BRISTOL WATER – WATER RESOURCES MANAGEMENT PLAN 2024

Biodiversity Net Gain and Natural Capital Assessment

Report for: Bristol Water

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Ricardo Energy & Environment, Gemini Building, Fermi Avenue, Harwell, Oxfordshire, OX11 0QR, UK | +44(0)1235 75 3000 | ee.ricardo.com
Registered company no. 08229264 | VAT no. GB 212 8365 24

Customer:
Bristol Water

Customer reference:
3500077343

Contact:
Dr Stuart Ballinger, Ricardo Energy & Environment, First Floor North, 21 Prince Street, Bristol, BS1 4PH UK

T: +44 (0) 1235 753 353
E: stuart.ballinger@ricardo.com

Authors:
Freya Love
Rea Yellowlees

Approved by:
Dr Jenny Mant

Signed

Ricardo reference:
ED15765

Date:
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1. INTRODUCTION

1.1 BACKGROUND AND PURPOSE OF REPORT

Water companies in England and Wales have a statutory requirement to prepare a Water Resources Management Plan (WRMP) every five years. The latest Water Resource Planning Guideline (WRPG) produced by the regulatory bodies (Ofwat, The Environment Agency (EA) and Natural Resources Wales) states that water companies are required to ensure their WRMP delivers net biodiversity gain where appropriate and uses a proportionate natural capital approach. This report is driven by this requirement and demonstrates how Bristol Water (BW) will meet these requirements in the assessment of their Water Resource Management Plan 2024 (WRMP24) constrained feasible options and Preferred Programme.

1.2 BIODIVERSITY NET GAIN, NATURAL CAPITAL AND ECOSYSTEM RESILIENCE

Biodiversity Net Gain (BNG) is an approach to the development of land and marine management that aims to leave biodiversity in a measurably better condition than prior to development. BNG seeks to provide a means of quantifying losses or gains in biodiversity value bought about by changes in land use. When designed and delivered well, BNG can secure benefits for nature, people and places, and for the economy[1].

Natural Capital (NC) studies key components of nature which are essential for the long-term provision of benefits on which society relies. These components can have a direct or indirect value to people. A natural capital approach, which has been followed in this assessment, understands that nature underpins human wealth, health, wellbeing and culture and seeks to demonstrate the value of the natural environment for people and the economy[2].

Natural assets provide ecosystem services such as regulating floods and improving air quality, and those ecosystem services provide benefits such as reducing the chance a house will flood or improved health. This benefit can then be valued through use of natural capital metrics and can be used to develop targets, such as a target value of BNG delivered.

1.3 BIODIVERSITY NET GAIN AND NATURAL CAPITAL REQUIREMENTS FOR WRMPs

The purpose of a WRMP is to set out how a water company will achieve a secure supply of water for its customers, whilst protecting the environment and demonstrating that it is resilient to a range of future challenges including more extreme droughts, climate change, population growth.

As part of the WRMP, water companies must demonstrate that they have considered a range of environmental legislation and guidance, including the Environment Bill (2021) where options are in England. Additionally, the EA has published separate supplementary guidance on Environment and Society in decision-making[3], which provides more detail about the expectation for natural capital assessment (NCA) in England, and how a NCA can support decision-making. NCA will allow water companies and regional groups to “make decisions that do not devalue and look to enhance the value of the natural world for society benefit” (WRPG Supplementary Guidance[8]).

The requirements for BNG and NCA of a water companies WRMP are outlined in the 2022 WRPG, as shown in Box 1.

[1] Natural England (2021), Biodiversity Net Gain – more than just a number. Accessible via: https://naturalengland.blog.gov.uk/2021/09/21/biodiversity-net-gain-more-than-just-a-number/

[2] UK Government (2021), Enabling a Natural Capital Approach (ENCA) – Updated 20 August 2021

[3] EA (2021) WRPG 2024 supplementary guidance – Environment and society in decision-making. Published 24/03/2021

Box 1 WRPG 2022

Section 4.1.1 High-level considerations

England

Ensure your plan contributes to the conservation and enhancement of biodiversity, delivers net biodiversity gain where appropriate, delivers environmental gain and uses a proportionate natural capital approach.

Consider your duty to conserve biodiversity under section 40 of the Natural Environment and Rural Communities Act (2006) and the list of species and habitats of principal importance set out in section 41 of the Act (England).

Takes a catchment-based approach.

2. ASSESSMENTS APPROACH: BIODIVERSITY NET GAIN AND NATURAL CAPITAL

2.1 OVERVIEW OF APPROACH

2.1.1 Biodiversity Net Gain Approach

The BNG assessment is based on use of the Defra Biodiversity Metric 3.0, to assess losses of biodiversity as a result of the options[4]. A GIS-based system has been used, using national datasets, to provide comprehensive coverage of habitat data.

To ensure the BW WRMP24 Preferred Programme of options contributes to the conservation and enhancement of biodiversity and delivers Biodiversity Net Gain, Defra's Biodiversity metric 3.0 has been used to demonstrate how net gain could be achieved on and off-site. Any options within the plan that need planning permission are legally required to provide BNG of 10% in England due to the Environment Act (2021). This is not a legal requirement of the WRMP itself, but it is logical to meet this requirement within the plan to demonstrate BW commitment to protecting and enhancing biodiversity and demonstrate that 10% BNG can be achieved when required.

For any supply side options that form part of the Preferred Programme, Potential Biodiversity Opportunity (PBO) areas are identified. These sites are within 5km from the option locations and are based on a scoring system largely based on the Lawton principles, which is outlined in **Section 2.3**. These sites should then be used in conjunction with the results from the Biodiversity metric, with the metric calculating how much mitigation would be required, and the PBO identification showing potentially beneficial locations for off-site mitigation.

