Biodiversity Net Gain Calculator

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1.1 The Biodiversity Net Gain calculator

The requirement for Biodiversity Net Gain is being introduced to the development planning system under Part 6 of the Environment Act 2021. It is not yet a legal requirement, however we are assessing it as if it was mandatory, which it will be in future. The calculator (specifically version 3.0) is the current recommended tool to assess net gains and losses for biodiversity as a result of a proposal.

The calculator combines information about gains and losses of different habitat types to determine overall gain/loss figures for three metrics, "habitats", "hedges" and "rivers". It also reports on "trading rules" which prevent losses of particular high-value habitats from being traded off against gains in lower value habitats as part of achieving an overall positive score.

There are three sets of tabs on the calculator spreadsheet, one set each for habitats in general (meaning terrestrial habitats measured by area), hedgerows and rivers. Ditches are included with rivers, and rows of trees with hedges. Each set of tabs contains a "baseline" tab which lists the habitats which currently exist and identifies how much of each will be retained; a "creation" tab which lists habitats which are either re-planted after construction or newly created; an "enhancement" tab for habitats which are improved without being cleared and re-planted; and one or more tabs for off-site habitat creation or enhancement. An off-site baseline tab also exists; this contains assumed data for the habitat which may exist currently at the location where off-site habitat creation or enhancement will take place. Information on off-site baseline habitat is included purely for the purposes of calculation; clearly until a programme of off-site habitat creation has been agreed we cannot know what the existing habitat will be.

Existing habitats are treated as "retained" if they are protected during construction and remain the same sort of habitat during and after the works. Habitats are "created" if the existing habitat is cleared during construction; it follows that all habitat within the footprint of the permanent Scheme works and all within the contractor's temporary working area, with the exception of some hedges, come under this category. Also, where new habitat is planted, such as some of the tree-planting areas, this area is treated as created even though the existing grassland will not be cleared.

The calculator also has two results tabs, one titled "headline results" which gives the overall scores for the three metrics and the other titled "trading summary" which shows whether any of the habitat types which cannot be traded against each other have negative scores.

1.2 Baseline surveys

The baseline habitat information is drawn from two main surveys. The first of these is the UK Habitats Survey reported in the Habitat and Botanical Survey Report (Environmental Statement Appendix C-3), which surveyed terrestrial habitats and hedges. The second is the River Condition Assessment, reported in Appendix C-6. Both were conducted in the summer of 2020 to inform the Environmental Statement and the calculation of Biodiversity Net Gain. As ditches were not included in either of these surveys, a walkover survey of ditches was carried out in October 2021 specifically for this calculation, the results being input directly into the calculator spreadsheet. In Hinksey Meadow, the UK Habitats Survey is supplemented by a National Vegetation

Classification survey (Environmental Statement Appendix C-4) to define the location of the highest-value meadow habitats.

For detail of the methodology and results of the surveys, refer to the relevant reports. The survey results are summarised on the following Figures attached to this report:

Habitats

Figure 1 shows the UK Habitat Classification (UKHab) types as reported by the survey, with the red line boundary superimposed. Habitat areas outside the red line boundary are not considered in the calculation.

Figure 2 shows the habitat quality score for each polygon, as taken from the survey information. Habitat quality was assessed by professional ecologists while conducting the survey, which was carried out in mid-summer so that diversity of species at each site could be more easily seen.

Figure 3 shows the strategic significance of each polygon, recording whether areas are within one of the Conservation Target Areas or designated protected sites (see chapter 8 of the Environmental Statement).

Figure 4 shows which line of the baseline tab of the calculator each polygon was included in. The baseline tab has one line for each different combination of habitat type, quality and strategic significance which exists within the red line boundary. All polygons with the relevant combination of characteristics are combined to produce a single baseline area per line and a single area of retained habitat.

Hedges

Figure 5 shows existing hedges. Hedges are not categorised as to whether or not they are Important hedges, as the calculator does not make this distinction. Hedges which form part of the red line boundary were included in the calculation, although they are all retained, hedges outside the red line boundary were not included. Hedges within the second stage channel will be permanently lost, while a new hedge will be planted along the edge of the channel for much of its length. Compare Figure 5 with Figure 8 to see hedges lost or newly planted.

Rivers and Ditches

Figure 6 shows the reaches into which the existing streams and ditches were divided, with their reference numbers.

