - CWT applied the same pond scores as HS2 where data was available and applied the same principles where data was limited.
- 98 All habitats identified as being of low habitat distinctiveness (including those not surveyed) were automatically allocated a condition weighting of 1 by HS2. For medium and high distinctiveness habitats, where access was not available for survey a condition weighting of 2 was assumed by HS2. Where there was a very clear justification based on the information available a condition weighting of 1 was allocated by HS2. A condition score of 3 was allocated by HS2 for all habitat areas of high or moderate distinctiveness that occur within designated wildlife sites i.e. LWS and SSSI, based on the precautionary assumption that these are managed for the benefit of nature conservation. *CWT applied the same principles.*
- 99 HS2 separated out scattered scrub and dense scrub, whereas CWT measured the individual patches of scrub and identified the remaining area the underlying habitat.
- 100 The following criteria were developed by HS2 Ltd.:
- Distinctiveness: Priority ponds (distinctiveness 6) were identified due to the presence of Great Crested Newts, Water vole or White Clawed Crayfish. Non-priority ponds were attributed a medium distinctiveness value.
 - Condition: if a pond was not surveyed it was assigned a condition weighting of moderate 2. Where ponds were surveyed, they were assigned a condition weighting of 2 if they met one of the following criteria. If they met two or more criteria, they were assigned a condition weighting of x 1
 - a) more than 500m from any other water body
 - b) not within semi-natural habitat (i.e. if these are within hard standing, arable, pasture)
 - c) contain non-native (signal) crayfish
 - **CWT applied the same pond scores as HS2 where data was available and applied the same principles where data was limited.**
- 101 Removed 345.07u due to amends time to target condition for grassland distinctiveness 4, woodland distinctiveness 6. Revised value is correct for the published time to target condition risk multipliers.
- 102 Removed buildings valued at 45.34u
- 103 Difference in area due to the inclusion of whole waterbodies that are impacted
- 104 Removed buildings valued at 38.57u
- 105 Removed buildings valued at 7.79u
- 106 Not accounting for area of field trees
- 107 Ancient Woodland and other woodland habitats that have been excluded from the metric that are part of Ancient Woodland mitigation
- 108 Grassland habitats excluded from the metric that are part of Ancient Woodland mitigation
- 109 -45.34 u for built areas
- 110 Other habitats that are part of Ancient Woodland mitigation excluded from the metric plus areas of Running water. Running water habitats are accounted for separately as linear based biodiversity units and areas of Running water have been excluded from the area-based biodiversity units
- 111 Difference to HS2's figures predominantly due to the inclusion of the entire area of impacted waterbodies in baseline assessment.
- 112 Not accounting for area of field trees
- 113 Ancient Woodland and other woodland habitats that have been excluded from the metric that are part of Ancient Woodland mitigation
- 114 Removed buildings -7.79 u
- 115 Grassland habitats excluded from the metric that are part of Ancient Woodland mitigation
- 116 Other habitats that are part of Ancient Woodland mitigation excluded from the metric plus areas of Running water. Running water habitats are accounted for separately as linear based biodiversity units and areas of Running water have been excluded from the area-based biodiversity units

We are facing climate and ecological emergencies, and the two are inextricably linked — we cannot solve one crisis without tackling the other. The Wildlife Trusts is on a mission to restore a **third of the UK's land and seas** for nature by 2030 — not only in celebration of the value of nature, but also because people are part of, and entirely dependent on, nature.



We believe **everyone, everywhere, should have access to nature** and the joy and health benefits it brings. No matter where you are in the UK, there is a Wildlife Trust **empowering people to take action for nature** and standing up for wildlife and wild places. Each Wildlife Trust is an independent, grassroots, community-powered charity formed by people getting together to make a positive difference for wildlife, climate and future generations. Together we care for 2,300 diverse and beautiful nature reserves and work with others to manage their land for nature, too.

The Wildlife Trusts

✉ info@wildlifetrusts.org

🖱 wildlifetrusts.org

🐦 [@WildlifeTrusts](https://twitter.com/WildlifeTrusts)

📘 [@wildlifetrusts](https://www.facebook.com/wildlifetrusts)

📷 [@thewildlifetrusts](https://www.instagram.com/thewildlifetrusts)

For requests about information and data in this report please email: campaigning@wildlifetrusts.org
All images used are for indicative purposes only

Registered Charity No 207238
Copyright The Royal Society of Wildlife Trusts 2023