2.1.2 Natural Capital Assessment Approach

WRPG Supplementary Guidance states that NCAs in England should include as a minimum the following five ecosystem services:

- Biodiversity and habitat
- Climate regulation
- Natural hazard regulation
- Water purification
- Water regulation

At the project outset, a review was undertaken of other ecosystem services, through which it was agreed that the following additional services would be taken into account:

- Agriculture
- Recreation and tourism.

2.2 SEQUENTIAL PROCESS

Throughout the WRMP process BNG and NCA have been considered in increasing levels of detail, proportionate to the wider WRMP programme. **Figure 2.1** shows the sequential process followed for the assessments. The approach taken for feasible options and consequent programmes of options is as follows:

- Feasible options – Stages 1 to 3 of **Figure 2.1**
- Preferred programme of supply options, and any reasonable alternative plans which include supply options – Stages 1 to 6 of **Figure 2.1**.

[4] While a newer version of the metric, v3.1, has now been released, v3.0 has been used for these assessments to provide consistency across multiple WRMPs and through the stages of assessment

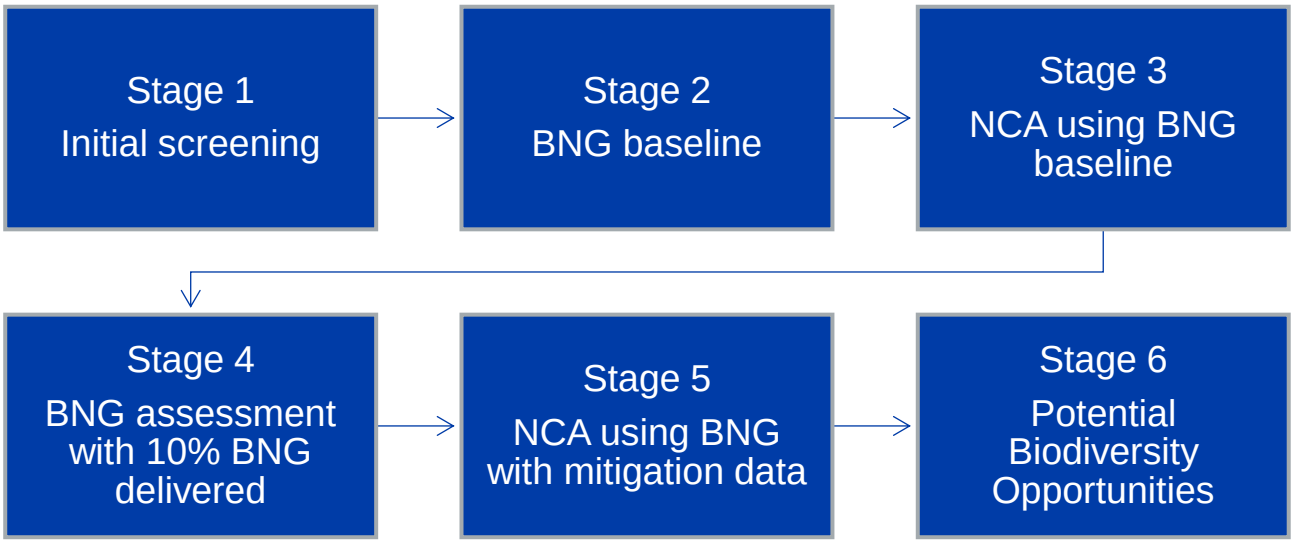

Figure 2.1 The sequential process followed for the Natural Capital and Biodiversity Net Gain assessments[5]

2.3 METHODOLOGY

2.3.1 Stage 1 - Initial screening

This high-level qualitative scoring was used to assist with the development of the Strategic Environmental Assessment (SEA) and support detailed screening of options (and associated ecosystems) for the identification the feasible list of options. The results of the Stage 1 assessments are not presented in this report, as they were used only to inform preliminary stages of assessment and were superseded by subsequent stages of assessment.

The feasible options were subsequently further appraised by BW resulting in a final constrained, feasible list of options. These are made up of a number of customer demand management options and distribution/leakage options and 11 supply-side options.

Note that at later stages in the BW dWRMP24 decision making process an approach for deriving environmental and social metrics from the SEA option level results was developed. This is described in full in Section 14 of the WRMP24. The metrics were developed by Bristol Water and external consultants to help identify the solution to the supply-demand deficit over the planning period. The metrics that were derived directly from consideration of the findings of the SEA also incorporated NCA, BNG assessment findings.

2.3.2 Stage 2 - Biodiversity Net Gain baseline calculation

2.3.2.1 Baseline habitat area and condition

Areas of habitats were calculated in QGIS. The CORINE land cover dataset[6] forms the basis of the habitat data, providing continuous coverage across the whole of the UK. This has been supplemented by other datasets where available, to provide improved resolution:

- The Priority Habitats Inventory[7], covering all nationally mapped areas of priority habitat;
- National Forest Inventory 2018, to provide improved information about areas of forestry;
- OS Zoomstack, providing data about areas of open water and urban extents;

[5] Staged 4-6 relate to the preferred programme where supply options are included.

[6] https://www.data.gov.uk/dataset/cd2c59e7-afd9-471d-a056-c5845619dcd7/corine-land-cover-2018-for-the-uk-isle-of-man-jersey-and-guernsey

[7] https://www.data.gov.uk/dataset/4b6ddab7-6c0f-4407-946e-d6499f19fcde/priority-habitat-inventory-england

- Bristol Water's Biodiversity Index providing condition and extent (area) of land assets (2019-2020).