1.3 Post-Scheme habitat proposals

The area within the red line boundary is divided into polygons on our GIS system, based on the "action" allocated to each area, the existing baseline habitat and, where relevant, the future planting proposals. Polygons are shown on Figure 7, which also shows the proposed planting where relevant.

The primary division of the polygons is by action, as follows:

- "Retained": these polygons are shown on Figure 7, coloured plain orange. They are not altered by the Scheme and appear in the Baseline tab of the calculator as retained habitat. The area of these polygons appears both in the total area and the retained area on the relevant line of the Baseline tab.
- "MG4 Mitigation": these polygons are shown on Figure 4, coloured pale purple and lacking a row number. These polygons do not appear in the calculator and are excluded from the metric altogether. The most northerly area is excluded because it is habitat of very high distinctiveness (see section 1.6 below), the other areas are excluded because the habitat creation and enhancement in these areas is part of the bespoke mitigation plan for the MG4 meadow grassland.
- "First Stage Channel": these polygons are where the new first stage stream will be constructed. They can be identified by comparing polygons shown on Figure 7 as habitat type "Rivers and streams" with those shown on Figure 1. Within the calculator, these polygons appear in the Baseline but are not on the Create tab, and are treated as lost from the (terrestrial) habitats metric because their post-Scheme habitat is included in the Rivers metric.

- "Create": these polygons will be planted when works are complete, or as part of planned woodland planting. The habitat in the Create tab of the calculator is shown on Figure 7 and is based on the species mix on the Scheme's landscape drawings as set out below.

Each polygon with the action of "create" is also allocated a strategic significance score, which is the same as the strategic significance in the baseline situation.

Habitat types and condition scores for future habitat derive from the planting and management proposals. We have used professional judgement to predict the type of habitat resulting from the planting mixes, ground conditions and proposed management. Figure 7 shows the predicted habitats, and also shows those areas where existing habitat is to be retained. Most planting will produce good habitat quality, with these exceptions:

- Lowland meadow is mainly excluded from the calculator as it is part of the bespoke MG4 mitigation plan. The only area included in the calculator is of moderate quality, due to the wetness of the lowered ground in this location. Most meadow habitat will be of good quality, with appropriate seed mixes used for sowing, locations for the new meadows chosen to have low soil nutrient levels and appropriate soil wetness and a management regime involving a single late-summer hay cut followed by optional grazing. For further information on the habitat proposals, refer to the MG4 mitigation strategy (Environmental Statement Appendix D-23), however it should be borne in mind that all good-quality created meadow is excluded from the calculation.

- Modified grassland (i.e. amenity grassland, in existing amenity areas and on flood embankments) is given a poor quality score; this is grass which will be managed for functional purposes not for ecology.

- Other neutral grassland: most of this habitat will be of good quality, planted with appropriate seed mixes and managed so as to increase its ecological value. We have scored this habitat poor where the planting plans show general reseeding of temporary working areas, with a view to returning them to their existing use without specific ecological management. In practice some of these areas are currently of moderate or good quality and could be expected to achieve a higher quality after restoration, but we have decided to score all these areas as poor for consistency.

- All areas planted with mixed shrubs are scored moderate and treated as mixed scrub, except for the woodland edge planting which is treated as part of the woodland it is integrated with rather than as mixed scrub.

- All woodland, whether wet woodland or otherwise, is scored as moderate in recognition of the difficulty of achieving high-quality woodland from plantation other than over very long time periods.

Wet woodland is defined as woodland where the species mix is determined by the ground being regularly wet; it is not essential that it be regularly flooded, as long as the ground is saturated for enough of the year. This will apply to most of the areas of woodland planting in the Scheme area, which has driven our choice of tree-planting species mix for these areas. The exception is the woodland planting at Kendall Copse, where the soil is drier in part due to being above a former landfill. A different species mix is proposed here, and it is treated as broadleaved woodland in the calculator.

We propose to manage the grassland in the central part of the second stage channel as Floodplain Grazing Marsh. The hydraulic modelling for the Scheme shows this part of the second stage will be under water for several weeks each winter, drying out in summer, making it ideal for this habitat type. The land is also well suited to cattle grazing, being effectively one large field with no internal fences. However, we are not assuming for the calculator that the habitat will be successfully converted to floodplain grazing marsh. We are planting a seed mix which combines a mixture of grasses suitable for wet ground and of wildflowers which prefer similar habitat and while the habitat should eventually develop into Floodplain Grazing Marsh it will first develop into a less specialised grassland type. Therefore, we are treating it as Other Neutral Grassland of good quality for the calculator.