The Zone of Influence (ZoI) was calculated for each option using GIS data provided by BW:

- Where shapefile polygons were available for on-site infrastructure such as water treatment works or pumping stations, they were used directly
- Where polygons were not available, a best estimate of area was made using grid references
- For pipelines, a 30m buffer (15m on each side) was assumed around polyline shapefiles

All areas were defined as having either a temporary or permanent loss of habitat. Pipelines were assumed to have a temporary impact, unless passing through woodland. The latter was classed as permanent to recognise the longer time period to reinstatement. All other types of infrastructure were classed as permanent. The areas of permanent and temporary loss were mapped over the habitat data and run through a model that identified habitats which would be impacted by the construction and operation of the option. This model prioritises the habitat layers that have high resolution, importance and validity. This ensured that the most accurate and important data was not missed due to overlapping data of lower resolution.

All habitats within the construction buffer are assumed to be lost and re-instated with the existing baseline habitat type and restored to the same condition, except those that will be replaced by permanent above-ground infrastructure.

2.3.3 Stage 3 - Natural Capital Assessment

2.3.3.1 Data sources, gaps, and assessment

The NCA has been completed using the data sources outlined in 2.3.2.1, as recommended by the All Company Working Group (ACWG) environmental assessment guidance for SROs[8] and the EA Water Resources Planning Guideline (WRPG) WRMP24 Supplementary Guidance on Environment and Society in Decision-Making[9].

The tools outlined in the WRMP guidance have been reviewed for these assessments and where feasible these have been used. Where not used for a specific service, this has been justified as requested in the guidance noting that many tools have limitations or need a level of detail not necessarily currently available. As such we have applied the WRMP supplementary guidance approach to account for qualitative, quantitative and monetised assessments where proportionally appropriate. Further details on assumptions are outlined in **Appendix A**.

2.3.3.2 Natural Capital stocks

The NCA approach is based on the same available open-source data as used for the Stage 2 BNG assessment. The habitat types used for BNG were converted to broad habitat types to give the total area of each broad habitat impacted by each option. The conversion from the detailed habitat layers to broad habitat was undertaken and is outlined in **Appendix B.**

Broad habitat groupings were determined following the broad groups identified for calculation of carbon sequestration by land use from the EA's Supplementary Guidance (see **Table 2.1** below). Modified grassland has been classified as arable land and not grassland, as per advice from the Office for National Statistics (ONS) in developing a semi-natural grassland ecosystems account[10]. The UK NEA differentiates semi-natural grassland from improved and amenity grassland, as semi-natural grassland has a much higher species-richness[11]. Where a land cover class could belong in multiple broad habitat groups it was placed within the one that had a lower carbon sequestration rate, to give a more conservative estimate of benefits.

2.3.3.3 Climate Regulation (carbon sequestration)

The carbon sequestration rates for NC stocks have been taken from the EA WRPG Supplementary Guidance, as shown in **Table 2.1**. Carbon sequestration rates of the relevant Natural Capital assets have been converted

[8] All Company Working Group (2020). WRMP environment assessment guidance and applicability with SROs

[9] Environment Agency (2020) Water resources planning guideline 2024 supplementary guidance- Environment and society in decision-making (England).

[10] Office for National statistics (2018) Developing semi-natural grassland ecosystem accounts

[11] UK Habitat Classification Working Group (2018). UK Habitat Classification - Habitat Definitions V1.0 at hhtp://ecountability.co.uk/ukhabworkinggroup-ukhab

into monetary values using the Department for Business, Energy, and Industrial Strategy (BEIS) Carbon Values. As the prices published by BEIS are in £2020, GDP deflators were used to adjust them to the £2019 base year of modelling.

It is not possible to quantify the non-spatial changes in biodiversity and habitat ecosystem services arising from habitat condition improvement. To avoid overestimating the beneficial impact of the change in non-traded carbon sequestration value following BNG habitat creation / reinstatement, this value has been calculated by summing the change in non-traded carbon sequestration value during construction (the temporary loss), the permanent loss and creation.

The monetisation is based on the size of the area, temporary or permanent loss, and biodiversity value of the habitats affected. Higher biodiversity value habitats (e.g., woodland, lowland meadows, heathland) have higher carbon sequestration monetised value. The higher biodiversity habitats are typically more difficult to recreate following completion of the construction phase so loss and reinstatement of these habitats will result in a greater impact relative to lower value habitats (e.g., arable fields or modified grassland).

Table 2.1 Carbon sequestration of land use from EA WRPG Supplementary Guidance

Land use type	C seq rate (t/CO2e/ha/yr)
Woodland (deciduous)	4.97
Woodland (coniferous)	12.66
Arable land	0.10
Pastoral land	0.39
Grassland	0.39
Heathland & shrub	0.7
Urban	0

2.3.3.4 Natural Hazard Regulation

An annual monetary value was only derived for the flood regulating services of woodland and wetland/ floodplain assets (see **Table 2.2**). Robust monetary values for other broad habitat types, and which could be considered comparable to the values in **Table 2.2**, are not currently available. As a result, it has not been possible to provide a monetised estimate of other services.

Table 2. 2 Benefit Transfer Values: Natural Hazard Regulation[12]

Broad habitat type	Annual value	Reference
Woodland	115 (£2018/ha)	Forest Research (2018) & ENCA Services Databook
Freshwater (Open waters/ wetlands/ floodplains)	407 (£2011/ha)	Morris & Camino (2011) & ENCA Services Databook

2.3.3.5 Water Purification

The WRPG does not require the monetisation of Water Purification services, as these services are highly dependent on local factors (e.g. proximity to a water body) and there are limited tools available to provide accurate monetised assessment. Thus, at this stage, only a qualitative assessment rather than a monetised assessment of this service has been undertaken. This qualitative assessment is based on habitat data and WFD status information from the EA's Catchment Explorer.[13]

Baseline provision of water purification services is dependent on the following:

- Land cover (habitat)

[12] References:

- Forest Research (2018). Valuing flood regulation services of existing forest cover to inform natural capital accounts.
- Morris & Camino (2011) UK National Ecosystem Assessment Economic Analysis Report, School of Applied Sciences, Cranfield University.