There are a number of wetland habitat types within the Scheme area, mostly small areas of swamp. There is one area of Lowland Fen in the survey area, in New Hinksey, but this is outside the red line boundary as we adjusted the area available for the contractor's working area to avoid it. The baseline survey identified Jubilee Scrape as lowland fen, but on review we do not believe this is correct; the habitat is relatively recent, having existed only since the Jubilee Scrape was created on the site of the old river channel which had previously

been filled in, and is more akin to reedbed. We have treated all these areas as reedbed, which is a habitat of High Distinctiveness and requires replacement with the same habitat type. Part of the Jubilee Scrape is within the second stage channel; we intend to restore the reedbed-type habitat in the scrape, which should be of similar wetness to its present state, but will be closer to the surrounding ground level as the surrounding ground will be lower.

Hedges are assessed in a similar way to areas of terrestrial habitat, with the exception that they are assessed by length not area, so they are represented in our GIS system as lines rather than polygons. Figure 8 shows the hedges which will be retained or replanted, plus new hedge planting.

Post-Scheme river habitat is handled differently, as explained in section 1.8 below.

1.4 Target scores

There are two separate requirements which must be met in the net gain calculation. One is that each of the three separate metrics, habitats, hedges and rivers, should each achieve a score of at least +10%. Off-site habitat creation is included in this total score. Secondly, there are "trading" rules relating to specific habitats. Habitat creation of specific types may be required to balance losses of that specific habitat type, in addition to achieving a +10% score overall. This is to prevent damage to particularly valuable habitats from being compensated for by creating large areas of habitats which are less valuable. For rivers there is a slightly different rule, which says that a net loss of river habitat cannot be compensated for by improved ditch habitat, and vice versa. This means in practice that both river and ditch habitats must achieve a neutral or positive score, while there is flexibility as to whether the +10% overall gain is delivered via rivers or ditches.

In addition to the required target scores, we have our own target to achieve a score of at least +20% where possible. This is independent of the planning application process; we will pursue it through discussions with landowners and with our proposed providers of off-site habitat creation. As it will not affect the planning process, habitat creation beyond that needed to comply with the standard target scores is not considered in the calculator. Our objectives for the trading rules are the same as the standard requirements.

1.5 Off-site habitat creation

Where habitat creation is needed which can't be fitted into the Scheme area, habitat creation at off-site locations can be included. The calculator reduces the points scored for this compared to on-site habitat, meaning that more habitat has to be enhanced/created offsite than if it was enhanced/created on site. We will enter into arrangements with one or more partner organisations to create habitats off-site and discussions with potential partners are underway. The habitat types needed are identified in sections 1.6 to 1.8 below. We cannot commit at this stage to where the habitat creation will be, as the Scheme's planned start date for construction is still more than a year away and we are in early but promising discussions with a potential offsite provider.

Our arrangements for off-site habitat creation will also include provision for additional habitat in the event that less of a valuable habitat results from the Scheme than anticipated. This would be most likely in the case of reedbed, if the areas of shallow pond we will create develop differently than anticipated. Additional wetland habitats would be created if that were the case. We will investigate opportunities to achieve our internal target of +20% biodiversity net gain through creating additional off-site reedbeds, in order to ensure this habitat has a net positive score.

1.6 Terrestrial habitats

Each polygon in the GIS database is allocated information on its baseline habitat and an "action". If the action is "created", meaning that the area in question is to be cleared before construction and re-planted after, the polygon also has a future habitat allocated. Areas are allocated to the lines on the calculator according to the combination of habitat type, habitat quality and strategic significance of each polygon; the areas on each line representing the total of all the polygons with the same combination of data. Areas which are retained by definition have the same score in the calculator before and after the Scheme. For other areas, the calculator gives a score before and after based on the change in area and/or quality of a habitat type, with newly-created habitat scoring lower than long-established habitat of the same type. The target of achieving +10% biodiversity net gain is calculated by comparing the post-Scheme score with the baseline score, summed across all habitat types except those specifically excluded.

Habitats are divided into four categories of "distinctiveness", Very High, High, Medium and Low; how habitats are treated by the trading rules of the Metric varies according to which of these categories the habitat falls into.

If habitats of Very High distinctiveness are lost due to a development, specific mitigation is required, separate from the biodiversity net gain. Therefore, the approximately 2 ha of lowland meadow (of which 1.3 ha is MG4 grassland) which will need to be dug up for the Scheme and the approximately 2 ha of replacement meadow and 18 ha of new meadow which will be created specifically to compensate for the lost meadow area are both excluded from the calculator. A small area of lowland meadow which will be created (replacing trees at the edge of Seacourt Stream) is included in the calculator as this area is not currently meadow grassland and will not become MG4 post-Scheme so it is not part of the mitigation plan. The same rule applies to lowland calcareous grassland; however in this case there will be no loss of habitat as the existing grassland will be retained throughout the construction period, therefore separate mitigation is not required.

If habitats of High distinctiveness are lost, the resulting negative score on the calculator must be balanced by a positive score relating to the same habitat type. In practice this means that more of each such habitat type must be created than is lost. There are three such habitats for which at least some existing area will be lost during construction. For ponds, the creation of many new ponds and backwaters means that the total score is positive. For wet woodland there is a loss of habitat due to the Scheme, even after allowing for planting of almost twice the area that will be felled, as newly planted woodland is less valuable than long-established woodland. We have incorporated as much wet woodland planting into the Scheme proposals as possible, but will require off-site habitat creation which must be wet woodland. The area of new habitat required will depend on the location of the habitat creation scheme; the figure of 9.2 ha of wet woodland is only indicative. For wetlands other than ponds (which includes swamps, reedbeds and other related habitats) the projected small net gain assumes that a total of just over 1.2ha of the pond habitat shown on the Scheme drawings and planting plans will develop as reedbed or swamp. We anticipate that the shallower ponds in the second stage channel and a proportion of the edges of deeper ponds will develop naturally into reedbed or similar habitat, and we intend to manage the ponds so as to encourage this. However it is hard to predict how much of the habitat will become reedbed and how much will be pond, partly because some of these features will be subject to light grazing pressure. If less reedbed develops than we have estimated, we may need to create offsite reedbed habitat. We have allowed for 0.5ha of additional off-site reedbed, where none would be required by the trading rules on our current assumptions, to allow for this uncertainty. Additional reedbed habitat, above this amount, could be created to help us achieve our internal target of +20% overall

If there is a net loss of habitats of Medium distinctiveness, this must be compensated for by habitats of Medium or High distinctiveness, so the total score for all High and Medium must be above zero. The Scheme achieves this.

Habitats of Low distinctiveness which are lost can be compensated for by creation of any type of habitat, without restriction.

The Scheme's total score for habitats is +15.88%, rising to +16.57% when off-site habitat creation is included and to +16.73% including an extra 0.5ha of off-site reedbed creation. The off-site habitat baseline includes an assumed area of existing off-site habitat to be replaced by new hedges, as well as the area needed to create wetland habitats and wet woodland.

1.7 Hedges

While we have made a conscious effort to retain as many hedges as possible, and we are deliberately planting new hedge where we can, it is the nature of the Scheme that more hedges will be removed than can be planted on-site. We are unable to plant hedges in the second stage channel, as they would trap debris during high flows and obstruct the operation of the Scheme. Therefore we will need to create new hedge habitat off-site. The length of hedge to be planted off-site will be of the order of 4 to 5 km. We anticipate that we will need to identify more than one habitat creation scheme, for example replacing existing fences with hedge. With off-site hedge-planting the Scheme can achieve +10% net gain; without off-site planting the score for hedges would be negative.

1.8 Rivers

The watercourses in the study area were split up into assessment parcels covering the entire length of channels within, and local to (where appropriate), the red line boundary. The division between assessment parcels was established with reference to the proposed Scheme and the baseline River Condition Assessment (RCA). Each assessment parcel was entered on one line in the BNG Metric. The assessment parcel lengths are shown in Figure 6.

For inclusion in the BNG Metric, the condition scores were assigned the calculated category derived from the results of the river condition assessment survey (Environmental Statement Appendix C-6). Following the guidance issued with the BNG Metric, an assessment of the hydrological connectivity between the riparian and floodplain environments was conducted, to establish if a channel was over-deep. For any section that was found to be over-deep, the condition category was manually lowered by one condition (e.g. from moderate to fairly poor).