[13] https://environment.data.gov.uk/catchment-planning/

- Proximity to receptor (i.e. a water body)
- Current water quality of receptors
- Interception and removal of contaminants
- Pollutant store opportunities.

2.3.3.6 Water Regulation

The WRPG does not require the monetisation of Water Regulation services. Due to the proportionate response to each level of assessment, Water Regulation is screened out of the assessment for options in the constrained list and is screened in for options in the Preferred Programme. For options in the constrained list, it is considered that this service is well represented by the Water Framework Directive (WFD) compliance assessment.

2.3.3.7 Recreation and Tourism

The Outdoor Recreation Valuation Tool (ORVal)[14] has been used to estimate recreation demand from greenspaces, as a proxy for recreation value. Both open greenspaces and public footpaths were considered.

A conditional percentage was applied to the footpath values depending on the number of footpath intersections (and therefore alternative routes) present.

- If there are no intersections, and therefore no alternative routes, then we take 100% of the footpath value;
- If there are 1-2 intersections present, then 50% of the value is taken;
- If there are 3-4 intersections present, then 25% of the value is taken;
- And if there are 5+ intersections present, 10% of the value is taken.

The use of the ORVal tool has uncertainties surrounding the 'true' impact that the construction may have on recreation and tourism, with ORVal potentially giving an overstated account of the impact. This uncertainty has been reduced by using a developed conditional multipliers approach as outlined above. Additionally, the uncertainty has been reduced by assuming that the impact to recreation and tourism will be, in almost all cases, a temporary impact, although at this stage of assessment and when using the ORVal tool the actual duration of impact (e.g. a footpath closure) is not known. However, at this level of assessment, ORVal remains the recommended and most informative data set to use. The ORVal values are priced to £2016, and the values have been adjusted to £2019 for this assessment.

2.3.3.8 Agriculture

This assessment adopted the same principles for ecosystem services associated with agriculture as outlined in the UK Natural Capital Accounts, i.e. the distinction between what is considered 'natural capital' and what is 'produced capital' is defined as the "point at which vegetable biomass is extracted"[15]. For the purposes of this assessment, to estimate the annual value per ha of ecosystem services relevant to agricultural production, an adaptation of the whole-farm income method outlined by the UK Office of National Statistics (ONS) Natural Capital Accounts was used[16]. This approach was used as opposed to the industry residual value method adopted for the 2020 ONS Natural Capital Accounts as it allows for differentiation between the provisioning services associated with different farm types (in this case arable and pasture) and was therefore considered more appropriate for this assessment. The marginal values estimated per hectare derived from this method (presented in **Table 2.3** below) remain comparable to the estimated industry residual value per hectare reported by the ONS for their 2020 accounts (£241.80/ ha in 2018).

[14] https://www.leep.exeter.ac.uk/orval/

[15] ONS (2017) Principles of Natural Capital Accounting. [Last accessed 29/04/2021] Accessible via: https://www.ons.gov.uk/economy/environmentalaccounts/methodologies/principlesofnaturalcapitalaccounting

[16] Office for National Statistics (ONS), 2019. UK natural capital accounts methodology guide: October 2019, s.l.: ONS

Table 2.3 Benefit transfer values: provisioning services supporting agriculture

	All farm types (average value/ha, £2019)	Arable (cropping) (average value/ha, £2019)	Pasture (grazing livestock) (average value/ha, £2019)
South West England (BW)	272.3	326.99	268.74

These values represent the average farm output level estimate of the industry residual value for farms in the Northwest of England. Data was obtained from the Farm Business Survey (England)[17] and was subject to the following high-level calculation:

$$\frac{Average\ output\ from\ agriculture\ -Average\ costs\ for\ agriculture}{Average\ total\ farm\ area\ (ha)}$$

The original method outlined by the ONS (2019) was adapted after calculations with Southeast specific data resulted in a negative residual value per hectare for both arable and pasture. This would imply that the provisioning services of these natural assets have no inherent value and that they do not contribute to agricultural production. It is concluded in the literature that a probable explanation of negative resource rents is that they reflect market distortions such as subsidies[18]. The original method outlined by the ONS excludes subsidies and agri-environment payments and activities from their calculation, however the adapted method adopted for this assessment includes these factors. An overview of what is included is outlined in **Table 2.4**.

The total annual benefit values calculated for this assessment make use of the Southeast estimated averages calculated for each of the variables and component for each of the high-level farm types associated with this assessment (arable and pasture).

Table 2.4 Components included within the adapted farm income method

Variable	Components included
Output from agriculture	• Output from agriculture (excl. subsidies and agri-environment payments) • Subsidies and payments to agriculture (excl. agri-environment payments • Agri-environment and related payments (incl. HFA) • Basic Farm payment • Output from diversification
Costs for agriculture	• Costs for agriculture (excluding agri-environment activities) • Costs for agri-environment work • Costs of diversification out of agriculture • Costs associated with Basic Payment Scheme

[17] https://farmbusinesssurvey.co.uk/

[18] Obst, C., Hein, L., & Edens, B., (2016). National Accounting and the Valuation of Ecosystem Assets and their Services, Environ Resource Econ 64, pp 1-23.

2.3.4 Stage 4 – Biodiversity Net Gain Assessment with mitigation

Note: Sections (Stages 4 – 6) are included to meet the requirements of a proportionate response to each level of assessment. Only supply side options are assessed at the preferred programme level. Through the processes of developing their WRMP24, BW have identified they can maintain supply to 2080 with a plan that is focused on demand reduction rather than developing new water resources. Only one supply side option has been included in the WRMP24 preferred programme. This is a catchment management option that cannot be assessed using the method set out below. This is because the land use change of a catchment management option is not the same as the land use change required by a non-nature based solution, such as expansion of a water treatment works, where the natural environment would be changed to urban / concrete environment, reducing ecosystem services. In contrast, implementing a nature based solution would achieve ecosystem service benefits. Therefore, discussion regarding Stages 4 to 6 below is for illustrative purposes only.

The catchment management option has been assessed in a qualitative manner, where key ecosystem service benefits of the option have been given.

The calculation of net loss/gain within the Biodiversity Metric 3.0 considers both direct impacts resulting in habitat loss (whether permanent or temporary) and changes in habitat condition related to supply side preferred options. The areas required to achieve 10% net gain for each option could be identified based on the baseline habitats present within the option footprint and following the requirements of the Biodiversity Metric 3.0. This includes requirements such as requiring the same habitat (for High distinctiveness habitats) or replacement with the same habitat type or one of higher distinctiveness (for low distinctiveness habitats).

The off-site mitigation required used in the assessments is intended to provide an indicative area of off site habitat required to achieve 10% net gain for the schemes. Habitats, where possible, could be used in the same proportions as the baseline habitats, excluding habitats which do not provide BNG Units and are not possible to enhance within the metric (e.g., Urban-sealed surface). Moderate to Very high distinctiveness habitats could be mitigated through off site enhancement e.g. poor to moderate or moderate to good. It is not possible to enhance cropland in the Biodiversity Metric, so consequently modified grassland would be used for off-site mitigation to offset impacts to crop land using a change in habitat type from poor condition Modified grassland to moderate condition Neutral grassland. Examples are shown in **Table 2.5** below.

Table 2.5 Off-site habitat enhancement rules used to calculate habitat area required to achieve 10% net gain

On-site baseline habitat lost	Off-site habitat pre-mitigation		Off-site habitat post-mitigation	
	Habitat	Condition	Habitat	Condition
Cropland	Modified grassland	Poor	Other neutral grassland	Moderate
Modified grassland	Modified grassland	Moderate	Other neutral grassland	Moderate
Other neutral grassland	Neutral grassland	Moderate	Other neutral grassland	Good
Woodland (broad leaved)	Modified grassland	Moderate	Woodland (broad leaved)	Moderate
Woodland (mixed)	Modified grassland	Moderate	Woodland (mixed)	Moderate
Traditional orchards	Modified grassland	Moderate	Traditional orchards	Moderate
Floodplain wetland mosaic (CFGM)	Modified grassland	Moderate	Floodplain wetland mosaic (CFGM)	Moderate
Lowland calcareous grassland	Lowland calcareous grassland	Moderate	Lowland calcareous grassland	Good

2.3.5 Stage 5 – Natural Capital Assessment: Biodiversity Net Gain Assessment with mitigation

The NCA that would be undertaken in Stage 5 for supply side options would present the temporary and permanent loss as at Stage 3, and also take account of the areas planned for habitat creation and habitat improvement, including consideration of required mitigation for BNG (as calculated at Stage 4).

2.3.5.1 Stage 5 additions in comparison to Stage 3

As a proportionate approach has been taken there are key differences with the water purification, water regulation and natural hazard regulation assessments between Stage 3 and 5. The additional work that would be carried out in Stage 5 for these ecosystem services is outlined below.

Water purification

In addition to the qualitative assessment carried out in Stage 3, a baseline quantitative assessment for Water purification would be undertaken using the Natural Environment Valuation Online (NEVO)[19] .

Water regulation

A high-level assessment would be undertaken, based on the WFD status of a waterbody and the CAMS data to assess the water resource availability, identify water bodies status and any potential deterioration caused by the construction and operation of the scheme.

Natural hazard regulation

For the purposes of this assessment, flooding was determined to be the most significant natural hazard risk, however, the drought risk has also been considered. A high-level qualitative assessment would be undertaken based on the EA flood risk zones[20], this assessment would examine the grassland and woodland that would be impacted within the ZoI and would consider both the temporary and permanent loss caused by the construction and operation of the option. The drought risk would be considered in relation to the Catchment Abstraction Management Strategy (CAMS) data with the impact to groundwater and surface water resources reviewed at a high level. This approach would enable a high-level assessment of key questions related to economics, drought mitigation, water storage, and natural function.

2.3.6 Stage 6 – Potential Biodiversity Opportunity areas identification

For supply side options within the preferred programme, Potential Biodiversity Opportunity (PBO) areas would be identified. These sites would be within 5km of the option locations and would be identified based on a scoring system (as shown in **Table 2.6**). A bespoke model has been developed, as outlined in Figure 2.2. It pools together more than 20 datasets (outlined in **Table 2.6**) to identify the PBOs, assign scores to them so they could be prioritised, and identify the most suitable PBOs for habitat restoration or creation. The scoring system is largely based on the Lawton principles[21], whereby effort should be made for new/enhanced habitats to be actively incorporated into a healthy ecological network (including landscape corridors, buffer zones, sustainable use areas, etc.), rather than being isolated. In addition to the datasets listed in **Table 2.6**, the system also considers variables from the Biodiversity Metric.