For the post-Scheme assessment, the 32 condition indicators from the baseline survey data allocated to each assessment parcel were inspected and manually modified to reflect the changes due to the proposed Scheme, with reference to the indicator calculation descriptions in the RCA guidance.

The river condition score is derived from 32 condition indicators. These can be used to establish the condition of the bank top, bank face, channel margins and bed. This determined the condition category for the proposed Scheme scenario.

To conduct a full appraisal of the impacts of the proposed Scheme along the entire length of the local channel network, professional judgement was used to extend the condition category, derived for each individual MoRPh5 survey, to cover a representative assessment parcel (which had a greater length than the shorter MoRPh5 survey). This means that there was a level of judgement required by the assessor, not only when defining the parcel extents, but also when applying scoring for each of the 32 indicators. It was not always possible to follow the guidance (which is designed for application to MoRPh5 lengths rather than longer assessment parcels) precisely: professional judgements were often required as to what changes merited inclusion in the scoring process.

For example, a decision was made to avoid scoring for isolated, short components of the scheme such as proposed ford crossings and associated bank works: although this work may be locally significant within the context of a MoRPh5 survey, it would have a disproportionate influence when applied to the far longer length of an assessment parcel. Similarly, when considering riparian encroachment from bridges, a decision was made to avoid inclusion of the negative multipliers associated with this as, when considered in the context of an assessment parcel, the influence of encroachment from these features, with a relatively short length along the watercourse, would be disproportionate. Notes within the comments column of the calculator identify where these judgements were made.

Where the condition category did not change between the baseline and the proposed Scheme, the record in the calculator was set to retain the whole length. Where the condition category reduced between baseline and the proposed Scheme, this was recorded in the creation section of the calculator, as this is the only way to record a decline in condition for rivers in the current metric. Where the condition category increased between baseline and the proposed Scheme, it was recorded in the enhancement section of the calculator, following the guidance for the metric.

Following the definition of the differentiation between creation and enhancement in Table 8-9 of the Biodiversity Metric 3.0 User Guide, the proposed new stream (from its northern end to Old Abingdon Road) was entered to the calculator as an enhancement to local reaches of the existing Hinksey Stream. South of Old Abingdon Road, the new channel will be less natural in profile, due to the constraints of the bridges and the landfill, therefore we judged this section of the new stream should be treated as created; the metric guidance assuming and directing that a “created” channel is relatively artificial in profile while an “enhanced” one is relatively natural.

As part of BNG Metric 3.0, it was necessary to include an appraisal of ditches in the Rivers and Streams metric. A walkover survey of the ditch network within the red line boundary was conducted in October 2021 and judgements were made as to whether elements of the network met the habitat description criteria described in the RCA guidance for inclusion within the assessment. Many ditches did not meet the criteria and were excluded: Figure 6 illustrates those ditches that were assessed. It should be noted that in the BNG Metric, as

well as a being classified as a different river type, ditches have a different strategic significance from the rivers and streams. The rivers and streams have a strategic significance of "within river basin management plan", whereas ditches are "low potential/action not identified in any plan".

The overall score for the rivers metric is +13.83%, however within this the score for ditches is negative. Due to the rule that gains in river habitat cannot be used to compensate for losses in ditches, off-site habitat creation or enhancement will be needed to satisfy the trading rules for ditches. Whether we create new ditches or enhance the quality of existing ones will depend on the priorities of our partner organisation and the sites which become available to us. We have used the calculator to estimate that, if we are to enhance existing poor ditch habitat to good quality, the length required is approximately 730 m. We may also be able to create new ditches to achieve some of the trading rule requirements as part of a larger wetland creation scheme and are currently exploring options.

1.9 Conclusion

The overall scores for the rivers and habitats metrics exceed +10% and the hedges metric will achieve +10% through off-site planting which will be carried out or funded by the Environment Agency as part of the Scheme. The net gain calculations demonstrate that with the combination of on-site habitat creation and enhancement proposals, plus the off-site ditch enhancements and the creation of new off-site wet woodland and (if needed) reedbed habitats needed to satisfy the calculator's trading rules, the Scheme will achieve and, in the case of habitats and rivers, exceed the +10% target. Furthermore, the achievement of net gain can be demonstrated whilst retaining the coherence of the original habitat creation and landscape plans for the scheme, which have been developed to ensure the ecological integrity and biodiversity value of the modified landscape within which the Scheme will function.