Table 2.6 Scoring criteria for Potential Biodiversity Opportunity areas

Scoring criteria	Dataset/source	Score			
		3	2	1	0
Distance to pipeline	Pipeline options	<1 km	1-3 km	3-5 km	>5 km
Within same LPA as scheme/option – county boundaries	Pipeline options Ordnance Survey GB Counties	Yes	-	-	No

[19] https://sweep.ac.uk/portfolios/natural-environment-valuation-online-tool-nevo/

[20] https://flood-map-for-planning.service.gov.uk/location

[21] Prof. J. Lawton (2010), Making Space for Nature. Report for the UK Government

Scoring criteria	Dataset/source	Score			
		3	2	1	0
Non-statutory designation	Local wildlife sites, proposed country parks, ecosites	Yes	-	-	No
Proximity to statutory sites	National Nature Reserves, Ramsar sites, Special Areas of Conservation, Special Protection Areas, SSSI sites, Local Nature Reserves	Within 2 km	Within 5 km	-	No
Strategic significance designation	Canal conservation and restoration, green networks, local greenspace, special landscape, sites for green infrastructure	Yes	-	-	No
Proximity to ancient woodland	Ancient Woodland England and Wales	0.3 km	1 km	-	No
Owned/operated or managed by the relevant water company/companies	Information provided by relevant water company	Yes	-	-	No
Identified as common land	Common Land England	-	-	No	Yes
Size	Calculated using QGIS	>5 ha	1-5 ha	<1 ha	-

3. ASSESSMENT OF THE CONSTRAINED OPTIONS

This section outlines:

- The supply side options in the constrained list for BW WRMP24
- The final outcomes of the BNG and NC at an option-level for each of the options in the constrained list for BW WRMP24.

3.1 CONSTRAINED OPTIONS INCLUDED

Through an extensive optioneering process, considering a wide range of potential options to balance future supply and demand, BW have selected the most suitable options to make up the constrained options list. Only the supply side constrained options are presented below, as only these and not demand management options require BNG and NC assessments. The supply side options are presented in **Table 3.1.**

Table 3.1 Constrained options included within the WRMP24

Reference	Option Name/Brief	Option Category	Maximum Resource Value
P01-01	Charterhouse – Increase performance of existing sources to increase DO near to licensed quality	Resource Management (Water treatment works (WTW) capacity increase)	0.74Ml/d
P01-02	Forum – Increase performance of existing sources to increase DO near to licensed quality	Resource Management (WTW capacity increase)	1.59Ml/d
P06	Catchment Management of the Mendip Lakes (Chew, Blagdon and Cheddar) to manage outage risk from algal blooms	Resource Management (Catchment management)	0.7Ml/d
P08	Alderley WTW – Increase performance of existing sources (Alderley WTW) to increase DO	Resource Management (WTW capacity increase)	7.00Ml/d
R005	Cheddar Reservoir[22]	Resource Management (New Reservoir)	13.5Ml/d
R007	Pumped Refill of Chew Valley Reservoir	Resource Management (Reservoir enlargement)	25Ml/d
R08-02	Bathford – New water sources within Bristol Water CAMS area for the location Middle River Avon at Bathford	Resource Management (New surface water)	1.4Ml/d
R08-03	Frome at Frenchay - New water sources within Bristol Water CAMS area	Resource Management (New surface water)	1.1Ml/d

[22] Since the Draft WRMP24, it has been shown that there is not the need, in Bristol Water's supply area for an additional reservoir at the present time and as a result the option has been removed from Bristol Water's feasible options list. However, this option has been selected as a preferred option within the WCWR regional plan and is being developed within Bristol Water's supply area to serve the wider region as part of the RAPID gated process. Information concerning the Cheddar 2 option as assessed at the Draft WRMP24 stage has been retained in this report for reference.

Reference	Option Name/Brief	Option Category	Maximum Resource Value
	for the location Bristol Frome at Frenchay		
R014	Avonmouth WwTW Direct Effluent Reuse	Resource Management (Water reuse)	10Ml/d
R016	Huntspill Transfer	Resource Management (Internal raw water transfer)	20Ml/d
R24	Honeyhurst – Bring Honeyhurst source back into supply	Resource Management (New groundwater)	2.4Ml/d

3.2 STAGE 2 (BIODIVERSITY NET GAIN OUTCOMES)

The results of the Stage 2 Biodiversity Net Gain calculations are presented for all options in **Table 3.2.**

Table 3.2 Results of Stage 2 (constrained options) BNG calculations

WRMP24 ref.	Temporary area lost (ha)	Total units lost (ABHU)	Permanent area lost (ha)	Total units lost (ABHU)
P01_01	0.94	-4.44	0.02	-0.04
P01_02	0.42	-1.98	0.06	-0.06
P08	2.33	-19.08	0.02	0
R007	46.37	-176.85	0.19	-0.51
R014	23.83	-102.08	4.14	-9.01
R016	57.91	-563.14	0.95	-12.49
R08_02	49.8	-163.09	0.57	-3.05
R08_03	41.8	-149.91	0	0
R24	12.11	-43.41	0	0
P06	0	0	0	0
R005	171.63	-764.85	102.5	-599

Temporary losses of habitat (associated with pipeline construction) vary between 0 and -564.14 Area Based Habitat Units (ABHU) per option. The greatest losses are associated with options that have the longer lengths of new pipeline that will need to be installed. The types of habitats that would be disturbed by pipeline construction vary, with extensive areas of neutral grassland being lost.

Permanent losses of habitat include those associated with new permanent above-ground infrastructure. Permanent losses vary between 0 and -599 ABHU per option. If discounting R005 permanent habitat losses range between 0 and 12.49 ABHU per option, showing the most significant losses would be caused by the creation of the new reservoir.

3.3 STAGE 3 (NATURAL CAPITAL OUTCOMES)

The results of the Stage 3 Natural Capital calculations are presented for all options in **Table 3.3.**.

Table 3.3 Results of Stage 3 (constrained options) Natural Capital calculation

	Temporary impacts					Permanent impacts				
WRMP24 Ref.	Biodiversity	Climate Regulation	Natural Hazard Regulation	Recreation and Tourism	Agriculture	Biodiversity	Climate Regulation	Natural Hazard Regulation	Recreation and Tourism	Agriculture
	Hectares	£2019/year	£2019/year	£2019/year	£2019/year	Hectares	£2019/year	£2019/year	£2019/year	£2019/year
P01 01	-£0.94	-£208.82	-£67.54	£0.00	£0.00	-£0.02	-£0.46	£0.00	£0.00	-£0.02
P01 02	-£0.42	-£5.46	£0.00	£0.00	-£59.04	-£0.06	-£0.22	£0.00	£0.00	-£0.06
P08	-£2.33	-£417.69	-£187.37	£0.00	-£15.14	-£0.02	£0.00	£0.00	£0.00	-£0.02
R007	-£46.37	-£1,771.45	-£444.84	-£215,868.13	-£13,765.63	-£0.19	-£1.26	-£6.08	-£58.86	-£0.19
R024	-£11.97	-£80.94	-£43.49	-£65,441.79	-£2,155.19	£0.00	£0.00	£0.00	£0.00	£0.00
P06	na	na	na	na	na	na	na	na	na	na
R08 02	-£49.80	-£2,019.19	-£610.56	-£145,638.04	-£13,129.96	-£0.57	-£3.07	-£59.39	-£143.55	-£0.57
R08 03	-£41.80	-£1,178.80	-£507.20	-£241,149.39	-£12,059.72	£0.00	£0.00	£0.00	£0.00	£0.00
R14	-£23.04	-£677.71	-£539.39	-£127,097.54	-£1,137.60	-£4.14	-£118.45	-£241.95	£0.00	-£4.14
R16	-£57.91	-£1,167.54	-£2,068.78	-£280,635.16	-£3,681.91	-£0.95	-£25.58	-£6.55	£0.00	-£0.95
R005	-£171.63	-£3,153.18	-£718.67	-£310,165.02	-£50,569.00	-£102.54	-£1,068.40	-£246.52	-£27,558.49	-£102.54

3.3.1.1 Water purification

Table 3.4 presents the qualitative assessment that has been undertaken. Impacts to water purification services range from negligible to moderate.

Table 3.4 Water purification assessment results for the constrained options

WRMP24 Ref.	Water purification assessment
P01 01	Option does not intersect any WFD waterbodies. Water purification services are currently offered by woodland and grassland habitats. Construction of feature (pump upgrade) will have a moderate impact on water purification services.
P01 02	Option does not intersect any WFD waterbodies. There are no surrounding habitats providing water purification services which the scheme (WTW upgrade) will impact.
P08	Option does not intersect any WFD waterbodies, however one is in close proximity. Water purification services are currently offered by woodland habitats. Construction of feature (WTW upgrade) will have a moderate impact on water purification services.
R007	Option does not intersect any WFD waterbodies. Water purification services are currently offered by woodland and grassland habitats. Construction of feature (pipeline) will have a temporary moderate impact on water purification services. Option does not intersect any WFD waterbodies. Water purification services are currently offered by woodland and grassland habitats. Construction of feature (upgrade of sewage treatment works) will have a moderate impact on water purification services.
R024	Water purification services are currently offered by woodland/grassland/ grazing marsh habitats. Construction of feature (pipeline) will have a temporary moderate impact on water purification services.
P06	Water purification services would be improved under this option, raw water quality is likely to be improved, and there will be reduced nutrient losses to the environment. Natural capital benefits could arise from a farmed wetland being created. Other catchment management solutions within this scheme would not provide a natural capital benefit, such as installation of trackways etc, as while these options will improve water quality, they are not naturally provided. Scheme is likely to have a moderately good impact.
R08 02	Water purification services are currently offered by woodland/ grassland habitats. Construction of feature (pipeline) will have a temporary moderate impact on water purification services
R08 03	Water purification services are currently offered by woodland/ freshwater habitats. Construction of feature (pipeline) will have a temporary moderate impact on water purification services.
R14	Water purification services are currently offered by woodland, salt marsh, grazing marsh habitats. Construction of feature (pipeline) will have a temporary severe impact on water purification services. Water purification services are currently offered by woodland habitats. Construction of feature (storage reservoir) will have a moderate impact on water purification services.
R16	Water purification services are currently offered by grassland/ wetland/ grazing marsh habitats. Construction of feature (pipeline) will have a temporary moderate impact on water purification services.
R005	Option does not intersect any WFD waterbodies, however it is near a water body. Water purification services are currently offered by grazing marsh and grassland habitats. Construction of feature (reservoir) will have a significant impact on water purification services.

3.3.1.2 Recreation and tourism

Temporary losses of recreational benefits, as calculated using the Orval tool (described in **Section 2**), have been valued at between £0 and -£310,165 per year per option. The losses are associated with disruption to public footpaths, assuming that footpaths crossed by the pipeline route could not be used during construction. In general, options with longer pipelines and those in more highly populated/visited areas experience the greatest losses of value (the former because a longer pipeline has the potential to cross more footpaths. The latter because footpaths in highly populated/visited areas tend to have a higher value).

The values obtained from Orval provide a useful comparison between options. However, they should not be compared to the other monetised services that are discussed here, because the Orval values are considered to be incomparably high.

3.3.1.3 Agriculture

Temporary losses of the agriculture service have been valued at between £0 and -£50,569 per year per option. The greatest losses relate to long pipelines that cross extensive areas of farmland.

Permanent losses of the agriculture service have been valued at between £0 and -£103 per year per option, minimal permanent loss is expected.

4. ASSESSMENT OUTCOMES FOR THE PREFERRED PROGRAMME AND ANY REASONABLE ALTERNATIVES

The WRMP24 preferred programme and majority of the alternative programmes developed by BW only involve leakage reduction and demand policy delivery-based options with no supply side options selected. As such, assessment Stages 4 – 6 have not been conducted in line with providing a proportionate assessment.

Option P06 has been selected in the preferred plan, this option looks at a catchment management approach of the Mendip Lakes. Due to the nature of this option not being a detriment to the environment and not requiring BNG uplift, assessment Stages 4 – 6 were not possible or necessary. However, a list of benefits has been provided below.

Environmental benefits

- Improved raw water quality
- Reduced nutrient losses to the environment (soils and water)
- Improved biodiversity and habitat (wetlands/watercourses/soil health)
- Improved air quality (slurry store / spreading improvements)
- Reduced nitrous oxide emissions from bare, waterlogged soils
- Reduced algae growth
- Reduced flooding risks from soil health improvements
- Reduced greenhouse gas emissions than a grey solution

Business benefits

- Reduced water treatment operational costs (Opex) from improved raw water quality
- Offset capital investment (capex) from delaying future treatment need
- Reduced likelihood of disruptions to supply from pollution events
- Meets WFD requirements to not rely on further water treatment

Social benefits

- Improved reputational impact with customers
- Improved reputational impact with stakeholders (farmers, charities, regulators)
- Mostly green or nature-based solutions
- Reduced risk from algae to dogs, walkers and swimmers

Agricultural benefits

- Improved farm infrastructure
- Improved nutrient use on farm (reduced fertiliser use through utilisation of manures)
- Reduce soil loss from erosion
- Improved soil health (increased organic matter from cover cropping)
- Accessibility to free environmental advice
- Improved operations / management on farm (tidying yards for example)
- Improved animal welfare due to reduced poaching / muddy fields
- Improved water resource use (rainwater harvesting)

Additionally, the ‘High demand’ scenario and the ‘Plausible worst case climate change and demand’ scenario contain supply options. Under these worst-case scenarios the supply options are shown not to be required until after 2068 (well beyond the statutory planning period). Undertaking assessment Stages 4 – 6 on the supply side options in the alternative programmes would not be valuable at this stage due to the uncertainties involved.

5. SUMMARY

This report has presented the Biodiversity Net Gain and Natural Capital Assessments that have been undertaken for Bristol Water’s Water Resources Management Plan 2024. The approaches taken are in line with relevant guidance, notably the WRPG 2024 Supplementary Guidance on Environment and Society in Decision-making.

For the constrained options in the BW WRMP24, this report has presented losses of biodiversity associated with all supply side options that involve any temporary or permanent land-take. The losses have been assessed using the Defra biodiversity metric v3.0, based on spatial land use and habitat datasets with national coverage. Associated natural capital losses have been calculated for an agreed selection of ecosystem services. The assessment shows that the greatest impacts on biodiversity and associated regulating ecosystem services are associated with land that would be temporarily lost due to the Huntspill Transfer scheme, due to the pipeline that would be created. If this option had been selected for the preferred programme, the environmental impact would have been reduced due to BNG mitigation being created.

As BW have identified they can maintain supply to 2080 with a plan that is focused on demand reduction rather than developing new water resources, further stages of assessment looking at achieving biodiversity net gain, recalculating the impact on the ecosystem services, and then conducting opportunity mapping was not required. However, a qualitative assessment of the proposed catchment management option has been provided to demonstrate the beneficial impact on ecosystem services that the delivery of this scheme brings.

APPENDICES

Appendix A Natural Capital assumptions and caveats

Ecosystem service	Compliance level	Type of assessment	Caveats and assumptions
Biodiversity	Minimum	Qualitative	Full best practice not available at this stage as no data related to condition and extent of habitats, will require more detailed assessment at planning stage
	N/a	Monetisation	Limited data to apply any proportional monetised approach at this stage. Would require more detailed assessment at planning stage and any future monetisation agree with regulators if required.
Climate Regulation	Minimum	Qualitative	Knowledge of this in Hectares (Ha) provide an assessment of habitats with carbon storage potential that maybe lost (temporary and permanent) with a key focus on grassland and woodland.
Water Purification	Minimum	Qualitative	High level assessment at this stage. Future and current abstractors need to be reviewed during stakeholder engagement at detailed planning stage.
Recreation	Not essential	Monetised (losses only) provided	Values only relate to recreational assets that will be lost temporarily.

Appendix B Conversion from UKHab to Broad Habitats

Land Cover Classification	Broad habitat type
Cropland – Cereal crops	Arable
Modified grassland	Semi natural grassland
Heathland and shrub	Heathland and shrub
Lowland mixed deciduous woodland	Deciduous woodland
Neutral grassland	Semi natural grassland
Lakes – pond	Freshwater
Other coniferous woodland	Coniferous woodland
No habitat	Urban
Broadleaved woodland	Deciduous woodland
Poor semi-improved grassland	Semi natural grassland
Other rivers and streams	Freshwater
Eutrophic standing waters	Freshwater
Other coniferous woodland	Coniferous woodland
River and streams	Freshwater
Sparsely vegetated land	Sparsely vegetated land
Lowland heathland	Heathland and shrub
Other woodland mixed	Deciduous woodland
Traditional orchards	Semi natural grassland
Lowland meadows	Semi natural grassland
Floodplain wetland mosaic	Semi natural grassland
Traditional orchards	Semi natural grassland
Bramble	Heathland and shrub

T: +44 (0) 1235 75 3000
E: enquiry@ricardo.com
W: ee.ricardo.com